Essays in Finance and Applied Microeconomics

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Abstract

The thesis consists of three independent essays on various aspects of Finance and Applied Microeconomics. The first two essays focus on the impact of princeling connections, while the third essay examines the impact of Universal Credit on children's mental health. The introduction provides a brief overview of the background, and the conclusion summarizes the main findings across the three chapters.

The first essay explores the impact of princeling connections on regulatory enforcement over Chinese listed firms. I first examine the factors that may influence princelings' preference to join a particular firm and then test whether enforcement agencies punish princeling-connected firms less. The findings indicate that princelings tend to join firms with better financial performance, weaker governance structures, fewer Corporate Social Responsibility (CSR) activities, and more investment in innovation. Through Propensity Score Matching (PSM), I match princeling-connected and non-connected firms with similar characteristics and find that regulatory enforcement is distorted for princeling-backed firms due to the privileges and protections they receive. The heterogeneity test reveals that princeling connections have a more significant influence in regions with weaker legal environments, non-state-owned enterprises, and firms with lower Return On Assets (ROA) ratios. Moreover, I investigate whether the effects of princeling connections have changed after the Chinese government's anti-corruption campaign in 2012, which serves as an exogenous shock. The results demonstrate that even after the anti-corruption campaign, princeling-connected firms are still less likely to be punished. The robustness checks provide supporting evidence. In summary, the study suggests that princeling-backed firms enjoy a lower likelihood of punishment, highlighting another advantage of cultivating princeling connections.

Using data from Chinese listed firms between 2008 and 2018, the second essay examines the impact of Private Equity (PE) on portfolios' Initial Public Offering (IPO) and post-IPO performance, and the role of princeling connection in this process. First, I explore whether PEs can help portfolio firms perform better. The findings indicate that the involvement of PE in listed firms leads to lower IPO underpricing and improved post-IPO performance, demonstrating that PE's market specialization, financial support, and active involvement contribute to enhancing IPO performance. Furthermore, PEs with princeling connections can achieve even lower IPO underpricing compared to PEs without such connections. However, the certification role of princeling-connected PEs is insignificant in the long run. This suggests that the function of princeling-connected PEs is primarily to provide political relationships with government regulators rather than additional oversight of their portfolio firms. The

results withstand rigorous sensitivity tests, and the effects are heterogeneous in two ways: first, firms backed by reputable PEs experience superior IPO performance; second, the positive effects of PE on IPO performance are more pronounced among non-state-owned enterprises. Then I investigate the role of PE during periods of high Economic Policy Uncertainty (EPU). I find that targets backed by non-princeling-connected PEs are more resilient while targets backed by princeling-connected PEs cannot offer support when facing high policy uncertainty in terms of IPO underpricing and post-IPO performance. This is consistent with the view that the skills and expertise PE investors accumulate over time, as well as their vast networks of board chairs and directors, can contribute to the better performance of the portfolio firms during the high EPU period. However, princeling-connected PEs have limited capacity to provide additional support to target firms when faced with high policy uncertainty.

The last essay investigates the impact of Universal Credit (UC) on children's mental health. It was implemented at different times across various regions, starting in the northwest of England in April 2013. By May 2016, families with children became eligible to apply for UC. Leveraging the effects of UC on children's mental health, I analyze a dataset consisting of 8,026 observations from 6,215 children (aged 4-10 years) in England, Wales, and Scotland who participated in the UK Household Longitudinal Study (UKHLS) between 2009 and 2019. Employing a two-way fixed effects approach, I divide respondents into two groups: children with unemployed parents eligible for UC (intervention group) and children with parents who are not unemployed and thus would typically not be eligible for UC (comparison group). To demonstrate the change in self-reported psychological distress, measured using the Strengths and Difficulties Questionnaire (SDQ), between the intervention group and the comparison group before and after the introduction of the reform, the parallel trend graph indicates that the prevalence of psychological distress increased in the intervention group after the implementation of UC compared to the comparison group. This graph provides preliminary evidence that Universal Credit has had a negative impact on children's mental health. Regression results further demonstrate that children experience a 9% higher likelihood of having mental health problems following UC in the treatment groups. Exploring potential mechanisms, the study finds that reduced benefit income does not exert a significant influence on children's mental health. However, the strict job search requirements associated with UC lead to parents spending less time with their children, resulting in poorer mental health outcomes. Heterogeneity analysis suggests that households with multiple children and households with a single parent are more profoundly affected by UC. The results remain consistent across various robustness checks. The results also highlight that Universal Credit has a larger effect on younger children. Therefore, the findings suggest that the introduction of Universal Credit has led to an increase in psychological distress among recipient children, indicating higher levels of mental health difficulties among those impacted

by the policy.

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List of Acronyms

ATT Average Treatment effects on the Treated.

BBC British Broadcasting Corporation.

BHPS British Household Panel Survey.

CAR Cumulative Abnormal Stock Returns.

CCDI Central Commission for Discipline Inspection.

CEO Chief Executive Officer.

CI Confidence Interval.

CICC China International Capital Corporation Limited.

CP Central Politburo.

CRE Correlated Random Effects.

CSMAR China Stock Market & Accounting Research.

CSR Corporate Social Responsibility.

CSRC China Securities Regulatory Commission.

DiD Difference-in-Difference.

DWP Department of Work and Pensions.

EDP Enhanced Disability Premium.

EITC Earned Income Tax Credit.

EPU Economic Policy Uncertainty.

ESG Environmental, Social, and Corporate Governance.

GEM Growth Enterprise Market.

GHQ General Health Questionnaire.

GP General Partner.

IMR Inverse Mills Ratio.

IPO Initial Public Offering.

IT Information Technology.

KKR Kohlberg Kravis Roberts.

LP Limited Partner.

LPM linear probability model.

M&A Mergers and Acquisitions.

OLS Ordinary Least Square.

OTC Over The Counter.

PE Private Equity.

PSC Politburo Standing Committee.

PSM Propensity Score Matching.

R&D Research and Development.

RMB RenMinBi.

ROA Return On Assets.

SDP Severe Disability Premium.

SDQ Strengths and Difficulties Questionnaire.

SEC Securities and Exchange Commission.

SME Small and Median-sized enterprises.

SOE State-Owned Enterprise.

SSE Shanghai Stock Exchange.

STAR Sci-Tech Innovation Board.

SZSE Shenzhen Stock Exchange.

UC Universal Credit.

UK United Kingdom.

UKHLS UK Household Longitudinal Study.

VC Venture Capital.

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Author’s Declaration

“I declare that, except where explicit reference is made to the contribution of others, that this dissertation is the result of my own work and has not been submitted for any other degree at the University of Glasgow or any other institution.”
Printed Name: Huihui Song
Signature:

1 Introduction

This thesis comprises three chapters on policy evaluation. The first two chapters contribute to the field of political economics by studying the determinants and consequences of princeling connections, using data and context from a developing country, China. The third chapter contributes to the field of health economics, utilizing policy context and data from a developed country, the United Kingdom.

Political connection is a prevalent phenomenon worldwide (Adhikari et al., 2006), which refers to the connection between enterprises and government or regulatory officials (Su et al., 2019). In the context of different countries, political connections have various manifestations. For example, lobbying is the most common way of political connections in the United States. While in China, political connections usually mean firms have executives who have previously worked for the government (Liu et al., 2016; Su et al., 2019; Wang et al., 2017b). Numerous studies have demonstrated that political connections can influence corporate activities in various aspects, including external financing (Fan et al., 2007; Claessens et al., 2008), access to government resources (Kroszner and Stratmann, 1998; Goldman et al., 2009), and firm performance (Fisman, 2001; Azmi et al., 2020). In contrast, some studies have found that rent-seeking behaviors associated with political connections can harm a company's performance (Frye and Shleifer, 1996; Shen et al., 2015).

In recent years, the concept of princeling connections, which refers to the connections between relatives of top government officials and entrepreneurs, has garnered public and research interest. This interest arises not only from the fact that princelings have influence in politics, the economy, and the military but also from their ability to amass significant wealth and exert substantial influence over resource allocation. Given that this is a relatively novel topic that has not been extensively investigated in the literature, there are only two papers that examine the impact of princeling connections on the Chinese economy. One paper, Chen and Kung (2019), studies how princelings exert an impact on land transactions, while the other paper, Li et al. (2019), investigates the impact of princeling connections on bank loan decisions. I aim to examine whether princelings can leverage their privileged status

to provide advantages to their connected firms in terms of regulatory enforcement and the private equity industry, thereby influencing economic activities. The focus of the first two chapters will be on Chinese data within the context of princeling connections.

In the second chapter, I explore the impact of princeling connections on regulatory enforcement. In the initial stage, I examine the determinants of firm characteristics that attract princelings. Next, to assess whether princeling connections help shield related firms from legal punishments, I create a sample of control firms using various matching methods (e.g., nearest-neighbor, kernel, and local linear matching), ensuring that they have similar firm characteristics except for the princeling-connected status. Finally, leveraging the anti-corruption campaign launched at the end of 2012, I investigate whether this campaign effectively reduces the influence of princeling connections. The results reveal that princelings tend to establish connections with firms that exhibit better financial performance, weaker governance structures, fewer Corporate Social Responsibility (CSR) activities, and more investment in innovation. The possible reason for this preference arises from the fact that princelings can easily divert profits from these firms into their own accounts without detection. Furthermore, I test whether princeling-connected firms enjoy protection in terms of both the likelihood of punishment and the number of punishments in a given year. The findings indicate that princeling-connected firms are less likely to face regulatory punishments compared to control firms. Specifically, princeling-connected firms are 4 percentage points less likely to be punished by the regulatory body and 8 percentage points less likely to incur more penalties in a single year compared to non-connected firms. I extend the analysis to provide evidence of the ineffectiveness of the anti-corruption campaign, as princeling-connected firms continue to receive fewer punishments even after the campaign. The heterogeneity tests show that princelings have a more pronounced effect in regions with underdeveloped legal environments, privately owned firms, and firms with lower-than-average Return On Assets (ROA) ratios. These findings suggest that these characteristics provide greater opportunities for princelings to exert their influence.

In Chapter 3, I shift my focus to examining the role of princeling connections in the private equity (PE) industry. Firstly, I investigate whether PE plays a certification role for target companies in China, specifically regarding their Initial Public Offering (IPO) performance and post-issue performance. Next, I explore whether PEs with princeling connections have an impact on the IPO performance of their portfolio firms. Lastly, I analyze the influence of policy uncertainty on IPO performance in the PE industry using the policy uncertainty index developed by Baker et al. (2016). Using non-PE-backed firms as the baseline group, the findings of this chapter demonstrate that companies backed by PE experience a reduction in IPO underpricing by

2% compared to companies without PE backing. Furthermore, PE's strategic and financial support enhances the post-IPO performance of targets by an additional 3% compared to non-PE-connected firms, thus supporting the hypothesis of PEs' certification role. I further divide all PE firms into two groups: PEs with princeling connections and PEs without princeling connections. The sample includes targets with princeling-connected PEs, targets with PEs but without princeling connections, and targets without any PE support (baseline group). The results continue to show that firms with non-princeling-connected PE support exhibit better IPO performance. In contrast, princeling-connected PEs can assist targets in achieving lower underpricing but do not subsequently offer help in long-term post-IPO stock performance. This finding supports the hypothesis that princeling-connected PEs primarily provide political relationships rather than additional oversight of the companies. Lastly, utilizing the policy uncertainty index, I find that firms with non-princeling-connected PEs exhibit greater resilience during periods of high policy uncertainty compared to their counterparts. However, PEs with princeling connections are unable to enhance the IPO performance of their portfolio companies in the face of high uncertainty. This occurs because non-connected PE targets receive strategic advice, financial support, and industry specialization, whereas, connected targets cannot receive any support due to the negative impact of high uncertainty on those PEs. Moreover, exploring firm-level heterogeneity reveals that the impact of PE is stronger when the PE fund has a higher reputation and when the portfolio firms are privately owned.

The fourth chapter examines the impact of welfare reform on the mental health of children. Childhood and adolescence are critical stages of life for mental health, as they involve rapid growth and brain development. Globally, 10% of children and adolescents experience mental disorders, yet the majority of them do not seek or receive necessary care. In the United Kingdom (UK), mental health has deteriorated over the past two decades. Analysis of the survey "Mental Health of Children and Young People in England" reveals a substantial number of children and young people with mental health conditions[1]. For instance, in 2022, approximately 18.0% of children aged 7 to 16 years and 22.0% of young people aged 17 to 24 years were identified as having a probable mental disorder. Also, there is evidence that welfare reforms have contributed to this phenomenon (Barr et al., 2015, 2016). The objectives of a well-functioning welfare state are to raise the welfare of recipients while incentivizing self-sufficiency through work (Hartley et al., 2022). Failure to strike the correct balance can result in unintended consequences such as mental health issues, illness, or criminal activities among claimants (Blank, 1997, 2002).

In 2013, the UK introduced a major change to its welfare system with a new ben-

[1]These findings are based on responses to the Strengths and Difficulties Questionnaire (SDQ), a validated tool used to assess various aspects of mental health.

efit called Universal Credit (UC). UC was intended to provide greater incentives for claimants to enter employment (National Audit Office, 2018). However, evidence shows that the early roll-out had only a positive, albeit very modest, effect on the employment of claimants[2]. Furthermore, doctors have raised concerns that the UC reform is harming health and increasing the workload of general practitioners (Arie, 2018). Several studies have shown that the introduction of UC has resulted in a decline in the mental health of adults (Wickham et al., 2020; Brewer et al., 2022). However, more attention should be given to the impact of UC on the mental health of children. This is important not only because having a child with poor health is associated with reduced employment for both mothers and fathers (Kuhlthau and Perrin, 2001), which indicates that the condition of child health is key to the success of Universal Credit in encouraging people to work and achieving its goals (Davey and Hirsch, 2011), but also because poor health in childhood is associated with lower educational attainment, worse health, and inferior labor market outcomes in adulthood (Case et al., 2005; Currie, 2004; Graham et al., 2004). Therefore, conducting a comprehensive evaluation of the reform requires identifying the mental health costs for children.

In Chapter 4, I utilize data from the UK Household Longitudinal Study (UKHLS) spanning the years 2009 to 2019. The dataset provides 8,026 observations from 6,215 children. I classify the children into two groups: the comparison group consists of children with employed parents who are not eligible for UC, while the treatment group consists of children with unemployed parents who are eligible for UC. It is important to note that in May 2016, families with fewer than two children become eligible for UC. Taking this into account, I use a parallel trend graph to show whether the proportion of children experiencing mental health problems (measured using the SDQ with a score equal to or greater than 17) has changed before and after 2016. The graph suggests that, following the introduction of UC, a higher proportion of children in the treatment group exhibit mental health issues compared to the comparison group. To further investigate the treatment effect of UC on children's mental health, I employ a two-way fixed-effects model, incorporating fixed effects at both the individual and year levels. The results show that UC exacerbates children's mental health problems among unemployed parents. Specifically, the treatment groups are 9% more likely to have mental health issues. This finding remains robust when considering various models and sample specifications. Furthermore, I explore the mechanisms through which the treatment effect on children's mental health arises. One significant channel is the increased time spent on job searching, leading to higher utilization of childcare services, which in turn negatively impacts children's mental health. It is worth noting that the reform does not significantly reduce household

[2]Department for Work and Pensions (2014) found that 69% of UC claimants found a job between making their claims six months later compared to 65% of legacy claimants.

income, which could potentially affect children's mental health. Additionally, I examine potential heterogeneity in the treatment effect based on children's gender, the number of children in the household, and the parental status of the household. The findings also emphasize that younger children are more significantly affected by Universal Credit.

2 Princeling Connection and Financial Regulatory Favouritism for Listed Firms in China

2.1 Introduction

Extensive studies have explored mechanisms through which political connections improve firms' operating situation, such as helping firms obtain external financing (Francis et al., 2009; Boubakri et al., 2008, 2012; Chen et al., 2014) and getting preferential treatments in the distribution of government resources (Faccio, 2006; Boubakri et al., 2008; Yan and Sun, 2016). On the other hand, some studies also point out that the rent-seeking brought about by political connections could harm a company's performance (Faccio, 2006; Fan et al., 2007). In this chapter, I explore higher levels of political connections, princeling connections, which have received limited attention in the literature.

Princeling connections refer to the relationship between firms and the relatives of top-ranking government officials. This represents a higher level of political connections, which exerts a crucial impact on Chinese society. It has garnered the attention of both politicians and the research community in recent times. Although there are only a few princelings in China, they have left their footprints in politics, economy, society, and the military, and have even monopolized the country's wealth[3]. Consequently, princelings could exert a considerable influence on social activities and resource allocation. However, to date, only two studies have examined the impact of princeling connections through empirical analysis (Li et al., 2019; Chen and Kung, 2019). Therefore, further research is warranted to clarify their influence on China.

In this chapter, my aim is to study the impact of princeling connections on regula-

[3] https://www.bbc.com/zhongwen/simp/chinese_news/2012/05/120520_press_princelings

tory enforcement, which is considered an essential determinant of the development of financial markets (La Porta et al., 2000, 2002; Shleifer and Wolfenzon, 2002). The protection of investors' rights is achieved through the enforcement of regulations and laws, with enforcement being as important as, or even more important than, the content of the regulations (Defond and Hung, 2004). However, in China, the rapid growth of the private sector has not been accompanied by an equally rapid development of laws and regulations. China has consistently witnessed a phenomenon where policy implementation is lacking, and the China Securities Regulatory Commission (CSRC) is influenced by political connections (Wang et al., 2017b). Therefore, I explore whether princelings intervene in the process of regulatory enforcement, potentially undermining the overall investment environment and eroding investors' confidence.

Furthermore, the recent anti-corruption campaign initiated by President Xi at the end of 2012 has garnered significant attention. This anti-corruption campaign is widely regarded as the boldest in Chinese history. According to Jiancha Daily (2015), over a hundred government officials at the provincial level or higher were either under investigation or arrested on charges of corruption. Consequently, this anti-corruption campaign, considered a political shock, has the potential to cause companies to lose political protection or weaken the influence of politicians. Some studies have found evidence supporting the effectiveness of this anti-corruption campaign in reducing corruption (Griffin et al., 2016; Liu et al., 2016; Hope et al., 2020), while others provide contradictory findings (Alonso et al., 2022; Griffin et al., 2021). However, only a few studies have examined its impact on regulatory enforcement.

In the first step of this study, I manually collect data on princelings and princeling-connected firms by utilizing the news media and search engines. In total, I identify 72 listed firms that are connected to 57 princelings, who are family members of 38 top politicians. Then I analyze the factors that might influence princelings to join a firm by employing panel data from 2008 to 2018 encompassing all listed firms. The first set of tests reveals that princelings prefer to establish connections with firms exhibiting better financial performance, weaker governance structures, fewer CSR activities, and more innovation investment. This preference stems from the potential for princelings to derive greater personal profits from such firms while minimizing the likelihood of detection. Building on the findings from the first set of tests, I further investigate whether princelings can prevent connected firms from facing legal punishments. I employ the Propensity Score Matching (PSM) method to pair connected and non-connected firms, ensuring that they have similar firm characteristics except for the princeling-connected status. The regression results demonstrate that princeling-connected firms are indeed less likely to face regulatory enforcement. Specifically, the probability of being punished for princeling-connected

firms is 4 percentage points lower than their counterparts. Additionally, firms with princeling connections are 8 percentage points less likely to have multiple penalties in a given year. Furthermore, I find that princelings have a more pronounced effect in areas with an underdeveloped legal environment, firms with private ownership, and below-average ROA ratios. These findings indicate that companies with these characteristics typically afford greater leeway for princelings to exercise their special privileges. Lastly, I leverage the anti-corruption campaign initiated at the end of 2012 to examine whether princelings can continue to shield connected firms from legal punishments. The findings show that even after the campaign, the advantageous effects of princeling connections in protecting associated firms persist, indicating the campaign's ineffectiveness in eradicating princeling connections. Overall, the baseline regression results suggest that princelings contribute to a lower probability of regulatory enforcement for connected firms, and this benefit remains unaffected by the anti-corruption campaign. Moreover, the results withstand various robustness checks.

This paper makes a significant contribution to the literature by addressing the research gap in princeling connections. It is widely accepted that political ties have an important impact on firm outcomes. However, the underlying channels are complex and unclear. Through this article, I uncover one important channel through financial regulatory enforcement for listed firms with political connections to the highest political powers in China, the "princelings". Additionally, the manually collected dataset of princeling connections can be utilized in other research exploring this topic. This study is also the first to combine princelings with the China Stock Market & Accounting Research (CSMAR) database and investigate their influence on listed firms. Furthermore, the findings of this paper suggest that princeling connections are more pronounced in regions with lower levels of legal development, among non-State-Owned Enterprise (SOE)s, and firms with higher ROA ratios, which could have policy implications for the government. For instance, enhancing legal development or firm performance can serve as effective measures to deter princeling connections.

The rest of the chapter organizes as follows. The next section briefly introduces the institutional background. Section 3 provides relevant literature, and section 4 develops three hypotheses in this paper. Section 5 deals with the data collection process. Section 6 reports research findings and discussion. Robustness checks and heterogeneity regression results are presented in section 7 and section 8 individually. The conclusion and comments on political implications are shown in the last section of this paper.

2.2 Institutional background

2.2.1 The rise of princelings

2.2.1.1 Definition of princeling connections

In early research, the term "princeling" refers to individuals who held high positions in the Chinese Communist Party prior to the Cultural Revolution in 1966 (Bo, 2015). However, in the current political climate, "princeling" typically refers to the offspring of high-ranking officials (Zhang, 2014; Wang, 2017; Li et al., 2019).

