

申 报	系列：教师系列
	专业：企业管理
	职称：教授

业绩成果材料

（申报人的业绩成果材料包括论文、科研项目、获奖以及其他成果等）

单 位（二级单位） 经济管理学院

姓 名 郭 萍

材料核对人：

单位盖章：

核对时间：

华南农业大学制

目 录

一、教学研究业绩

1.教学研究项目：

- 1.1 关于《涉农企业管理教学案例库》项目（B类）的立项通知及
有关佐证材料 4
- 1.2 关于《领导力与高效管理》思政示范课程建设项目（B类）
的立项通知及有关佐证材料 7
- 2.编写教材：《绩效管理：理论与案例》 10

二、科研项目

1.主持：

- 1.1 关于《女性参与治理与家族企业成长》项目（国家社科基金）
的立项通知及有关佐证材料 15
- 1.2 关于《家族企业对员工更好吗？——基于广东省的调查研究》
（B类）的立项通知及有关佐证材料 19

三、论文、著作等

- 1.检索证明..... 23
- 2.以第一作者发表本专业论文情况
 - 2.1 Female CEOs and green innovation in family firms: promoting
or inhibiting?（T2类）25
 - 2.2 女性CEO会雇佣更多的女性下属吗？——基于中国家族上市
公司的经验数据（A类） 49
 - 2.3Female CEOs and earnings management: examining risk aversion
versus social identity theories（B类）65
 - 2.4 独生子女家族企业的传承研究：基于比较的视角（C类） ..89
- 3.以通讯作者发表本专业论文情况
 - 3.1 An integrated decision framework for resilient sustainable waste
electric vehicle battery recycling transfer station site selection（T₂

类)	97
3.2 近代中国民营企业的科学管理 (A 类)	118
3.3 抗战前中国民营棉纺织企业成长因素分析 (1894-1937) (A 类)	136
4. 学术专著:《家族治理与民营企业成长:理论与案例研究》 (B 类)	159

四、其他业绩

1.个人荣誉

1.1 校级“教书育人先进个人”证书	164
1.2 校级“优秀班主任”证书	164

教育部全国高等学校 农业经济管理类专业教学指导委员会

农经教指委【2023】第5号

签发：唐忠

关于 2023 年度本科教学质量与教学改革工程 项目评审立项结果的通知

各位委员、各有关单位：

截至 2023 年 8 月，农经教指委本科教学质量与教学改革工程项目收到立项申报 78 项，其中一般项目 38 项，思政项目 37 项，虚拟教研室项目 3 项。根据同单位回避原则，本教指委全体委员分为两组开展三类项目立项评审工作。各位评审委员对申报材料进行了认真评审、严格把关，按照同意票超过 2/3 的原则对申请项目进行评审，结果如下：同意立项 76 项，其中一般项目 37 项，思政项目 36 项，虚拟教研室 3 项。现将具体评审结果发给各委员及有关单位。

附件1：农经教指委2023年本科教学改革与质量建设研究项目立项评审结果（一般项目）

附件2：农经教指委2023年本科教学改革与质量建设研究项目立项评审结果（思政项目）

附件3：农经教指委2023年本科教学改革与质量建设研究项目立项评审结果（虚拟教研室项目）

根据教育部教高厅函【2014】2号的通知，指导委员会由主任委员所在单位代章。
——教育部高校农经教指委秘书处

教育部全国高等学校农业经济管理类专业教学指导委员会
2023年9月25日

主题词：教学改革项目立项通知

报：教育部高教司

发：主任委员、副主任委员、秘书长、委员

农业经济管理类专业教学指导委员会 2023 年 9 月 25 日印发

附件2:

农经教指委 2023 年本科教学改革与质量建设研究项目立项评审结果

(思政项目)

序号	项目批准号	申请人	专业职务	单位	项目名称
1	NJX23101	宋亮	讲师	安徽农业大学	农林经济管理专业课程思政体系的构建研究——以安徽农业大学为例
2	NJX23102	肖双喜	副教授	安徽农业大学	农林经济管理专业思政建设模式研究
3	NJX23103	秦会艳	讲师	东北林业大学	新农科背景下生态经济学课程思政建设的探索与实践
4	NJX23104	戴永务	教授	福建农林大学	习近平生态文明思想引领下《林业经济学》课程思政资源库建设
5	NJX23105	邓燕雯	副教授	福建农林大学	管理学原理课程思政示范课建设探索与实践
6	NJX23106	袁鹏举	副教授	贵州大学	基于价值引领和创业能力培养的《农业企业管理》课程思政教学模式研究
7	NJX23107	袁智慧	副教授	贵州大学	《财务管理》“课程思政”示范课建设与实践
8	NJX23108	李滢	副教授	河北农业大学	农林经济管理专业计量经济学课程思政教学模式研究
9	NJX23109	石国华	讲师	河北农业大学	深度学习及 PBL 理念下专业核心课程思政教学创新实践研究
10	NJX23110	袁伟民	讲师	河北农业大学	基于 OBE 理念的“三位一体”课程思政教学模式研究——以“农业推广学”为例
11	NJX23111	陈晓敏	副教授	华南农业大学	立经世济民之志，学过硬专业本领——《会计学原理》课程思政示范课程建设
12	NJX23112	郭萍	副教授	华南农业大学	《领导力与高效管理》思政示范课程建设
13	NJX23113	钟文晶	副教授	华南农业大学	原创案例赋能课程思政，厚植“三农”情怀——《新制度经济学》课程思政示范课建设
14	NJX23114	贝淑华	讲师	南京林业大学	《中国对外贸易发展概论》课程思政教学模式创新研究
15	NJX23115	肖静	副教授	南京林业大学	《运筹学》课程思政建设创新研究
16	NJX23116	葛继红	教授	南京农业大学	《农产品运销学》课程思政示范课程建设

17	NJX23117	李强	讲师	青岛农业大学	农业经济管理专业课课程思政教学模式创新
18	NJX23118	李欣	副教授	上海海洋大学	基于 OBE 理念的《大国海洋》课程思政教学设计研究
19	NJX23119	高凌云	讲师	沈阳农业大学	基于链式教学模式的《农村金融学》课程思政教学改革研究
20	NJX23120	张良	副教授	四川农业大学	服务农业现代化的“财会监督课程群”建设探索与实践
21	NJX23121	闫振宇	副教授	西北农林科技大学	《农村公共管理》课程思政“三位一体”模式探索与实践
22	NJX23122	余建宇	教授	西南财经大学	《中国农业产业组织》国际化教学课程思政建设
23	NJX23123	高静	教授	西南大学	《生态经济学》课程思政的科学伦理特色建设
24	NJX23124	邓羽佳	副教授	新疆农业大学	《农产品国际贸易》课程案例教学嵌入思政元素的内容及方式研究
25	NJX23125	郭琳	讲师	新疆农业大学	嵌入式《管理学原理》课程思政教学体系探索
26	NJX23126	逢春蕾	讲师	新疆农业大学	基层党建与农林经济管理学科专业建设协同模式研究
27	NJX23127	黄春燕	教授	扬州大学	思政元素与专业知识融合视角的课程思政建设研究——以《农业经济学》为例
28	NJX23128	夏莉艳	副教授	扬州大学	外国农业经济学课程思政教学研究
29	NJX23129	张玉娥	讲师	扬州大学	《农产品国际贸易》课程思政示范课建设研究
30	NJX23130	李永前	教授	云南农业大学	《农产品营销学》课程思政与专业教学互融研究
31	NJX23131	宋丽华	讲师	云南农业大学	农林经济管理专业《经济法》课程思政研究
32	NJX23132	杨洁	讲师	云南农业大学	“三全育人”视角下财政学课程思政教学模式研究
33	NJX23133	郭鸿鹏	教授	吉林大学	《计量经济学》用数据讲好中国农业农村发展故事
34	NJX23134	丛志强	副教授	中国人民大学	新农科与新文科交叉融合的课程建设创新：以《融合设计振兴乡村》为例
35	NJX23135	吕亚荣	副教授	中国人民大学	践学研学：创新《调查研究方法》课程思政建设路径
36	NJX23136	唐建军	教授	中国人民大学	农业经济管理类本科专业课程思政模式研究——以《经济学原理》为例

广东省教育厅

粤教研函〔2022〕1号

广东省教育厅关于公布 2022 年广东省 研究生教育创新计划项目的通知

各研究生培养单位：

为加强创新人才培养体系建设，进一步改革人才培养机制和创新人才培养模式，形成有利于高层次、高质量、创造性人才培养的研究生培养体系，提升研究生创新能力，提高研究生培养质量，今年我厅继续实施广东省研究生教育创新计划项目。经学校推荐并组织专家评审，现认定“中山大学第七届‘海纳百川’模拟国际学术论坛”等 76 个项目立项为 2022 年广东省研究生学术论坛，“2023 年中山大学天琴中心引力波暑期学校”等 27 个项目立项为 2022 年广东省研究生暑期学校，“面向高质量发展的地理学研究生培养体系改革研究”等 155 个项目立项为 2022 年广东省学位与研究生教育改革研究项目，“国际中文教育研究方法”等 95 项课程立项为 2022 年广东省研究生示范课程建设项目，“《财务报表分析》课程教学案例库建设”等 82 个项目立项为 2022 年广东省研究生案例库建设项目，中山大学与佛山市顺德

区旺海饲料实业有限公司联合共建的研究生联合培养基地等 83 个基地为 2022 年广东省联合培养研究生示范基地。具体名单附后。

请各有关高校根据相关规定要求，切实履行管理职责，进一步完善管理制度，规范项目管理，为项目实施提供支持保障，确保实施进度，达到预期目标。

- 附件： 1. 2022 年广东省研究生教育创新计划项目一览表
（分发）
2. 2022 年广东省联合培养研究生示范基地一览表
（分发）



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校对入：阮念

附件1

2022年广东省研究生教育创新计划项目一览表（分发）

单位	序号	项目名称	立项类别	负责人姓名	项目批准号
华南农业大学	1	高校研究生“导学思政”模式建构路径研究	学位与研究生教育改革研究	孔晓娟	2022JGXM019
华南农业大学	2	农业专业学位研究生“专项制”培养模式改革研究	学位与研究生教育改革研究	邓诣群	2022JGXM020
华南农业大学	3	科技小院“五协同”创新型乡村振兴人才培养模式研究	学位与研究生教育改革研究	杨慧荣	2022JGXM021
华南农业大学	4	国际视野下研究生课程建设研究——以科学技术史学科为例	学位与研究生教育改革研究	陈志国	2022JGXM022
华南农业大学	5	基于校企协同育人的风景园林专业学位研究生实践能力培养模式创新研究	学位与研究生教育改革研究	刘小蓓	2022JGXM023
华南农业大学	6	大数据视角下专业学位研究生实践能力需求与培养研究——以计算机技术领域为例	学位与研究生教育改革研究	张建桃	2022JGXM024
华南农业大学	7	数智时代艺工农交叉融合的艺术硕士专业实践环节创新与探索	学位与研究生教育改革研究	邹岚	2022JGXM025
华南农业大学	8	基因工程原理与方法	研究生示范课程建设项目	周海	2022SFKC017
华南农业大学	9	舞台正音与表演	研究生示范课程建设项目	郑颜文	2022SFKC018
华南农业大学	10	园艺植物基因工程原理与技术	研究生示范课程建设项目	陈长明	2022SFKC019
华南农业大学	11	科学技术史	研究生示范课程建设项目	赵艳萍	2022SFKC020
华南农业大学	12	分子数量遗传学	研究生示范课程建设项目	刘桂富	2022SFKC021
华南农业大学	13	蚕桑资源利用课程教学案例库	专业学位研究生教学案例库建设项目	刘吉平	2022ANLK014
华南农业大学	14	网络食品犯罪案例库建设	专业学位研究生教学案例库建设项目	杜国明	2022ANLK015
华南农业大学	15	新工科典型工程教学仿真案例库建设	专业学位研究生教学案例库建设项目	丛沛桐	2022ANLK016
华南农业大学	16	专业学位研究生高级植物学课程教学案例库的建设与应用	专业学位研究生教学案例库建设项目	白玫	2022ANLK017
华南农业大学	17	涉农企业管理教学案例库	专业学位研究生教学案例库建设项目	郭萍	2022ANLK018
华南农业大学	18	农业产业振兴社会调查研究——《社会调查研究方法》课程教学案例库建设	专业学位研究生教学案例库建设项目	齐文娥	2022ANLK019
华南农业大学	19	《现代翻译技术》涉农翻译教学案例库建设	专业学位研究生教学案例库建设项目	吕靖	2022ANLK020

理论
与
案例

绩效管理

Performance
Management



郭 萍 编著



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Contents



目 录

绩效管理

理论与案例

001 前 言

001 第一章 导 论

004 第一节 什么是绩效

007 第二节 如何进行绩效管理

010 第三节 为何进行绩效管理

011 第四节 谁来进行绩效管理

014 案例 1 腾讯的人力资源三支柱模型

016 案例 2 某集团公司人力资源三支柱变革

021 第二章 绩效计划

024 第一节 绩效计划的制订流程

027 第二节 绩效指标的设计与提取

031 第三节 绩效标准的确定

034 第四节 绩效指标的权重设置

037 第五节 绩效考核周期的设定

038 第六节 绩效合约的形成与确认

043 第三章 绩效沟通与辅导

046 第一节 绩效沟通

050 第二节 绩效信息收集

052 第三节 绩效辅导

056 案 例 星巴克一线经理对员工的绩效辅导

057 第四章 绩效考核设计

060 第一节 绩效考核方法的分类

062 第二节 绩效考核主体的选择

065 第三节 绩效考核的基本流程

069 第五章 非系统性的绩效考核方法

072 第一节 相对评估法

075 第二节 绝对评估法

079 案例 Facebook 的 360 度考核

080 第三节 行为导向型考核方法

085 第四节 特征导向型考核方法

089 第五节 绩效考核误区及规避方法

093 第六章 基于关键绩效指标的绩效考核

096 第一节 关键绩效指标概述

097 第二节 关键绩效指标体系的构建

102 案例 1 KPI 分解实例

105 第三节 关键绩效指标考核的优缺点

105 案例 2 小米手机：从“去 KPI”到重回 KPI

109 第七章 基于平衡计分卡的绩效考核

112 第一节 平衡计分卡的发展历程

114 第二节 平衡计分卡的基本内容

116 案例 1 海底捞平衡计分卡的逻辑

119 第三节 基于平衡计分卡的绩效指标开发

123 第四节 平衡计分卡考核的优缺点与适用条件

128 案例 2 新奥集团个人平衡计分卡的实践

131 第八章 绩效反馈

134 第一节 绩效反馈概述

136 第二节 绩效反馈面谈

142 第三节 绩效申诉

145	第九章 绩效考核结果的应用
148	第一节 绩效改进
151	第二节 在员工薪酬中的应用
154	案例 1 某公司年度绩效考核奖励基金管理制度
157	第三节 在岗位调配中的应用
159	案例 2 华为的“能力—绩效”九宫格
160	第四节 在员工培训中的应用
161	案例 3 某集团关于骨干员工的培养规划
162	案例 4 华为的人才培养体系
165	第十章 绩效管理新趋势之一：目标与关键成果法（OKR）
168	第一节 OKR 的起源与发展
170	第二节 OKR 的基本操作流程
173	第三节 OKR 与 KPI 的比较
175	第四节 OKR 的优点与适用条件
177	案 例 理想汽车的 OKR 实践
183	第十一章 绩效管理新趋势之二：游戏化管理
186	第一节 游戏化管理概述
187	第二节 游戏化管理的设计要素
189	第三节 游戏化管理与传统绩效管理的比较
191	案 例 步科销售团队的游戏化管理实践
195	参考文献

全国哲学社会科学规划办公室

2017 年度国家社会科学基金项目 立项通知书

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女性参与治理行为与家族企业成长研究

获准立项，批准号 17BGL081 ，项目类别 一般项目 ，

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全国哲学社会科学规划办公室

2017年6月30日

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广东省哲学社会科学规划专项小组

粤社科规专通〔2024〕38号

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广东省哲学社会科学规划专项小组

广东省哲学社会科学规划领导小组办公室（代章）

2024 年 7 月 11 日

SCAULIB202625697

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2	女性 CEO 会雇佣更多的女性下属吗?——基于中国家族上市公司的经验数据	商业经济与管理 出版年: 2020 卷期: 页码: - 文献号: 文献类型:	第一	A 类	华南农业大学	CSSCI, 北大核心	无	无
3	近代中国民营企业的科学管理	上海经济研究 出版年: 2019 卷期: 页码: - 文献号: 文献类型:	通讯作者	A 类	华南农业大学	CSSCI, 北大核心	无	无

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5	独生子女家族企业的传承研究:基于比较 的视角	理论月刊 出版年: 2015 卷期: 页码: - 文献号: 文献类型:	第一	C类	华南农业大学	北大核心	无	无

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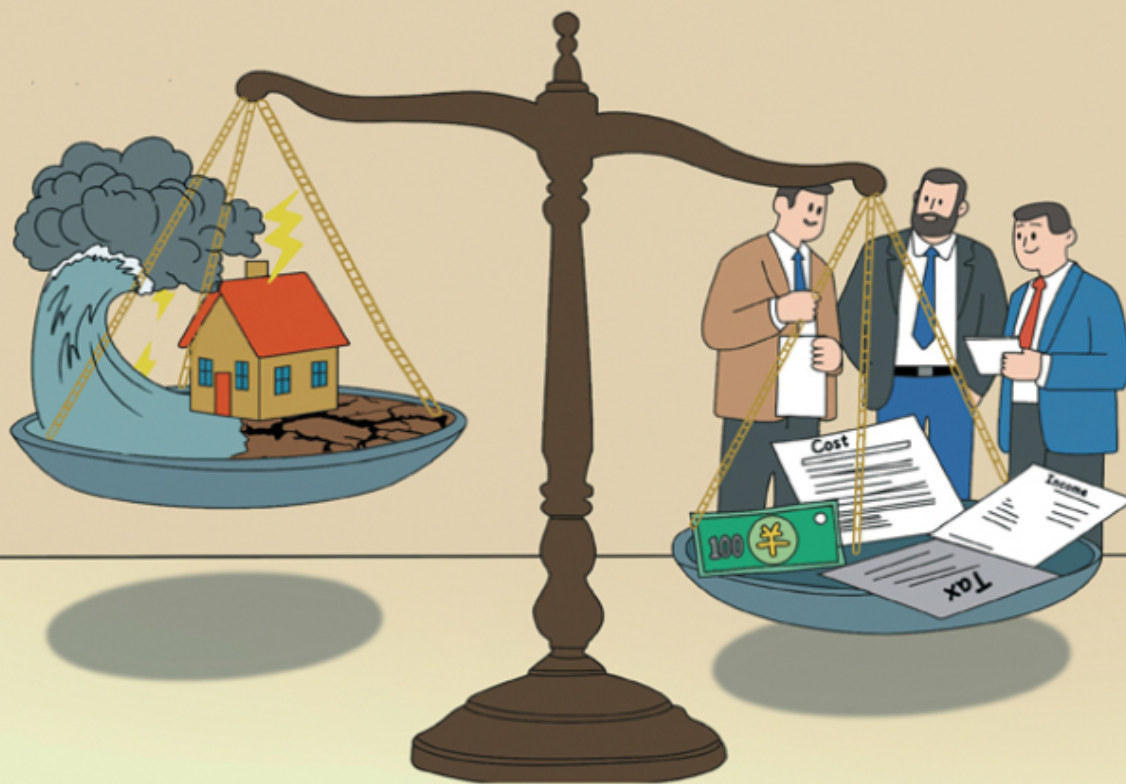
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Giuseppe Nicolo, Giovanni Zampone, Giuseppe Sannino, Paolo Tartaglia Polcini

Pages: 9040-9058 | First Published: 07 July 2025

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Female CEOs and Green Innovation in Family Firms: Promoting or Inhibiting?

Ping Guo, Yijun Liu, Jiannan Yu, Yanyan Chen

Pages: 9059-9080 | First Published: 07 July 2025

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Joan Torrent-Sellens, Mihaela Enache-Zegheru, Pilar Ficapal-Cusí

Pages: 9093-9119 | First Published: 07 July 2025

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Aymen Ammari, Kaouther Chebbi

RESEARCH ARTICLE

Female CEOs and Green Innovation in Family Firms: Promoting or Inhibiting?

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Correspondence: Yanyan Chen (daisycyy5@hotmail.com)

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Keywords: CEO gender | family firms | green innovation | role congruity theory | socioemotional wealth theory

ABSTRACT

Green innovation involves both environmental protection and significant risk, posing a strategic challenge for top management. Existing research provides inconclusive evidence on the influence of executive gender on green innovation, particularly within family firms. Drawing on role congruity theory and socioemotional wealth theory, this study investigates the impact of female CEOs on green innovation in Chinese listed family firms from 2010 to 2021. Employing OLS regressions with year and industry fixed effects, we demonstrate that female CEOs inhibit green innovation compared to male counterparts. This finding remains robust after addressing endogeneity through propensity score matching, instrumental variable methods, and difference-in-differences estimation, as well as after various robustness tests. Female leadership representation, family control, and male offspring involvement mitigate this negative relationship, while regional gender inequality exacerbates it. Notably, the inhibitory effect disappears when family control exceeds 55%. Furthermore, female CEOs tend to substitute green innovation with corporate social responsibility activities. Our study expands the understanding of the boundary conditions for female leadership decisions and provides empirical insights into the role of female executives in shaping sustainable development in family firms.

1 | Introduction

Green innovation plays a pivotal role in facilitating corporate green transformation by enabling cost-effective environmental protection (Adams et al. 2016; Atif et al. 2020). Upper echelon theory posits that the demographic characteristics of top leaders, such as gender, influence their cognitive patterns and strategic decisions (Ryan 2017; Arena et al. 2018). However, previous studies present conflicting findings on the relationship between female executives and green innovation, with some suggesting a

positive impact while others indicate a negative one. These contradictions may arise from theoretical divergence and methodological inconsistencies.

Social role theory suggests that the socialization process endows female executives with heightened ethical sensitivity, thereby promoting environmental protection (Eagly and Johannesen-Schmidt 2001; Eagly et al. 2003). Empirical studies show that female directors or CEOs promote green innovation (He and Jiang 2019; Nadeem et al. 2020; Javed

Abbreviations: CEOs, chief executive officers; CNRDS, Chinese Research Data Services; CSMAR, China Stock Market & Accounting Research; CSR, corporate social responsibility; SEW, socioemotional wealth; SOEs, state-owned enterprises.

et al. 2023), greenhouse gas disclosure (Ben-Amar et al. 2017; Hollindale et al. 2019), and environmental performance (Cordeiro et al. 2020). In contrast, risk aversion theory argues that female executives are more conservative in decision-making (Croson and Gneezy 2009; Huang and Kisgen 2013). Some studies show that female executives significantly inhibit green innovation (Ma et al. 2022; Tang and Li 2024). Inferring female executives' decision-making solely from gender traits overlooks their simultaneous leadership roles. When societal expectations of gender roles conflict with those of leadership, the impact on strategic decision-making remains unclear. Thus, role congruity theory may offer a more appropriate theoretical framework (Eagly and Karau 2002).

Methodological inconsistencies further complicate these findings. First is divergent operationalization of "female executives." Some studies narrowly focus on the proportion of female directors (He and Jiang 2019; Nadeem et al. 2020), though McGuinness et al. (2017) note that the presence of women on boards does not guarantee active decision-making participation and may be influenced by gender quotas. Second is variability in measuring green innovation. Nadeem et al. (2020) proxy green innovation through environmental innovation scores from the ASSET4 database, while most studies adopt green patents to measure green innovation. They identify green patents with their own keywords in patent databases (He and Jiang 2019; Ma et al. 2022; Javed et al. 2023; Tang and Li 2024). The subjectivity inherent in keyword-based green patent classification raises reliability concerns.

Existing research also inadequately addresses contextual contingencies shaping the relationship between executive gender and green innovation. Family firms are characterized by the intertwining of business and family systems, with strategic decision-making primarily influenced by the socioemotional wealth objectives of controlling families (Lumpkin and Brigham 2011; Miller and Breton-Miller 2014). This unique context renders family firms an especially valuable sample for examining green innovation decisions. However, existing research has not sufficiently addressed the distinctiveness of family firms (Li and Tang 2010).

To address these gaps, based on the role congruity theory and socioemotional wealth theory, we examine the impact of female chief executive officers (CEOs) on green innovation among Chinese listed family firms from 2010 to 2021. As the principal strategist and decision-maker, the CEO's influence surpasses that of other executive team members (Jeong and Harrison 2017). Moreover, the CEO's role often extends to directorships and key board committees, enhancing their impact beyond that of a typical board member. By focusing on the gender of core decision-makers, our research design offers a more precise theoretical explanation for the relationship between female leadership and green innovation. Furthermore, for measuring green innovation, we utilize data from the Chinese Research Data Services (CNRDS) database, which provides standardized annual records of listed firms' green patent applications and grants, including document numbers, application dates, and approval timelines. CNRDS data, increasingly adopted in recent studies (Wang, Ma, et al. 2023; W. Zhang et al. 2024), reduce classification bias and enhance comparability.

Our study investigates two research questions: (1) Do female CEOs promote or inhibit green innovation in family firms? (2) What are the moderating factors influencing the association between female CEOs and green innovation? We find that female CEOs engage in less green innovation compared to male counterparts. Our results indicate that female leadership representation, family control, and male offspring involvement mitigate this negative relationship, while regional gender inequality exacerbates it.

Our study contributes to the literature in two ways. First, drawing on role congruity theory, we analyze the relationship between female CEOs and green innovation, emphasizing the conflict between gender roles and leadership roles faced by female CEOs in strategic decision-making. While the pro-environmental orientation of women's gender roles may promote green innovation, their risk-averse tendencies may inhibit it. However, previous research has not fully explored the potential negative impact of socially constructed leadership roles on female CEOs' green innovation behavior. Our study highlights that organizational gender discrimination can intensify female CEOs' concerns regarding the legitimacy of their leadership, prompting a greater focus on job security over environmental initiatives and resulting in less green innovation compared to male CEOs. Moreover, the moderating effects of regional gender inequality and female leadership representation further support role congruity theory, which emphasizes prejudice against female leaders.

Second, we extend the application of socioemotional wealth (SEW) theory to the context of green innovation in family firms. We show that the pursuit of extended SEW, such as family succession intentions, can mitigate the negative association between female CEOs and green innovation. Conversely, when family control is low, controlling families may avoid green innovation to prevent potential threats to their control, in line with restricted SEW goals. As family control increases, the inhibiting effect of female CEOs on green innovation diminishes. Notably, when family control surpasses a threshold of 55%, female CEOs no longer inhibit green innovation.

The rest of this study is organized as follows. In Section 2, we conduct a theoretical analysis and develop our hypotheses. Section 3 outlines the sample selection and research methodology. Section 4 presents the results of various empirical analyses, while Section 5 concludes the study.

2 | Theoretical Model and Hypothesis Development

We construct our theoretical framework using role congruity theory and socioemotional wealth theory (see Figure 1). Drawing on role congruity theory, we develop our main hypothesis that female CEOs inhibit green innovation. Then, we examine four moderators influencing the relationship between female CEOs and green innovation. Drawing on role congruity theory, we analyze the moderating effects of regional gender inequality and female leadership representation. Grounded in socioemotional wealth theory, we assess how family control and male offspring involvement shape this association.

has prioritized environmental protection and implemented carbon emission control policies. State-owned enterprises (SOEs) are more actively aligned with the government's priorities and participate in environmental initiatives (Li and Tang 2010). In contrast, family firms are not obligated to meet such social objectives as environmental protection. SOEs are required to take on part of the government's environmental goals, which encourages their female CEOs to engage in green innovation practices. In this context, the female leadership roles and gender roles are synergistically consistent. However, female CEOs in family firms lack this external force, so they are more cautious in assessing the potential risks that green innovation may pose to their positions.

Drawing on role congruity theory, we posit that female CEOs in family firms prioritize leadership legitimacy and job security over environmental stewardship. To consolidate authority and demonstrate managerial competence, they avoid high-risk innovations with uncertain returns. Coupled with the lack of external environmental mandates akin to SOEs, this dynamic suppresses green innovation. Therefore, we propose the first hypothesis:

Hypothesis 1. *Family firms with female CEOs display a lower level of green innovation than family firms with male CEOs.*

2.2 | Moderating Effect on Female CEOs–Green Innovation Relationship

2.2.1 | Moderating Effect of Regional Gender Inequality

The institutional perspective on management states that firms, as well as individual managers, are embedded in an institutional environment that shapes their actions and affects the outcomes of these actions (Scott 2008). More specifically, informal norms alter the costs and gains of economic activities by influencing transaction costs and resources. Following this institutional perspective, Hoch and Seyberth (2022) demonstrate that gender inequality weakens the positive effect of gender diversity on firms' market valuation, and Amore et al. (2014) show the positive effect of female interactions on profitability is reduced when the firm is located in areas characterized by gender prejudices.

Accordingly, institutions play a moderating role in the relationship between female CEOs and green innovation. Drawing on role congruity theory, female CEOs engage in less green innovation due to the conflict between their gender roles and leader roles. We posit that regional gender inequality exacerbates the negative relationship by identifying this conflict. The socio-cultural environment, through customs and popular discourses, generates normative concepts that subsequently define the social status and behavioral norms of both sexes in both public and private spheres (Yang 2017). China's vast geographic and cultural diversity—shaped by historical, linguistic, religious, and demographic factors (Zhao et al. 2015)—has led to pronounced regional disparities in gender norms. For instance, regions dominated by multi-generational single-surname clans often exhibit rigid adherence to traditional patriarchal norms. In contrast, areas

characterized by mixed-surname immigrant communities tend to adopt more flexible social conventions. While gender equality has improved nationally, significant regional imbalances persist, with some regions even regressing toward traditional adages such as “marrying well supersedes professional success.”

In regions with progressive gender role perceptions, the social roles and decision-making preferences of male and female leaders converge. Conversely, in areas entrenched with “male superiority” cultural traditions, women's social roles remain distinct from men's, and female leaders often exhibit more conservative personality traits. This divergence amplifies the glass ceiling for female CEOs in patriarchal regions, where job insecurity motivates risk-averse strategies. Given green innovation's high upfront costs and delayed returns, female CEOs in such contexts are more likely to avoid it. This rationale proposes Hypothesis 2:

Hypothesis 2. *Regional gender inequality exacerbates the negative relationship between female CEOs and green innovation in family firms.*

2.2.2 | Moderating Effect of Female Leadership Representation

Individuals define themselves based on their membership in specific groups, such as gender, race, class, and occupation. After self-categorization and comparison with other groups, individuals gradually develop a sense of identity associated with their belonging to a particular group (Hogg et al. 1995). Due to gender identity, female interactions have been shown to benefit women. Prior studies document that female directors increase the likelihood that firms will appoint female CEOs (Wang and Kelan 2013; You 2019), female board chairs (Wang and Kelan 2013), and female share among top executives (Matsa and Miller 2011).

According to role congruity theory, female CEOs engage in less green innovation due to the conflict between their gender roles and leader roles. However, we posit that female leadership representation fosters a more positive working relationship among women, thereby mitigating the negative impact of female CEOs on green innovation. First, female executives may enhance self-esteem and reduce the psychological burden for female CEOs operating in a male-dominated leadership environment (Koenig et al. 2011). Second, a critical mass of women in leadership also encourages cooperation and information exchange (Amore et al. 2014), enabling female CEOs to advocate more effectively for green innovation. Their interactions with female CEOs enhance women's pro-environmental inclinations and bolster their “confidence” in making green innovation decisions. Generally, a higher representation of female leadership implies more female interaction and a diminished influence of male executives, thereby reducing female CEOs' job insecurity associated with the risks of green innovation. Based on this analysis, we propose Hypothesis 3:

Hypothesis 3. *Female leadership representation mitigates the negative relationship between female CEOs and green innovation in family firms.*

2.2.3 | Moderating Effect of Family Control

Family firms are distinctive in that their objectives are shaped not only by economic goals but also by the emotional priorities of the controlling family, known as socioemotional wealth (SEW). Miller and Breton-Miller (2014) divide SEW priorities into those that are of narrow and short-term benefit to the family (restricted SEW) and those that are of more enduring benefit to a broader range of stakeholders (extended SEW).

Restricted SEW primarily focuses on maintaining family control, leading family firms to adopt conservative approaches in high-risk situations. Green innovation, which requires substantial initial investments, often necessitates external financing (equity or debt), potentially diluting family control or introducing creditor oversight that could threaten this control (Miroshnychenko et al. 2022). In emerging economies, where the government often controls essential innovation resources, securing these resources for green innovation becomes more challenging, thus heightening the perceived risks (Musacchio and Lazzarini 2014). Hence, green innovation is seen as a threat to restricted SEW, resulting in a diminished propensity for innovation in family firms.

Family voting right often reflects family control. A higher family voting right implies a broader “moat” of control, which mitigates the impact of external financing for green innovation on restricted SEW. In such scenarios, the controlling family may be more open to green innovation, evident in actions such as granting the CEO greater authority for green R&D investments and providing better resources for the company's green transformation. Additionally, there may be a relaxation in assessing the CEO's performance targets during the green innovation phase. Since innovation inherently involves risks, a family willing to share these risks could alleviate a female CEO's concerns about how innovation failure might affect her position's legitimacy, thereby increasing her inclination towards green innovation. Based on these observations, we propose the fourth hypothesis:

Hypothesis 4. *Family control mitigates the negative relationship between female CEOs and green innovation in family firms.*

2.2.4 | Moderating Effect of Male Offspring Involvement

Regarding extended SEW, priorities include investing in a firm to enhance a family's reputation with stakeholders, forming sustaining relationships with partners to increase the chances of firm survival, and investing in the community to ensure an abundance of goodwill toward the family and its business (Cennamo et al. 2012). In this case, the rewards accrue not merely to the family, but to other stakeholders as well. The benefits to the business may be of a more long-term nature (Miller and Breton-Miller 2014).

While investments in innovation and environmental protection may initially burden family businesses, they can yield substantial long-term benefits, including performance improvement and the maintenance of the family's reputation and

status. Hence, family firms that value extended SEW generally adopt a positive attitude towards green innovation strategies (Aragón-Correa and Sharma 2003). They perceive innovation activities as crucial for enhancing the firm's long-term competitive advantage, rather than merely as cost-increasing, high-risk activities, and are thus more receptive to the risks associated with green innovation. Additionally, the environmental aspect of green innovation can improve the favorability of the family business among consumers, communities, and governments, furthering goals like enhancing family reputation and promoting intergenerational succession. Therefore, family businesses emphasizing extended SEW typically adopt a long-term perspective and are more supportive of green innovation initiatives. This support creates a conducive environment for female CEOs, reducing their concerns about the potential negative impacts of green innovation risks on their job security, alleviating mental stress, and fostering a greater inclination towards green innovation.

Existing literature uses the intention for generational succession as a proxy for extended SEW. This intention is a special value indicating the family firm owners' desire to continue the business across generations (Chua et al. 1999). It embodies the family's long-term orientation, guiding the family to focus on the long-term growth of the business (Lumpkin and Brigham 2011; Chrisman and Patel 2012). To achieve this, family firms must balance the interests of family and non-family members, internal and external stakeholders, and maintain long-term cooperative relationships with these stakeholders. The intention for family succession is the driving force that motivates family firms to uphold the family's reputation and consider the welfare of shareholders, communities, and other stakeholders (Pan et al. 2018). The involvement of family male offspring in firm management signifies not only an intention to perpetuate the business but also the initiation of substantive succession processes. These firms exhibit reduced susceptibility to short-term economic pressures, thereby creating a conducive environment for CEO-driven green innovation. Conversely, under China's traditional “sons first” succession norm, male offspring's managerial participation signals to female CEOs that their leadership role is transitional, as the firm will ultimately transition to the “legitimate” male heir. This dynamic alleviates female CEOs' concerns about job security risks associated with innovation, enabling them to pursue green initiatives more assertively in alignment with their values. Therefore, we propose the fifth hypothesis:

Hypothesis 5. *The involvement of family male offspring mitigates the negative relationship between female CEOs and green innovation in family firms.*

3 | Data and Methodology

3.1 | Sample Selection and Data Source

We analyze data from all A-share non-financial family firms listed on the Shenzhen and Shanghai stock exchanges from 2010 to 2021. The criteria for identifying family firms are the following: (1) the ultimate controller¹ is an individual or a family connected by blood or marriage; (2) two or more family

members with kinship hold shares or serve as executives; (3) the ultimate controller owns at least 10% of the firm's voting rights (Rodríguez-Ariza et al. 2016; Islam et al. 2022). After identifying the initial sample, we exclude firms in abnormal trading status (ST,*ST, PT) and those with missing data, resulting in a final sample of 10,468 firm-year observations.

The literature commonly adopts green patents as an indicator of green innovation (He and Jiang 2019; Ma et al. 2022; Javed et al. 2023; Tang and Li 2024). These studies identify green patents with their own keywords in patent databases. The subjectivity inherent in keyword-based green patent classification raises reliability concerns. In contrast, our green patent data are sourced from the Chinese research data services (CNRDS) database, which mitigates subjectivity biases associated with keyword-dependent green patent analyses. Additionally, we gather data on CEO gender and other control variables from the China stock market & accounting research (CSMAR) database. Both the CNRDS and CSMAR databases are widely used in China-focused research. To mitigate the effect of outliers, we winsorize all continuous variables at the top and bottom 1%.

3.2 | Measures of Variables

According to the National Intellectual Property Administration, green patents are categorized into three types: invention patents, utility model patents, and design patents. Among these, green invention patents are considered more technically challenging and have higher practical application value, making them a more accurate measure of a company's substantive innovation level (Li and Yu 2022). Therefore, we use the number of green invention patents independently applied for by the firm within the year as the measure of green innovation. To mitigate the effects of heteroscedasticity, we use the logarithmically transformed values as proxy variables for the dependent variable (*GI*).

Our key variable, *Gender*, indicates whether the firm has a female CEO. We also incorporate four moderating variables for cross-sectional analyses. At the macro level, we utilize the provincial gender inequality index (*Inequality*) from the Chinese General Social Survey 2010,² calculated as the mean of all survey responses within each province, where higher scores denote greater gender inequality. At the firm governance level, we measure female leadership representation (*FLR*) as the proportion of women serving on the board of directors, board of supervisors, and executive team. Following Piyasinchai et al. (2024), we employ two family-related moderators: *Control*, measured as the ultimate controller's voting right to assess family control, and *Son*, a binary variable to measure male offspring involvement, coded as "1" if the ultimate controller's son is in the executive team, and "0" otherwise.

Consistent with prior literature (Ma et al. 2022; Javed et al. 2023), we control for firm, governance, and CEO characteristics. Firm-level controls include six variables: firm size (*Size*), measured as the natural logarithm of total assets, as research indicates its influence on innovation performance and knowledge creation

capabilities (Halme and Korpela 2014); return on assets (*ROA*), calculated as net profit divided by total assets; leverage (*Lev*), measured as the ratio of total liabilities to total assets; sales growth (*SG*), reflecting operating revenue growth; operating cash flow (*CF*), computed as the ratio of operating cash flow to total assets; and firm age (*Firm_Age*), measured as the natural logarithm of the firm's age.

Governance-level controls comprise three variables. Board size (*Board*) is included as directors contribute valuable social capital and information resources (Hillman et al. 2000). The proportion of independent directors (*Indir*) is measured as their ratio to total board members, as independent directors typically prioritize social responsibility over economic performance and may advocate for long-term sustainability investments (Post et al. 2011). Institutional investor ownership (*Inst*) is included because long-term institutional investors often promote environmental governance through shareholder activism (Dyck et al. 2019). CEO-related controls measure CEO power, which influences decision-making implementation (Finkelstein 1992): CEO duality (*CEO_Duality*), tenure (*CEO_Tenure*), and age (*CEO_Age*).

Additionally, whether a firm adopts green innovation is influenced by its industry and region (Huang and Li 2017). We control for industry characteristics through a binary variable indicating heavily polluting industries (*Pollution*), and regional factors through the proportion of provincial environmental protection expenditure (*Prov_Env*), calculated as provincial environmental protection spending divided by total general budget expenditure. Industry and year fixed effects are included to account for cross-sectional and temporal variations. Variable definitions are provided in Appendix 1.

3.3 | Empirical Models

We conduct OLS regressions with year and industry fixed effects to test the hypotheses. All of the standard errors are robust and clustered at the industry level. Equation (1) is used to test the effect of female CEOs on green innovation (Hypothesis 1). *GI* is the dependent variable, and *Gender* is the key variable that indicates whether the CEO is female. *Controls* are a set of control variables. All independent variables are lagged by 1 year to alleviate the endogeneity problem.

$$GI_{i,t} = \beta_0 + \beta_1 \text{Gender}_{i,t-1} + \text{Controls}_{t-1} + \text{Year FE} + \text{Industry FE} + \varepsilon_{i,t} \quad (1)$$

We include the interaction term *Gender*Moderator* to test the moderating effects. The moderator includes the gender inequality index (*Inequality*), female leadership representation (*FLR*), ultimate controller's voting right (*Control*), and an indicator of whether the ultimate controller's son is absent from the executive team (*Son*).

$$GI_{i,t} = \beta_0 + \beta_1 \text{Gender}_{i,t-1} + \beta_2 \text{Moderator}_{i,t-1} + \beta_3 \text{Gender}_{i,t-1} * \text{Moderator}_{i,t-1} + \text{Controls}_{t-1} + \text{Year FE} + \text{Industry FE} + \varepsilon_{i,t} \quad (2)$$

3.4 | Descriptive Statistics and Correlation

Table 1 presents the descriptive statistics. In our sample of listed family firms, 9.27% have female CEOs, a figure significantly higher than the 5.7% reported by Javed et al. (2023) for all listed firms in China. However, there are only about nine female CEOs for every 100 family firms, suggesting that it is still challenging for women to climb to the top position of family firms.

The mean value of green innovation after logarithmic transformation is 0.1885, with a standard deviation of 0.5392, indicating large discrepancies across family firms. During the sample period, the mean board size, post-logarithmic transformation, is 2.0798, with 4.17% being independent directors. The mean CEO tenure, after logarithmic transformation, is 3.5365, and the mean CEO age, similarly transformed, is 3.8746.

The results of Pearson correlations between the variables are provided in Appendix II. Female CEO is negatively correlated with green innovation, consistent with our prediction. In addition, the correlation between all independent variables is within an acceptable range. We further calculate the variance inflation factors (VIFs). The average VIFs are 1.20, substantially under the general cutoff of 10. Thus, multicollinearity is unlikely to be a concern in our study.

TABLE 1 | Descriptive statistics ($N=10,468$).

Variable	Mean	SD	Min	p50	Max
<i>GI</i>	0.1885	0.5392	0.0000	0	5.8319
<i>Gender</i>	0.0927	0.2900	0.0000	0	1.0000
<i>Inequality</i>	1.7474	0.2792	0.5117	1.7427	2.2290
<i>FLR</i>	0.2110	0.1242	0.0000	0.2000	0.5455
<i>Control</i>	0.4121	0.1561	0.1266	0.4024	0.7661
<i>Son</i>	0.4181	0.4933	0.0000	0	1.0000
<i>Size</i>	21.7141	0.9844	19.9838	21.6043	24.6611
<i>ROA</i>	0.0577	0.0570	−0.1578	0.0542	0.2322
<i>LEV</i>	0.3542	0.1847	0.0460	0.3382	0.8092
<i>SG</i>	0.1874	0.6123	−0.9305	0.1224	4.0949
<i>CF</i>	0.0489	0.0683	−0.1521	0.0482	0.2339
<i>Firm_Age</i>	2.7007	0.3966	1.3863	2.7726	3.4012
<i>Board</i>	2.0798	0.1820	1.6094	2.1972	2.4849
<i>Indir</i>	0.4166	0.1096	0.3333	0.4000	0.8571
<i>Inst</i>	0.3442	0.2570	0.0008	0.3078	0.8701
<i>CEO_Dual</i>	0.4116	0.4922	0.0000	0	1.0000
<i>CEO_Tenure</i>	3.5365	1.0196	0.0000	3.7408	5.0795
<i>CEO_Age</i>	3.8746	0.1574	3.4340	3.8918	4.2047
<i>Pollution</i>	0.3907	0.4879	0.0000	0	1.0000
<i>Prov_Env</i>	0.0285	0.0082	0.0132	0.0273	0.0567

4 | Results and Discussion

4.1 | Regression Results and Discussion

Table 2 presents the baseline regression results. In Column (1), the coefficient of *Gender* is -0.0348 , significant at the 1% level. It indicates that female CEOs in family firms have an economically significant effect on green innovation by decreasing 18.46% ($=\text{coefficient of Gender}/\text{the average patents} = 0.0348/0.1885 \approx 18.46\%$) in green invention patents compared to male CEOs. This result is consistent with Hypothesis 1. Our observation of a negative association between female CEOs and green innovation contradicts social role theory, which predicts a positive relationship, while aligning with risk aversion theory and role congruity theory. Prior studies (Ma et al. 2022; Tang and Li 2024) argue that the negative impact of female CEOs on green innovation is attributed to women's risk aversion. However, we propose that role congruity theory may hold more explanatory power in the context of family firms. The moderating effect of regional gender inequality and female leadership representation could further corroborate our argument.

Among the control variables, firm size, ROA, CEO age, and CEO duality are positively associated with green innovation, while firm age and sales growth show negative relationships. These results suggest that larger family firms with higher ROA are more inclined to invest in green innovation, and older, more

TABLE 2 | Female CEOs' effect on green innovation.

	Dependent variable: GI								
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
<i>Gender</i>	−0.0348*** (0.0116)	−0.0351*** (0.0117)	0.0651 (0.0522)	−0.0203 (0.0140)	−0.0693* (0.0379)	−0.0334** (0.0118)	−0.1910*** (0.0457)	−0.0427*** (0.0118)	−0.0524*** (0.0133)
<i>Inequality</i>		−0.0097 (0.0123)	−0.0040 (0.0128)						
<i>Gender*Inequality</i>			−0.0581** (0.0260)						
<i>FLR</i>				−0.1295*** (0.0281)	−0.1431*** (0.0226)				
<i>Gender*FLR</i>					0.1596* (0.0882)				
<i>Control</i>						−0.0438 (0.0266)	−0.0755** (0.0283)		
<i>Gender*Control</i>							0.3574*** (0.0826)		
<i>Son</i>								−0.0582*** (0.0071)	−0.0608*** (0.0071)
<i>Gender*Son</i>									0.0301* (0.0148)
<i>Size</i>	0.0970*** (0.0128)	0.0971*** (0.0128)	0.0971*** (0.0128)	0.0952*** (0.0129)	0.0953*** (0.0131)	0.0963*** (0.0130)	0.0967*** (0.0130)	0.0982*** (0.0128)	0.0984*** (0.0127)
<i>ROA</i>	0.6238*** (0.0931)	0.6243*** (0.0931)	0.6248*** (0.0928)	0.6265*** (0.0924)	0.6271*** (0.0923)	0.6455*** (0.0942)	0.6418*** (0.0936)	0.6063*** (0.0903)	0.6071*** (0.0904)
<i>LEV</i>	0.1938*** (0.0524)	0.1934*** (0.0525)	0.1933*** (0.0523)	0.1902*** (0.0524)	0.1891*** (0.0522)	0.1918*** (0.0513)	0.1905*** (0.0513)	0.1868*** (0.0513)	0.1861*** (0.0515)

(Continues)

TABLE 2 | (Continued)

	Dependent variable: GI								
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
<i>SG</i>	−0.0200*** (0.0058)	−0.0201*** (0.0058)	−0.0200*** (0.0058)	−0.0200*** (0.0057)	−0.0200*** (0.0057)	−0.0201*** (0.0058)	−0.0204*** (0.0058)	−0.0206*** (0.0058)	−0.0207*** (0.0058)
<i>CF</i>	−0.0457 (0.0877)	−0.0441 (0.0889)	−0.0439 (0.0882)	−0.0469 (0.0890)	−0.0487 (0.0886)	−0.0451 (0.0869)	−0.0432 (0.0860)	−0.0378 (0.0848)	−0.0379 (0.0848)
<i>Firm_Age</i>	−0.0700*** (0.0134)	−0.0701*** (0.0134)	−0.0703*** (0.0134)	−0.0701*** (0.0131)	−0.0698*** (0.0132)	−0.0710*** (0.0130)	−0.0708*** (0.0129)	−0.0609*** (0.0130)	−0.0608*** (0.0129)
<i>Board</i>	−0.0074 (0.0501)	−0.0068 (0.0496)	−0.0069 (0.0499)	−0.0133 (0.0490)	−0.0130 (0.0490)	−0.0120 (0.0495)	−0.0104 (0.0483)	0.0069 (0.0499)	0.0060 (0.0498)
<i>Indir</i>	−0.0439 (0.0298)	−0.0439 (0.0297)	−0.0423 (0.0296)	−0.0425 (0.0300)	−0.0414 (0.0299)	−0.0417 (0.0290)	−0.0432 (0.0299)	−0.0418 (0.0301)	−0.0425 (0.0302)
<i>Inst</i>	−0.0134 (0.0117)	−0.0131 (0.0115)	−0.0135 (0.0114)	−0.0119 (0.0117)	−0.0119 (0.0117)	−0.0116 (0.0113)	−0.0118 (0.0114)	−0.0075 (0.0116)	−0.0071 (0.0115)
<i>CEO_Duality</i>	0.0306*** (0.0105)	0.0306*** (0.0105)	0.0302*** (0.0103)	0.0315*** (0.0103)	0.0316*** (0.0104)	0.0315*** (0.0105)	0.0332*** (0.0111)	0.0252** (0.0108)	0.0249** (0.0108)
<i>CEO_Tenure</i>	−0.0012 (0.0065)	−0.0012 (0.0065)	−0.0012 (0.0066)	−0.0010 (0.0065)	−0.0010 (0.0065)	−0.0012 (0.0065)	−0.0015 (0.0066)	0.0002 (0.0063)	0.0003 (0.0063)
<i>CEO_Age</i>	0.0512** (0.0232)	0.0507** (0.0230)	0.0505** (0.0234)	0.0506** (0.0237)	0.0513** (0.0243)	0.0497** (0.0229)	0.0475* (0.0226)	0.0354 (0.0209)	0.0334 (0.0211)
<i>Pollution</i>	−0.1681*** (0.0044)	−0.1683*** (0.0044)	−0.1683*** (0.0044)	−0.1656*** (0.0045)	−0.1656*** (0.0045)	−0.1684*** (0.0043)	−0.1674*** (0.0042)	−0.1660*** (0.0045)	−0.1660*** (0.0045)
<i>Pro_Env</i>	1.8677* (0.9477)	1.8920* (0.9531)	1.9189* (0.9506)	1.9720* (0.9515)	1.9474* (0.9382)	1.8630* (0.9292)	1.9004* (0.9201)	1.6788* (0.9567)	1.6769* (0.9501)
<i>Intercept</i>	−1.9811*** (0.2672)	−1.9657*** (0.2629)	−1.9742*** (0.2609)	−1.9044*** (0.2750)	−1.9087*** (0.2781)	−1.9301*** (0.2857)	−1.9216*** (0.2842)	−1.9723*** (0.2603)	−1.9664*** (0.2602)
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

(Continues)

TABLE 2 | (Continued)

	Dependent variable: GI								
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Industry FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	10,468	10,468	10,468	10,468	10,468	10,468	10,468	10,468	10,468
Adj. R ²	0.0948	0.0947	0.0947	0.0955	0.0955	0.0949	0.0956	0.0973	0.0973

Note: This table reports the OLS regression results for Equations (1) and (2). The dependent variable is green innovation (GI). See Table 1 for the definition of variables. The robust stand errors clustered in industries are in parentheses.

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

powerful CEOs may possess the influence or resources necessary to advance such efforts. These findings align with prior studies (Nadeem et al. 2020; Ma et al. 2022; Tang and Li 2024). However, our analysis reveals a notable divergence: firm leverage exhibits a statistically significant positive effect on green innovation, contrasting with Ma et al. (2022), who report an insignificant relationship, and Nadeem et al. (2020), who identify a negative association. This discrepancy may be attributable to differences in sample composition, such as variations in geographic scope or time periods studied.

Columns (2) and (3) introduce the gender inequality index (*Inequality*) and its interaction with the explanatory variable (*Gender*Inequality*). The coefficient of the interaction term in Column (3) is significantly negative ($-0.0581, p < 0.05$), suggesting that a one standard deviation increase in gender inequality (0.2792) is associated with an 8.6% reduction in green invention patents for firms led by female CEOs ($-0.0581 \times 0.2792 / 0.1885 \approx -8.61\%$). This finding indicates that higher gender inequality—reflecting greater discrimination against women—amplifies the negative effect of female CEOs on green innovation, thereby supporting Hypothesis 2. This result aligns with previous studies, which demonstrate that gender inequality weakens the positive effect of gender diversity on firms' market valuation (Hoch and Seyberth 2022) and profitability (Amore et al. 2014). While both risk aversion theory and role congruity theory predict a negative impact of female CEOs on green innovation, only role congruity theory anticipates the negative moderating effect of gender inequality. Hence, this moderating test further substantiates the validity of role congruity theory.

Columns (4) and (5) investigate the female leadership representation (*FLR*) and its interaction term (*Gender*FLR*). The interaction term in Column (5) shows a statistically significant positive coefficient ($0.1596, p < 0.1$). In economic terms, a one standard deviation increase in female leadership representation (0.1242) corresponds to a 10.52% rise in green invention patents for firms with female CEOs ($0.1596 \times 0.1242 / 0.1885 \approx 10.52\%$). This finding suggests that greater female representation in leadership mitigates the adverse impact of female CEOs on green innovation, consistent with Hypothesis 3. This result aligns with prior research indicating that female interaction benefits women by helping other women reach management positions (Matsa and Miller 2011; Wang and Kelan 2013; You 2019). According to role congruity theory, female CEOs engage in less green innovation due to the conflict between their gender roles and leader roles. Increased female leadership representation mitigates this negative relationship by fostering a more supportive environment for female CEOs. Notably, this finding contradicts risk aversion theory. If this theory holds, more women in leadership indicates greater female interaction and exhibits higher risk aversion, which would exacerbate the negative association between female CEOs and green innovation. However, the observed moderating effects of female leadership representation suggest otherwise. Instead, they provide robust evidence in support of role congruity theory.

Columns (6) and (7) examine family control (*Control*) and its interaction (*Gender*Control*). The coefficient of the interaction term in Column (7) is significantly positive ($0.3574, p < 0.01$), implying that a one standard deviation increase in family control (0.1561) is

associated with a 29.60% increase in green invention patents for firms led by female CEOs ($0.3574 \times 0.1561 / 0.1885 \approx 29.60\%$). This finding indicates that higher family control mitigates the negative impact of female CEOs on green innovation. Our evidence supports Hypothesis 4. Our result is consistent with Rodriguez-Ariza et al. (2016) and suggests that greater family control provides a more supportive environment for female CEOs, reducing their performance-related concerns and encouraging them to increase green innovation initiatives. The finding that family control mitigates the negative relationship between female CEOs and green innovation confirms the validity of restricted SEW goals.