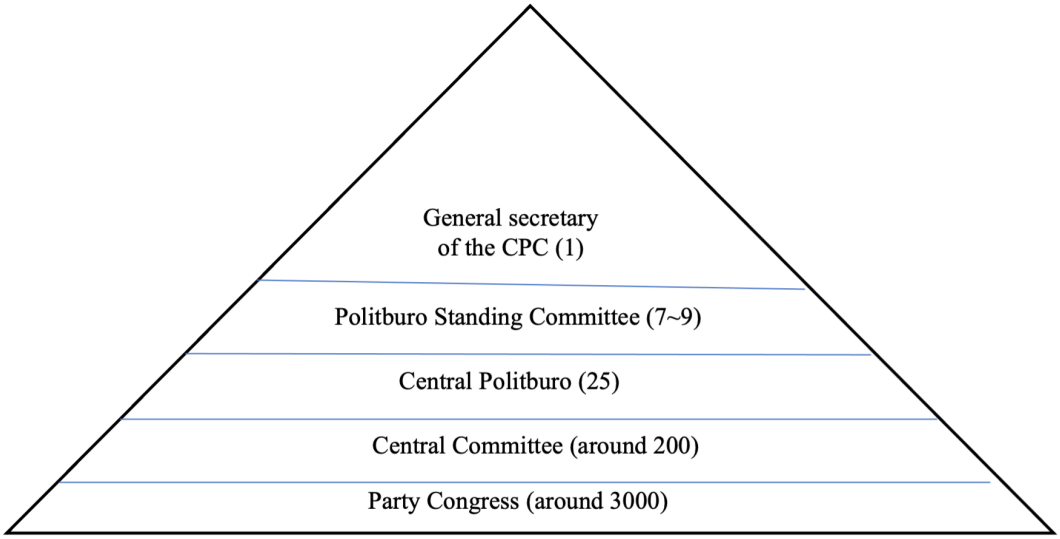
Figure 2.1 depicts the power pyramid of the National Congress of the Communist Party of China. In China's one-party governing system, the Politburo stands as the pinnacle of this power pyramid. It comprises an average of 25 members who are elected from the pool of Central Committee members. These Central Committee members are, in turn, selected from among thousands of National Congress delegates. Among these approximately 20 elites, 7 to 9 are further chosen to serve as members of the Politburo Standing Committee, with one individual assuming the role of the Party General Secretary. Consequently, the Politburo and its Standing Committee yield the majority of power within the Chinese Communist Party.

From the perspective of China's administrative hierarchy(Figure 2.1), Chen and Kung (2019), Zhang (2014), and Zhang (2019) regard senior officials are the members of Central Politburo (CP) and Politburo Standing Committee (PSC) in their research. Following their definition, I define princelings are the relatives of the senior officials who serve in the CP or PSC in the National Congress. The National Congress is the highest governing body and legislature of the People's Republic of China. Therefore, the hierarchy of the National Congress can reflect the power and influence of government officials in China. Additionally, since the membership of the Political Standing Committee is publicly available, accurate lists of princelings can be identified.

2.2.1.2 The channels of princeling connections

China has put in place strict regulations, such as the "Civil Servants Law of the People's Republic of China" and "China's Joint Disciplinary Measures Regulation", which prohibit government officials from engaging in commercial activities while

Figure 2.1: The power pyramid of the National Congress of the Communist Party of China



Note: Source: Chen and Kung (2019).

they are in office. Due to these restrictions, individuals with "royal lineage", known as princelings, have become an important means for Chinese officials to exercise their rights. Princelings have four different channels to obtain huge profits.

The first channel involves engaging in private business, where they can establish or invest in a company and leverage their political status to win government or other commercial resources. Princelings may even enter into state-owned monopoly industries that are closely regulated and turn these assets into lucrative investments[4].

The second way for princelings to be involved in business is to join a large, listed firm or a State-Owned Enterprise (SOE) and serve as an executive or a member of the director board. They can leverage their political connections to help the company generate higher profits and secure fair returns (Chen et al., 2017). For instance, Zhu Yunlai, the son of Zhu Rongji, former Premier of the CPC Central Committee, joined China China International Capital Corporation Limited (CICC) in 1998 and served as the company's Chief Executive Officer (CEO). Since he entered the CICC, the company has almost monopolized the overseas listing of large Chinese SOEs[5]. In 2004, he was

[4]For example, Jiang Zhicheng, the grandson of Jiang Zemin, former General Secretary of the CPC Central Committee, co-founded Boyu Capital Co., Ltd. in Hong Kong in 2010 and served as its first director. In just a year and a half after its establishment, Boyu successfully completed two large deals, including the listing of Alibaba and Cinda International Holdings Limited. It would be impossible for other Chinese investment companies to accomplish such feats in such a short period. Boyu Capital also acquired a controlling stake in Rishang Duty-Free Bank in 2011, a sector previously monopolized by the state in Chinahttps://www.reuters.com/article/special-report-princeling-private-equity-idCNCNEA3A09G20140411.

[5]http://www.ftchinese.com/story/001019041?archive

also named "Asia's most influential business leader" by Fortune Magazine. In this paper, I mainly study the influence of the participation of princelings on the listed firms through this channel, investigating whether princelings can help related firms free from legal punishments.

Another way for princelings to participate in business is to establish informal contact with the company and use their connections to help the company obtain political resources or investments. The company will give the princelings corresponding remuneration(e.g., real estate property and luxury yachts) but these transactions are invisible.

Lastly, foreign enterprises also try to establish connections with those Chinese princelings to achieve their business goals. A very famous case is the "Sons and Daughters program" implemented by JP Morgan. The success of this program once again proves the crucial role of princelings in the Chinese economy[6].

2.2.2 Anti-corruption campaign

Since economic reforms and fiscal decentralization in the early 1980s, corruption in China has increased significantly. As Chen et al. (2014) state, corruption as an accepted culture has grown exponentially over the past 40 years and is endemic throughout China's political, military, and business structure. Successive Chinese leaders continually criticize the severe corruption problem and make anti-corruption efforts. However, their impacts are comparatively small, and senior government officers are rarely affected. On 14th November 2012, Xi Jinping took office as the leader of China at the Eighteenth National Congress. Soon after assuming power, Xi Jinping initiated an unprecedented anti-corruption wave intending to correct the prolific presence of corruption and re-establish economic growth in China. Since its inception, four national leaders and hundreds of senior government officials and military officers have been investigated and removed. The campaign has removed a vast number of government officials who violated laws and disciplines. According to Forbes (2016), the number of individuals investigated during this anti-corruption campaign exceeded 200,000, with a conviction rate of 99%. Additionally, The Diplomat reports that the Central Commission for Discipline Inspection (CCDI), which is at the forefront of corruption investigations at the central and provincial levels, has

[6]Between 2006 and 2013, JP Morgan hired hundreds of employees or interns with a strong political background, trying to establish connections with the government. Consequently, this program has brought a massive return of $100 million to JP Morgan. https://www.forbes.com/sites/antoinegara/2016/11/17/jpmorgan-agrees-to-pay-264-million-fine-for-sons-and-daughters-hiring-program-in-china

investigated and punished over 4 million cadres and nearly 500 senior officials since Xi took office in 2012[7].

2.2.3 Regulatory enforcement

In December 1990 and July 1991, respectively, Shanghai Stock Exchange (SSE) and Shenzhen Stock Exchange (SZSE) were opened, and the capital market has grown rapidly. However, the rapid growth of the private sector has not been accompanied by equally rapid developments in laws and regulations, causing investors to face the risk of dealing with unscrupulous managers and dishonest financial advisors (Anderson, 1999). One of the steps taken by the state to remedy corporate abuses is to set up regulatory bodies (e.g., CSRC whose duties include the monitoring and supervision of listed firms, intermediaries, and stock exchanges. CSRC is also the regulatory body that carries out investigations to identify and prosecute corporate fraud. But CSRC was viewed as being ineffective and subject to a lot of political pressure in the early days (Anderson, 1999). Lo et al. (2006) summarize five reasons to illustrate in detail why enforcement of regulations at local levels has been far from impressive, which could also reflect the background of Chinese society. Firstly, the highly fragmented bureaucratic structure of the Chinese regulation system is more likely to cause this problem (Ross, 1998; Sinkule and Ortolano, 1995; Ma and Ortolano, 2000; Sims, 1999). Secondly, the strong pro-growth orientation of most local leaders might lead them to ignore the regulation violations by firms (Lo et al., 2000). The third reason is an inadequate enforcement capacity in terms of both resources and management skills of the Chinese system (Alford and Shen, 1997; Van Rooij, 2002). Fourthly, the pro-development values of the enforcement officials themselves could also let them ignore regulation supervision problems (Chan et al., 1995). Finally, a well-entrenched informal authority structure known as "guanxi" grounds influence on the strength of relationships and norms of reciprocity (Sinkule and Ortolano, 1995; Chan et al., 2002).

[7] https://thediplomat.com/2022/05/chinas-anti-corruption-campaign-tigers-flies-and-everything-in-between/

2.3 Literature review

2.3.1 Why firms build political connections

2.3.1.1 Reasons for building political connections

The mutual needs of both sides activate the links between corporates and government officers. For entrepreneurs, when the market fails to support the rapid development of enterprises, such as existing burdensome regulations, overwhelming tax burdens, and weak assurance of property rights, political connections can help surmount the ever-increasing bureaucratic requirements (Li et al., 2006, 2008). Secondly, if the government possesses the discretion to distribute resources as well as to ratify state-funded programs (Child, 1996), political connections may facilitate relevant companies to obtain preferential treatments and vital resources and resolve external issues and difficulties (Pfeffer and Salancik, 2003). From the perspective of politicians, they too require the support of companies in their endeavour to achieve political or socio-economic targets (Shleifer and Vishny, 1994), such as the resources that are necessary to support their election campaigns or fund-raising activities during elections (Miettinen and Poutvaara, 2014). Additionally, enterprises could help government officers to maintain their administrations (Choi, 2012).

2.3.1.2 The value of political connections

It has been widely acknowledged in the literature that political connections add value to firms in both developing and developed countries through different mechanisms (Fisman, 2001; Johnson and Mitton, 2003; Li et al., 2008; Goldman et al., 2009; Cooper et al., 2010; Azmi et al., 2020). For example, politically connected firms enjoy easier access to external financing (e.g., bank loans) (Claessens et al., 2008; Chen et al., 2014; Hung et al., 2017; Fan et al., 2007). The findings of Yan and Sun (2016) show that political connections could bring tax incentives. Other studies have proved that political connections can be used as an alternative mechanism to protect a firm's property rights and interests from infringement by other market participants as well as obtain government subsidies or contracts, all of which ultimately increase firms' market value or improve their economic performance (Allen et al., 2005; Faccio and Parsley, 2009; Goldman et al., 2009; Acemoglu et al., 2016; Faccio, 2006).

However, some studies suggest that the value of political ties is less certain. Gray et al. (2016), Bertrand et al. (2018), and Farag and Dickinson (2020) find that there is no evidence indicating that government ties are particularly abundant or valuable to shareholders. There are studies that emphasize the associated costs of political connections for firms which may lead to lower operating performance and undermine the value of the firm due to rent-seeking activities (Frye and Shleifer, 1996; Faccio, 2006; Fan et al., 2007; Shen et al., 2015; Zhang and Truong, 2019; Li and Cheng, 2020). For example, politically connected firms are more likely to pursue social objectives that are encouraged by the government or politicians, which leads to the misallocation of resources (Boubakri et al., 2008; Marquis and Qian, 2014; Zhang et al., 2016). Hiring more qualified employees than required is another example that causes firms to bear high labour costs and pay subsidies as wages exceed the market average (Shleifer and Vishny, 1994; Bertrand et al., 2007; Zhang and Truong, 2019).

2.3.2 Princeling connection for Chinese firms

2.3.2.1 Empirical studies on princeling connections

The positive effects of princeling connections can be reflected at the individual and firm levels. At the firm level, Li et al. (2019) study the roles of princeling connections in bank lending decisions for SOEs and non-SOEs separately, indicating that princeling connections could enable non-SOEs to have better access to bank loans while the effect is insignificant for SOEs. In terms of the price and quantity of land transactions, Chen and Kung (2019) find that companies linked to Central Politburo (CP) and Politburo Standing Committee (PSC) members have greater advantages than companies without connections. What's more, from the perspective of provincial party chiefs, cooperation with princelings can give them more possibilities for promotion. Besides, Wang (2017) discovers a negative effect of the downfall event of Bo Xilai, a national leader, on the nationally connected firms' stock return. For individuals, princeling status can provide convenience in their career path. For example, Zhang (2019) and Shih et al. (2012) elaborate that the princelings have a higher probability of promotion in comparison with non-princelings on the central committee.

The negative influence of princeling connections may magnify at the firm and country levels. Li et al. (2019) find that the existence of princeling connections makes the overall resource allocation of the country ineffective. However, the anti-corruption campaign launched in 2012 can reduce the degree of resource misallocation. As for

the firm level, princeling connections may negatively affect the company's performance. Chen et al. (2017) discover that the princeling-connected companies usually present high retained earnings but pay little cash dividends, which may indicate that the company's retained earnings are used in grey, thus increasing the risk of investors' profits being expropriated. Besides, Liu (1989) describes the networks of princelings as "the new bureaucratic bourgeoisie", which is more harmful to social society than the bureaucratic bourgeoisie that exists under the Kuomintang regime.

2.3.2.2 Theoretical explanation for rent-seeking behaviour

Rent-seeking activities were first described by Tullock (1967) and then defined by Krueger (1974). Tullock (1967) points out that rent-seeking may make social welfare costs more serious. Krueger (1974) further explains that the nature of rent-seeking activities is competitive, and one of the reasons for the existence of rent-seeking is government intervention. Since government officials have the right to distribute licenses, they can accept part of the rent in the distribution process which is regarded as corruption. Later on, Murphy et al. (1993) explain why rent-seeking is so costly to growth. Firstly, rent-seeking activities show a naturally increasing return, which is similar to the idea of Tullock (1967). The increase in rent-seeking activity makes rent-seeking more attractive relative to productive activity, leading to a high level of rent-seeking and low output in society. Secondly, public rent-seeking (e.g., tax, lobbying, and corruption) by government officials is likely to hurt innovative activities more than everyday production. Since innovation drives economic growth, public rent-seeking hampers growth severely. Recently, Hillman (2013) proposes the standard definition of rent-seeking as the quest for privileged benefits from the government. In this paper, crony capitalism, a form of rent-seeking, could better explain the phenomenon of princeling connections. Crony capitalism is a term describing an economy in which business success depends on close relationships between business people and government officials (Rubin, 2016), such as hiring friends and relatives of the national leaders (Kang, 2003; Thiessen, 2011). Especially in China, cronyism has arguably run rampant (Pei, 2016; Bai et al., 2014; Gong, 2015; Wedeman and Wedeman, 2012). The existence of rent-seeking behaviours can also explain why politically connected firms enjoy more resources but suffer poorer performance (Zhang, 2014; Fan et al., 2006; Liu et al., 2018; Wei et al., 2020; Lee et al., 2020).

2.3.3 Studies on the anti-corruption campaign

Corruption is considered to be a global problem, particularly in developing economies (Pan and Tian, 2017), and it is expected to have negative impacts on economic growth (Mauro, 1995; Mo, 2001). To combat corruption, implementing anti-corruption campaigns is one approach that can be taken. Most studies prove that fighting corruption has generated a beneficial influence on the economy. For example, Berkowitz et al. (2015) find that enhanced anti-corruption measures could protect creditors from the possibility of predatory government officials requisitioning the collateral established against their secured loans. Other evidence of the benefits of the anti-corruption campaign can be seen in that the performance of SOEs has improved (Kong et al., 2017), and the risk of stock prices plummeting has been reduced during the post-event period (Chen et al., 2018). Besides, Xu et al. (2017) show that the ongoing anti-corruption campaign has improved the possibility for companies to obtain external funds, mainly long-term debt. Anti-corruption campaigns can help the central governments to increase the public's trust towards them (Zhao et al., 2020; Gilley and Holbig, 2009) and eliminate political enemies (Fu, 2019). However, other studies demonstrate that anti-corruption campaigns may be ineffective. For example, Ramalho (2003) finds that the drop in the stock price of politically connected family corporates is temporary. Oyamada (2005) demonstrates that even after the anti-corruption campaign, the public still holds a distrustful attitude toward the government in the Philippines. Regarding the anti-corruption in China, Griffin et al. (2021) and Alonso et al. (2022) indicate the political partiality of this anti-corruption campaign, suggesting that the anti-corruption is not always effective.

2.3.4 The effect of political connections on regulatory enforcement

Political connections have been considered an essential factor that might influence the effectiveness of regulatory enforcement. Gordon and Hafer (2005) document lower investigation rates by the Nuclear Regulatory Commission for firms that make political action committee contributions. Similarly, Correia (2014) reveals that firms and executives with long-term political contributions and lobbying are less likely to be involved in Securities and Exchange Commission (SEC) enforcement actions and face lower penalties if prosecuted by the SEC. Richter et al. (2009) show that lobbying firms experience lower tax rates, possibly due to more lenient interpretation and enforcement of tax laws by the Internal Revenue Service. However, the results of the effect of political connections on mitigating regulation enforcement in China are

mixed. Sam and Zhang (2020) value the new environmental enforcement regime under the central government's control, and they find neither political connections nor firm size mitigated the severity of the market losses. In contrast, Tian et al. (2019) argue that political relationships can alleviate the negative effect of regulation on the stock value of heavy-polluting firms. In particular, the buffer effect of political connections on the stock value is more substantial for the central political connections. Regarding corporate regulation, the findings of Wu et al. (2016) suggest that political connections can help reduce the incidence of enforcement action against corporate fraud.

Overall, the effect of princeling connections, a higher level of political connections, has never been discovered with regard to regulatory enforcement, and none of the research studies the impact of the anti-corruption campaign on regulatory enforcement. Even though it is believed that princeling status can protect them from legal punishment when facing charges, there is no research empirically to show the correlation between them[8]. So, this paper is expected to fill in these gaps, providing a new perspective on studying princeling connections and regulatory enforcement.

2.4 Hypotheses

2.4.1 The determinants of princeling connections.

Numerous studies demonstrate the correlation between political connections and company performance. Concerning corporate firm performance, Wu et al. (2012) demonstrate that private firms with political connections outperform those without. Similarly, another study (Li et al., 2008) highlights that politically connected private firms tend to exhibit better performance due to their ability to secure loans from banks and other state institutions. The literature also elucidates the negative relationship between corporate governance and political connections. A study by Shen et al. (2015) suggests that corporate governance and regulations can act as substitutes; firms with strong corporate governance tend to focus less on building political connections, while politically connected firms often display poor governance prac-

[8]One example is that Li Xiaopeng, the son of Li Peng (the former prime minister of China), was not sanctioned by law when the firm he served as chairman was found to be involved in the embezzlement of 8 million US dollars of public funds. In addition, there has always been a saying in the officialdom that "PSC members will not be punished by law". Even if there are cases to be investigated, the PSC members will not be involved. This rule applies to all PSC members, regardless of whether they are current or former PSC members. It was not until 2015 that this statement ended when Zhou Yongkang, a former member of PSC, was sentenced to life imprisonment.

tices.

Likewise, research reveals the negative relationship between investment and political connections. Hou et al. (2017) find that political connections hinder corporate innovation activities and diminish innovation efficiency, implying the existence of a political resource curse effect on corporate innovation in Chinese firms. Lastly, certain studies indicate a relationship between political connections and Corporate Social Responsibility (CSR) performance. CSR activities serve as tools for Chinese firms to establish government connections (Wang et al., 2020). Based on these insights, I am motivated to investigate the factors that attract princelings to engage with firms.

Specifically, I hypothesize that firms' financial performance, governance structure, CSR performance, and innovation investment affect the princelings' decision to join the listed firm. It is expected that princelings are more likely to join firms with better financial performance and weaker corporate governance structures, as this provides them with greater opportunities for conducting tunneling activities without detection. Similarly, a lower level of CSR activities indicates that the company has fewer expenditures in this area, resulting in higher potential profits for princelings. In terms of innovation investment, if the firm invests most of the retained earnings in Research and Development (R&D), it may have better long-term performance. Thus, for princelings, they could continue rent-seeking activities in the long run. Therefore, I propose the following hypothesis:

H1: Princelings prefer firms with better operating performance, weaker governance structures, fewer CSR activities, and more innovation.

2.4.2 Princeling connections and the probability of being punished.

As Li and Naughton (2007) point out, Chinese regulatory agencies are still not fully independent from the government management bodies from which they were originally "hived off". China's legal institutions are regarded as government-driven rather than citizen or litigant drove (Clarke et al., 2008). Gong (2004), Wu et al. (2016), and Heitz et al. (2021) also point out that China's judiciary operates as an administrative unit within the political system, with its authority derived from the state rather than from the law. Firms having princeling-connected executives are tied together in a dense network with the regulatory body who are responsible for implementing the law (Lin et al., 2016; Li et al., 2019). This phenomenon can be explained by Lindblom (1959), who proposed the concept of Iron Triangles.

The Iron Triangles emphasize the exchange of favors between agencies, special interest groups, and congressional committees with jurisdiction over specific issues. The idea is that agencies can secure higher funding levels and increase their power by catering to specific interest groups. These groups, in turn, can influence Congress and contribute to the re-election of politicians who support their preferred legislation, creating a cycle where pressure is exerted on regulatory agencies to develop favorable policies. The theoretical works of Stigler (1971) and Pelzman (1976) provide further support for this theory through mathematical modeling.

Given that the political systems of China and the United States differ, the composition of the Iron Triangle may vary in practice. In this article, I consider the iron triangle to consist of princelings, connected firms, and regulatory bodies. Each entity within this triangle can obtain corresponding benefits from regulatory actions. As a result, the influence of princeling connections on regulatory enforcement is always present and significant.

Therefore, it is rational to assume that those firms are less overseen by the institutions. Thus, the second hypothesis is proposed as follows:

H2: Princeling connections can reduce the probability of being punished for connected firms.

2.4.3 Princeling connections and the anti-corruption campaign

The recent anti-corruption campaign initiated by President Xi Jinping at the end of 2012 is intended to significantly lower the corruption level in China. In the following two years, more than 50 officials at or above the provincial level had been dismissed or forced to resign, including politicians from the central and provincial governments and chairmen of the PCs. Therefore, one may expect that the anti-corruption campaign reduces the impact of political connections on listed firms (Berkowitz et al., 2015; Xu et al., 2017; Zhou et al., 2020). However, some studies show that the value of political connections persists after the anti-corruption campaign, indicating its limitations (Griffin et al., 2021; Alonso et al., 2022). Moreover, none of the princelings in the dataset are being arrested. Thereby, I predict that princeling-connected firms are still able to escape the sanctions of the law and enjoy a lower probability of being punished after the campaign and propose the third hypothesis:

H3: Princeling connections can still protect connected firms even after the campaign.

2.5 Data and methodology

2.5.1 Data

2.5.1.1 Sample selection and data collection on princelings

This paper selects the country's A-share listed companies between 2008 and 2018 as the sample. While not all firms with political connections are listed, the listed firms constitute a large part of the Chinese economy. For instance, the total market value of listed companies accounted for over 60% of the GDP in 2019[9].

Data on princelings are collected from various sources. First, I identify government officials with the highest political powers. These include the members of PSC and PC who have served on the committee after 1997[10]. In total, I build a list of 86 top politicians, including 62 politburo members and 24 top government officials[11].

Next, I search for information on the offspring and relatives of the politicians using search engines and news media. In a similar vein with Chen and Kung (2019), I define princelings as the offspring and other extended family members of China's top politicians, although the list of top politicians is more expansive than theirs. For each top politician, I search for three generations of their offspring and relatives. Using Wikipedia, Baidu, and Google search engines to search for these top leaders, I could get most of the information about the princelings. I also take advantage of news resources (e.g., the New York Times, the Financial Times, and the China Daily, British Broadcasting Corporation (BBC)) to search for the names of top officials. When I use Google to search for their names, these news media sources might include the names of top government officials or princelings. Following that, I validate whether the details are indeed related to the same individuals by searching for more relevant information in those news media. As a result, I identify 416 individuals as princelings. Wherever possible, I collect information on their background information, including gender, date of birth, education, and occupation. More detailed information on the process of collecting princeling name list is shown in Appendix A.1.

[9]The cutoff year is motivated by the fact that China adopted the new accounting principles for listed firms in 2008.

[10]The Politburo began to gain supreme power after the national leader Deng Xiaoping and other founding members of the CPC stepped down in 1997 (Chen and Kung, 2019).

[11]This list includes the ten founding marshals, eight "Elders", and all previous general secretaries since the founding of China in 1949 as the top and most influential leaders in the Chinese society, which Chen and Kung (2019) do not cover in their dataset.

Table 2.1: Sample distribution

Panel A: The distribution of the relatives of the government officials (N=416)			
By relation to the government officials			
The same generation	Wife and other in-laws	39	9.375%
	Sister/brother and sister-/brother-in-law	64	15.385%
	Total	103	24.76%
The second generation	Son/daughter and son-/daughter-in-law	194	46.635%
	Nephew/niece and Nephew-/niece-in-law	60	14.423%
	Total	254	61.058%
The third generation	Grandson/granddaughter and Grandson-/granddaughter-in-law	51	12.260%
	Grandnephew/grandniece and Grandnephew-/ grandniece-in-law	8	1.923%
	Total	59	14.183%
Panel B: The distribution of the princelings' occupation (N=379)			
SOE high executives		33	8.707%
Private firm owners or investors		94	24.802%
Government officials		86	22.691%
Army officials		61	16.095%
Others		87	22.960%
Multiple jpbs		18	4.750%
Panel C: The distribution of the relatives of the government officials who are connected to listed firms(N=57)			
By relation to the government officials			
The same generation	Wife and other in-laws	6	10.526%
	Sister/brother and sister-/brother-in-law	6	10.526%
	Total	12	21.053%
The second generation	Son/daughter and son-/daughter-in-law	33	57.895%
	Nephew/niece and Nephew-/niece-in-law	4	7.012%
	Total	38	64.912%
The third generation	Grandson/granddaughter and Grandson-/granddaughter-in-law	6	12.260%
	Grandnephew/grandniece and Grandnephew-/ grandniece-in-law	1	1.923%
	Total	7	14.183%
Panel D: The distribution of the princelings' occupation who are connected to listed firms(N=57)			
SOE high executives		14	24.56%
Private firm owners or investors		23	40.350%
Multiple jpbs		20	35.088%

Note: This table describes the distribution of the sample based on princelings' relationship and occupation. Panel A shows that there are 416 princelings connected to top politicians. In panel B, princelings who do not have an identifiable occupation are excluded, leaving 379 princelings. Panels C and D report relevant information regarding princelings who have connections with listed firms

Panel A of Table 2.1 reports the distribution of the relatives within the three generations for each government official. Most princelings are from the second generation (46%). Dropping 37 princelings whose career information is missing, panel B shows the distribution of princelings' occupations. Princelings participate more in private firms than in other fields. Panels C and D indicate the distribution of princelings who have connections with listed firms (N=57), which have similar features as the overall distribution.

Lastly, I identify firms that are connected to princelings. Information on firm executives (CEO, president, vice-president, chairman, secretary, or independent directors) is available in the CSMAR database, including their background characteristics (gender, date of birth, education), position, and time in office[12].

[12]I follow previous literature on the definition of political connections (Fan et al., 2007; Calomiris

I start by matching the princeling list to the executive names, and then manually check if it is the same individual by matching their background information. In this process, I identify 49 firms that are connected to princelings during the research period. If a princeling serves in a parent firm that has listed subsidiaries, I also regard those subsidiaries as princeling-connected firms[13]. In this step, I identify 17 connected firms. I further include 6 firms that have been reported to have a less visible connection with a princeling, where the princeling does not serve in a public position in the firm but is connected through other channels[14]. Altogether I identify 72 listed firms in total that are connected to 57 princelings, who are family members of 38 top politicians.

The distribution of the princeling-connected firms is presented in Table 2.2. Panel A of Table 2 shows that the number of princeling-connected firms has remained stable given the increasing number of listed firms and is around 1 percent of all companies, which is similar to the results of Chen and Kung (2019). Panel B shows the distribution of princeling-connected firms by industry. The manufacturing industry has the highest proportion of princeling-connected firms, reaching about 30%, followed by the financial sector (13%).

2.5.1.2 Data collection for regulatory enforcement

I collect the enforcement actions data from 2008 to 2018 from the CSMAR database. The CSMAR Enforcement Actions Research sub-database collects relevant data dating from 1994[15]. In sum, 6,989 regulatory enforcement announcements have been made during the period. CSRC investigates and deals with 16 types of violations firms may commit[16]. Such violations may involve the firm, its management, or its shareholders.

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et al., 2010; Wu et al., 2012).

[13]This is consistent with previous studies such as Chen and Kung (2019) who also include the subsidiaries.

[14]For example, The New York Times reported that several princelings are connected to Wanda, a real estate firm, but none of them are shown in the firms' official report. https://www.nytimes.com/2015/04/29/world/asia/wang-jianlin-abillionaire-at-the-intersection-of-business-and-power-in-china.html?_ga=2.207181395.1311164855.1669827411-688502164.1669827411

[15]The database includes announcements released by violating companies listed on the Shanghai Stock Exchange (SSE) and the Shenzhen Stock Exchange (SZSE), reports from the media designated by the CSRC, and announcements from supervisors.

[16]The 16 types of violations are inflated profits, fabrication of assets, false records (misleading statements), delayed disclosure, major omissions, false disclosures (others), fraudulent listing, violations in capital contributions, unauthorized changes in fund use, shareholder embezzlement, insider trading, illegal share trading, price manipulation, granting of illegal guarantees, improper handling of general accounting, and others.

Table 2.2: Distribution of princeling-connected firms by year and industry

Panel A: Year distribution of princeling-connected firms											
	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018
Number of princeling- connected firms	49	44	41	40	38	37	38	52	49	43	48
Total listed firms	1604	1700	2063	2342	2494	2489	2613	2827	3052	3485	3584
Percentage	0.03	0.03	0.02	0.02	0.02	0.01	0.01	0.02	0.02	0.01	0.01
Panel B: Industry distribution of princeling-connected firms											
Industry classfication						Frequency					Percentage
Mining						17					4.52
Manufacturing						107					28.46
					Food, beverages	5					4.67
					Timber, furniture	1					0.93
					Paper making, printing	15					14.02
					Petroleum, chemistry, plastics	6					5.61
					Medicine, biological products	1					0.93
					Metal, non-metal	24					22.42
					Machinery, equipment, instruments	38					35.51
					Electronics	15					14.02
					Waste resource utilization	2					1.87
Electricity, gas, and water supply						21					5.59
Construction						17					4.52
Wholesale and retail trade						27					7.18
Transportation and storage						33					8.78
Information technology and computer						21					5.59
Financial						57					15.16
Real estate						54					14.36
Leasing and business services						12					3.19
Environment and public facilities						5					1.33
Culture, sports and entertainment						5					1.33
Total						359					100

Note: This table describes the distribution of princeling-connected firms by year and industry. Panel A reports the number and percentage of princeling-connected firms among all the listed firms from 2008 to 2018. Panel B reports the number and percentage of princeling-connected firms in each industry. Firms in the manufacturing industry are further classified by the industrial four codes.

There are eight types of potential sanctions[17].

Table A.1 in Appendix provides a breakdown of the various types of violations, using the categories supplied by the CSRC. Table A.2 in Appendix shows the distribution of regulatory enforcement across different provinces and industries. After deleting regulatory enforcement (361 violations) for delisted firms, a total of 6,628 pieces of enforcement actions were obtained.

2.5.1.3 Other aspects

The data for financial performance, governance structure, CSR performance, and innovation investment is also obtained from the CSMAR database.

2.5.1.4 Outliers

To control for the potential influence of outliers, the continuous variables used in the empirical regression are winsorized, employing a 1 percent cut-off for each tail as suggested by Dixon (1960). In other words, for each variable, I assign values corresponding to the 1st and 99th percentiles of its distribution to all observations that fall beyond those thresholds. This approach, previously employed to assess the sensitivity of investments to cash flow (Cleary, 1999; Bertoni et al., 2010), serves to mitigate the impact of outliers while utilizing a larger number of observations than would be feasible through outright outlier removal[18]. Following these adjustments, the sample comprises 26,017 firms over a 10-year span[19].

2.5.2 Methodology

The empirical question is whether princeling-connected firms are less likely to be penalised by financial regulatory authorities. A simple comparison of penalty outcomes between connected and non-connected firms would lead to an endogeneity

[17]The 8 types of sanctions are public reprimand, warnings, condemnation, fines, confiscation of illegal gains, cancellation of the business license (order to close), market prohibition, and others.

[18]The results remain robust even if I exclude the top and bottom 1 percent of outliers.

[19]I include the data description without winsorization in Tables A.4 and A.5 in the Appendix. By comparing the results before and after winsorization, it can be observed that the influence of outliers is reduced.

problem, in that connected and non-connected firms may differ in observable and unobservable characteristics.

Therefore, I employ Propensity Score Matching (PSM) to estimate the treatment effect of princeling connections. PSM constitutes a specific nonexperimental evaluation method that utilizes information from a pool of units not involved in the intervention to ascertain the hypothetical outcomes of participating units in the absence of the intervention. By comparing the differences in outcomes for participants and observationally similar nonparticipants, it becomes feasible to approximate the effects of the intervention (Heinrich et al., 2010). The PSM technique finds application across an extensive range of fields within the program evaluation literature. For instance, Heckman et al. (1997) and Smith and Todd (2005) employ PSM techniques to estimate the impact of the labor market and training programs on income. Additionally, Jalan and Ravallion (2003) evaluate antipoverty workfare programs, Trujillo et al. (2005) analyze the influence of health insurance on medical-care participation, Lavy (2002) estimates the effect of teachers' performance incentives on pupil achievement, and Persson et al. (2003) examine the impact of electoral reform on corruption.

Owing to the rich data available on firm characteristics, propensity score matching is adopted to address the selection issue in this paper. The identification assumption for the PSM method is that selection bias is entirely captured by observable characteristics. While it is impossible to come up with the full list of determinants of political connection, existing evidence points out that important factors include financial performance (He et al., 2019), corporate governance (Shen et al., 2015), CSR (Wang et al., 2020), and innovation (Hou et al., 2017). Such factors are all observable in our data. A second feature of the data is that I have a much larger number of unconnected firms relative to connected firms, which ensures a higher likelihood of finding good matches for each connected firm.

The first step of PSM involves the estimation of a propensity score measuring the likelihood of political connection for a firm. To understand the determinants of princeling connection, I run the following logit model

$$\text{Prob}(princeling_{ijkt} = 1|\mathbf{X}_{ijkt-1}) = \text{logistic}(\mathbf{X}_{ijkt-1}\boldsymbol{\beta}) \tag{2.5.2.1}$$

where $\text{logistic}(\cdot) = \frac{\exp(\cdot)}{1+\exp(\cdot)}$ is the logistic function, and $X\beta_{ijkt-1}$ is a linear combination of lagged firm characteristics.

$$\begin{aligned}\mathbf{X}_{ijkt-1}\boldsymbol{\beta} =& \alpha_0 + \alpha_1 Financial\ performance_{ijkt-1} + \alpha_2 Governance_{ijkt-1} \\ &+ \alpha_3 CSR_{ijkt-1} + \alpha_4 Innovation_{ijkt-1} + \nu_j\ + \delta_t + \delta_t \times \nu_j + \gamma_k,\end{aligned} \tag{2.5.2.2}$$

where i indexes firms, j indexes industries, t indexes years, and k indexes provinces. I control for industry-by-year fixed effects $\delta_t \times \nu_j$, such that the comparisons are based on a like-for-like basis, within the industry and year. This term allows differential trends that may exist in different industries. The variables used to measure corporate characteristics cover four domains financial performance, governance, CSR, and innovation. Results obtained from this step are used to test H1.

In equation 2.5.2.2, α_1 comprises variables that reflect the company's performance (such as Size, Tobin, ROA, Leverage, and Investment). It is anticipated to yield positive results due to the inclination of princelings to affiliate with companies demonstrating superior firm performance. α_2 encompasses variables indicative of corporate governance quality (Largest, Ceodual, Boardsize, Indepedent, Big 4, Institution, and Top 10). A negative correlation is expected in this case, attributed to a weaker governance structure that facilitates princelings' engagement in tunneling activities. α_3 is linked to a variable associated with company innovation investment (Innovation), and a positive correlation is projected. Enhanced innovation suggests the potential for better future performance. α_4 indicates whether the company publishes CSR reports, and a negative relationship is expected. Elevated expenditures on CSR activities, reflecting greater involvement in non-profit endeavors, could potentially diminish the company's profits. If the regression coefficients yield the anticipated results, they can be employed to substantiate Hypothesis 1, which posits that princelings exhibit a preference for affiliating with companies demonstrating superior financial performance, weaker corporate governance, heightened investment in innovation, and fewer CSR activities. More detailed definitions and explanations of the variables are provided in the section 2.6.2 as well as the Table A.3.

The propensity score for each firm is calculated based on the logistic regression results above. I adopt a number of matching methods including kth-nearest neighbour, kernel, and local linear matching algorithms to check for robustness. There are generally three common matching methods in the literature, namely nearest neighbor matching, kernel matching, and local linear matching. In the context of the study of Dehejia and Wahba (1998), they use 1-1 nearest-neighbor matching, where each treated unit is paired with the closest unit in the comparison group based on a parametric propensity score. In this approach, the assignment of weights is simplified to two values: W=1 for the nearest-neighbor unit and W=0 otherwise. An alternative technique is kernel matching, which involves matching a treated unit with all control units while assigning weights proportional to the degree of similarity between the treated and control units (Imbens, 2000). This approach takes into account all

control matches and allows for a more continuous distribution of weights. Extending the kernel matching concept, local linear matching incorporates a linear term into the weighting function. This addition serves to enhance the matching process and mitigate potential bias (Heckman et al., 1997). The quality of matching is reported in Figure A.1 and Table A.6 in the appendix, showing a substantial reduction in differences between princeling-connected and non-connected firms after matching.

I then match firms based on propensity scores, to compute the Average Treatment effects on the Treated (ATT), which is the mean of the difference in outcomes for each matched treated and control pair conditional on the propensity score. After matching, princeling-connected firms and non-connected firms are statistically alike in all other economically relevant characteristics that may affect the probability of being punished, except for the treatment status. Therefore, I can compare the average probability of being punished between the connected firms and non-connected firms. Following the study of Wang et al. (2017a), I use equation 2.5.2.3 to estimate hypothesis 2.

$$ATT = E_{p(X)}[\{E(Y \mid D = 1, p(X) = p) - E(Y \mid D = 0, p(X) = p)\} \mid D = 1] \quad \textbf{(2.5.2.3)}$$

where $E(.)$ represents the expectation in the population. D denotes the treatment (Princeling), Y denotes the outcome (Penalty and Number of penalties), and $p(X)$ denotes a set of covariates sufficient for confounding control.

The outcomes I investigate include the likelihood of being punished and the number of penalties in one year[20]. Results obtained from this step are used to test H2. If the ATT's result is negative, it could test the second hypothesis that firms with princeling ties are less likely to be punished.

In addition, Heckman et al. (1997) stress that there may be systematic differences between participant and non-participant outcomes, even after conditioning on observables. Such differences may occur, for example, because of programme selectivity on unmeasured characteristics or because of level differences in outcomes $(E\left(Y^1 - Y^0 \mid P = 1\right))$ that might arise when participants and non-participants reside in different regions. Therefore, adopting a conditional Difference-in-Difference (DiD) matching estimator is one way to improve the results of the matching procedure. Let t represent a time period after the programme start date and t' a time period before the programme. The conditional d $-$ i $-$ d estimator compares the conditional before-after outcomes of programme participants with those of nonpar-

[20]Since the chance of being caught cannot be directly observed. Therefore, I can reflect on it through the probability of being punished and the number of penalties, following the previous literature (Wu et al., 2016; Chen et al., 2006; Hass et al., 2016), to measure regulatory enforcement in China.

ticipants: $E\left(Y_t^1 - Y_{t'}^0 \mid P = 1, \boldsymbol{X}\right) - E\left(Y_t^0 - Y_{t'}^0 \mid P = 0, \boldsymbol{X}\right)$. The DID is attractive because, unlike conventional matching estimators, it permits selection to be based on potential programme outcomes at time t' and to control for unobserved time-invariant factors.

To test H3 by investigating whether there are differences in the probability of being punished before and after the anti-corruption campaign, I first run the kernel PSM matching as before, then I use the least square model based on the matched sample, and the model is adopted as follows:

$$Penalty_{ijkt} = \alpha_0 + \alpha_1 Princeling_{ijkt} + \alpha_2 Post_t + \alpha_3 Princeling_{ijkt} \times Post_t + \varepsilon_{ijkt} \tag{2.5.2.4}$$

From this equation, α_1 indicates the difference in the probability of being punished for princeling-connected and non-connected firms. It is anticipated to be negative, suggesting that princeling-connected firms are less likely to face penalties from regulatory authorities. α_2 signifies the difference in the likelihood of punishment before and after the anti-corruption campaign. A positive value is expected, indicating that the anti-corruption campaign entails stricter enforcement. This term can be regarded as eliminating the time trend difference that affects the probability of being punished. For the treated group (princeling-connected firms), the difference before and after the anti-corruption campaign for connected firms is α_3, which is the primary interest here. The interaction term $Princeling_{ijt} * Post_t$ manifests the changes in the probability of being punished for princeling-connected firms after the anti-corruption campaign. I anticipate the coefficient of this interaction term to be significantly negative, which means that after the campaign, the princeling-connected firms still have a lower chance of receiving punishments. The results can be utilized to support Hypothesis 3, which proposes that princelings continue to enjoy privileges even after the anti-corruption campaign.

2.6 Regression results

2.6.1 Descriptive statistics

Table 2.3 reports the summary statistics for the main variables used in the following regression analysis[21]. The indicators for the financial, governance, CSR, and inno-

[21] I place the table with univariate test without winsorization in Table A.4.

vation variables are defined in Table A.3. Princeling is a dummy variable measuring whether a firm has princeling connections. Also, Penalty is a dummy variable that equals 1 if a firm commits fraud and is punished and 0 otherwise. Number of penalties measures the number of times a company is penalized within a year. To minimize the effect of outliers, all variables are winsorized at the 1% quantile.

The average ratio of ROA to Tobin Q is 0.04 and 2.13, respectively. The average firm size, based on the logarithm of total assets, is 21.96. The average ratio of leverage is 0.45. The average investment ratio is 0.05. On average, the largest shareholder holds 36% of the total outstanding shares. Additionally, 24% of firms have the CEO serving as a board director on average. The average value of the log of the Boardsize is 2.28. The highest proportion of independent directors is 60%. Institutional ownership and Top 10 shareholders own approximately 47% and 58% of all firms' outstanding shares individually. The innovation investment on average is 0.67. On average, 4% firms disclose the CSR report, which shows a small number of listed firms attach significance to CSR activities. The Big 4 auditors in China account for 6% of the market share. On average, approximately 1% of listed firms are princeling-connected. Corporate punishment cases (Penalty) account for 16% of the total number of firm-year observations. On average, the company receives 0.24 penalties per year. I place the original data without winsorization in Table A.4, and it can be observed that winsorization effectively removes the influence of outliers. To deflate the data, I use the Consumer Price Index of 2010 as the base year.

2.6.2 Univariate test

Table 2.4 presents the T-test results comparing firms with and without princeling connections in terms of firm characteristics[22]. For financial performance, I use the natural log of total assets at the beginning of the year to measure firms' size following the study of Fan et al. (2007) and find that princelings tend to join larger firms, which is significant at the 1 % level. Additionally, I incorporate Tobin Q, calculated as the ratio of a firm's total market capitalization to total assets at the beginning of the year. This ratio has become a widely accepted proxy for firm value (Lang et al., 1989). The leverage ratio, measured as the ratio of a firm's total debt to total assets at the beginning of the year, indicates the proportion of a company's total capital financed by debt. Princeling-connected firms exhibit a higher leverage ratio and a lower value of Tobin Q, suggesting that the financial performance of princeling-connected firms is

[22]I place the univariate test without winsorization in Table A.5. By comparing the results, it is found that the significance of leverage has changed, although princeling-connected firms still exhibit a higher leverage ratio, while the significance of the other variables remains the same.