Columns (8) and (9) analyze the effects of the involvement of the ultimate controller's son (*Son*) and its interaction (*Gender***Son*). The interaction term in Column (9) exhibits a significantly positive coefficient ($0.0301, p < 0.1$), implying that firms led by female CEOs experience a 15.97% increase in green invention patents when male offspring are involved ($0.0301 / 0.1885 \approx 15.97\%$). The result indicates that the involvement of the ultimate controller's son lessens the negative impact of female CEOs on green innovation, supporting Hypothesis 5. This result aligns with Pan et al. (2018), who show that family firms engage in more corporate philanthropy in connection with family firm succession. Family firms focused on intergenerational succession are more likely to adopt a long-term perspective, thereby mitigating the negative impact of female CEOs on green innovation. Our findings provide empirical support for extended SEW goals. In summary, the moderating effect of family control and family firm succession provides evidence supporting the SEW theory.

4.2 | Endogeneity Concerns

The results discussed above are based on a regression model with the explanatory variable lagged by one period, which helps mitigate some endogeneity issues. However, the relationship between female CEOs and green innovation in family firms may still be influenced by endogeneity concerns such as model specification errors, self-selection bias, and omitted variable bias. We employ propensity score matching (PSM), two-stage least squares (2SLS), and difference-in-differences (DID) to address these issues.

4.2.1 | Propensity Score Matching

The influence of female CEOs on green innovation may be affected by model specification errors, such as the omission of quadratic and interaction terms. To mitigate issues related to functional form misspecification, we employ propensity score matching (PSM) methods.

We take firms with female CEOs as our experimental sample and use PSM to construct a control sample comprising firms run by male CEOs with highly similar characteristics. For matching, we run a probit regression for female CEOs (*Gender*) on the control variables in Equation (1). We use the propensity scores obtained from the probit regression and perform one-to-one nearest neighbor matching without replacement.

We then rerun Equation (1) on the PSM sample. Column (1) of Table 3 shows that the coefficient of *Gender* is negative and significant ($-0.0373, p < 0.1$). Overall, these findings after propensity score matching are basically similar to our baseline results, suggesting that they are unlikely to be driven by model misspecification.

4.2.2 | Two-Stage Least Squares (2SLS) Estimation

Family firms with insufficient green innovation might appoint a female CEO to gain legitimacy, which causes reverse causality. To alleviate this endogeneity concern, we employ the Two-Stage Least Squares (2SLS) estimation, using the divorce rate (the total number of divorces divided by the total population) in the firm's registered province as the instrumental variable. The area with a higher divorce rate indicates a stronger female employment (Kalmijn and Poortman 2006). As a result, women are more likely to engage in business operations, potentially increasing the likelihood of a female serving as CEO. Furthermore, this variable is exogenous to the firm's green innovation, making it suitable as an instrumental variable. Columns (2) and (3) of Table 3 present the results of the 2SLS estimation. The coefficient of the instrumental variable (*Divorce*) is positive and significant, indicating that the instrumental variable is relevant. The F statistic is 278.817, higher than the recommended value of 10. At the same time, the weak identification test shows that the Cragg-Donald Wald F statistic is 65.641, above the Stock-Yogo critical values. The coefficient of *Gender* in the second-stage model remains significantly negative, consistent with our baseline results.

Following Schopohl et al. (2021), we also use the proportion of female CEOs in each industry for a given year (*Female_Ind*) as the instrumental variable in the first-stage model. The proportion of female CEOs in the industry affects a firm's likelihood of hiring a female CEO. We argue that there are no obvious economic reasons underlying the direct impact of the industrial proportion of female CEOs on a firm's green innovation. Columns (4) and (5) present the results. In the first-stage regression, the variable *Female_Ind* is positively associated with the choice of female CEOs in family firms, while satisfying the exogeneity requirement. In the second-stage regression, the coefficient of *Gender* remains significantly negative, consistent with our baseline results.

4.2.3 | Difference-in-Differences Estimation

In the baseline regressions presented in Table 2, we control for various observable characteristics that are shown to affect earnings management in the literature. However, unobservable time series changes contemporaneous with CEO changes could also affect green innovation, which possibly makes our results spurious. Following Francis et al. (2015), we apply difference-in-differences (DID) estimation to mitigate the endogeneity concern.

The DID estimation compares green innovation before and after male-to-female CEO transitions with a control sample of male-to-male transitions. Our final sample comprises 97 CEO

TABLE 3 | Tests of PSM, 2SLS, and DID.

	PSM	2SLS (IV = <i>Divorce</i>)		2SLS (IV = <i>Female_Ind</i>)		DID
	<i>GI</i>	<i>Gender</i>	<i>GI</i>	<i>Gender</i>	<i>GI</i>	<i>GI</i>
	(1)	(2)	(3)	(4)	(5)	(6)
<i>Gender</i>	−0.0373* (0.0203)		−0.9904*** (0.3580)		−0.5285*** (0.1615)	
<i>IV</i>		0.0215*** (0.0044)		0.8531*** (0.1292)		
<i>Transition</i>						−0.0333* (0.0165)
<i>Size/ΔSize</i>	0.0572*** (0.0156)	−0.0065 (0.0040)	0.0917*** (0.0090)	−0.0066* (0.0040)	0.0943*** (0.0092)	0.0729** (0.0274)
<i>ROA/ΔROA</i>	0.5141*** (0.1578)	0.0443 (0.0647)	0.6704*** (0.0971)	0.0475 (0.0647)	0.6479*** (0.0975)	0.0321 (0.1628)
<i>LEV/ΔLEV</i>	0.1298* (0.0692)	−0.0315 (0.0201)	0.1601*** (0.0339)	−0.0314 (0.0201)	0.1764*** (0.0326)	0.0561 (0.1060)
<i>SG/ΔSG</i>	−0.0156 (0.0129)	0.0018 (0.0051)	−0.0184** (0.0081)	0.0026 (0.0051)	−0.0192** (0.0081)	−0.0029 (0.0185)
<i>Firm_Age/ΔFirm_Age</i>	−0.0434 (0.0289)	0.0176** (0.0082)	−0.0525*** (0.0152)	0.0178** (0.0082)	−0.0609*** (0.0148)	0.0137 (0.0788)
<i>CF/ΔCF</i>	−0.3261** (0.1527)	0.0313 (0.0499)	−0.0227 (0.0827)	0.0253 (0.0496)	−0.0338 (0.0820)	0.4012*** (0.1185)
<i>Board/ΔBoard</i>	−0.0078 (0.0525)	−0.0886*** (0.0174)	−0.0903* (0.0481)	−0.0863*** (0.0174)	−0.0503 (0.0342)	−0.1619 (0.1271)
<i>Indir/ΔIndir</i>	−0.1067 (0.0837)	0.0146 (0.0275)	−0.0345 (0.0512)	0.0104 (0.0274)	−0.0391 (0.0512)	−0.0622 (0.0834)
<i>Inst/ΔInst</i>	0.0964** (0.0418)	−0.0114 (0.0122)	−0.0252 (0.0202)	−0.0104 (0.0122)	−0.0195 (0.0196)	−0.2419* (0.1279)
<i>CEO_Duality/ΔCEO_Duality</i>	0.0080 (0.0247)	−0.0585*** (0.0063)	−0.0259 (0.0221)	−0.0584*** (0.0063)	0.0014 (0.0144)	−0.0233 (0.0209)
<i>CEO_Tenure/ΔCEO_Tenure</i>	−0.0075 (0.0130)	0.0070** (0.0028)	0.0053 (0.0055)	0.0064** (0.0028)	0.0021 (0.0051)	0.0184*** (0.0056)
<i>CEO_Age/ΔCEO_Age</i>	0.1917*** (0.0565)	−0.0159 (0.0200)	0.0387 (0.0303)	−0.0125 (0.0201)	0.0448 (0.0300)	0.0418** (0.0145)
<i>Pollution/ΔPollution</i>	−0.1553*** (0.0229)	−0.0082 (0.0062)	−0.1748*** (0.0121)	−0.0063 (0.0062)	−0.1715*** (0.0116)	0.0328 (0.0276)
<i>Pro_Env/ΔPro_Env</i>	−0.4663 (1.2976)	0.6248 (0.3854)	2.6675*** (0.7429)	0.8537** (0.3841)	2.2809*** (0.6951)	−1.8619 (2.4143)
Intercept	−1.7752*** (0.4187)	0.3408*** (0.1145)	−1.8867*** (0.2381)	0.3077*** (0.1144)	−2.0449*** (0.2211)	−0.0075 (0.0203)

(Continues)

TABLE 3 | (Continued)

	PSM	2SLS (IV = <i>Divorce</i>)		2SLS (IV = <i>Female_Ind</i>)		DID
	<i>GI</i>	<i>Gender</i>	<i>GI</i>	<i>Gender</i>	<i>GI</i>	<i>GI</i>
	(1)	(2)	(3)	(4)	(5)	(6)
Year FE	Yes	Yes	Yes	Yes	Yes	No
Industry FE	Yes	Yes	Yes	Yes	Yes	No
<i>N</i>	1940	10,468	10,468	10,468	10,468	964
Adj. <i>R</i> ²	0.1075	0.0288	0.0989	0.0324	0.0987	0.0277

Note: Columns (1) report regression results after PSM, respectively. Columns (2) and (3) present the 2SLS results using the divorce rate in the firm's registered province as the instrumental variable. Columns (4) and (5) present the 2SLS results using the percentage of female CEOs in the industry for a given year as the instrumental variable. Column (6) reports the results of difference-in-differences estimation. The robust stand errors clustered in industries are in parentheses.

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

transitions from male to female and 867 CEO transitions from male to male. We create a dummy variable *Transition*, which equals one if a firm experiences a male-to-female CEO transition and zero otherwise. We use Equation (3) to conduct DID estimation.

$$\Delta GI = \beta_0 + \beta_1 \text{Transition} + \Delta \text{Controls} + \epsilon \quad (3)$$

ΔGI is the absolute difference between the mean value of green innovation for the post-transition period and the pre-transition period. The control variables are the same as those in Equation (1), while we use the mean differences instead of actual values. That is, $\Delta \text{Controls}$ is the difference between the mean value of the control variable for the post-transition period and the pre-transition period. DID estimation helps us to interpret the coefficient on *Transition* as the average difference in green innovation for a firm with the average sample characteristics. Moreover, it is less likely to suffer from multicollinearity problems compared to the traditional DID model that uses actual values of variables and interaction terms (Francis et al. 2015).

We report the results of DID estimation in Column (6) of Table 3. The coefficient of *Transition* is negative and significant at the 1% level. Compared to male CEOs, female CEOs engage in less green innovation following CEO transitions. Our DID estimation results indicate a causal effect of CEO gender on green innovation.

4.3 | Robustness Checks

4.3.1 | Alternative Regression Models

Given that the number of green invention patents is a count variable that only takes non-negative integers, employing the Negative Binomial and Poisson regression may be more appropriate. In the new regressions, we use the number of green invention patents (*GII*) rather than the logarithmic transformation as our dependent variable. The results presented in Columns (1) and (2) of Table 4 confirm a significant negative correlation between female CEOs and green innovation in family firms when using alternative regression models.

4.3.2 | Alternative Measures of Green Innovation

In the baseline regression, we use the number of green invention patents independently applied for by the firm to measure green innovation. To further validate the robustness, we adopt two alternative measures for green innovation: *GI2* and *GI3*. *GI2* is identified as the industry average adjusted *GI*. *GI3* is calculated as the natural logarithm of the sum of green invention and utility model patents independently applied for by the firm plus one. We use the new dependent variables to rerun the regressions of Table 4. The results in Columns (3) and (4) of Table 4 suggest that our findings are robust to alternative measures of green innovation.

4.3.3 | Alternative Definition of Family Firms

To assess the robustness of our findings, we examine whether alternative definitions of family firms affect the results. In the baseline analysis, we define family firms using a 10% control threshold. Following prior studies (Lozano et al. 2016; Wei and Chen 2023), we reclassify family firms using a 15% control criterion. As shown in Column (4) of Table 4, the results remain consistent, confirming that our hypotheses are robust to alternative definitions of family firms.

4.3.4 | Including Non-Family Firms

Our study focuses on family firms, and whether the incentive of female CEOs to engage in a lower level of green innovation being contingent on ownership type (family vs. non-family) is worth further investigation. We include non-family firms in our sample to provide empirical evidence. Column (1) of Table 5 reveals a negative and significant coefficient for *Gender* ($-0.0290, p < 0.01$) across the entire sample, indicating that female CEOs are generally associated with lower levels of green innovation. In societies with lower gender equality, female CEOs encounter the "glass ceiling" in both family firms and non-family firms. To preserve their tenuous leadership positions, they may suppress pro-environmental inclinations to avoid innovation-related risks that could jeopardize their job security.

TABLE 4 | Robust tests.

	Negative binomial regression <i>GI1</i> (1)	Poisson regression <i>GI1</i> (2)	Industry-adjusted green innovation <i>GI2</i> (3)	Green innovation including invention and utility model patents <i>GI3</i> (4)	Alternative definition of family firms <i>GI</i> (5)
<i>Gender</i>	−0.3916** (0.1537)	−0.9398*** (0.2021)	−0.0350** (0.0121)	−0.0236* (0.0114)	−0.0278** (0.0111)
<i>Inalpha</i>	2.2389*** (0.0477)				
Controls	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes	Yes
Observations	10,468	10,468	10,468	10,468	10,468
Pseudo R^2 /Adj. R^2	0.0755	0.3458	0.0580	0.1250	0.0977

Note: This table reports the robust results for Equation (1). Columns (1) and (2) present the Negative Binomial and Poisson regression results, respectively. The dependent variable (*GI1*) is the number of green invention patents independently applied for by the firm. Columns (3) and (4) present the OLS results of alternative measures of green innovation. *GI2* is identified as the industry average adjusted *GI*. *GI3* is calculated as the natural logarithm of the sum of green invention and utility model patents independently applied for by the firm plus one. Column (5) shows the results for family firms using a 15% control criterion. The robust stand errors clustered in industries are in parentheses. The control variables are the same as those in Column (1) of Table 2.

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

TABLE 5 | Tests for including non-family firms.

	Dependent variable: <i>GI</i>		
	Full sample (1)	Family firms (2)	Non-family firms (3)
<i>Gender</i>	−0.0290*** (0.0091)	−0.0348*** (0.0116)	0.0386 (0.0330)
Controls	Yes	Yes	Yes
Year FE	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes
Observations	22,071	10,468	11,603
Adj. R^2	0.1322	0.0952	0.1858

Note: Column (1) reports the results of full sample. Columns (2) and (3) present the results for family firms and non-family firms, respectively. The control variables are the same as those in Column (1) of Table 2. The robust stand errors clustered in industries are in parentheses.

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

In Column (2), which focuses on the family firms, the coefficient of *Gender* is significantly negative, aligning with baseline regression results. However, Column (3) reveals an insignificant relationship between female CEOs and green innovation in non-family firms. This divergence may stem from the predominance of state-owned enterprises (SOEs) in the non-family firm sample (Usman et al. 2018). Unlike family firms, SOEs must align with government environmental objectives, which may take precedence over economic goals when conflicts arise. This alignment

potentially provides a more conducive environment for female CEOs to engage in green innovation compared to family firms. Nevertheless, female CEOs in SOEs remain a minority group, which may still have concerns about job security. We posit that these two mechanisms—alignment with government objectives and job security concerns—exert opposing effects on the green innovation behavior of female CEOs in non-family firms. The challenge of identifying the dominant mechanism may explain the statistically insignificant association observed.

4.4 | Further Tests

4.4.1 | Boundary Conditions for Family Control

To further investigate the “moat effect” of family control on the relationship between female CEOs and green innovation, we introduce four dummy variables (*Control25*, *Control35*, *Control45*, and *Control55*) based on thresholds of family control exceeding 25%, 35%, 45%, and 55%, respectively. The interaction terms between these moderating variables and the explanatory variable (*Gender*) are incorporated into the models. The results, as shown in Panel A of Table 6, reveal the following: (1) The coefficients of all interaction terms are significantly positive, affirming the robustness of the moderating effect of family control; (2) while the coefficients of the interaction terms are positive when family control is below 45%, none surpass the coefficient of *Gender*; (3) when family control exceeds 55%, the coefficient of the interaction term is 0.1513, surpassing the absolute value of the coefficient of *Gender* (−0.0736). This suggests that at this level of family control, the “moat effect” is substantial enough to mitigate the dilution of control in family firms due to high-risk investments in green innovation.

TABLE 6 | Further tests.

Panel A: Boundary conditions for family control				
	Dependent variable: <i>GI</i>			
	<i>X</i> = 25%	<i>X</i> = 35%	<i>X</i> = 45%	<i>X</i> = 55%
	(1)	(2)	(3)	(4)
<i>Gender</i>	−0.1482*** (0.0313)	−0.0812** (0.0295)	−0.0637*** (0.0183)	−0.0736*** (0.0196)
<i>ControlX</i>	−0.0491** (0.0216)	0.0005 (0.0116)	−0.0093 (0.0094)	−0.0365*** (0.0075)
<i>Gender*ControlX</i>	0.1315*** (0.0307)	0.0639* (0.0312)	0.0630*** (0.0198)	0.1513*** (0.0255)
Controls	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
Industry FE	Yes	Yes	Yes	Yes
Observations	10,468	10,468	10,468	10,468
Adj. <i>R</i> ²	0.0959	0.0949	0.0949	0.0961
Panel B: Tests for alternative strategy				
	<i>GI</i>	<i>CSR</i>		
	(1)	(2)		
<i>Gender</i>	−0.0348*** (0.0116)	1.1421*** (0.2120)		
Controls	Yes	Yes		
Year FE	Yes	Yes		
Industry FE	Yes	Yes		
Observations	22,071	10,468		
Adj. <i>R</i> ²	0.0948	0.2625		

Note: Panel A shows the results of different family control. The variables *Control25%*, *Control35%*, *Control45%*, and *Control55%* are based on thresholds of family control exceeding 25%, 35%, 45%, and 55%, respectively. Panel B reports the comparative results of green innovation and corporate social responsibility. The control variables are the same as those in Column (1) of Table 2. The robust stand errors clustered in industries are in parentheses.

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

4.4.2 | Female CEOs' Strategic Substitution: CSR as an Alternative Pathway

Drawing on role congruity theory, we provide empirical evidence that female CEOs in family firms avoid green innovation—a high-risk, long-cycle investment—to safeguard their leadership positions. We postulate that female CEOs may exhibit gender-congruent traits through other socially responsible behaviors, such as philanthropy and employee care, thereby enhancing their reputation and social influence while balancing the conflict between their gender and leadership roles. To explore this proposition, we investigate the relationship between CEO gender and corporate social responsibility (CSR) in family firms.

This study utilizes the CSMAR database's Corporate Common Prosperity Research Data—a composite CSR score derived from seven rigorously weighted indicators: employee sharing, customer sharing, shareholder sharing, partner sharing, benign competition, tax contributions, and public welfare charity.³

This metric comprehensively captures CEOs' prioritization of both internal and external stakeholder interests. In Panel B of Table 6, Column (2) shows that female CEOs in family firms are significantly positively correlated with corporate social responsibility (coefficient = 1.1421, $p < 0.01$). Based on the congruence between gender and leadership roles, female CEOs in family firms are likely to substitute green innovation strategies with CSR strategies.

5 | Conclusion and Implication

5.1 | Conclusion

We integrate role congruity theory and socio-emotional wealth theory to investigate the relationship between female CEOs and green innovation in Chinese family firms from 2010 to 2021. Employing OLS regressions with year and industry fixed effects, we demonstrate that female CEOs engage in less green

innovation compared to male counterparts. To address potential functional form misspecification, we employ propensity score matching. Moreover, we mitigate endogeneity concerns stemming from self-selection bias and unobservable factors using 2SLS model and difference-in-differences estimation, with results corroborating our primary conclusions. Robustness checks—including alternative regression models, diverse green innovation metrics, and varying definitions of family firms—further validate these findings. Our analysis identifies four moderating factors: female leadership representation, family control, and male offspring involvement mitigate the negative association, whereas regional gender inequality exacerbates it. Notably, female CEOs do not inhibit green innovation when family control exceeds 55%. Moreover, female CEOs tend to substitute green innovation with corporate social responsibility strategies.

5.2 | Theoretical Contributions

This study provides three theoretical contributions. First, this study advances role congruity theory by examining its implications for female CEOs navigating dual social expectations. The theory posits that alignment with role expectations enhances approval, job satisfaction, and performance, while misalignment triggers conflict and stress. Female CEOs face a unique contradiction: they must reconcile societal expectations of their gender roles with those of their leadership roles. In gender-discriminatory environments, our findings reveal that female CEOs prioritize conformity to leadership role expectations while subtly integrating gender-specific traits through alternative strategies. For example, while reducing green innovation may conflict with women's pro-environmental inclinations, female CEOs may instead emphasize stakeholder engagement through corporate social responsibility (CSR) initiatives to align with gender role expectations.

Second, this study disentangles the competing explanations of role congruity theory and risk aversion theory in shaping female CEOs' green innovation decisions. While both theories suggest female CEOs inhibit green innovation, our moderation analysis reveals critical distinctions. Regional gender inequality exacerbates the negative relationship between female CEOs and green innovation, supporting role congruity theory's assertion that prejudice against female leaders diminishes their engagement in such initiatives. Additionally, female leadership representation mitigates this negative relationship, contradicting risk aversion theory's premise that increased female representation heightens risk aversion. These findings collectively underscore role congruity theory as the dominant framework for understanding female CEOs' green innovation behavior.

Third, this research extends Socioemotional wealth (SEW) theory to green innovation management in family firms. When role congruity theory predicts a negative relationship between female CEOs and green innovation in family firms, SEW theory elucidates the boundary conditions of this relationship. Controlling families with restricted SEW objectives often inhibit green innovation to preserve their authority. In contrast, families with extended SEW objectives actively promote green

innovation and proactively adjust executive performance evaluations, thereby mitigating the gender-leadership role conflict faced by female CEOs. Notably, when family control exceeds 55%, this marks a transition from restricted to extended SEW objectives, enabling female CEOs to avoid suppressing green innovation. These findings identify the type of SEW objectives as a significant moderator of gender-leadership role conflict for female CEOs in family firms.

5.3 | Practical Implications

This study provides valuable insights for family firms and policymakers. First, our findings reveal that female CEOs in family firms inhibit green innovation due to the gender-leadership conflict, and increased gender diversity in leadership mitigates this negative effect. Accordingly, we suggest that family firms committed to green innovation support female leaders through measures such as extending performance evaluation periods and establishing sustainability committees. Additionally, family firms could actively recruit more women into leadership positions, including the board of directors, senior management, and supervisory board, to foster a more female-friendly environment. These recommendations are especially important for innovation-intensive family firms, which should empower female leaders to serve as effective advocates for environmental initiatives.

Second, this study reveals that family ownership and intergenerational succession amplify female CEOs' pursuit of green innovation. This finding suggests that policymakers should consider the heterogeneity among family firms and tailor support mechanisms for those demonstrating long-term orientation. Specific policy instruments could include prioritizing green technology products or services from such firms in government procurement and offering fiscal incentives like "low-interest loans for green innovation" or "green innovation tax credits." These measures would align private-sector innovation incentives with societal sustainability goals.

Finally, this study highlights the moderating influence of female leadership representation and regional gender equality. These underscore the need for policymakers to advance gender parity through public interventions that legitimize women's leadership roles. Given the current absence of legal gender diversity mandates for corporate boards, we recommend implementing female director quotas within corporate governance regulations. Furthermore, local governments could facilitate annual forums, such as "Women's Leadership and Sustainable Development Forums", to disseminate best practices in green innovation pioneered by female leaders. Such initiatives, by addressing cultural barriers, can unlock the potential of female executives to drive the innovation toward ecological value creation.

5.4 | Limitations and Future Research

Despite its contributions, this study has several limitations that suggest avenues for future research. First, the findings are situated within the cultural and institutional context of Chinese

family firms, which may constrain their generalizability. While significant progress has been made in gender equity in China, enduring gender disparities in traditional Chinese society—particularly the glass-ceiling effect that restricts women's advancement—may uniquely shape female CEOs' strategic choices. By contrast, Western family firms operating in environments with stronger gender parity norms might yield divergent outcomes. Future research could extend the investigation to a broader range of countries and regions and verify the applicability of our findings. Second, the exclusive focus on listed family firms introduces potential biases, as these entities differ markedly from non-listed small and medium-sized enterprises in their structural characteristics, decision-making frameworks, and strategic priorities. To address this, further studies should analyze how female CEOs in unlisted family firms navigate green innovation to develop a more nuanced cross-organizational perspective. Finally, the reliance on secondary data limits our ability to empirically test the mediating mechanisms underlying female CEOs' influence on green innovation. Future work could adopt multi-method approaches, such as in-depth interviews and surveys, to validate the specific mechanisms through which female CEOs influence green innovation in family firms.

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Endnotes

¹ Chinese listed firms are required to disclose their ultimate controllers in their annual reports. According to the China Securities Regulatory Commission (CSRC) regulations, the ultimate controller is defined as an entity that can effectively control the firm's operations through investment relationships, contractual agreements, or other arrangements.

² The China General Social Survey assesses individual attitudes toward gender equality through five questions, each rated on a 5-point scale: (1) *Men give priority to their careers while women give priority to their families*; (2) *female employees are given priority for dismissal during economic downturns*, (3) *it is better to have a good marriage than a good job*; (4) *men are naturally more capable than women*; (5) *Husbands and wives should share household chores*. For the first four items, higher scores indicate lower gender equality, while for the fifth item, higher scores reflect greater gender equality. These indicators measure deeply embedded societal gender perceptions and serve as proxies for cultural factors affecting gender equality.

³ Scholars have not reached a consensus on CSR measurement methodologies. Some studies rely on secondary data (e.g., listed firms' charitable donations or private enterprise surveys) but inadequately account for multi-stakeholder engagement. Others employ third-party evaluations, such as Hexun's CSP scores or Runling Global's RKS ratings, though these datasets frequently suffer from incomplete sampling. To address these limitations, we utilize the CSMAR database's Corporate Common Prosperity Research Data.

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Appendix I

Variable Definitions

Types	Variable	Indicator	Definition
Dependent variable	Green innovation	<i>GI</i>	The natural logarithm of the number of green invention patents independently applied for by the firm plus one.
Independent variable	CEO gender	<i>Gender</i>	A dummy variable equals one if the CEO is female and zero otherwise.
Moderator variable	Gender inequality index	<i>Inequality</i>	Index calculated as the mean of all survey responses within each province from Chinese General Social Survey 2010 (CGSS2010).
	Female leadership representation	<i>FLR</i>	The proportion of women serving on the board of directors, board of supervisors, and executive team.
	Ultimate controller's control	<i>Control</i>	The ultimate controller's voting right in the firm.
	Male offspring involvement	<i>Son</i>	A binary variable coded as "1" if the ultimate controller's son is in the executive team, and "0" otherwise.
Control variable	Firm size	<i>Size</i>	The natural logarithm of total assets.
	Return on assets	<i>ROA</i>	The net income divided by total assets.
	Firm leverage	<i>LEV</i>	Total debt scaled by total assets.
	Sales growth	<i>SG</i>	The percentage change in sales from the previous year.
	Firm cash flow	<i>CF</i>	The net cash flow from operations scaled by total assets.
	Firm age	<i>Firm_Age</i>	The natural logarithm of firm age.
	Board size	<i>Board</i>	The natural logarithm of the number of directors.
	Percentage of independent directors	<i>Indir</i>	The percentage of independent directors over total directors.
	Institutional investor ownership	<i>Inst</i>	The tradable shares of institutional investors divided by total tradable shares.
	CEO duality	<i>CEO_Duality</i>	A dummy variable equal to one if the CEO is also the Chairman, zero otherwise.
	CEO tenure	<i>CEO_Tenure</i>	The natural logarithm of CEO tenure (in month).
	CEO age	<i>CEO_Age</i>	The natural logarithm of CEO age.
	Pollution industry	<i>Pollution</i>	A dummy variable equals one if it is a polluting industry ^a in accordance with the Guidelines on Environmental Information Disclosure for Listed Companies (2010), and zero otherwise.
	Proportion of provincial environmental protection expenditure	<i>Prov_Env</i>	Provincial environmental protection expenditure scaled by total general budget expenditure

Note: Green innovation (*GI*) is sourced from the Chinese research data services (CNRDS) database. Gender inequality index (*Inequality*) is from Chinese General Social Survey 2010 (CGSS2010). The remaining variables are from the China stock market & accounting research (CSMAR) database.

^aWe define the mining industry (B), agricultural and sideline food processing industry (C13), food manufacturing industry (C14), wine, beverage, and refined tea manufacturing industry (C15), textile industry (C17), textile apparel, clothing industry (C18), leather, fur, feather, and its products and shoemaking industry (C19), papermaking and paper products industry (C22), printing and reproduction of recording media industry (C23), cultural, educational, arts, sports, and entertainment goods manufacturing industry (C24), petroleum processing, coking, and nuclear fuel processing industry (C25), chemical raw materials and chemical products manufacturing industry (C26), pharmaceutical manufacturing industry (C27), chemical fiber manufacturing industry (C28), rubber and plastic products industry (C29), non-metallic mineral products industry (C30), ferrous metal smelting and rolling industry (C31), non-ferrous metal smelting and rolling industry (C32), metal products industry (C33), and the power, heat, gas, and water production and supply industry (D) as heavy pollution industries.

Appendix II
Correlation Matrix

	<i>GI</i>	<i>Gender</i>	<i>Inequality</i>	<i>FLR</i>	<i>Control</i>	<i>Son</i>	<i>Size</i>	<i>ROA</i>	<i>LEV</i>	<i>SG</i>
<i>GI</i>										
<i>Gender</i>	−0.0306***									
<i>Inequality</i>	0.0087	−0.0271***								
<i>FLR</i>	−0.0635***	0.2751***	0.0084							
<i>Control</i>	−0.0264***	0.0674***	0.0216**	0.1061***						
<i>Son</i>	−0.0652***	−0.0699***	0.0389***	0.0119	−0.0885***					
<i>Size</i>	0.1589***	−0.0124	0.0342***	−0.1294***	−0.0822***	0.0704***				
<i>ROA</i>	0.0252***	0.0056	0.0312***	0.1981***	0.0162*	−0.0139	−0.0517***			
<i>LEV</i>	0.1056***	−0.0120	−0.0049	−0.1449***	−0.0671***	0.0202**	0.5324***	−0.3424***		
<i>SG</i>	0.0186*	−0.0021	−0.0082	−0.0083	−0.0170*	−0.0190*	0.1610***	0.1308***	0.1416***	
<i>Firm_Age</i>	−0.0185*	0.0239**	−0.0260***	−0.0613***	0.0534***	0.0978***	0.1804***	−0.0787***	0.1514***	0.0086
<i>CF</i>	−0.0028	0.0060	0.0348***	0.0714***	0.0228**	0.0251**	0.0487***	0.3874***	−0.1422***	0.0174*
<i>Inst</i>	0.0321***	−0.0148	0.0327***	0.0393***	−0.0270***	0.0844***	0.2717***	0.0998***	0.1298***	0.0594***
<i>Board</i>	0.0120	−0.0473***	0.0489***	−0.1509***	−0.1072***	0.1157***	0.1276***	0.0446**	0.0271***	0.0082
<i>Indir</i>	−0.0017	0.0150	−0.0161*	0.0719***	0.0485***	−0.0436***	−0.0143	−0.0439***	0.0249**	0.0125
<i>CEO_Age</i>	0.0268***	−0.0290***	−0.0341***	−0.0195**	0.0174*	−0.0885***	0.0411***	0.0045	−0.0090	−0.0014
<i>CEO_Tenure</i>	0.0169*	0.0097	−0.0075	−0.0117	0.0212**	0.0196**	0.0821***	−0.0207**	0.0242**	−0.0327***
<i>CEO_Dual</i>	0.0206**	−0.0912***	−0.0156	0.0831***	0.0245**	−0.1294***	−0.1198***	0.0150	−0.0744***	−0.0060
<i>Pollution</i>	−0.1300***	−0.0223**	−0.0292***	−0.0094	0.0171*	0.0801***	0.0267***	0.0765***	−0.0965***	−0.0166*
<i>Prov_Env</i>	0.0576***	0.0185*	0.0599***	−0.0190*	0.0567***	−0.0715***	0.0671***	−0.0272***	0.0162*	0.0129

	<i>Firm_Age</i>	<i>CF</i>	<i>Inst</i>	<i>Board</i>	<i>Indir</i>	<i>CEO_Age</i>	<i>CEO_Tenure</i>	<i>CEO_Dual</i>	<i>Pollution</i>	<i>Prov_Env</i>
<i>GI</i>										
<i>Gender</i>										
<i>Inequality</i>										
<i>FLR</i>										
<i>Control</i>										
<i>Son</i>										
<i>Size</i>										
<i>ROA</i>										
<i>LEV</i>										
<i>SG</i>										
<i>Firm_Age</i>										
<i>CF</i>	0.0886***									
<i>Inst</i>	0.0025	0.0867***								
<i>Board</i>	−0.0373***	0.0060	0.0906***							
<i>Indir</i>	0.0248**	0.0052	−0.0481***	−0.3564***						
<i>CEO_Age</i>	0.1101***	0.0563***	0.0273***	−0.0002	0.0145					
<i>CEO_Tenure</i>	0.0382***	0.0429***	−0.0244**	−0.0064	−0.0226**	0.2231***				
<i>CEO_Dual</i>	−0.0382***	−0.0244**	−0.0694***	−0.1096***	0.0515***	0.2886***	0.1403***			
<i>Pollution</i>	0.0592***	0.1297***	0.0246**	0.0499***	−0.0157	0.0213**	0.0294***	−0.0217**		
<i>Prov_Env</i>	0.0450***	−0.0135	−0.0400***	−0.0114	0.0294***	0.0520***	0.0126	0.0224**	−0.0298***	

Note: This table presents Pearson correlations.

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



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特 稿

大数据、人工智能与厂商竞争路径

何大安 (5)

现代商贸流通

实体零售全渠道商业模式创新对经营绩效的影响

——基于双重差分法的研究

丁 宁 丁 华 (17)

中国物流业效率提升是否有路径显现?

——基于省级数据的定性比较分析

卢美丽 (27)

企业管理研究

中国文化情景下组织内创造力的多层面精神性动力机制研究

邓志华 陈维政 (38)

本刊严格实行同行专家双向匿名审稿制
本刊不以任何形式收取版面费和审稿费

表层扮演对员工离职倾向的影响: 情绪耗竭的中介作用与组织支持的调节效应

何建华 左 璐 常莉俊 (49)

财务管理与会计

女性 CEO 会雇佣更多的女性下属吗?

——基于中国家族上市公司的经验数据 郭 萍 陈 凌 杨学儒 (59)

创新还是寻租? 业绩期望落差对企业风险承担行为的影响

何晴晴 杨 柳 潘 镇 (71)

产业经济与区域经济

双向直接投资协同发展对中国资源错配的影响

杨校美 肖红叶 (86)

本期执行编辑: 束顺民

女性 CEO 会雇佣更多的女性下属吗?

——基于中国家族上市公司的经验数据

郭 萍¹, 陈 凌², 杨学儒¹

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摘 要: 学界对于女性上级是否更愿意雇佣女性下属的问题一直存在争议。基于中国家族上市公司2008–2016年的经验数据, 实证检验了 CEO 的性别身份对高管团队中女性下属雇佣的影响以及 CEO 的家族身份在二者关系中的调节作用, 研究发现家族企业女性 CEO 雇佣的女性下属比男性 CEO 少; 进一步地, 女性 CEO 对具有同样家族身份的女性下属的雇佣是最低的, 即家族女性 CEO 雇佣的家族女性下属在所有 CEO 中是最少的; 同样地, 非家族女性 CEO 雇佣的非家族女性下属在所有 CEO 中也是最少的。研究拓展了象征主义理论在家族企业女性高管雇佣上的适用情境与条件机制, 丰富了性别与家族企业领域的研究成果。

关键词: 社会认同理论; 象征主义; 家族企业; 女性高管

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Does Female CEO Employ More Female Subordinates?

——An Empirical Study Based on Chinese Family Listed Companies

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Abstract: There has always been a controversy in the academic circles about whether female superiors are more willing to employ female subordinates. Based on the data of Chinese family listed companies from 2008 to 2016, this paper studies the influence of CEO's gender on the employment of female subordinates, and the moderation effect of CEO's family attribute. Research results show that: first, female CEOs in family businesses employ fewer female subordinates than male CEOs. Second, compared with family male CEOs, non-family male CEOs and non-family female CEOs, family female CEOs employ the least number of family female subordinates. Similarly, non-family female CEOs employ the least non-family female subordinates among all CEOs. The paper expands the application situation of tokenism and enriches the research on gender and family business.

Key words: social identity theory; tokenism; family business; female executives

一、引言

随着全球政治、经济和文化水平的不断提高, 男女平等观念日益深入人心。不过女性进入企业高管团

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队的机会依旧很少,“玻璃天花板”现象仍普遍存在。近些年来,包括格力电器、天齐锂业、新希望以及通用汽车、IBM、百事可乐在内的一些国内外知名企业陆续聘用女性 CEO 的事件成功吸引了大众眼球。根据社会认同理论的预测,女性在公司领导层中的地位越高,她们会基于性别身份认同创造出有利于女性的组织环境,包括雇佣更多的女性进入高管团队从而减少持续存在的性别不平等现象。然而事实真的如此吗?女性 CEO 会促进女性高管比例的提高吗?或者说,基于性别身份的社会认同真的会对女性 CEO 的高管雇佣决策带来显著影响吗?

进一步地,中国民营企业大多是家族企业(中国民(私)营经济研究会家族企业研究课题组,2011)^[1]。根据社会情感财富理论,家族身份认同是家族企业 CEO 制定决策的重要参考点(Gomez-Mejia 等,2011)^[2]。大量的统计数据显示,家族企业确实比非家族企业雇佣了更多的女性高管(EY Romania 和 Kennesaw State University,2017; Credit Suisse,2014)^[3-4]。本文不免提出疑问,这是由于家族 CEO 更愿意雇佣家族女性高管所致吗?家族女性 CEO 的性别身份和家族身份认同会对女性高管的雇佣产生共同影响吗?

为回答上述问题,本文构建了2008-2016年中国上市家族企业女性 CEO 和女性高管雇佣的面板数据库,实证检验了 CEO 的性别身份和家族身份对女性高管雇佣的影响。研究结果与前述“直觉”恰恰相反,女性 CEO 非但没有显著增加中国上市家族企业女性高管的雇佣,反而导致了其下降;更有甚者,家族女性 CEO 雇佣的家族企业女性高管比例是最低的。

与以往的文献相比,本文的主要贡献在于:(1)丰富了女性高管雇佣的情境研究。以往文献主要从上级的性别身份这一维度出发来探讨其对女性下属雇佣决策的影响。本文聚焦家族企业情境,考察了 CEO 的性别身份和家族身份双重维度对高管团队中女性下属雇佣的共同影响,对于女性下属的家族身份也同样予以细分,进一步细化和丰富了不同情境下女性上下级关系的研究,为理解具有多重身份 CEO 的高管雇佣决策打开了窗口。(2)拓展了象征主义理论在家族女性高管雇佣上的适用情境与条件机制。本文研究发现家族企业女性 CEO 雇佣的女性下属比男性 CEO 少。这很可能是因为女性 CEO 缺乏晋升机会,导致她们排斥其他女性进入高管团队;而且女性 CEO 对具有同样家族身份的女性下属的雇佣是最低的。即家族女性 CEO 雇佣的家族女性下属在所有 CEO 中是最少的;同样地,非家族女性 CEO 雇佣的非家族女性下属在所有 CEO 中也是最少的。

二、理论回顾和假设提出

(一) 相关理论回顾

当组织中的领导与下属都是女性时,两者之间的关系究竟是同性“相吸”还是“相斥”?社会认同理论与象征主义理论对此的观点截然相反。

1. 社会认同理论。Byrne(1971)^[5]很早就提出了相似性吸引范式,即包括态度等在内的多种相似性会增进人与人之间的相互吸引力,还有证据表明人口统计学相似的员工更喜欢彼此之间合作(Glaman 等,1996)^[6]。社会认同理论为此提供了理论解释。社会认同是指个体认识到自己属于特定的社会群体,同时也认识到作为群体成员带给自己的情感和价值意义(Tajfel 和 Turner,1986)^[7]。在自我分类以及与其他群体相比较之后,个体会逐渐衍生出对自己归属于某个群体的身份认知。出于积极维护自尊的需要,个体会对自己所在的社会群体给予正面评价,即形成内群体偏好,而给予外群体更负面的评价。根据社会认同理论,性别是个体归属的一种身份,同性别也应该是社会认同的显著维度之一。据此可知,女性上级会基于性别身份认同对其他女性成员给予正面评价。与男性上级相比,女性上级更愿意为女性下属提供帮助和支持(Koenig 等,2011)^[8],从而在同性上下级之间形成更积极的工作关系(Vecchio 和 Brazil,2007)^[9]。

2. 象征主义理论。尽管政策倡导者通常认为女性担任最高领导时会增加更低级别女性的晋升率,但实际情况并非如此。女性在男性主导的领域获得职业成功后,她们可能拒绝帮助其他女性爬上公司的权力阶梯,这就是所谓的“蜂后现象”。一些轶事证据和少数实证研究都显示,女性在工作场所面临的最大挑战居

然是其他成功的女性(Klaus, 2009; Bagues 和 Esteve-Volart, 2010)^[10-11]。最典型的案例就是英国首位女首相玛格丽特·撒切尔,她在1979-1990年为期11年的执政期间很少提拔女性进入内阁。Kanter(1977)^[12]提出的象征主义理论认为,在男性主导的现代企业中,属于少数派的女性主要是出于“装点门面”的需要象征性雇佣的。在象征主义情境下,女性上级会拒绝为女性下属提供帮助和支持,进而导致女性上级与女性下属之间的紧张关系。这为“蜂后现象”提供了解释,但关于象征主义理论在企业高管雇佣问题上的适用情境与条件机制的研究还比较缺乏。

被雇佣者属于社会地位低下的少数群体是象征性雇佣发生的基本条件。但是占比较低和社会地位低下究竟是指何等水平尚不明确。Kanter(1977)^[12]建议,如果少数群体在组织中的占比不到15%就意味着代表性严重不足,属于典型的象征性雇佣。不过也有研究表明,简单数字化的代表性不足并不一定引发象征性雇佣的负面效应,少数群体的社会地位低下才是关键(Mcdonald 等, 2004)^[13]。比如男性进入一个女性主导的领域时,尽管属于少数派,但由于男性是社会上占主导地位的群体,他们并不会经历像女性那样的紧张关系。因此导致女性之间紧张关系的象征主义必须同时具备两个条件:(1)在组织中的代表性不足(即占比较低);(2)社会地位低下(即弱势群体)。

另一方面,象征主义并没有为企业高管层中女性领导雇佣其他女性下属的决策提供明确答案,尤其是象征性雇佣和企业特性的共同影响更是鲜有研究。一个例外是, Ryan 等(2012)^[14]通过实验方法探讨了象征性雇佣的女性拒绝帮助其他女性行为的驱动因素,部分地回应了象征性雇佣对女性下属的不利影响。他们发现,当象征性雇佣的女性在企业中的晋升机会有限且不确定时,女性上级会采取个人主义策略——远离被负面评价的群体成员,以突出她个人的特殊地位并与其他女性群体成员形成对比。如果晋升机会较多的话,象征性雇佣的女性上级则可能采取集体主义策略——为其他女性成员提供帮助和支持,从而提升整个女性群体的社会地位。

(二) 研究假设提出

1. CEO 性别对女性高管下属雇佣的影响。正如前文所述,女性上级与女性下属之间的关系既可能是积极正面的,也可能是消极负面的。如果女性上级拥有较多的晋升机会,那么她们会愿意提拔女性下属;如果女性上级晋升的可能性很低,为了将女性下属排斥在可竞争的范围之外,女性上级会拒绝提拔女性下属。这就是职场中对女性高管数量的非正式限制或者象征性雇佣(Dezso 等, 2016)^[15]。Kunze 和 Miller(2017)^[16]认为,在象征性雇佣的情境下,处于相同管理层次的女性会为了争夺有限的晋升机会展开最激烈的竞争;但不同管理层次的女性之间的竞争关系会减弱,此时女性上级更愿意为女性下属提供帮助和支持^[14]。本文所讨论的女性CEO和其他女性高管同属企业的高管团队成员,在管理层次上属于同一梯队或者等级。由此可见,她们之间存在潜在的竞争关系。不过CEO拥有的实权比其他高管大,除了主持公司的生产经营管理工作和拟订公司内部管理机构设置方案之外,CEO还有提请聘任或者解聘公司副总经理、财务负责人的人事权。^①因此CEO与其他高管之间属于同一管理等级内的上下级关系。

尽管女性的社会地位在过去的50年里得到了极大改善,但女性进入企业高管团队的机会仍然极低(穆里尔·德·圣·苏维尔, 2013)^[17]。Catalyst 机构的最新调查显示,2018年全世界范围内有女性高管的企业达到了75%,比上一年提高了9个百分点。不过企业高管团队中的女性比例依然偏小,女性CEO更是少之又少。比如,女性在日本企业的高管团队中仅占5%;加拿大100家最大上市公司的C级(即CEO、COO、CFO等)女性高管的比例不到10%;美国S&P500企业的女性CEO仅占4.8%,女性在最高收入管理者中的占比约为11%;欧盟(EU-28)最大上市公司中有15.9%的高管和5.5%的CEO是女性;印度企业中女性CEO的比例为7%。^②中国的情况也不例外,由于女性解放的时间落后于西方国家,加上儒家文化中“男尊女卑”“女子无才便是德”等观念根深蒂固,导致女性在社会上普遍遭遇性别歧视。有学者统计发现,2012~2014

①参见《公司法》第四十九条。

②以上统计数据来自于 Catalyst 官方网站(<https://www.catalyst.org/>)。

年中国 A 股上市公司中女性高管的比例低于 16.76% (朱文莉、邓蕾, 2017)^[18]; 女性 CEO 的占比在 2015 年达到 7.15% (李彬等, 2017)^[19]。以上数据表明, 中国上市公司女性高管 (尤其是女性 CEO) 的比例明显偏低, 符合 (Kanter, 1977)^[12] 的象征性雇佣特征。

在象征性雇佣情境下, 女性 CEO 已经处于公司权力阶梯的顶端, 几乎没有进一步晋升的可能。一旦将其他女性提拔至高管职位, 这些女性下属将成为女性 CEO 最直接的竞争者。所以, 女性 CEO 并不会为其他女性成员进入高管团队提供支持。本文的样本是中国 A 股上市公司中的家族企业, 女性高管基于家族身份可以区分为家族和非家族女性高管。基于上述象征性雇佣逻辑, 女性 CEO 对家族或非家族女性获得高管职位具有类似的不利影响。综上所述, 本文提出以下研究假设:

H1: 家族企业 CEO 的性别与女性高管下属的雇佣呈负相关关系。

H1a: 家族企业 CEO 的性别与家族女性高管下属的雇佣呈负相关关系。

H1b: 家族企业 CEO 的性别与非家族女性高管下属的雇佣呈负相关关系。

2. CEO 家族身份对 CEO 性别与女性高管下属雇佣的影响。家族企业高管除了性别身份之外, 还可能拥有家族身份。本文接下来分别讨论 CEO 家族身份对 CEO 性别与家族女性下属/非家族女性下属雇佣的影响。

CEO 的家族身份究竟会弱化还是加剧女性 CEO 对家族女性下属雇佣的负相关关系? 本文认为 CEO 家族身份会加剧女性 CEO 对家族女性下属雇佣的负相关关系。这是因为无论古今, 许多女性成员都感到她们在家族企业中是透明或者“不被看见”的角色, 没有受到与男性成员同等的对待。这在家族企业的传承中体现地尤为明显。在以往文献中, 对男性继承人的偏好是显而易见的 (Dumas, 1992; Constantinidis 和 Nelson, 2009; Heinonen 和 Hytti, 2011)^[20-22]。这意味着在通常情况下家庭中任何非男性的家族成员 (如妻子、女儿或姐妹), 除非绝对必要, 否则不会被视为潜在的继承人 (Ip 和 Jacobs, 2006)^[23]。只有在没有男性竞争者 (儿子/女儿) 或者男性后代年龄尚幼的情况下, 女性才有较大机会挑起家族企业领导的重任。最近的研究表明, 性别在选择继任者方面仍然发挥着重要作用 (Ahrens 等, 2015; Schenkel 等, 2016)^[24-25]。由此可见, 与家族男性成员相比, 家族女性成员在高管团队中也是少数派, 符合象征性雇佣的特征。在这种情况下, 继任 CEO 的女性面临的竞争者可能来自家族内部的其他女性成员。因此为了减少潜在的竞争威胁, 家族女性 CEO 会更加排斥其他女性家族成员进入高管团队。当然家族女性之间的紧张关系并不局限在同辈之间, 也有可能出现创始人母亲与女儿之间。Resnick (1994)^[26] 的研究发现, 作为母亲的女性创始人可能会过分控制其女儿, 而女儿也可能表现出对母亲的过度批评。Vera 和 Dean (2005)^[27] 的研究也证实, 大多数女性成员与她们的创始人父亲相处融洽, 但与创始人母亲之间的关系则会经历更多困难。这主要源自母亲们倾向于要求完美, 并且害怕失去控制力。

此外, 有学者从其他视角的观察也可能得出类似的结果。比如, 创始人父母一般都深感企业经营之不易, 不希望儿女们走相同的道路 (何轩等, 2014)^[28]。与男性相比, 女性作为家族企业接班人会面临更多的家庭—工作冲突, 如果让女儿们接班的话, 肯定对家庭要有所牺牲 (Cadieux 等, 2002)^[29]。同是女性的创始人母亲对此更能感同身受, 为了避免女儿吃苦, 她们会选择不让女性后代进入企业高管层。而且这种情况在规模较小的家族企业里更可能发生 (王连娟等, 2010)^[30]。

综上所述, 本文提出以下研究假设:

假设 H2a: CEO 家族身份会强化 CEO 性别与家族女性下属雇佣的负相关关系。

此外 CEO 的家族身份又会如何影响 CEO 性别与非家族女性下属雇佣之间的关系呢? 根据前文所述, 与家族男性成员相比, 家族女性在高管团队中属于少数派。通常在男性接班人缺位时, 家族女性成员才有较大可能继任企业 CEO 职位。坐上了 CEO 宝座的女性最担心的竞争者就是其他家族女性成员, 其次是非家族男性经理, 最后才是非家族女性经理。也就是说, 家族身份是将非家族成员与家族企业权力顶峰隔绝的“天然屏障”。对于非家族女性成员来说, 要成为家族企业的掌权者更是难上加难。鉴于此, 家族外的女性高管非但不是家族女性 CEO 的“劲敌”, 而且常常可以成为家族女性 CEO 团结的对象。因此本文认为 CEO 的家族身份会弱化女性 CEO 对非家族女性下属的排斥, 综上所述, 本文提出以下研究假设:

假设 H2b: CEO 家族身份会弱化 CEO 性别与非家族女性下属雇佣的负相关关系。

非家族女性高管在数量上会超过家族女性高管,所以在考虑 CEO 家族身份对 CEO 性别与总体女性高管雇佣的影响时,家族身份对 CEO 性别与非家族女性下属雇佣的正向调节效应会大于它对家族女性下属雇佣的负向调节效应,最后呈现出净的正向效应。综上所述,本文提出以下研究假设:

假设 H2c: CEO 家族身份会弱化 CEO 性别与女性下属雇佣的负相关关系。

三、研究设计

(一) 样本与数据收集

本文以我国 A 股家族上市公司为研究对象,通过以下标准确定样本: (1) 最终控制人能追踪到自然人或家族; (2) 最终控制人直接或间接持有的公司必须是上市公司的第一大股东; (3) 至少有两位及以上具有亲缘关系的家族成员持股或担任上市公司高管职务(包括董事长、董事和高层经理职务); 样本时间期限为2008–2016年。

本文的被解释变量和调节变量主要来自于手工收集。基于 CSMAR 数据库中的高管姓名和性别,本文手工计算了每个家族上市公司在各年份的女性高管比例。CEO 或女性高管与控股家族的亲缘关系从以下几个渠道搜索: (1) 将 CEO 或女性高管的姓名与实际控制人的姓名进行匹配,能够匹配上的说明是实际控制人本人; (2) 对于没有匹配上的高管,从上市公司年报、招股说明书、上市公告中获取相关信息,根据“本公司与实际控制人之间的产权和控制关系方框图”以及“一致行动人说明”进行甄别,可以将与实际控制人有亲缘关系的高管识别出来; (3) 对于以上途径没有披露亲缘关系的 CEO 或女性高管,借助公司官网、Baidu 和 Google 搜索引擎逐一确定。本文其他变量主要来源于 CSMAR 数据库。

在删除严重缺失数据的样本后,本文最终获取了1244家公司的非平衡面板数据库,共计6202个样本观测值。为了保证数据有效性并消除异常值对研究结论的干扰,本文利用 Winsorize 方法对主要的连续变量在1%水平上的极端值进行了处理。

(二) 模型与变量定义

考虑被解释变量女性高管比例为0–1之间的双向归并数据,其条件分布并非正态分布,故在后续分析中,本文采用针对归并数据更常用的 Tobit 模型。本文的主要模型有2个: 主效应模型检验的是 CEO 性别(*gender*) 对于女性高管下属雇佣的影响。其中,被解释变量会分别考虑女性下属比例(*rfe*)、家族女性下属比例(*rffe*) 以及非家族女性下属比例(*rnffe*)。调节效应模型是在主效应模型的基础上,加入了 CEO 性别与其家族身份(*family*) 的交互项,用来检验 CEO 家族身份对 CEO 性别与以上三个被解释变量之间关系的调节效应。

$$rfe/rffe/rnffe = \alpha_0 + \alpha_1 gender + \alpha_2 CV + YD + ID + \xi \quad (1)$$

$$rfe/rffe/rnffe = \alpha_0 + \alpha_1 gender + \alpha_2 family + \alpha_3 gender \times family + \alpha_4 CV + YD + ID + \xi \quad (2)$$

参考相关文献,本文选取了以下9个控制变量(为简化公式用 *CV* 表示): 企业规模、企业年龄、财务杠杆、经营杠杆、高管总人数、资产回报率、CEO 年龄、CEO 受教育年限以及家族总人数。同时以上模型还控制年度效应(*YD*) 和行业效应(*ID*)。所有变量的定义以及测量见表1。

表1 变量定义

变量名	变量代码	测量
女性下属比例	<i>rfe</i>	CEO 为女性时, $rfe = (\text{女性高管总人数} - 1) / (\text{高管总人数} - 1)$ CEO 为男性时, $rfe = \text{女性高管人数} / (\text{高管总人数} - 1)$
家族女性下属比例	<i>rffe</i>	CEO 为女性且为家族成员时, $rffe = (\text{家族女性高管人数} - 1) / (\text{高管总人数} - 1)$ 其他情况下, $rffe = \text{家族女性高管人数} / (\text{高管总人数} - 1)$