Table 2.3: Descriptive statistics

(N=26,017)	Mean	Median	SD	Min	Max
ROA	0.04	0.04	0.06	-0.22	0.20
Tobin	2.13	1.66	1.45	0.94	9.80
Size	21.96	21.75	1.40	19.22	27.00
Leverage	0.45	0.45	0.22	0.05	1.01
Investment	0.05	0.04	0.05	0.00	0.25
Largest	0.36	0.34	0.15	0.09	0.75
Ceodual	0.24	0.00	0.43	0.00	1.00
Boardsize	2.28	2.20	0.25	1.61	2.94
Independent	0.38	0.36	0.07	0.25	0.60
Institution	0.47	0.50	0.24	0.01	0.92
Top10	0.58	0.59	0.16	0.22	0.91
Big4	0.06	0.00	0.25	0.00	1.00
Innovation	0.67	0.12	1.83	0.00	13.85
CSR	0.04	0.00	0.21	0.00	1.00
Penalty	0.16	0.00	0.37	0.00	1.00
Number of penalties	0.24	0.00	0.69	0.00	20.00
Princeling	0.01	0.00	0.12	0.00	1.00

Note: The table presents descriptive statistics for the variables used in this chapter. Mean represents the arithmetic average of the values, Median is the middle value in the sorted data, SD stands for standard deviation, Min is the smallest observed value, and Max represents the largest observed value. Table A.3 shows the definition of all variables used. All the data are winsorized at the 1st and 99th percentile values.

less favorable compared to non-princeling-connected firms. Furthermore, I include the Return on Assets (ROA) ratio, calculated as the ratio of a firm's net income to total assets at the start of the year. It is a financial ratio that measures a company's ability to generate profits relative to its total assets. However, no significant difference is observed between princeling-connected and non-connected firms in this aspect. Investment is another ratio considered, representing a firm's capital expenditure relative to total assets at the start of the year. The results indicate that princeling-connected firms exhibit a lower investment ratio than their counterparts.

In terms of corporate governance, I employ Largest to quantify the percentage of shares held by the largest shareholders, and Top 10 to estimate the concentration of shares held by the top 10 shareholders. Boardsize is measured as the logarithm of the number of board members. Independent is assessed as the percentage of independent directors on the board. The findings reveal that princelings are inclined to associate with firms featuring higher ownership concentration (e.g., Largest and Top 10), a larger board size, and a lower percentage of independent directors. Such firms tend to exhibit weaker governance structures, potentially making it easier for princelings to engage in tunneling activities. Institution denotes the percentage of institutional investor holdings, indicating that princelings tend to align with firms characterized by a higher proportion of institutional ownership. Ceodual is a dummy variable defined as 1 if the firm's CEO also serves as the chairman of the board, and 0 otherwise. The results indicate that princelings are less likely to join firms where the CEO holds both positions. Big4 is a dummy variable defined as 1 if a firm is audited by one of the Big4 auditing firms. The results suggest that princeling-connected firms are more inclined to engage the services of a Big4 auditor.

Moreover, princeling-connected firms tend to exhibit a higher level of innovation investment, as indicated by the amount of the R&D expenditure in the firm. These firms also demonstrate a greater likelihood of issuing CSR reports, which is captured by a dummy CSR indicating whether the firm issues CSR reports or not.

The primary focus is on the distinctions between princeling-connected firms and non-connected firms concerning regulatory enforcement measures including Penalty and Number of penalties. Penalty is a dummy variable defined as 1 if a firm engages in fraudulent activities and receives punishment from regulatory authorities. Number of penalties quantifies the count of penalties in a given year. The results indicate that princeling-connected firms display notably lower probabilities of regulatory punishment and a lower number of penalties in a single year.

Overall, most of the indicators show significant differences between princeling-connected and non-connected firms at the 1% significance level, which gives prelim-

inary proof for further study.

Table 2.4: Univariate test

	(1)		(2)		(3)	
	princeling=0 (N=25658)		***princeling=1*** (N=359)		***p-value***	
	Mean	Std.Dev.	Mean	Std.Dev.	T-test	P-value
ROA	0.04	0.06	0.04	0.06	0.00	(0.58)
Tobin	2.13	1.45	1.69	1.14	0.44***	(0.00)
Size	21.93	1.38	23.61	2.08	−1.68***	(0.00)
Leverage	0.45	0.22	0.57	0.23	−0.12***	(0.00)
Investment	0.05	0.05	0.04	0.05	0.01***	(0.00)
Largest	0.35	0.15	0.40	0.18	−0.05***	(0.00)
Ceodual	0.24	0.43	0.13	0.34	0.11***	(0.00)
Boardsize	2.28	0.25	2.40	0.31	−0.12***	(0.00)
Independent	0.38	0.07	0.37	0.06	0.01*	(0.04)
Institution	0.47	0.24	0.61	0.22	−0.15***	(0.00)
Top10	0.58	0.16	0.62	0.19	−0.04***	(0.00)
Big4	0.06	0.24	0.27	0.44	−0.21***	(0.00)
Innovation	0.66	1.80	1.27	3.37	−0.61***	(0.00)
CSR	0.04	0.20	0.14	0.35	−0.10***	(0.00)
Penalty	0.17	0.37	0.08	0.26	0.09***	(0.00)
Number of penalties	0.24	0.70	0.09	0.36	0.16***	(0.00)

Note: This table presents the univariate test to illustrate the differences between princeling-connected and non-connected firms. The definition of all variables used is shown in Table A.3. *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively. All the data are winsorized at the 1st and 99th percentile values.

2.6.3 Baseline regressions

2.6.3.1 Hypothesis 1: The determinants of princeling connections.

Table 2.5 presents the estimation results for the factors influencing princelings to join a firm. I examine four main aspects of firms' characteristics: financial performance, governance structure, CSR performance, and innovation investment[23]. Column (1) reports the odds ratio without controlling for fixed effects, column (2) controls for

[23]I use indicators such as ROA, Tobin Q, size, investment, and leverage to capture the firm's overall financial performance. The governance structure is measured by the percentage of independent directors, the percentage of the largest shareholders, the percentage of top 10 shareholders, the percentage of institutional shareholders, whether the firm is audited by one of the top 4 audit firms, the board size, and whether the CEO also serves as the board chairman. I also consider whether the firm issues CSR reports and the amount of innovation investment.

industry and year-fixed effects, column (3) adds the interaction of industry and year-fixed effects, and column (4) additionally includes the province-fixed effects.

In column (4), regarding the financial factors, the odds ratio of Tobin Q and Size is greater than one and statistically significant. These results indicate that princelings prefer firms with higher Tobin Q values and larger sizes. A higher Tobin Q value suggests that the firm's market value of capital exceeds the repositioning cost of that capital, indicating the creation of net value (Wernerfelt and Montgomery, 1988). Moreover, larger firms typically have a higher ability to produce and disseminate information (Atiase, 1985; Slovin et al., 1992), thereby reducing the degree of information asymmetry. Additionally, larger firms tend to be more established and have greater access to funding. They also enjoy more repeat business, resulting in higher sales and larger profits compared to smaller-scale companies. Furthermore, the odds ratio of Investment is smaller than one, and it holds statistical and economic significance, suggesting that a larger investment is associated with a lower probability of being connected to princelings. Having a higher level of investment may lead to increased volatility and risks for firms. Ai and Kiku (2016) argue that firms with high exposure to idiosyncratic volatility, characterized by high future investment and growth, tend to exhibit greater idiosyncratic variation in equity returns. This evidence is consistent with the findings of Cao et al. (2008) and Kogan and Papanikolaou (2013), both of whom establish a positive relationship between the level of idiosyncratic risk and firms' growth opportunities. Thus, princelings may prefer firms with more stable operations.

The existing body of literature has delved into the potential impact of political connections on firms' performance. For instance, Wu et al. (2012) provide evidence that private firms with politically connected CEOs or Chairs of the Board outperform those without such connections. Li et al. (2008) argue that politically connected private firms exhibit superior performance compared to their non-connected counterparts, attributing this advantage to the connections' facilitation of securing loans from banks and other state institutions. Furthermore, He et al. (2019) posit that political connections aid distressed firms in accessing increased debt financing and enhance their chances of recovery, particularly between 1999 and 2015.

In terms of the governance structure in column (4), the odds ratio of Institution is greater than 1 and statistically significant at the 5% level. These results indicate that princelings tend to join firms with a higher percentage of ownership held by the institutional investor. Furthermore, the coefficient of TOP10 is smaller than one, which suggests that the probability of a firm being connected to princelings is lower when there is a high concentration of ownership among the top 10 shareholders. This finding contrasts with the first hypothesis, as the literature generally suggests that

Table 2.5: Determinants of princeling connections

	(1)	(2)	(3)	(4)
ROA_{t-1}	6.64	2.45	2.52	8.81
	(11.01)	(4.04)	(4.18)	(15.50)
$Tobin_{t-1}$	1.05	1.15**	1.20***	1.12*
	(0.08)	(0.07)	(0.07)	(0.07)
$Size_{t-1}$	1.74***	1.80***	1.86***	1.74***
	(0.14)	(0.14)	(0.15)	(0.16)
$Leverage_{t-1}$	1.08	0.86	0.92	1.63
	(0.48)	(0.41)	(0.44)	(0.74)
$Investment_{t-1}$	0.02**	0.02***	0.03**	0.07*
	(0.03)	(0.03)	(0.04)	(0.10)
$Largest_{t-1}$	3.35**	2.89**	2.89**	1.92
	(1.67)	(1.50)	(1.51)	(1.15)
$Ceodual_{t-1}$	0.70*	0.78	0.80	0.84
	(0.14)	(0.16)	(0.17)	(0.18)
$Boardsize_{t-1}$	1.15	1.32	1.31	1.17
	(0.40)	(0.46)	(0.47)	(0.43)
$Independent_{t-1}$	0.34	0.51	0.53	0.42
	(0.29)	(0.45)	(0.48)	(0.39)
$Big4_{t-1}$	1.24	0.95	0.94	0.76
	(0.19)	(0.16)	(0.16)	(0.14)
$Institution_{t-1}$	7.66***	3.87**	2.77*	4.26**
	(4.83)	(2.27)	(1.56)	(2.64)
$Top10_{t-1}$	0.06***	0.11***	0.14***	0.08***
	(0.04)	(0.07)	(0.09)	(0.06)
$Innovation_{t-1}$	0.98	1.06***	1.07***	1.04*
	(0.02)	(0.02)	(0.02)	(0.02)
CSR_{t-1}	0.58***	0.59***	0.51***	0.40***
	(0.10)	(0.11)	(0.10)	(0.09)
Constant	0.01***	0.01***	0.01***	0.01***
	(0.00)	(0.00)	(0.00)	(0.00)
N	22374	21512	20306	15863
Year FE	YES	YES	YES	YES
Industry FE	NO	YES	YES	YES
Industry*Year FE	NO	NO	YES	YES
Province FE	NO	NO	NO	YES

Note: This table examines the factors that might influence princelings to join the firm using equation 2.5.2.2. The dependent variable Princeling is a dummy that measures the princeling connections of listed firms, which equals 1 if the firm is princeling-backed and 0 otherwise. Standard errors are clustered at the industry by year level. *, **, and *** indicate statistical significance at the 10%, 5%, and 1 % level, respectively. The definition of all variables used is shown in Appendix Table A.3. All the data are winsorized at the 1st and 99th percentile values.

a higher proportion of the top 10 shareholders is associated with poorer company governance (Lichtenberg and Pushner, 1994). Nevertheless, when examining the correlation coefficients, a positive correlation between princelings and the top 10 shareholders is observed. However, the negative coefficient in the regression results could potentially be attributed to multicollinearity, as I have also included variables such as Largest and Institution. On the other hand, the other variables are not statistically significant, indicating that these factors are not the primary considerations for princelings when choosing a firm.

The primary focus of current research centers on the dynamic interplay between political connections and corporate governance. For instance, Shen et al. (2015) establish the existence of a substitution effect between political connections and corporate governance. They observe that firms with strong corporate governance tend to place less emphasis on cultivating political connections, whereas politically connected firms often exhibit weaker governance practices, as evidenced by data from Taiwan. Additionally, Bruno and Claessens (2010) proposes that corporate governance and regulations can act as substitutes.

In column (4), the odds ratio of Innovation is greater than one, indicating that princelings consider the company's long-term profitability. Higher investment in innovation is seen as a way to ensure better future performance (Darroch, 2005), allowing princelings to continue benefiting from the company's success. On the other hand, the odds ratio of CSR is smaller than one and statistically significant. This suggests that princelings approach firms with better CSR performance cautiously. It implies that princelings weigh the potential costs associated with CSR activities, which might outweigh the benefits in their decision-making process. This is consistent with the study by Price and Sun (2017) which shows that firms engaging in little CSR perform better than firms engaging in high levels of CSR.

In the context of research on political connections and innovation, Hou et al. (2017) identify a hindrance effect, indicating that political connections impede corporate innovation initiatives and diminish their efficiency. This suggests the presence of a political resource curse that affects innovation within Chinese firms. Certain research reveals that Chinese firms employ CSR activities as a means to establish ties with the government (Wang et al., 2020). Subsequently, these studies demonstrate that politically connected firms tend to surpass their non-connected counterparts in performance (Lin et al., 2015).

In summary, existing literature has explored the impact that political connections may have on firms' development. For instance, in terms of firm performance, Wu et al. (2012), He et al. (2019), and Li et al. (2008) have demonstrated that private

firms with politically connected CEOs or Chairs of the Board outperform those without such connections. The current research also uncovers the intricate relationship between political connections and governance structure (Shen et al., 2015; Bruno and Claessens, 2010), confirming the substitution effect. Studies have found that CSR activities serve as a tool for Chinese firms to establish government connections (Wang et al., 2020). In terms of studies examining political connections and innovation, Hou et al. (2017) discover that political connections hinder corporate innovation activities and reduce innovation efficiency. However, few studies have analyzed the types of companies that government officials are willing to join. Therefore, this paper provides a new perspective to comprehend the relationship between corporate characteristics and political connections.

Overall, the regression results support the first hypothesis. It can be concluded that princelings tend to prefer joining firms with better financial performance, weaker governance quality, higher innovation investment, and fewer CSR activities. This preference may be attributed to the potential opportunity for princelings to divert profits from the firm into their own pockets.

2.6.3.2 Hypothesis 2: Princeling connections and probability of being punished.

It is likely that factors influencing whether a company establishes princeling connections will also affect the likelihood of the company facing punishments[24]. To address the issue of endogeneity, I initially employ PSM to match firms and then conduct the regression analysis. In this paper, I utilize the kth-nearest neighbor, kernel, and local linear matching algorithms to match the control group individually. Firstly, k-to-1 nearest neighbor matching is one of the simplest matching procedures. K firms from the comparison group are selected as matches for each treated individual based on their closest propensity scores. I use a 10-to-1 nearest-neighbor matching approach to accommodate a larger number of control units. Secondly, the kernel method utilizes information from all non-treated cases, offering advantages such as using more information and retaining all study subjects (Imbens, 2000). It assigns different weights to all control units, with the highest weight placed on those with scores closest to the treated firm. In this paper, I use the Epanechnikov kernel with the default bandwidth set to 0.06 following previous studies (Shen et al., 2023). Thirdly, with local linear matching, weights are assigned to control units based on their proximity to treated units. This approach is flexible and considers the local relationship

[24]For example, Liao et al. (2019) demonstrate that firms with more CSR activities are less likely to engage in financial fraud. Negative relationships between the quality of governance structure and fraud have been observed by Ding et al. (2015) and Wu et al. (2012).

Table 2.6: The impact of princelings on a firm's fraud punishment after PSM

	Penalty			Number of penalties		
	(1)	(2)	(3)	(4)	(5)	(6)
	Nearest neighbour	Kernel	Local linear	Nearest neighbour	Kernel	Local linear
ATT	-0.03^{*}	-0.04^{**}	-0.03^{*}	-0.07^{***}	-0.08^{***}	-0.06^{**}
	(0.02)	(0.02)	(0.02)	(0.03)	(0.03)	(0.03)
N	2325	15110	15110	2325	15110	15110

Note: This table examines the impact of princelings on a firm's fraud punishment using equation 2.5.2.3. The key dependent variables are Penalty and Number of Penalties. Penalty is a dummy that equals 1 if the firm commits fraud and receives punishment and 0 otherwise. Number of Penalties measures the number of punishments a firm incurs in one year. The independent variable Princeling is a dummy that measures the princeling connections of listed firms, which equals 1 if the firm is princeling-backed and 0 otherwise. Bootstrap standard errors are in parenthesis. *, *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively. The definition of all variables used is shown in Appendix Table A.3. All the data are winsorized at the 1st and 99th percentile values.

between the propensity scores and the covariates.

The results are shown in Table 2.6[25]. Columns (1) to Columns(3) report the firm's probability of being punished (Penalty), and columns (4) to column (6) report the number of penalties of a firm incurs in one year (Number of penalties). The coefficients of ATT are negative and statistically significant under different specifications, which indicates that building connections with princelings could help firms evade legal punishment. In column (1), the ATT is -0.03, which means that princeling-connected firms are 3% less likely to be punished compared with non-connected firms. I can get similar results by using the kernel and local linear approaches in columns (2) and (3); that is, princeling connections play a role in protecting the company from punishment to the extent of four percentage points lower than the control group. The impact of princeling connections is more significant when considering the number of penalties a firm receives in one year from columns (4) to columns (6). The ATT demonstrates that firms with princeling connections incur 8 percentage points fewer penalties in one year. In the Appendix A.7, I report results without matching. The main explanatory variable princeling is still significant and could show that there is a huge difference between the connected and non-connected firms in terms of the probability of being punished. Overall, the results suggest that princeling-connected firms tend to receive fewer penalties from the regulatory body.

[25]Given that the likelihood of being apprehended cannot be directly observed, I rely on indirect indicators, as suggested by prior studies (Wu et al., 2016; Chen et al., 2006; Hass et al., 2016). Specifically, I gauge regulatory enforcement in China by examining the probability of facing penalties and the frequency of sanctions.

In empirical studies, the influence of political connections on regulatory enforcement has been extensively examined and confirmed. In China, Wu et al. (2016) conduct a study on the impact of political connections on corporate fraud and find that such connections could reduce the incidence of enforcement actions against corporate fraud by 20%. Additionally, political connections have been found to mitigate the negative impact of regulations on the stock value of heavily-polluting firms (Sam and Zhang, 2020). Internationally, studies have also demonstrated the influence of political connections on regulatory enforcement. For instance, Correia (2014) investigates the relationship between long-term political connections, including contributions and lobbying, and enforcement actions by the SEC. The results indicate that politically connected firms are less likely to be involved in SEC enforcement actions and face lower penalties if prosecuted. Similarly, Heitz et al. (2021) provide evidence that connected firms experience lower levels of regulatory enforcement and penalties under the Clean Air Act. Therefore, the findings of this paper align with previous literature and support the notion that political power can have a positive impact on regulatory enforcement. In summary, based on propensity score matching models, I conclude that there is a significant and negative difference in the probability of being punished between princeling-connected firms and non-connected firms, thus confirming hypothesis 2.

2.6.3.3 Heterogeneity

2.6.3.3.1 The impact of princeling connections in regions with different legal development

Many studies argue that a country's institutional and legal environment, including its process of enacting and enforcing laws, is crucial for creating sustainable growth and fostering the entrepreneurial spirit (North, 1990). Thus, the institutional environment can shape the value of princeling connections. As Faccio (2006) points out, the favourable treatment enjoyed by firms with political connections is more pronounced in countries with interventionist governments and weak protection of property rights because political connections are more likely to bring privileges in such environments. Wu et al. (2016) generalize the country-level argument of Faccio (2006) to the region-level data in China, as there is a great heterogeneity of legal environments between the different regions. Therefore, it is likely that princeling connections have a more significant influence in areas where legal development is less developed.

Regarding the overall legal environment, I use the MLEGAL index (the fifth com-

ponent of the market index), which captures legal development in the protection of property rights for every province in China compiled by Fan et al. (2001)[26]. I create a dummy variable "Developed" equals 1, indicating that the firm is located in a legally developed region with the above-median legal score and 0 otherwise.

Table 2.7: The heterogeneous impact of princelings on a firm's fraud punishment using kernel matching

	Legal Development		SOE		ROA	
	(1)	(2)	(3)	(4)	(5)	(6)
	Developed	Undeveloped	SOE	Non-SOE	Low-ROA	High-ROA
Panel A: The impact of princeling connections on the likelihood of being punished						
ATT	-0.02	-0.06***	-0.02	-0.09*	-0.08***	0.01
	(0.03)	(0.02)	(0.02)	(0.05)	(0.02)	(0.03)
N	6156	6366	3984	5618	5487	5745
Panel B: The impact of princeling connections on the number of punishments in one year						
ATT	-0.03	-0.14***	-0.05*	-0.15**	-0.16***	0.01
	(0.05)	(0.03)	(0.03)	(0.06)	(0.03)	(0.04)
N	6156	6366	3984	5618	5487	5745

Note: This table examines the heterogeneous impact of princelings on a firm's fraud punishment using equation 2.5.2.3. The key dependent variables are Penalty and Number of penalties. Penalty is a dummy that equals 1 if the firm receives punishment and 0 otherwise. Number of penalties measures the number of penalties a firm receives in one year. The independent variable Princeling is a dummy that measures the princeling connections of listed firms, which equals 1 if the firm is princeling-backed and 0 otherwise. Robust standard errors are clustered at the industry and year levels. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% level, respectively.The definition of all variables used is shown in Appendix Table A.3. All the data are winsorized at the 1st and 99th percentile values.