续表1

变量名	变量代码	测量
非家族女性下属比例	<i>rnffe</i>	CEO 为女性且非家族成员时, $rnffe = (\text{非家族女性高管人数} - 1) / (\text{高管总人数} - 1)$; 其他情况下, $rnffe = \text{非家族女性高管人数} / (\text{高管总人数} - 1)$
CEO 的性别	<i>gender</i>	CEO 的性别为女, 记为1; 否则为0
CEO 家族身份	<i>family</i>	CEO 是家族成员, 记为1, 否则为0
企业总资产	<i>asset</i>	企业总资产的对数
企业年龄	<i>fage</i>	取企业年龄的对数
财务杠杆	<i>flever</i>	$flever = (\text{净利润} + \text{收入税费用} + \text{财务费用}) / (\text{净利润} + \text{收入税费用})$
经营杠杆	<i>mlever</i>	$mlever = (\text{净利润} + \text{所得税费用} + \text{财务费用} + \text{固定资产折旧} + \text{无形资产摊销} + \text{长期待摊费用摊销}) / (\text{净利润} + \text{所得税费用} + \text{财务费用})$
高管总人数	<i>tmt</i>	高管总人数的对数
资产回报率	<i>roa</i>	$roa = \text{当年净利润} / (\text{总资产期初余额} + \text{总资产期末余额}) / 2$
CEO 的年龄	<i>ceoage</i>	CEO 的实际年龄
CEO 教育年限	<i>ceoedu</i>	初中及以下受教育年限 = 8年; 高中或中专 = 11年; 大学本科 = 15年; 硕士研究生 = 18年; 博士研究生 = 21年
家族总人数	<i>famn</i>	实际控制人家族成员总人数
年份虚拟变量	<i>YD</i>	2008 ~ 2016年共有9年(8个变量)
行业虚拟变量	<i>ID</i>	按证监会2012年行业分类标准, 剔除金融行业后共有17个行业(16个变量)

四、研究结果

(一) 描述性结果

表2报告了本文主要变量的描述性统计结果。在本文的上市家族企业样本中, 至少拥有1位女性高管的公司占比达96%; 女性CEO比例的均值为9.1%, 其他高管职位由女性担任的比例均值为21%; 与朱文莉等(2017)^[3]、李彬等(2017)^[9]的研究对比, 家族上市公司雇佣的女性高管以及女性CEO均高于中国A股上市公司的平均水平。不过, 每100个家族企业中仅有9位女性CEO, 其他职位上的女性高管也仅占五分之一左右, 这说明女性高管(尤其是女性CEO)在家族企业中依旧是少数群体。

另外, 样本企业CEO的家族身份均值为0.587, 即有近60%的CEO是实际控制人及其家族成员, 这与翁霄暉等(2014)^[6]的研究类似。样本企业的相关特征变量经过对数处理后的数据如下: 企业规模均值为21.48(即4.08亿元左右), 企业年龄的均值为2.44(即12.85年左右), 高管总人数的均值为2.622(即15人左右)。

(二) 多层次分析

本文采用Stata 13.0进行数据处理, 检验前文假设。表3报告了主要的回归结果。模型1-3的被解释变量是女性高管比例。其中模型1为基本模型, 仅包含了控制变量; 模型2包含了所有的控制变量以及加入解释变量

表2 主要变量的描述性统计性

变量代码	均值	标准差	最小值	最大值	观测数
<i>rfe</i>	0.210	0.120	0	0.727	6202
<i>rffe</i>	0.035	0.049	0	0.385	6202
<i>rnffe</i>	0.175	0.111	0	0.636	6202
<i>gender</i>	0.091	0.288	0	1	6202
<i>family</i>	0.587	0.492	0	1	6202
<i>asset</i>	21.484	0.974	19.006	24.474	6202
<i>flever</i>	1.217	0.762	-0.406	6.326	6202
<i>mlever</i>	1.409	0.742	-1.510	5.410	6202
<i>fage</i>	2.440	0.513	0.693	3.296	6202
<i>tmt</i>	2.622	0.193	1.792	3.664	6202
<i>roa</i>	0.059	0.056	-0.160	0.243	6202
<i>ceoage</i>	47.563	7.413	26	79	6202
<i>ceoedu</i>	15.435	3.424	0	21	6202
<i>Famn</i>	3.173	1.416	1	8	6202

后的检验模型。模型2的结果显示,CEO的性别与女性高管下属的雇佣显著负相关(系数 = -0.0326 , $p < 0.01$),且在后续加入调节变量后的模型3中依然稳健,说明在女性CEO的家族企业中女性高管下属的比例更低,本文假设H1得到支持。模型4-5的被解释变量是家族女性下属比例。模型4的结果显示,CEO的性别与家族女性下属的雇佣仍是负相关(系数 = -0.0560 , $p < 0.01$),且在后续加入调节变量后的模型5中依然稳健,说明女性担任CEO的家族企业中,家族女性下属比例确实较低,本文假设H1a得到支持。模型6-7的被解释变量是非家族女性下属。模型6的结果显示,CEO的性别与非家族女性下属雇佣的系数为 -0.0046 ,但不显著。本文的假设H1b没有得到支持。

表3 主要的Tobit回归结果

	模型1	模型2	模型3	模型4	模型5	模型6	模型7
	<i>rfe</i>		<i>rffe</i>		<i>rnffe</i>		
<i>gender</i>		-0.0326^{***} (-5.94)	-0.0575^{***} (-7.07)	-0.0560^{***} (-12.27)	-0.0313^{***} (-4.29)	-0.0046 (-0.84)	-0.0418^{***} (-5.20)
<i>family</i>			0.0008 (0.25)		0.0030 (1.05)		-0.0006 (-0.19)
<i>gender × family</i>			0.0425^{***} (4.05)		-0.0389^{***} (-4.33)		0.0641^{***} (6.16)
<i>asset</i>	-0.0033 (-1.46)	-0.0036 (-1.62)	-0.0038^* (-1.68)	-0.0063^{***} (-3.08)	-0.0060^{***} (-2.94)	-0.0015 (-0.70)	-0.0018 (-0.80)
<i>flever</i>	0.0013 (0.97)	0.0013 (0.93)	0.0014 (1.00)	-0.0015 (-1.26)	-0.0016 (-1.36)	0.0017 (1.22)	0.0018 (1.33)
<i>mlever</i>	-0.0002 (-0.12)	-0.0000 (-0.01)	-0.0000 (-0.01)	-0.0009 (-0.74)	-0.0008 (-0.71)	0.0001 (0.09)	0.0001 (0.10)
<i>fage</i>	-0.0023 (-0.44)	-0.0015 (-0.29)	-0.0008 (-0.15)	-0.0106^{**} (-2.16)	-0.0109^{**} (-2.23)	0.0010 (0.20)	0.0020 (0.39)
<i>tmt</i>	-0.0583^{***} (-6.98)	-0.0594^{***} (-7.13)	-0.0598^{***} (-7.16)	-0.0121^* (-1.68)	-0.0113 (-1.56)	-0.0453^{***} (-5.44)	-0.0463^{***} (-5.55)
<i>roa</i>	0.0563^{***} (2.61)	0.0579^{***} (2.69)	0.0577^{**} (2.69)	0.0183 (0.99)	0.0191 (1.04)	0.0493^{**} (2.29)	0.0493^{**} (2.30)
<i>ceoage</i>	-0.0001 (-0.67)	-0.0002 (-0.83)	-0.0002 (-0.90)	0.0004^{**} (2.30)	0.0004^{**} (2.40)	-0.0003^* (-1.80)	-0.0004^* (-1.92)
<i>ceoedu</i>	0.0006 (1.29)	0.0006 (1.36)	0.0007 (1.40)	0.0008^* (1.86)	0.0008^* (1.93)	0.0004 (0.80)	0.0004 (0.82)
<i>famn</i>	0.0007 (0.54)	0.0007 (0.50)	0.0007 (0.50)	0.0104^{***} (8.32)	0.103^{***} (8.21)	-0.0041^{***} (-3.05)	-0.0041^{***} (-2.98)
<i>YD</i>	控制	控制	控制	控制	控制	控制	控制
<i>ID</i>	控制	控制	控制	控制	控制	控制	控制
截距项	0.472^{***} (8.43)	0.484^{***} (8.66)	0.487^{***} (8.68)	0.120^{**} (2.29)	0.109^{**} (2.07)	0.382^{***} (6.93)	0.389^{***} (7.03)
<i>sigma_u</i>	0.107^{***} (43.60)	0.107^{***} (43.62)	0.107^{***} (43.63)	0.112^{***} (29.55)	0.113^{***} (29.59)	0.103^{***} (42.63)	0.103^{***} (42.66)
<i>sigma_e</i>	0.0633^{***} (96.63)	0.0630^{***} (96.57)	0.0628^{***} (96.57)	0.0383^{***} (60.59)	0.0382^{***} (60.60)	0.0628^{***} (94.44)	0.0625^{***} (94.41)
<i>N</i>	6202	6202	6202	6202	6202	6202	6202
<i>Log likelihood</i>	6151.20	6168.81	6177.88	2438.31	2447.39	5762.04	5781.96
<i>LR chi2</i>	4715.32	4750.50	4758.42	4956.82	4968.57	4448.63	4480.38
<i>P</i>	0.000	0.000	0.000	0.000	0.000	0.000	0.000

注: 括号内为z值, **、*和°分别表示在1%、5%和10%水平显著

表3的模型3、5、7分别检验了在不同被解释变量模型中CEO家族身份的调节作用。模型5的检验结果表明,CEO性别与家族身份的交互项(*gender × family*)与家族女性高管比例(*rffe*)是显著负相关关系(系数 = -0.0389 , $p < 0.01$),说明CEO的家族身份会加剧女性CEO对家族女性下属雇佣之间的负相关关系,本文

的假设 H2a 得到了支持。模型7的检验结果表明,CEO 性别与家族身份的交互项($gender \times family$)与非家族女性高管比例($rnffe$)是显著正相关关系(系数=0.0641, $p < 0.01$),在调节变量进入之后,CEO 性别与非家族女性高管比例的系数为-0.0418,在1%的水平上显著。这说明 CEO 的家族身份会弱化女性 CEO 对非家族女性下属雇佣之间的负相关关系,本文的假设 H2b 得到了支持。模型3的检验结果表明,CEO 性别与家族身份的交互项($gender \times family$)与女性高管比例(rfe)是显著正相关关系(系数=0.0425, $p < 0.01$),说明 CEO 的家族身份会弱化女性 CEO 对总体女性下属雇佣之间的负相关关系,本文的假设 H2c 也得到了支持。

为了进一步理解上述三个显著的交互效应,本文使用 Aiken 和 West(1991)^[3]的方法进行了简单斜率检测和两维交互图(图1-3)的绘制,结果全部支持前文假设。

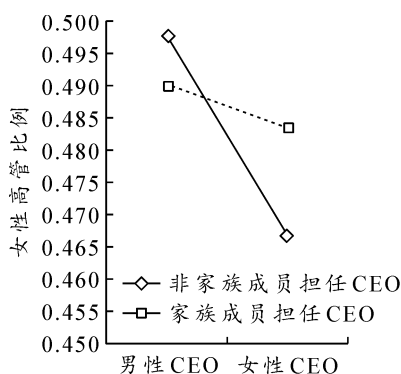


图1 家族身份对 CEO 性别与女性高管比例的调节效应

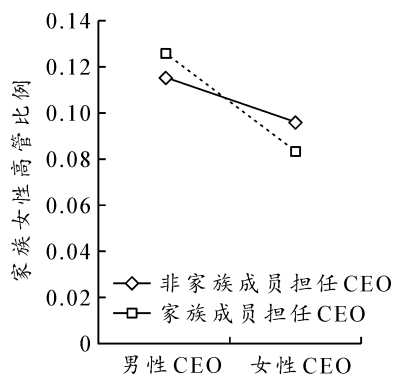


图2 家族身份对 CEO 性别与家族女性高管比例的调节效应

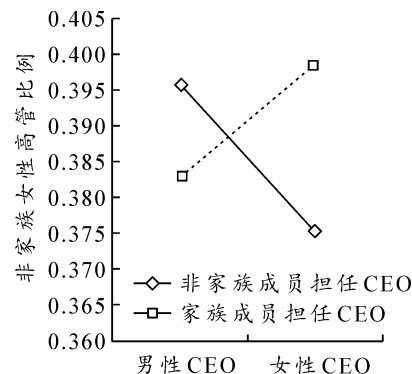


图3 家族身份对 CEO 性别与非家族女高管比例的调节效应

(三) 稳健性检验

在前文中,本文通过全样本观测值的统计检验发现,CEO 的家族身份会负向调节其性别与家族女性下属雇佣之间的关系,即家族女性 CEO 雇佣的家族女性下属会比非家族女性 CEO 雇佣的少。导致这个结果的原因除了我们讨论的象征性雇佣对家族女性成员关系的影响之外,可能还会受到家族规模约束的影响。如果以上效应在成员较多的家族也同样成立的话,说明家族女性 CEO 雇佣家族女性下属的决策并非受到实际控制人家族规模的客观约束,从而进一步证实本文的观点。

为了统一对比口径,采用家族总人数与公司高管总人数的比值($familysize$)对实际控制人的家族规模进行标准化。其分布为: $familysize \geq 20\%$ 的样本占总样本的49.39%; $familysize \geq 30\%$ 的样本占比21.69%; $familysize \geq 40\%$ 的样本占比是7.74%。考虑 $familysize \geq 40\%$ 的样本过少,本文在前两组子样本中重新对研究假设 H2a 进行检验,回归结果依然稳健(如表4所示)。

表4 不同家族规模分组的稳健性检验(Tobit 模型)

	被解释变量: 家族女性高管的比例($rffe$)			
	子样本1: $familysize \geq 20\%$		子样本2: $familysize \geq 30\%$	
$gender$	-0.0569*** (-9.11)	-0.0157 (-1.47)	-0.0353*** (-3.50)	0.0187 (1.13)
$family$		0.0071* (1.91)		0.0076 (1.23)
$gender \times family$		-0.0600*** (-4.76)		-0.0791*** (-4.13)
CV	控制	控制	控制	控制
YD	控制	控制	控制	控制
ID	控制	控制	控制	控制
σ_u	0.111*** (24.36)	0.111*** (24.40)	0.115*** (17.42)	0.116*** (17.46)
σ_e	0.0390*** (47.61)	0.0388*** (47.64)	0.0397*** (31.02)	0.0392*** (31.01)
N	3422	3422	1454	1454
$Log\ likelihood$	1518.00	1529.45	634.54	643.06
$LR\ chi2$	2772.25	2775.07	1161.89	1174.98
P	0.000	0.000	0.000	0.000

注: 括号内为 z 值, **、*和^{*}分别表示在1%、5%和10%水平显著

为进一步检验本文研究结论的稳健性,本文还进行了如下检验。首先,采用固定效应模型对本文的假设进行重新检验,回归结果与主检验相同(表5)。其次,替换被解释变量的测量方法。采用女性下属的数量(*nfe*)、家族女性下属的数量(*nffe*)、非家族女性下属的数量(*nnffe*)作为替代测量,重新对研究假设进行检验,统计结果与主检验完全类似(表6)。再次,用当年CEO的性别对第二年女性高管下属(包括家族女性下属与非家族女性下属)数量的滞后影响进行了检验,同时考虑CEO的家族身份在其中的调节效应。检验结果与本文的主检验完全一致(表7),本文的结论仍然稳健。

表5 固定效应模型的稳健性检验

	<i>rfe</i>			<i>rffe</i>		<i>nnffe</i>	
<i>gender</i>		-0.0414 *** (-3.67)	-0.0655 *** (-4.25)	-0.0328 *** (-5.44)	-0.0176 ** (-2.10)	-0.0086 (-0.73)	-0.0479 *** (-2.93)
<i>family</i>			-0.0004 (-0.07)		0.0004 (0.19)		-0.0008 (-0.17)
<i>gender × family</i>			0.0440 ** (2.32)		-0.0278 *** (-2.59)		0.0718 *** (3.81)
<i>CV</i>	控制	控制	控制	控制	控制	控制	控制
年度固定效应	控制	控制	控制	控制	控制	控制	控制
行业固定效应	控制	控制	控制	控制	控制	控制	控制
<i>N</i>	6202	6202	6202	6202	6202	6202	6202
调整 R^2	0.0387	0.0483	0.0515	0.0549	0.0638	0.0447	0.0538
<i>F</i> 值	3.68	4.27	4.74	3.27	3.62	3.98	5.08

注: 括号内为 *t* 值, ***、**和* 分别表示在1%、5%和10% 水平显著

表6 被解释变量替换的稳健性检验(Tobit 模型)

	<i>nfe</i>			<i>nffe</i>		<i>nnffe</i>	
<i>gender</i>		-0.445 *** (-5.90)	-0.802 *** (-7.19)	-0.731 *** (-12.22)	-0.419 *** (-4.37)	-0.078 (-1.05)	-0.597 *** (-5.41)
<i>family</i>			-0.0080 (-0.18)		0.0372 (1.00)		-0.0269 (-0.60)
<i>gender × family</i>			0.616 *** (4.28)		-0.489 *** (-4.15)		0.896 *** (6.30)
<i>CV</i>	控制	控制	控制	控制	控制	控制	控制
<i>YD</i>	控制	控制	控制	控制	控制	控制	控制
<i>ID</i>	控制	控制	控制	控制	控制	控制	控制
<i>sigma_u</i>	1.458 *** (43.59)	1.467 *** (43.60)	1.467 *** (43.62)	1.513 *** (29.69)	1.516 *** (29.72)	1.405 *** (42.73)	1.407 *** (42.77)
<i>sigma_e</i>	0.870 *** (96.69)	0.865 *** (96.63)	0.864 *** (96.63)	0.501 *** (60.32)	0.500 *** (60.34)	0.860 *** (94.53)	0.856 *** (94.50)
<i>N</i>	6202	6202	6202	6202	6202	6202	6202
<i>Log likelihood</i>	-9379.00	-9361.67	-9352.08	-3965.35	-3957.03	-9101.28	-9081.00
<i>LR chi2</i>	4738.84	4773.34	4783.95	5065.74	5075.58	4514.66	4548.21
<i>P</i>	0.000	0.000	0.000	0.000	0.000	0.000	0.000

注: 括号内为 *z* 值, ***、**和* 分别表示在1%、5%和10% 水平显著

表7 自变量滞后一期的稳健性检验(Tobit 模型)

	第二年女性下属的数量		第二年家族女性下属的数量		第二年非家族女性下属的数量	
<i>gender</i>	-0.202 ** (-2.41)	-0.548 *** (-4.62)	-0.488 *** (-7.39)	-0.364 *** (-3.64)	0.0642 (0.78)	-0.357 *** (-3.05)
<i>family</i>		0.00275 (0.06)		0.0361 (0.87)		-0.0141 (-0.29)
<i>gender* family</i>		0.631 *** (4.07)		-0.212 * (-1.69)		0.766 *** (5.00)
<i>CV</i>	控制	控制	控制	控制	控制	控制
<i>YD</i>	控制	控制	控制	控制	控制	控制
<i>ID</i>	控制	控制	控制	控制	控制	控制
<i>sigma_u</i>	1.466 *** (40.39)	1.465 *** (40.43)	1.527 *** (27.15)	1.529 *** (27.15)	1.415 *** (39.51)	1.416 *** (39.56)
<i>sigma_e</i>	0.856 *** (88.20)	0.854 *** (88.22)	0.512 *** (54.58)	0.511 *** (54.57)	0.848 *** (86.30)	0.845 *** (86.30)
<i>N</i>	5185	5185	5185	5185	5185	5185
<i>Log likelihood</i>	-7816.70	-7807.81	-3335.36	-3333.91	-7593.89	-7580.90
<i>LR chi²</i>	3982.26	3995.27	4104.22	4098.01	3795.54	3818.61
<i>P</i>	0	0	0	0	0	0

注: 括号内为 *z* 值, **、*** 和 * 分别表示在1%、5%和10% 水平显著

五、结论、启示与展望

本文以2008–2016年中国 A 股家族上市公司作为样本,实证检验了 CEO 的性别与家族身份对女性高管下属雇佣的共同影响,研究结果表明:

第一,CEO 性别与女性下属雇佣之间呈现出显著的负相关关系。即仅考虑 CEO 性别身份的话,中国上市家族企业女性 CEO 雇佣的女性下属比男性 CEO 雇佣的少。这印证了象征主义理论的观点。实际上女性 CEO 在全球范围内的企业中都属于是象征性雇佣。当向上的社会流动性极低时,女性 CEO 会拒绝提拔其他女性进入高管团队,以避免她们对自己的职位形成竞争关系。尽管与非家族企业相比,家族企业为家族女性担任高管提供了便利条件,但是在中国儒家文化背景下,家族女性继任 CEO 的比例仍然较低。换言之,家族企业也无法改变女性 CEO 象征性雇佣的基本条件。

第二,CEO 的家族身份会显著调节 CEO 性别与女性下属雇佣的关系,但调节效应对家族女性下属与非家族女性下属的雇佣产生了完全不同的影响。

(1) CEO 的家族身份会负向调节 CEO 性别与家族女性下属雇佣之间的关系。与家族男性 CEO、非家族男性 CEO 以及非家族女性 CEO 相比,家族女性 CEO 雇佣的家族女性下属是最少的(图4中的区域2)。这可能是因为在象征性雇佣和家族企业的特殊情境下,同是家族成员的女性下属最可能对家族女性 CEO 的地位构成威胁,从而引发对方的排斥。相对而言,非家族女性 CEO 对家族女性下属的排斥不会像家族女性 CEO 那样强烈(图4中的区域4),毕竟血缘优先是中国家族企业最基本的传承规则,在男性接班人缺位或者能力较弱的情况,家族女性高管迟早要上位,这是非家族女性 CEO 无力改变的事实。

(2) CEO 的家族身份会正向调节 CEO 性别与非家族女性下属雇佣的关系,且正向调节效应(系数=0.0641)超过了女性 CEO 对非家族女性下属雇佣的负面影响(系数=-0.0418)。正如数据显示,不同身份的 CEO 雇佣非家族女性下属的排序是:非家族男性 CEO > 家族女性 CEO > 家族男性 CEO > 非家族女性 CEO。也就是说,非家族女性 CEO 雇佣的非家族女性下属在所有 CEO 中也是最少的(图4中的区域3)。而如果女性 CEO 是家族成员的话,她们对非家族女性下属的敌意没那么严重(图4中的区域1),因为非家族成员女性不太可能纳入家族企业继任的候选名单,她们非但不会给 CEO 职位构成真正的威胁,反而可能成为共同对付男性高管的盟友。这也许是家族女性 CEO 比家族男性 CEO 雇佣更多非家族女性下属的原因。

以上结论拓展了象征主义理论在家族企业女性高管雇佣上的适用情境与条件机制。家族身份相同的女性上下级之间才可能经历紧张关系,而家族身份不同的女性上级与下属之间的关系并不必然是消极负面的。本文还有一个隐含的结论,那就是将社会情感财富理论引入到家族企业女性高管雇佣的研究中一定要谨慎。因为在本文的数据中,家族女性CEO并没有出于保护社会情感财富的动机雇佣其他家族女性成员担任高管。这说明社会情感财富理论至少在家族企业女性高管雇佣决策中的适用性是受限的(Overbeke等,2013) [3]。

本文的实践启示是:性别歧视并非局限于男性上级与女性下级这样的异性之间,女性上级对其他女性下属持有偏见也是性别歧视的一种形式。实际上和男性对女性的歧视相比,女性对女性的歧视才是最狠的。这呼吁各级政府组织和企业应重视这些研究结果,并采取补救和约束措施,以降低象征性雇佣对女性群体继续获得职业晋升机会的不利影响,有效地促进性别平等,从而帮助企业和社会从充分发挥女性的优质人力资本中获益。

本文的局限性在于样本的选择。本文是以中国文化背景下的家族企业为样本,华人家族文化既强调“血亲关系本位”,又受到了“男尊女卑”传统儒家思想的影响。因此本文的结论是否可以推论到其他文化群体(比如普遍信任程度较高或性别平等指数更高的国家/地区)的家族企业,还有赖于未来研究继续探讨。

女性上级如何影响女性下属职业发展的研究有着非常积极的现实意义,是需要不断深入的课题。本文只是考察了家族企业情境下的同一管理层级(高管团队)内部的女性上下级关系,今后如果能够利用多种途径从多个角度获得企业各层级管理者的晋升信息与数据,还可以考察不同管理层级的女性管理者是否会提拔女性下属,这将为该主题的研究提供更全面的结论。

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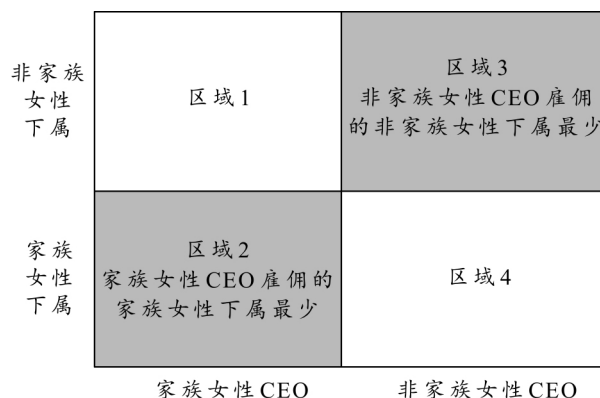


图4 女性CEO与女性下属的家族身份组合

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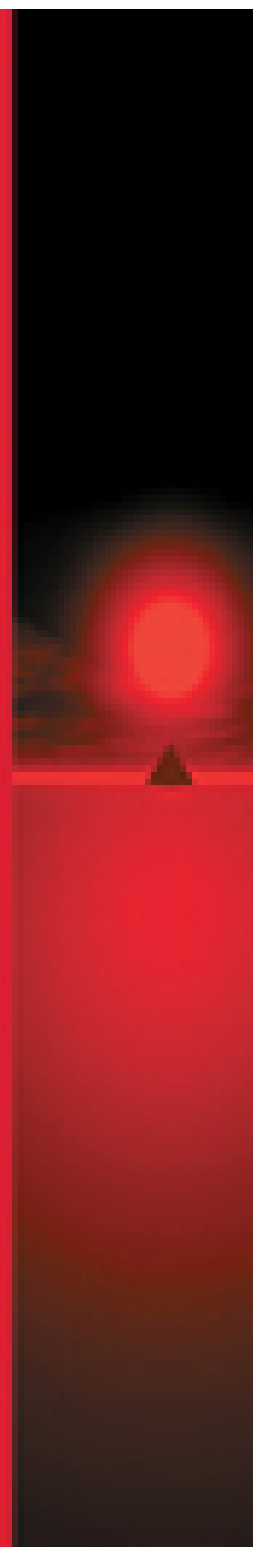
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- 137 **Spatial imbalance in the digital era: how the digital economy affects urban sprawl in China**

Wen, HW; Yu, HL and Lee, CC

Aug 15 2025 | **APPLIED ECONOMICS** [arrow_drop_down](#) 57(38), pp.5992-6005

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Economic and social activities in the digital age have changed business forms and spatial relations, and identifying evolution of the urban form in the digital age is the key to sustainable urban governance. Based on data from prefecture-level cities in China from 2010 to 2021, this study explores the impact of t ... [Show more](#) [expand_mon](#)

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- 138 **Regime changes and extreme risk spillovers of INE crude oil futures**

Liu, M; Yang, X and Lee, CC

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This study identifies the regime changes and investigates the extreme risk spillovers of China's first international crude oil futures (INECOFs). The novelty of this study is that a non-linear process is incorporated to examine the structural breaks of the INECOFs and to capture the movements of the INECOFs extr ... [Show more](#) [expand_mon](#)

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- 139 **Female CEOs and earnings management: examining risk aversion versus social identity theories**

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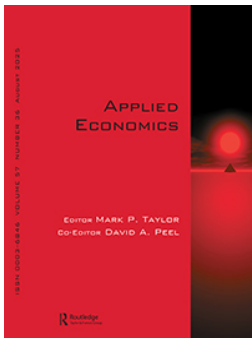
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- 140 **Improved methods for identifying the operational determinants of a bank's capital ratio**

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Female CEOs and earnings management: examining risk aversion versus social identity theories

Ping Guo, Zhidong Wu, Qingtie Yao & Yanyan Chen

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Female CEOs and earnings management: examining risk aversion versus social identity theories

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ABSTRACT

We examine the effect of CEO gender on earnings management in the contrasting theoretical contexts of risk aversion and social identity. Using a sample of Chinese family firms, we demonstrate that firms with female CEOs display a higher level of earnings management than firms with male CEOs. These findings remain robust after using alternative measures for key variables and addressing endogeneity concerns. Furthermore, family identity and board gender diversity, which provide family support and female support to alleviate social bias against female CEOs, weaken the relationship between female CEOs and earnings management. Conversely, financial crisis, which exacerbates social bias, strengthens this relationship. From the perspective of economic consequence, earnings management increases the pay – performance sensitivity for female CEOs and reduces their termination risk. Overall, we provide evidence in support of social identity theory.

KEYWORDS

Female CEOs; earnings management; family firms; risk aversion; social identity

JEL CLASSIFICATION

M41; M14

I. Introduction

The increasing presence of female executives and directors in corporate leadership has received substantial attention in academic literature (Harris, Karla, and Lawrence 2019; Zalata et al. 2018). A particular focus has been on the gender differences in earnings management practices.¹ Grounded in the theory of risk aversion (Croson and Gneezy 2009), lower levels of earnings management are observed in the firms with female chief financial officers (CFOs) (Barua et al. 2010; Peni, Vahamaa, and Yu 2010; Vahamaa 2014), and firms with a higher proportion of female directors (Arun, Almahrog, and Ali Aribi 2015; Kyaw, Olugbode, and Petracci 2015; Lakhal et al. 2015). However, Adams and Funk (2012) argue that gender differences in risk preference prevalent in the general population may vanish in top management. For example, Peni et al. (2010) and Barua et al. (2010) find that female CFOs are associated with less earnings management, whereas female CEOs are not. Similarly, Lakhal et al. (2015) demonstrate that

more female directors mitigate earnings management, but this effect does not hold for female CEOs and CFOs. Moreover, Ye et al. (2010) do not find evidence for the impact of female top executives (the Chair of the Board, CEO, or CFO) on earnings management. Zalata et al. (2018) report that the extent of classification shifting² is significantly higher in firms with female CEOs during the pre-Sarbanes – Oxley Act period. Overall, these diverse findings suggest that the relationship between female leadership and earnings management is more complex than explained by risk aversion.

The existing literature on gender differences in accounting decisions neglects the theory of social identity, which is a social psychological theory of intergroup relations, group processes, and the social self (Hogg, Terry, and White 1995). The basic idea is that a social categorization into which one falls, and to which one feels one belongs, provides a definition of who one is in terms of the defining characteristics of the categorization. Self-categorization as a woman or man produces self-stereotyping, involving the

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¹We explore the impact of CEO gender on earnings management within the theoretical frameworks of risk aversion and social identity, which distinguish between female and male genders. We recognize that categorizing individuals into two gender groups may overlook complex gender rights issues. Consequently, our discussion on gender is subject to certain limitations.

²Zalata et al. (2018) define classification shifting as a subtle form of earnings management that involves a deliberate attempt at misclassifying the presentation of some core expenses as special expenses within the income statement.

ascription of typical gender in-group attributes to the self, along with accentuation of differences from the gender out-group (Turner et al. 1987). Inconsistencies between female stereotypes and leadership stereotypes lead to social bias against female leaders (Eagly and Karau 2002). Female leaders experience a lack of support and face challenges to their authority (Glass and Cook 2016; Vial, Napier, and Brescoll 2016), which hurts firm performance and ultimately pushes female leaders towards a crisis of professional legitimacy. Due to social biases, female leaders are more likely to signal their competence to the manager market by engaging in earnings management, thereby reducing external distrust and termination risk.

In the context of contrasting perspectives from risk aversion and social identity theories, we examine the impact of CEO gender on earnings management within Chinese family firms. Prior studies show that families directly control most publicly traded firms around the world, and the situation is the same in East Asian (S. J. Benjamin et al. 2016; Claessens, Djankov, and Lang 2000). In China, family businesses constitute 90% of private enterprises. The growth of private enterprises, is one of the major contributors to the rapid development of the Chinese economy, contributing more than 60% of the GDP, 50% of tax revenues, and 90% of new job creation (G. M. Huang 2010). Moreover, by concentrating on family firms and excluding state-owned enterprises (SOEs), this study aims to eliminate the influence of political factors on the CEOs' selection and remuneration. CEOs of SOEs are appointed by the governments (An et al. 2016), and their incentive system consists of both monetary compensation and promotion within the bureaucratic system (Xin, Bao, and Hu 2019). Given that SOEs are exposed to both political and market forces, family firms offer a clean setting to investigate the relationship between CEO gender and earnings management. Within the setting of family firms, we could further explore the interaction among the triple identities of female CEOs, which are leader roles, female roles, and family member roles.

Using a sample of Chinese family firms over the 2006–2019 period, we find that firms with female

CEOs display a higher level of earnings management than firms with male CEOs. Family identity and board gender diversity, which provide family support and female support to alleviate social bias, weaken this relationship. In contrast, financial crisis, which exacerbates social bias, strengthens this relationship. Moreover, earnings management increases the pay – performance sensitivity for female CEOs and reduces their termination risk. Finally, cross-sectional analysis indicates that disclosure quality and litigation risk mitigates the relationship between female CEOs and earnings management. Overall, we provide evidence in support of social identity theory but not risk aversion theory.

To the best of our knowledge, this study is the first to support the social identity theory, conflicting with other studies aligned with the risk aversion theory. The reasons could stem from the fact that most studies are conducted in developed countries (e.g. the U.S. and the European Union), with few research focusing on Chinese firms. In our sample, 9.6% of family firms in China had female CEOs in 2019. This figure is higher than that for S&P 500 firms (6.4%) and the firms in the European Union (7.9%).³ Since the establishment of the socialist China in 1949, and today many urban husbands and wives share employment, income and housework together (Cooke 2001). The gender differences are cultivated through the socialization process of infants and children (Gilligan 1982). As male and female executives in China were trained to think and judge in similar modes when they were young (K. Ye, Zhang, and Rezaee 2010), risk aversion and social identity could be different in China compared to the developed countries. This study not only broadens our understanding of female leaders and accounting decisions in China, but also encourages more research to re-examine this notion in other nations with institutional context distinct from developed countries.

Our study also sheds light on the relationship between female executives and accounting decisions by exploring the moderating roles of family identity and female directors. The positive association between female CEOs and earnings management is driven by social biases arising from inter-

³The data source is a recent survey by Catalyst (a leading non-profit organization for women).

group relation, while within-group relation (family group and female leader group) brings about the mitigation effect. These findings affirm the significance of both inter-group and within-group relations, the two socio-cognitive processes emphasized by social identity theory (Hogg, Terry, and White 1995).

Finally, our study contributes to the literature by exploring the economic consequences of female CEOs' influence on earnings management. While prior studies examine the relationship between female leaders and earnings management, a direct investigation of the consequences of earnings management for female leaders has been notably absent. This gap underscores the need for a more robust understanding of individuals' motivations and behaviours. By employing the 'identity-motivation-behaviour-consequence' paradigm, we establish a causal link between female CEOs and earnings management within the framework of social identity theory.

II. Hypothesis development

Risk aversion

Psychology research indicates that tend to exhibit greater risk aversion than men (e.g. Croson and Gneezy 2009). This theory has spurred empirical investigations into the influence of gender differences on earnings management. Evidence suggests that firms led by female CFOs engage in lower levels of earnings management (Barua et al. 2010; Peni, Vahamaa, and Yu 2010), and transitions from male to female CFOs lead to decreased discretionary accruals (Vahamaa 2014). Moreover, firms with a greater number of female directors are associated with more restrained earnings management practices (Arun, Almahrog, and Ali Aribi 2015; Kyaw, Olugbode, and Petracci 2015; Lakhal et al. 2015).

However, Adams and Funk (2012) contend that gender differences in risk preference in the population might vanish in top management. Empirical evidence shows that woman at the firms' highest level are equivalent to their male counterparts in earnings management practice. For example, Peni et al. (2010) and Barua et al. (2010) find that female CFOs are associated with less earnings management, whereas female CEOs are not. Lakhal et al.

(2015) demonstrate that more female directors mitigate earnings management, but that female CEOs and female CFOs do not affect earnings management. In addition, Ye et al. (2010) fail to validate a lower tendency of female top executives (the Chair of the Board, CEO, or CFO) to engage in earnings management, respectively. Harris et al. (2019) explore CEO compensation' role, revealing that female and male CEOs display similar earnings management behaviours at higher levels of equity-based compensation. Notably, Zalata et al. (2018) show that classification shifting is more prevalent in firms with female CEOs than those with male CEOs during the pre-Sarbanes – Oxley Act period.

So far, the negative relationship between female executives and earnings management anticipated by risk aversion have been found for female CFOs and directors. However, there is no such empirical evidence for female CEOs. These inconsistent findings imply that the relationship between female CEOs and earnings management is more complex than suggested by risk aversion.

Social identity

Social identity theory is intended to be a social psychological theory of intergroup relations, group processes, and the social self (Hogg, Terry, and White 1995). The basic idea is that a social category (e.g. nationality, political affiliation, gender) into which one falls, and to which one feels one belongs, provides a definition of who one is in terms of the defining characteristics of the category—a self-definition that is a part of the self-concept.

Social identity highlights people's sense of belonging to the social group, of women or men (Turner et al. 1987). As female stereotypes do not match leadership stereotypes, female CEOs are at a higher risk of losing their jobs than male CEOs. Based on the theory of role consistency, leadership stereotypes are generally similar to male gender stereotypes (independent, initiative, self-confident, and competitive), but contradict female gender stereotypes (dependent, submissive, inferior, and collectivist). Inconsistencies between female gender stereotypes and leadership stereotypes lead to social bias against female leaders (Eagly and Karau 2002). If female CEOs show female traits (e.g. engage in communication and

negotiation) in their work, they are perceived as vulnerable and lacking the decisiveness and control essential for a good leader. However, if they show leadership traits, they are criticized for not being feminine and even labelled ‘macho women’ (Becker and Eagly 2004). Such double bundling prevents female CEOs from establishing their authority within the organization and gaining the support of subordinates (Glass and Cook 2016; Vial, Napier, and Brescoll 2016). This ultimately hurts firm performance and pushes female CEOs towards a crisis of professional legitimacy.

Although some evidence shows that family firms provide favourable career development opportunities to female executives, it is not easy for women to become CEOs of such firms. Due to a preference for male family heirs, female family members play unrecognized or ‘invisible’ roles in family firms (Ahrens, Landmann, and Woywode 2015; Heinonen and Hytti 2011). Female family members often become CEOs of family firms only when they are far more capable than male members or when the family lacks competitive male offspring (Ahrens, Landmann, and Woywode 2015). This shows that women remain limited by the glass ceiling in family firms.

Irrespective of gender, CEOs are motivated to engage in earnings management to establish their reputation, increase their compensation, meet performance requirements, and be reinstated when required (Ali and Zhang 2015). Compared with male CEOs, female CEOs often suffer from a crisis of professional legitimacy, giving them stronger incentives to engage in earnings management. Female CEOs are more likely to signal their competence to the manager market by engaging in earnings management to reduce external distrust and termination risk.

Risk aversion highlights the positive impact of female CEOs on earnings management, whereas social identity points to their negative impact. Therefore, we propose the following competing hypotheses:

H1a: Family firms with female CEOs display a lower level of earnings management than family firms with male CEOs.

H1b: Family firms with female CEOs display a higher level of earnings management than family firms with male CEOs.

III. Data and methodology

Sample selection and data source

We use family firms in China to test our hypotheses. We use family ownership and family participation in management as the selection criteria. A firm is identified as a family firm if its ultimate controller is an individual/family who controls at least 10% of the firm’s shares, with at least two family members participating in management. The sample includes all A-share listed family firms from 2006 to 2019 that meet the following criteria: (a) belong to a non-financial industry, (b) not in abnormal trading status, including special treatment (ST), *special treatment (*ST), Particular Transfer (PT),⁴ and (c) no missing data. Ultimately, we obtain 5,987 firm-year observations across 1,217 firms.

We obtain CEOs’ name, gender, education, and tenure from the China Stock Market and Accounting Research (CSMAR) database and manually collect CEOs’ family affiliations from various sources (e.g. press releases and firm announcements). Firm accounting and governance data are also obtained from the CSMAR database. To mitigate the effect of outliers, we winsorize all of the continuous variables at the top and bottom 1%.

Measurements of variables

We use *AbsACC* to measure earnings management, which is the absolute value of discretionary accruals of the modified Jones model (Dechow, Sloan, and Sweeney 1995). Following Francis et al. (2015), we first estimate Eq. (1) for each industry in a given year.

$$TAC_{i,t} = \beta_0(1/Asset_{i,t-1}) + \beta_1\Delta REV_{i,t} + \beta_2PPE_{i,t} + \varepsilon_{i,t} \quad (1)$$

⁴When a listed company faces the risk of delisting, its stock abbreviation is prefixed with *ST; for other risk warnings, the abbreviation is prefixed with ST. A company experiencing losses for three consecutive years will have its stocks suspended from trading and subjected to Particular Transfer (PT).

$$NDAC_{i,t} = b_0(1/Asset_{i,t-1}) + b_1(\Delta REV_{i,t} - \Delta REC_{i,t}) + b_2PPE_{i,t} + \varepsilon_{i,t} \quad (2)$$

$$AbsACC_{i,t} = |TAC_{i,t} - NDAC_{i,t}| \quad (3)$$

TAC is measured as the change in non-cash current assets minus the change in current non-interest bearing liabilities, minus depreciation and amortization, scaled by lagged total assets; ΔREV is the annual change in revenue scaled by lagged total assets; ΔREC is the annual change in receivables scaled by lagged total assets; *PPE* is property, plant, and equipment, scaled by lagged total assets. We then use the estimated regression coefficients (b_0 , b_1 , and b_2) from Eq. (1) to calculate non-discretionary accruals (*NDAC*). Finally, *AbsACC* is the absolute difference between total accruals and non-discretionary accruals, as shown in Eq. (3).

Our key variable, *CEO_Female*, indicates whether the firm has a female CEO. We also control for CFO gender (*CFO_Female*) and the proportion of female directors on the board (*Board_Female*). In the regression, we include CEO, firm, and governance characteristics. As CEO characteristics, we include CEO age (*CEO_Age*), education (*CEO_Edu*), and duality (*CEO_Duality*). As firm characteristics, we control for firm size (*Size*), return on asset (*ROA*), firm leverage (*LEV*), negative profit (*Loss*), sales

growth (*SG*), cash flow from operations (*CF*), and book-to-market ratio (*BTM*). For governance characteristics, we control for shareholding by institutional investors (*Inst*), shareholding by the second to fifth largest shareholders (*Shareholder2-5*), Big4 auditor (*Big4*), board size (*Board*), and board dependence (*Indr*). Table 1 provides detailed definitions of these variables.

Empirical models

We use Model (1) to test our hypotheses. All standard errors are adjusted for heteroscedasticity using robust estimator. In Eq. (4), *AbsACC* is the dependent variable and *CEO_Female* is the key variable. *Controls* represents the set of control variables, *Year FE* indicates year fixed effects, and *Industry FE* indicates industry fixed effects. All of the independent variables are lagged by 1 year to alleviate the endogeneity problem.

$$AbsACC_{i,t} = \beta_0 + \beta_1 CEO_Female_{i,t-1} + Controls_{t-1} + Year\ FE + Industry\ FE + \varepsilon \quad (4)$$

Descriptive statistics and correlation

Table 2 shows the distribution of female CEOs by year in our sample. *CEO_Female* is lagged by 1 year and the corresponding period is 2005–2018.

Table 1. Variable definitions.

Variable	Definition
<i>AbsACC</i>	The absolute value of discretionary accruals of the modified Jones model.
<i>CEO_Female</i>	A dummy variable equals 1 if the CEO is female, and 0 otherwise.
<i>Family</i>	A dummy variable equals 1 if the CEO is a family member, and 0 otherwise.
<i>Crisis</i>	A dummy variable equals 1 in the period of 2008–2010, and 0 otherwise.
<i>CFO_Female</i>	A dummy variable equals 1 if the CFO is female, and 0 otherwise.
<i>Board_Female</i>	The proportion of female directors on the board.
<i>CEO_Age</i>	The natural logarithm of CEO age.
<i>CEO_Edu</i>	The education years of CEO.
<i>CEO_Duality</i>	A dummy variable equal to 1 if the CEO is also the Chairman, and 0 otherwise.
<i>Size</i>	Firm size, calculated as the natural logarithm of total assets.
<i>ROA</i>	Return on assets, calculated as the net income divided by total assets.
<i>Lev</i>	Firm leverage, calculated as total debt scaled by total assets.
<i>Loss</i>	A dummy variable equal to 1 if the net income is negative, 0 otherwise.
<i>SG</i>	Sales growth, the percentage change in sales from the previous year.
<i>CF</i>	Firm cash flow, calculated as the net cash flow from operations scaled by total assets.
<i>BTM</i>	Book-to-market ratio, calculated as the firm's book value divided by firm's market value.
<i>Inst</i>	The tradable shares of institutional investors divided by total tradable shares.
<i>Shareholder2-5</i>	The shares of the second to fifth largest shareholders divided by total shares.
<i>Big4</i>	A dummy variable equal to 1 if a Big4 auditor audits a firm, 0 otherwise.
<i>Board</i>	The natural logarithm of the number of directors.
<i>Indr</i>	The percentage of independent directors over total directors.

Table 2. Percentage of female CEO in China by year.

year	Female CEO	Male CEO	Total
2005	3(8.82%)	31(91.18%)	34
2006	5(12.20%)	36(87.80%)	41
2007	6(8.96%)	61(91.04%)	67
2008	17(11.33%)	133(88.67%)	150
2009	23(11.11%)	184(88.89%)	207
2010	30(9.80%)	276(90.20%)	306
2011	48(9.45%)	460(90.55%)	508
2012	65(10.45%)	557(89.55%)	622
2013	66(10.09%)	588(89.91%)	654
2014	62(9.55%)	587(90.45%)	649
2015	60(8.31%)	662(91.69%)	722
2016	52(8.65%)	549(91.35%)	601
2017	66(9.17%)	654(90.83%)	720
2018	72(10.20%)	634(89.80%)	706

This table provides the actual values of percentage of female CEOs for each year in the period of 2005–2018. Our sample period spans from 2006 to 2019. To mitigate the issue of endogeneity, we have lagged the variable for female CEOs by one year, corresponding to the period from 2005 to 2018.

We observe a fluctuation in the percentage of firms with a female CEO. The figure is around 9% for 2005 and rises above 11% during the period of 2008 and 2009. It drops to 8.31% in 2015 and remains stable at above 10% in 2018. The average percentage of female CEOs in our sample is 9.60%.

Table 3 reports the descriptive statistics of all of the variables. The mean *ACC* is 0.0714, with a median of 0.0465 and a standard deviation of 0.0791. The average percentage of female CEOs is 9.60%, with 57.21% of CEOs being family members. The mean *CFO_Female* is 33.41% and the mean *Board_Female* is 16.52%. The mean *Size* is 21.6986 and the mean *LEV* is 38.36%. In addition, the mean *ROA* and *SG* are 4.60% and 23.84%, respectively.

Table 4 reports the results of the Pearson correlations between the variables. *CEO_Female* is positively correlated with *ACC*, consistent with our prediction. The mean and maximum variance inflation factors are 1.31 and 2.14, respectively, which are well below the general cut-off of 10. Thus, multicollinearity is unlikely to be a concern in our study.

IV. Empirical results and analysis

Female CEOs and earnings management

In Table 5, we examine the effect of female CEOs on earnings management. In Column (1), the coefficient of *CEO_Female* is 0.0088, significant at the 5% level. This indicates that female CEOs have an economically significant effect on earnings management, wherein they increase *AbsACC* by more than 12.32% (= coefficient of *CEO_Female*/mean *AbsACC* = 0.0088/0.0714 = 12.32%) compared with male CEOs.

To alleviate the concern that the increase in discretionary accruals may arise from female CFOs or female directors rather than female CEOs, we include *CFO_Female* and *Board_Female* in the regression. The results are shown in Columns (2)–(4). When controlling for CFO gender and board gender diversity, the coefficient of *CEO_Female* remains statistically significant at the 5% level and the magnitude remains nearly the same as the baseline result. We also find

Table 3. Descriptive statistics.

Variable	N	Mean	SD	25%	Median	75%
<i>AbsACC</i>	5,987	0.0714	0.0791	0.0203	0.0465	0.0902
<i>CEO_Female</i>	5,987	0.0960	0.2947	0.0000	0.0000	0.0000
<i>CEO_Family</i>	5,987	0.5721	0.4948	0.0000	1.0000	1.0000
<i>Crisis</i>	5,987	0.1107	0.3138	0.0000	0.0000	0.0000
<i>CFO_Female</i>	5,987	0.3341	0.4717	0.0000	0.0000	1.0000
<i>Board_Female</i>	5,987	0.1652	0.1326	0.0909	0.1429	0.2222
<i>CEO_Age</i>	5,987	3.8750	0.1550	3.7842	3.8918	3.9890
<i>CEO_Edu</i>	5,987	16.1572	2.3958	15.0000	15.0000	18.0000
<i>CEO_Duality</i>	5,987	0.3516	0.4775	0.0000	0.0000	1.0000
<i>Size</i>	5,987	21.6986	1.0070	20.9501	21.5843	22.2945
<i>ROA</i>	5,987	0.0460	0.0558	0.0208	0.0447	0.0726
<i>Lev</i>	5,987	0.3836	0.2006	0.2187	0.3699	0.5300
<i>Loss</i>	5,987	0.0603	0.2381	0.0000	0.0000	0.0000
<i>SG</i>	5,987	0.2384	0.4763	0.0134	0.1562	0.3311
<i>CF</i>	5,987	0.0411	0.0721	0.0018	0.0411	0.0834
<i>BTM</i>	5,987	0.5785	0.2217	0.4071	0.5836	0.7485
<i>Inst</i>	5,987	0.3601	0.2538	0.1214	0.3470	0.5733
<i>Shareholder2–5</i>	5,987	0.2103	0.1090	0.1252	0.2003	0.2861
<i>Big4</i>	5,987	0.0160	0.1256	0.0000	0.0000	0.0000
<i>Board</i>	5,987	2.2134	0.1618	2.0794	2.3026	2.3026
<i>Indr</i>	5,987	0.3765	0.0519	0.3333	0.3333	0.4286

Table 4. Correlation matrix.

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
1. AbsACC	1.000																		
2. CEO_Female	0.042	1.000																	
3. CFO_Female	-0.014	0.060	1.000																
4. Board_Female	0.006	0.229	0.174	1.000															
5. CEO_Age	-0.042	-0.017	0.015	0.026	1.000														
6. CEO_Edu	0.019	0.021	-0.013	0.025	-0.087	1.000													
7. CEO_Duality	-0.005	-0.071	0.009	0.033	0.289	-0.025	1.000												
8. Size	-0.089	0.000	-0.028	0.005	0.035	0.055	-0.083	1.000											
9. ROA	-0.025	0.020	0.025	0.023	0.013	0.026	-0.012	-0.012	1.000										
10. Lev	0.095	-0.005	-0.055	-0.047	-0.054	0.015	-0.094	0.482	-0.313	1.000									
11. Loss	0.064	0.008	-0.001	-0.003	0.004	0.010	0.032	-0.045	0.084	0.076	1.000								
12. SG	0.070	0.004	-0.031	-0.009	-0.018	0.037	0.006	0.032	0.208	0.260	-0.151	1.000							
13. CF	-0.110	0.006	0.017	0.014	0.031	0.005	-0.014	-0.032	0.340	-0.156	-0.125	-0.008	1.000						
14. BTM	-0.060	-0.006	-0.030	-0.036	-0.023	-0.058	-0.059	0.372	-0.192	0.260	-0.005	-0.011	-0.177	1.000					
15. Inst	0.042	0.013	0.010	-0.027	-0.038	0.030	-0.105	0.268	0.102	0.195	-0.062	0.072	0.079	0.042	1.000				
16. Shareholder2-5	-0.012	0.005	-0.030	0.004	0.006	0.012	0.006	-0.108	0.080	-0.217	-0.039	0.048	0.017	0.014	-0.077	1.000			
17. Big4	-0.020	0.071	-0.034	0.024	-0.035	0.039	-0.027	0.136	0.021	0.063	-0.016	-0.008	0.054	0.048	0.085	-0.021	1.000		
18. Board	-0.002	-0.027	0.003	-0.052	-0.023	-0.001	-0.143	0.119	0.054	0.060	-0.017	-0.015	0.036	0.096	0.093	0.015	-0.022	1.000	
19. Indr	-0.016	0.054	-0.001	0.033	0.048	0.018	0.142	-0.009	0.002	-0.019	0.005	0.030	0.001	-0.053	-0.066	0.021	0.009	-0.618	1.000

This table presents Pearson correlation. Correlations greater than |0.002| are significant at the 10% level.

Table 5. Female CEOs' effect on earnings management.

	Dependent variable: <i>AbsACC</i>			
	(1)	(2)	(3)	(4)
<i>CEO_Female</i>	0.0088** (2.49)	0.0090** (2.53)	0.0085** (2.29)	0.0085** (2.30)
<i>CFO_Female</i>		-0.0020 (-1.00)		-0.0022 (-1.09)
<i>Board_Female</i>			0.0034 (0.42)	0.0047 (0.58)
<i>CEO_Age</i>	-0.0069 (-1.03)	-0.0069 (-1.02)	-0.0069 (-1.03)	-0.0069 (-1.02)
<i>CEO_Edu</i>	0.0004 (1.04)	0.0004 (1.03)	0.0004 (1.04)	0.0004 (1.02)
<i>CEO_Duality</i>	0.0032 (1.46)	0.0032 (1.47)	0.0032 (1.45)	0.0032 (1.45)
<i>Size</i>	-0.0106*** (-6.98)	-0.0106*** (-7.01)	-0.0106*** (-6.98)	-0.0106*** (-7.01)
<i>ROA</i>	0.0895** (2.57)	0.0901*** (2.59)	0.0892** (2.56)	0.0897** (2.57)
<i>Lev</i>	0.0432*** (5.31)	0.0431*** (5.28)	0.0433*** (5.31)	0.0431*** (5.28)
<i>Loss</i>	0.0248*** (4.15)	0.0248*** (4.15)	0.0248*** (4.15)	0.0248*** (4.15)
<i>SG</i>	0.0085*** (2.99)	0.0085*** (2.98)	0.0085*** (3.00)	0.0085*** (2.98)
<i>CF</i>	-0.1210*** (-5.89)	-0.1210*** (-5.89)	-0.1210*** (-5.89)	-0.1210*** (-5.89)
<i>BTM</i>	-0.0301*** (-4.46)	-0.0301*** (-4.45)	-0.0301*** (-4.46)	-0.0301*** (-4.45)
<i>Inst</i>	0.0073* (1.74)	0.0075* (1.76)	0.0074* (1.74)	0.0075* (1.77)
<i>Shareholder2-5</i>	0.0092 (1.01)	0.0087 (0.96)	0.0092 (1.01)	0.0087 (0.96)
<i>Big4</i>	-0.0009 (-0.15)	-0.0011 (-0.19)	-0.0009 (-0.15)	-0.0012 (-0.20)
<i>Board</i>	-0.0019 (-0.25)	-0.0018 (-0.24)	-0.0018 (-0.24)	-0.0017 (-0.22)
<i>Indr</i>	-0.0298 (-1.32)	-0.0297 (-1.32)	-0.0297 (-1.32)	-0.0296 (-1.31)
<i>Intercept</i>	0.3504*** (7.11)	0.3516*** (7.14)	0.3498*** (7.10)	0.3509*** (7.13)
<i>Year FE</i>	Yes	Yes	Yes	Yes
<i>Industry FE</i>	Yes	Yes	Yes	Yes
<i>Observations</i>	5,987	5,987	5,987	5,987
<i>Adj. R²</i>	0.1140	0.1142	0.1140	0.1142

This table reports the OLS regression results for female CEOs and earnings management. The dependent variable is the absolute value of discretionary accruals (*AbsACC*). The robust t statistics are in parentheses. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% level, respectively.

that the coefficients of *CFO_Female* and *Board_Female* are not statistically significant. Hence, our evidence is in line with *H1b*, which states that firms with female CEOs display a higher level of earnings management than firms with male CEOs.

There are three outcomes regarding the relationship between female CEOs and earnings management: negative, neutral, and positive. Even though the negative relationship between female top executives and earnings management anticipated by risk aversion have been found for female CFOs (Barua et al. 2010; Vahamaa 2014) and for female directors (Arun, Almahrog, and Ali Aribi 2015; Kyaw, Olugbode, and Petracci 2015), there is no

such empirical evidence for female CEOs. Some studies only find that female CEOs display similar earnings management behaviours as male CEOs (Barua et al. 2010; Lakhal et al. 2015; K. Ye, Zhang, and Rezaee 2010), suggesting an absence of gender-based differences in risk reference among CEOs. Contrary to existing literature, our research reveals a positive association between female CEOs and earnings management, aligning with social identity theory.

In Table 5, the coefficients of *CEO_Age*, *CEO_Edu*, and *CEO_Duality* are not statistically significant. Regarding the firm-level controls, earnings management is positively associated with *Loss*, *ROA*, *LEV*, and *SG*, but negatively associated with

Size and *CF*. These results are consistent with those reported in the literature (Arthur, Tang, and Lin 2015; Harris, Karla, and Lawrence 2019). However, the coefficients of the governance variables are not statistically significant.

Further tests of social identity

In this section, we seek to reinforce our evidence by investigating moderating factors within social identity theory framework. According to social identity theory, earnings management serves as a strategic response of female CEOs to social biases against them. If the theory holds, the factors which alleviate or exacerbate social bias against female CEOs are expected to correspondingly weaken or strengthens the relationship between female CEOs and earnings management. Moreover, we examine the economic consequences of such earnings management practices. Social identity theory posits that the motivation for female CEOs to engage in more earnings management is to have higher compensation and greater job security. If the theory is valid, we expect that earnings management increases the pay – performance sensitivity of female CEOs and reduces their termination risk.

Social identity, family support and earnings management

Drawing on the social categorization of gender, CEOs can be distinguished as either female or male. Additionally, from the perspective of familial ties, CEOs can be classified as either family or non-family members. Family identities refers to whether CEOs are the members of the firm's founding family, in contrast to non-family CEOs who are professional managers without ties to the founding family. Social identity theory invokes two underlying socio-cognitive processes: inter-group and within-group relations (Hogg, Terry, and White 1995). When facing prejudice from out-group members, female CEOs may receive support from the founding family if they belong to it.

Firstly, possessing a family identity offers career security for female CEOs, as founders appreciate the traits and dedication of family successors (Sharma and Irving 2005). Female CEOs with family identities are not concerned about the unfair

valuation of their capabilities by founding family. Secondly, compared with professional managers, family members enjoy unique advantages in terms of familiarity with corporate culture and inheritance of special resources (Family Enterprise Committee of China Private Economic Research Association 2015). This facilitates enhanced communication and collaboration between female CEOs and the founding family. Collectively, family identities diminishes the pressure on female CEOs to secure their positions through earnings management.

The results of CEOs' family identities are shown in Column (1) of Table 6. The dummy variable *CEO_Family* indicates whether the CEO is a member of founding family. The coefficient of *CEO_Female* is still positive and statistically significant (0.0219, $p < 0.001$). With respect to the interaction term *CEO_Family*CEO_Female*, the coefficient is negative and statistically significant (-0.0169 , $p < 0.05$). Our results show that family identity could mitigate 77.17% of female CEOs' aggressive earnings management ($0.0169/0.0219 = 77.17\%$). It implies that support from founding family significantly mitigates the positive relationship between female CEOs and earnings management.

Social identity, female support and earnings management

Recent research explores the impact of CFO gender and board gender composition on corporate decision-making environments (S. J. Benjamin and Biswas 2019; S. Benjamin, Mansi, and Pandey 2020; Schopohl, Urquhart, and Zhang 2021). This study concentrates on the 'girl-help-girl' phenomena among corporate female leaders. Following the analysis of family support, social identity theory suggests that female CEOs, despite encountering prejudice from out-group members, may receive support from in-group members, such as female CFOs and directors.

Firstly, female CFOs and directors are more likely to provide higher evaluations of female CEOs, as they share the commonality of being female leaders (Terjesen, Serly, and Singh 2009). Secondly, an increase in female leadership creates a 'normalization' where gender is no longer a barrier to communication and promotes more

Table 6. Social identity and earnings management.

	Dependent variable: <i>AbsACC</i>			
	<i>X</i> = <i>CEO_Family</i> (1)	<i>X</i> = <i>CFO_Female</i> (2)	<i>X</i> = <i>Board_Female</i> (3)	<i>X</i> = <i>Crisis</i> (4)
<i>CEO_Female</i>	0.0219*** (2.85)	0.0123** (2.39)	0.0244*** (2.87)	0.0040 (1.14)
<i>X*CEO_Female</i>	−0.0169** (−1.97)	−0.0013 (−0.59)	−0.0637** (−2.35)	0.0382** (2.37)
<i>X</i>	−0.0091*** (−3.51)	−0.0091 (−1.32)	0.0103 (1.23)	0.0279** (2.45)
<i>CFO_Female</i>	−0.0024 (−1.15)		−0.0022 (−1.07)	−0.0023 (−1.14)
<i>Board_Female</i>	0.0051 (0.64)	0.0047 (0.58)		0.0048 (0.60)
<i>CEO_Age</i>	−0.0132* (−1.90)	−0.0067 (−0.99)	−0.0072 (−1.06)	−0.0071 (−1.05)
<i>CEO_Edu</i>	0.0003 (0.66)	0.0004 (1.00)	0.0003 (0.88)	0.0004 (0.94)
<i>CEO_Duality</i>	0.0091*** (3.51)	0.0031 (1.42)	0.0031 (1.42)	0.0032 (1.47)
<i>Size</i>	−0.0106*** (−6.96)	−0.0106*** (−6.98)	−0.0105*** (−6.92)	−0.0105*** (−6.93)
<i>ROA</i>	0.0918*** (2.64)	0.0894** (2.57)	0.0897** (2.57)	0.0879** (2.52)
<i>Lev</i>	0.0421*** (5.15)	0.0430*** (5.28)	0.0432*** (5.30)	0.0425*** (5.23)
<i>Loss</i>	0.0249*** (4.18)	0.0250*** (4.18)	0.0249*** (4.18)	0.0248*** (4.15)
<i>SG</i>	0.0083*** (2.91)	0.0085*** (2.97)	0.0084*** (2.93)	0.0083*** (2.90)
<i>CF</i>	−0.1206*** (−5.90)	−0.1212*** (−5.90)	−0.1209*** (−5.89)	−0.1191*** (−5.83)
<i>BTM</i>	−0.0288*** (−4.27)	−0.0301*** (−4.46)	−0.0303*** (−4.49)	−0.0299*** (−4.43)
<i>Inst</i>	0.0064 (1.50)	0.0074* (1.74)	0.0071* (1.67)	0.0074* (1.74)
<i>Shareholder2–5</i>	0.0128 (1.40)	0.0080 (0.88)	0.0085 (0.93)	0.0082 (0.91)
<i>Big4</i>	−0.0044 (−0.72)	−0.0011 (−0.19)	−0.0015 (−0.25)	−0.0010 (−0.17)
<i>Board</i>	−0.0013 (−0.17)	−0.0018 (−0.23)	−0.0020 (−0.26)	−0.0022 (−0.29)
<i>Indr</i>	−0.0261 (−1.16)	−0.0295 (−1.31)	−0.0303 (−1.34)	−0.0292 (−1.30)
<i>Intercept</i>	0.3746*** (7.56)	0.3478*** (7.07)	0.3481*** (7.11)	0.3464*** (7.16)
<i>Industry FE</i>	Yes	Yes	Yes	Yes
<i>Year FE</i>	Yes	Yes	Yes	Yes
<i>Observations</i>	5,987	5,987	5,987	5,987
<i>Adj. R²</i>	0.1179	0.1145	0.1151	0.1163

This table reports the results of further tests of social identity. *CEO_Family* in Column (1) is a dummy variable that equals one if the CEO is a family member and zero otherwise. *CFO_Female* in Column (2) indicates whether the firm has a female CFO. *Board_Female* in Column (3) is the proportion of female directors on the board. *Crisis* in Column (4) is an indicator of the financial crisis period of 2008–2010. The robust t statistics are in parentheses. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% level, respectively.

effective cooperation and information exchange (Amore, Garofalo, and Minichilli 2014). Thirdly, a female-friendly corporate culture arising from more female leaders enables female CEOs to consolidate their authority and secure subordinate support. If social identity theory is applicable, the backing from fellow female leaders could mitigate the challenges female CEOs face regarding professional legitimacy, thereby reducing their propensity for earnings management.

We present the results of female CFOs and female directors in Table 6. *CFO_Female* in Column (2) indicates whether the firm has a female CFO. The interaction term *CFO_Female*CEO_Female* has a coefficient of −0.0013, which was not statistically significant. *Board_Female* in Column (3) represents the proportion of female directors on the board. The coefficient of *CEO_Female* remains positive and statistically significant (0.0244, $p < 0.001$).

Regarding the interaction term *Board_Female*CEO_Female*, the coefficient is negative and statistically significant (-0.0637 , $p < 0.05$). The results indicate a 10% increase in female directors on the board leads to a reduction of 26.11% in earnings management by female CEOs ($((0.0637 \times 0.1)/0.0244 = 26.11\%)$), which is a substantial influence. These findings suggest that the support from female directors weaken the positive relationship between female CEOs and earnings management. However, support from female CFOs does not exhibit a significant effect. Given that CFOs are subordinate to the CEOs, their support may not influence CEO appointments and evaluations. In contrast, the board of directors, who monitor and assess CEOs, could significantly affect CEO incentives.

Social identity, financial crisis and earnings management

Social identity theory posits that incongruity between female and leader groups leads to prejudice against female CEOs, increasing the risk of losing their positions. Financial crises may exacerbate this career insecurity for female CEOs. During a crisis, the economic environment deteriorates, making it highly probable for firms to experience poor accounting performance and stock returns. Female CEOs in a crisis face the equivalent of standing on the edge of a dangerous glass cliff (Ryan and Haslam 2005). If firm performance deteriorates under their leadership, controlling shareholders may replace them with male CEOs perceived as more competent and capable (Cook and Glass 2014). Consequently, female CEOs face greater performance pressure and are in a more precarious position in crisis years than in non-crisis years. To avoid falling off the glass cliff, female CEOs may engage more in earnings management during a crisis than non-crisis periods.

We create a dummy variable *Crisis*, which equals 1 for 2008, 2009, and 2010. In Column (4) of Table 6, the interaction term *Crisis*CEO_Female* is positive and significant (0.0382 , $p < 0.05$), showing that the financial crisis strengthens the positive relationship between female CEOs and earnings management.

Social identity and economic consequence of earnings management

We conduct an integrated analysis of the 'Identity-Motivation-Behavior-Consequence' paradigm to prove causality between female CEOs and earnings management. According to social identity theory, female CEOs are subjected to lower compensation and increased job insecurity as a result of social biases against female leaders (Identity). Earnings management serves as a strategic response to these biases, which provide female CEOs with higher compensation and enhanced job security. (Motivation). So far, we have found that firms with female CEOs display a higher level of earnings management than firms with male CEOs (Behaviour). If the theory holds, we expect that earnings management increases the pay – performance sensitivity of female CEOs and reduces their termination risk (Consequence).

In a typical model of pay – performance sensitivity (Gao and Li 2015), the dependent variable is the natural logarithm of CEO pay and the key independent variable is ROA. To examine the effect of earnings management, we first decompose ROA into ROA after excluding discretionary accruals (ROA_A) and discretionary accruals (ACC). Then, we include two interaction terms, *CEO_Female*ROA_A* and *CEO_Female*ACC*, in the model. We predict that the coefficient of *CEO_Female*ACC* in Eq. (5) is positive.

$$\begin{aligned} \ln(\text{CEO pay})_{i,t} = & \beta_0 + \beta_1 \text{CEO_Female}_{i,t-1} \\ & + \beta_2 \text{CEO_Female}_{i,t-1} * \text{ROA_A} \\ & + \beta_3 \text{CEO_Female}_{i,t-1} * \text{ACC} \\ & + \beta_4 \text{ROA_A}_{i,t-1} + \beta_5 \text{ACC}_{i,t-1} \\ & + \text{Controls}_{t-1} + \text{Year FE} \\ & + \text{Industry FE} + \varepsilon_{i,t} \end{aligned} \quad (5)$$

Column (1) of Table 7 only includes ROA_A and *CEO_Female*ROA_A*. The coefficient of ROA_A is positive and significant, whereas that of *CEO_Female*ROA_A* is negative and significant. This indicates that the pay – performance sensitivity of female CEOs is low when discretionary accruals are excluded. We add ACC and *CEO_Female*ACC* in Column (2). Their coefficients are both positive and significant, whereas the signs of ROA_A and *CEO_Female*ROA_A*

Table 7. Social identity and economic consequence of earnings management.

	ln (CEO pay)		Termination risk	
	(1)	(2)	(3)	(4)
<i>CEO_Female</i>	−0.0199 (−0.57)	−0.0253 (−0.72)	1.0698 (0.67)	1.1017 (0.97)
<i>CEO_Female*ROA_A</i>	−0.4671* (−1.78)	−0.4584* (−1.74)	3.0074 (1.58)	2.7592 (1.44)
<i>CEO_Female*ACC</i>		0.3287* (1.67)		0.3664* (−1.79)
<i>ROA_A</i>	0.1813** (2.28)	0.1740** (2.20)	1.1887 (0.73)	1.1932 (0.75)
<i>ACC</i>		0.0547** (2.41)		1.0954*** (5.00)
<i>CFO_Female</i>	−0.0003 (−0.01)	0.0008 (0.04)	0.9850 (−0.24)	0.9868 (−0.21)
<i>Board_Female</i>	0.0663 (0.93)	0.0594 (0.83)	1.0992 (0.40)	1.0805 (0.32)
<i>CEO_Age</i>	0.0072*** (5.71)	0.0072*** (5.70)	0.9806*** (−4.23)	0.9808*** (−4.18)
<i>CEO_Edu</i>	0.0328*** (9.11)	0.0329*** (9.14)	0.9940 (−0.46)	0.9937 (−0.48)
<i>CEO_Duality</i>	−0.0033 (−0.16)	−0.0024 (−0.12)	0.7215*** (−4.84)	0.7220*** (−4.84)
<i>Size</i>	0.3203*** (24.01)	0.3179*** (23.75)	0.8138*** (−4.65)	0.8167*** (−4.57)
<i>Lev</i>	−0.2835*** (−4.67)	−0.2714*** (−4.45)	0.7650 (−1.39)	0.7671 (−1.37)
<i>Loss</i>	−0.0889** (−1.99)	−0.0793* (−1.77)	0.9487 (−0.39)	0.9464 (−0.41)
<i>SG</i>	0.0221 (1.10)	0.0154 (0.77)	1.3236*** (4.16)	1.3113*** (3.99)
<i>CF</i>	0.8353*** (5.95)	0.9487*** (6.63)	1.4650 (0.86)	1.3591 (0.68)
<i>BTM</i>	−0.4876*** (−8.31)	−0.4810*** (−8.21)	2.1306*** (3.98)	2.0959*** (3.89)
<i>Inst</i>	0.0942** (2.52)	0.0931** (2.49)	1.1364 (0.98)	1.1391 (1.00)
<i>Shareholder2–5</i>	0.5492*** (6.70)	0.5511*** (6.72)	1.4713 (1.42)	1.4758 (1.43)
<i>Big4</i>	0.2642*** (3.82)	0.2671*** (3.88)	0.7362 (−1.29)	0.7273 (−1.34)
<i>Board</i>	0.0220*** (2.71)	0.0223*** (2.75)	1.0112 (0.42)	1.0121 (0.45)
<i>Indr</i>	0.0387 (0.17)	0.0386 (0.17)	1.8250 (0.92)	1.8054 (0.90)
<i>Intercept</i>	4.9761*** (14.31)	5.0163*** (14.46)		
<i>Year FE</i>	Yes	Yes	Yes	Yes
<i>Industry FE</i>	Yes	Yes	Yes	Yes
<i>Observations</i>	5,924	5,924	5,987	5,987
<i>Log Likelihood</i>			−9,492	−9,489
<i>Adj. R²</i>	0.2820	0.2832		

Columns (1) and (2) examine the effect of earnings management on pay-performance sensitivity. Columns (3) and (4) examine the effect of earnings management on termination risk, where we use survival analysis (Cox proportional-hazard model). We report the hazard ratios instead of coefficients in the survival analysis. The variable *ROA_A* in Table 7 is defined as ROA after excluding discretionary accruals, and *ACC* is discretionary accruals. See Table 1 for the definition of variables. The robust t statistics are in parentheses. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% level, respectively.

remain the same. These findings suggest higher pay – accrual sensitivity for female CEOs than for male CEOs, consistent with the social identity theory.

Survival analysis is often used when measuring time to termination. Brookman and Thistle (2009) argue that survival analysis is particularly valuable when studying CEO tenure because right censored

observations can be easily and correctly accommodated, and because it incorporates time at risk. We use the Cox proportional-hazard model, a general survival analysis approach, to examine the effect of earnings management on CEOs' termination risk. The model is presented in Eq. (6). For each CEO in the sample, we have observations for tenure (*Tenure_i*), an indicator of whether the observation

is censored ($Turnover_i$), and the covariates (X). $Turnover_i = 0$ if the CEO is censored (not terminated) and $Turnover_i = 1$ if the CEO fails (is terminated). λ_0 ($Tenure$) is the baseline hazard, which is dependent on tenure but independent of X .

$$\ln \lambda(Tenure; X) = \beta X + \ln \lambda_0(Tenure) \quad (6)$$

The last two columns of Table 7 report the hazard ratios (e^β) instead of the coefficients (β) in our survival analysis. The hazard ratios of ROA_A and $CEO_Female*ROA_A$ are not statistically significant in the two columns. The hazard ratio of $CEO_Female*ACC$ in Column (4) is 0.3664 ($\beta = -1.0041$, $e^\beta = 0.3664$) and significant at the 5% level, indicating that discretionary accruals decrease the termination risk of female CEOs by 63.36%. These results suggest that earnings management reduces the termination risk of female CEOs, consistent with social identity theory.

Cross-sectional analysis

The role of disclosure quality

Enhanced disclosure quality can curb managerial opportunism by facilitating the market participants' detection of earnings management. Cassell et al. (2015) suggest that increased disclosure transparency regarding certain accounts or transactions reduces the likelihood of earnings management. Similarly, Shaw (2003) explore the relationship between disclosure quality and accruals-based earnings management using overall disclosure quality. Their findings consistently show that firms with superior disclosure quality report lower levels of discretionary accruals.

Building upon this foundation, our research investigates whether disclosure quality mitigates the influence of female CEOs on earnings management. Following Ye et al. (2023), we utilize on the Shanghai and Shenzhen Stock Exchanges' assessment of disclosure quality, which is assigned one of four ratings: (A) excellent, (B) good, (C) qualified, and (D) unqualified. In our analysis, firms are classified as having high-disclosure-quality ($Disclosure = 1$) if they received an 'A' rating in the previous year, and as having low-disclosure-quality ($Disclosure = 0$) if they were rated 'B', 'C',

or 'D'. Columns (1)-(2) of Table 8 reveal that the coefficient of CEO_Female is significantly negative only within the low-disclosure-quality subsample, and not statistically significant within the high-disclosure-quality subsample. This suggests that high disclosure quality may reduce the tendency towards increased earnings management in firms with female CEOs.

The role of litigation risk

Litigation risk constrains managerial opportunism by imposing substantial financial and reputational penalties on errant managers. Hopkins (2018) demonstrates that the threat of shareholder litigation serves as a deterrent against financial misreporting, using the 1999 ruling of the Ninth Circuit Court of Appeals as an indicator of the reduction in litigation threat. Using a similar setting, Huang et al. (2020) find that firms increasingly resort to earnings management following the implementation of the Ninth Circuit Court's ruling.

Given that litigation risk acts as a strong governance mechanism deterring managerial opportunism, we expect that it could also mitigate the influence of female CEOs on earnings management. Following Mao and Meng (2013), we categorize firms as high-litigation-risk ($Litigation = 1$) if they were defendants in lawsuits in the previous year, and low-litigation-risk ($Litigation = 0$) if they were not. Columns (3)-(4) of Table 8 reveals that the coefficient of CEO_Female is significantly negative only within the low-litigation-risk subsample, and not statistically significant within the high-litigation-risk subsample. We show that litigation risk mitigates the propensity for increased earnings management among firms led by female CEOs.

Robustness checks

Propensity score matching and Heckman selection approach

The economic consequences of female CEOs may suffer from endogeneity problems if female CEOs are not randomly distributed among firms. To address this self-selection bias, we use the propensity score matching (PSM). We take firms with female CEOs as our experimental sample and use PSM to construct a control sample comprising firms run by male CEOs with highly similar characteristics. For matching, we

Table 8. Cross sectional analyses.

	Dependent variable: <i>AbsACC</i>			
	<i>Disclosure = 1</i> (1)	<i>Disclosure = 0</i> (2)	<i>Litigation = 1</i> (3)	<i>Litigation = 0</i> (4)
<i>CEO_Female</i>	−0.0023 (−0.36)	0.0103** (2.33)	0.0268 (1.42)	0.0078** (2.08)
<i>CFO_Female</i>	−0.0035 (−0.88)	0.0005 (0.20)	0.0049 (0.48)	−0.0021 (−1.00)
<i>Board_Female</i>	0.0185 (1.15)	0.0151 (1.54)	−0.0248 (−0.66)	0.0064 (0.78)
<i>CEO_Age</i>	−0.0068 (−0.52)	−0.0004 (−0.04)	−0.0278 (−1.01)	−0.0062 (−0.89)
<i>CEO_Edu</i>	0.0000 (0.00)	0.0001 (0.23)	0.0007 (0.34)	0.0004 (1.08)
<i>CEO_Duality</i>	0.0026 (0.64)	0.0047* (1.77)	−0.0036 (−0.34)	0.0038* (1.71)
<i>Size</i>	−0.0070** (−2.26)	−0.0095*** (−4.92)	−0.0052 (−0.74)	−0.0110*** (−7.04)
<i>ROA</i>	0.1181* (1.83)	0.0435 (1.07)	−0.1447 (−1.10)	0.1279*** (3.64)
<i>Lev</i>	0.0164 (1.02)	0.0414*** (4.73)	0.0510* (1.70)	0.0451*** (5.31)
<i>Loss</i>	0.0279 (1.27)	0.0195*** (2.82)	0.0191 (0.79)	0.0233*** (3.76)
<i>SG</i>	0.0074 (1.23)	0.0090*** (2.84)	0.0160 (1.52)	0.0076** (2.57)
<i>CF</i>	−0.0422 (−0.84)	−0.1043*** (−4.45)	−0.1490 (−1.54)	−0.1237*** (−5.82)
<i>BTM</i>	−0.0151 (−1.26)	−0.0308*** (−3.51)	−0.0179 (−0.50)	−0.0275*** (−4.09)
<i>Inst</i>	−0.0148* (−1.80)	0.0136*** (2.60)	0.0285 (1.43)	0.0067 (1.53)
<i>Shareholder2–5</i>	−0.0113 (−0.70)	0.0174 (1.58)	0.0409 (1.00)	0.0058 (0.62)
<i>Big4</i>	0.0219** (2.01)	−0.0045 (−0.65)	−0.0129 (−0.48)	−0.0007 (−0.12)
<i>Board</i>	0.0103 (0.74)	−0.0007 (−0.07)	0.0106 (0.28)	−0.0028 (−0.35)
<i>Indr</i>	−0.0202 (−0.53)	−0.0402 (−1.45)	−0.1685 (−1.33)	−0.0238 (−1.03)
<i>Intercept</i>	0.3223*** (3.30)	0.3740*** (4.49)	0.2645 (1.18)	0.3612*** (7.09)
<i>Industry FE</i>	Yes	Yes	Yes	Yes
<i>Year FE</i>	Yes	Yes	Yes	Yes
<i>Observations</i>	997	4,008	305	5,682
<i>Adj. R²</i>	0.1731	0.1190	0.2508	0.1137

The first two columns present the results of subsamples based on disclosure quality. Firms are classified as having high-disclosure-quality (*Disclosure* = 1) if they received an 'A' rating in the previous year, and as having low-disclosure-quality (*Disclosure* = 0) if they were rated 'B', 'C', or 'D'. The last two columns present the results of subsamples based on litigation risk. We categorize firms as high-litigation-risk (*Litigation* = 1) if they are defendants in lawsuits in the previous year, and low-litigation-risk (*Litigation* = 0) if they are not. The robust t statistics are in parentheses. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% level, respectively.

run a logistic regression for female CEOs (*CEO_Female*) on the control variables in Eq. (4). We use the propensity scores obtained from the logit regression and perform one-to-one nearest neighbour matching without replacement. We then rerun Eq. (4) on the PSM sample. Column (1) of Table 9 shows that the coefficient of *CEO_Female* is positive and significant (0.0112, $p < 0.05$). This result indicates that self-selection bias is not an issue in the study.

We also adopt the Heckman selection to mitigate self-selection bias. Following Schopohl et al. (2021), we use the median proportion of female

directors for each industry in a given year (*Board_Female_Median*) as the instrumental variable, which affects a firm's likelihood of hiring a female CEO. Column (2) of Table 9 presents the first-stage model. The coefficient of *Board_Female_Median* is positive and significant. Column (3) shows that the coefficient of *CEO_Female* in the second-stage model remains statistically positive (0.0086, $p < 0.05$) after controlling for the inverse Mills ratio (*IMR*). We show that our results are unlikely to be driven by self-selection bias in female CEO appointments.

Table 9. Tests of PSM, Heckman selection and DID.

	PSM	Heckman selection		DID
		Stage 1	Stage 2	
	<i>AbsACC</i> (1)	<i>CEO_Female</i> (2)	<i>AbsACC</i> (3)	Δ <i>AbsACC</i> (4)
<i>CEO_Female</i>	0.0112** (2.06)		0.0086** (2.32)	
<i>Board_Female_Meidan</i>		2.3955*** (6.50)		
<i>IMR</i>			0.0154* (1.67)	
<i>Female</i>				0.0449* (2.45)
<i>CFO_Female/ΔCFO_Female</i>	−0.0044 (−0.91)		−0.0022 (−1.07)	−0.0096 (−0.70)
<i>Board_Female/ΔBoard_Female</i>	0.0148 (0.75)		0.0087 (1.03)	−0.0147 (−0.33)
<i>CEO_Age/ΔCEO_Age</i>	−0.0188 (−1.23)		−0.0069 (−1.02)	−0.0391* (−2.07)
<i>CEO_Edu/ΔCEO_Edu</i>	0.0015 (1.59)		0.0004 (1.01)	0.0007 (2.01)
<i>pinghen/ΔCEO_Duality</i>	−0.0029 (−0.61)		0.0033 (1.50)	0.0184*** (4.09)
<i>Size/ΔSize</i>	−0.0124*** (−3.74)	−0.0427 (−1.51)	−0.0111*** (−7.18)	0.0035 (0.98)
<i>ROA/ΔROA</i>	0.1896*** (2.60)	1.3203** (2.23)	0.1072*** (2.92)	−0.2634* (−2.41)
<i>Lev/ΔLev</i>	0.0557*** (2.66)	0.0904 (0.63)	0.0442*** (5.41)	−0.0083 (−0.40)
<i>Loss/ΔLoss</i>	0.0302** (2.49)	0.2312** (1.97)	0.0277*** (4.46)	−0.0267 (−1.50)
<i>SG/ΔSG</i>	0.0054 (0.96)	0.0022 (0.05)	0.0085*** (2.98)	−0.0117 (−0.70)
<i>CF/ΔCF</i>	−0.1210** (−2.16)	−0.2707 (−0.80)	−0.1245*** (−6.04)	0.0776 (1.38)
<i>BTM/ΔBTM</i>	−0.0313** (−2.06)	0.0787 (0.68)	−0.0294*** (−4.35)	−0.0029 (−0.17)
<i>Inst/ΔInst</i>	0.0095 (0.88)	0.0765 (0.82)	0.0085** (1.97)	0.0153 (0.79)
<i>Shareholder2–5/ΔShareholder2–5</i>	0.0440* (1.81)	0.1423 (0.67)	0.0099 (1.08)	0.0590 (1.05)
<i>Big4/ΔBig4</i>	−0.0073 (−1.00)	0.7051*** (4.92)	0.0074 (0.94)	−0.0511* (−2.36)
<i>Board/ΔBoard</i>	−0.0085 (−0.41)	0.1454 (0.81)	0.0005 (0.07)	0.0188 (0.72)
<i>Indr/ΔIndr</i>	−0.0930* (−1.85)	2.0699*** (3.87)	−0.0033 (−0.12)	0.0961 (0.73)
<i>Intercept</i>	0.3863*** (3.76)	−2.0859*** (−2.84)	0.3144*** (5.84)	0.0992*** (26.61)
<i>Year FE</i>	Yes	No	Yes	No
<i>Industry FE</i>	Yes	No	Yes	No
<i>Observations</i>	1,150	5,987	5,987	940
<i>Adj. R²</i>	0.1979	0.0235	0.1146	0.0218

Column (1) reports regression results after PSM. Columns (2) and (3) present the Heckman two-stage regression results using the median proportion of female directors per year as an instrumental variable. Column (4) reports the results of difference-in-difference estimation. The robust t statistics are in parentheses. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% level, respectively.

Difference-in-differences estimation

Unobservable time series changes contemporaneous with CEO changes could also affect earnings management, possibly making our results spurious. Following Francis et al. (2015), we apply difference-in-differences (DID) estimation to mitigate the endogeneity concern.

The DID approach compares earnings management before and after male-to-female CEO transitions, with a control sample of male- or female-to-male transitions. Our final sample comprises 83 male-to-female and 857 male/female-to-male CEO transitions. We create the dummy variable *Female*, which equals 1 if

a firm experiences a male-to-female CEO transition, and 0 otherwise. We use Eq. (7) to conduct our DID estimation.

$$\Delta AbsACC = \beta_0 + \beta_1 Female + \Delta Controls + \varepsilon \quad (7)$$

Where $\Delta AbsACC$ is the absolute difference in the mean value of discretionary accruals between the post-transition and pre-transition periods. $\Delta Controls$ is the difference in the mean values of the control variables between the post-transition and pre-transition periods. This approach allows us to interpret the coefficient of *Female* as the average difference in earnings management for a firm with the average sample characteristic.

We report the results in Column (4) of Table 9. The coefficient of *Female* is positive and significant at the 10% level. Compared with male CEOs, female CEOs engage more in earnings management following CEO transitions. Our DID results indicate a causal effect of CEO gender on earnings management.

Alternative measures of earnings management

We use the absolute value of discretionary accruals to focus on the level of earnings management. However, studies indicate that CEOs engage in different directions of earnings management. CEOs are inclined to manage earnings upwards to improve their reputation and compensation (Wilson and Wang 2010). In contrast, CEOs manage earnings downwards to smooth profits or preserve profits for the coming years (Beuselinck,

Deloof, and Vanstraelen 2014). We run Eq. (4) in two subsamples (discretionary accruals ≥ 0 vs. discretionary accruals < 0). Columns (1)–(2) of Table 10 present the results. The coefficient of *CEO_Female* is significantly positive (negative) in the subsample of discretionary accruals ≥ 0 (< 0). This indicates that female CEOs engage more in accrual-based earnings management, regardless of the direction.

A systematic correlation may exist between accounting performance and accrual, rendering the modified-Jones model biased in estimating non-discretionary accruals. To address this issue, we adopt a performance-adjusted accrual model (Kothari, Leone, and Wasley 2005), which controls for ROA in the modified-Jones model. The results, presented in Column (3) of Table 10, reveal that the coefficient of *CEO_Female* is positive and significant, similar to the results from modified-Jones model. Further analysis, through regression of performance-adjusted accruals in two subsamples categorized by their signs, indicates that female CEOs are more inclined towards earnings management, irrespective of the direction of the accruals, as shown in Columns (4) and (5).

We also explore the impact of female CEOs on earnings management through real activities. We estimate real earnings management following the methodology developed by Cohen and Zarowin (2010).⁵ Column (6) of Table 10 reports the results of the absolute value of real earnings management. The coefficient of *CEO_Female* is positive and sig-

Table 10. Tests for alternative measures of earnings management.

	ACC			ACC_PA			REM	
	ACC ≥ 0 (1)	ACC < 0 (2)	AbsACC_PA (3)	ACC_PA ≥ 0 (4)	ACC_PA < 0 (5)	AbsREM (6)	REM ≥ 0 (7)	REM < 0 (8)
<i>CEO_Female</i>	0.0128* (1.64)	−0.0128** (−2.28)	0.0096*** (2.61)	0.0146* (1.75)	−0.0122** (−2.25)	0.0329*** (2.58)	0.0331* (1.75)	−0.0318** (−2.04)
<i>Controls</i>	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
<i>Year FE</i>	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
<i>Industry FE</i>	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
<i>Observations</i>	3,249	2,738	5,987	2,847	3,140	5,710	2,817	2,893
<i>Adj. R²</i>	0.1321	0.1040	0.1307	0.1296	0.1026	0.1141	0.1556	0.1370

This table reports the result for alternative measures of earnings management. Columns (1) and (2) show the results of two subsamples (discretionary accruals ≥ 0 vs. discretionary accruals < 0). Column (3) uses the absolute value of performance-adjusted discretionary accrual (*AbsACC_PA*) as the dependent variable. Columns (4) and (5) show the results of two subsamples (performance-adjusted discretionary accruals ≥ 0 vs. performance-adjusted discretionary accruals < 0). Column (6) shows the results using the absolute value of real earnings management (*AbsREM*) as the dependent variable. Columns (7) and (8) show the results of two subsamples (real earnings management ≥ 0 vs. real earnings management < 0). The control variables are the same as those in Column (4) of Table 5. The robust t statistics are in parentheses. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% level, respectively.

⁵We present the estimation procedure in Appendix I.

nificant. We also run the regression of real earnings management in the two subsamples based on their signs. The last two columns show that female CEOs engage more in real earnings management, regardless of the direction. These findings suggest that our results are robust to alternative measures of earnings management.

Alternative measures of family firms

Several studies use different thresholds of shareholding by ultimate controllers when defining family firms (Amin and Liu, 2020). We redefine family firms using 15% and 20% cut-offs to examine whether our results are sensitive to the shareholding thresholds. We present the results obtained using the new samples of family firms in Columns (1) and (2) of Table 11. The coefficients of *CEO_Female* remain positive and significant, suggesting that our results are robust to different samples of family firms.

Excluding the impact of the reform of accounting standards

Chinese listed firms implemented new accounting standards on 1 January 2007. To circumvent the impact of the reform of accounting standards on discretionary accruals, we exclude observations before and during the reform (2005, 2006, and 2007). Column (3) of Table 11 reports the results. The statistical and economic significance of the coefficient of *CEO_Female* is similar to our baseline results.

Table 11. Robustness checks for family firms and sample period.

	Dependent variable: <i>AbsACC</i>		
	Ultimate controllers' holding $\geq 15\%$	Ultimate controllers' holding $\geq 20\%$	Excluding years before accounting standards reform
	(1)	(2)	(3)
<i>CEO_Female</i>	0.0091** (2.40)	0.0098** (2.52)	0.0090** (2.40)
<i>Controls</i>	Yes	Yes	Yes
<i>Year FE</i>	Yes	Yes	Yes
<i>Industry FE</i>	Yes	Yes	Yes
<i>Observations</i>	5,605	4,998	5,912
<i>Adj. R²</i>	0.1173	0.1276	0.1147

This table reports the result of robustness tests for family firms and the sample period. Columns (1) and (2) show the results on the family firms sample using a 15% and 20% threshold of ultimate controllers' shareholding, respectively. Column (3) shows the regression results excluding the sample before and during the accounting standards reform (2005, 2006, and 2007). The control variables are the same as those in Column (4) of Table 5. The robust t statistics are in parentheses. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% level, respectively.

Table 12. Tests for including non-family firms.

	Dependent variable: <i>AbsACC</i>	
	(1)	(2)
<i>CEO_Female</i>	0.0040** (2.00)	0.0064** (2.27)
<i>Familyfirm</i>		0.0013 (1.21)
<i>Familyfirm*CEO_Female</i>		-0.0049 (-1.28)
<i>Controls</i>	Yes	Yes
<i>Year FE</i>	Yes	Yes
<i>Industry FE</i>	Yes	Yes
<i>Observations</i>	20,821	20,821
<i>Adj. R²</i>	0.0832	0.0833

This table reports the result of the sample including family firms and non-family firms. *Familyfirm* in Column (2) is an indicator of a family firm. The control variables are the same as those in Column (4) of Table 5. The robust t statistics are in parentheses. ***, **, and * indicate statistical significance at the 1%, 5%, and 10% level, respectively.

Including non-family firms

Our study focuses on family firms, and whether the incentive of female CEOs to engage in earnings management being contingent on ownership type (family vs. non-family) is worth further exploring. We include non-family firms in our sample to provide empirical evidence. In Column (1) of Table 12, the coefficient of *CEO_Female* for the entire sample is positive and significant. Moreover, we generate the variable *Familyfirm* as the indicator of a family firm. In Column (2), the coefficients of *CEO_Female* remains positive and significant, while the interaction term *Familyfirm*CEO_Female* is statistically insignificant. These findings suggest that female CEOs to engage in higher level of earnings management are consistent across both family and non-family firms.

V. Conclusion

This study shows that firms with female CEOs display a statistically and economically higher level of earnings management than firms with male CEOs. These results hold when using alternative measures of the key variables and addressing the endogeneity issues. Furthermore, family identity and board gender diversity, which provide family support and female support to alleviate social bias against female CEOs, weaken the relationship between female CEOs and earnings management. Conversely, financial crisis, which exacerbates social bias, strengthens this relationship. From the perspective of economic consequence, earnings management increases

the pay – performance sensitivity of female CEOs and reduces their termination risk. Finally, cross-sectional analysis shows that disclosure quality and litigation risk mitigates the relationship between female CEOs and earnings management. Thus, we provide evidence to support social identity theory but not risk aversion theory.

Our findings provide two implications. First, despite the notable increase in women's participation at the top executive level in recent years, it may be not useful to improve earnings quality by hiring more female CEOs in China. Controlling shareholders and boards of directors need to shift from merely recognizing social biases against female leaders to actively finding ways to mitigate the impact of those biases. Creating a female-friendly environment that ensures fair appointment and evaluation of female executives by controlling shareholders and boards of directors can be instrumental in curbing earnings management. Second, our findings serve as a cautionary note for external auditors. External auditors may reduce their audit fees for firms with female CEOs, because they believe that female CEOs enhance the quality of financial reporting and minimize auditors' assessment of the risk of material misstatement (Gull et al. 2021). However, our study shows that female CEOs engage in aggressive earnings management due to social identity pressure. Consequently, external auditors should not automatically assume a lower risk profile associated with female top executives.

Utilizing the context of China, we bring about the social identity theory into the research of female top executives and accounting decision. It inspires more studies to investigate this notion in emerging markets with institutional background distinct from developed countries. Research spanning multiple countries could further examine the circumstances under which social identity or risk aversion theory is valid. As our study only focus on earnings management, future research should investigate gender differences in various accounting practices, such as earnings quality, accounting conservatism, and financial reporting manipulation.

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Appendix I. Real earnings management

We use Eq. (1)-(4) to estimate real earnings management following the methodology of Cohen and Zarowin (2010).

Abnormal cash flow from operations (EM_CFO) is the actual cash flow from operations (CFO) minus the normal cash flow from operations estimated from Eq. (1).

$$\frac{CFO_{i,t}}{A_{i,t-1}} = \alpha_0 + \frac{\alpha_1}{A_{i,t-1}} + \alpha_2 * \frac{Sales_{i,t}}{A_{i,t-1}} + \alpha_3 * \frac{\Delta Sales_{i,t}}{A_{i,t-1}} + \varepsilon_{i,t} \quad (1)$$

$A_{i,t-1}$ is the total assets of firm i at the end of period $t-1$, $Sales_{i,t}$ is the sales of firm i during period t , and $\Delta Sales_{i,t} = Sales_{i,t} - Sales_{i,t-1}$.

We define production costs ($PROD$) as the sum of cost of goods sold and the change in inventory. We estimate normal production costs using Eq. (2). Abnormal production costs (EM_PROD) are the actual production costs minus the normal production costs.

$$\frac{PROD_{i,t}}{A_{i,t-1}} = \alpha_0 + \frac{\alpha_1}{A_{i,t-1}} + \beta_1 * \frac{\Delta Sales_{i,t}}{A_{i,t-1}} + \beta_2 * \frac{\Delta Sales_{i,t-1}}{A_{i,t-1}} + \varepsilon_{i,t} \quad (2)$$

We define discretionary expenses ($DISEXP$) as the sum of sales expenses and administrative expenses. We estimate normal discretionary expenses as a linear function of contemporaneous sales. Abnormal discretionary expenses (EM_DISEXP) are the actual discretionary expenses minus the normal discretionary expenses.

$$\frac{DISEXP_{i,t}}{A_{i,t-1}} = \alpha_0 + \frac{\alpha_1}{A_{i,t-1}} + \beta * \frac{Sales_{i,t}}{A_{i,t-1}} + \varepsilon_{i,t} \quad (3)$$

Finally, we estimate from Eq. (4) the absolute value of real earnings management ($AbsREM_{it}$).

$$AbsREM_{it} = |EM_PROD_{it} - EM_CFO_{it} - EM_DISEXP_{it}| \quad (4)$$

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【专稿】	【文史天地】	【社会经纬】
【马克思主义研究】	【法政探索】	【热点关注】
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目录

CONTENTS



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主管：湖北省社会科学界联合会

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出版：《理论月刊》编辑部

■ 专稿

- 5/走中国特色海洋强国之路托起中国梦 蔡娟

■ 马克思主义研究

- 11/论社会主义的价值合理性
——从恩格斯《社会主义从空想到科学的发展》说起 张瑞军
- 16/马克思主义人学视野中的社会组织与人的全面发展
——以“社会组织参与社会治理”为论域 曾正滋
- 22/重新审视“两个决不会”思想 王黎明
- 27/马克思主义法学的发源地
——《黑格尔法哲学批判》解读 李龙 凌彦君

■ 哲学论丛

- 33/冯从吾《中庸》学的诠释特质 李敬峰
- 37/论我国当代意识形态一元主导与多样发展 聂立清
- 43/对革命与改革关系的一点思考 罗小青
- 48/哈贝马斯生活世界理论及其对我国现实的启示 吴宁 许慧

■ 文史天地

- 54/先唐江苏文学家的地理分布与成因 晁成林
- 60/全球化语境下中国文化软实力的困境与崛起路径 罗淑宁
- 65/流变与重建——可持续消费伦理解构消费主义文化 相雅芳 郭强
- 70/论中医文化传播的困境与突围 陶林 张宗明
- 74/浅析殖民地时期韩国小说中的他者形象
——以同伴作家小说为中心 曾思齐
- 79/人文社会科学研究中的文献综述撰写 支运波

■ 法政探索

- 84/公众意愿与压力型司法
——基于李昌奎案的延伸思考 韩宏伟
- 90/当代中国死刑适用标准探析 王鹏祥

96/我国食品安全犯罪中严格责任制度的立法考量	逢晓枫 刘晓莉
102/检察机关参与公益诉讼问题研究	富 饶 杨光普
107/论我国足球贿赂犯罪被害人特征	康均心 刘 莉
114/我国台湾地区主任检察官制度初探	张永进

■ 经济纵横

118/评西方学者关于斯大林经济思想的研究	雷晓欢
124/主导产业对城镇化的促进作用探析	刘成军 孙育红
128/我国盐业企业战略转型的理论框架与路径选择	董 欢
132/独生子女家族企业的传承研究:基于比较的视角	郭 萍

■ 社会经纬

137/社会组织承接公共服务研究:机制、路径与规范	刘 博
142/嵌入、促进、发展与保障:现阶段大学生村官职业实践的问题分析与对策建议	王 强
148/道路、理论、制度——中国特色残疾人事业发展的体系建构	邱观建 安治民
153/担当实现“中国梦”重任的创新人才培养困境与对策研究	钟 萃 李祖超
158/论我国边疆地区的宗教渗透与治理	朱碧波

■ 热点关注

163/近年来国内外“中国梦”研究述要	谢霄男 李 净
169/“人才”集体户:特大城市户籍制度改革的突破口——以北京市为例	李晓壮
174/网络公共讨论中网络理性的缺失与构建	邹 新 贺祥林

■ 全球视野

179/美国海外利益维护机制及其对中国的启示	王发龙
184/苏联意识形态话语权建设的嬗变历程与教训探析	刘国普 莫岳云

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独生子女家族企业的传承研究:基于比较的视角

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[摘 要] 独生子女家族企业的传承问题是中国一个独有的话题。论文简要回顾了计划生育政策下独生子女家族企业的产生及大致规模,然后从所有权传承与管理权传承两方面入手,对独生子女家族企业与多子女家族企业的传承特征进行了比较分析。经研究发现,与多子女家族企业相比,独生子女家族企业在股权传承上具有先天优势,且信任半径的扩大有助于吸纳更多的管理人才辅佐接班人。但在接班人的培养与甄选环节上,独生子女家族企业面临更大的风险与劣势。不过,考虑到独生子女家族企业群体较小,其存在的潜在风险不会从根本上危及中国民营经济的发展。

[关键词] 独生子女;计划生育政策;家族企业;传承;比较研究

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改革开放以来,民营家族企业对我国的经济增长和就业机会创造做出了重要的贡献。经过三十多年的发展,第一代创业者多数已年近花甲,许多企业都面临着权力交接、领导人换代等紧迫问题。来自世界各地的大量经验都表明,“富不过三代”并不是中国所独有的现象。但值得注意的是,大陆家族企业传承在今后的一段时间内会存在一个独特的现象,即独生子女的问题。人们很自然会问这样的问题,当家庭中仅有一位接班人时,家族企业的传承会受到哪些影响?极为严格的计划生育引致的家庭规模缩水是否会危及中国的家族企业?对于这些问题的探索不仅有助于家族企业的平稳发展,对家族企业传承领域的理论研究也有较好的补充作用。

1 计划生育政策与独生子女家族企业

独生子女家族企业作为一个群体的出现应该归因于计划生育政策的实施。20世纪70年代初,为了解决庞大的人口规模与相对匮乏的资源和较低的经济水平之间的矛盾,中国政府制定了以“控制人口数量、提高人口素质”为主要内容的人口与计划生育政策。后

来,经过几次重大的调整最终成为我国的一项基本国策(彭佩云,1997)。^[1]据全国历次人口普查数据显示,计生政策确实起到了限制大陆家庭规模的明显效果。但值得注意的是,中国的计生政策并非一刀切的“一孩政策”。冯国平、郝林娜(1992)根据当时28个地方计生条例的梳理发现,20世纪80年代后期以来,生育政策出现了多元化的状态。^[2]郭志刚等(2003)对全国420个地区政策生育率的量化统计也证实了这一点:1.3~1.5之间的政策生育率在全国占主导地位,全国人口的大多数处于1.3~2.0之间的政策生育率地区,实行“1.5孩”生育政策的人口占全国的一半以上。^[3]关于中国独生子女人口的规模,朱玉等(2005)指出,自实行计划生育政策以来,我国已累计出生9000万独生子女。^[4]张为民等(2008)根据全国1%人口抽样调查对独生子女的总量进行了测算显示,我国0~25岁独生子女的数量为1.26亿,占同龄人口的27.7%。^[5]

郭萍(2014)在一项探索性研究中发现民营企业家的生育行为较为特殊。与普通入相比,他们的生育欲望较强而超生约束较小,这导致他们生育子女的数量往往较多。而仅生育一孩的民营企业家只是其中一

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个非常小的群体。^①经梳理发现,生育独生子女的企业主基本都符合以下三个特征:一是在创立(或改制成立)家族企业之前都曾在党政机关、事业单位或国有企业、集体企业工作过。因为国家1984年的7号文件明确规定:“国家干部和职工、城镇居民除特殊情况经过批准外,一对夫妇只生育一个孩子。”^②如果违反规定,政府将采用行政手段对超生者夫妇予以调职、降职、减薪等纪律处分,情节严重的甚至要开除公职。二是企业主的生育行为发生在计划生育政策严格执行的20世纪70年代末之后,大多数独生子女是“80后”。三是企业主在创办或改制成立家族企业之后没有继续生育。实际上,真正同时符合这三个条件的企业主数量并不多。许多企业主受“养儿防老”“多子多福”等传统观念的影响,以及出于对年迈时自己的产业和财富如何传承的实际考虑,会想方设法地追生孩子(尤其是男孩)。而超生可能产生的处罚成本对民营企业主而言并不足以对其超生的动机予以根本限制。以2010年违反规定超生一个子女为例,全国主要城市的社会抚养费征收范围在7万~50万之间。这与私营企业主的财力相比并不算什么,更何况,如果在国内超生过于麻烦,他们完全可以选择去国外或者香港生育并入当地户籍。

目前尚没有独生子女家族企业的直接统计数据,但《中国家族企业发展报告》(2011)对“企业主创办企业前的主要经历”进行了抽样调查:^③在4614份总样本中,回答“曾经在党政机关、事业单位工作过”的有648人,“在国有企业工作过”的有1186人,“在集体企业工作过”的有775人,其中,同时拥有以上两种经历的共有206人,同时拥有以上三种经历的共有43人。扣除重复计算的情形,有过以上三种经历之一的家族企业主占抽样总体的比重为50.217%。根据前面谈及的第一个特征,这是生育一个孩子的潜在企业家群体比例。风笑天(2006)介绍了上世纪80年代初期北京、上海等大城市人群生育意愿的调查结果,愿意只生一个孩子的比例基本上都在25%以下。^④在思想较为开放的大城市尚且如此,更不用说宗族思想较强的农村了。也就是说,我们可以用25%作为70年代末至80年代初全国人口仅生育一个孩子的意愿率上限。加上家族企业主在经济上没有超生罚款的压力,这使得真正仅生育

一孩的企业家非常少。根据上述的两个数据笔者保守估算出,独生子女家族企业占我国家族企业的比例在12.55%左右。这说明,计划生育导致了独生子女家族企业的产生,但该群体在当前中国家族企业并非主流。

2 独生子女与非独生子女家族企业传承过程的比较

根据Breton-Miller, Miller和Steier(2004),家族企业代际传承可以划分为四个阶段(见图1):第一,设立传承规划;第二,潜在继承人的培养和发展;第三,接班人甄选;第四,领导权与所有权的最终交接。^⑤考虑所有权传承对解决第二代领导结构十分关键,笔者将“所有权传承规划与资本传递”作为一个独立环节进行专门探讨,而继任者培养与甄选则作为管理权继任的两个重要环节分别予以分析。

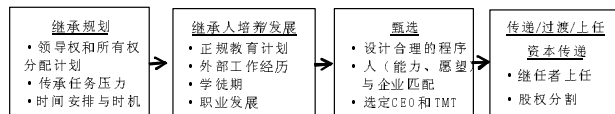


图1 传承过程(管理权与所有权)

资料来源:Breton-Miller, Miller和Steier(2004)

2.1 所有权传承规划与传递的比较

Barach & Ganitsky(1995)指出,由于所有权分配的结果对管理权继任十分关键,所以,要提前做好所有权传承规划,而股权转让至少应该与领导权传递保持同步。^⑥我们的调研结果显示,独生子女家族企业的家庭结构较为简单,股权传承的对象仅有一人,其传承模式毫无悬念地是由一个控制型所有者向另一个控制型所有者的权力转移。在这种情境下,创始人会较早着手制定继承规划并将股份逐步转移给自己的独生子(女)。比如廖伟佳16岁就拥有家族集团20%的股份,成为重庆小天鹅集团最年轻的董事;拓日新能陈五奎的独生女陈琛在22岁之前就已经持有家族投资公司(即上市公司的母公司)53.60%的股权;娃哈哈集团的宗馥莉21岁的时候就担任恒枫贸易有限公司的董事长并实际参与公司资本运作,这家离岸公司是宗氏家族的控股公司,实际控制了多家娃哈哈非合资公司;新朋股份创始人的独生子宋琳31岁就持有公司36%的股份。此外,圣农发展、山东威达的独生子女接班人都

①中共中央批转国家计划生育委员会党组《关于计划生育工作情况的汇报》(中发[1984]7号,1984年4月13日)。参见:国家计划生育委员会编:《计划生育文献汇编(1981~1991)》,中国民主法制出版社,1992:P35~43。

②中国民(私)营经济研究会家族企业研究课题组:《中国家族企业发展报告[R]》,中信出版社,2011:P17。

持有超过 10% 的家族企业股份。创始人较早开始转移股权的做法反映了他们打算逐步给继承人授权并增强其地位的意图。此外,这一做法还有防止股权一次性继承可能带来的股价波动以及规避股权交易税费的附加作用(Potts et al., 2001)。^[9]

在多子女家族企业里,股权继承计划很少被认为是十分紧急的事情而被优先考虑。为何股权继承在多子女家族企业多被当作“身后事”处理?其中的原因:一是创始人父辈害怕失去控制是他们推迟计划的一个原因。创始人在世时掌控绝大多数股权有助于对家族企业战略大方向的把握以及维持自己在家族内部的家长权威。二是许多创始人担心家族内部出现冲突。他们认为股权继承计划的公布需要家族成员间进行十分艰难的对话,这可能导致他们之间爆发公开的战争。父辈对股权分配的内容保持缄默使得第二代领导结构的安排成为悬而未决的问题,有些时候可能导致子女的冲突延后到父母过世时集中爆发而无力挽回。而且,中国传统多子女家族企业在处理股权分配结构时,往往会出现所谓“家庭资源转移的异质性”问题(Lin, 1982)。^[10]即创始人父母希望将企业的掌门人位置传给最有能力的儿子,但出于公平考虑却在多个孩子之间平等分配股份。这种家庭资源转移上的不一致将造成家族成员中个体占有的资源呈现一种抗衡性的特征,这是多子女家族企业代际传承最大的隐患。而独生子女家族企业的代际传承并不存在这方面的潜在问题。

2.2 继任者的培养与发展的比较

家族企业继承人的培养包括正规学校教育、企业外部锻炼与企业内培养。通常,企业主都会为子女精心安排优质的教育资源,几乎绝大多数的家族二代成员都有大学本科以上学历且有海外留学的背景。在这一点上,独生子女接班人与来自多子女家庭的接班人并无差异。但是在“企业外部锻炼”上,两者有较显著区别。独生子女接班人有企业外部锻炼经历的比例相当少,大部分的独生子女接班人都是在完成正式教育后直接进入家族企业工作。比如俏江南的汪小菲、三一重工的梁治中、圣农发展的傅芬芳、娃哈哈的宗馥莉、拓日新能的陈琛、山东威达的杨明燕、新朋股份的宋琳、兴盛集团的张静静等等。接班人在进入家族企业之前获得外部工作经验的好处,一是可以得到对潜在接班人成就的准确反馈,从而能够对候选人做一个准确的评价;二是可以给企业带回新的技术知识和管理经验,避免家族企业因陷入复杂的关系网而丧失对企业领域