The results are presented in the first two columns of Table 2.7. The ATT of princeling is negative and statistically significant for firms operating in provinces with weaker legal environments in column (2). However, the ATT of princeling is negative but insignificant for firms registered in legally developed provinces in column (1). These findings indicate that princeling connections play a positive role in regions with underdeveloped legal environments while establishing connections with princelings in developed regions does not provide firms with reduced supervision. This finding aligns with the expectation that the government's favorable treatment of firms with princeling connections is more prominent in weaker legal environments. Studies by Li et al. (2021), Wu et al. (2016), and Ling et al. (2016) all demonstrate

[26]The market index developed by Fan et al. (2001) captures the characteristics of each regional institutional environment through analysis of the five aspects, namely the relationship between the government and the markets, the development of non-state business, the development of product markets, the development of factor markets, and the development of market intermediaries and the legal environment.

the exceptional significance of political connections for firms located in less marketized regions. Furthermore, Chen et al. (2011) reveal that Chinese firms in less marketized regions have stronger incentives to pursue political connections in order to access government subsidies and other additional benefits.

2.6.3.3.2 The impact of princeling connections in SOEs and non-SOEs

In this section, I examine the impact of princeling connections under different forms of ownership. The value of political connections primarily stems from the advantage of accessing critical resources from the government (Adhikari et al., 2006; Claessens et al., 2008). In the context of China's economic system, which combines elements of a market economy and a planned economy, State-Owned Enterprises (SOEs) have direct ties to the government, and their government ownership links are more explicit and stable (Li et al., 2009, 2008; Poncet et al., 2010). In contrast, non-SOEs face discrimination in society. Therefore, retaining managers with princeling connections becomes a feasible and effective strategy for non-SOEs to overcome regulatory obstacles and secure favorable treatment (Boubakri et al., 2012). Once established, non-SOEs are likely to receive significant benefits. As a result, I hypothesize that princeling connections have a greater impact on non-SOEs than on SOEs in terms of regulatory enforcement.

Following the approach of La Porta et al. (2000) and Bortolotti and Faccio (2009), I trace the identity of the largest shareholders to determine the ultimate owner of the firm. The sample is then classified based on whether the government ultimately controls the firm. I divide the samples into two groups: the "non-state" group and the "state group" respectively. The results are presented in Table 2.7 in the Appendix. In the non-SOE subsample, the ATT of princeling is negative and statistically significant in column (4), indicating a lower likelihood of being punished. Within SOEs, the ATT of princeling is also negative and statistically significant in panel B but to a lesser extent in column (3). This may indicate that the involvement of princelings in SOEs has a weaker impact on helping firms avoid the attention of regulatory bodies than in non-SOEs. These findings are consistent with the expectation that princeling connections play a more significant role in mitigating regulatory enforcement against fraud for non-SOEs. Additionally, the study by Li et al. (2019) also confirm that princelings facilitate improved access to bank loans for non-SOEs while bringing no significant benefits to SOEs.

2.6.3.3.3 The impact of princeling connections on firms with different ROA

In the last heterogeneity test, I examine whether the impact of princeling connections on regulatory enforcement varies among firms with different financial performances, as measured by their ROA ratios. Previous studies have found that firms with higher ROA ratios are subject to less supervision (Wu et al., 2012). Based on this, I hypothesize that the participation of princelings in firms with below-average ROA ratios can help them avoid the attention of regulators. Therefore, I predict that the impact of princeling connections is stronger in firms with lower-than-average ROA ratios.

I divide the sample firms into two groups based on the industry-year average ROA ratio: the "high" group with an above-average ROA ratio and the "low" group with a below-average ROA ratio. The results are presented in Table 2.7. For firms with a lower ROA ratio, the ATT of princelings is significantly negative at the 1% significance level in column (5). This indicates that if firms have a ROA ratio lower than the industry average, they are approximately ten percent less likely to face punishment when establishing princeling connections. However, for firms with better financial performance, the ATT of princelings is insignificant in column (6). This suggests that the protective role of princeling connections in those firms is limited. Therefore, it can be concluded that princelings have a more substantial impact on protecting firms with a lower ROA ratio, while their protective effect is limited for firms with a higher ROA ratio. This finding is consistent with the hypothesis.

2.6.3.4 Hypothesis 3: Princeling connections and the anti-corruption campaign.

In this section, I investigate whether princeling-connected firms continue to benefit from regulatory enforcement after the anti-corruption campaign. Before conducting the regression analysis, I examine the parallel trends between the intervention and comparison groups during the pre-intervention period by plotting a graph. Figure 2.2 demonstrates that non-connected firms and connected firms exhibit similar trends prior to the campaign. Although the intervention and comparison groups differ in terms of fraud punishment before the anti-corruption campaign, this disparity does not introduce bias in the estimation, assuming the parallel trends persist in the absence of the campaign. Following the implementation of the policy change, the probability of fraud punishment increases for non-princeling-connected firms. In contrast, firms with princeling connections exhibit an even lower likelihood of being punished after the campaign.

Table 2.8 reports the regression results based on the PSM-matched sample, where the dependent variables are Penalty and Number of penalties. The coefficients as-

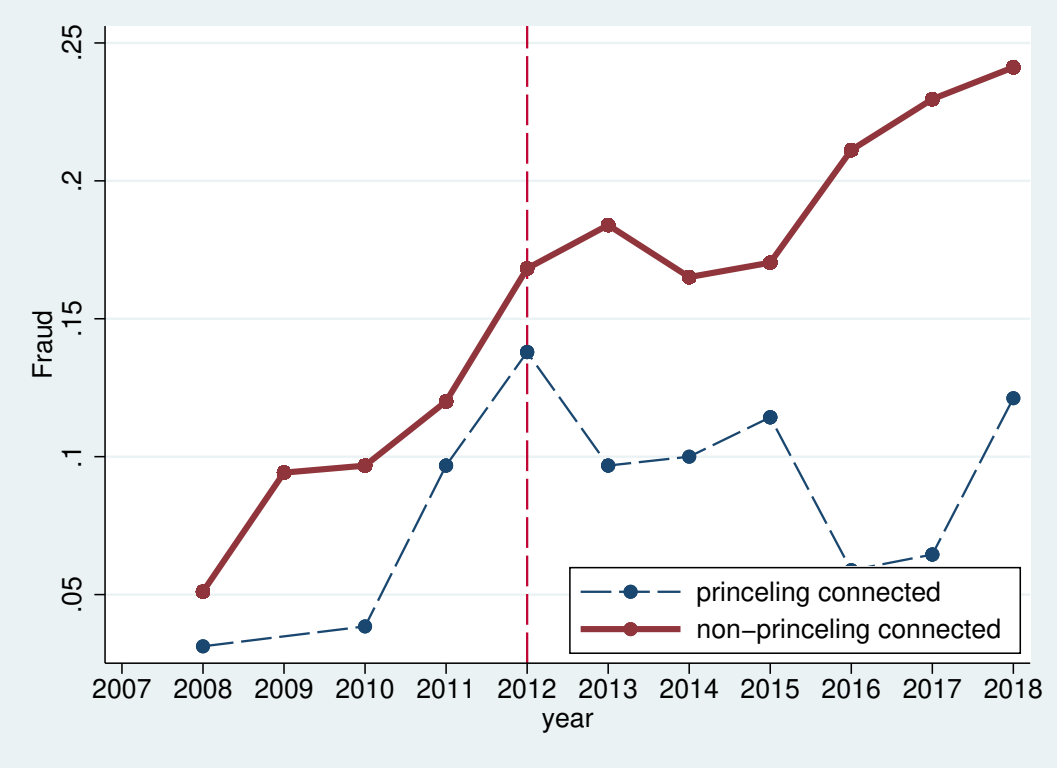

Figure 2.2: The parallel trend between princeling-connected and non-connected firms

Note: This figure illustrates the parallel trend between princeling-connected and non-connected firms before and after the anti-corruption campaign in 2012.

sociated with princeling remain negative, indicating that princeling-connected firms receive less oversight from regulatory agencies. Of particular interest is the coefficient of Prinpost, which is negative and statistically significant in both specifications in columns (1) and (2). These results suggest that the likelihood of princeling-connected firms being punished for engaging in fraud or having multiple penalties within a year is further reduced after the anti-corruption campaign. This finding highlights the limitations of anti-corruption campaigns in effectively regulating companies with political connections.

Two potential reasons can explain this phenomenon. Firstly, anti-corruption campaigns in China are often conducted by legal and financial institutions that lack transparency, leading to controversy and speculation regarding their true intentions. Some argue that these campaigns may be used as a means to eliminate political opposition rather than solely focusing on addressing corruption. Secondly, although some government officials have been arrested during the anti-corruption campaign, they represent only a small fraction of the total number of government officials. Importantly, none of the princelings in the dataset have been punished. This leniency towards princeling-connected firms by law enforcement agencies may contribute to the lower likelihood of regulatory enforcement actions.

Table 2.8: The impact of princelings on a firm's fraud punishment after the anti-corruption campaign using kernel matching

	Penalty	Number of penalties
	(1)	(2)
Princeling	0.00	−0.01
	(0.01)	(0.02)
Prinpost	−0.04***	−0.09***
	(0.01)	(0.02)
Constant	0.04***	0.05***
	(0.01)	(0.01)
N	9175	9100

Note: This table examines the impact of princelings on a firm's fraud punishment after the anti-corruption campaign using equation 2.5.2.4. The key dependent variables are Penalty and Number of penalties. Penalty is a dummy that equals 1 if the firm receives punishment and 0 otherwise. Number of penalties measures the number of punishments a firm incurs in one year. The independent variable Princeling is a dummy that measures the princeling connections of listed firms, which equals 1 if the firm is princeling-backed and 0 otherwise. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% level, respectively. The definition of all variables used is shown in Appendix Table A.3. All the data are winsorized at the 1st and 99th percentile values.

These results are consistent with the study by Zhang (2018), which also investigates the relationship between the anti-corruption campaign and corporate fraud. Zhang finds that firms are 3.8% less likely to commit fraud in the post-campaign period than in the pre-campaign period. Alonso et al. (2022) provide evidence that the value of political connections in the private sector increased after the campaign because they became a less risky alternative to corruption. Griffin et al. (2021) argue that the campaign has not caused a general improvement in corporate corruption indicators and culture for Chinese firms as a whole. However, these results contradict other studies investigating the effectiveness of the anti-corruption campaign. Chen and Kung (2019) demonstrate the effectiveness of the anti-corruption campaign by showing that the price discount for princeling-connected firms to obtain lands has been significantly reduced after 2012. Similarly, Li et al. (2019) find that princeling-backed firms can no longer earn extra bank loans utilizing such connections. Consequently, bank loans are reallocated, leading to a recovery in the accessibility of loans for non-princeling-backed firms. This suggests that the anti-corruption campaign may have different effects in different fields.

This finding is consistent with Hypothesis 3: the likelihood of fraud in princeling-connected firms remains lower than that of their counterparts after the anti-corruption campaign. Therefore, the impact of anti-corruption measures on reducing the issue of law enforcement is limited.

2.7 Robustness check

2.7.1 Using non-linear methodology

In the baseline regressions, the linear probability model (LPM) is primarily used after matching. In this robustness check, the results obtained using the corresponding non-linear methodology and LPM without matching are presented in Table A.7 in the appendix. Logistic regression allows the analysis of dichotomous or binary outcomes with two mutually exclusive levels, making it a valuable tool for modeling relationships between independent variables and binary or categorical outcomes (Domínguez-Almendros et al., 2011; LaValley, 2008). This makes it applicable in the context where I aim to predict the probability of facing punishment. In probability theory and statistics, the Poisson distribution, named after the French mathematician Denis Poisson, is used in statistical analysis when dealing with count data, where the outcome variable represents the number of events or occurrences in a fixed unit of time or space (Sellers et al., 2012). Consequently, I employ the Poisson distribution to calculate the probability of princeling-connected firms being punished multiple times in one year.

The results are consistent with those of the baseline regression. Specifically, in column (1), the negative and significant coefficient of the variable princeling indicates that firms that establish connections with princelings are approximately 4% less likely to face legal punishment compared to non-connected firms without PSM matching. The results remain consistent when using the logistic model in column (2). In column (3), the negative coefficient of princeling persists in the OLS model, suggesting that princeling-connected firms face less oversight from regulatory agencies in terms of the number of penalties they receive in one year. I get a similar conclusion when using the Poisson model in column (4).

2.7.2 Oster bound

In the last robustness check, I implement a novel technique proposed by Oster (2019), which is used for evaluating the robustness of results to potential omitted variable bias. The distinctive feature of this technique is that it accounts for both coefficient movements and movements in R-squared values after the inclusion of controls.

I will first briefly introduce this method. The impact of princeling connections on

regulatory enforcement can be estimated using the following equation:

$$Y = \alpha + P\beta + W_1 + W_2 \ + \varepsilon_{it} \tag{2.7.2.1}$$

Where Y is the probability of punishment, P equals one if the firm is princeling-connected. W_1 is an index that is a linear combination of observed variables and their corresponding coefficients (control variables). W_2 is a similar index of variables correlated with both Y and P but are not observed. ε_{it} is measurement error in Y, uncorrelated with P, W_1 and W_2.

In general, the Oster method uses information about the correlation between the observables (W_1) and P to compute the correlation between the unobservables (W_2) and P in order to estimate the degree of bias in the estimate of Y arising from omitted variables. Oster (2019) is critical of the argument often made in the existing literature; that is, if a coefficient is stable after the inclusion of the observed controls, then omitted variable bias must be limited. This intuitive argument rests on the idea that bias arising from the observed controls is informative of bias arising from the unobserved factors. To make a more robust estimation, they specify two key parameters in the model: one is the parameter that examines the proportion between observable and unobservable selection, and the other measures the maximum amount of variation the model can explain. The first parameter, δ, is the coefficient of the proportionality of the unobservables relative to the observables. When δ = 1, the observables and the unobservables are equally important and affect β in the same direction; when 0 <δ < 1, the unobserved factors are less important than the observed factors (and the opposite holds when δ > 1). The second parameter, R_{max}, is the unknown overall R-squared of a model which controls for observables, unobservables, and the treatment variable. This measure indicates how much variation in the outcome variable can be explained by controlling for observables ($W1$) and unobservables ($W2$). This can be as high as one if Y is measured without error (ε_{it}), but this cannot be smaller than the R-squared obtained from the controlled regression.

To correctly identify the right coefficient of princeling, one needs assumptions for δ and R_{max}. Oster (2019) argues that $\delta \in [0, 1]$ is useful bound because observed control variables are usually chosen based on the fact that they are the most important controls. Hence, it is unlikely that unobservables have a stronger impact on the outcome variable than the control variables, which would be the case by assuming a value for δ greater than one. In this specification, I use both $\delta = 1$ and $\delta = 2$, assuming that unobserved components are as important as or even as twice important as observed control variables. Similarly, it is plausible to assume that $R_{max} < 1$, as some idiosyncratic component in the variation of Y is likely, which cannot be explained entirely by the observed and unobserved explanatory variables. Oster (2019)

suggests a heuristic approach setting $R_{max} = 1.3\tilde{R}$ based on a sample of randomized trials. The regression results are shown in Table 2.9. The consistent sign of the coefficient of $princeling$ suggests that this estimate can be considered robust against omitted variable bias (Oster, 2019). The value of δ is also greater than one when the treatment effect is zero. So far, I could prove the robustness of my results.

Table 2.9: Oster bounds estimations given $R_{max} = 1.3\tilde{R}$

	(1)	(2)	(3)	(4)	(5)
Treatment variable	Baseline effect	Controlled effect	$\delta = 1$	$\delta = 2$	δ for $\beta = 0$
Panel A: The impact of princeling connections on a firm's punishment likelihood					
Princeling	-0.06***	-0.03*	-0.02	-0.01	2.1
	(0.02)[0.02]	(0.02) [0.04]			
Panel B: The impact of princeling connections on a firm's number of punishments in one year					
Princeling	-0.13***	-0.08**	-0.05	-0.03	2.95
	(0.03)[0.02]	(0.03)[0.05]			

Note: This table examines the impact of princelings on a firm's fraud punishment using Oster bound. The key dependent variables are Penalty and Number of penalties. Penalty is a dummy that equals 1 if the firm receives punishment and 0 otherwise. Number of penalties measures the number of punishments a firm incurs in one year. The independent variable Princeling is a dummy that measures the princeling connections of listed firms, which equals 1 if the firm is princeling-backed and 0 otherwise. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% level, respectively. The definition of all variables used is shown in Appendix Table A.3. Robustness standard errors are reported in paratheses. R-squared are reported in squares. All the data are winsorized at the 1st and 99th percentile values.

2.7.3 Correlated random fixed effects model

To take into account of panel nature of the data, I use the Correlated Random Effects (CRE) in the robustness check[27]. This approach proves invaluable when working with datasets that exhibit unobserved heterogeneity or time-invariant individual-specific effects that are correlated with the independent variables under scrutiny (Wooldridge, 2019). By incorporating correlated random effects, it becomes possible to more effectively account for and control the potential bias introduced by omitted variables, endogeneity, or unobserved factors that may influence the outcomes under investigation. This methodology offers a potent means of modeling the intricate interplay between time-varying covariates and individual-specific characteristics.

From Table 2.10, it is observed that princelings still prefer to join larger firms and firms with higher Tobin Q, suggesting that they prefer to join companies with strong

[27]Fixed effects methods cannot be applied due to problems of over-parameterization (Roy, 2017), dropping most of the observations. One major advantage of the CRE approach over the fixed-effects approach is that it is able to estimate the effect of variables that remain unchanged within panel clusters.

Table 2.10: Determinants of princeling connections using random correlated effects

	(1)
ROA	-0.03
	(0.06)
Tobin	0.01***
	(0.00)
Size	0.02***
	(0.00)
Leverage	-0.01
	(0.01)
Investment	-0.08*
	(0.05)
Largest	0.01
	(0.02)
Ceodual	-0.00
	(0.01)
Boardsize	0.00
	(0.01)
Independent	-0.02
	(0.04)
Big4	0.02**
	(0.01)
Institution	-0.00
	(0.01)
Top10	-0.01
	(0.02)
Innovation	0.00
	(0.00)
CSR	0.01
	(0.01)
Constant	-0.36***
	(0.06)
N	22374
Year FE	YES

Note: This table examines the factors that might influence princelings to join the firm. The estimates capture the difference between the between-cluster and within-cluster effects of cluster-varying variables on Princeling. The dependent variable Princeling is a dummy that measures the princeling connections of listed firms, which equals 1 if the firm is princeling-backed and 0 otherwise. Standard errors are clustered at the industry by year level. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% level, respectively. The definition of all variables used is shown in Appendix Table A.3. All the data are winsorized at the 1st and 99th percentile values

performance. At the same time, they are less inclined to join companies with a high investment ratio, which aligns with the baseline results. Additionally, they also show a preference for firms audited by the Big Four, while other factors become less significant, indicating that a company's performance is the primary factor influencing whether a princeling chooses to join.

Similarly, in Table 2.11, it is found that princeling-connected firms are 9% less likely to face punishment in column (1) and receive fewer penalties within a year in column (2). These results persist even after the anti-corruption campaign, evidenced by the negative and significant coefficient of Prinpost in panel B. This demonstrates the robustness of the findings.

Table 2.11: The impact of princelings on a firm's fraud punishment using correlated random effects

	Penalty	Number of penalties
	(1)	(2)
Panel A: The impact of princelings on a firm's fraud punishment		
ATT	-0.09^{***}	-0.16^{***}
	(0.02)	(0.04)
Panel B: The impact of princelings on a firm's fraud punishment after the anti-corruption campaign		
princeling	-0.03^{***}	-0.04^{***}
	(0.01)	(0.01)
Prinpost	-0.03^{***}	-0.11^{***}
	(0.01)	(0.02)
Constant	0.07^{***}	0.09^{***}
	(0.01)	(0.01)
N	12024	13812

Note: This table examines the impact of princelings on a firm's fraud punishment. The key dependent variables are Penalty and Number of penalties. Penalty is a dummy that equals 1 if the firm receives punishment and 0 otherwise. Number of penalties measures the number of punishments a firm incurs in one year. The independent variable Princeling is a dummy that measures the princeling connections of listed firms, which equals 1 if the firm is princeling-backed and 0 otherwise. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% level, respectively. The definition of all variables used is shown in Appendix Table A.3. All the data are winsorized at the 1st and 99th percentile values.

2.8 Concluding remarks

This study analyzes the role of princeling connections in mitigating the risk of anti-fraud regulatory enforcement in Chinese-listed firms. The incidence of enforcement

against fraud is measured by analyzing the enforcement announcements made by the CSRC, the Shanghai stock exchange, and the Shenzhen stock exchange between 2008 and 2018. Choosing this period also allows to analyze the effect of the anti-corruption campaign established at the end of 2012 on regulatory enforcement.

I first investigate the factors that might affect princelings joining a firm. The findings indicate that princelings prefer firms with better financial performance, poorer corporate governance structure, worse CSR performance, and greater innovation investment. These characteristics are attractive to princelings as they seek stable operating conditions and opportunities to transfer profits to themselves. Next, I examine the impact of princeling connections on regulatory enforcement. The results reveal that firms with princeling connections have a lower incidence of receiving punishments in various forms, suggesting a protective effect of these connections against regulatory actions. Heterogeneity tests reveal that princeling connections play a more significant role in reducing the incidence of regulatory enforcement in regions with underdeveloped legal markets. Moreover, princeling connections have a stronger impact on reducing enforcement actions for non-SOEs compared to SOEs, and this effect is particularly pronounced in firms with a below-average ROA ratio. Furthermore, considering the recent anti-corruption campaign as an exogenous shock to firms, the results show that princeling-connected firms continue to have a lower likelihood of being punished even after the anti-corruption campaign. This finding suggests that the anti-corruption campaign has been ineffective in reducing the incidence of regulatory enforcement for princeling-connected firms. The regression results consistently hold up under various checks.

This paper contributes to the academic literature in several ways. Firstly, it addresses gaps that have been overlooked in previous studies, such as examining the impact of princeling connections on the economy and exploring the interaction between political connections and firm behavior. Secondly, at an empirical level, the use of detailed data provides new evidence and interdisciplinary insights into the complex dynamics of princeling connections and regulatory enforcement.