重要技术和管理发展的洞察力。为何企业家对独生子女接班人设置类似于多子女家族企业那样的“在加入家族企业之前,孩子们应当在其他的与本家族的企业没有联系的公司中工作 3-5 年”的条件?我们认为可能的原因是:一是继任者是企业家家中唯一的子女,在没有其他候选人的情况下,父母通过独生子女在其他企业的锻炼业绩来评价其能力的功能散失。二是独生子女尽早进入家族企业锻炼,可以了解自家企业特有的知识并通过长时间与创始人合作建立默契,这样更有利于代际之间的知识传承。当然,继承人较早进入家族企业工作,亦即增加接班人对企业的投入,可以有效地提高接班人接班后对企业的价值评价,显著减少他们的经营冒险行为(Shepherd, 2000)。^[11]三是最近关于美国东北部 119 个家族样本的调查研究显示,接班人即使有过家族企业外部的锻炼经历但所从事的是非高层管理的岗位,这种性质的锻炼反而不利于接班人对家族企业内部的机会识别(Sardeshmukh & Corbett, 2011)。^[12]而对于多子女的企业主家庭,引导子女之间的良性竞争是创始人挑选接班人的有效途径,在家族企业外部锻炼的业绩是对潜在接班人能力考核的指标之一。所以,多子女的企业主更倾向于通过企业外部的锻炼机会来培育接班人。

与外部锻炼相比,创始人更加重视独生子女在家族企业内部的经验学习。具体的形式包括:第一,企业内轮岗。如武汉凡谷的孟凡博、三一重工的梁治中。第二,授权担任助理职务。如上海兴盛实业的张静静、重庆小天鹅的廖伟佳。第三,特殊项目,即由接班人来领导开发一个全新的企业战略计划。比如宗馥莉积极开拓娃哈哈集团的童装和日化新业务、俏江南汪小菲回国致力于家族企业的海外拓展等。在此过程中,独生子女家庭良好的亲子关系可以为继承人的培养提供支持。郝玉章、风笑天(2002)^[13]研究发现,独生子女家庭规模小,家庭范围内的互动对象变少,家庭成员间互动频率增加,容易使亲子关系表现出更为亲密的倾向(尤其是亲代对子代的关系)。然而在传统的多子女家庭中,父母的角色主要意味着对孩子的抚养和教育,父母的形象主要是照料者、培养者、教育者,长幼有序、“父父子子”,亲子两代之间的角色距离十分明显。父母的角色在当今的独生子女家庭中已发生了一定的改变,亲子之间的距离大大接近了,亲子关系呈现更加平等的伙伴化趋势。这种关系反映在家族企业中,可以令创始人父辈与继任者双方彼此感受到来自对方的支持和

认可,并能够建立信任和反馈的良性循环,进而有效地促进知识、社会资本以及网络的代际转移。

2.3 继任者与接班团队甄选的比较

国内外对合意继承人标准的研究发现,接班人的“忠诚度”、“诚实”、“对企业的承诺”是家族企业主最为看重的品质。当前,我国的社会信任资源不足,有效的职业经理人市场缺失导致社会缺少制度来保证企业能吸纳到守信的经理人,从家族成员中选择继任者(也即子承父业模式)就成为合适的替代性制度安排。但子承父业模式常常受到人们的诟病,很大程度上是因为许多继承人都表现出了能力不足的缺陷。大量研究表明,继承人的技能、成绩以及领导组织的经历对企业的成功传承有着显著的影响。如果企业主生育的子女数量较多则可以在一定程度上减低这种风险,因为家庭内部可以为之提供有潜力的管理者候选人越多,从中甄选出来的家族接班人的管理能力就更优。相反,企业主的子女数量越少,从中可以择优选择的机会越少。当家族第二代只有一个孩子时,唯一继承人能否具备足够的管理能力成为独生子女家族企业存续的关键。当然,要想通过家族成员的参与来实现家族对企业的永续控制,还必须要具备一定素质的后代成员对企业感兴趣。《中国家族企业发展报告》(2011,P29)的调查发现,年龄在50岁以上的1014位企业家中,子女有接班意愿的占35%,虽然超过了没有接班意愿的31%,但是年长企业主的子女不接班意愿仍处在较高水平。与此相比,多子女家庭中几个孩子同时缺乏接班意愿的概率呈几何阶数下降。

为了尽可能弥补独生子女在管理能力上的不足,企业主们除了努力培养之外就是栽培有效的高层管理团队(TMT)作为接班人的辅佐力量。根据对多个案例TMT成员结构的分析发现:尽管基于血缘的特殊信任仍在发挥作用,但信任半径在独生子女家族企业得到更明显的扩大。这体现在:一方面是独生子女家庭关系的简化,使得家庭内部的信任不得不向外部有能力的旁系家族成员扩展,比如三一重工。目前的高管团队中就有梁稳根的侄子。另一方面是通过内部晋升的非家族成员在TMT中所占比例越来越大。这些能力强、素质高的非家族年轻人经过企业主多年的潜心栽培后组成团队班子,他们精通生产、营销、财务等方面业务实践,经过了较长时间的磨合和协调,形成以家族企业继承人为领导核心的运作模式。为何独生子女家族企业的信任半径普遍会有所放大?人口社会学家风笑天

(2000)^[14]用“社会交往补偿”理论来解释这一现象。他指出,独生子女在幼儿时期的“交往实践机会”少于非独生子女。但是到了青少年时期,由于缺少同兄弟姐妹交往的家庭环境,独生子女“被迫”更多地与同学和同龄伙伴往来,开始将信任和依赖的对象从成人(父母和教师)转向自身和同龄群体。相反,非独生子女有条件、也有多得多的时间是与其兄弟姐妹一起在家庭环境中度过的,这种手足之间的交往在一定程度上限制了他们在家庭外与同学、朋友的交往。而且由于家庭这一具有首属关系的“我群体”中交往规则不同于家庭之外众多具有次属关系的“他群体”中的交往规则,因此,独生子女的社会交往能力和表现会相对强于同龄非独生子女。

3 研究结论与讨论

独生子女的继承问题是中国一个独有的话题。本文从所有权传承与管理权传承两个大方面入手,以多子女家族企业为参照,对独生子女家族企业传承特征的比较研究。笔者发现,两者在传承过程中各有优缺点。

独生子女家族企业传承的优势。首先,独生子女家族企业在股权传承规划与传递上具有优势。仅有一孩的家族企业主在制订所有权继承规划时更加透明、清晰,股权的代际转让环节较早就得以着手进行,多数独生子女富二代非常年轻就持有比例不低的家族股权。而在多子女家族企业里,父辈与子女之间、子女相互之间的关系更加复杂,股权继承问题是触及各方实质利益的“敏感点”,所以,一般是在新的接班人上任之后再逐步进行控制权的转移。当然,多子女家族企业的创始人在安排股权分配的时候还面临有效传承与家族和谐之间的艰难抉择,如果处理不当,很容易造成子女之间的关系紧张。这种隐患在独生子女家族企业不会出现。其次,独生子女家族企业接班团队的信任半径更大。由于缺少同兄弟姐妹交往的家庭环境,独生子女接班人不得不将信任和依赖的对象从“我群体”扩展到“他群体”,信任半径的扩大有助于吸纳更多的管理人才为家族企业服务。从这个角度来看,独生子女家族企业的社会化程度会高于多子女家族企业(即TMT中非家族成员的比例提高)。

独生子女家族企业传承的劣势。最主要的问题体现在继任者的培养和甄选环节上。由于我国法律制度环境对职业经理人行为的约束机制不健全等原因,许

多家族企业主表示“难以信任”外人,这使得“子承父业”仍是中国家族企业继承的主流模式。当企业主仅有一个子女时,唯一继承人是否具备足够的管理能力和接班意愿都使独生子女家族企业的持续经营处于极大的风险之下。而在多子女家族企业,创始人可以从孩子中择优选择接班人的概率大大增加,这也是民营企业家在计划生育政策下仍要超生、多生的经济动机。其次,当可能的接班人只有一位时,企业主通过子女在家族企业之外的锻炼业绩来评估考核接班人能力的功能散失。尽管为了弥补接班人管理能力的不足,企业会更加重视接班人在企业内部的培养,但不可否认的是,很多独生子女接班人只接受了西方教育,回来后直接到领导岗位,未必得到了充分锻炼。缺乏在真正职场的打拼与竞争,不利于接班人对社会真实情况的全面感知,难以积累起对员工管理的宝贵经验。

综合起来看,独生子女家族企业传承面临的风险与困难大于其优势。不过,“多子多福”的传统规范会软化国家计划生育政策的刚性(彭玉生,2009)^[15]。而且,国家实施计划生育政策并非禁止性的而是惩罚性的,这导致家族企业主的超生行为非常普遍。根据保守估算,当前独生子女家族企业的占比在12.55%左右,这个比例在今后还会进一步下降。也就是说,无论在当前还是未来,独生子女家族企业都不会是中国家族企业的主体,即使它身上存在一些潜在的风险也不可能根本危及中国民营经济的发展。

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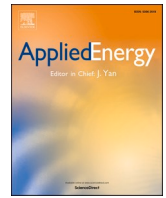
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An integrated decision framework for resilient sustainable waste electric vehicle battery recycling transfer station site selection

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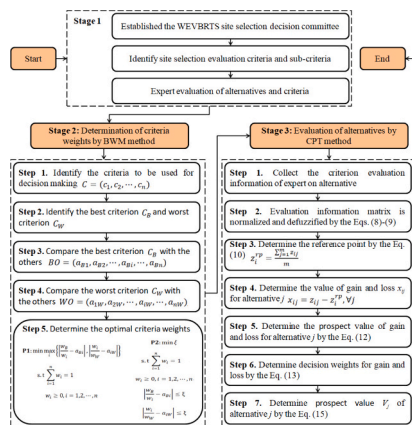
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HIGHLIGHTS

- This paper addresses the issue of battery recycling transfer station site.
- This study identifies a resilience and sustainability evaluation indicator system.
- An analysis framework to locate a battery recycling transfer station is proposed.
- Sensitivity and comparison analyses are provided to verify method validity.
- Several important theoretical implications and managerial insights are provided.

GRAPHICAL ABSTRACT



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ABSTRACT

This study is driven by a company engaged in renewable resource recovery. As the company's battery recycling market continuous continues to grow, the existing recycling facilities are unable to cope with the demand for sorting and storage. As a result, there is an urgent need to identify a suitable electric vehicle battery recycling transfer station (EVBRTS) to alleviate the strain on the recycling plant. The issue of electric vehicle battery recycling location has received scant attention in previous research, with a notable absence of studies focusing on EVBRTS location. Thus, the primary objective of this study is to establish an integrated decision-making framework using the best worst method (BWM) and cumulative prospect theory (CPT) to determine the optimal EVBRTS location. To achieve this goal, a panel of experts representing various sectors was assembled to formulate five primary criteria and fifteen secondary sub-criteria across the economic, social, environmental, technological, and resilience domains, drawing on existing literature and expert insights. The BWM method was employed to determine the criteria weights, followed by a ranking of the alternatives using the CPT approach. Furthermore, an integrated analytical model for the EVBRTS site selection evaluation index system was developed herein. A sensitivity and comparative analysis was carried out to demonstrate the practicality and

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robustness of the proposed method. A notable finding highlighted in this study is the significant impact that the order in which the expert ratings information was aggregated had on the ranking results. Undoubtedly, this study offers a fresh perspective based on resilience and sustainability for battery recycling managers to make informed strategic decisions on site selection, thereby enhancing resilience in the context of EVBRTS site selection.

1. Introduction

Despite challenges like the impact of COVID-19 and supply chain disruptions on the electric vehicles manufacturing and sales over the past three years, the global electric vehicle market is experiencing rapid growth as the automotive industry increasingly shifts towards electrification [39,62]. According to the statistics, global new energy vehicles deliveries increase by approximately 55% to 10.5 million in 2022 compared to 2021, and China, the world's largest electric vehicle manufacturer and the largest electric vehicle market, has increased its sales of electric vehicles by almost 82% in 2022 compared to 2021.¹ Electric vehicles are expected to gain market share as more environmental policies are adopted and demand for green technology increases [44]. While the environmental benefits of electric vehicles are recognized, it is important to address the challenges posed by the electric vehicle batteries. With the rise of electric vehicles, batteries as a critical component of electric vehicles are experiencing a significant growth trend. However, once the remaining capacity of an electric vehicle battery decays beyond a certain point, the battery needs to be replaced [28]. Further research is needed to develop effective strategies for managing the significant volume of end-of-life electric vehicle batteries.

With the rapid growth of electric vehicles, many electric vehicle batteries will reach the end of their life in the coming years [67]. As power batteries contain many heavy metals and other toxic and hazardous substances that are harmful to the ecosystem as well as to public ([82,17]), the benefits of electric vehicles will be reduced if waste batteries are not properly managed. Fortunately, end-of-life electric vehicle batteries can be recycled or disassembled to recover their useful metal components. Battery recycling plays a key role in the transition to a global circular economy, offering significant economic, environmental and social benefits. This process not only facilitates the reuse of finite resources but also helps to reduce negative environmental impacts [30]. More importantly, battery recycling also plays an important role in promoting employment [26]. Battery recycling has a promising future [48]. On the one hand, as the number of retired batteries increases dramatically, economies of scale for battery recycling will become a reality. On the other hand, battery recycling, as the last link in the chain to develop new energy and environmental protection, is strongly supported by various countries in the battery recycling industry [64,71]. While recycling is a viable solution to the scarcity of raw materials for batteries, significant investment is needed to improve and expand the battery recycling infrastructure to alleviate the burden of inadequate facilities.

This work is being driven by a renewable resource recovery company seeking to build a robust battery recycling infrastructure in anticipation of a surge in battery disposal. The primary concern is the strategic location of waste electric vehicle battery recycling transfer station (EVBRTS) to ensure sustainable development. Faced with operational challenges and capacity limitations at the recycling center, the company is seeking to alleviate the pressure by selecting a suitable EVBRTS as part of its expanding battery recycling operations. The transfer station's role is to collect, sort, and store waste batteries, not to dismantle or dispose of them. The strategic selection of EVBRTS sites is critical for effective business management, since failure to make this choice can put business operations at risk. Thus, the importance of EVBRTS site selection cannot be overstated. The focus of this paper is to address this crucial decision-

making process in order to provide a resilient, sustainability-focused site solution for the renewable energy company.

Sustainability is about meeting the needs of the present without compromising the ability of the future [70]. Economic sustainability emphasizes the importance of pursuing economic growth in a manner that is sustainable, prioritizing long-term development over short-term gains. Social sustainability advocates for equitable, inclusive, and stable societal development, ensuring that the needs of the majority are not overshadowed by the interests of a few. Environmental sustainability underscores the necessity of balancing economic benefits with environmental preservation. Evaluation studies often utilize economic, social, and environmental criteria to assess sustainability across various domains [5,54]. Furthermore, EVBRTS site selection is also influenced by technical criteria, and technical criteria should therefore also be considered when sitting battery recycling transfer stations. More importantly, given the complex, changing and uncertain external environment, resilience should also be considered when building a sustainable framework [14,60]. For example, when the market environment is very good, whether the capacity of the potential location can meet the market demand; and when the market environment is not good, whether the potential location can cope with the changes in the market. Location resilience refers to the ability of an organization to adapt and respond quickly when faced with uncertainty and risk. This concept highlights the importance of the flexibility and adaptability of the chosen site to make timely and appropriate adjustments to maintain production and supply stability in the face of unforeseeable events, market fluctuations or mismatches between supply and demand. Therefore, it is crucial to consider resilience criteria in EVBRTS site selection. Additionally, due to the absence of precise and integrated analytical framework models for determining the location of EVBRTS, this study utilizes insights from academic literature and expert to develop a comprehensive set of criteria. These criteria cover economic, social, environmental, technical and resilience aspects and aim to fill the gap in the decision-making framework for EVBRTS site selection.

However, the location of EVBRTS presents a complex and challenging scientific problem with many influencing factors. The primary challenge lies in identifying the optimal EVBRTS location amidst various evaluation criteria, including both qualitative and quantitative factors, in order to mitigate decision-making risks. Traditional location allocation optimization models can usually handle quantitative criteria in site selection, but are unable to capture qualitative criteria [16]. Consequently, the traditional mathematical model approach is not applicable to the problem of EVBRTS site herein. However, multi-criteria decision-making (MCDM), which has proven to be a reliable and powerful tool for site selection problems where qualitative and quantitative criteria exist [18,65], has potential advantages in solving evaluation problems with multiple evaluation criteria and complexity, which has led to its widespread use in many fields, such as disaster risk assessment [42], renewable energy rankings [34] and electric vehicle charging station location [15]. In reality, given the differences in the knowledge and experience of the experts, their assessment of qualitative criteria is often subjective and ambiguous, and thus linguistic terms can be used to assess qualitative criteria.

The growth of the battery recycling industry has highlighted the key role of the EVBRTS sites within the recycling network. Despite their growing importance, there is a noticeable lack of literature on EVBRTS sites. This paper seeks to fill this gap by examining the issue of EVBRTS location through the lenses of resilience and sustainability, thereby contributing valuable insights to the existing literature. Specifically, this

¹ <https://www.ev-volumes.com/>

paper aims to answer the following research questions: i) What are the resilient and sustainable evaluation criteria used for EVBRTS location? ii) What MCDM method is employed to derive the significance of the criteria? iii) Which MCDM approach is adopted to obtain the best alternative? iv) How do the parameters in the proposed method have an impact on the sorting results?

To address the aforementioned research questions, this paper outlines four key objectives: i) developing resilient and sustainable evaluation criteria for selecting EVBRTS sites based on academic literature and expert insights; ii) determining the criteria weights using the best-worst method (BWM); iii) establishing alternative rankings through cumulative prospect theory (CPT); and iv) validating the findings through sensitivity analysis. To achieve these research objectives, a hybrid MCDM approach that integrates BWM and CPT methods is proposed. The methodology consists of three main steps: identifying evaluation criteria for EVBRTS sites, constructing an integrated analytical framework model, applying BWM to calculate criteria weights, and determining alternative rankings using the CPT approach.

The contributions we have made are highlighted in the following threefold: i) To the best of our knowledge, the existing literature ignores the EVBRTS problem. After identifying the characteristics of the EVBRTS problem, this paper presents an integrated approach that combines BWM and CPT methods to address the challenges of EVBRTS location. The methodology integrates two effective decision analysis tools, which helps to capture the decision maker's risk preferences under uncertainty and improve the reliability of location decisions. ii) The second contribution of this study is the identification of an evaluation indicator system for determining the location of EVBRTS from the perspective of resilience and sustainability. Additionally, this study has developed a comprehensive analytical framework model for this indicator system, which can provide a valuable reference for the construction of similar systems. Importantly, this paper provides practical methods and experiences to guide future research on similar issues, as well as new ideas and directions for decision-making in the field of battery recycling site selection. iii) The ultimate contribution of this paper is to show, through a comparative study, that the order in which expert evaluation information is aggregated has a significant impact on the results. Furthermore, this study provides some key theoretical and managerial insights that offer valuable inspiration and reference for EVBRTS managers. These insights are important for advancing the science and standardization of electric vehicle battery recycling facilities.

The rest of this work will be structured in the following way: Section 2 provides an overview of the research that is relevant to this paper. Section 3 presents the BWM and CPT methodologies and constructs the EVBRTS sitting decision making analytical framework. Section 4 establishes the EVBRTS system of site selection evaluation criteria. In Section 5, a case study is used to demonstrate the application steps of the integrated methodology. Section 6 presents the sensitivity analysis, the comparative analysis, the advantages of the proposed BWM-CPT method and the managerial implications. Finally, Section 7 summarizes the conclusions, research limitations and future important research directions.

2. Literature review

This section provides a review of the extensive literature in three dimensions: the application of BWM, the application of CPT, and the location of electric vehicle battery recycling facilities.

2.1. Application of best worst method

Since Rezaei first proposed BWM in 2015 [57], the method has received increasing attention from academics and industry and has had a wide range of applications, for instance, company's R&D performance evaluation [61], site of the facility [33], supplier selection [23,58], and circular economy barriers assessment [21]. Ahmadi et al. [3] examined

the issue of social sustainability in the manufacturing supply chains and identified the importance of criteria through the BWM approach, which helps organizations to better manage the social sustainability aspects. Rezaei et al. [59] studied logistics performance index by using BWM, identified the importance of the criteria and provided a reference for policy development for relevant logistics practitioners. Aboutorab et al. [1] developed an approach that integrated Z-numbers and BWM to address the uncertainty in the assessment information. Liang et al. [38] presented a new consistency measure to compensate for the shortcomings of the original and extended BWM, which further strengthens the theoretical foundation of BWM. Wankhede and Vinodh [77] examined the key challenges of applying Industry 4.0 technologies and applied BWM to obtain the importance sorting of the key challenges. Liu et al. [40] extended the BWM into D numbers and proposed the D-BWM to deal with situations where assessment information is incomplete. Xiao et al. [81] extended BWM in the q-rung orthopair fuzzy environment for determining criteria weights in manufacturer selection. Dehshiri et al. [11] used an improved BWM approach to evaluate the criteria for the application of blockchain technology, which bridges the gaps in the fuzzy BWM approach. Aghaloo et al. [2] used fuzzy BWM and geographic information system to construct an assessment methodology for hybrid renewable energy sites. Huang et al. [29] adopted the fuzzy BWM to compute the subjective weights of the criteria.

Recently, publications have extended BWM to various fuzzy environments, such as probabilistic linguistic [47], interval rough numbers [13], interval-valued trapezoidal fuzzy numbers [73], interval-valued number [52], interval type-2 fuzzy environment [68], intervals and interval type-2 fuzzy sets [43], and rough probabilistic linguistic [86], etc. These studies have undoubtedly contributed significantly to the theoretical and applied development of BWM.

2.2. Application of cumulative prospect theory

Since Tversky and Kahneman first proposed the CPT [72], it has been the subject of a great deal of attention. As CPT is a powerful MCDM tool, it has a wide range of applications. For instance, portfolio choice [24], emergency response [41], charging station planning [37], risk analysis [74], and departure time choice [19], etc., Baucells and Heukamp [8] have made an important contribution to the theoretical development of CPT by extending the second-order stochastic dominance condition to it. Yang and Jiang [83] developed a stochastic consumer equilibrium method based on CPT for the route choice model, and numerical results show that the proposed method can better characterize risk preferences. Because of CPT's strength as a reflection of decision-makers' risk appetite, Wu et al. [80] have applied the CPT methodology to renewable energy assessments, providing excellent insights for investors with different risk appetites. Wang et al. [76] suggested a combined approach of deploying quality function deployment and CPT to facilitate product concept selection. Wu et al. [79] applied triangular fuzzy numbers (TFNs) to describe the ambiguity of the assessment information and introduced CPT to evaluate suppliers, showing that decision-makers' psychological behaviour had a significant effect on the sorting results. Zhao et al. [85] introduced CPT to multi-attributive border approximation area comparison (MABAC) in an intuitionistic fuzzy linguistic environment, developed a novel method and validated the reliability of the proposed method with a practical application. Besides, Zhang et al. [84] proposed a method of grey relational analysis based on CPT in a spherical fuzzy set environment, which was demonstrated through a case study of supplier selection for emergency materials. To reduce decision risk, Wang et al. [75] presented an MCDM approach that integrates CPT and ranking relationships and validate the powerful advantages of the method in portfolio selection with real data. Chai et al. [9] extended CPT to deal with the uncertainty and ambiguity of evaluation information in fuzzy sets, and validated the proposed method's effectiveness in a supplier selection case.

The existing literature indicates significant advances in theoretical

and applied research on CPT, highlighting its effectiveness in elucidating individuals' decision-making processes and risk attitudes. Building on this foundation, our study aims to use CPT in the context of site selection for a waste battery recycling transfer station to gain deeper insights into decision makers' risk preferences and uncertainties. Despite the widespread use of CPT in various domains, there is a noticeable lack of studies investigating its utility in the specific domain of EVBRTS. By filling this research gap, our work not only extends the scope of application of the CPT, but also enriches its practical relevance in real-life decision making scenarios.

2.3. Location of facilities in electric vehicle battery recycling

Facility location is a strategic decision for management, influenced by numerous factors such as market demand, transportation infrastructure, labor availability, operational costs, and government regulations [6,10,32,69]. As a critical component of strategic decision-making, facility location must consider the long-term implications and potential risks [7,22]. Selecting the right facility location can result in improved market development, enhanced service capabilities, reduced operating costs, increased efficiency and increased market competitiveness for the company. Recently, literature has been published on the facilities location for electric vehicle batteries recycling. Wei et al. [78] built a multi-objective mathematical model for waste battery recycling center location and proposed a heuristic algorithm with objective ranking method and greedy take-off to solve the optimization model. Hu et al. [27] built a mathematical programming model for electric vehicle battery recycling, which was able to solve the problems of battery recycling center location and vehicle transportation routes, and verified the reliability of the model through case studies. Sherif et al. [63] presented an integrated MCDM methodology to battery recycling station location and constructed 18 sustainability evaluation criteria. Pamucar et al. [50] developed a decision-making analytical framework model for waste battery recycling centers and applied a realistic case study to demonstrate the reliability of the proposed method. Tan et al. [66] developed an integer planning model to determine the optimal location and transport routes for battery recycling plants, taking into account cost minimization and customer satisfaction maximization objectives. Hezam et al. [26] constructed an evaluation system for battery recycling plants on the basis of environmental, economic, social and technical criteria and used the MCDM methodology to obtain the best sorting results. Puviarasu et al. [51] proposed an integrated fuzzy decision making trial and evaluation laboratory (DEMATEL), BWM and technique for order preference by similarity to an ideal solution (TOPSIS) method for the location of battery recycling plants.

Based on the findings of the literature review, the predominant focus in the realm of battery recycling facility location research has been on recycling centers, employing methods such as mathematical optimization models and MCDM approaches. However, as the volume of battery recycling continues to escalate rapidly, recycling plants facing capacity constraints must seek suitable battery recycling transfer stations to alleviate potential operational pressures. Consequently, in contrast to the prevailing literature, this study addresses the critical issue of battery recycling transfer stations site selection. Despite the inherent complexity of determining optimal transfer station locations, scant scholarly attention has been devoted to this specific aspect of the battery recycling process. To fill this research gap and improve the understanding of electric vehicle battery recycling logistics, this study develops a comprehensive MCDM framework integrating BWM and CPT to provide valuable insights for industry practitioners and decision makers.

3. The proposed method for EVBRTS site selection

The aim of this section is to introduce the BWM and CPT methods and to propose an integrated analytical framework model for EVBRTS site selection.

3.1. The best worst method

The BWM method is commonly used to calculate criteria weights, as it enables consistent outcomes to be achieved with minimal comparative information. This section outlines the BWM method for assessing information, following the procedure below.

Step 1. Identification of the criteria to be used in the decision-making process. Assume that the decision maker determines the criteria to be $C = (c_1, c_2, \dots, c_n)$.

Step 2. Identification of the best criterion C_B and the worst criterion C_W . It should be noted that the best criteria are those considered by experts to be the most important, while the worst criteria are the least important. If the expert considers that there are several best or worst criteria, then the choice can be arbitrary [46].

Step 3. The best-to-others (BO) vector is determined by comparing the best criterion C_B with the others, and is given in the following form:

$$BO = (a_{B1}, a_{B2}, \dots, a_{Bi}, \dots, a_{Bn}), \quad (1)$$

where a_{Bj} denotes preferring the best criterion to the other, and $a_{Bi} \geq 1$, $i = 1, 2, \dots, n, i \neq B$.

Step 4. Compare the worst criterion C_W with the others to determine the Worst-to-Others (WO) vector, which is given as follows.

$$WO = (a_{1W}, a_{2W}, \dots, a_{iW}, \dots, a_{nW}), \quad (2)$$

where a_{jW} denotes preferring the worst criterion to the other, and $a_{iW} \geq 1, i = 1, 2, \dots, n, i \neq W$. Note that in steps 3 and 4, a number from 1 to 9 is used to indicate the comparative value of the criteria given by the expert.

Step 5. A mathematical model is developed to determine criteria weights. To obtain criteria weights, we need to ensure that the maximum absolute differences $\left| \frac{w_B}{w_i} - a_{Bi} \right|$ and $\left| \frac{w_i}{w_W} - a_{iW} \right|$ are minimized, and the following mathematical model is developed.

$$P1 : \min \max_i \left\{ \left| \frac{w_B}{w_i} - a_{Bi} \right|, \left| \frac{w_i}{w_W} - a_{iW} \right| \right\} \quad (3)$$

$$\text{s.t. } \sum_{i=1}^n w_i = 1 \quad (4)$$

$$w_i \geq 0, i = 1, 2, \dots, n \quad (5)$$

Indeed, P1 is a non-linear model and to facilitate model solving, ξ is introduced to represent the maximum absolute difference, then we can transform the model P1 into a linear model like this:

$$P2 : \min \xi$$

$$\text{s.t. } \sum_{i=1}^n w_i = 1$$

$$w_i \geq 0, i = 1, 2, \dots, n$$

$$\begin{aligned} \left| \frac{w_B}{w_i} - a_{Bi} \right| &\leq \xi \\ \left| \frac{w_i}{w_W} - a_{iW} \right| &\leq \xi \end{aligned} \quad (6)$$

The criteria weights $w = (w_1, w_2, \dots, w_n)$ can be obtained by solving model P2.

3.2. Cumulative prospect theory

CPT is a psychological theory that sheds light on real-world decision-making and behaviors, describes how individuals make choices in uncertain situations. CPT emphasizes that human decision-making is

impacted by subjective probabilities and how they perceive potential gains and losses. In this paper, we use the CPT method, which captures the risk attitudes of decision makers, for the determination of the optimal EVBRTS location. The steps below are an outline of the process:

Step 1. Assume that there are K ($k = 1, 2, \dots, K$) experts, where the weight of expert k is w^k , and collect the criterion evaluation information of expert k on alternative, expressed by TFNs $(\underline{t}_{ij}^k, t_{ij}^k, \bar{t}_{ij}^k)$. And the evaluation information for expert k is represented by the following matrix $\tilde{T}^k$.

$$\tilde{T}^k = \begin{bmatrix} (\underline{t}_{11}^k, t_{11}^k, \bar{t}_{11}^k), (\underline{t}_{12}^k, t_{12}^k, \bar{t}_{12}^k), \dots, (\underline{t}_{1m}^k, t_{1m}^k, \bar{t}_{1m}^k) \\ (\underline{t}_{21}^k, t_{21}^k, \bar{t}_{21}^k), (\underline{t}_{22}^k, t_{22}^k, \bar{t}_{22}^k), \dots, (\underline{t}_{2m}^k, t_{2m}^k, \bar{t}_{2m}^k) \\ \vdots, \vdots, \vdots, \vdots \\ (\underline{t}_{n1}^k, t_{n1}^k, \bar{t}_{n1}^k), (\underline{t}_{n2}^k, t_{n2}^k, \bar{t}_{n2}^k), \dots, (\underline{t}_{nm}^k, t_{nm}^k, \bar{t}_{nm}^k) \end{bmatrix}, \quad (7)$$

where i ($i = 1, 2, \dots, n$) denotes the criterion and j ($j = 1, 2, \dots, m$) denotes the alternative. In this paper, as both quantitative and qualitative criteria are involved, we can use crisp value to express the quantitative criteria, which is then converted into the TFNs; while we can apply the linguistic terms to express qualitative criteria, in relation to the corresponding TFNs as shown in Fig. 1. Besides, the interval value (a, b) can be transformed into a TFN $(a, \frac{a+b}{2}, b)$ if the expert's evaluation information is an interval value. If the evaluation information is a crisp value c , then it can be translated into a TFN (c, c, c) .

Step 2. The evaluation information matrix $\tilde{T}^k$ for expert k is normalized. Let $[\tilde{r}_{ij}^k]_{n \times m}$ denote the normalized matrix of $\tilde{T}^k$. Then it can be normalized by the following Eq. (8). In addition, the fuzzy evaluation matrix $[\tilde{r}_{ij}^k]_{n \times m}$ of expert k is defuzzified by Eq. (9). Thus, the matrix of crisp values for expert k is obtained as $T^k = [z_{ij}^k]_{n \times m}$.

$$(\underline{r}_{ij}^k, r_{ij}^k, \bar{r}_{ij}^k) = \begin{cases} \left(\frac{\underline{t}_{ij}^k}{\max_j \underline{t}_{ij}^k}, \frac{t_{ij}^k}{\max_j t_{ij}^k}, \frac{\bar{t}_{ij}^k}{\max_j \bar{t}_{ij}^k} \right), & \text{for benefit criterion} \\ \left(\frac{\min_j \underline{t}_{ij}^k}{\underline{t}_{ij}^k}, \frac{\min_j t_{ij}^k}{t_{ij}^k}, \frac{\min_j \bar{t}_{ij}^k}{\bar{t}_{ij}^k} \right), & \text{for cost criterion} \end{cases} \quad (8)$$

$$z_{ij}^k = \frac{\underline{r}_{ij}^k + 2r_{ij}^k + \bar{r}_{ij}^k}{4} \quad (9)$$

Step 3. Determine reference point. The choice of reference point is crucial for the CPT method. In this paper, we use the average value as the reference point in the CPT method. Thus, we apply the Eq. (10) to calculate the average values, denote RP_i^k .

$$RP_i^k = \frac{\sum_{j=1}^m z_{ij}^k}{m} \quad (10)$$

where m indicates the number of alternatives.

Step 4. Determine gain and loss value. Let x_{ij}^k represent the expert k 's gain or loss value for alternative j . If the difference between the values of the reference point and the evaluation data exceeds zero, this difference represents the gain. Conversely, if the difference obtained by subtracting the value of the reference point from the value of the assessment information is a negative number, then this difference is the loss value. The expressions are as follows.

$$x_{ij}^k = z_{ij}^k - RP_i^k. \quad (11)$$

Step 5. Determine the prospective value $v(x_{ij}^k)$. Let $v^+(x_{ij}^k)$ and $v^-(x_{ij}^k)$ represent decision weights with regard to gain and loss, respectively. Then $v(x_{ij}^k)$ can be obtained by

$$v(x_{ij}^k) = \begin{cases} v^+(x_{ij}^k) = (x_{ij}^k)^\alpha, & \text{if } x_{ij}^k \geq 0 \\ v^-(x_{ij}^k) = -\theta(-x_{ij}^k)^\beta, & \text{if } x_{ij}^k < 0 \end{cases}, \quad (12)$$

where α and β represent the exponential parameters of gain and loss respectively, and $0 \leq \alpha, \beta \leq 1$, while θ denotes the risk aversion parameter of the decision maker, $\theta > 1$.

Step 6. Determine decision weights $\pi(x_{ij}^k)$. Let $\pi^+(x_{ij}^k)$ and $\pi^-(x_{ij}^k)$ represent decision weights with regard to gain and loss, respectively. The decision weights are then determined by the following equation.

$$\pi(x_{ij}^k) = \begin{cases} \pi^+(x_{ij}^k) = \frac{w_i^\eta}{[w_i^\eta + (1 - w_i)^\eta]^{1/\eta}}, & \text{if } x_{ij}^k \geq 0 \\ \pi^-(x_{ij}^k) = \frac{w_i^\delta}{[w_i^\delta + (1 - w_i)^\delta]^{1/\delta}}, & \text{if } x_{ij}^k < 0 \end{cases} \quad (13)$$

where w_i indicates the criterion i 's weight derived by the BWM, η and δ indicate the decision maker's risk preferences for gain and loss, $0 < \eta, \delta < 1$.

Step 7. Determine the expert k 's cumulative prospect value V_j^k of alternative j by Eq. (14). It is worth noting that, to facilitate the calculation, the gain and loss values for each alternative need to be ranked in descending order. Those with subscripts 1 to t are the gain values, while those with subscripts $t+1$ to n are the loss values. Finally, use the Eq. (15) to calculate the weighted cumulative prospect value V_j .

$$V_j^k = \sum_{i=1}^t \pi^+(x_{ij}^k) v^+(x_{ij}^k) + \sum_{i=t+1}^n \pi^-(x_{ij}^k) v^-(x_{ij}^k) \quad (14)$$

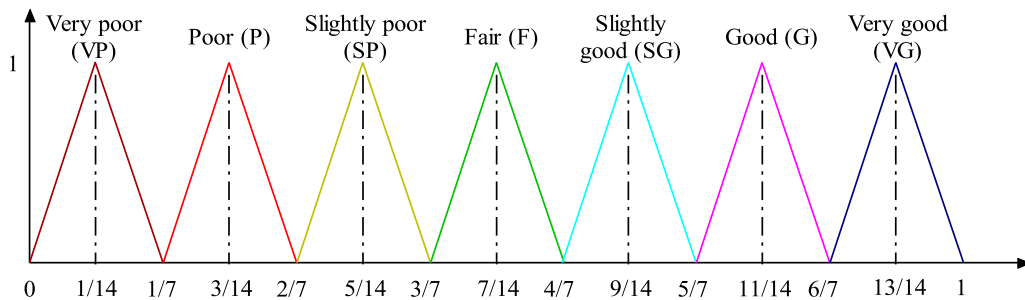


Fig. 1. Linguistic terms corresponding to the TFNs.

$$V_j = \sum_{k=1}^K V_j^k w^k \quad (15)$$

where w^k denote the weight of expert k , and $\sum_{k=1}^K w^k = 1$.

3.3. Decision framework of the EVBRTS site selection

As EVBRTS location has a key role to play in battery recycling in a circular economy, however, the lack of an integrated framework literature on EVBRTS location limits the development of corporate battery recycling operations at scale. This study thus applies BWM and CPT approaches to develop a decision framework for EVBRTS site selection, as shown in Fig. 2. The first step is to identify a list of experts in the various fields and establish an EVBRTS site selection decision group; then a system of evaluation indicators is defined based on academic literature and expert opinion; finally, experts provide information on the evaluation of options and criteria. In the second stage, the BWM can be used to derive criteria weights. In the final stage, the CPT method is used to determine the prospect values of the alternatives and then the best alternative is selected. It should be noted that in the CPT method, the quantitative data collected needs to be transformed, as shown in step 1 of the CPT method description. The adoption of a site decision framework that integrates BWM-CPT methodologies can improve the scientific and accuracy of decision making. On the one hand, quantitative assessment and comprehensive consideration of multiple factors can avoid subjective bias and arbitrary decision-making, ensuring more objective and rational site selection decisions. On the other hand, by developing a decision framework based on the BWM and CPT methods, the efficiency and accuracy of site selection can be improved, providing

scientific guidance to companies and promoting the large-scale development of the battery recycling business. Most importantly, the integrated BWM and CPT methods framework proposed herein can be applied to other similar site problems.

This paper constructs a hybrid MCDM theoretical framework for EVBRTS site selection. The main reasons for using a hybrid MCDM instead of a single MCDM method are as follows. First, hybrid MCDM methods can overcome the limitations of a single MCDM method, consider the decision problem in a more comprehensive and multi-perspective way. Each MCDM method may have its own advantages and limitations, and using a mixture of them can compensate for the shortcomings of a single method to improve the comprehensiveness and accuracy of the decision-making. Second, hybrid MCDM methods can improve the robustness of the decision. Using multiple MCDM methods can increase the robustness of decision making and reduce the dependence on a single method. When different methods produce similar results, it can increase confidence in decision making; when the results are inconsistent, it can help decision makers to consider different factors more fully to make more informed decisions. Third, hybrid MCDM methods can increase credibility of decision making. The credibility and persuasiveness of decisions can be improved by using a mixture of MCDM methods. Different methods may perform better in different ways, and using them in combination can reduce subjectivity and bias, making decisions more objective and credible.

The BWM and CPT methods proposed in this paper are particularly suitable for the site selection of battery recycling transfer stations. In the decision making of battery recycling transfer station location, decision makers need to consider many factors such as accessibility, environmental impact, cost and other attributes, as well as a weighting method that is intuitive and has a visualization process. For this reason, this

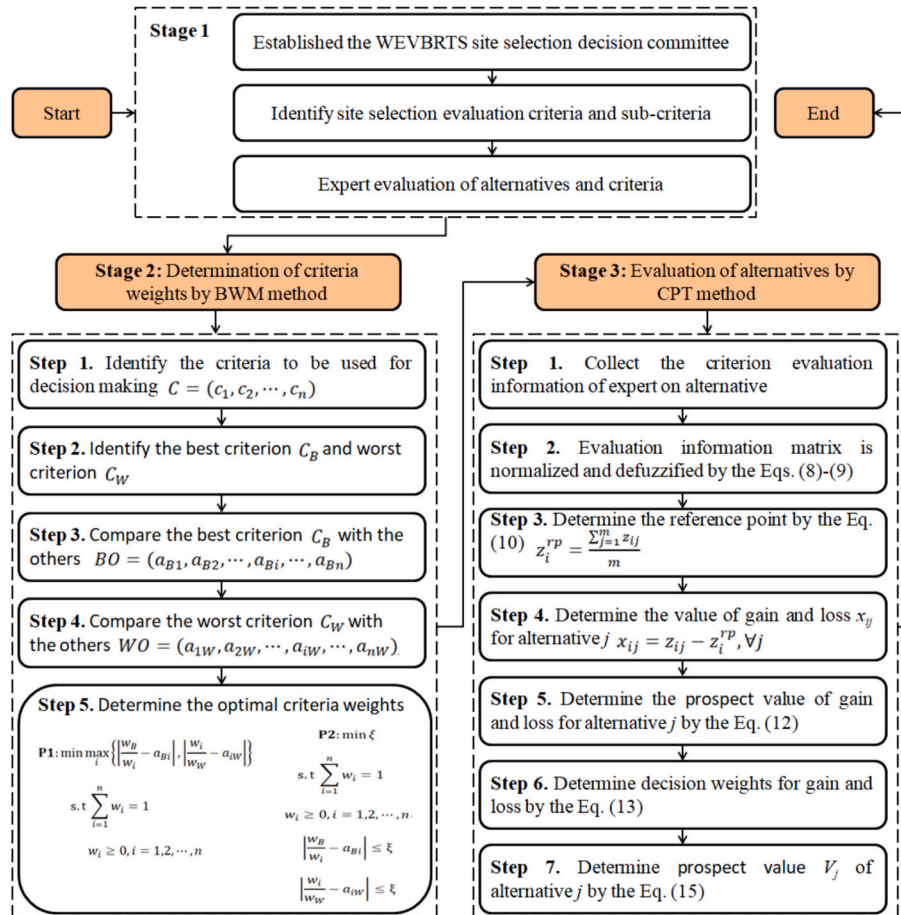


Fig. 2. Decision framework for EVBRTS site selection.

paper finally adopts the BWM method by comparing it with other weighting methods, because the BWM method can help determine the best and worst performance of each alternative in terms of each attribute, and help decision makers understand the advantages and disadvantages of each alternative more clearly, which helps to make a reasonable choice. Moreover, the BWM method can provide decision makers with an intuitive basis for decision making on the location of battery recycling transfer stations, which contributes to the transparency and visualization of the decision-making process. In the process of ranking the alternatives, the battery recycling transfer station location decision maker needs to consider the uncertainty factors and the potential gains and losses of the preference choices, however, among the many ranking methods, the CPT is very suitable because the CPT method combines the probability distributions and the decision maker's preferences to consider the impacts of these uncertainties on the location decision, helping the decision maker to make a more robust decision. On the whole, the BWM and CPT methods are very suitable for resilient and sustainable used EV battery recycling transfer station site selection, which provides scientific and effective decision support for decision makers, and helps to formulate the optimal site selection plan in line with the sustainable development goals and actual situation.

4. Evaluation indicator system

The importance of the evaluation indicator system for site selection cannot be overstated, as the evaluation criteria form the foundation for EVBRTS site selection. It is therefore undeniable that the establishment of a comprehensive and scientifically sound evaluation criteria system for EVBRTS site selection is important. Despite the abundance of evaluation criteria for facility location in the existing literature, there is a noticeable gap in the discussion of the evaluation index system specific to EVBRTS in the context of the circular economy. This gap may be due to the specific characteristics of EVBRTS sites, which are the subject of particular attention and research.

This paper summarizes the following typical characteristics of

EVBRTS site selection: i) Electric vehicle batteries are hazardous, and when sitting a recycling transfer station, it is essential to consider the potential contamination of soil, water, and air; ii) The location of EVBRTS should consider accessibility to transportation routes, utilities, and waste treatment facilities; iii) EVBRTS may face opposition from the local community due to concerns about environmental pollution, safety risks, and potential negative impacts on property values; and iv) Setting up an EVBRTS involves significant costs for land acquisition, construction, equipment and ongoing operation and maintenance, and it is therefore crucial that these costs are carefully weighed against the benefits of recycling electric vehicle batteries when making decisions. Thus, considering the fundamental characteristics of EVBRTS outlined above, this paper establishes site selection criteria for EVBRTS that integrate resilience and sustainability objectives.

This paper constructs an analytical framework for the EVBRTS evaluation index system to further realize the scientificity and validity of the criteria selection, as shown in Fig. 3. Firstly, Company H invited five experts from the engineering department, environmental protection department, operation department, university and finance department to form the EVBRTS site selection decision committee, all of whom have rich working experience and educational background, with basic information as shown in Table 1. Next each expert individually reviewed the relevant literature to screen out potential evaluation criteria and summarize the evaluation criteria provided by the experts. All experts discussed the screened criteria centrally, retaining the relatively important ones. The rationality of the indicator system was evaluated and adjusted through a questionnaire survey, and the EVBRTS evaluation index system was finally established.

Through a rigorous selection of EVBRTS criteria by experts, the structure of evaluation index systems constructed herein is shown in Fig. 4 and contains economic, social, environmental, technical and resilience criteria. A detailed description of the EVBRTS site selection evaluation criteria is shown in Table 2.

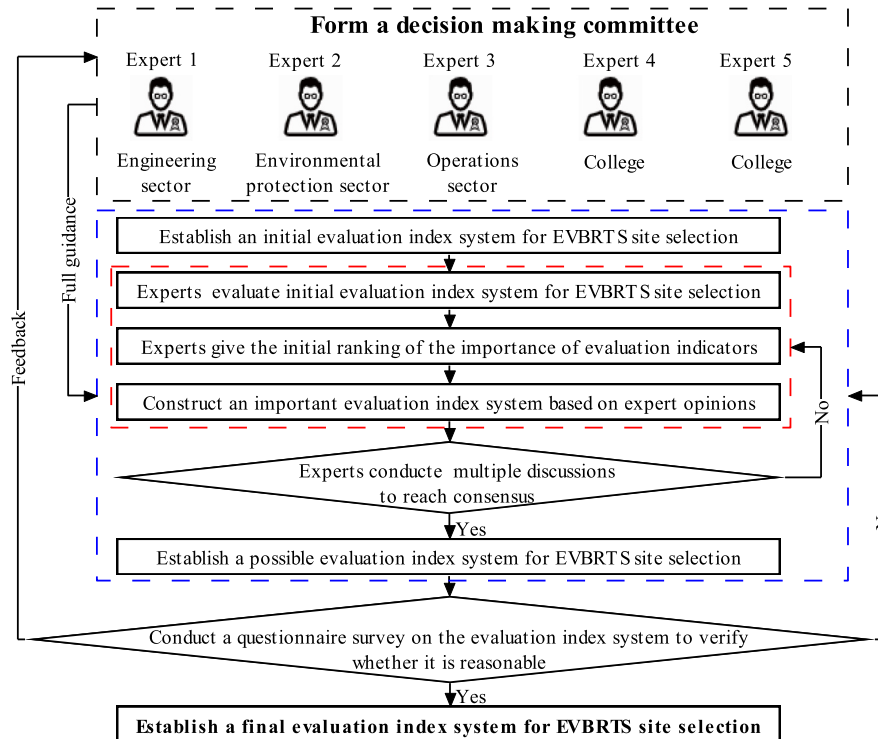


Fig. 3. Analysis framework of the designed evaluation index system.

Table 1
General information about the experts.

Experts	Occupation	Education	Experience (years)	Position	Weight
E1	Industry	Undergraduate	25	Engineering manager	0.15
E2	Industry	Master	28	Environmental manager	0.2
E3	Industry	Master	35	Operation manager	0.2
E4	Academia	PhD	22	Professor	0.2
E5	Academia	PhD	29	Professor	0.25

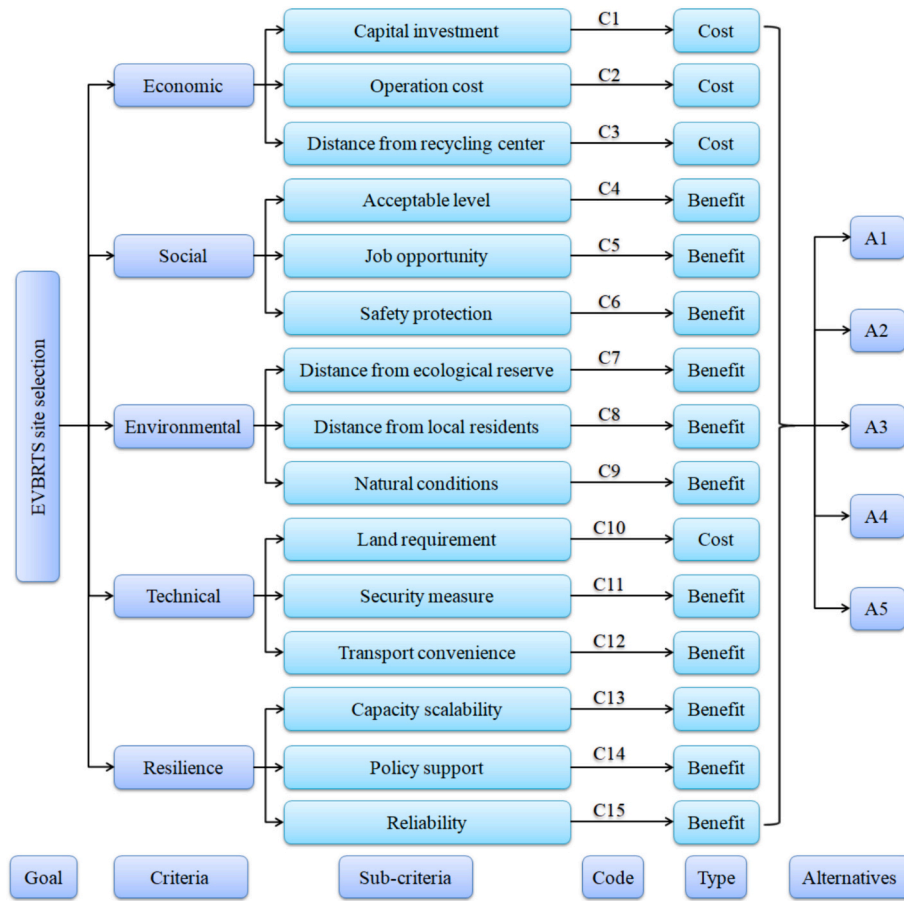


Fig. 4. A three-level decision hierarchy for EVBRTS site selection.

5. Application of the proposed method

This section illustrates the effectiveness of the proposed BWM-CPT method in capturing expert ambiguity and risk attitudes through a case study, and the ease of use of the methodology proposed here through a concrete demonstration of the application process. Potential EVBRTS alternatives were identified through field research with companies, and all alternatives are described in detail in the feasibility report.

5.1. Case description

Driven by the principles of the circular economy and supportive policies, the adoption of new energy vehicles has surged in recent years. However, as the capacity of electric vehicle batteries decreases to the point where they are no longer suitable for use in electric vehicles, a significant volume of used batteries will need to be recycled. The recycling of electric vehicle batteries is of the utmost importance. On one hand, electric vehicle batteries contain hazardous substances and precious metals. Improper disposal or indiscriminate discarding of these

batteries can lead to severe environmental pollution, posing risks of harmful substances infiltrating water sources and the atmosphere. On the other hand, these batteries are rich in valuable materials like lithium, nickel, and cobalt, crucial elements in the production of new batteries. Battery recycling reduces dependence on finite resources and facilitates resource recycling by reusing these scarce resources.

Given the many benefits of electric vehicle battery recycling, there are already many companies in the battery recycling business. A renewable resource company, which is referred to by the pseudonym Company H, plans to locate a suitable EVBRTS site to relieve the pressure of increasing battery recycling volumes. Company H specializes in recycling and technology development of waste lithium-ion batteries, waste electric vehicle batteries, nickel batteries, disposable dry batteries, etc.; battery recycling types include nickel-cadmium, nickel-hydrogen batteries, lithium-ion digital batteries, mobile phone batteries, electric bicycle batteries, new energy electric vehicle batteries, etc. With the increasing scale of business, the recycling centre faces many constraints, such as inventory and sorting operations. Company H therefore decides to build a battery recycling transfer station to acquire part of the business of the recycling plant. The transfer station will be

Table 2
Description of EVBRTS site selection criteria.

Criteria	Sub-criteria	Detailed descriptions	Literatures
Economic	Capital investment	This mainly includes land costs, construction costs, equipment costs, and project capital costs.	Pamucar et al. [50], and Li et al. [36]
	Operation cost	It involves wages, asset depreciation, operation and maintenance costs, etc.	Lee et al. [35], Sherif et al. [63], and Deveci et al. [12]
	Distance from recycling center	The proximity to recycling center saves transport costs as the role of transfer station is to store and sort waste battery without dismantling functions.	Authors contribution
Social	Acceptable level	It focuses on the acceptability of the EVBRTS location to surrounding residents.	Sherif et al. [63], and Mastrocinque et al. [45]
	Job opportunity	It indicates the number of jobs that potential alternative locations could bring to the public.	Lee et al. [35], and Kannan et al. [31]
	Safety protection	As used batteries are hazardous, specialized equipment should be provided to protect employees.	Govindan et al. [20], and Sherif et al. [63]
Environmental	Distance from ecological reserve	Potential locations should be away from farmland, water sources, ecological reserves, etc.	Sherif et al. [63], and He et al. [25]
	Distance from local residents	Potential locations should be as far away from residential areas as possible for safety.	Rahimi et al. [53], and Sherif et al. [63]
	Natural conditions	Transfer station locations should be strategically located in well natural conditions to avoid risks of flooding, cyclones, drought, etc.	Rao et al. [56], and Sherif et al. [63]
Technical	Land requirement	Area of land occupation at potential locations.	Pamucar et al. [50], and Li et al. [36]
	Security measure	Safety measures include fire compliance, response plans to deal with emergencies, etc.	Authors contribution
	Transport convenience	It includes the improvement of the surrounding infrastructure, the convenience of transport, etc.	Feng et al. [16]
Resilience	Capacity scalability	Potential locations should have the ability to readily respond to rising capacity to achieve economies of scale.	Feng et al. [16]
	Policy support	Local government's attitude towards environmental enterprises, financial subsidies, etc.	Pamucar et al. [50]
	Reliability	Reliability of potential location infrastructure and relationships with sellers of used batteries.	Authors contribution

used to store the waste batteries collected, sort them, test their remaining capacity, etc. It will not involve the dismantling of the batteries or their subsequent disposal. To select a suitable location for the EVBRTS, Company H has conducted prior field research on potential five alternatives, which denotes $A_j (j = 1, 2, \dots, 5)$. The key challenge for Company H is thus to select the appropriate method to evaluate the potential alternatives to obtain the optimal site.

5.2. Determining the criteria weights by the BWM

After obtaining the EVBRTS site evaluation index system (shown in Table 3), the five experts gave the best criterion C_B and worst criterion C_W , as shown in Table 4. Then the experts gave the evaluation information BO and WO respectively, which are given in Table A1 and A2 in Appendix.

The obtained values which are given in Table A1 and A2 in Appendix are brought into the model P2 to obtain criteria weight, as shown in Table 5.

Due to the differences in the experience and professional background of the experts, it is necessary to give different weights to the experts, the weights of the experts $w^k (k = 1, 2, \dots, 5)$ given herein are shown in Table 1, and the final criteria weights are determined by the following expression.

$$w_i = \sum_{k=1}^5 w^k w_i^k \quad (16)$$

where w^k indicates the criterion weight derived from expert k . The weighted criteria weights obtained are given in Table 5. In purpose of easy to see the magnitude relationship between the criterion weights, a histogram of the criterion weights was drawn as shown in Fig. 5. As illustrated in Fig. 5, the resilience criteria have the largest weighting of 0.3063, while the social criteria have the smallest weighting of 0.1308, indicating that the decision-making team preferred to achieve resilient sustainable development of the site.

5.3. Determining the optimal sorting by the CPT

Each of the five experts gave an evaluation of the alternatives, as shown in Tables A3-A7 in Appendix. The evaluation information is then transformed into TFNs as described in step 1 of the CPT method. Then the data is normalized by Eq. (8), defuzzified by Eq. (9). Then the average value can be calculated by Eq. (10) and this average value will be used as the reference point. Eq. (11) is next applied to calculate the values of gains and losses for each alternative. Then the prospective values of gains and losses are calculated separately by expression (12), and decision weights for gain and loss are determined by expression (13). It is worth noting that in expression (12) and (13), the parameter

Table 3
EVBRTS site evaluation index system.

Criteria	Sub-criteria	Notation
Economic	Capital investment	C1
	Operation cost	C2
	Distance from recycling center	C3
Social	Acceptable level	C4
	Job opportunity	C5
	Safety protection	C6
Environmental	Distance from ecological reserve	C7
	Distance from local residents	C8
	Natural conditions	C9
Technical	Land requirement	C10
	Security measure	C11
	Transport convenience	C12
Resilience	Capacity scalability	C13
	Policy support	C14
	Reliability	C15

Table 4
Best and worst criterion determined by expert.

Experts	Best criterion	Worst criterion
E1	Capacity scalability	Land requirement
E2	Natural conditions	Job opportunity
E3	Capital investment	Job opportunity
E4	Policy support	Security measure
E5	Capacity scalability	Acceptable level

Table 5
Calculation of the weighting of criteria for each expert assessment.

Criteria	E1	E2	E3	E4	E5	Final weights
C1	0.0943	0.0802	0.2156	0.0991	0.0707	0.1108
C2	0.0943	0.0802	0.0437	0.0594	0.0942	0.0744
C3	0.0708	0.0603	0.0328	0.0743	0.0565	0.0582
C4	0.0404	0.0481	0.0875	0.0425	0.0202	0.0467
C5	0.0472	0.0190	0.0187	0.0495	0.0354	0.0334
C6	0.0708	0.0481	0.0656	0.0425	0.0354	0.0507
C7	0.0404	0.0401	0.0875	0.0372	0.0404	0.0491
C8	0.0404	0.0401	0.0525	0.0372	0.0565	0.0461
C9	0.0404	0.1868	0.0437	0.0594	0.0471	0.0758
C10	0.0203	0.0802	0.0656	0.0425	0.0404	0.0508
C11	0.0404	0.0481	0.0375	0.0212	0.0354	0.0363
C12	0.0404	0.0481	0.0656	0.0743	0.0707	0.0613
C13	0.2325	0.0401	0.0437	0.0743	0.2322	0.1245
C14	0.0708	0.1203	0.0525	0.2441	0.0942	0.1176
C15	0.0566	0.0603	0.0875	0.0425	0.0707	0.0642

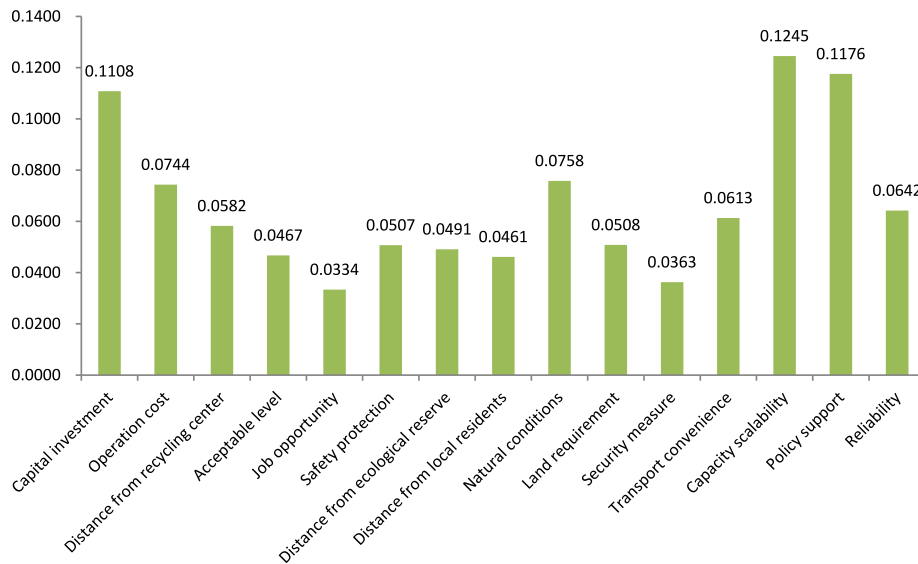


Fig. 5. Criteria weights.

Table 6
The ranking of the alternatives.

Experts	Results	A1	A2	A3	A4	A5
E1	Numerical results	−0.0163	−0.1655	−0.2270	−0.0070	−0.7202
	Sorting results	A4 > A1 > A2 > A3 > A5				
E2	Numerical results	−0.0611	−0.2694	0.1354	−0.3248	−0.6296
	Sorting results	A3 > A1 > A2 > A4 > A5				
E3	Numerical results	−0.2021	−0.3719	−0.0156	−0.1125	−0.4656
	Sorting results	A3 > A4 > A1 > A2 > A5				
E4	Numerical results	−0.1933	−0.2943	−0.5090	0.1268	−0.2680
	Sorting results	A4 > A1 > A5 > A2 > A3				
E5	Numerical results	−0.0400	−0.3798	−0.0874	0.0758	−0.5569
	Sorting results	A4 > A1 > A3 > A2 > A5				
Weighted	Numerical results	−0.1038	−0.3069	−0.1338	−0.0442	−0.5198
	Sorting results	A4 > A1 > A3 > A2 > A5				

$\alpha = \beta = 0.88$, $\theta = 2.25$, $\eta = 0.61$, and $\delta = 0.69$ [80]. Next the prospect values for each alternative were computed by Eq. (14), and finally the weighted cumulative prospect value V_j can be calculated by Eq. (15). The final ranking of the alternatives is presented in Table 6. Therefore, the best location should be alternative A4.

Fig. 6 depicts the performance of each alternative across economic, social, environmental, technical, and resilience criteria. Evidently, each alternative shows different performance levels across these criteria. For example, Alternative A1 excels in the environmental criterion but falls short in the resilience criterion. In contrast, Alternative A3 shows outstanding performance in the economic criterion but lacks in the environmental criterion. Alternative A5 demonstrates the weakest performance in both the economic and environmental criteria, whereas Alternative A4 displays a more balanced performance across economic, social, environmental, technical, and resilience criteria.

6. Analyses and discussions

In this section, the sensitivity and comparative analysis will be used to demonstrate the applicability and stability of the proposed methodology. Besides, the theoretical and management implications are also discussed.

6.1. Sensitivity analysis

To further analyze the affect of parameter changing on the ranking results, this paper performs a sensitivity analysis on the risk attitude

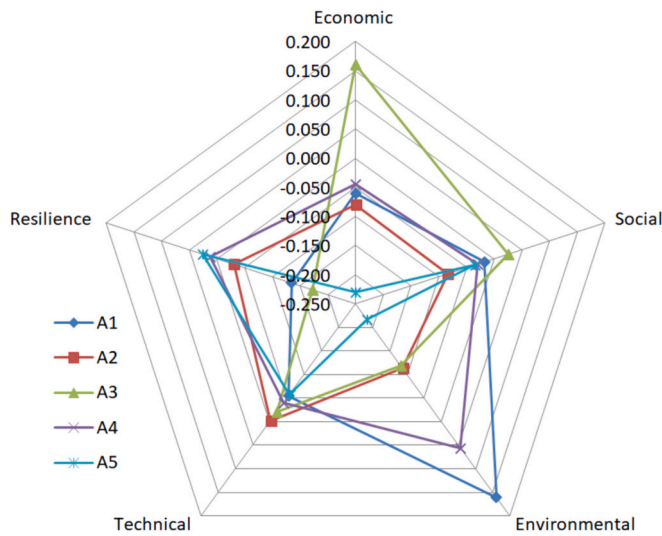


Fig. 6. Performance of each alternative in terms of economic, social, environmental, technical and resilience criteria.

parameters α , β , θ , η and δ , the expert weights, and criteria weights, respectively.

6.1.1. Effect of changes in risk attitude parameter α , β , θ , η and δ on results

In the CPT approach, both the prospect function and the decision weight function contain risk attitude parameters of the decision maker, so it is necessary to discuss these parameters. This section discusses the sensitivity analysis of risk parameters for the following five scenarios. It is worth noting that the analyses in this section are based on the aggregation of expert assessment information following Eq. (9).

Scenario 1: Parameter α is changed from 0.1 to 1 at intervals of 0.1.

Scenario 2: Parameter β is changed from 0.1 to 1 at intervals of 0.1.

Scenario 3: Parameter θ is changed from 1 to 10 at intervals of 1.

Scenario 4: Parameter η is changed from 0.1 to 0.9 at intervals of 0.1.

Scenario 5: Parameter δ is changed from 0.1 to 0.9 at intervals of 0.1.

Fig. 7 shows the results of the calculations for each of the five scenarios above. Apparently, these parameter variations have a significant impact on the sorting results. For example, the results of the alternatives decrease as the parameter α increases, and when the value of parameter α is < 0.9 , the sorting of alternatives does not change; whereas when the value of parameter α is between 0.9 and 1, the sorting of alternatives A3 and A1 changes. Alternative ranking is most sensitively affected by changes in the parameter η . For example, when $\eta = 0.1$, the best sorting is $A1 > A3 > A4 > A2 > A5$, and when $\eta = 0.5$, the optimal sorting is $A4 > A1 > A3 > A2 > A5$. Moreover, the sensitivity of the risk aversion parameter θ to changes in the ranking of alternatives can be found in Fig. 7(c), which demonstrates that risk preference can influence the EVBRTS site selection results. Actually, parameters α and β represent the trends of gains and losses in the value function, respectively; the larger the value of parameters α and β , the greater the likelihood of a risk-seeking attitude; while the lower the value of parameters α and β , the greater the likelihood of a risk-averse attitude.

6.1.2. Impact of changing expert weights

Both the BWM and CPT methods involve the use of expert weights, and in order to evaluate the influence of these weights on the ranking outcomes of the alternatives, a sensitivity analysis is carried out. This study selects several sets of different expert weight combinations, as detailed in Table A8 in the Appendix. The sorting results of the alternatives under various expert weight combinations are presented in Fig. 8. It is clear that adjustments in expert weights have no impact on

the ranking of the top alternative, but they do affect the rankings of the other alternatives. Expert weights play a crucial role in determining the ordering of alternatives, especially when there is little differentiation in performance among them. For instance, consider alternatives A1 and A3 as depicted in Fig. 8. In light of this, decision-makers should allocate varying weights to experts based on their knowledge background and practical experience to ensure a more accurate evaluation of the alternatives.

6.1.3. Impact of changing criteria weights

This section aims to analyze the impact of changes in criteria weights on the results. The following scenarios with different combinations of weights are considered: i) C1 criterion weights change from 0.1073 to 0.0773, C4 criterion weights change from 0.047 to 0.077, while the rest of the criterion weights remain unchanged; ii) C1 criterion weights change from 0.1073 to 0.0773, and C7 criterion weights change from 0.0505 to 0.0805; iii) the C1 criterion weight changed from 0.1073 to 0.0773, the C10 criterion weight changed from 0.052 to 0.082; iv) the C1 criterion weight changed from 0.1073 to 0.0773, the C13 criterion weight changed from 0.1185 to 0.1485. The results are shown in Table 7.

Table 7 illustrates only a few potential combinations, highlighting the varying impacts of different criteria weights on the alternatives. For example, by lowering the C1 criterion weights and increasing the C10 weights, alternative A3 will be superior to A1. Consequently, alterations in criterion weights have the potential to shift the evaluation results of the alternatives, potentially relegating initially top-ranked alternatives due to changes in specific criteria weights, or promoting initially lower-ranked alternatives to the forefront as a result of increased weights for certain criteria. Thus, fluctuations in criterion weights redefine the hierarchy of the alternatives. Changes in criterion weights may introduce bias into decision outcomes, as subjective increases in the weight of a criterion can favor one alternative at the expense of others. To mitigate the impact of criterion weight adjustments on the evaluation of alternatives, decision-makers should strive for objectivity and impartiality when determining criteria weights. It is essential to consider the significance and impact of each criterion, while avoiding subjective biases and interference from vested interests.

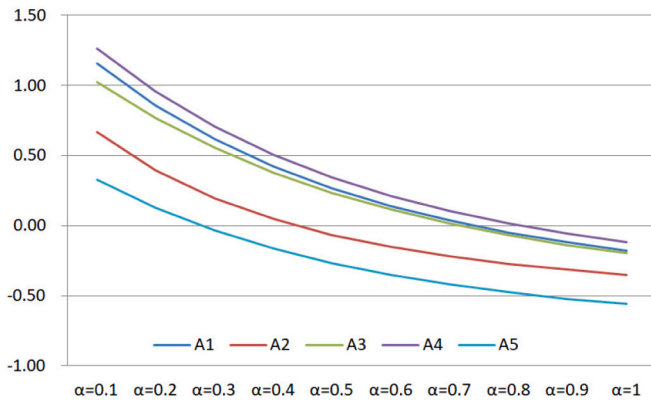
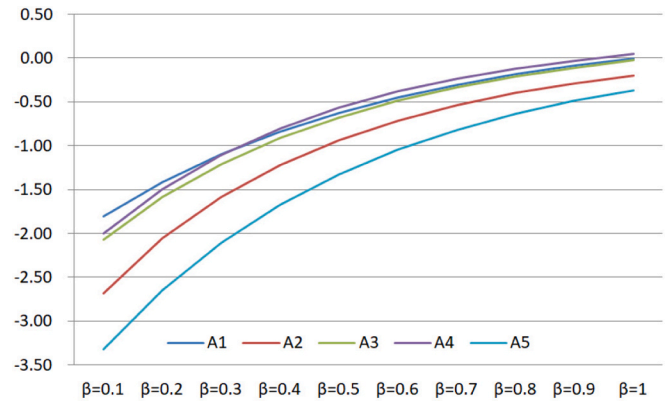
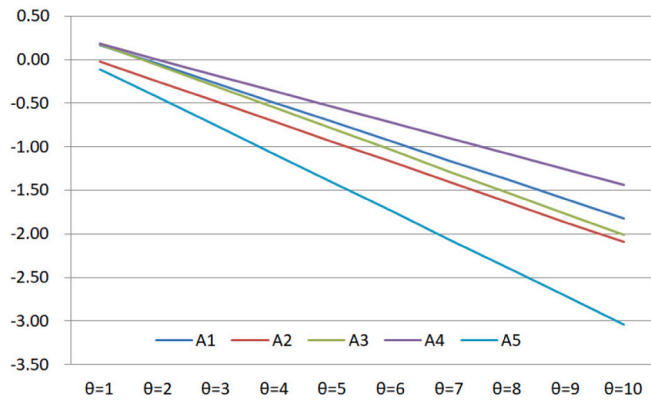
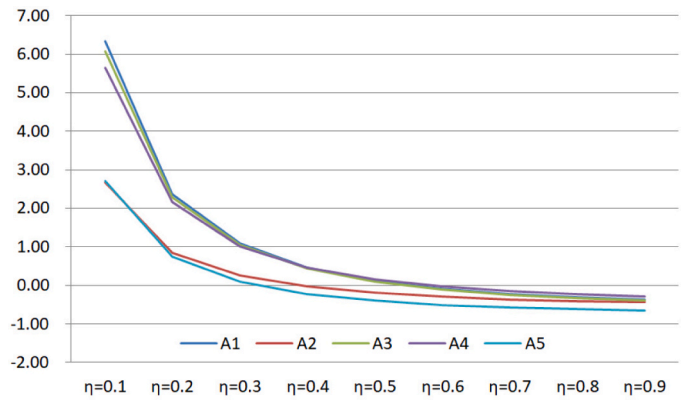
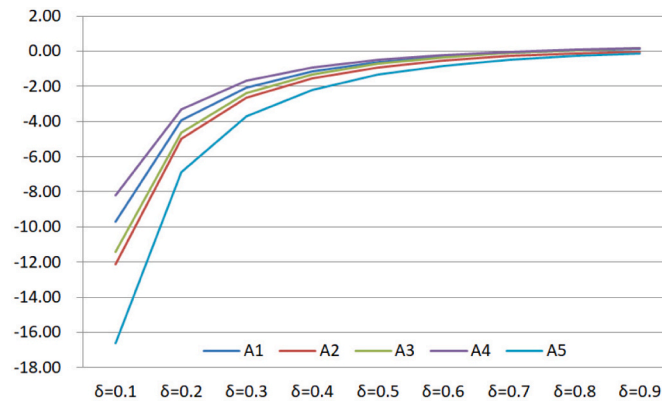
6.2. Comparative analysis

This section delves into the reliability of the proposed method by conducting a comparative analysis with other MCDM methods and exploring different aggregation sequences of expert evaluation information.

6.2.1. Comparison with other MCDM methods

In order to further validate the validity and flexibility of the method presented, the method presented was subject to a comparative analysis with three other well-known MCDM methods, namely TOPSIS [55], MABAC [49], and weighted aggregated sum product assessment (WASPAS) [4] methods. The ranking of alternatives are presented in Table 8.

The TOPSIS, MABAC, WASPAS, and CPT methods each adhere to distinct calculation rules. Nevertheless, they share common ground in identifying the best and worst alternatives. While the ranking of alternatives generated by the TOPSIS and WASPAS methods deviates slightly from the one presented in this paper. TOPSIS calculates the weighted Euclidean distance between alternatives and the positive and negative ideal solutions to determine their rankings, whereas the WASPAS method integrates two renowned MCDM methods—a weighted sum model and a weighted product model. In this study, a weight of 0.5 was assigned to the weighted sum model and another 0.5 to the weighted product model within the WASPAS approach. Conversely, the CPT method incorporates a risk attitude parameter, and alterations in parameter values yield varying rankings. For example, the ranking re-

(a) Sensitivity analysis of parameter α (b) Sensitivity analysis of parameter β (c) Sensitivity analysis of parameter θ (d) Sensitivity analysis of parameter η (e) Sensitivity analysis of parameter δ **Fig. 7.** Effect of changes in risk attitude parameter α , β , θ , η and δ on results.

sults obtained are the same as those obtained by TOPSIS and WASPAS methods when the parameters $\alpha = 0.7$, $\beta = 0.88$, $\theta = 2.25$, $\eta = 0.61$ and $\delta = 0.69$. In essence, the CPT method is more flexible and responsive to various decision-maker risk attitudes, thereby resulting in diverse ranking outcomes. By adjusting the decision maker's risk attitude, the CPT method can potentially generate varying ranking results. On the

other hand, MABAC operates as a compensatory method where attributes are considered independently, factoring in the magnitude of potential losses and gains without explicitly accounting for the decision maker's risk attitude. The effectiveness and compatibility of the proposed method are validated through comparisons with the TOPSIS, WASPAS, and MABAC methodologies.

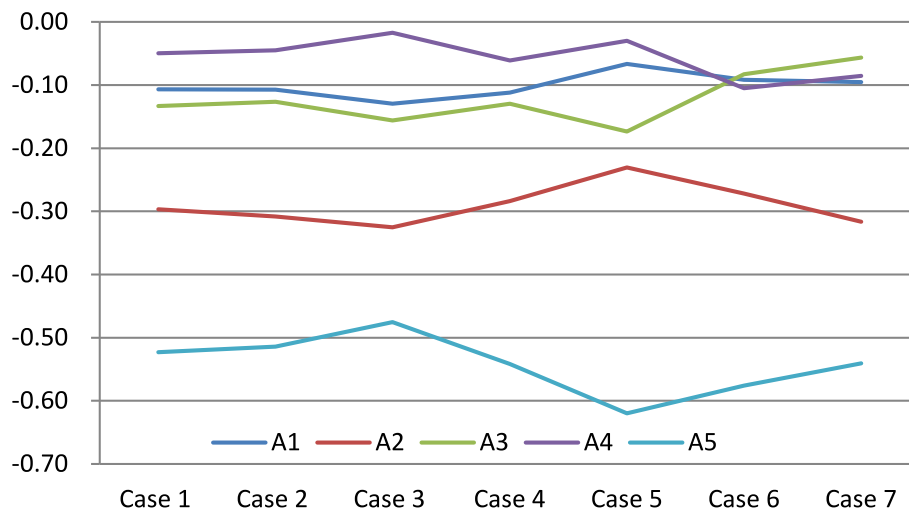


Fig. 8. Impact of changing expert weights.

Table 7

Impact of different combinations of criteria weights on results.

Combinations	Results	A1	A2	A3	A4	A5
(i)	Numerical results	-0.0769	-0.2489	-0.0897	0.0386	-0.4219
	Sorting results	A4 > A1 > A3 > A2 > A5				
(ii)	Numerical results	-0.0583	-0.2481	-0.1313	0.0733	-0.4516
	Sorting results	A4 > A1 > A3 > A2 > A5				
(iii)	Numerical results	-0.0941	-0.2445	-0.0745	0.0437	-0.4439
	Sorting results	A4 > A3 > A1 > A2 > A5				
(iv)	Numerical results	-0.0861	-0.2378	-0.1056	0.0531	-0.4224
	Sorting results	A4 > A1 > A3 > A2 > A5				

Table 8

Comparative results with other MCDM methods.

Methods	Results	A1	A2	A3	A4	A5
TOPSIS	Numerical results	0.5167	0.4256	0.5180	0.5604	0.3032
	Sorting results	A4 > A3 > A1 > A2 > A5				
WASPAS	Numerical results	0.8260	0.8140	0.8443	0.8451	0.7781
	Sorting results	A4 > A3 > A1 > A2 > A5				
MABAC	Numerical results	0.0466	0.0394	0.0454	0.1285	-0.0302
	Sorting results	A4 > A1 > A3 > A2 > A5				
The proposed method	Numerical results	-0.1038	-0.3069	-0.1338	-0.0442	-0.5198
	Sorting results	A4 > A1 > A3 > A2 > A5				

The CPT method considers the decision maker's attitude and preference for risk, which can better describe the psychological process of the decision maker, and can also deal with non-linear preferences and uncertainty, which is more in line with the actual situation of human decision making. The TOPSIS method is simple and easy to understand, and the calculation process is more intuitive, but it does not take into account the decision maker's risk appetite and psychological preference, and may not fully reflect the actual needs of decision makers. WASPAS and MABAC methods have the advantages of simplicity and intuition when dealing with simple multi-criteria decision-making problems, and are suitable for some more direct decision-making situations. The CPT method is relatively more complex, requiring an in-depth understanding of the decision maker's psychological preferences, more cumbersome data collection and processing, as well as a large amount of data and the decision maker's personalized parameter settings, especially when there are high requirements for risk and uncertainty, which will increase the complexity and cost of the calculation.

6.2.2. Comparing various aggregation sequences of experts' evaluation information

This section delves into the impact of different aggregation sequences of experts' assessment information on the alternatives. While both the BWM and CPT methods entail aggregating expert evaluation information, for the sake of simplicity in analysis, this paper focuses solely on the influence of different aggregation sequences of experts' assessment information on the outcomes within the CPT method. As such, three distinct orders of aggregation are explored: sequence 1) the aggregation order employed in this study; sequence 2) aggregation subsequent to Eq. (9); and sequence 3) aggregation following Eq. (7). The results of these sequences are presented in Table 9.

Obviously, different aggregation sequences have different impacts on the alternatives. If the experts' evaluation information is aggregated in the first step, then some of the information may be lost, which brings more risk to the evaluation. As a result, the later the aggregation of experts' information is necessary for the alternatives, so that unnecessary loss of linguistic information can be reduced.

Table 9
Effect of different aggregation sequences on alternatives.

Sequences	Results	A1	A2	A3	A4	A5
Sequence 1	Numerical results	−0.1038	−0.3069	−0.1338	−0.0442	−0.5198
	Sorting results	$A4 \succ A1 \succ A3 \succ A2 \succ A5$				
Sequence 2	Numerical results	−0.0831	−0.2417	−0.0845	0.0439	−0.4391
	Sorting results	$A4 \succ A1 \succ A3 \succ A2 \succ A5$				
Sequence 3	Numerical results	0.1633	0.1318	0.0334	0.1077	−0.1413
	Sorting results	$A1 \succ A2 \succ A4 \succ A3 \succ A5$				

6.3. Advantages of the proposed BWM-CPT method

By means of sensitivity analysis and comparative analysis, the integrated BWM-CPT method presented herein has the below advantages:

First, BWM is relatively simple and intuitive to understand and use. It does not require excessive data support and is sufficient to consider the relative importance of different factors. BWM helps to prioritize criteria by identifying the most and least important criteria, thus providing a holistic picture of the relative importance of these criteria in the decision-making process. BWM takes into account the subjective preferences of decision makers and, by asking them to assess the interrelationships between the best and worst criteria, provides a more accurate understanding of the personal preferences of assessment experts. In addition, BWM is a structured method that ensures transparency in the decision-making process. The explicit weights of the criteria obtained through this method can be easily communicated to stakeholders and results are more consistent and reliable.

Second, the CPT approach describes how human assess potential losses and gains when making decisions. Unlike traditional expected utility theory, CPT emphasizes that human have asymmetric perceptions of and responses to losses and gains, which better explains differences in human's decision-making behaviour. In addition, CPT emphasizes how human consider a target reference point when making decisions, assessing gains and losses based on the reference point rather than absolute utility. In addition, the CPT approach takes into account psychological factors in the decision-making process, such as risk aversion and loss aversion, which on the one hand provides a more realistic reflection of the way decision makers make choices under uncertainty; on the other hand, the CPT approach takes into account a non-linear utility function, which enables it to more accurately reflect decision maker's preferences, which is particularly important when dealing with complex and uncertain decision-making situations.

Third, the proposed method is able to obtain stable results and has a visualization of the calculation process. In the CPT method, decision makers can adjust the risk attitude parameters to obtain stable ranking results. The visualized calculation process is relatively simple and easy to practice. More importantly, in real scenarios, there are often multiple uncertainties and complex situations. By adopting an integrated BWM and CPT approach for informed and robust decision-making results, such complex decision-making environments can be better adapted to improve the validity and reliability of decisions.

6.4. Theoretical implications

Several theoretical implications are highlighted as follows: i) This is the first paper to present an analytical framework model for the EVBRTS site selection evaluation indicator system, which contributes to the identification of resilient sustainability criteria for EVBRTS site selection. Importantly, the analytical framework is an excellent reference for the development of other evaluation criteria systems; ii) This study developed a framework model for the location of battery recycling transfer stations and provided a theoretical and informational basis for the decision-making process of battery recycling managers; and iii) The theoretical validation of this paper highlights the effect of the order in which expert assessment information is aggregated on the ordering of

results, showing that delayed aggregation of expert assessments tends to produce more favourable results, which is attributed to the potential loss of linguistic information during the aggregation process. As a result, this paper provides a solid theoretical foundation for the optimal order of aggregation of expert assessment information in alternative selection.

6.5. Managerial implications

This paper provides battery recycling managers with a decision-making framework for the strategic site selection problem of EVBRTS from a resilience and sustainability perspective, and provides important managerial implications for the EVBRTS site selection, which contributes to the practical application of the proposed methodology.

First, this paper conducts an exploratory study focusing on the location challenges faced by companies operating transfer stations. To identify the optimal EVBRTS site, we develop an evaluation indicator system comprising five criteria and fifteen sub-criteria, meticulously refined through extensive discussions between industry stakeholders and academia. Nonetheless, the dynamic nature of the external environment may require adjustments to these criteria. For example, while traditional site selection analyses emphasize sustainability, evolving market dynamics warrant a focus on site resilience. Therefore, a resilience sustainability assessment indicator system for EVBRTS sites is established herein.

Second, the integrated approach proposed herein reduces the risk for managers associated with site selection decisions. Traditional methods such as TOPSIS, MABAC and WASPAS overlook the risk attitudes of decision-makers and fail to capture the nuances of their psychological behaviour during the decision-making process. In contrast, the CPT method is used in this study to rank alternatives and help decision makers to implement the necessary risk controls to prevent losses. Furthermore, the parameters in the CPT method can be adjusted according to the different attitudes of decision makers towards risk, making the methodology highly flexible and stable.

Last, the sequence in which experts' assessment information is aggregated significantly influences result sorting, as elucidated in the comparison of various orders of aggregated expert evaluation information. Consequently, in practice, managers must recognize that delaying the aggregation of expert assessments can minimize the loss of linguistic information, thereby reducing decision-making risks. While some loss of assessment information is inevitable during aggregation, managers can mitigate this loss by employing suitable methods.

7. Conclusions

The recycling of electric vehicle batteries has attracted increasing attention from academia and industry, aiming to promote sustainable economic, social, and ecological development. With a growing volume of waste electric vehicle batteries, urgent measures are needed to recycle this surplus and mitigate adverse impacts on the ecosystem. This study was initiated by a renewable energy company facing the challenge of expanding its battery recycling business, as the current recycling plant is insufficient to meet demands. Thus, there is an urgent need to establish a suitable battery recycling transfer station to relieve pressure on the recycling facility. To address this requirement, a framework model for

EVBRIS site selection was developed, integrating the BWM-CPT method and establishing a system of site selection evaluation criteria. The BWM method was employed to determine the weight of each criterion, followed by the application of CPT to rank alternatives. Sensitivity and comparison analyses demonstrate that the integrated method developed in this study provides a reliable scientific basis for a robust ranking of alternatives.

The key findings derived from the paper presented herein are as follows: i) the order in which the experts' assessment information is aggregated significantly influences the ranking outcomes. This is due to the fact that there may be a loss of potential information in the aggregation of assessment information from multiple experts. Typically, the assessment information from various experts is aggregated in the final step to reduce the loss of information; ii) criteria weights and decision makers' risk attitudes have an impact on the evaluation results. Decision-makers evaluate potential losses and gains based on reference points, and different risk attitudes lead to varying ranking results. As a result, the CPT method demonstrates greater compatibility compared to other MCDM methods; and iii) the application of the BWM and CPT methods in EVBRIS site selection has stability and robustness, and the evaluation indicator system framework model developed in this study is applicable to the most transfer station location.

In this paper, the BWM and CPT methods are adopted to study the problem of battery recycling transfer stations site selection, and the significance of the study is highlighted in the following ways. 1) The BWM method can help to determine the importance and weight of the location factors and help the decision maker to evaluate the alternatives more comprehensively, while the CPT method takes into account the decision maker's uncertainty about the gains and losses, which can make the location decision more scientific and accurate and improve the success rate of the decision. The application of these methods can improve the scientificity and effectiveness of the decision on the location of the battery recycling transfer station. 2) The study of the location of the battery recycling transfer station can help improve recycling efficiency and resource utilization, reduce the impact of waste batteries on the environment, promote green development, and contribute to environmental protection and sustainable development of society. 3) The study of the location of the battery recycling transfer station embodies the company's awareness of social responsibility and sustainable development. By making scientific location decisions, the Company fully considers environmental, social, economic and resilience factors to achieve the goal of sustainable development and make more contributions to society. 4) This paper provides a theoretical framework based on the MCDM method for the site selection problem in the battery recycling process, which fills the research gap of the existing research ignoring the site selection in the battery recycling process, and contributes to the sustainable development of the battery recycling field.

This paper offers a valuable tool for companies seeking to identify the optimal EVBRIS location; nonetheless, it also presents some limitations. First, the use of clear values to compare criteria in the adopted BWM methodology may ignore the ambiguity inherent in the experts' evaluation of these criteria. Therefore, it would be both interesting and meaningful to explore the inclusion of expert-provided interval values

conforming to a normal distribution to characterize assessment uncertainty in future studies. Second, in the adopted CPT methodology, this paper sets the value of the decision maker's risk attitude parameter based on previous research. However, since each decision maker's risk attitude parameter value may be different, determining how to measure the decision maker's risk attitude through a specific methodology can greatly improve the accuracy of site selection. Third, this study did not consider the possible correlations between the selected criteria. Considering the possible interdependence of the criteria, the use of the DEMATEL method to assess the importance of each of the evaluation indicators in the system would be a worthwhile direction to explore in future studies. Last, future research should focus on updating EVBRIS standards based on practical applications. By integrating geographic information system technology into site selection analysis, researchers can consider factors such as geography, transportation accessibility, and resource distribution to optimize EVBRIS locations. Furthermore, as the body of literature on battery recycling site selection continues to grow, it would be valuable to compile a review article summarizing the key findings and insights in this field. This review article could serve as a comprehensive resource for researchers and practitioners interested in battery recycling sitting issues.

CRediT authorship contribution statement

Jianghong Feng: Writing – review & editing, Resources, Methodology, Investigation, Formal analysis, Data curation. **Ping Guo:** Validation, Software, Investigation, Formal analysis. **Gangyan Xu:** Software, Resources, Investigation, Data curation. **Yu Ning:** Visualization, Software, Investigation.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

Data availability

Data will be made available on request.

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Appendix A. Appendix

Table A1

BO vectors for five experts.

Criteria	E1	E2	E3	E4	E5
	Capacity scalability	Natural conditions	Capital investment	Policy support	Capacity scalability
Capital investment	3	3	1	3	4
Operation cost	3	3	6	5	3
Distance from recycling center	4	4	8	4	5
Acceptable level	7	5	3	7	9
Job opportunity	6	7	9	6	8
Safety protection	4	5	4	7	8
Distance from ecological reserve	7	6	3	8	7
Distance from local residents	7	6	5	8	5
Natural conditions	7	1	6	5	6
Land requirement	9	3	4	7	7
Security measure	7	5	7	9	8
Transport convenience	7	5	4	4	4
Capacity scalability	1	6	6	4	1
Policy support	4	2	5	1	3
Reliability	5	4	3	7	4

Table A2

WO vectors for five experts.

Criteria	E1	E2	E3	E4	E5
	Land requirement	Job opportunity	Job opportunity	Security measure	Acceptable level
Capital investment	7	7	9	6	6
Operation cost	6	7	3	5	7
Distance from recycling center	5	6	2	6	5
Acceptable level	3	4	7	3	1
Job opportunity	4	3	1	4	2
Safety protection	6	4	5	3	2
Distance from ecological reserve	3	4	6	2	3
Distance from local residents	2	4	5	2	4
Natural conditions	3	9	3	5	4
Land requirement	1	7	6	2	3
Security measure	3	5	3	1	2
Transport convenience	2	4	5	6	6
Capacity scalability	9	4	3	5	9
Policy support	6	8	4	9	6
Reliability	5	5	7	3	5

Table A3

Results of expert E1's assessment of alternatives.

Criteria	Unit	A1	A2	A3	A4	A5
C1	\$(10^5)\$	[40,50]	[32,40]	[24,36]	[38,46]	[39,48]
C2	\$(10^4)/\text{year}\$	[20,24]	[17,22]	[10,15]	[18,21]	[20,23]
C3	km	20	34	28	24	39
C4	–	G	VG	G	F	VG
C5	–	SG	G	VG	VG	G
C6	–	G	F	SP	G	F
C7	km	13	11	8	15	9
C8	km	10	5	6	8	4
C9	–	VG	VG	G	SG	G
C10	hm ²	0.31	0.24	0.17	0.26	0.28
C11	–	G	SG	SG	VG	VG
C12	–	VG	G	F	F	G
C13	–	SP	F	G	SG	F
C14	–	VG	G	G	VG	SG
C15	–	SG	VG	SP	G	F

Table A4

Results of expert E2's assessment of alternatives.

Criteria	Unit	A1	A2	A3	A4	A5
C1	\$(10^5)\$	[40,50]	[32,40]	[24,36]	[38,46]	[39,48]
C2	\$(10^4)/\text{year}\$	[20,24]	[17,22]	[10,15]	[18,21]	[20,23]
C3	km	20	34	28	24	39
C4	–	SG	F	VG	F	F
C5	–	G	SP	G	F	G
C6	–	SG	F	G	F	G
C7	km	13	11	8	15	9
C8	km	10	5	6	8	4
C9	–	G	G	VG	SP	F
C10	hm ²	0.31	0.24	0.17	0.26	0.28
C11	–	VG	G	G	SG	VG
C12	–	VG	SG	F	G	F
C13	–	F	G	SG	G	G
C14	–	VG	VG	VG	G	SG
C15	–	F	G	F	G	VG

Table A5

Results of expert E3's assessment of alternatives.

Criteria	Unit	A1	A2	A3	A4	A5
C1	\$(10^5)\$	[40,50]	[32,40]	[24,36]	[38,46]	[39,48]
C2	\$(10^4)/\text{year}\$	[20,24]	[17,22]	[10,15]	[18,21]	[20,23]
C3	km	20	34	28	24	39
C4	–	SP	G	G	F	SG
C5	–	VG	SP	VG	SG	SG
C6	–	SG	SG	F	G	F
C7	km	13	11	8	15	9
C8	km	10	5	6	8	4
C9	–	G	F	G	F	G
C10	hm ²	0.31	0.24	0.17	0.26	0.28
C11	–	G	F	SG	VG	G
C12	–	G	SG	F	G	SG
C13	–	SP	VG	SP	SG	F
C14	–	G	SG	G	F	G
C15	–	F	SG	G	G	G

Table A6

Results of expert E4's assessment of alternatives.

Criteria	Unit	A1	A2	A3	A4	A5
C1	\$(10^5)\$	[40,50]	[32,40]	[24,36]	[38,46]	[39,48]
C2	\$(10^4)/\text{year}\$	[20,24]	[17,22]	[10,15]	[18,21]	[20,23]
C3	km	20	34	28	24	39
C4	–	G	SG	SG	G	G
C5	–	G	F	G	VG	VG
C6	–	SP	VG	SG	G	G
C7	km	13	11	8	15	9
C8	km	10	5	6	8	4
C9	–	G	SG	F	VG	SG
C10	hm ²	0.31	0.24	0.17	0.26	0.28
C11	–	G	G	F	G	VG
C12	–	F	SG	G	F	SG
C13	–	F	VG	SP	F	G
C14	–	G	F	F	VG	VG
C15	–	VG	G	G	G	SG

Table A7

Results of expert E5's assessment of alternatives.

Criteria	Unit	A1	A2	A3	A4	A5
C1	\$(10^5)\$	[40,50]	[32,40]	[24,36]	[38,46]	[39,48]
C2	\$(10^4)/\text{year}\$	[20,24]	[17,22]	[10,15]	[18,21]	[20,23]
C3	km	20	34	28	24	39
C4	–	G	SG	G	G	VG

(continued on next page)

Table A7 (continued)

Criteria	Unit	A1	A2	A3	A4	A5
C5	–	VG	VG	G	G	SP
C6	–	G	G	VG	G	SG
C7	km	13	11	8	15	9
C8	km	10	5	6	8	4
C9	–	G	SG	G	G	SG
C10	hm ²	0.31	0.24	0.17	0.26	0.28
C11	–	G	G	SG	F	F
C12	–	F	G	F	G	SG
C13	–	G	SG	G	SG	VG
C14	–	G	G	F	VG	VG
C15	–	SG	F	G	VG	VG

Table A8
Different expert weight combinations.

Cases	E1	E2	E3	E4	E5
Case 1	0.2	0.2	0.2	0.2	0.2
Case 2	0.15	0.2	0.2	0.2	0.25
Case 3	0.1	0.1	0.3	0.25	0.25
Case 4	0.3	0.15	0.3	0.15	0.1
Case 5	0.6	0.1	0.1	0.1	0.1
Case 6	0.3	0.3	0.2	0.1	0.1
Case 7	0.1	0.3	0.2	0.1	0.3

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5 必须正确解读新中国 70 年经济发展之谜

——庆祝新中国成立 70 周年

简新华

14 新中国 70 年党的领导集体对中国经济发展道路的探索

王 瑶 郭冠清 黄志刚

25 习近平东北老工业基地振兴与国企改革思想研究

曾燕南

新时代经济高质量发展研究

33 绿色证券投资基金财务绩效、环境绩效与投资者选择

邹小芃 胡嘉炜 姚 楠

45 长三角地区城市创新关联及其隐性壁垒研究

王腾飞 马仁锋

- CSCI 来源期刊
- 中文核心期刊要目总览
- 中国人文社会科学核心期刊
- 中国人民大学书报资料中心“复印报刊资料”重要转载来源期刊

2019 年 第 12 期

总第 375 期

(每月 15 日出版)

56 基于 DSGE 模型的能源税征收最优环节选择：产出型抑或投入型？

张晓娣 孔圣禹

68 制造业企业生产要素收入分配公平性与研发投入强度

张伯超

80 数字经济的技术—经济范式

王林楠 陈江生

金融安全、稳定与系统风险防范

95 城镇职工基础养老金可持续：缴费模式调整与政策选择

范维强 刘俊霞 杨华磊

经济史与经济思想史研究

109 近代中国民营企业的科学管理

姚清铁 郑 菲 李瑞尧 郭 萍

123 2019 年《上海经济研究》总目录

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近代中国民营企业的科学管理*

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内容摘要: 从 20 世纪初科学管理思想开始传入中国,到 1920—30 年代民族企业家们开始广泛响应这一思想,中国实业界掀起了一场前所未有的科学管理革命,其内容之一便是革除传统的工头制,但在实际运作中,各家企业的变革效果却不尽相同。本文运用知识转移理论对这一变革的条件与动机、转移的机制和知识应用的方式所呈现出来的不同特点加以讨论,并以德大厚生纱厂、民生公司、美亚织绸、申新三厂、商务印书馆和康元制罐厂等六家典型企业为讨论对象,认为不同的知识转移粘性导致近代中国企业在实践中产生了不同的管理变革路径,并以此将进行管理革命的近代企业分为成功转移、低转移粘性与高转移粘性三类。

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一、引言

在近代中国“西风东渐”的背景下,20 世纪初,发端于美国的科学管理法在中国留学生群体的热心推广下开始传入中国,到了 20 世纪二十年代,科学管理法得到民族企业家们的重视和广泛响应,申三、民生公司、美亚织绸和商务印书馆等企业纷纷开始引进西方的科学管理法,施行科学管理改革,然而这些变革的企业到了 1930 年代却多有发生回潮与反复,有些甚至回到了之前的工头制。对于这一独特的企业制度变革与回潮现象,以及这一时段中国企业的科学管理改革起因、过程及效果,国内外学者已有不少讨论,比较有代表性的研究包括韩起澜(1987)、徐鼎新(1995)、裴

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宜理(2001)、高家龙(2002)、张忠民(2002)、高超群(2008)、朱荫贵(2009)和冯筱才(2013)等人。^①

总结起来,既有的研究主要从以下三个方面展开:

一是从企业制度变迁的角度所进行的讨论,这一讨论以张忠民(2002)为代表,认为 20 世纪二三十年代因实行科学管理的各项条件已然成熟,故而能够推行以科学管理为中心的公司管理制度的改革。但对于改革中的反复现象,张著着墨不多,未作深入探讨。

二是从劳资关系角度所进行的分析,具有代表性的高家龙(2002)和高超群(2008)等人。比如高家龙就认为荣氏企业改革工头制的动机是为了防止罢工,而尽管 1924—1925 年的申新纱厂的改革尝试失败了,但 1933 年在无锡、汉口顺利完成了公司管理等级制度的建立,即便在上海的申新厂中仍保留了部分工头,总体上 1933 年申新纱厂的改革是成功的。而高超群(2008)在讨论申新三厂和民生公司的工头制改革时,同样认为这一变革未能造就成熟的企业管理制度,申新三厂的改革是失败的。

三是从外部环境因素角度所进行的讨论,具有代表性的学者包括韩起澜(1987)、潘必胜(1998)、裴宜理(2001)、朱荫贵(2009)和冯筱才(2013)等人。尽管都是从外部因素进行的讨论,学者的立场与观点却不尽一致。比如韩起澜认为上海纱厂内部建立的“现代”管理体系后来都遭到挫折,与控制上海工人的帮会势力有关。裴宜理在对美亚的讨论中则认为行业萧条的压力是导致美亚受挫,回到了“租机制”的主要原因。朱荫贵注意到近代导致改革反复的另一层阻碍是几千年农业社会形成的各种传统因素的障碍,正是这一长期形成的传统和习惯导致了政治和社会环境的不如意之处。同样是持外部因素论,冯筱才则聚焦于美亚织绸管理变革的细节,认为当外在经济环境变化,企业主开始缩减工人所得时,科学管理制度因缺乏中间的缓冲环节,是导致劳资冲突发生、管理变革反复的重要因素。

从上述的学术史简单梳理,我们不难发现,尽管是对同一问题的分析,而学者研究的对象企业固然各不相同,聚焦点也不尽一致,但对于这一变革过程中的一些重要基本问题远未达成共识,集中表现在两点:一是对导致变革与回潮的原因看法各不相同;二是对不同企业变革的结果成功与否评价不相一致。如果进一步探究,已有的研究还呈现出两个特点:一是重变革的原因与结果分析,轻变革的过程探讨;二是重个案的情境性因素分析,轻整体的一般性因素分析。有鉴于此,本文拟对近代民族企业的管理变革问题作更进一步分析,分析的重点则在于:一、是否可以用一个视角统一分析近代民族企业管理变革的全过程——从发生、发展到结果?二、对于近代民族企业管理变革的全过程,是否有一般性的经验可以总结?本文将借助管理学中的知识转移理论对这一变革作整体梳理,以期引玉。

① 与近代中国管理革命的相关研究主要有:

韩起澜,吴竟成.解放前上海的包身工制度[J].史林,1987(01):129—138.;

徐鼎新,唐传泗,姜铎.“五卅”运动与上海的资产阶级[J].上海社会科学院学术季刊,1985(02):138—148.;

潘必胜.荣家企业组织研究[J].中国经济史研究,1998(02):15—28.;

裴宜理.上海罢工:中国工人政治研究[M].江苏人民出版社,2001;

高家龙.大公司与关系网——中国境内的西方,日本和华商大企业(1880—1937)[M].上海社会科学院出版社,2002.;

张忠民.艰难的变迁:近代中国公司制度研究[M].上海社会科学院出版社,2002.;

高超群.科学管理改革与劳资关系——以申新三厂和民生公司为中心[J].中国经济史研究,2008(03):68—77.;

朱荫贵.试论近代中国社会传统力量对早期现代化发展的障碍作用——以穆藕初引进推广现代西方科学管理理论的实践为例[J].近代中国,2009(00):269—287.;

冯筱才.科学管理、劳资冲突与企业制度选择——以 1930 年代美亚织绸厂为个案[J].史林,2013(06):11—23+185.

二、知识转移理论对企业组织的理解

正如经济学中对企业本质的认识有资源配置说、交易成本说等一系列不同的视角一样,人们一直试图从不同的角度来理解企业、解释企业,并且,经济学理论中对企业的理解关注企业与市场之间的关系。但 1980 年代之后的实证研究显示,企业表现为超额利润率的竞争优势并非来自外部市场力量,而是来自企业自身的某种因素。既然传统的“外向思维”表现出了局限性,管理学于是在传统的“企业—市场”视角之外,另起炉灶,转向“内向思维”,试图从企业层面来理解企业,这其中又以 Penrose 的资源观最具代表性。沿着这一思路,我们对企业的理解转而进入了古典经济学所谓的企业“黑盒”,将企业拆解为更为基础的单元,从内部来理解企业的成长与发展,认为企业的竞争优势来自于企业配置、开发与保护资源的能力。在此基础上所产生的知识理论则认为,隐藏在能力背后,并决定企业能力的,是企业所掌握的知识。并由此对企业的存在、内部协调和企业的异质性问题形成了有效解释。

与交易费用理论相比,知识观视角下的企业,强调的重点已经不再是机会主义和成本,而是有限理性和价值。在此基础上,对企业的研究也延伸至企业知识活动的各种微观机理,这其中重要的部分即为知识的转移。而对于企业管理变革这样的组织学习话题来说,知识转移则无疑是一个有效的解释角度。

知识转移通常被分为组织内和组织间的转移分开讨论,此概念最早由 Teece^①(1977)提出,认为转移方和接收方的特征会影响到转移成本,且不同类型的知识其转移的速度和效果也不同。而知识本身又可分为显性知识和隐性知识,隐性知识由于其本身的可表达性不强,故而转移的难度更大(Polanyi, 1966)^②。而知识转移本身又可看作是一个群体、部门接受另一群体、部门经验的过程(Argote 等, 2000)^③,在此过程中,组织能够在新环境中重新创造并维持复杂的、具有因果模糊性的一系列惯例(Szulanski, 2000)^④。具体来看,知识转移作为一个过程来理解,大致可分为接触期(initiation)、交流期(impletation)、应用期(rame up)以及维持期(integration)四个阶段(Vito, 1999)^⑤。而知识能否被成功转移,则取决于能否克服这四个转移阶段中的粘性因素。常常导致知识转移具有粘性的因素大体可分为以下四方面:1、接受者特征,如接受者的学习意图、吸收能力、维持能力等;2、知识源特征,如转移方的转移动机、转移能力等;3、知识的特征,如知识的可编码性、因果模糊性、可明晰化表达等;4、转移双方关系的亲密度以及其他因素,如组织距离、文化距离。

为解释近代中国民营企业管理革命的过程,及其中的变革反复现象,本文将采用知识转移模型来解读近代民族企业对西方科学管理法的引入、学习与适应过程。分析时,我们将借鉴 Vito 的四阶段理论,将其分为初始阶段、执行阶段、扩张阶段和整合阶段,并关注不同阶段的变革与转移粘性之间的关系,以及与此相关的变革难度及变革反复现象。在分析的过程中,我们将综合考虑资料的可得性及是否实施过科学管理改革,选出六家样本企业作为本文的研究对象,其基本情况

① Teece D J. Technology transfer by multinational firms: The resource cost of transferring technological know-how[J]. The economic journal, 1977, 87(346): 242—261.

② Polanyi M. The logic of tacit inference[J]. Philosophy, 1966, 41(155): 1—18.

③ Darr E D, Argote L, Eppel D. The acquisition, transfer, and depreciation of knowledge in service organizations: Productivity in franchises[J]. Management science, 1995, 41(11): 1750—1762.

④ Szulanski G. The process of knowledge transfer: A diachronic analysis of stickiness[J]. Organizational behavior and human decision processes, 2000, 82(1): 9—27.

⑤ Albino V, Garavelli A C, Schiuma G. Knowledge transfer and inter-firm relationships in industrial districts: the role of the leader firm[J]. Technovation, 1998, 19(1): 53—63.