This research also holds significant implications for the policymaking community. The outcomes of this study underscore the critical nature of continuous endeavors to foster accountability among government officials. Strengthening mechanisms that hold them responsible for their actions and decisions is imperative to curb corrupt practices. This could involve implementing transparent reporting systems, enhancing oversight procedures, and promoting a zero-tolerance approach toward unethical behavior. Additionally, the research suggests that enhancing the legal framework is a viable strategy to improve regulatory enforcement. This could encompass revisiting existing laws, regulations, and policies to ensure they align with contemporary chal-

lenges. Strengthening legal provisions against bribery, nepotism, and other corrupt practices, along with simplifying the legal processes for reporting and prosecuting such cases, could further contribute to a robust anti-corruption environment. Moreover, this research emphasizes the necessity of reinforcing law enforcement mechanisms in present-day China to create a more conducive business environment for investors. Furthermore, the research serves as a clarion call for a nuanced perspective that acknowledges the inherent limitations of an anti-corruption campaign in fully attaining the desired outcomes.

Furthermore, this study opens the door for prospective investigations that could delve into the broader impact of princeling connections on various dimensions of Chinese economic activities. For instance, future research might explore the influence of these connections on domains like green finance, and more specifically, how they intersect with factors such as firms' carbon emissions or their Environmental, Social, and Governance (Environmental, Social, and Corporate Governance (ESG)) performance. Such investigations could provide valuable insights into the intricate interplay between political affiliations, economic practices, and sustainability concerns in the Chinese context.

2.A Appendix

2.A.1 Data collection of princelings

I first choose to study the members of PSC and PC who have served on the committee after 1997, and this is because only after China's national leader Deng Xiaoping and other founding members of the CPC stepped down in 1997, did the Politburo begin to have supreme powerBeforeto this, important decisions related to the party were basically made by Deng Xiaoping and these founding members (Chen and Kung, 2019). Besides, I also regard the ten founding marshals, eight immortals, and all the previous general secretaries since the founding of China in 1949 as the top and most influential leaders in the Chinese society, which Chen and Kung (2019) do not cover in their dataset. In this data collection process, a total of 62 politburo members and other 24 top government officials are obtained. In the second stage, I use different kinds of social media to find information about their relatives. For each leader, princelings encompass three generations, including their own generation's siblings/spouses, as well as their sons/daughters (second generation), and their grandchildren(third generation). Table 2.1 shows a more detailed breakdown. Using Wikipedia, Baidu, and Google search engines to search for these top leaders, I could get most of the information about the princelings. As the information about some leaders' relatives is not available, I also take advantage of news resources (e.g., the New York Times, the Financial Times, and the China Daily, British Broadcasting Corporation (BBC)) to search for the names of top officials. When I use Google to search for their names, these news media sources might include the names of top government officials or princelings. Following that, I validate whether the details are indeed related to the same individuals by searching for more relevant information in those news media. This procedure aligns with the methodology outlined in Chen and Kung (2019). Meanwhile, there are many princelings lists online which I can check if I miss some important princelings. From the steps above, I could have a princeling name list.

Then I need to find princeling-connected firms. Using the CSMAR database, which covers managerial persons' basic characteristics, background characteristics (such as financial background, academic background, overseas background, and occupational background), and concurrent positions during their terms of office, I could match the princeling name list with the related firms, and I also include firms that have been shown to have a direct connection with the princelings by social media even if the princelings' names are not shown in the official document. Finally, there are 67 different princeling-connected firms in total. In addition, I also include the princeling-connected subsidiaries in the sample. Specifically, if a princeling serves in a par-

ent firm that has listed subsidiaries, then I regard those subsidiaries as princeling-connected firms. This data collection process is consistent with the previous studies such as Chen and Kung (2019) which also include the subsidiaries. An interesting discovery during the data collection is that the period that princelings take a position in a listed firm is not restricted to the top leader's tenure, which also proves that senior officials still have great rights in the economy and politics even if they have retired. So, I can study the relatives of top officials as princelings, whether they are in power or not.

2.A.2 Figures

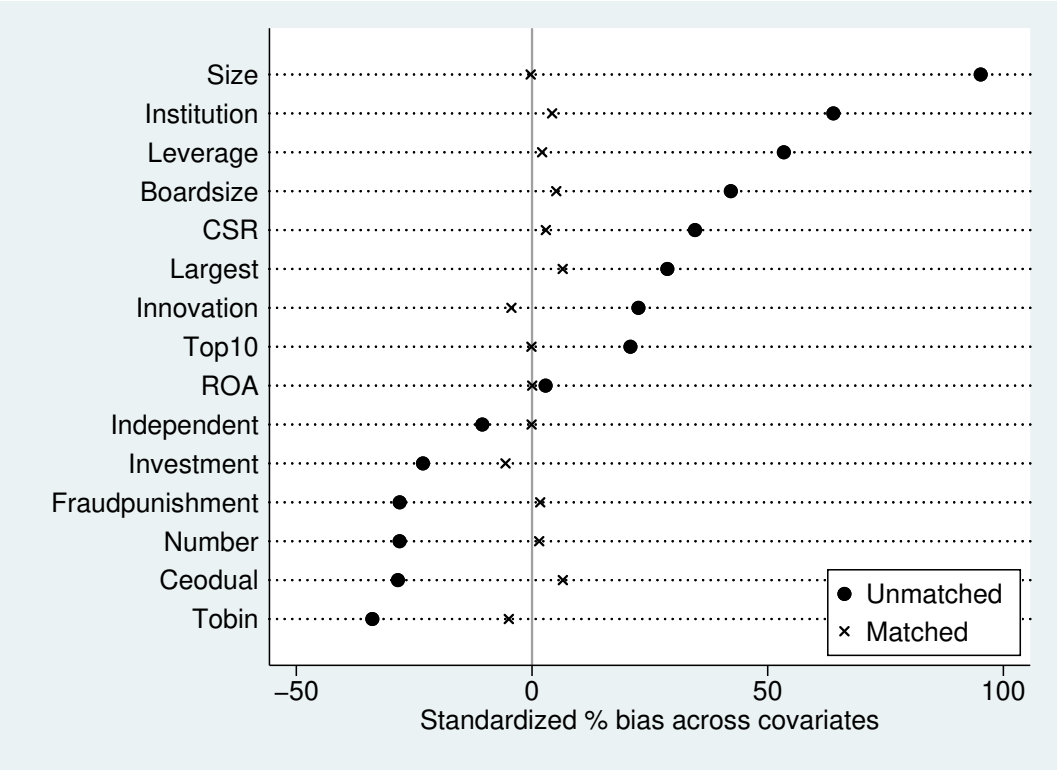

Figure A.1: Matching quality

Note: The standardised % bias is the % difference of the sample means in the treated and matched non-treated sub-samples as a percentage of the square root of the average of the sample variances in the treated and non-treated groups.

2.A.3 Tables

Table A.1: Breakdown of enforcement actions by type of violation

By type of violation	Frequency	Percentage
Improper handling of general accounting	63	0.90
Others	1,283	18.36
Insider trading	169	2.42
Shareholder embezzlement	59	0.84
False disclosure (others)	84	1.20
Delay in disclosure	616	8.81
Unauthorized changes in fund use	14	0.20
Price manipulation	11	0.16
False record (misleading statement)	258	3.69
The fabrication of assets	2	0.03
Inflated profits	42	0.60
Illegal share trading	794	11.36
The granting of the illegal guarantees	18	0.26
Major omission	223	3.19
Fraudulent listing and price manipulation	1	0.01
The fabrication of assets, false record (misleading statement), and fraudulent listing	2	0.03
Inflated profits, false record (misleading statement), and fraudulent listing	1	0.01
Violating two or more types at the same time	3349	47.92
Total	6989	100%

Note: This table describes the distribution of the eighteenth types of violations firms might commit. Frequency represents the number of the listed firms' violations of each type. Percent represents the ratio of the number of the listed firms' violations of each type to the total number of violations.

Table A.2: Descriptive statistics for regulatory enforcement from 2007 to 2018

	Frequency	Percent
Panel A: by province		
Shanghai	469	7.08
Yunnan	75	1.13
Neimenggu	68	1.03
Beijing	354	5.34
Jilin	126	1.90
Sichuan	245	3.70
Tianjin	98	1.48
Ningxia	55	0.83
Anhui	192	2.90
Shandong	364	5.49
Shanxi	140	2.11
Guangdong	1,076	16.23
Guangxi	140	2.11
Xinjiang	137	2.07
Jiangsu	480	7.24
Jiangxi	87	1.31
Hebei	102	1.54
Henan	192	2.90
Zhejiang	666	10.05
Hainan	123	1.86
Hubei	272	4.10
Hunan	202	3.05
Gansu	98	1.48
Fujian	274	4.13
Xizang	34	0.51
Guizhou	41	0.62
Liaoning	126	1.90
Chongqing	124	1.87
Shaanxi	128	1.93
Qinghai	33	0.50
Heilongjiang	107	1.61
Total	6628	100.00
Panel B: by industry		
Agriculture, forestry, animal husbandry, and fishery	138	2.08
Mining	159	2.40
Manufacturing	3,980	60.06

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	Frequency	Percent
Power, gas, and water	191	2.88
Construction	169	2.55
Wholesale and retail	310	4.68
Transportation, warehousing, and postal industry	113	1.71
Accommodation and Catering Industry	33	0.50
Information technology	506	7.64
Financial	355	5.36
Real estate	232	3.50
Leasing and business services	125	1.89
Scientific research and technical service industry	32	0.48
Water conservancy, environment	88	1.33
Education	29	0.44
Health and social work	27	0.41
Culture, sports, and entertainment industry	84	1.27
Conglomerates	56	0.85
Total	6,627	100.00

Note: This table describes the distribution of regulatory enforcement from 2007 to 2018 in terms of location (Panel A) and industry (Panel B). Frequency represents the number of the listed firms' violations for each province (industry) in Panel A (B). Percent represents the ratio of the number of the listed firms' violations of each province (industry) to the total number of violations.

Table A.3: The definition of variables

Variable	Definition
Dependent variable:	
Princeling	A dummy variable is defined as 1 if a firm has built princeling connections.
Regulatory enforcement	
Penalty	A dummy variable is defined as 1 if a firm commits a violation and is punished, and 0 otherwise.
Number of penalties	The number of penalties a firm receives in one year.
Independent variables	
Panel A: Governance mechanisms indicators	
Largest	The Percentage of shares held by the largest shareholders.
Independent	The percentage of independent directors on the board.
Ceodual	A dummy variable is defined as 1 if the firm's CEO is also the chairman of the board year and 0 otherwise.
Boardsize	The log of the number of board members.
Top10	The concentration of shares held by the top 10.
Institution	The percentage of ownership held by institutional investors. (e.g., mutual funds, insurance companies, social security funds, qualified foreign institutional investors (QFIIs), trust companies, and securities companies.)
Panel B: Financial performance indicators	
Leverage	The ratio of a firm's total debt to total assets at the beginning of the year.
ROA	The ratio of a firm's net income to total assets at the beginning of the year.
Tobin Q	The ratio of a firm's total market capitalization to total assets at the beginning of the year.
Investment	The ratio of a firm's capital expenditure (cash payments for fixed assets, intangible assets, and other long-term assets minus the cash income from the sale of these assets) to total assets at the beginning of the year.
Size	The natural log of total assets at the beginning of the year. The figure is adjusted using the Consumer Price Index ratio in 2010.
Panel C: CSR performance	
CSR	A dummy variable is defined as 1 if a firm discloses the CSR report.
Panel D: Innovation measurement	
Innovation	The amount of R&D expenditure in the firm is measured in 10,000 Renminbi. The figure is adjusted using the Consumer Price Index ratio from 2010.

Note: This table describes the definition of all variables used in this paper, including five different categories of firms' characteristics.

Table A.4: Descriptive statistics without winsorization

(N=26,017)	Mean	Median	SD	Min	Max
ROA	-0.05	0.04	13.33	-21.16	108.37
Tobin	3.05	1.66	93.39	0.68	148.31
Size	21.96	21.75	1.48	11.35	30.89
Leverage	0.52	0.45	5.60	-0.19	87.26
Investment	0.05	0.04	0.05	0.00	0.64
Largest	0.36	0.34	0.15	0.00	0.90
Ceodual	0.24	0.00	0.43	0.00	1.00
Boardsize	2.29	2.20	0.25	1.39	3.30
Independent	0.38	0.36	0.07	0.13	0.80
Institution	0.47	0.50	0.24	0.00	1.01
Top10	0.58	0.59	0.16	0.01	1.01
Big4	0.06	0.00	0.25	0.00	1.00
Innovation	0.94	0.12	6.83	0.00	738.39
CSR	0.04	0.00	0.21	0.00	1.00
Penalty	0.16	0.00	0.37	0.00	1.00
Number of penalties	0.24	0.00	0.69	0.00	20.00
Princeling	0.01	0.00	0.12	0.00	1.00

Note: The table presents descriptive statistics for the variables used in this chapter. Mean represents the arithmetic average of the values, Median is the middle value in the sorted data, SD stands for standard deviation, Min is the smallest observed value, and Max represents the largest observed value. Table A.3 shows the definition of all variables used.

Table A.5: Univariate test without winsorization

	(1)		(2)		(3)	
	princeling=0 (N=25658)		***princeling=1*** (N=359)		***p-value***	
	Mean	Std.Dev.	Mean	Std.Dev.	T-test	P-value
ROA	-0.05	13.42	0.04	0.09	-0.09	(0.30)
Tobin	3.06	94.05	1.72	1.40	1.34^{*}	(0.02)
Size	21.94	1.45	23.80	2.46	-1.87^{***}	(0.00)
Leverage	0.52	5.64	0.59	0.31	-0.07	(0.06)
Investment	0.05	0.05	0.04	0.05	0.01^{***}	(0.00)
Largest	0.35	0.15	0.40	0.19	-0.05^{***}	(0.00)
Ceodual	0.24	0.43	0.13	0.34	0.11^{***}	(0.00)
Boardsize	2.28	0.25	2.40	0.31	-0.12^{***}	(0.00)
Independent	0.38	0.07	0.37	0.06	0.01^{*}	(0.04)
Institution	0.47	0.24	0.62	0.22	-0.15^{***}	(0.00)
Top10	0.58	0.16	0.62	0.20	-0.04^{***}	(0.00)
Big4	0.06	0.24	0.27	0.44	-0.21^{***}	(0.00)
Innovation	0.91	6.68	3.20	13.73	-2.28^{**}	(0.00)
CSR	0.04	0.20	0.14	0.35	-0.10^{***}	(0.00)
Penalty	0.17	0.37	0.08	0.26	0.09^{***}	(0.00)
Number of penalties	0.24	0.70	0.09	0.36	0.16^{***}	(0.00)

Note: This table presents the univariate test to illustrate the differences between princeling-connected and non-connected firms. The definition of all variables used is shown in Table A.3. *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively.

Table A.6: Test of covariate balancing

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
		Mean		% bias	% reduction	t-test		VT/VC
		Treated	Control		of bias	t	P>|t|	
ROA	Unmatched	0.04	0.04	1.10		0.21	0.83	0.95
	Matched	0.04	0.04	0.00	96.50	0.01	1.00	1.37*
Tobin	Unmatched	1.69	2.12	-33.10		-5.68	0.00	0.66*
	Matched	1.70	1.76	-5.00	84.80	-0.69	0.49	0.74*
Size	Unmatched	23.61	21.96	93.60		22.27	0.00	2.27*
	Matched	23.59	23.60	-0.30	99.70	-0.03	0.97	1.09
Leverage	Unmatched	0.57	0.45	54.70		10.47	0.00	1.07
	Matched	0.57	0.57	2.10	96.10	0.28	0.78	1.03
Investment	Unmatched	0.04	0.05	-22.30		-4.18	0.00	0.99
	Matched	0.04	0.04	-5.70	74.60	-0.78	0.44	1.12
Largest	Unmatched	0.40	0.35	28.90		5.95	0.00	1.42*
	Matched	0.40	0.39	6.50	77.40	0.81	0.42	1.02
Ceodudal	Unmatched	0.13	0.25	-29.90		-5.06	0.00	.
	Matched	0.13	0.11	6.50	78.20	1.04	0.30	.
Boardsize	Unmatched	2.40	2.28	42.30		8.91	0.00	1.53*
	Matched	2.40	2.38	5.20	87.80	0.65	0.52	1.13
Independent	Unmatched	0.37	0.38	-10.70		-1.96	0.05	0.90
	Matched	0.37	0.37	-0.10	99.20	-0.01	0.99	0.99
Institution	Unmatched	0.61	0.47	64.30		11.58	0.00	0.83
	Matched	0.61	0.60	4.20	93.40	0.60	0.55	1.02
Top10	Unmatched	0.62	0.58	19.90		4.15	0.00	1.48*
	Matched	0.62	0.62	-0.10	99.40	-0.02	0.99	1.14
Innovation	Unmatched	1.27	0.71	20.60		5.55	0.00	3.26*
	Matched	1.28	1.39	-4.30	79.00	-0.46	0.65	0.93
CSR	Unmatched	0.14	0.04	34.20		8.87	0.00	.
	Matched	0.14	0.13	2.90	91.40	0.32	0.75	.

Note: The table presents balancing tests for the covariates used in the PSM matching. Unmatched refers to the treated group and control group before applying PSM, while matched indicates the groups after the matching process. % bias quantifies the difference in means of a covariate as a percentage of the mean in the treated group. % reduction of bias presents the percentage reduction in the difference of covariate means between the treated and control groups, before and after applying the matching. T-Test is used to compare the means of the two groups. VT/VC stands for Variance of Treatment / Variance of Control. Table A.3 shows the definition of all variables used. *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively. All the data are winsorized at the 1st and 99th percentile values.

Table A.7: The impact of princelings on a firm's fraud punishment without matching

	Penalty		Number of Penalties	
	(1)	(2)	(3)	(4)
	OLS	Logistic	OLS	Poisson
princeling	-0.04*	0.65*	-0.08**	0.58**
	(0.02)	(0.16)	(0.03)	(0.13)
Constant	1.20**	0.29*	1.09	0.14***
	(0.10)	(0.20)	(0.19)	(0.10)
N	22374	22226	22374	22374
Year FE	YES	YES	YES	YES
Industry FE	YES	YES	YES	YES
Industry*Year FE	YES	YES	YES	YES
Province FE	YES	YES	YES	YES

Note: This table examines the impact of princelings on a firm's fraud punishment using linear models. The key dependent variables are Penalty and Number of penalties. Penalty is a dummy that equals 1 if the firm receives punishment when it commits a fraud and 0 otherwise. Number of penalties measures the number of penalties a firm incurs in one year. The independent variable Princeling is a dummy that measures the princeling connections of listed firms, which equals 1 if the firm is princeling-backed and 0 otherwise. Robust standard errors are clustered at the industry and year levels. The odds ratio is used in logistic regression, and the incidence rate ratio is used in Poisson regression. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% level, respectively.The definition of all variables used is shown in Appendix Table A.3. All the data are winsorized at the 1st and 99th percentile values.

3 Princeling Connections and Initial Public Offering Performance in Chinese Private Equity Industry

3.1 Introduction

Private equity (PE) refers to an asset class and investment strategy where investors raise capital from institutional and high-net-worth individuals to invest in privately held companies. PE investors acquire ownership stakes in these companies, often with a controlling interest, with the aim of generating significant returns over the medium to long term. When PEs believe that the portfolio company has reached its maximum potential or encounters a favorable exit opportunity, they initiate the process of selling the company. This can involve conducting an Initial Public Offering (IPO)[28], selling to another private equity firm or strategic buyer, facilitating a management buyout to take the company private, or opting for liquidation. The impact of private equity on portfolio firms in developed countries has been extensively studied in the literature. For example, Megginson and Weiss (1991), Levis (2011), and Awounou-N'dri and Dubocage (2019) demonstrate that private equity-backed IPOs experience approximately 10% lower underpricing. Moreover, research indicates that private equity targets show improvements in operating performance, productivity, employment, and related dimensions (Acharya et al., 2013; Boucly et al., 2011; Fracassi et al., 2022).

The Chinese private equity market has experienced significant growth, playing a

[28]IPO underpricing refers to the phenomenon where the initial public offering (IPO) price of a company's shares is set lower than the price at which the shares trade in the secondary market on the first day of trading after the IPO. In other words, the market price of the shares increases significantly on the first day of trading, resulting in a gap between the IPO price and the market price. Underpricing is estimated as the percentage difference between the price at which the IPO shares are sold to investors (the offer price) and the price at which the shares subsequently trade in the market(Ljungqvist, 2007).

crucial role as a source of capital for Chinese companies. This market also presents foreign investors with an enticing opportunity to participate in China's expanding economy and potentially achieve lucrative returns on their investments. In fact, China holds the distinction of being the most attractive emerging country for private equity investors, as evidenced by its high ranking on the Global Venture Capital and Private Equity Country Attractiveness Index. Among the various exit strategies available, IPO serves as the primary method for PE firms to exit their investments in China, accounting for 41.2% of all exit cases. However, the role of private equity in the Chinese market remains relatively understudied. Specifically, there is a dearth of research exploring the impact of PE investment on the IPO performance of target firms in China. Existing studies either rely on outdated data sets, such as the one by Otchere and Vong (2016), which examines the effects of private equity participation in IPOs from 1990 to 2008, or they concentrate on specific subsets of listed firms, as seen in the study by Tan et al. (2013) and Guo and Jiang (2013). However, it is important to note that financial market development in China has undergone rapid progress[29]. Thus, the role of private equity may have significantly differed compared to a decade ago. This highlights the urgent need to gain a deeper understanding of the role of Chinese private equity firms in the IPO performance of portfolio firms by utilizing more recent and comprehensive data.

Taking into account its unique institutional context, one important characteristic of the Chinese PE market is the potential effect of political connections (Faccio and Hsu, 2017; Wang and Wu, 2020; Feng and Johansson, 2017). These connections can provide several advantages. Firstly, they offer access to valuable resources, networks, and information that may not be readily available to other firms. Secondly, political connections can influence regulatory decisions and policy outcomes, directly impacting portfolio companies. However, it is important to note that the effects of political connections on portfolio performance are not always positive. Political risks, such as changes in political leadership, policy shifts, or reputational issues, can introduce uncertainties and potential drawbacks.