如下表所示。

表 1 样本企业及其属性

企业	企业主/总经理	所属行业	科学管理改革时间
德大、厚生	穆藕初	棉纺织业	1920 年—1923 年
美亚	蔡声白	丝织业	1926 年以后
申新三厂	荣宗敬、荣德生	棉纺织业	1923 年以后
民生公司	卢作孚	航运业	1926 年以后
康元印刷制罐厂	项康原	制罐业	1927 年以后
商务印书馆	王云五	出版业	1930 年以后

三、初始阶段：知识转移的动机差异

泰罗作为古典管理理论代表人物之一，于 1911 年出版《科学管理原理》，由此标志着科学管理的诞生。泰罗管理变革的背景是 19 世纪末 20 世纪初的第二次工业革命，这一革命导致传统的经验管理已经无法适用机器大工业的社会化大生产，而将如何提高劳动生产效率这一命题抛到前台，并引起广泛关注。因为这一原因，泰罗的理论在西方世界引发了学习科学管理法的浪潮。

在《科学管理原理》中，泰罗开宗明义地指出：“写作本书的主要目的就在于提倡以高工资和低劳动成本作为最良好的管理制度的基础”^①，因而科学管理法这一新制度的目的是使得雇主和雇员有相互的利益，简言之，既使雇主实现最大程度的富裕，也联系着使每个雇员实现最大限度的富裕。由于该理论强调雇主和雇员的最大化利益且致力于取代低效能的经验式管理，因而在西方世界盛行并得到了众多公司的推崇和实验。泰罗的理论实验同样引起了正在学习西方经验，并推进工业发展的中国实业界的注意。1920 年，穆藕初向国内介绍引进科学管理法并身体力行。如果从 1920 年开始计算，尝试使用科学管理方法的近代中国民营企业至少有十数家，但就其转移动机来说，这些企业却不尽相同。在这些企业中，有些是出于对科学管理本身的认同而自发地引进实践，而有些则是迫于外在压力不得已而为之，本文因此从知识转移动机差异的角度，将其分为三类：

（一）外在动机驱使

从引入科学管理的动机来说，有些企业是因为外部环境情势逼人，为摆脱经营困境或者避免旧式管理制度的弊病，而不得不想办法引进科学管理法。持这一动机的企业主要是荣家企业和卢作孚的民生公司。

以荣家企业为例，1918 年荣氏在无锡创建了申新三厂，但是棉纺织业在一战以后特别是 1923 年之后面临日商倾销、在华投资激增的困境，“大战期间，日本棉业界正忙于在国内扩张设备，且彼时日本纺织机器的生产尚无根基，所以日商之来华投资并不活跃”^②，但是欧战结束之后，日本棉业界出现了战后萧条，日本厂方在战时订购的机器已经交付，却在国内无立足之地，于是正好搬运到中国来，1921—1922 年因此便成为日商来华设厂的最盛时期。1922 年以后特别是自 1925 年开始，日商在中国设厂的数量以及机器设备陡然上升（见表 2）进而导致了“花贵纱贱”的情形。

表 2 日本纱厂之机器设备（已开）

年份	纱锭	线锭	布机
1913	111,936	?	886

①（美）F·W·泰罗：《科学管理原理》[M]，北京：中国社会科学出版社，1984.10.第 34 页。

② 严中平：《中国棉纺织史稿》[M]，商务印书馆，2011。

1919	332,922	?	1,486
1922	621,828	?	2,986
1924	932,728	?	3,929
1925	1,268,176	58,744	7,205
1927	1,291,974	77,632	9,625
1928	1,397,272	117,544	10,801
1929	1,462,160	185,484	11,467
1930	1,587,776	233,504	13,554
1931	1,715,792	232,236	15,983

资料来源:严中平. 中国棉纺织史稿[M]. 商务印书馆, 2011, 第 221 页。

面对日商倾销、来华投资设厂、花贵纱贱的外部困境,荣氏发现申新三厂生产落后,产品价格
在无锡各厂中最低、纱厂利润下降,成本、产量、质量等各方面都远赶不上日本纱厂。面对着内忧
外患,荣氏决定学习日本纱厂,改革工头制,并选择从无锡的申新三厂开始试点。显然,申三的管理
变革是源于外部的压迫。

虽然同样是迫于外部压力而采用科学管理制,卢作孚的民生却与荣家企业不一样,表现在它
并没有后来进行变革,而是从一开始就实行科学管理的经理制。1926 年,卢作孚成立了民生实业
股份有限公司并担任总经理,其实早在 1925 年卢作孚等人已经在四川省合川县通俗教育馆开始
筹备民生公司,筹备会后,卢作孚等人的第一步工作是到重庆调查一切轮船;第二步工作是到上海
调查一切机器,订购轮船^①。在调查期间,卢作孚就对当时川江华轮公司的管理体制与经营状况进
行了详细研究,发现华轮公司普遍亏损的原因不是轮船过多,而是管理不善,其中普遍推行的“包
办制”是其致命伤^②。

依据调查结果,卢作孚认为航运业的一些惯例应当进行变更,当时轮船的“包办制”又称为“三
包制”,因为轮船事务被分成三个部分,分别外包。一是人事包办。人员由船长任用,公司无权过
问。二是事务包办。不同经营事务承包给承包人,卫生、载重量、船票、膳食等公司无权干预。三
是物品包办。船用物品如五金用料、机油等以一定款额承包^③。“三包制”将轮船各部业务分离,容
易形成各自为政,无法统一管理的局面,且航运公司对轮船的掌握程度较弱,考虑到旧式的轮船管
理体制的弊病,卢作孚毅然决定创建民生公司之初便采用科学管理法的“经理制”,于是 1926 年 8
月,民生实业股份有限公司成立之初,便规定船上事务设经理一人主持之,公司轮船实行经理制
度。显然,卢作孚的这一作法并非出自对科学管理法发自内心的认同,而是从规避旧式轮船管理
制度的弊端的角度出发而作出的决定,因此卢氏的科学管理变革仍然属于外部动机驱使。

(二)内在动机驱使

与荣氏兄弟及卢作孚不同,另一部分企业主则是出于对科学管理法发自内心的认同与接受,
而主动将国外的科学管理法转移到自身企业的运作上,属于内部动机驱使。具有代表性的包括穆
藕初和蔡声白。值得注意的是,此二人均具有留洋背景,因此区别于在国内接受高等教育的企业
主,属新式企业主。

以穆藕初为例,1913 年穆从美国伊利诺伊大学学农毕业,又想学工,便前往美国德克萨斯州
(State of Texas),“全力注意于植棉与纺织,理想与实验同时并进,并研习科学的管理法”,“余曾与
戴、吉二君反复讨论,获益甚多。”正是在德州的见闻让穆藕初感受到了科学管理法的魅力,并萌
发了向国内翻译介绍泰罗著作的想法。因为这一早年的经历及多年对科学管理理论的研究,穆 1920

① 凌耀伦,熊甫. 卢作孚文集[J]. 北京:北京大学出版社,1999,第 361 页、545 页。

② 凌耀伦. 卢作孚与民生公司[M]. 四川大学出版社,1987.,第 94 页。

③ 《民生实业股份有限公司十一周年纪念刊》,第 17 页。

年创办德大、厚生纱厂时,也同样从一开始就施行科学管理法。

同样在美国里海大学留学,美亚织绸的蔡声白也是在留洋期间接触到了科学管理法。也许是机缘巧合,1921 年以前蔡声白在麻省里海大学留学的城市伯利恒(Bethlehem)正好是泰罗推广科学管理实验的地方,且最早推行科学管理的 The Bethlehem Steel Company 也是蔡声白实习的公司。泰罗给伯利恒钢铁公司介绍科学管理时,所做的第一件工作就是尝试着把搬运生铁改为计件工,最终实验证明使用科学管理法的钢铁工人确实能够得到比他们周围其他工人多 60% 的工资,也许正是见识到科学管理法的效果,才激发了蔡声白学习掌握科学管理法。鉴于此,穆藕初、蔡声白均是在留学期间学习的科学管理法,属于主动的转移动机。

(三)混合动机驱使

而近代较早转移西方科学管理法的康元制罐厂并不像以穆藕初、蔡声白为代表的留学企业主,是因为感受到科学管理法的魅力而自发学习,属于内在动机;也不纯粹像以荣氏为代表的企业主那样,是出于经营困境而学习西方的知识,属于外部动机。而是迫于外部因素学习科学管理法,但是学习的过程又不像外部动机驱使情形下那样被动地借助第三方帮助实施改革,而是主动积极推行该方法,因而将其归类为混合动机,是外在和内在动机的结合体。持这一动机的代表企业是康元制罐和商务印书馆。

项康原设立康元制罐厂可以追溯到 1922 年,但此后直到 1926 年前,他远赴察哈尔、绥远,工厂因此委托他人代为管理,等到 1927 年项康原再次回到上海时,他发现工厂管理不善,亟需整顿。一方面迫于工厂经营不善的压力,需要寻求解决之法,另一方面,西方舶来的科学管理法引起了他的注意,于是他大量阅读有关科学管理方面的书籍,并且为此特意去学习英文和日文。在参照了东西各国的经验之后,项康原决定在国内率先采用“科学管理法”,对原有的管理方式进行全面系统的变革。康元制罐厂对科学管理法的学习一方面是迫于企业经营的困境,具备外在动机;另一方面也自发、主动地学习科学管理法,区别于荣氏的申新三厂选择借助于有经验的工程师和新职员,具备内在动机,故而康元制罐厂的学习属于混合动机驱使。

与康元制罐厂学习科学管理法较为相似的是,王云五主持的商务印书馆也是受混合动机驱使。1927 年以后的十年是中国出版业发展的黄金十年,在教育上虽然总体的情况并不乐观,但是全国的学生人数规模与教育经费投入呈现逐年上升的趋势,1928 年大学院在颁布全国各学校必须广泛设置图书馆的通令以后,这十年间图书馆的数量从 1928 年的 557 所增加到了 1936 年的 5196 所^①,教育的提高和图书馆实业的增长为出版业的兴盛提供了良好的外部环境。作为出版业巨头的商务印书馆与中华书局、世界书局的竞争也日益激烈,1927 年商务印书馆的出书量为 842 卷,中华书局和世界书局合计共出书 481 卷,只有商务印书馆出书量的 57%,而到了 1929 年,商务出书 1040 卷,而中华和世界书局的出书量达到了 1024 卷,可谓旗鼓相当^②。危机感迫使商务印书馆务必提高生产和出版效率以保持市场份额,据记载“要出一本书,编辑发稿,工人包领去排。编辑催一次,工人送校一两页。编辑的士气不高,又有谁催呢?一本书两年也出不了版。”^③商务的出版情况如此之不乐观,出版效率的低下迫使王云五改革管理体制。在摸索可替代现行管理体制的过程中,自 1930 年 3 月 7 日开始,王云五先后前往英、美、日等九个国家考察科学管理法,阅读三、四百册书籍,搜罗千余种刊物,最终完成了四十万字的笔记。

我们这里之所以花篇幅来区分并讨论不同企业的不同转移动机,是因为知识转移者的不同转移意愿会影响到接受者的知识吸收能力,并进而影响到知识转移的效果。知识转移的意愿越高,

① 吴永贵,李明杰.中国出版史(下)[M].湖南大学出版社,2008.,第95页。

② 冯开文.中国民国教育史[M].人民出版社,1994.,第92页。

③ 高翰卿.商务印书馆九十五年[M].商务印书馆,1992.,第490页。

则转移的效果越好(Nordtvedt, 2008)^①。在这个意义上,当属内在动机驱使的德大、厚生企业和美亚企业转移动机最为强烈;混合动机的项康原和王云五次之;外在动机驱使的荣氏企业和民生企业则最为被动。这种低转移意愿也为后续企业的革除工头制的科学改革受挫、并出现反复埋下伏笔。

四、执行阶段:知识转移的机制差异

受不同动机驱使的接受者们在做出了转移知识的决策之后,就进入到了知识转移的第二个阶段——执行阶段。在执行阶段,知识源与接受者双方就转移的知识本身进行交流、沟通、吸收活动。在此阶段中,接受者的吸收能力是影响该阶段知识能否顺利被吸收的重要因素,接受者主要通过转移机制吸收该知识。接受者的转移机制是多样化的,组织间促进知识转移的常见机制有四类:(一)组织学习机制。包括学习伙伴企业知识、整合并运用从合作伙伴处学到的知识与企业自身知识以及联合技术创新等形式来促进知识转移;(二)信任——承诺机制。具体表现为合作双方达成充分信任,愿意对合作关系进行承诺并分享机制,转移知识;(三)资源优势机制。利用合作双方知识的依赖性、互补性和可转移性来论证知识转移的必要性、重要性和可行性;(四)人员转移机制。组织间可以通过技术共享、多向沟通、互派人员等形式来促进知识转移。另外,企业内知识转移中的编码化转移机制也适用于合作企业间的知识转移,编码化转移机制具体指通过各种硬件、软件、文件、书面报告、数据系统、内部网络等来实现知识的获取、组织。就近代中国企业的变革实践来看,大体可以分为两类:

(一)组织学习机制

首先是受内部动机驱使的企业,如穆藕初通过考察美国的农场、在德克萨斯农工专修学校接触泰罗的科学管理法,回国翻译《科学管理原理》等途径深入学习了科学管理法,并总结了科学管理法的精髓,1914年回国之初,他一边翻译泰罗的著作,一边身体力行本着科学管理法的节省“时间、精力、物质”三大纲,筹建德大纱厂,穆藕初对科学管理法的转移机制显然属于组织学习机制。与穆藕初相似的是,蔡声白在留学期间接触到科学管理法,也是通过自身学习获取的,因而将其吸收科学管理法的转移机制划分为组织学习机制。

与此同时,受混合动机驱使的企业也呈现出组织学习机制的特征。如项康原通过发奋学语言、阅读大量有关科学管理法的书籍的方式吸收科学管理法,该种转移机制属于典型的组织学习机制。同样是受混合动机驱使的王云五做出转移科学管理法的决策既受到商务印书馆不合理的管理体制影响,同时也是出于对科学管理的浓厚兴趣使然。1930年担任商务印书馆总经理的王云五,在上任之后于1930年3月7日搭乘比亚士总统号立刻前往日、美、英、法、德、比等国考察管理,他先后前往九个国家,参观了40多家公司工厂,走访了50多位管理专家,阅书三、四百册,搜罗刊物千余种,草成笔记四十万言^②。显而易见,王云五出国考察并研究科学管理法,其吸收科学管理的机制属于典型的组织学习机制。另一家混合动机驱动的企业——民生公司——这一阶段的资料不多,但根据卢作孚在民生公司所作的制度规定,我们同样将它归入组织学习机制。

(二)人员转移机制

与上述企业不同,受外部动机驱使的荣氏兄弟1918年新办的申新三厂,产品价格无锡各厂中最低,不论是成本、产量、还是质量等各方面都赶不上日本纱厂,荣德生苦恼于生产落后,向张謇

^① Pérez-Nordtvedt L, Kedia B L, Datta D K, et al. Effectiveness and efficiency of cross-border knowledge transfer: An empirical examination[J]. Journal of management Studies, 2008, 45(4): 714-744.

^② 总结自《王云五文集》6《岫庐八十自述上》第二十章“初出国门与专题考察”。

哭诉工头们不切实于工作,在张謇的介绍下,毕业于张謇所办纺织学院的余中祥等六人被派往申新三厂帮助管理工厂,而此六人学的都是现代西洋的一套管理办法^①;与此同时,荣宗敬在 1924 年 1—2 月间,派原在日本丰田纱厂工作的楼秋泉,进入申新三厂担任粗纱间领班^②。荣氏兄弟通过引入这些受过高等、中等专业技术教育,懂得管理的新职员来帮助实施工头制改革,故荣氏兄弟吸收科学管理法的转移机制属于人员转移机制。

受不同动机驱使的民族企业家们缘何选择特定的转移机制呢?

1911 年泰罗出版了专著《科学管理原理》,彼时在西方世界科学管理法也才刚刚流行,更遑论东方了。而在海外留学的穆藕初在回国前一年才接触到科学管理法,除了穆藕初本人对科学管理法的兴趣以外,传播科学管理法的客观环境也迫使其只能通过主动学习来自西方世界的知识、整合并运用从美国学到的知识来促进知识转移。而蔡声白在 1921 年开始主持美亚织绸厂的事务,与穆藕初相似的是,他也是在海外留学过程中接触并主动学习的科学管理法,究其根源,科学管理法在西方世界的兴起和盛行是促使穆藕初、蔡声白选择组织学习机制的重要原因。

受外部动机驱使的荣宗敬、荣德生二人选择通过技术共享、互派人员的人员转移机制来促进知识转移,科学管理法早在 20 世纪初就已经传入中国,而广泛应用该知识却发生在 20 世纪 20—30 年代,据穆藕初本人表述“《工厂适用学理的管理法》译好后,全部译稿仅售了一百元,而且在这本书出版后的十年之中,只售出八百本,其中一百本是我自己买来送人的”^③,这一表述也验证了 20 世纪初科学管理法并没有引起实业界的重视。是何原因导致实业界晚了 20—30 年才开始重视科学管理法?一方面,1914—1918 年的世界大战使得西方列强无暇顾及挤占中国市场,并且还需要国内各行业向国际市场供给产品,特别是棉纺织行业在一战期间迅速发展,故而民族企业家们既没有内在动力驱使也没有外在压力去学习西方的管理体制。然而,一战以后,日本国内经历着棉纺织业的大萧条,为了应对危机,1921—1922 年间日商纷纷来华设立工厂^④,到了 20—30 年代不仅仅棉纺织业面临了激烈的竞争和外部困境,整个中国的经济发展都不容乐观,西方列强重新进入中国市场再加上 1933 年的经济危机,民族企业家们普遍面临外部经济环境的大萧条,又适逢旨在提高劳动效率、降低成本的科学管理法在近代中国的传播越来越广泛,给民族企业家们提供了管理的新方法,故而受外部动机驱使急于降低成本的民族企业家们选择了科学管理法。尽管如此,出于外部压力的民族企业家们仅仅把科学管理法当成是一种新的工具,这种工具强调通过标准化、规范化、科学化来降低成本同时提高劳工工资,有助于企业提高产量、提高生产效率、降低成本、缓和劳资关系、减少浪费,因而始终并未摆脱“西学为用”的思想,故而民族企业家们并不主动学习,而是选择雇佣拥有技术和管理背景的工程师们帮助实施管理体制的改革。

受混合动机驱使的项康原和王云五两人在做出转移决策的过程中,虽然也受企业经营状况不理想的驱动,但是从项康原学习语言、遍读科学管理书籍,王云五出国连番考察的举动可以看出,自发的对科学管理的兴趣是更为重要的因素,因而他们会选择组织学习机制吸收科学管理法。此外,两人的教育背景也是不容忽视的因素之一,项康原、王云五两人并不似穆藕初、蔡声白那样拥有海外留学背景,但是此二人也曾在国内接受过高等教育,项康原曾就读于上海工业专科学校以及吴淞商船学校。光绪二十九年,王云五曾就读于美国教会创办的英文专修学校守真书馆^⑤,光绪

① 上海社科院中国企业史资料中心:荣家企业抄档 06—003—102~146;申三大革命时期的工人运动,后简作“荣家抄档”。

② 荣家抄档 06—003—006~008。

③ 穆藕初,穆家修,柳和城,等.穆藕初文集[M].上海古籍出版社,2011,第 379 页。

④ 严中平.中国棉纺织史稿[M].商务印书馆,2011,第 219—220 页。

⑤ 《王云五文集 6》岫庐八十自述上第四章“回乡与复学”第 33 页。

三十年曾入学英国老教师私设的同文馆^①,后又入英文专修学校益智书室^②,这些入学经历给王云五烙下了深厚的英文背景,也为其日后游历英美,遍览科学管理群书奠定了基础。

五、扩张阶段:知识的吸收与保持能力

知识的接受者在沟通、交流、吸收知识以后便进入了知识转移的扩张阶段,扩张阶段开始于知识的接受者在企业中应用该知识,当企业能够顺利推行新举措后才能认定该企业完成了知识转移的扩张阶段。如果企业一开始遭遇了抵制但在扩张阶段内成功解决了问题,该扩张阶段也被认为是顺利的。在知识转移的扩张阶段,接收者的吸收与保持能力是重要的影响因素,接受者的吸收与保持能力越强,越能够顺利推行新举措。纵观近代企业的管理变革,基本呈现出三种类型:^③

(一)吸收与保持能力差

这一类企业以申三与美亚为代表。我们这里以美亚为例来说明问题。

1921年,留学归来的蔡声白以莫殇清女婿的身份在美亚织绸厂开展工作之初,便以科学管理法进行主持。从资料中我们看到,美亚织绸厂的科学管理改革在1926年开始较为引人注目,具体包括:(1)自设发行机构——美亚绸庄。之前织绸品的销售均假手绸庄,美亚厂本身并不了解销路、客户以及市场行情,1926年,蔡声白自设发行机构,此举掌握了管理大权。(2)实行差异化计件工资。1927年初,美亚设立了生产竞赛和奖励制度,实行计件工资,对产量较高者给予现金奖励,此举将企业的生产活动与工人的利益协调起来,能够充分调动工人的积极性、提高生产效率和产量。(3)实行职能管理,专业化分工。1929年设立了总管理处,并分设总务处、技术处、发行所、总账房、采办处、训练所等;各厂还会合设经纬厂、纹制合作社,这是为了能够集中生产、统一调度、标准化产品、节省流动资金。(4)注重技术进步。1930年和1931年分别成立了美亚织物试验所、美亚检查所^④,加强对技术的投入和改进,检查所通过派员对各厂半成品、成品进行检查,以有利于各厂产品的统一和改进。蔡声白对美亚织绸厂的科学管理改革是有成效的,然而美亚在改革的过程中也遇到了难以解决的工人罢工问题。近代中国的民族企业发展之所以较为曲折,外部环境的压力不可不说是重要的影响因素,美亚的科学管理改革推进到了1929年,然而1929—1933年的经济危机导致整个上海工商业全面萧条,美亚本就处于苦苦支撑阶段,然而随着美亚的南洋市场被挤占、产成品的价格——绸价日渐跌落,美亚不得不寻求脱困之法,工厂的生产成本过高,工人的工资竟然占据了销售收入的18%^⑤,于是降低工人工资便成了美亚的选择之一,然而此次降低工资的举动却引发了全面性的罢工风潮。针对工厂生产成本过高的问题,在外部经济环境不景气的情况下,美亚选择缩减经营规模,把各个分散的厂合并,且改组成立了美亚织绸厂股份有限公司,部分厂还搬离了上海,此举是为了集中力量,突破困难。其次,部分厂采用传统的“放料代织”即包机制来应对工潮,避免工人的管理问题。美亚从应用科学管理法到恢复传统的“包机制”,此举无疑是旧的管理制度的回潮。从实施科学管理改革再到选择回归到传统的管理体制中去,美亚到底缘何出现如此行径?《江南丝织工业史》中的资料透露出了部分信息,采用“包机制”一方面是为了规避工人罢工的再次管理,另一方面是为了解决企业内部成本过高的问题。“包机制”是否能有效缓解成本过高的压力呢?已有的资料显示“因‘包机制’降低成本效果卓著,使用该制度的工厂比重从

① 《王云五文集 6》岫庐八十自述上第五章“再度休学与教学相长”第38页。

② 《王云五文集 6》岫庐八十自述上第五章“再度休学与教学相长”第42页。

③ 需要说明的是,限于资料,我们无法找到民生公司管理变革的后续资料,故样本企业到这一阶段剔除民生,收缩为5家。

④ 秦瑛. 蔡声白经营美亚绸厂的智囊机构——设计委员会[J]. 上海经济研究, 1986(4): 70—74.

⑤ 裴宜理. 上海罢工: 中国工人政治研究[M]. 江苏人民出版社, 2001, 第259页, 336页。

20%上升为 1936 年 60%^①”。表面上看,美亚织绸厂 1926 年的科学管理改革因 1934 年工人全面性罢工而中断,且在解决工人罢工的问题中选择了恢复传统的管理制度,“包机制”的回潮标志着美亚织绸厂 1926 年的科学管理改革最终只停留在了扩张阶段,因不能顺利解决罢工问题而无法成功过渡到知识转移的整合阶段。

荣氏申三的情形与美亚极为相似,同样是因为工人罢工而选择放弃(1924 年管理改革,1925 年工人罢工),并且回到了之前申三所保留的工头制,这里限于篇幅,不作详述。

(二)吸收与保持能力好

这一类企业以穆藕初的德大、厚生及项康原为代表。穆藕初在 1914 年创办企业伊始,就确立了以工程师为核心的生产管理制度,制定规范的工艺流程,同时,在会计记账方法方面采用新式复式记账法,建立统计监督制度。德大“开机前后约计半年内,日间督策工作,夜间创制各种报告表格”,期间编制了各车间生产统计表、技术设备运行、维修状况报表以及各部门原料消耗、成品及成本统计表^②。在应用科学管理法的过程中,穆藕初秉承科学管理的基本原理,虽然在扩张阶段遇到了难题但是其通过灵活变通解决了难题,“从民国四年开始办纱厂以后,但凡遇到业务繁荣的年度,我的厂总比别家的工厂盈利多些,如遇到不景气的年度,即便亏本,也总比别人的厂亏得少些,这不得不说是实行科学管理的结果”^③。

而项康原主持的康元制罐厂的科学管理改革在扩张阶段的执行也颇为顺畅。1929 年 7 月以后,项康原开始主持科学管理改革,改革的主要举措如下:(1)实行职能管理。康元厂设总务处,总务处又下设立各分部,各分部下设各股,各分部各股专司其职,分工合作又相互衔接。(2)人事管理制度化。凡是应聘的职工,进厂需填履历表及担保人,上班时必须准时签到。(3)依据实际情形,实行标准工作时间。康元厂原工作时长为每天 12 小时,为了有效提高劳动效率,标准工作时长减少为每天 9 小时。(4)标准定额制度。试行科学管理法之初制定各类产品、半成品的标准工作量和耗用原料的标准定额以及检验标准。超额有奖,达不到标准必罚。简言之,康元制罐厂的科学管理改革覆盖了科学管理法的标准化原理、时间研究原理、职能管理原理以及差别性计件工资制度。事实上,工人们初始抵触此套以提高劳动生产效率为中心的科学管理制度,但时间一长,因为绝大多数工人都能达到厂里制定的标准,且都拿到了超额奖,反对声也就渐渐消散了^④。康元制罐厂实施科学管理改革之所以区别于其他样本企业较为顺畅的原因,一方面在于康原厂能够依据工人工作的实际情形及时调整工厂标准,比如将额定的标准工作时长减少为 9 小时,另一方面,康元厂的职工教育和管理也是不可忽视的重要原因。早在项康原本人学习西方科学管理时,他就曾自上而下地贯彻对科学管理法的学习,他曾召集职员系统讲解科学管理法,并且分发书籍给厂中人员,还会亲自检查阅读情况,正是由于在吸收阶段对厂中人员的知识灌输导致厂内职工对新的改革的反对声颇不成规模。科学管理改革给康元制罐厂带来了更加长足的发展,1928 年的康元制罐厂的营业额猛增到了 30 万,生产成本也由 20.8%下降至 14.1%,开支成本由 32.7%下降至 25.1%,1933 年,由于厂内业务和规模的扩大,康元制罐厂正式改组为康元股份有限公司。

(三)吸收与保持能力出现波折

与前面两类企业不同,王云五主持的商务印书馆在实施科学管理改革中较为波折。1930 年 9 月王云五结束国外考察后开始制定科学管理计划,期间实行以人、物、财为中心的全面科学管理改革,主要措施如下:(1)改革组织管理体制。取消总务处会议制度,改为总经理独任制,该项管理体制

① 上海社会科学院经济研究所:徐新吾.近代江南丝织工业史[M].上海社会科学院出版社,1991,第 326、338—339、341—342 页。

② 沈祖炜主编.近代中国企业:制度和发展[M].上海人民出版社,2014,第 158 页。

③ 穆藕初等著,赵靖.穆藕初文集[M].北京大学出版社,1995,第 578 页。

④ 孔令仁,李德征.中国老字号.肆工业卷(下册)[M].高等教育出版社,1998,614—617 页。

制的改革避免了合议制度下互相推诿、无人办事的情形。(2)依据科学管理原理,提出实行“科学管理计划”。该项计划包含 12 个子计划,分别为预算制度、成本会计制度、统计制度、工厂合理布置与机器充分使用、岗位分类与新职员管理、动作研究与节省疲劳、时间研究、劳心工作标准与奖励制度、标准化与简单化、按件计酬制与售货量比较制、改良与健全组织机构、训练员工与管理人、迅速处理劳资纠纷等等,该项科学管理计划包含了时间研究、动作研究、标准化等工作原理,财务核算与成本核定、推行标准化,使各部工作顺利衔接、明确职责,量化工作、按成绩取酬、机构改革为纵横结合形式,实行总经理独裁。虽然王云五制定出了较为全面的计划,但是最终改革还是采取了先试点的办法。1930 年 12 月 18 日,王云五决定先在馆内编译所试点,并于 1931 年 1 月 10 日宣布了《编译所编译工作报酬标准试行章程》,该项章程的颁布正式启动了科学管理的改革。然而商务印书馆的改革无疑也遭遇到了馆内职工的反对,1931 年 1 月 15 日,编译所召开职工大会,决议暂缓承认编译所的新章程,并且选择仍照向例工作,随后馆内其他三个职工工会也加入了反对行列,声势浩大。1931 年的 1 月 19 日,编译所再次召开职工大会,还邀请社会名流参加,将馆内纠纷推向社会,这场声势浩大的馆内纠纷最终以王云五的妥协而告终。为了缓和馆内矛盾,经上海社会局调节,王云五提出撤回原案,第一阶段商务印书馆的科学管理改革以失败告终^①。在事后的反思中,王云五认为自己过于急功近利,所以实施全盘计划,导致馆内职工的反对,他认为改革应分步骤、按次推行,循序渐进,然而此次编译所科学管理计划的流产并未阻碍王云五实施科学改革脚步。如果说蔡声白主持的美亚织绸厂在外部萧条的情况下导致最终改革功亏一篑的话,那么 1932 年的外部动荡反而给了王云五第二次实施科学管理改革的机会。1932 年 1 月 28 日爆发了“一二八事变”,商务印书馆在该次事变中损失惨重,物质损失占总资产的 80%,王云五开始着力复兴商务印书馆,然而鉴于第一次科学管理改革过于激进的后果,第二阶段的改革王云五采取了将科学管理化整为零、分项实施、明暗结合,曲折实行的方针,此次科学管理改革主要以物、财为中心并不涉及人事改革,且改革历经了 5、6 年之长。首先,机构方面,成立了总管理处,总管理处受总经理管辖,总管理处又下设六个部门,各司其职、互相协助。其次,物品使用方面,实行出品及原料的标准化、不购买新机器,增加对旧机器的利用率、使各部门工作顺利衔接。再次,人事改革方面,由于商务印书馆损失惨重,因而采取精简原则,解雇了 2/3 原职工,并实行“特别奖励”激励职工,制定严格的工作标准和管理制度。最后,财务方面,由于对事务的管理收到了成效,财务状况也甚为好转。很显然,第二次科学管理改革给商务印书馆带来了巨大的变化,第二阶段的改组以后,商务印书馆在结构上具备了现代企业的雏形。1932 年,商务印书馆出版物数量仅占全国的 6%不到,到了 1934 年已经占据全国市场的 45%,1936 年更是占据了半壁江山,占比达到了 52%^②,值得关注的是与第一次全面科学管理改革遇到的声势浩大的馆内职工反对不同的是,第二次改革并未遇到任何反对声音。究其原因,一方面由于外部政治环境的动荡和 1933 年上海经济的萧条,由于经济环境不佳,工人们害怕失业,故而并不会选择在此阶段罢工;另一方面,第二次改革期间曾解雇了 2/3 的原职工也是重要原因之一。

六、整合阶段:知识转移的情境因素,以及转移粘性

如果知识转移的过程在扩张阶段并未能解决意想不到的问题,那么知识转移就停留在了扩张阶段,如果转移双方顺利度过了扩张阶段就会进入到整合阶段。在知识转移的整合阶段,如果企业持续使用该种知识并且将其融合成企业的日常惯例,这样的知识转移则是成功的,如果企业由

① 《岫庐八十自述》197 页。

② 高晓东. 民国时期科学管理思潮研究(1927—1937)[D]. 南京大学,2011。

于各种原因未能持续保持对知识的使用和融合,则此时知识转移遇到了粘性,并未能顺利完成知识转移的整合阶段。已有的研究认为导致整合阶段转移出现粘性的显著因素包括:接受者缺乏转移动机、接受者的吸收与保持能力不足以及企业组织的不良环境(Suzulanski,2000)。然而在对近代企业的史料分析中,我们却观察到,相对于内部因素,诸如企业组织的不良环境等外部因素,更不利于新知识的持续应用和保持非内部因素。更进一步来说,外部因素也包含知识转移的转移国与目的国之间的文化距离,以及外部的经济环境差异等等。

在我们所讨论的样本企业中,蔡声白主持的美亚织绸厂,荣宗敬、荣德生主持的申新三厂因外部困境以及工头与新职员的矛盾等原因,导致知识转移过程停留在了扩张阶段,而德大、厚生纱厂、商务印书馆以及康元制罐厂进展到了知识转移的最后阶段——整合阶段。在这一阶段,三家企业走向了两个不同的归属,成功进行整合的是商务印书馆和康元制罐厂,反倒是最早在国内鼓吹科学管理法的穆藕初企业功亏一篑,这里我们以失败的穆藕初企业为例来进行分析。

前文已经提及,穆藕初时任厚生纱厂的总经理,但是厚生纱厂却为四大股东所把持。公司、股份制度这些都是外国的舶来品,即便在近代中国的土壤上遍地开花,但实际上却没有多少人能真正理解公司的内涵。对于当时的公司股东们而言,公司运营的红利远比实业本身更重要。在穆藕初企业里,大股东贝润生和薛宝润占据了 3/4 的股份,穆藕初并不拥有纱厂的任何股权。由于经理人与股东的目标不一致,因而在经营方面,穆藕初难免与公司大股东结下了重重矛盾,特别是当厚生纱厂处于困境之中时,矛盾不断被深化。矛盾之一体现在穆藕初积极推崇新式管理法,允许他人学习厚生生产及管理办法,此举引发股东不满;矛盾之二体现在股东作为公司决策者无人办事,管理缺位。1922 年因战事原因,钱庄停止了对企业的新放款,并且还要到期收回放出的信用贷款,厚生纱厂无法偿还 200 多万两到期款,而公司的最大股东薛宝润对此坐视不管;矛盾之三体现在公司大股东薛宝润未经董事会及总经理穆藕初同意便聘请李迪先担任协理,此举引发穆藕初不满,气忿之下于 1923 年 5 月 22 日辞职。离开了穆藕初领导的厚生纱厂后期是否继续实行科学管理法不得而知,但是通过荣家企业史料,我们可以间接探知厚生纱厂在 1923 年之后的经营状况:1931 年 10 月,因颜料商薛宝润无意经营,加之厚生欠钱庄款项无法偿付,厚生纱厂被荣氏收购改编为申新六厂,1924 年德大也破产被申新系统收编为申五。从前后经营状况不难判断出厚生纱厂后期可能并未继续实行科学管理改革,并最终走向了覆灭。

由此,我们可以将这些企业在管理变革中的知识转移粘性加以归类,转移粘性(Stickiness)通常用来讨论知识流动的难度,转移的难度越大,则粘性越大。而过高的转移粘性会阻碍知识的有效转移,从而降低组织的核心竞争力。这里我们根据既有的讨论将这些企业的知识转移粘性角度归为三类:

一是高转移粘性,以申三为代表。申新三厂的知识转移过程较为一波三折,为了摆脱外部的经济危机,出于外部动机驱使的申新三厂开始施行科学管理改革,但是区别于其他的近代企业,申新三厂选择通过借助第三方来实施改革。由于新职员的改革过于激进,一方面工人感到受约束太紧,工作强度陡然变大并不自由,另一方面工头们也因为新职员的改革丢了饭碗,对新职员充满了怨恨的情绪,因而工人们在工头的挑唆下发生了工人大罢工事件,从工人殴打工程师的行为不难判断出工人本身对于科学管理方法的不满,而新职员又不懂得循序渐进的改革。在组织学习中,导致扩张阶段知识转移出现粘性的主要因素是转移方的吸收与保持能力,而造成申新三厂吸收与保持能力的原因即新旧管理体制的冲突。因为申新三厂一开始是出于外部动机驱使开始转移的科学管理法,其并非是信仰科学管理法,而是想用科学管理法帮助申新三厂走出经营不佳的困境,故而企业家并非信仰科学管理法,当转移出现粘性时,为了避免更大的矛盾,企业主们会选择妥协式的改革,而不是排除万难继续执行改革。

二是低转移粘性,以美亚和德大、厚生为代表。基于本文之前的解释,我们不难发现美亚织绸

厂与德大、厚生纱厂均是在知识的扩张阶段,即应用并推行该知识时容易遇到粘性问题。而导致粘性问题的原因并非新旧管理体制本身的冲突,而是外部的情境因素如缺失的商业文明、恶劣的经济大环境等等。

第三类是转移成功的类型,以康元制罐厂以及商务印书馆为代表。这两家企业尽管在初始阶段的转移意愿为混合动机,且商务印书馆在扩张阶段还曾经遭遇过一次改革的失败,但都走到了最后。实际上,这两家企业的管理改革成功来自对转移粘性的有效克服,而非其粘性本身就低。

综合上面的三种情形,我们总结得到下表(见表3),该表也可视作知识转移路径与近代企业管理革命关系的一个归纳。

表 3 近代样本企业知识转移的科学管理改革四阶段

企业名称	科学管理改革阶段				转移粘性
	初始阶段	执行阶段	扩张阶段	整合阶段	
民生公司	√,外在动机	√,组织学习	—	—	—
申新三厂	√,外在动机	√,人员转移	×,差	×	×,高转移粘性
美亚织绸厂	√,内在动机	√,组织学习	×,差	×	×,低转移粘性
德大、厚生纱厂	√,内在动机	√,组织学习	√,好	×	×,低转移粘性
商务印书馆	√,混合动机	√,组织学习	√,波折	√	√,转移成功
康元制罐厂	√,混合动机	√,组织学习	√,好	√	√,转移成功

七、结 语

在外部环境诱使或逼迫下,近代中国企业进行了系列科学管理革命,这其中尤以革除工头制为代表。在对比分析之后,我们看到,所列举的各样本企业,从改革动机到改革路径,再到改革结局大相径庭。尽管我们所讨论的样本企业有限,但从已有的分析中,仍然可以得到一些有益的启示:

1. 近代科学管理变革从知识转移的角度来看,是一个完整的链条,成功的转移要求链条不能中断。任何一个环节的失败均可能会导致知识转移的失败,甚至可能会导致企业因此走向覆灭。德大、厚生即是因为不彻底的改革导致企业易手而最终走向消亡。

2. 科学管理改革的初始动机并不能决定改革的结果,可视为知识转移链条中的次要环节。但改革的动机是主动还是被动,会影响到企业在执行阶段会采取何种知识转移模式,而转移模式同样有优劣之分,人员转移模式与组织学习模式相较,转移的效果更差,进而会使得整个转移的链条更脆弱。申三即是先天动机不足,而后续转移环节未能充分强化,反而在扩张阶段即因较差的保持能力而导致变革流产,进而导致高转移粘性的一个案例。

3. 转移链条中短暂的挫折并不会使得管理变革必定会走向失败,在某些环节上适当的妥协与回归有可能会赋予企业二次变革,及成功变革的机会。这一点在商务印书馆身上有充分的体现。

4. 整合阶段是转移链条中最困难,也是最为惊险的环节。所谓“画虎画皮难画骨”,创新姿态如穆藕初企业,亦仍然无法在整合阶段将所引入的科学管理法变成企业日常自觉的行动。实际上,整合环节能否顺利进行直接体现了企业管理变革中是否存在转移粘性。

5. 情境性因素是影响知识转移整合阶段能否成功的主要因素,这一点与若干学者分析后认为外部环境是导致近代中国企业管理变革失败的看法不谋而合。至于当外部情境导致整合困难时,企业当如何克服以推进改革则又是另外一个故事了,也将是后续进一步研究努力的方向。□

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Scientific Management of Private Enterprises in Modern China

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Abstract: The Thought of scientific management began to be introduced into China from the beginning of the 20th century. Until 1920—30's, the national entrepreneurs began to respond to this thought extensively. An unprecedented scientific management revolution was launched in the Chinese industry. One of its contents was to get rid of the traditional foreman system, but in the actual operation, the effect of each enterprise's change was not the same. Based on the theory of knowledge transfer, this paper discusses the conditions and motivations of this change, the mechanism of transfer and the different characteristics of knowledge application, and takes six typical enterprises, such as Deda, housheng, Minsheng, Meiya weaving, Shenxin, commercial press and Kangyuan can factory, as the objects to be discussed. Different knowledge Transfer Stickiness lead to modern China In practice, enterprises have different ways of management reform, and based on this, modern enterprises that have carried out management revolution are divided into three categories: successful transfer, low transfer stickiness and high transfer stickiness.

Keywords: Knowledge Transfer; Transfer Stickiness; Foreman System; Scientific Management



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中国特色社会主义政治经济学研究

5 论习近平新时代全面深化改革思想

竞 辉

15 马克思贫困理论及其中国化的探索与发展

汪连杰

22 习近平新时代金融思想述论

韩心灵

新时代经济高质量发展研究

31 经济高质量发展的新型结构

周振华

35 研发支持政策、制度环境与企业研发投入

林木西 张紫薇 和 军

金融安全、稳定与系统风险防范

49 我国卫生筹资中政府与市场的作用研究

周 婷

征 稿 启 事

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新型经济全球化研究

- 61 “一带一路”基础设施投融资合作基础与机制构想

李 原 汪红驹

经济史与经济思想史研究

- 72 谭崇台经济发展学术思想研究

张 旭

- 79 改革开放40年我国城镇居民财产性收入不平等状况的演进分析

韩海燕

- 90 清代粮价数据质量及其制度性因素探析

余开亮

- 100 抗战前中国民营棉纺织企业成长因素分析(1894-1937)

姚清铁 陈 倩 刘子恒 郭 萍

- 118 近代在华外商企业产权结构研究
——以美商上海电力公司为例

陈碧舟 龙登高

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抗战前中国民营棉纺织企业 成长因素分析(1894—1937)*

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内容摘要: 棉纺织业作为近代中国民营机器工业中较为发达的一个部门,在抗战前获得了长足的发展。本文通过史料梳理,在分析了近代民营棉纺织企业成长的特点后,结合使用案例分析法与扎根理论,得到近代民营棉纺织企业成长的主要因素:1. 机遇和资源驱动是企业成长的基础;2. 不稳定的环境和管理水平是企业持续成长的主要障碍;3. 扩充和并购能力是企业高速成长的催化剂;4. 战略企业家和技术研发是企业开拓创新的源泉。这些因素同样也为当代中国企业的成长提供了有益启示。

关键词: 企业成长 因素分析 棉纺织企业 扎根理论

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一、引 言

在近代世界经济发展的历史上,与国外相比,中国的机器大工业起步的时间晚,发展的时间短,且水平低。这其中,民族机器大工业的起步时间则更是滞后,在重重内外因素的夹击下,发展过程也显得迟缓。尽管如此,到了二十世纪二、三十年代,中国的民族工业仍然迎来了属于自己的成长黄金期,这其中,相对较为发达的棉纺织企业的成长与发展则更早一步。严中平认为,在近代棉纺织业中,“开车”运转之后的厂数的多少最能反映行业的实际发展水平,因为它相较于其它的指标更能反映棉纺织企业对中国经济发生影响的时间。按这一标准,“结果最多年份应该在 1921—1922 年间,此项数字始真代表中国棉纺织企业发展之实际状况。”^①

从 19 世纪末第一家民族棉纺织企业诞生到 1920 年代这一行业进入高速成长期,近代中国民营棉纺织企业的成长,不可谓不艰辛。从 1894 年到抗战全面爆发的 1937 年的四十多年间,民营棉纺织企业的成长过程可谓险象环生——既要面临政府的更迭、战乱、国际竞争、灾祸等一系列外部环境带来的种种压力;也要能够及时处理技术落后、管理不当、资金募集困难等企业内部的问题,稍有不慎就面临着倒闭的危险。在经营困难时,或被他人租办继续经营;或被拍卖;或落入外商之

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① 严中平《中国棉纺织史稿》,商务印书馆,2011:439。

手;或停工。更有甚者,一次意外的天灾人祸亦可将一家规模不小的企业推向绝境,如通久源纱厂和通裕纱厂就是先后(1917 年和 1920 年)毁于意外的火灾。

对于近代民营企业的成长问题,已经有了较为丰富的著述。综合来看,已有的研究基本有两类:一类集中于企业的扩张方面,讨论企业的边界扩展,如马俊亚(1999)等人认为,近代民营企业为了盈利和获取资金,通过多元化投资,家族式经营来建立企业联合体,这种企业机构的扩张已经使其非常接近于企业集团的形式;另一类则从财务、人力资本、技术、原料以及外部市场等方面,通过个案分析来讨论近代企业的发展,财务角度如徐鼎新等(1979)对永安“黄金期”的分析,茅家琦(1994)对大生的讨论;技术角度如肖爱丽(2014)对申新纱厂的创新分析。

从企业边界扩张角度分析企业发展的传统源自于斯密的古典经济学,威廉姆森(1996)等人则从资产专用性、不确定性和交易效率等视角对此进行了进一步深化,这种基于市场机制对企业所进行的分析方法无疑是有效的,但 Penrose(1959)认为古典经济学的视角忽略了企业的异质性,也没有考虑到企业对内部资源的应用。通过个案分析的方法讨论企业成长无疑可以立体地还原企业成长中方方面面的影响因素,而缺陷则在于难以通过归纳得到通用性的规律,缺乏一般性。

在近代企业成长的分析中,如何调和企业的同质性与异质性,一般与个案的关系?为此,本文尝试使用扎根方法对近代棉纺织企业成长进行因素分析,^①通过多案例比较分析来得到一般性的成长原因,并以此来进一步解析影响近代棉纺织企业的成长因子及其传导机制。

二、战前民营棉纺织企业的成长

在进行具体分析之前,首先需要对这一时期的民营棉纺织企业的成长概况作一分析。关于企业成长量化的指标,国内外学者给出了一些参考,Chandler 和 Hanks(1994)将销售额、资产、职工、利润等作为指标衡量企业的成长。国内学者使用财务指标来衡量企业成长的比较多,如余红剑(2007)将销售额、雇员及市场份额作为衡量企业成长的三个指标。对于本文的讨论来说,主要指标应包括历年厂商的数量、历年纱锭数及其增长率、工人数量和资本额等,但由于年代的久远、数据资料的不足,目前通过史料挖掘整理,能得到较为齐全的衡量近代棉纺织的企业成长的指标主要是厂商数和纱锭数,这也将是本文的主要分析指标。分析的时点则从 1894 年第一家民营棉纺织企业开始,至 1937 年抗日战争全面爆发结束,历时四十余年。所讨论的区域总体为全国,具体区域依照近代报刊中对棉纺织企业的区域划分,细分为上海、江苏、河北、湖北和其他等省区。

在资料方面,严中平在《中国棉纺织史稿》中对 1890—1937 年的新开工纱厂数和纱锭数量提供了大量基础性研究,本文以此为蓝本加以增补。主要的依据是华商棉纺织企业联合会刊印的《中国纱厂一览表》和国民党统计委员会发表的《全国棉纺织厂调查报告》,对于其中有冲突的地方,以华商棉纺织企业联合会编制的一览表为准。关于记载各厂开车年月及其变动状况者,有两种较完备的调查,一是华商纱厂联合会所刊印的《中国纱厂一览表》,一为国民党统计委员会发表

^① 扎根理论(Grounded Theory)是一种定性研究的方式,其主要宗旨是从经验资料的基础上建立理论(Strauss,1987)。研究者在研究开始之前一般没有理论假设,直接从实际观察入手,从原始资料中归纳出经验概括,然后上升到系统的理论。这是一种从下往上建立实质理论的方法,即在系统性收集资料的基础上寻找反映事物现象本质的核心概念,然后通过这些概念之间的联系建构相关的社会理论。扎根理论一定要有经验证据的支持,但是它的主要特点不在其经验性,而在于它从经验事实中抽象出了新的概念和思想。这一研究法由哥伦比亚大学的 Anselm Strauss 和 Barney Glaser 两位学者共同发展提出。本文限于篇幅,不作过多介绍。

的《全国棉纺织厂调查报告》。^①前者出自各厂的通讯报告；^②后者为 1934 年之实地调查。

通过整理的这一时期民营棉纺织企业数量可以通过图 1 得到反映。从图上看,最早的民营棉纺织企业出现在上海和河北,且上海的棉纺织企业数远远高于其他地区,约占全国总棉纺织企业数的三分之一。江苏的民营棉纺织企业虽晚至 1897 年,但是发展迅速,且很快便成为仅次于上海的棉纺织企业数最多的地区。在很长一段时间里,江苏和上海的棉纺织企业数之和,占了全国棉纺织企业数的一半多。应该说,长三角地区的棉纺织企业数量与发展速度,与当地较好的纺织传统是有关系的。从时段上看,1920—1921 年是棉纺织企业数增长最多的年份,一系列棉纺织企业如雨后春笋一般,纷纷涌现。第一次世界大战的爆发,让西方国家无暇顾及中国,中国民营纱厂有了喘息的空间,也为后来纱厂快速发展和成长奠定了基础;从 1918 到 1924 年,各区厂商数量都增长明显,尤其是上海——1920 年到 1922 年纱厂数量直线上升,这正是中国民族棉纺织企业成长的黄金时代。1924 年之后,各区纱厂只是小规模的增长,渐趋平稳。

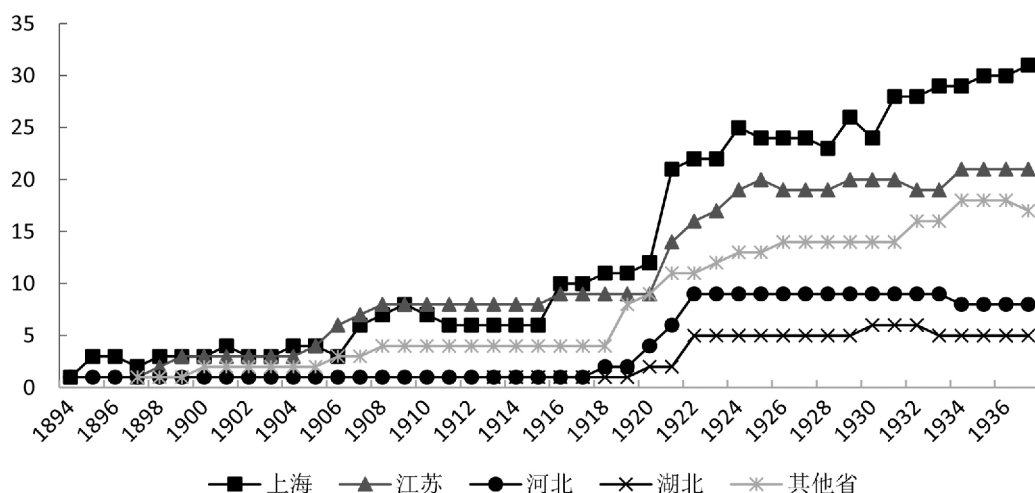


图 1 各区 1894 年—1937 年厂商数折线图

资料来源:根据民国报刊历年纱厂一览表整理。

当把这一时期的厂商数变化以增长率展现出来时(如图 2),^③可以看到,有三个增长较为明显的时段:一是 1896—1900 年,此时清政府出台政策,鼓励工商业的发展,各地掀起了实业救国的浪潮;二是 1905—1910 年,三是 1918—1922 年,第三时段也是增速最快的区间,此时是中国棉纺织业的黄金时期,新建厂商非常多。

① 《棉业月刊》第一卷第 4 期及第 7 期。

② 因为没有在华商纱厂联合会的季刊上找到纱厂一览表,所以依据均为近代报纸转载华纱联的中国纱厂一览表,具体参考的报刊为:1909 年《东方杂志》,1909 年《华商联合报》,1916 年《中国国货月报》,1921 年《钱业月报》,1924 年《大陆银行月刊》,1925 年《中外经济周刊》,1926 年《经济统计》,1930 年《工商部上海商品检验局丛刊》,1933 年《中国经济》,1933 年《中央银行月报》,1933 年《国际贸易导报》,1934 年《纺织周刊》,1937 年《中外经济情报》,1937 年《棉业月刊》。此外,1919 年数据参考 1920 年《华商纱厂联合报季刊》第 217 页,此处转引自森时彦《中国近代棉纺织业史研究》第 146—148 页。

③ 由于数据过多,且变化程度很大,直接做同比增长图比较繁乱,所以对同比增长率取对数值 $\ln$,得到同比增长率对数值再做折线图。经对数处理之后,在同比增长的折线图中,0 轴以上的,无论是上升还是下降,均表示增长,其中上升为增速增长,下降的曲线表示减速增长;0 轴以下的,均表示减少。

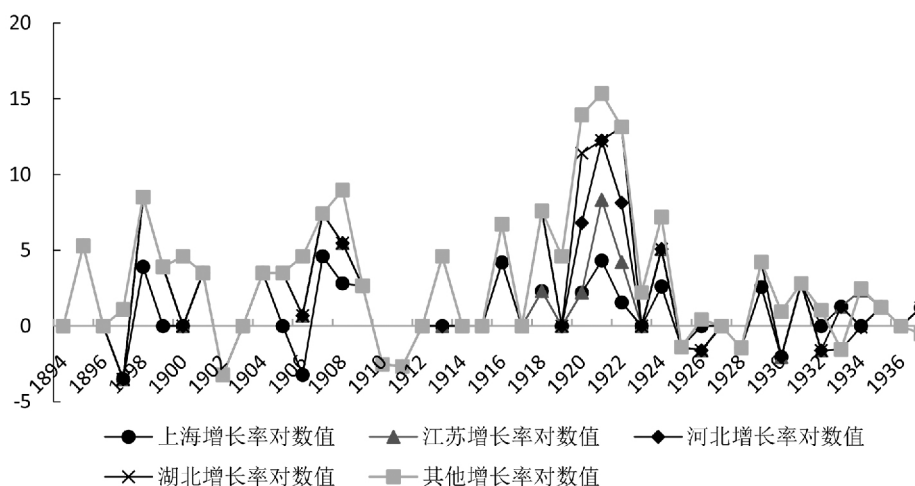


图2 各区1894年—1937年棉纺织企业数同比增长率对数值折线图

资料来源：根据民国报刊历年纱厂一览表整理。

再来看各区1894—1937年纱锭数增长的情况(见图3)。与上文棉纺织企业数量大多数年份在上升的情况相比,各地区及全国的纱锭数每年的情况显得较为不同,有的上升了很多,有的下降了很多,波动大,这是由于有的企业处于成长的状态,有的企业成长失败或遭遇天灾人祸而消亡。总体上而言,各地区纱锭数量还是不断上升的。就具体时段来说,1894到1906年间各区纱锭数都很低,增长幅度也很小;从1906年到1918年,除河北省外其他四区纱厂纱锭数有了不同程度的增长,且江苏省纱锭数一度超过了上海;1918年到1926年,这段时期各区纱厂的纱锭数增长幅度最大,上海的纱锭数增长最多,遥遥领先,成为中国棉纺织业发展的重地,江苏省紧随其后。

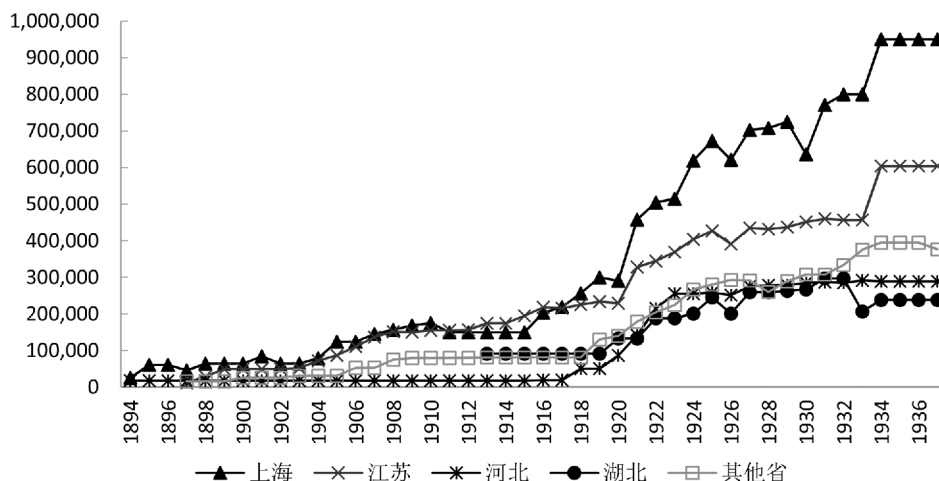


图3 各区1894年—1937年纱锭数折线图

资料来源：根据民国报刊历年纱厂一览表整理。

从图4的纱锭增长率变化图上看,纱锭数和棉纺织业数增长率的折线图趋势较为接近,1896—1900年和1918—1924年,纱锭数的增加量非常可观;而1903—1908年间,虽然新建棉纺织业数增长的不多,但各厂的纱锭数仍有一定规模的增长。

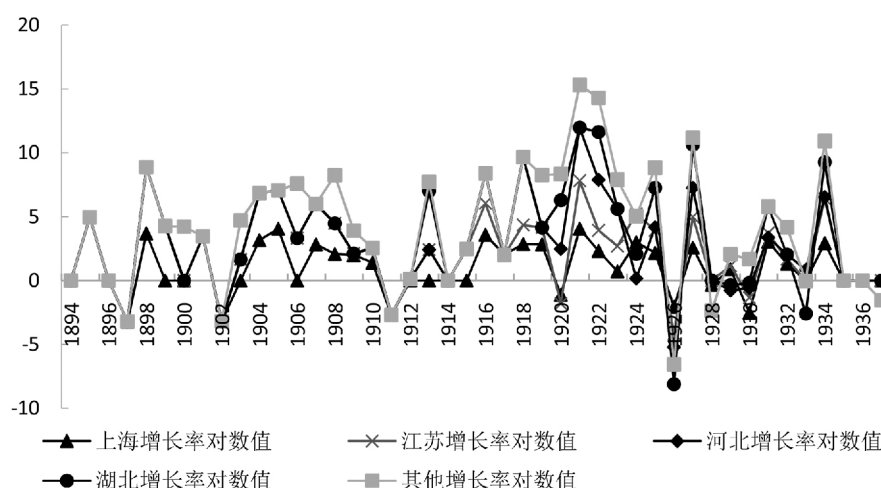


图 4 各区 1894 年—1937 年纱锭数同比增长率对数值折线图

资料来源：根据民国报刊历年纱厂一览表整理。

总体来说，通过纱锭数和纱厂数所呈现出来的近代民营棉纺织企业成长的趋势大多时候是一致的，包括一战后的飞速发展时期。也有背离的情况，如 1912 年到 1914 年，厂商数高于纱锭数增长，而在 1916 年到 1918 年，纱锭数同比增长率高于纱厂数，这说明纱厂内纱锭数目有大规模的扩大。