In this chapter, particular attention is given to a higher level of political connection known as "princeling connections". Princelings have recently garnered attention for their role in the private equity industry. Reuters (2014) reported that private equity funds with low transparency have become a haven for princelings. They identified 15 PE companies that were either founded by princelings or hired princelings for high-level positions. Since 1999, these private equity funds have raised at least

[29]For instance, private equity firms now have greater access to comprehensive information about their portfolio firms, including performance data and governance information. This improved access helps address the selection issue. Furthermore, the Chinese private equity market has experienced increased competition, which has prompted firms to enhance their oversight of portfolio companies and establish a strong reputation.

$17.5 billion in investment capital[30]. Other news media have also highlighted the significance of princelings in the private equity sector[31]. However, there is a lack of literature studying the impact of princeling connections in the private equity industry. A point of reference is Wang and Wu (2020) which demonstrates that target firms with politically connected private equity firms experience more underpricing and greater performance volatility, suggesting that politically connected private equity firms may not be more effective in monitoring their portfolio firms. Therefore, this chapter aims to conduct an analysis of the impact of private equity firms with princeling connections on the IPO performance of portfolio firms in order to fill this research gap.

In addition, the Chinese financial markets are characterized by relative immaturity and an uncertain investment environment (Li et al., 2020; Muhlhahn et al., 2009; Xin and Pearce, 1996). This uncertainty is further illustrated by Figure 3.1, which displays the 3-month moving average of China's monthly policy uncertainty index (constructed by Baker et al. (2016)) and the total investment amount in the private equity sector from 2007 to 2019. The figure clearly shows a sharp decline in private equity investment during periods of high policy uncertainty. For instance, when the Economic Policy Uncertainty (EPU) index reached a record high in August 2008, private equity investment plummeted from 35 billion to 7 billion yuan within a month. However, both the EPU index and private equity investment returned to pre-crisis levels by May 2009. While several studies have investigated the negative impact of EPU on private equity activities (Tian and Ye, 2018; Huang et al., 2022), none of them have examined its effect on private equity portfolio firms. In this paper, I aim to fill this research gap by studying whether private equity firms, including those with princeling connections, can effectively mitigate uncertainty and serve as a substitute for formal institutional support in relation to IPO performance.

To investigate the impact of private equity and princeling connections on the performance of target firms in China, I utilize the data on the IPO performance of all listed companies spanning the period from 2008 to 2018 in the China Stock Market & Accounting Research (CSMAR) database. The data on PE investments is obtained from the China Venture Database, which is the largest and most comprehensive database on PE investments in China. To begin with, I assess whether PE plays a positive role in assisting target firms with IPOs and their subsequent post-issue performance. Additionally, I explore the impact of princeling connections by categorizing PE firms

[30]Source:https://www.reuters.com/article/us-china-privateequity-special-report-idUSBREA3900D20140410

[31]https://www.debtwire.com/info/china-%E2%80%9Cprinceling%E2%80%9D-fund-execs-spin-out-under-new-name-seek-usd-500m-boyu-raises-quiet-usd-2bn; https://www.scmp.com/business/china-business/article/1621735/chinese-private-equity-firm-drops-ties-princeling; https://www.penews.com/articles/boyu-capital-private-equity-20130705

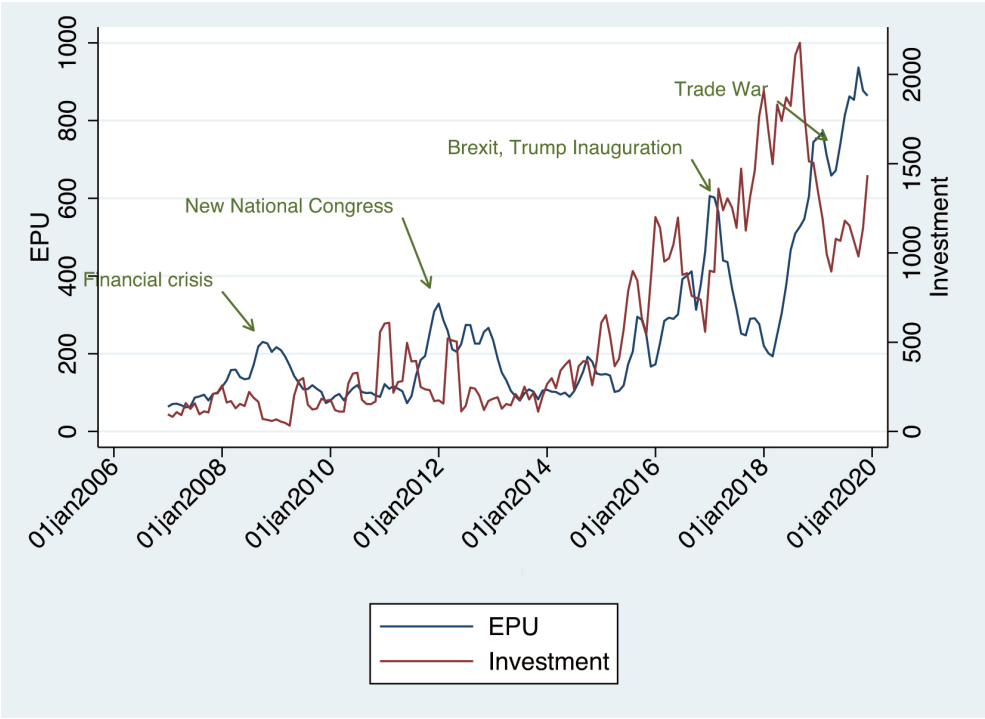


Figure 3.1: The correlation between China's policy uncertainty index and total investment in the private equity using a 3-month moving average

Note: This figure depicts how China's policy uncertainty index and the total investment amount in the PE industry evolve from 2007–2019. Based on the policy uncertainty index, the whole period can be divided into three subperiods according to four major events that happened, including the 2008 financial crisis, the new National Congress in 2012, the Brexit and Trump inauguration in 2017, and the trade war in 2019. Source: Baker et al. (2016)

into two groups: those with and without princeling connections. To test if firms with or without princeling connections exhibit different performance, two dummy variables, namely *Princeling* and *Non-princeling*, are included in the regression analysis 3.5.4.2. Lastly, I incorporate interaction terms of PE, princeling connections, and the EPU index into the regression analysis. This allows for an examination of whether PE and princeling connections can effectively mitigate uncertainty in the investment environment.

The empirical results indicate that firms with PE support experience lower underpricing and demonstrate better post-IPO stock and operating performance, confirming the certification role of PE, consistent with previous studies (Megginson and Weiss, 1991; Levis, 2011; Jain and Kini, 1995; Barry et al., 1990; Otchere and Vong, 2016). Furthermore, the results show that princeling connections have value for firms in transitional China, leading to reduced IPO underpricing. However, the post-issue performance of firms backed by princeling-connected PE is not superior to comparable firms. This suggests that the IPO market views princeling connections as an indication of a firm's ability to navigate the complexities of the political system, mitigating information asymmetries and resulting in lower underpricing (Feng and

Johansson, 2017). However, it does not guarantee improved post-IPO performance (Wang and Wu, 2020; Feng and Johansson, 2017). Moreover, using the EPU index developed by Baker et al. (2016), the findings reveal that non-princeling-connected PEs still provide support to their portfolio firms during high uncertainty periods but princeling-connected PE cannot mitigate the negative impact of uncertainty on targets' IPO and long-run performance. Finally, I exploit heterogeneity at the PE investor level and the firm level. Results indicate that PE has a more significant influence when they possess a higher reputation or invest in non-State-Owned Enterprise (SOE)s. Overall, this chapter provides insights into the certification role of PE, the impact of princeling connections, and the inability of princeling-connected PE to mitigate the effects of uncertainty on IPO and long-run performance. The results also highlight the importance of reputation and non-SOE investments in the influence of PE on target firms.

This study makes several significant contributions to the existing literature on the Chinese private equity market. Firstly, it expands the understanding of private equity in developing countries. Previous research has predominantly focused on developed markets, overlooking emerging markets with distinct business infrastructures and institutional contexts (Megginson and Weiss, 1991; Levis, 2011; Otchere and Vong, 2016; Awounou-N'dri and Dubocage, 2019; Acharya et al., 2013; Boucly et al., 2011; Fracassi et al., 2022). Moreover, only a limited number of studies have investigated the impact of private equity on Chinese firms, relying on partially Chinese-listed companies and outdated databases (Tan et al., 2013; Guo and Jiang, 2013; Otchere and Vong, 2016). Therefore, this paper provides valuable insights into the debate surrounding underpricing and post-IPO stock return performance by utilizing a new comprehensive database specific to China. Secondly, this research sheds light on the role of princeling connections in the private equity market. Previous studies have examined the influence of princeling connections in various domains, such as land transactions and bank loans (Chen and Kung, 2019; Li et al., 2019). However, there is a lack of research investigating the impact of princeling connections in the private equity sector. A point of reference is the paper by Wang and Wu (2020) which has explored political connections within the private equity industry. Therefore, this study fills a critical gap by specifically investigating the impact of princeling connections on the IPO performance of PE portfolio firms. Lastly, this study contributes to the literature by examining the effects of economic policy uncertainty on the IPO performance of private equity-backed firms. Previous studies have explored the influence of local policy risk on IPO underpricing and the impact of EPU on PE funding activities (Colak et al., 2021; Huang et al., 2022; Song and Kutsuna, 2021). I provide the first evidence of the impact of EPU on PE portfolio firms. Overall, this study contributes to the understanding of the Chinese private equity market by investigating the role of private equity, the impact of princeling connections, and the effects of economic

policy uncertainty.

Following the introduction section, the second section introduces the institutional background of PE in China. The third section outlines the literature review on the relationship between private equity, firms' performance, and the role of princeling connections on targets. The fourth section takes into consideration the data collection and descriptive statistics. The fifth section discusses the regression results. In the sixth section, I consider the robustness checks. The last two sections show the heterogeneity tests and draw conclusions.

3.2 Institutional backgrounds

3.2.1 Process of private equity investment

Different institutions and scholars have varying definitions of the scope of private equity. In developed countries, the broad definition of PE typically includes buyouts and venture capital funds. However, in the context of China, it becomes challenging to distinguish between PE and Venture Capital (VC) due to their similar investment practices in corporate equity at the Pre-IPO stage (Naqi and Hettihewa, 2007; Liu et al., 2013). Venture capitalists not only face market risks and agency problems but also encounter political risks that are beyond their control (Fiet, 1995; Oliver and Holzinger, 2008; Shleifer and Vishny, 1994). Consequently, investing in mature firms with a proven track record in established industries becomes a rational strategy to mitigate uncertainties at the institutional level (Tan et al., 2013). Moreover, databases that track PE investments, such as WIND, China Venture, and Zero2P, do not clearly distinguish between PE and VC. Therefore, following the approach of Michala (2019) and Fu et al. (2021), this paper employs a dummy variable for PE as a proxy for both PE- and VC-backed IPOs.

Compared to other forms of financial investment, private equity investment is a complex and lengthy process. It involves four stages in chronological order: fundraising, investment, post-investment management, and exit. In the fundraising stage, the PE sponsor, known as the General Partner (GP), determines the target investor group for fundraising, which can include government entities, institutional funds, and corporations. These investors become Limited Partner (LP) of the PE fund. Once the GP confirms the initial investment intention of LPs and meets certain requirements, such as reaching a minimum percentage of the fundraising target (e.g., more

than 70% in China), they can register with the local bureau and announce the completion of the fundraising stage. During the investment stage, PEs carefully evaluate investment applications from entrepreneurs. When they identify investment opportunities with high potential returns and growth, PEs sign an Investment Agreement with the target companies and acquire equity, marking the completion of the investment process. Subsequently, PEs actively engage in post-investment management, which sets them apart from other financing channels such as bank loans, loans from relatives and friends, and guarantees from third-party institutions. Post-investment management brings value-added effects to the invested companies (Sahlman, 1990; Bergemann and Hege, 1998; Cumming et al., 2005; Hsu, 2006; Bottazzi et al., 2008; Lindsey, 2008). In the exit stage, PEs recover their capital and earn investment income by transferring their shares in the invested company through various methods. Common exit methods in the literature include secondary buyout (selling to another PE or PE buyer), IPO, trade sale (selling the company to another firm), and liquidation. In the case of bankruptcy and liquidation of the invested company, PEs incur corresponding losses and write off their investments. Among these exit methods, IPO is often considered the most favorable for private equity (Bruton et al., 1999; Jeng and Wells, 2000; Jingu and Kamiyama, 2008; Suchard, 2017). Further analysis of the different exit channels in China will be presented in subsection 3.2.3.1.

3.2.2 Development of the private equity market in China

The development of China's private equity industry can be broadly divided into two stages. The first stage occurred before 2009, during which foreign investors predominantly raised funds in the Chinese PE market. The second stage began in 2009, marked by the dominance of Chinese RenMinBi (RMB)-denominated PE funds. Figure 3.2 visually depicts this shift in the industry's pattern.

Foreign private equity funds play a significant role in introducing the concept of PE to China. In 1992, the International Data Group became the first foreign PE firm to enter China. From then until 2009, renowned global PE funds such as Carlyle, Kohlberg Kravis Roberts (KKR), and Blackstone followed suit by raising funds abroad, investing in China, and subsequently exiting (primarily through IPOs) abroad. The limited involvement of RMB-denominated PE funds during this period can be attributed to organizational challenges and limited onshore exit options (Jia, 2014). In the United States, for instance, limited partnership is the predominant organizational structure for PE firms. This structure aligns the interests of various parties and provides strong incentives for maximizing profits (Gompers and Lerner, 1996; Sahlman, 1990). However, such organizational arrangements were not available in China until 2007,

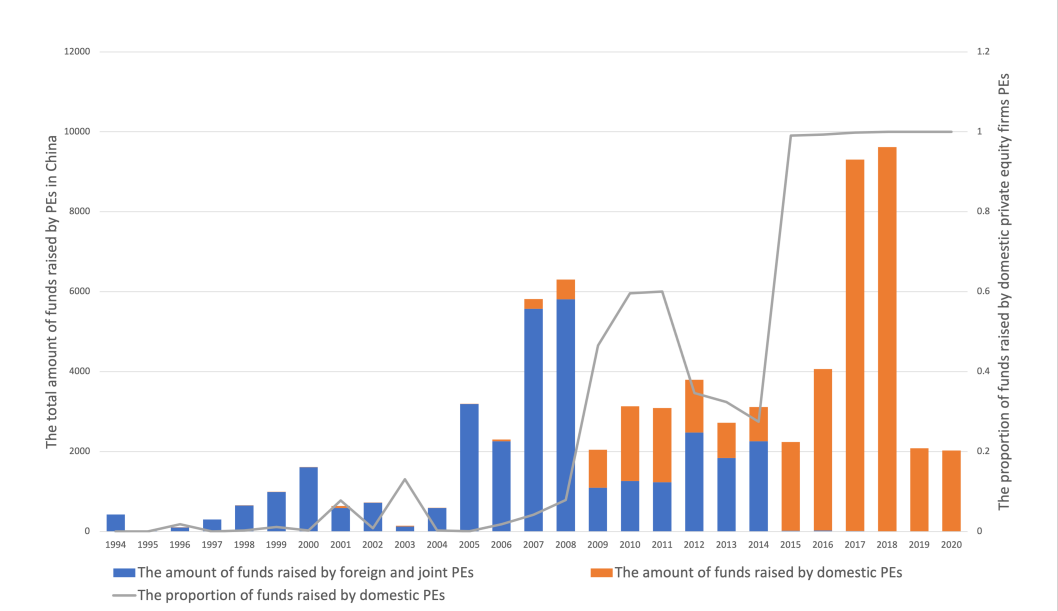


Figure 3.2: The total amount of funds raised by PEs – foreign versus domestic 1994-2020

Note: This figure depicts the amounts of funds raised by foreign PEs and domestic PEs individually in the Chinese PE market from 1994 to 2020. The values are deflated based on the Consumer Price Index from the year 2010 as the base period. Source: The data is obtained from the WIND database.

following an amendment to the Partnership Enterprise Law (Jia, 2014; Zhou et al., 2016). At that time, the only two available organizational forms for PE were corporations and trusts, which imposed higher taxes and involved unlimited liabilities. These factors discourage domestic capital from entering the PE market.

In the second stage, the rapid growth of personal wealth in China, along with loose monetary policies and limited investment channels, contributed to the rapid development of the domestic PE sector. Restrictions imposed by the government on residents investing overseas further stimulated the growth of the domestic PE market. Additionally, the majority of shares in new issues were owned by the state or other legal entities, leaving a small proportion available to public investors. This scarcity of new shares created a strong demand among Chinese investors who had limited alternative investment options. Figure 3.2 illustrates the significant shift in the composition of PE investments in China. Before 2008, foreign PE funds accounted for over 90% of the total PE market. However, this percentage dramatically decreased, and since 2015, foreign PE investments have represented less than 1% of the total funds invested in the market. The launch of China's Growth Enterprise Market (GEM) in 2009 provided an additional exit channel for PEs in China, marking the entry of the Chinese PE market into a new stage. The GEM facilitated financing for small and medium-sized private firms, addressing the financing challenges they previously faced due to the immature financial system. Consequently, there has been

an increase in the establishment of local PE funds and heightened competition in the market. To support the development of a healthy and sustainable private equity market, the Chinese government has enacted a series of related laws and regulations. For example, in March 2008, the Ministry of Commerce released its Guiding Opinions on the Work of Absorbing Foreign Investment Nationwide, emphasizing the need for greater utilization of foreign capital. Furthermore, with the establishment of the China Securities Investment Fund Industry Association in 2013, numerous normative documents have been released, contributing to the regulation and standardization of the industry. It is interesting to note that the funds raised by domestic private equity firms increased significantly in 2017 and 2018 but declined thereafter. One possible explanation is that the People's Bank of China raised interest rates in 2017 to curb the rapid expansion of financial leverage. Prolonged high-interest rates may have contributed to credit tightening in shadow banking, elevated financing costs, and consequently presented challenges for domestic private equity funds in obtaining financing[32].

3.2.3 Current characteristics of the Chinese private equity market

After more than 30 years of development, private equity has become a driving force in increasing economic vitality in China. The current Chinese private equity industry exhibits the following characteristics:

3.2.3.1 Preferred exit options: IPO and M&A for PE-backed companies

As I briefly discussed in section 3.2.1, PEs can exit through different options. Figure 3.3 displays the number of successful exits by private equity through various methods. In the early stages of the Chinese capital market, IPOs were the most popular exit strategy due to their high return potential (Fu et al., 2021). The number of IPO exits reached its peak before 2012 but has subsequently been surpassed by exits through Mergers and Acquisitions (M&A). This finding aligns with the research by Fang et al. (2018), who find that IPOs account for the primary exit method (41.2%) for private equity capital investments between 1992 and 2015, as recorded in the Zero2IPO database. However, after 2012, M&A emerged as the dominant channel for PE exits due to the suspension of the IPO market in the latter half of that year[33].

[32]Source: Everbright 2019 Summary of Private Equity Investment Industry and 2020 Annual Strategy Report,2020.

[33]The IPO market was suspended in 2012 as a part of regulatory measures taken by the Chinese government. The suspension was primarily aimed at addressing concerns related to market volatility,

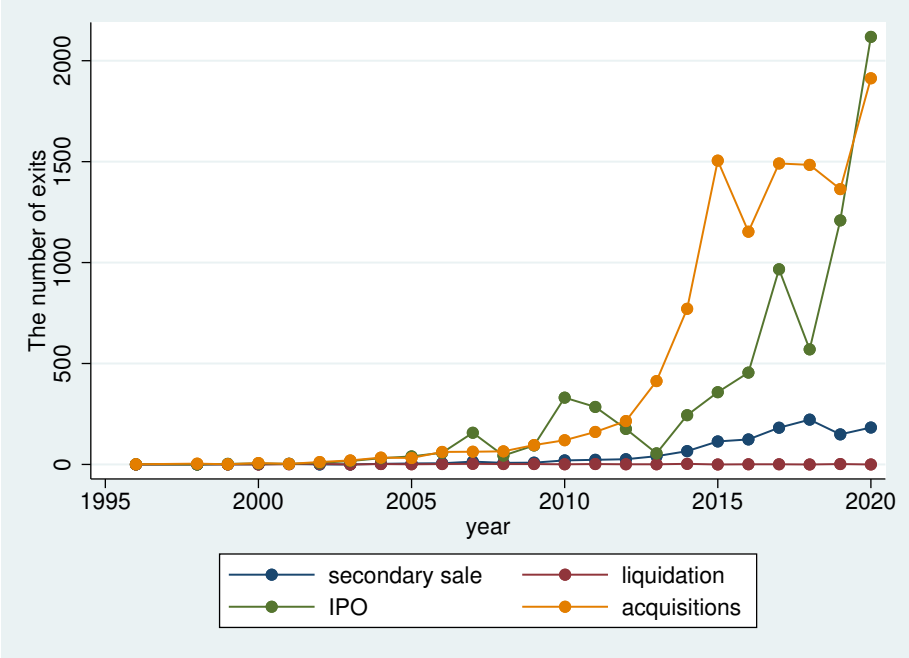


Figure 3.3: Time-series pattern of different exiting method

Note: This figure displays the time-series pattern from 1996 to 2020 of four different exit methods by PE in China. Source: The data is obtained from the WIND database.

Deloitte (2014) also notes an increasing optimism among Chinese investors regarding market dynamics in M&A, with a growing appetite for larger M&A transactions[34]. Furthermore, on March 7, 2014, the State Council issued a new Opinion that simplified the examination and approval process by canceling the pre-examination procedure for takeover reports of listed companies. Additionally, the recent abolition of the mandatory 75% loan-to-deposit ratio may incentivize Chinese banks to increase lending. Consequently, private equity investment in China has gradually adopted a pattern where the main exit methods are IPOs and M&A, supplemented by other exit channels. The reopening of the IPO market in early 2014 did not disrupt this trend.