三、研究设计

(一) 研究方法

基于前文对民营棉纺织企业成长脉络的基本分析，我们将继续探求其成长的原因，进行因素分析。分析的基本思路是综合运用扎根理论和案例研究，这其中，案例研究方法为基础，扎根方法为主导。

案例研究主要通过分析典型案例的资料，力图获得一个整体的、全面的观点。它注重对过去某事物的现象和走势的解读(Kerlinger, 1985)，这将有助于我们更清晰地理解近代中国民族棉纺织企业的成长，所以案例研究是本文的基本方法。扎根理论的主旨则是通过资料来建立理论，本文主要使用的是程序化扎根理论(Strauss, 1997)，主要步骤是收集资料贴标签、开放式译码、主轴译码以及选择性译码等，通过归纳概念、获得关键信息来提炼出近代中国民族棉纺织企业成长的要素，然后综合理论分析，构建近代中国民族棉纺织企业成长的理论框架。

之所以选择这样的研究方法，是因为对于近代的企业，由于资料的限制，无法展开样本数量充足的定量分析，而严格执行的扎根方法则可以在充分利用既有资料的基础上，得到较为可靠的结论，这一结论具有可复制性、严谨性、准确性和可验证性。

有鉴于此，本文将首先收集近代中国民族棉纺织企业成长史料，并参考多个二手史料来保证内容的完整、客观性，然后利用扎根方法来探索近代中国民族棉纺织企业成长要素，把资料分化重组，概念化、范畴化，从而得到扎根于史料的近代民族棉纺织企业成长的过程模式和理论框架。最后使用合理的策略，使得扎根研究在构建效度等信度效度指标符合要求(Yin, 1989; 吕力, 2014)，尽量保证客观性和严谨性。

(二) 研究样本选取

样本选择其实是对典型案例的选择，要求如下：第一，案例的研究资料较为丰富，基本上可以

梳理出近代民营棉纺织企业成长的过程,案例研究资料的记载有不同的视角,从而确保资料的真实性和客观性。第二,样本案例是近代中国民营棉纺织企业中不可忽视的重要企业,比如企业规模很大、连年盈利很多等。第三,案例资料应该以近代中国民营棉纺织企业的成长为中心的内容,因为本文重点研究的是企业成长问题,确保资料能够将企业整个成长过程较为完整的记载下来。除了这三点要求,为了综合分析不同时期企业成长共性和个性,在近代民营棉纺织典型企业案例的选择上,时间上要分布得均匀。根据以上条件,我们获得选择近代中国民营棉纺织企业成长问题的样本四个具体标准:(1)时间为近代。由于本文研究方向的限定,所以选择 1894—1937 年期间活跃的民营棉纺织企业;(2)企业性质为民营企业。在对棉纺织企业进行研究的时候,我们将选择民营企业,剔除官办和外资,这同样也是本研究主题的限制。(3)信息的可获取性。由于时间久远,且近代记录企业史料档案并不完善,近代棉纺织资料多是从民国报刊、档案等处获取,很多规模较小的棉纺织企业资料很少,所以我们要选择信息较为公开全面的案例,有利于数据和资料的获得,保证研究的有效进行;(4)案例的代表性。案例的选择以比较能集中反映近代民营棉纺织企业成长的代表性案例为原则,以提高研究的效度。

按照以上四个标准的原则,我们选择了张謇(大生纺织系统)、荣氏兄弟(申新系统)、郭氏家族(永安系统)以及徐荣廷等人(裕大华系统)这四家企业系统,如表 1 所示。^①

表 1 四大企业系统厂商基本信息表

企业家	企业系统 (企业数量)	纱厂名	地点	开办年	基本情况
荣氏兄弟	申新纺织系统—9	申一	上海	1914	新建厂
		申二	上海	1917	1916 年恒昌源纱厂,1917 年收购
		申三	无锡	1919	新建厂
		申四	汉口	1922	新建厂,1927 年受北伐军影响停业,1931 年洪灾
		申五	上海	1924	德大纱厂
		申六	上海	1925	先租办常州纱厂六年(1925—1931),1916 年厚生创办,于 1931 年被收购
		申七	上海	1928	购自英商东方纱厂(原为德商瑞记)
		申八	上海	1930	新建厂,为申新一厂之副厂,故合并讨论
		申九	上海	1931	1888 年官办华新纺织总局,改组集成、又新、三新纱厂,最终于 1931 年售与荣氏,为申新第九厂
郭氏家族	永安纺织系统—4	永安第一	上海	1921	新建厂,原名上海永安纺织有限公司
		永安第二	上海	1921	收购大中华纱厂
		永安第三	上海	1928	1916 年鸿裕纱厂
		永安第四	上海	1930	实为永安第二厂之西厂
徐荣廷等	裕大华纺织系统—2	裕华	武昌	1922	新建厂
		大兴	石家庄	1922	新建厂
张謇	大生纺织系统—4	大生第一	南通	1899	新建厂
		大生副厂	南通	1920	新建厂原名大生八厂永丰租办数年,1927 年大生收回自办,改成副厂
		大生第二	启东	1904	新建厂曾用名大生新厂分厂
		大生第三	海门	1920	新建厂

^① 共列出 19 家纱厂,其中大中华纱厂原本也属于裕大华系统的重要一支,但其创办年为 1936 年,而我们研究近代民族纱业时间为 1894—1937 年,故暂不讨论大中华纱厂;其次,在表中所列的 19 家纱厂中,永安第四纱厂,实为永安第二纱厂之分厂,故合并讨论,不再单独讨论永安第四纱厂;同样,申新第八厂实为申新第一厂之副厂,故合并讨论,不再单独讨论申新第八厂。

四、资料分析

单案例分析是多案例研究方法的第一步,从而确定资料收集和挖掘的关键点和范围;根据单案例分析的结果,再对后续的案例有侧重点的分析,一步一步地修正研究结论,直到理论饱和(Yin,2004)。因此选好单案例非常必要,它会对整个研究产生重要的影响,单案例选择要求研究者对样本有总体认识,从而准确选出最有代表性的单案例。本文选择申新棉纺织企业的资料作为第一个研究的案例,接着对大生、永安、裕大华等企业系统的资料分别译码从而进行补充。

资料分析其实就是对数据资料的编码,具体内容包含开放性编码、主轴编码、选择性编码和建立理论,这是一个渐进的过程。开放性编码是对收集来的资料进行分析对比、归纳概念、总结范畴;主轴编码则是按照编码典型模型来把开放性编码中获得的范畴进行联系,其中编码典型模型便是主轴,包括“因果条件—现象—脉络—中介条件—行动/互动策略—结果”,重新整合资料获得主范畴和副范畴;通过选择性编码获得核心范畴,统摄所有材料,形成故事线,让所有范畴能够联系成为一体。

(一)申新棉纺织企业成长的单案例分析

1. 开放性译码

在进行开放性的译码时,既要鄙弃偏见,又要保持心态开放,还要避免已有研究结论的干扰。把握好材料中所有可能的信息素,按照数据资料本身状态进行开放性译码。开放性译码的步骤是,首先贴标签和定义现象,就是说将原始数据分解为单个事件,并赋予其代表性名字,来说明其内涵(Strauss,Corbin,1990);其次概念化,将定义的现象归纳为完整的概念;最后是挖掘范畴,即围绕某一概念,并将其他概念聚集得到概念群,同时挖掘范畴的面向,面向代表范畴的属性在一个连续系统上所有不同的位置。建立上述开放式译码流程的基础上,综合本研究已定义的企业成长的标准,表2是对申新无限纺织公司的资料开放性译码示例。表中第一列是引用的资料,第二列“定义现象”就是一个标签化的过程,将第一列中与企业成长有关的词句后标注“(ax)”来指代,并进行初步提炼;表格中第三列“概念化”和第四列“初始范畴”是进一步分析、重组、抽象和聚集的过程,分别用“(Ax)”和“(AAx)”来代指,概念和范畴的命名有多重来源,既有研究者创造的,也有资料中的,还有借用其他学者的文献。通过对申新资料的开放性译码,我们初步得到了175个标签,58个概念和14个范畴。

表2 申新无限纺织公司开放性译码示例

个案:申新的资料(贴标签)	译码过程		
	定义现象	概念化	初始范畴
19世纪末20世纪初,在帝国主义列强大量对华商品输出和资本输出的刺激之下,反对外人在华办厂和“实业救国”、“设厂自救”的热潮接连掀起。当时,在钱庄务业的荣氏兄弟目睹国势陆危,对国人兴办实业一事也日益关心(a1)。	a1:实业救国 社会风气	A1:国内社会 环境(a1)	AA1:国内外 环境(A1)
荣氏兄弟最初投资的棉纺织企业为1905年的振新棉纺织企业,营业有利,不过到了1915年内部股东矛盾,荣氏兄弟让出振新棉纺织企业股份来获得茂新面粉厂(a2)。	a2:早期 创业经历	A2:商业 经验(a2)	AA2:企业家 才能(A2)
.....			

资料来源:《荣家企业史料》(上海人民出版社)、《荣家企业发展史》(人民出版社)、《中国棉纺织史稿》(商务印书馆)

2. 主轴译码过程

从开放性译码获得的范畴多数是独立的,也没有深入挖掘相互的关系,而主轴编码则是连接范畴、重新整合资料的过程,由此我们得到了申新纺织企业系统成长的项目模型如图 5 所示,图中中心是本研究的主题企业成长,圆圈外围均为开放性译码中获得的范畴。

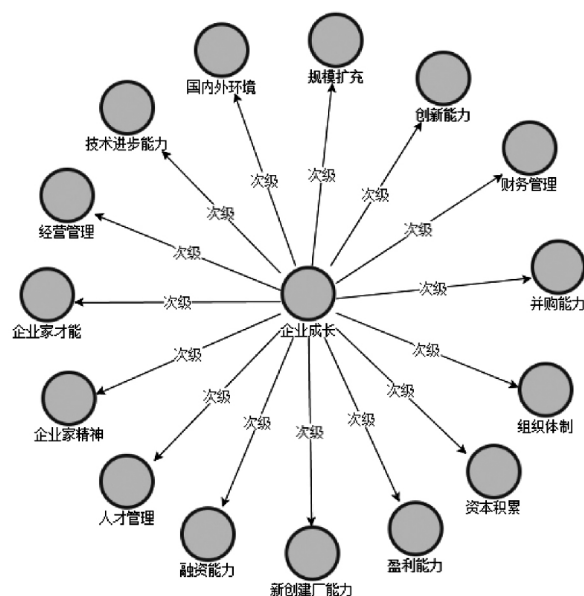


图 5 申新企业成长扎根分析的项目模型

申新纺织企业系统扎根理论得到的范畴及其对应概念如表 3 所示。

表 3

申新企业扎根理论获得的范畴及概念

范畴	概念
并购能力	收购东方、三新、德大、恒昌源、厚生
财务管理	财务管理改革
创新能力	经营管理和资金运作的创新
规模扩充	增添设备、企业规模扩展
国内外环境	国际环境、国内环境
技术进步能力	技术改进、引进、升级、改革
经营管理	产品销售、市场调查、原料采购、纱布交易所联合
企业家才能	商业经验
人才管理	公益教育事业、引进技术人才、员工管理培训
融资能力	抵押借款、挹注
新建厂能力	新建申八、申四、申三
盈利能力	欧战暴利、盈利率高
资本积累	资本积累的速度快
组织体制	无限公司制度、茂福申新总公司

由于开放性译码获得的初始范畴之间互相独立,相互关系讨论的很少,因此需要进一步进行主轴编码,来将这些范畴联结、分解和重组,典范模型是主轴编码的重要工具,使用“因果条件—现象—脉络—中介条件—行动/互动策略—结果”这个典范模型,来引导对范畴之间的整理,通过将范畴安排至典范模型六个方面的不同位置,可以识别范畴间的关系,关系即反映为理论,通过运用“典范模型”对申新棉纺织企业成长的范畴进行继续归类、逻辑推导,最终让所有资料数据形成一个证据链,具体见图 6。

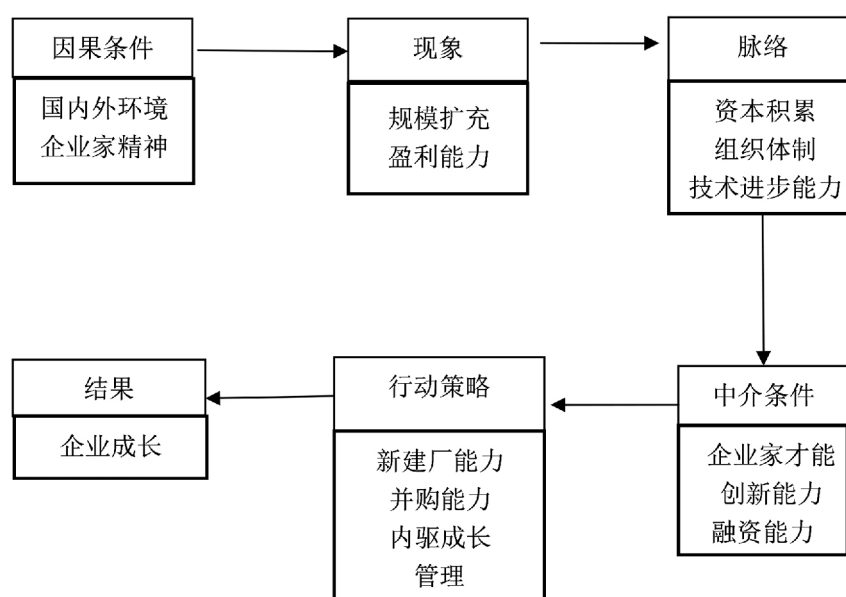


图 6 申新棉纺织企业“企业成长”的典范模型

更进一步,图 6 可以表达为如下的具体内容:

因果条件分析:近代国内外环境,对于申新的成长和发展来说,既是机遇又是挑战,政府鼓励工商业发展的政策又成了催化剂。此外,申新成长重要动力之一是企业家,企业家的才能、精神、气场,抓住机遇,敢于和善于利用成长机会,而且企业家能够在实践中不断总结经验教训,不断探索和创新,发挥精神领导作用。

现象分析:企业家们有着很强的学习能力,积极进取,学习西方先进的管理经验,让申新的规模不断扩充,盈利水平不断提高。

脉络分析:申新纺织企业,既是民营企业,又是家族企业,其组织体制为无限责任公司制,使得企业的家族氛围和集权特色更加突出,在资本积累和技术进步方面,得到了很好的发展。

中介条件分析:企业家才能和创新能力对于申新企业的成长来说是锦上添花。

行动策略分析:一方面依赖自身资源积累发展,另一方面又难免受到外界环境的影响。好在在荣氏兄弟的领导下,申新的并购能力和自建厂能力很强,在充分利用资源的基础上,进行人事、财务、生产经营上的管理,是企业成长的主要策略。

结果分析:申新棉纺织企业获得很好的成长绩效,企业的利润率得以提高,内外部资源得以充分使用,通过一系列战略行为,从而达到成长的目标。

3. 选择性译码过程

选择性译码是扎根理论研究中最高级的阶段,主要任务是选择核心范畴并开发故事线。通过将核心范畴与其系统的其它范畴联结,进一步概念化和理论化的过程,从而形成完善的解释架构。选择性译码的过程主要包括:分析鉴别能够统领所有范畴的核心范畴,以及运用资料和所获得的范畴及其关系来梳理故事线。通过对主范畴和其他副范畴及相关关系的深入分析,最终本研究认为可以使用“内驱成长”来统筹整个申新成长的资料,图 7 为申新棉纺织企业成长的过程模式。以核心范畴的故事线描述可以为:在政权更迭、战乱、技术落后等状况下,申新棉纺织企业在艰难的环境中顽强发展,主要依托内在的驱动力,充分发挥企业家精神和才能,运用管理、创新、资本等内在资源,不断地新建纱厂和收购其他纱厂,申新棉纺织企业系统从而实现高速成长。

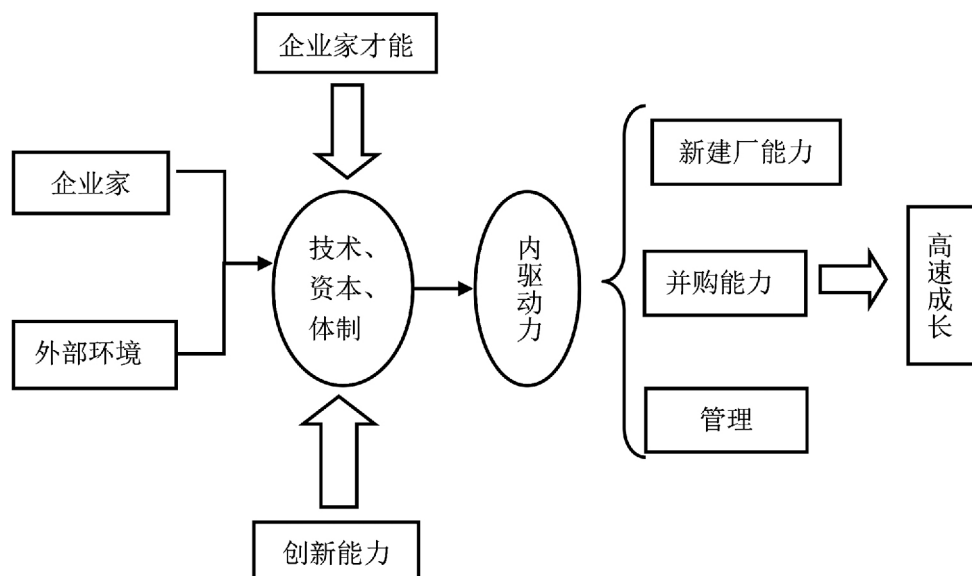


图 7 申新棉纺织企业成长过程模型

(二) 其他三家企业系统成长的扎根分析

通过对申新棉纺织企业成长的个案扎根分析,历经开放性译码、主轴译码和选择性译码等扎根程序操作,本研究使用“内驱成长”这一核心范畴来统摄申新棉纺织企业成长的资料,获得了申新棉纺织企业成长的过程模型。由此,我们也对近代中国棉纺织企业成长形成了初步认识。但是我们还需要进行多案例研究,对大生、永安和裕大华等企业成长再次分析,这是因为目前已有范畴只来自申新棉纺织企业成长的信息,对于近代中国民族棉纺织企业整体而言还不够,而且范畴间关系同样只来自申新棉纺织企业,普适性不足,所以需要进一步分析其他近代中国民族棉纺织企业的案例。

对大生、永安和裕大华企业成长的扎根分析和案例研究的过程与申新的单案例分析思路相似,严格按照扎根理论的程序化操作步骤,依旧包括资料收集、资料分析、饱和度检验和理论构建,资料分析部分主要是开放性译码、主轴译码以及选择性译码,从而获得概念和范畴,了解各范畴间联系,挖掘出核心范畴并开发一个完整的故事线。

首先是大生企业系统的开放性译码编码,如表 4 所示。

表 4 大生企业系统开放性译码示例

大生的资料(贴标签)	译码过程		
	定义现象	概念化	初始范畴
南通大生棉纺织企业,翰林院编修张謇(官僚)主持,领用官机,集私资创办(b1)	b1: 创办人及社会关系	B1: 政商关系(b1)	BB1: 社会关系(B1)
1903 年扩充纱锭 2.04 万枚(b2)	B2: 设备扩充	B2: 规模扩大(b2)	BB2: 规模扩大(B2)
.....			

资料来源:根据《大生系统企业史》(江苏古籍出版社)、《中国棉纺织史稿》(商务印书馆)整理而得。

其次是永安企业系统的开放性译码编码,如表 5 所示。

表 5

永安企业系统开放性译码示例

永安的资料(贴标签)	译码过程		
	定义现象	概念化	初始范畴
永安棉纺织企业自 1922 年开工以来,就面临着不利的生存环境,在永安棉纺织企业开工前三年,市场花纱比价不利(c1),永安棉纺织企业因此经历了一段挣扎图存的阶段。永纱产品的积压严重(c2)。	c1: 不 利 的 生 存 条件 c2: 初期销路停滞, 产品积压	C1: 市场环境(c1) C2: 销售不顺(c2)	CC1: 国 内 外 环 境 (C1) CC2: 经 营 管 理 (C2)
1925 年收购上海大中华棉纺织企业,改组为永安第二纺织厂(c3)。	c3: 收购大中华为永安第二厂	C3: 并购棉纺织企业(c3)	CC3: 并 购 能 力 (C3)
.....			

资料来源:根据《永安纺织印染公司》(中华书局)、《上海永安公司的产生、发展和改造》(上海人民出版社)整理而得。

最后是裕大华企业系统的开放性译码编码,如表 6 所示。

表 6

裕大华企业系统开放性译码示例

裕大华的资料(贴标签)	译码过程		
	定义现象	概念化	初始范畴
徐荣廷获得“四局”承租权,租期 10 年,民国 2 年(1913)年起租(d1)。	d1: 组办官办棉纺织企业	D1: 政商关系(d1)	DD1: 社 会 关 系 (D1)
民国 11 年(1922)年期满,组织楚兴公司。一战期间,楚兴发展迅速,楚兴经营 10 年,获得巨利,1100 余万两(d2)。	d2: 裕大华前身楚兴公司的发展	D2: 早期创业经验	DD2: 企 业 家 才 能 (D2)
.....			

资料来源:《裕大华纺织资本集团史料》(湖北人民出版社)、《中国棉纺织史稿》(商务印书馆)整理而得。

申新纺织企业系统的成长的单案例研究对后来其他棉纺织企业的案例研究的译码有帮助作用,当有新范畴时候,要与之前的译码结果进行比较,甚至还会返回案例修正概念和范畴。这是一种螺旋式的分析,能够让归纳体现的概念和范畴以及范畴之间的关系更加准确详细。本研究在第 3 个案例时候,概念和范畴达到基本饱和,不过还会有新的面向出现;在达到第 4 个案例时候,基本上没有新的面向出现。同时,本文选择永安纺织企业系统等案例资料作为验证概念、范畴、面向和关系的饱和度,结果表明本研究模型具有较好的理论饱和度和效度。各案例新获得范畴和面向呈现在表 7 中。

表 7

多案例扎根分析范畴汇总

大生企业范畴	永安企业范畴	裕大华企业范畴
	国内外环境	
	公共基础设施	
	人事管理	
	经营管理	
	财务管理	
	社会关系	
	盈利能力	
	资金运作	
	机遇推动	
	企业家精神	
	企业家才能	
教育培养人才	教育培养人才	

市场 棉纱销售市场	并购能力 战略布局 组织管理 贸易保护 企业文化	产品市场 战略布局 组织管理
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从表 7 可以看出,大生、永安和裕大华三个纺织企业系统的范畴有很多共同点,如外部环境,对机遇的把握,筹集资金的方式等,与上文申新的范畴较为类似。需要指出的是,即使是相同的范畴,不同的企业的具体操作方式也是不同的。

(三)近代棉纺织企业成长过程模式

通过对大生、永安和裕大华三大棉纺织企业扎根分析获得了新的范畴和面向,具体如表 8 所示。

表 8 其余三家公司分析得到的新范畴与新面向

案例	新范畴	新面向
大生系统	生产管理	厂址选择——棉产地以降低成本;原料供应;当地土布
	社会关系	政商关系;同业关系;朋友关系
	公共基础设施	配套设施
	—	不畏艰难、励精图治(企业家精神)
	—	官利制度,盈利分配(财务管理)
裕大华系统	—	求贤如渴,以人为本的人才观(人才管理)
	—	兴教育,培养技术人员——纺织学校(人才培养教育)
	战略眼光	区域优势,“内地—内需—乡村”市场的企业发展路线,产品适应需求——产品定位
永安系统	—	租办官局(社会关系)
	—	交通设备(公共基础设施)
	—	谋于合力的“永安精神”,家长式的管理风格,郭琳爽的改革与企业文化建设,文化推销——创办《永安月刊》(企业文化)
	—	地方社会网络(社会关系)
	—	公共设施硬件支撑(公共基础设施)
	—	家族企业的代际传承(组织管理)
	—	兼并趋势,并购潮流(规模扩大)
	—	财政与货币金融政策(经济政策)
	—	灵敏的商业嗅觉和经济头脑(企业家精神)
	—	融资集侨资、办企业(资金来源)

注:面向中括号内为已有范畴。

为了获得近代中国民营棉纺织企业成长的过程模式,我们需要将所获得的范畴再次修正、重组,合并相似的范畴,修正面向较为饱和的范畴,从而让研究更有一般性和普遍性,最后得到表 9 所示的范畴和面向结果。

表 9 所有案例的范畴和面向整合结果

序号	范畴	来源说明	面向整合结果
1	企业家才能	商业经验、战略眼光合并	产品定位,区域优势,厂址选择,经营经验等
2	外界环境	合并国内外环境、公共基础设施	国货运动,欧战,政府政策,硬件设施,交通设备等
3	资金运作	资金来源修正为资金运作	政府支持,融资,挹注,借贷,投资,招商
4	企业扩张	合并规模扩大,盈利	新建厂,兼并厂,增添设备,连年盈利等
5	技术进步	技术改造修正为技术进步	技术引进,技术改造,技术升级等
6	资本积累	—	资本积累

7	企业家精神	合并了创新、战略眼光、爱国热情	爱国、创新、灵敏、商业嗅觉、经济头脑、不畏艰难、励精图治等
8	经营管理	合并了生产管理	生产管理、销售管理等
9	组织管理	—	公司制度、组织体制等
10	人才管理	将人才培养教育合并到人才管理	求贤若渴、引进人才、培养人才、关心员工、员工培训等
11	财务管理	—	盈利分配、财务体制等
12	关系策略	社会关系修正为关系策略	政商关系、同业关系、朋友关系、亲属关系、同乡关系等
13	企业文化	人才培养教育修正为人才储备	兴教育、建学校、留学、企业文化建设等

通过对主范畴和其他副范畴及相关关系的深入分析,最终本研究认为可以用“环境制约—内驱成长”这一核心范畴来统摄材料。以核心范畴的故事线描述可以为:在不稳定的政治、经济、社会、国际环境的制约下,近代中国民营棉纺织企业在艰难的环境中顽强演进,充分利用内在驱动力,在技术、管理、经验落后的情况下,充分发挥企业家精神和企业文化,不断地进行技术的进步和资本的积累,做好经营、组织、人才、财务等方面的管理工作,利用好社会关系,从而为实现企业的顺利成长而努力。我们用 13 个范畴绘制出近代民营棉纺织企业的企业成长的过程模式图(见图 8)。

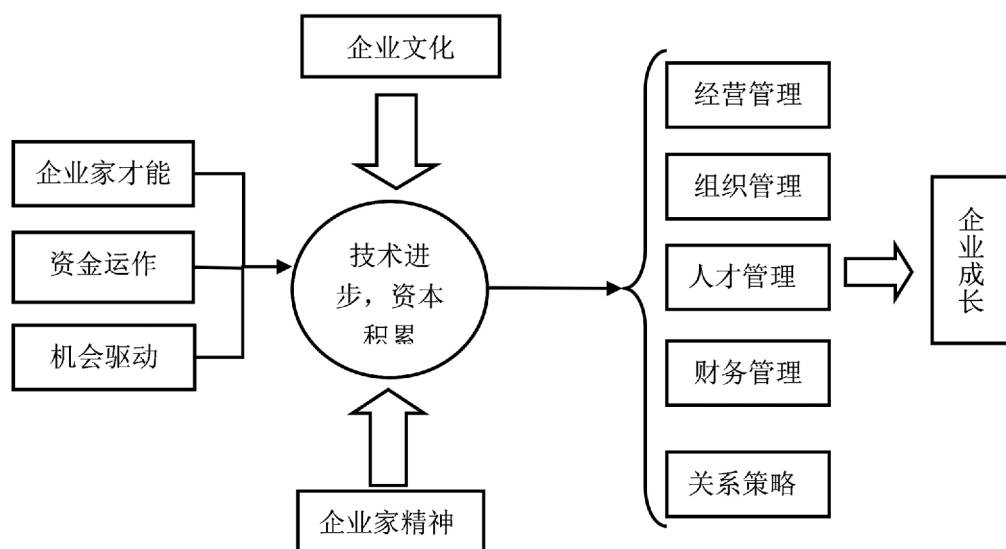


图 8 近代民营棉纺织企业成长的过程模式图

五、进一步的分析

通过梳理四大企业系统的编码所得到的概念和范畴,我们可以将近代民营棉纺织企业成长的因素归纳为两类:一是同质性因素;二是异质性因素。

首先是同质性因素:

机会驱动。对于一个企业来说,外界环境既包括国内环境和国际环境,也包括政治环境、经济环境和文化环境等。近代中国棉纺织企业所面临的环境是复杂多变的,战乱一度打断棉纺织企业的成长,给企业成长带来了巨大的阻力,外国棉纺织品在中国的消费,又给棉纺织企业带来了强大的竞争力,而几次国货运动的爆发,则促进了中国棉纺织品的销售和棉纺织企业的成长,从 1904 年到 1931 年,全国性的国货运动已有九次,地区性的国货运动更是数不清。尤其是欧战期间,西方国家忙于一战,中国棉纺织企业有了短暂的成长春天,这四家企业均在欧战期间获得暴利,这在一定程度上说明,外界环境的稳定对近代民族棉纺织企业成长是非常重要的;市场环境作为外界

不可控的条件,对企业产品的销售有着很大的影响,在同一时期,比如市场上某棉纱品的需求量,以及粗纱和细纱的需求量对于各个棉纺织企业的影响是相似的。

政府政策。与市场环境相似,各个时期的政府政策对于每一个企业集团来说都是相同的,无论是清政府时期还是北洋、国民政府时期,促进工商业发展的政府政策对于棉纺织企业的成长是有利的,如清政府时期颁布的《公司法》,给公司一个合法的地位,企业的成长有了一定的法律保障;欧战期间,北洋政府也在积极倡导经济建设,推出一系列经济政策,棉纺织企业迎来了成长的春天,新建工厂非常多,使得已有棉纺织企业成长速度得以加快,政府的支持无疑给民营纱业注入了强心剂。而在本文考察时段的后期,受国民政府统制经济政策的影响,企业的成长愈发波折。

公共基础设施。公共基础设施的建设,如公路、铁路、信息建设,能够大大地便利企业在成长过程中所面临的原材料运输和产品销售等问题,节约了成本。首先是近代铁路建设,京包、陇海等铁路干线修成,以及电报、无线电等信息系统建设,加速了近代中国民族棉纺织企业的成长。除了政府建立的公共基础设施,棉纺织企业自身积极投入基础设施的建设,也促进棉纺织企业的成长。例如,为适应和促进大生各棉纺织企业的发展,张謇在旗下各棉纺织企业励精图治的同时,在南通地方进行自治,提供教育、治安等公共产品。而张氏开办盐垦公司,固然有解决纱厂棉花供应的考虑,但这其中所包含的希图改良苏北盐碱土地的计画,同样也可视作在政府公共产品提供不足的情况下,企业与企业所进行的一种补充。

企业家精神。近代棉纺织企业家所具备的企业家精神中,爱国主义是重要的核心元素。近代中国面临内忧外患,尤其在面临外国军事和经济上的侵略与竞争时,民营企业所呈现出的实业救国、不畏艰险、越战越勇及不服输的企业家精神,表现出惊人一致的一面,对民营棉纺织企业来说,这也是推动其成长的一个共同因素。

融资。资金是企业正常运作的必需品,充足的资金是近代企业迅速扩张的重要因素,然而,对于近代企业来说,资金的匮乏始终是企业成长中挥之不去的一个阴影。不管是成长,还是收缩,近代棉纺织企业均表现出对资金的高度依赖与渴求。在融资方式方面,四大棉纺织企业系统均选择在同一企业集团上资金的挹注、向银行借贷等融资方式。荣氏兄弟为了申新的不断扩张,多次进行借贷并购其他棉纺织企业,既向华商银行借款,还向外资银行借款,借款能够在一定程度上缓解企业成长过程中所面临的资金压力,但是如果过度使用财务杠杆,则容易使企业发展的不确定性增强,申七搁浅就是一个向银行借款未如期归还而差点被拍卖的例子。1917年至1931年是上海永安迅速发展的黄金时段,充分利用联号企业的资金扩大经营业务。郭乐采取经营事业的一贯方针是集侨资、办企业,从发起人到倡办员、招股员,从最大的股东郭氏家族到认购几十、几百元的中散户,纵横交织形成一个细大不捐的招股网络。

人才教育培养。教育事关人力资本的发展,人才的培养和储备关系到企业未来的新鲜血液,重视人才培养的企业未来会有更好的发展。张謇大力兴办教育事业,开办各种形式的学校,包括小学 300 多所,中等学校 6 所。1906—1932 年间,荣氏兄弟共创建了 10 所小学,1 所中学。其中,1906 年在无锡创办公益第一小学,随后,为了给申新纺织企业系统提供能操作现代化机器的女工,1908 年创办第一所竞化女子学校,后又创建公益第二、第三、第四小学和女子竞化第二、第三、第四小学。中等教育上,荣氏兄弟在 1932 年创办公益中学。随着公司规模扩大,企业职工人数的增加,为了解决员工子女上学问题,荣氏兄弟在申新工厂附近建立上海申新子弟学校、无锡申新子弟学校。

其次是异质性因素:

组织体制。组织体制上,四个棉纺织企业系统是有差异的,首先是规模最大的申新纺织企业系统是无限责任公司制,这是荣氏兄弟在上一个振新棉纺织企业经营总结的经验,无限责任公司制让荣氏兄弟对申新有绝对的控制权和领导权,这为后期申新扩大到九厂奠定了一定的体制基础。其他三家大生、永安和裕大华棉纺织企业系统均是有限责任制公司体制,无限责任公司制和

有限责任公司制之间并没有优劣之分,两者都有自己的优缺点,选择适合的才是最好的,同时企业要学会规避风险,取长补短。

棉纱销售市场。大生纱厂的成功,与南通当地的市场特色密不可分。大生纱厂有稳定的原料供应基地和棉纱销售市场,更有当地农民利用棉纱织成土布的广阔市场,这是大生纱厂独有的,更体现了中国棉纺织市场的独特性,南通农村家庭手工工业非常发达,对棉纱的需求量很大,当地手工工业者使用大生纱厂的棉纱,土布质量得以提高,南通土布的销路也扩大了,这是机纱与土布的双赢,是中国棉纺织业和传统手工业的双赢,在这一点上,大生纱厂走出了自己独特的成长之路。

战略眼光。战略眼光是一个企业家进行战略决策时候考虑问题的久远性,不同的企业家考虑问题的角度也不一样,所以会有差异,而战略决策直接决定了企业成长的方向。如裕大华裕华纱厂选址武汉,大兴纱厂则是石家庄第一家机器工厂,徐荣廷等领导人成功开辟了内地市场,赢得了购销取近的市场竞争优势。企业家张謇拟定九厂的庞大建厂计划,展现了其长远的领导者眼光。

社会关系。社会关系包括同业关系、朋友关系、政商关系等,处理好社会关系能够让企业经营过程更加顺利,这其中有些关系,如政企关系一直为学界所关注。但我们这里把社会关系列作异质因素,是因为不同的棉纺织企业在运作社会关系时,所依赖与关注的焦点均有所不同。以大生来说,诸企业中,大生棉纺织企业 20 世纪初期的成长最好,这虽得益于清政府鼓励工商业发展的一系列措施,但张謇翰林院修撰等官方身份的影响是巨大的,在他创业的路上,得到了来自政府和官绅阶层的诸多支持和便利,从资金、设备到销售特权,都推动和加速了大生棉纺织企业的成长。而郭氏的永安企业因其侨商身份,一直努力令永安融入到地方社会网络中。为此,郭氏除扶持国货厂商,增加公司国货外,郭琳爽还通过各种慈善公益活动来提高公司形象和影响力。从永安公司的档案资料来看,众多慈善团体、学校、教会、各种协会等都致信郭琳爽,请求其捐赠物品、认购入场券、刊登广告、借用场地等等。1939 年 5 月,永安乐社应邀义演,为上海难民救济协会和广东旅沪同乡救济两广难民捐募委员会筹得 3 万多元经费,1940 年,又为上海救济中山难民会义演 8 场,筹得 7 万余元善款。永安公司的慈善公益活动并没有具体的选择性,既有长期赞助,也有临时捐赠,既有对广东团体和同乡的支持,也有对全国和上海本地组织的捐赠。

企业文化。企业文化代表了一个企业的灵魂,但不同企业的企业文化各不一样,重视程度也各不相同。这其中,永安企业是凝聚企业文化的典型——齐心合力的永安精神,鼓舞着永安上下的员工为企业做贡献。此外,公司还创办《永安月刊》,进行文化推销,扩大公司影响。1939 年 5 月创办的杂志《永安月刊》每期都会刊登各种商品的广告,经常附送商品免费奉送券、打折券等优惠券。这种重视企业文化,并将企业文化与营销手段结合的运行方法既让企业在成长的道路上形成一股充满凝聚力的合力,又推动了企业市场的扩大。

继承与人事管理。在人事的任免和管理上,四家纺织企业系统是有差异的,荣氏企业和永安企业是典型家长式继承制,而裕大华企业的领导人任免并非家族继承制,而是推荐制,推荐有能力的人管理企业。在民营家族企业中,领导人的继承是一个很大的问题,如果创始人二代有很高的才能,那就可以帮助企业继续繁荣,如永安郭氏二代继承人郭琳爽不仅对企业进行改革与文化建设,还鼓励员工自行参加社会培训提升自身能力和修养。裕大华企业走的是一条非传承的道路,历届领导人徐荣廷、苏汰余、张松樵等人,并无血亲关系,而裕大华企业从管理层开始就注重团结,形成了团结积极向上的公司氛围。

六、研究结论与讨论

(一)研究结论

根据前文分析,我们认为影响我国近代民营棉纺织企业成长的要素为:

1. 机遇和资源驱动是企业成长的基础。

近代中国民营棉纺织企业的成长,离不开政治、经济、文化、国际等环境提供的机会,更离不开企业本身所拥有的内部资源和能力的驱动。政府政策支持、相对和平的社会环境、国内的需求市场和支持国货的消费者心理,都会为企业发展提供机遇。无论是清政府时期,还是北洋政府或是国民政府时期,都曾对中国棉纺织企业有着不同程度的政策支持和提倡,²⁰ 世纪初,清政府推行“新政”,鼓励民营工商业发展。1928 年国民政府制订了保护国内民族工业发展的一项基本方针——提倡使用国货,并加以贯彻实施。日俄战争的刺激和世界经济从危机到复苏,促进民族棉纺织产品的销售,给近代中国的民族棉纺织企业的成长也带来了难得的机遇。此外,近代多次国货运动也为民族棉纺织品的国内市场的拓展提供了机遇。如 1919 年的“五四”运动和 1928 年“济南惨案”的发生,打击了日货在华的销售,民族棉纺织企业抓住历史机遇得以快速成长。

资源的内涵很广,既包括土地、原料等自然资源,也包括人力、信息等社会资源。资源的驱动同机会的驱动一样,是企业成长的基本,没有了资源企业就没有生存的根基。对于近代中国民族棉纺织企业,选址在原材料产地非常关键,能够降低企业的生产成本、原材料的运费,从而提升企业的核心竞争力。如大生纱厂选址南通,正是看中其离原材料近,南通有着广泛的棉纱销售市场。裕大华企业集团旗下大华纱厂选址西安,是看中了中部地区的潜力内需能力。申新和永安旗下多家纱厂选址上海,是因为上海作为近代较为发达的城市,有着丰富的人力、信息资源和发展空间。

2. 不稳定的环境和管理水平是企业持续成长的主要障碍。

战乱、政府更迭、外资竞争等不稳定的环境是制约棉纺织企业成长的最大障碍,在欧战时期相对稳定的国内外环境下,中国近代棉纺织企业成长速度最快,但是欧战后,日本等国棉纺织品再次投入到中国市场,对中国民族棉纺织企业的打击很大。所以不稳定的外界环境是影响近代棉纺织企业的一个重要障碍。

近代中国民营棉纺织企业起步比西方国家晚,在技术、机器、资源利用等方面远远比不上日本、美国、印度等国。近代民族企业的起点不同,如大生纱厂 1899 年开车,且得到清政府提供官机的支持,而申新第一纺织厂 1915 年才开车,完全依靠自己购买机器设备,申新第二纺织厂是 1919 年并购恒昌源纱厂而来,但因设备太旧,新设备又因运输延误等一系列因素,申新二厂连续几年没有盈利;近代民族企业有着厚重的家族管理气息,在分工、权力分配、职工安排等方面优缺点都很突出,荣氏企业家族式的人才管理思想,在企业发展初期发挥了巨大的作用,有利于企业迅速扩大规模。但是在企业发展后期,这种管理思想缺乏规范管理、任人唯亲现象严重,导致在下一代荣氏接班上出现问题。而裕大华纺织集团则采用非家族式管理结构,且领导层非常团结,任人唯贤,有能力者做管理,这从裕大华的徐荣廷、苏汰余和黄师让三任领导者可以看出来一二。

3. 扩充和并购能力是企业高速成长的催化剂。

企业的扩充和并购是一种市场化的表现,市场的自由竞争必会出现适者生存、优胜劣汰。科学合理的企业的扩充和并购能够加速企业的成长进程。近代中国民营棉纺织企业的扩张包括新建纱厂、增加资本额、增长职工人数、扩充纱锭数等,在研究的申新、大生、永安和裕大华这四家企业系统,纱厂数、纱锭数、资本额等方面均有着不同程度的扩充,这在一定程度上加速了这些企业的成长。

大规模地并购纱厂,能够更好地进行规模化生产,提高生产效率,降低生产成本和财务费用,企业的管理与分工更加有效系统,市场竞争的优势也很明显。1931 年申新纺织企业系统已经成为近代中国规模最大的民营棉纺织企业集团,这与其强大的并购能力是分不开的,申新旗下的九家纱厂中,申二、申五、申六、申七和申九分别并购了恒昌源纱厂、德大纱厂、厚生纱厂、东方纱厂和三新纱厂。不仅如此,荣氏兄弟还成立了茂新、福新、申新总公司,对旗下所有纱厂进行系统管理,统一调拨资源和资金,购买原材料等,更是大大降低了整个企业集团的经营成本,提高了申新产品的市场竞争力。

除了规模最大的申新纺织企业集团,规模第二的永安纺织企业系统的扩充和并购能力也值得一

提,其设备有一半是通过并购其他纱厂获得的,永安旗下虽仅有四家纱厂,但有两家是收购其他的纱厂,永安第二纺织厂收购了大中华纱厂,永安第三纺织厂收购了鸿裕纱厂。通过兼并收购其他纱厂,永安的规模得以大大扩张。扩充和并购能力作为企业能力的重要一部分,是企业高速成长的催化剂。

4. 战略企业家和技术研发是企业创新成长的源泉。

近代中国民族棉纺织企业虽然与西方国家比还有很大差距,但是中国近代的企业家不畏艰险,有着很高的政治抱负和爱国心,积极学习西方的管理经验,引进国内外优秀的技术人才,企业家们多次赴日企学习考察,高薪雇佣掌握先进技术的工人,此外不断搞科研、研究,花费大价钱引进西方先进的机器和人才,不断进行技术的引进、改进、升级等,充分发挥了创新能力。

为了培养企业技术人员,有的棉纺织企业还创办了纺织学校,如张謇的南通纺织学校、徐荣廷的楚兴纺织学校。本文所研究的大生、申新、永安和裕大华都非常重视人才的培养,尤其是技术人才的培养。荣氏兄弟于 1928 年在无锡建立申新职员养成所,专门聘用曾留学国外的纺织专家进行教学,短短四年间,申新职员养成所培养的技术人员已有 81 人^①,这些人才后来分配到申新的各个纱厂中,为企业的生产技术提供了支持。除了技术人员,拥有新式设备也是非常重要的,申新通过并购得到的设备难免有老旧的,因此荣氏兄弟会从西方发达国家如英美等国购买最新设备。如在 1931 年荣氏兄弟收购了上海厚生纱厂为申新第六纺织厂后,专门引进了五套美国的萨克洛威最新式单程清花机,这在当时的中国也是仅有的最新式清花机^②。

(二)现实意义

以史鉴今,古为今用,这也是我们不断探求企业历史的一个重要原因,战前棉纺织业的发展只是近代各行各业的一个缩影,又何尝不是今天中国企业的一面镜子,从这些企业发展因素的分析中,我们可以得到怎样的启迪呢?对此,这里作简短引申:

1. 抓住机遇。

企业的成长需要天时、地利、人和,缺一不可。企业的每一次跃迁都得益于其所身处的时代。企业不能造势,却可以有效地利用时代的风口,尽可能地实现自身利益的极大化。但并非所有的企业都能够对所处的时代有清晰的认识,对每一个机会都有很好的把握。近代棉纺织企业对一战市场机会的利用,对国货运动机会的敏锐捕捉,并借这一机会实现自身发展与壮大的史实说明,充分利用好时代所赋予的机会对企业的发展来说,是何等的重要。

这就要求企业和企业家能够对时代的大趋势有准确判断。实际上,近代成功的企业家都有着灵敏的嗅觉,如荣家企业的产品单一,始终执着于面粉与纺织两业,却不妨碍它成为一代巨擘;永安郭氏可以在花纱危机中发现行业机会,在别的纱厂陷入泥淖时逆向买入,从百货转入纱业,纱厂从无到有,一路做大,也证明了他们对时代大潮的敏锐把握。在梳理史料时,我们看到,近代纱厂不断地换手,更换名称,这既说明了企业的残酷竞争,也说明大浪淘沙是每一个时代永恒不变的主题,不进则退,企业家当常常居安思危。

抓住机遇同样也体现在管理的细节上,如申新对工头制废与立,几经反复,它既体现了近代中国新旧交替、内外交融的时代特征,也反映了企业家对当时国外科学管理法的积极感知与响应。

2. 不断创新。

创新是企业的立身之本,抱残守缺则意味着死路一条。这种创新并不仅仅体现在技术上的创新和产品上的创新,更体现在制度上的创新和管理上的创新。不仅体现在物的创新,也体现在人的创新上。如前文所举的例子中,荣氏企业对引进新机器的重视,为此不惜巨资。而各家企业对技术人才,也都是异常重视。大生早期高薪聘请外国工程师,深受人才不足的困扰,为此,张謇和荣

^① 许维雍,黄汉民:《荣家企业发展史》,人民出版社,1985:79。

^② 上海社会科学院经济研究所:《荣家企业史料》,上海人民出版社,1962:221—225。

氏都在教育,尤其是职业教育上倾注了不少心血。

需要注意的是,这种创新同时也应当是因地制宜的,可以称为适应性的创新。创新并不意味着用最好、最先进的技术与方法。荣氏企业在科学管理的使用上几度进退,废除工头制后又不得不再度启用就是一个例证。科学管理法当然是先进的,但是它显然不是二十年代申新所能够消化的。再比如为了解决企业融资困难的问题,近代纱企都创造性地建立了企业职工储蓄制度,如永安的银业部和荣氏的同仁储蓄部。

抗战前棉纺织企业的成长是一个曲折而漫长的过程,本文尝试性地使用扎根方法并结合多案例比较研究,希望能够对其成长的因素作系统性梳理,对这一过程进行重新解读,当然,分析远未结束,对于具体因素,如外部环境对企业成长的影响与制约也将是我们进一步讨论的方向。□

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(下转第 128 页)

Property Right Structure of Foreign Enterprises in Modern China ——A Case Study of American-Owned Shanghai Power Company

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Abstract: The company property right is one of the core contents in the research of modern enterprise history. Through the study of the capital structure and property structure of the typical modern foreign enterprises, American-owned Shanghai Power Company, the characteristics of the property right structure of foreign enterprises in modern China can be deeply analyzed. The research shows that Electric Bond and Share Co. had acquired the complete property right of its overseas subsidiary, American-owned Shanghai Power Company, with its tight and complex capital structure. Under the ingenious design of the Electric Bond and Share Co., the property right structure of American-owned Shanghai Power Company was a joint-stock company system with privileged stocks. The property right structure not only succeeded in achieving the stable operation of the foreign subsidiary of Electric Bond and Share Co., but also was a typical case of the property right arrangement in the transnational operations of foreign enterprises in modern China.

Keywords: Electric Bond and Share Co.; American-Owned Shanghai Power Company; Property Structure; Joint-Stock Company System; Transnational Operation

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On the Growth of Pre-war Chinese Private Cotton Textile Enterprises (1894—1937)

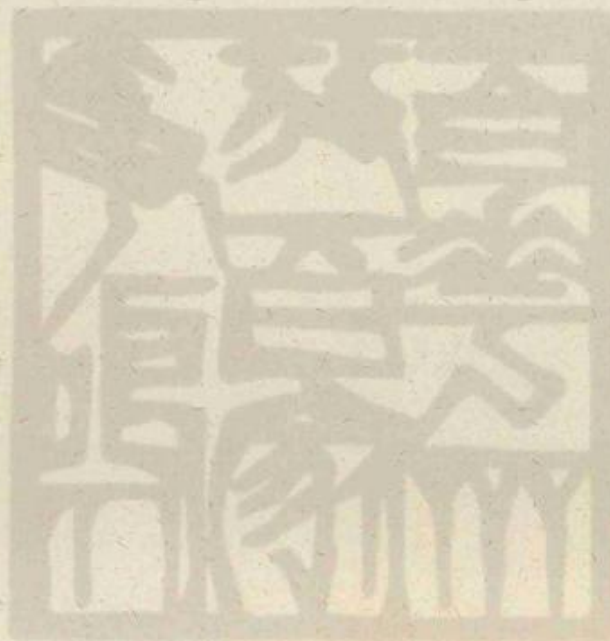
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2 School of Economics and Management, South China Agricultural University 510642)

Abstract: The cotton textile industry, as one of the prominent private industry, gained its growth since late 19th century. Based on archives, this paper tries to analyze the characteristics of growth of enterprises in modern cotton textile industry, and then focuses on the factors that resulted in their growths. With the help of case study and grounded theory, the author comes up with the detailed factors that played key roles of modern cotton textile firms. Finally the author reaches the conclusion as follows: 1. Opportunities and resource-drive are the foundations for the growth. 2. Unstable surroundings and managerial skills blocked them from reaching sustained growth. 3. Merger and acquisition accelerated their growth. 4. Strategic entrepreneurship and research & development guaranteed their technological innovation. What's more, these factors also give insights for the running of current firms in China.

Keywords: Business Growth; Textile Industry; Grounded theory; Factor Analysis



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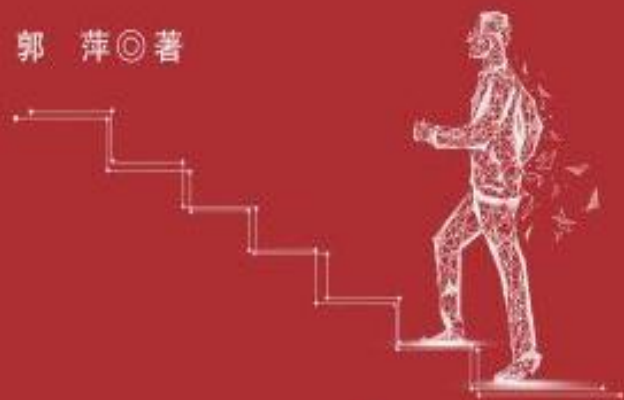


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家族治理 与民营企业成长: 理论与案例研究

郭 萍◎著



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目 录

1 家族治理：一个文献述评	1
1.1 问题的提出	1
1.2 家族治理：概念与结构	3
1.2.1 家族治理的概念界定	3
1.2.2 家族治理的构成	4
1.3 影响家族治理的因素	8
1.4 家族治理影响家族企业绩效的途径机理	11
1.4.1 家族文化与家族企业绩效	12
1.4.2 家族治理机构与家族企业绩效	13
1.4.3 家族协议与家族企业绩效	15
1.5 结论与研究展望	15
1.5.1 简要结论	15
1.5.2 进一步研究的方向	18
参考文献	18
2 中国近代康百万家族的治理与兴衰	23
2.1 引言	23
2.2 康氏家族发展史	24
2.3 康氏家族文化	25
2.4 康氏家族行为规范	26
2.4.1 家族内部关系的治理	26
2.4.2 康家与政府关系的治理	31
2.4.3 康家与社区关系的治理	32
2.4.4 康家与员工关系的治理	34
2.4.5 康家与竞争者关系的治理	35
2.5 康氏家族祠堂	35
2.6 结论与讨论	36
参考文献	38

3 香港李锦记与利丰集团的比较案例研究	40
3.1 案例选择与资料收集	40
3.2 案例介绍	42
3.2.1 香港李锦记	42
3.2.2 香港利丰	44
3.3 案例分析	47
3.4 简短的结语	49
参考文献	49
4 新加坡国际元立集团案例研究	50
4.1 国际元立集团成长过程概述	50
4.2 陈氏家族治理制度设计	53
4.2.1 非正式治理机制的建立	53
4.2.2 正式治理机制的构建	56
4.3 家族治理与陈氏家族绩效的关系	59
4.4 家族治理与国际元立集团的成长	60
4.5 评价与总结	62
参考文献	63
5 美国企业家族治理研究：以《纽约时报》为例	64
5.1 案例选择与资料来源	64
5.2 《纽约时报》及奥克斯-苏兹伯格家族简介	65
5.3 奥克斯-苏兹伯格家族治理的演进	67
5.3.1 阿道夫时期的家族治理设计	67
5.3.2 伊菲珍时期的家族治理设计	71
5.3.3 潘趣时期的家族治理设计	74
5.3.4 小阿瑟时期的家族治理设计	76
5.4 家族治理：《纽约时报》家业长青的秘诀	81
5.4.1 奥克斯-苏兹伯格家族文化的塑造与巩固	81
5.4.2 奥克斯-苏兹伯格家族协议的扩展与完善	82
5.4.3 奥克斯-苏兹伯格家族治理机构的多样化	84
参考文献	84

6 华人与美国企业家族治理体系的比较	86
6.1 华人与美国企业家族治理模式的相同点	86
6.1.1 家族目标与企业目标的兼容	86
6.1.2 确保家族对企业的股权控制	89
6.1.3 增进家族成员之间的沟通交往	91
6.1.4 塑造家族共同的价值观	92
6.1.5 明确家族与企业的界线	95
6.2 华人与美国企业家族治理模式的不同点	96
6.2.1 所处的文化背景不同	96
6.2.2 所处的法律制度不同	98
6.2.3 社会信任程度的差异	105
6.3 相关结论	107
参考文献	109
7 中国大陆企业家族治理的探索尝试	111
7.1 山东步长赵氏家族的治理设计	111
7.1.1 步长集团及其创业家族介绍	111
7.1.2 赵氏家族治理架构	113
7.2 广东万和卢氏家族的治理设计	115
7.2.1 万和集团及创业家族介绍	115
7.2.2 卢氏家族治理架构	117
7.3 浙江华茂徐氏家族的治理设计	118
7.4 浙江新光集团周晓光家族的治理设计	121
7.4.1 新光集团及创业家族介绍	121
7.4.2 周晓光家族治理设计	123
7.5 案例启示与展望	125
7.5.1 大陆民营企业对家族治理的需求日益增强	125
7.5.2 民营企业要重视家族文化的塑造	127
7.5.3 家族企业顾问团队的兴起迫在眉睫	129
参考文献	131
附 录	133
家族企业协议 (样本 1)	133
家族企业协议 (样本 2)	137