3.2.3.2 Government intervention and IPO process

Government intervention, especially in the IPO process, has been a prominent aspect of the Chinese private equity market. In emerging markets, governments often exert influence on business activities through taxation, regulation, and policy measures (Shleifer and Vishny, 1994; La Porta et al., 1999). In the case of China, where the government holds a significant role in the evolving capitalist economy, Lu et al. (2013) argue that the development of the private equity industry was driven not only

regulatory oversight, and the quality of listed companies. https://finance.sina.cn/stock/ywgg/2015-07-04/detail-ifxesfty0246104.d.html?from=wap.

[34] https://imaa-institute.org/docs/statistics/deloitte_china_outbound-m-and-a-2014.pdf

by the financing opportunities for high-tech entrepreneurial firms but also by the creation and elimination of institutional rents. Government officials in China have considerable discretion in resource allocation, particularly within the IPO process, due to the current quota system. Figure 3.4 illustrates the IPO process in China. Before a company can access public capital, it must meet the listing requirements set by the exchange, a process that typically takes one to three years. Subsequently, the company goes through the preparation of a prospectus, which is then reviewed by the securities regulators. Approval from the China Securities Regulatory Commission (CSRC) is necessary for a company to proceed with the listing. As a result, the CSRC wields substantial power in deciding which companies are granted approval, with firms having political connections being more likely to receive favorable consideration (Wang and Wu, 2020).

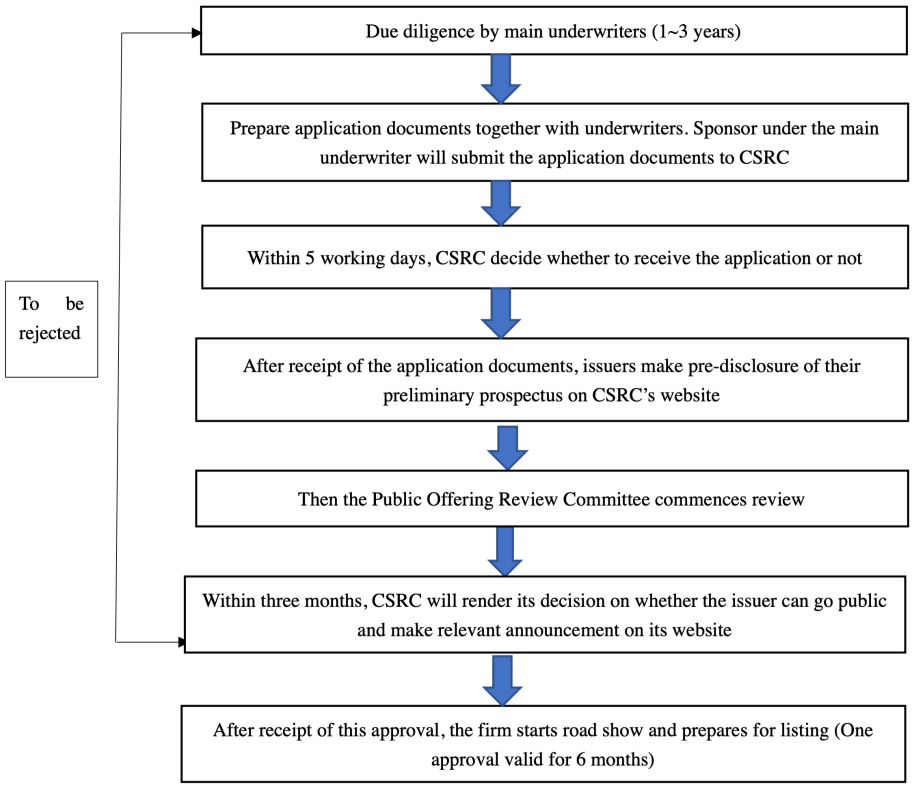


Figure 3.4: The process of IPO

Note: Source: Shanghai Stock Exchange website http://listing.sse.com.cn/aboutus/auditprocess/

3.2.3.3 A multi-tier capital market system

Many papers in the private equity literature utilize samples from specific listing boards, such as Tan et al. (2013), who focus on the Small and Medium-Sized Enterprises Board, and Guo and Jiang (2013), who use firms listed on the ChiNext board. In contrast, my analysis encompasses all A-share companies in China. To provide con-

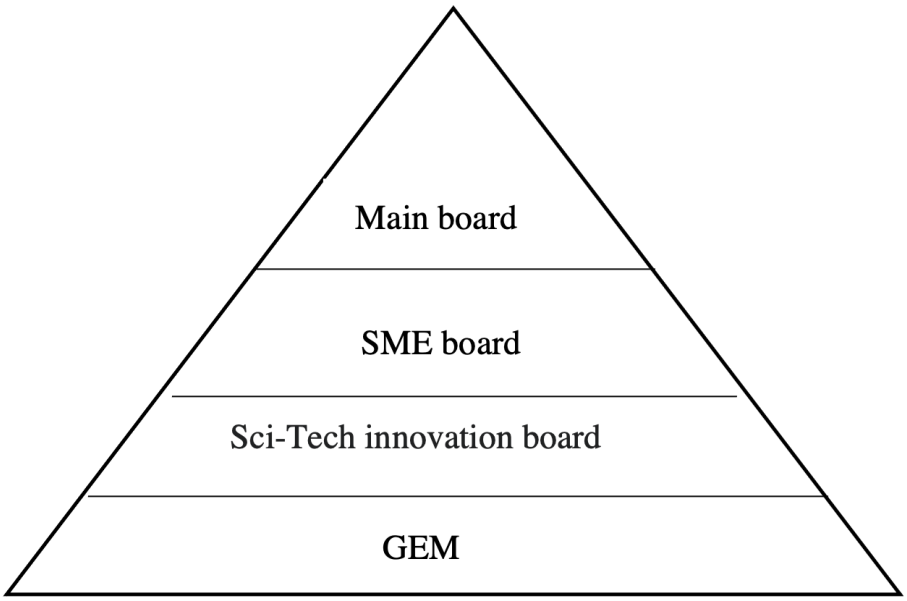


Figure 3.5: A multi-tier capital market system

Note: Source:Sina Finance https://finance.sina.cn/zl/2023-02-20/zl-imyhkezp6770276.d.html?vt=4&cid=79615&node_id=79615

text, it is important to introduce the various listing boards in China. Thus far, China has developed a relatively complete and multi-tier capital market system, comprising the mainboards on the Shanghai Stock Exchange (SSE) and Shenzhen Stock Exchange (SZSE), the SME board, the GEM board on the SZSE, the Sci-Tech Innovation Board (STAR) board on the SSE, and various Over The Counter (OTC) markets (Figure 3.5)[35]. Different boards provide PE firms with more opportunities to exit companies through IPOs.

The mainboard serves as a reflection of economic development. The Small and Median-sized enterprises (SME) board was established with the aim of providing direct financing opportunities for firms with relatively small circulating equity.In October 2009, the SSE officially launched the GEM, which provided a dedicated channel for the IPOs of high-tech SMEs. On April 27, 2020, the regulatory body approved the registration system for GEM to curb speculation and facilitate the return of innovative companies that had been listed overseas to A-shares[36]. Furthermore, on June 13,

[35]The mainboards, SME board, GEM board, and STAR board have different listing and investor requirements. For example, the mainboard requires listed firms to have positive net profit in the last three fiscal years, cumulative net profits exceeding RMB 30 million, no unrecovered losses in the most recent period, and accumulated net cash flow from operating activities in the last three fiscal years exceeding RMB 50 million or accumulated operating income in the most recent three fiscal years exceeding RMB 300 million. In comparison, the requirements for firms listed on the GEM board are more relaxed. The company only needs to meet one of the following three requirements: (1) being profitable for the last two consecutive years with a cumulative net profit of not less than RMB 10 million, (2) being profitable in the last year with a net profit of not less than RMB 5 million, or (3) having operating income in the most recent year of not less than RMB 50 million and a growth rate of operating income in the last two years of not less than 30%.

[36]A-shares refer to a class of shares that are traded on the mainland stock exchanges of China,

2019, the SSE launched the STAR and piloted the registration system. The companies listed on this market primarily focus on technological innovation and advancement.

3.3 Literature review

The theoretical framework of this study draws upon three distinct literature groups, which collectively examine the impact of private equity on portfolio firms' performance, the effect of policy uncertainty on firms' performance, and the role of political connections in the context of private equity.

3.3.1 The role of PE in targets

3.3.1.1 Underlying theory for the role of PE in targets

One theory that explains the value-added benefit of private equity is the certification hypothesis. According to this hypothesis, PE investors, as participants in a firm's IPO, have a vested interest in maintaining their reputation. They ensure that the offering price reflects all available and relevant inside information, thereby reducing underpricing (Barry et al., 1990; Megginson and Weiss, 1991; Brav and Gompers, 1997; Wang et al., 2003). If they fail to accurately price the IPO, their reputation and ability to secure favorable pricing in future offerings will be jeopardized, ultimately affecting the quality of their deal flow. Furthermore, PE-backed companies are more likely to obtain funds from banks and other institutions in the post-IPO phase due to the certification role played by PE investors. Secondary market investors also perceive PE as a highly efficient financial intermediary that can mitigate investment risks and address information asymmetry, leading to additional value creation (Mull, 1990).

The other theory that explains the outperformance of PE-backed firms compared to non-PE-backed firms is the screening and monitoring role of PEs. According to

including the SSE and the SZSE. These shares are denominated in Chinese Yuan and are only available for purchase by domestic investors and certain qualified foreign institutional investors through the Qualified Foreign Institutional Investor and Renminbi Qualified Foreign Institutional Investor programs. Another major category of shares in China is B-shares, which are denominated in Renminbi and are subscribed to and traded in foreign currency on the domestic securities exchanges of China. B-shares represent foreign capital stocks that are listed and traded within China, with both the company's registration and listing taking place within China's borders.

Gorman and Sahlman (1989) and Bygrave and Timmons (1992), PEs provide value-added services to their portfolio companies, including guidance, networking, and supervision, prior to the company's IPO, which helps reduce IPO underpricing. Additionally, PEs have a screening effect, as highlighted by Chemmanur et al. (2011), whereby they select higher-quality firms to back, resulting in a higher overall quality of firms backed by PEs compared to non-PE-backed firms. Furthermore, Puri and Zarutskie (2012) argue that the valuable expertise offered by PEs enables PE-backed firms to experience faster growth in scale after the IPO, outpacing their non-PE-backed counterparts. Moreover, researchers have illustrated that PE funding brings advantages to investee firms through improvements in their corporate governance structure. According to Allen and Santomero (1997), Kortum and Lerner (2001), and Belden et al. (2001), if PEs hold a significant ownership stake in investee firms, they may become involved in the management of the business, thereby reducing agency costs. Additionally, Puente (2022) suggests that the participation of PEs in the decision-making processes of investee firms can optimize corporate governance, improve capital structure, and lead to capital appreciation.

However, there are alternative hypotheses that challenge the positive impact of PE on firms. One such hypothesis is the grandstanding hypothesis proposed by Gompers (1996). This hypothesis suggests that venture capitalists, driven by the pressures of capital recovery and capital appreciation, may have a strong incentive to push underdeveloped companies into the IPO market prematurely. As a result, PE-backed firms may experience higher levels of underpricing and their operating performance may continue to deteriorate after listing. This hypothesis has been supported by subsequent studies conducted by Lee and Wahal (2004) and Neus and Walz (2005). Another hypothesis, presented by Amit et al. (1990), focuses on adverse selection. It argues that due to information asymmetry prior to investment and agency conflicts between venture capitalists and entrepreneurs, private equity tends to select companies with higher risks, uncertain prospects, or entrepreneurs with insufficient abilities. As a result, the performance of PE-backed firms may be negatively affected and underperform compared to non-PE-backed firms.

3.3.1.2 Empirical studies for the role of PE in targets

Regarding IPO performance, empirical studies have explored the potentially positive role of private equity in reducing underpricing. One line of research suggests that PE-backed firms tend to exhibit a lower extent of IPO underpricing. For instance, in a study comparing PE-backed IPOs to non-PE-backed IPOs matched by industry and offering size between January 1983 and September 1987, Megginson and Weiss (1991)

find that venture capital backing is associated with significantly lower initial returns and gross spreads. Similarly, Hogan et al. (2001) observe a similar pattern of lower average first-day returns in a sample of reverse leveraged buyouts from 1988 to 1998. This evidence has also been replicated in studies conducted in Taiwan (Liao et al., 2014) and mainland China (Rahman and Yang, 2021). However, there are studies that report a negative effect of private equity on IPO underpricing. Bradley and Jordan (2002) and Wang et al. (2003) argue that, after controlling for industry effects and underwriter quality, there is no significant difference in the underpricing between PE-backed and non-PE-backed IPOs. Addressing potential selectivity biases, Lee and Wahal (2004) find that PE-backed IPOs are significantly more underpriced compared to non-PE-backed IPOs. Similar negative results have been observed in the context of China. For example, using data from SMEs, Cao et al. (2013) find no significant difference in IPO underpricing between companies with private equity and those without. Additionally, Tan et al. (2013) and Otchere and Vong (2016) illustrate that PE-backed firms do not exhibit superior performance compared to non-PE-backed firms.

Regarding the post-issue performance of PE-backed companies, current research provides valuable insights. Studies demonstrate that PE can increase the value of investee companies and deliver benefits to investors after listing. For example, Brav and Gompers (1997) employ the Fama-French factor asset pricing model to show the positive impact of PE on investee company value. Additionally, analysis of a sample of 877 companies listed in the US from 1977 to 1990 by Jain and Kini (2000) reveals that companies backed by PE experience a smaller decline in performance after listing compared to non-PE-backed companies. PE plays a crucial role not only in capital appreciation but also in providing financial support for industrial upgrading and technological innovation, offering an efficient complement to traditional financing methods (Scholtens and Van Wensveen, 2000). This positive effect of PE extends to various countries, including the United Kingdom (UK) (Levis, 2011; Bergström et al., 2006; Bruton et al., 2010), Germany (Von Drathen, 2007; Borell and Tykvová, 2012), Brazil (Minardi et al., 2013), and the Netherlands (Van Frederikslust and Van der Geest, 2001). From a macro perspective, the impact of PE on the economy has been investigated. Davis et al. (2019) suggest a positive relationship between PE investment and the US economic growth rate over a 30-year period, indicating an improvement in the competitiveness of the US economy. However, contrasting conclusions are drawn by Wang et al. (2003) in their study of 164 companies listed on the Singapore Stock Exchange. Furthermore, studies conducted on listed Chinese companies by Song and Kutsuna (2021), Tan et al. (2013), and Liu et al. (2021b) find that the performance of companies without PE tends to be better than that of companies with PE.

3.3.2 The role of political connections

3.3.2.1 The role of political connections in the PE industry

Political connections can have a significant impact on private equity firms and their portfolio firms. For private equity companies, those with political connections are more likely to navigate politically influenced and discretionary bureaucratic processes, increasing their chances of obtaining approval for an IPO (Huang, 2011; Bao et al., 2016; Feng and Johansson, 2017; Wang and Wu, 2020). There is evidence of a positive relationship between political ties and successful PE exits through both stock markets and M&As (Anderson et al., 2017). Additionally, partially government-owned PEs have been found to increase the likelihood of a successful IPO exit in mainland China (Suchard et al., 2021). These findings align with the conclusion of Feng and Johansson (2017), which shows that entrepreneurial firms backed by partially government-owned PEs are less affected by policy uncertainty and market conditions. However, politically connected PEs may face pressures from local governments to promote local economies and support entrepreneurs with unattractive return prospects, rather than focusing on profitable activities (Cumming et al., 2020). Furthermore, PEs with political connections may be less effective in selecting PE managers, as they may prioritize political connections over expertise or experience (Jääskeläinen et al., 2007). Regarding PE-backed firms, the effects of politically connected private equity are mixed. On one hand, Feng and Johansson (2017) find that politically connected PEs can help portfolio firms achieve higher IPO offering prices and lower underpricing. However, these firms tend to experience worse long-term post-IPO stock performance and are more likely to engage in illegal earnings management. On the other hand, Wang and Wu (2020) show that target firms of politically connected PEs experience higher levels of underpricing, greater post-IPO underperformance, and higher performance volatility, indicating that politically connected PEs may not effectively monitor their portfolio firms. With my research, I aim to shed light on this debate and offer valuable insights for a deeper understanding. Instead of solely focusing on political connections, I investigate a higher level of political affiliations known as princeling connections, in order to provide a more comprehensive perspective.

3.3.2.2 The role of political connections in policy uncertainty

Political connections can influence the level of policy uncertainty. For example, Ovtchinnikov et al. (2020) demonstrate that political activism can help reduce polit-

ical uncertainty by effectively timing future legislation and shaping innovation strategies in anticipation of legislative changes. The study by Kim et al. (2019) reveals that firms can hedge their uncertainty by employing various political strategies, and this hedging effect is particularly significant for firms operating in industries with higher levels of uncertainty. Furthermore, Li et al. (2021) find a positive relationship between trade policy uncertainty and government subsidies, suggesting that firms with political ties may receive more subsidies as a way to mitigate uncertainty. Additionally, Liu et al. (2021a) provide evidence that political connections enable private firms to gain access to policy information before public disclosure, allowing them to hedge against policy uncertainty through reduced fixed-asset investment.

However, it is important to note that political connections can have drawbacks, particularly during times of political turmoil. While most studies focus on the influence of specific exogenous political events rather than the overall uncertainty index, they generally find that politically connected firms perform worse compared to their non-connected counterparts. This is because these events disproportionately affect connected firms, rather than impacting all firms equally. For example, Hillier and Loncan (2019) examine the effect of political uncertainty on stock returns by analyzing an exogenous shock to political stability in Brazil. The results demonstrate that political connections play a role in transmitting political risk to asset prices, leading to increased equity capital costs during periods of political instability. Similarly, studies examining China's anti-corruption campaign (Ying and Liu, 2018) or the 2011 Egyptian revolution (Dang et al., 2018) report similar findings. In terms of the impact of political connections on policy uncertainty within the private equity industry, a rare point of reference is Huang et al. (2022) which suggests that private equity firms with political connections are more sensitive and negatively affected by policy uncertainty. However, overall, there is limited evidence regarding whether political connections can effectively mitigate policy uncertainty in the private equity industry and subsequently impact the performance of portfolio firms.

3.3.3 Policy uncertainty and firms' performance

3.3.3.1 The impact of policy uncertainty on firms' performance

Policy uncertainty has the potential to impact stock markets and influence firms' performance. In a conceptual framework, Pástor and Veronesi (2012) develop a general equilibrium model that predicts a decline in stock prices following the announcement of a government policy change, with a more significant drop occurring during periods

of higher policy uncertainty. Expanding on this model, Pástor and Veronesi (2013) examine the implications of political uncertainty on stock prices. They demonstrate that the effects of political uncertainty on market prices can be ambiguous. If the government responds effectively during times of crisis, it can be seen as providing a protective put option on asset prices, resulting in positive effects on market prices. Conversely, political uncertainty can lead to negative impacts on market prices.

In empirical studies, the literature has examined and confirmed the influence of policy uncertainty on firms' performance. For example, Colak et al. (2017) demonstrate that uncertainty stemming from gubernatorial elections has an adverse effect on local IPO volumes. Additionally, Colak et al. (2021) find that a one-standard-deviation increase in political alignment between local politicians and the federal government leads to an average valuation discount of 5.39%. By leveraging the exogenous shock of the Bo Xilai political scandal in 2012 in China, Liu et al. (2017) discover a significant decline in stock prices, particularly for politically sensitive firms. The impact of policy-related uncertainty on asset prices has also been examined at the country or industry level, as evidenced by studies conducted by Białkowski et al. (2008), Bechtel and Fuss (2008), and Boutchkova et al. (2012). Recent publications highlight the efficacy of the EPU index constructed by Baker et al. (2016) in explaining stock market behavior. For instance, Pástor and Veronesi (2013) utilize this index and confirm the existence of a risk premium associated with political uncertainty, with stocks exhibiting higher volatility during periods of heightened uncertainty. Building on this line of research, studies by Christou et al. (2017), Balli et al. (2017), Bahmani-Oskooee and Saha (2019), and Chiang (2019) demonstrate a negative correlation between stock returns and an increase in EPU.

3.3.3.2 The impact of policy uncertainty on PE funds and PE-backed firms

Several studies have examined the impact of policy uncertainty on private equity activity and PE-backed firms. In the face of exogenous shocks to political stability, Kellard et al. (2021), Wright et al. (2016), and Gianfrate and Loewenthal (2015) find that uncertainty has a negative effect on PE activity. Using the policy uncertainty index developed by Baker et al. (2016), Tian and Ye (2018) find that increased policy uncertainty is associated with a lower propensity of PE funds to invest in the next two quarters, indicating a short-term effect rather than a long-lasting one. They further demonstrate that policy uncertainty adversely affects the exit prospects of PE investments. To mitigate the negative impact of policy uncertainty, PE funds rely more on stage financing and decrease the total investment amount. The findings of Huang et al. (2022) align with the predictions of real options theory, showing that

PEs delay refinancing their portfolio companies when faced with high EPU in China. Moreover, governmental PEs with higher exposure to economic policy uncertainty are more sensitive to EPU. Litov et al. (2021) document a significant negative relationship between policy uncertainty and PE investment in startups across emerging venture capital markets outside the United States. They also find that policy uncertainty reduces the amount of cross-border PE investment.

For PE-backed portfolio firms, a significant body of research has utilized exogenous shocks to examine the role of private equity in helping targets navigate uncertainties and achieve better performance (Thomas, 2010; Wilson et al., 2012; Bernstein et al., 2019; Wright et al., 2014; Lavery et al., 2023). However, it is also important to consider that the involvement of private equity in a firm may lead to worse performance when facing uncertainties. PE-backed firms often have a highly leveraged financial structure (Bernstein et al., 2017), which can result in short-term performance focus, employment reductions, and increased insolvency risk, particularly during economic downturns (ITUC, 2007; Rasmussen, 2008). For instance, Minardi et al. (2013) find that PE-backed IPOs issued during the 2007-2008 period in Brazil were not immune to the global economic crisis of 2008. Additionally, the grandstanding hypothesis suggests that PE may bring immature firms to go public (Gompers, 1996), and such firms may be more vulnerable when facing high uncertainties. So far, none of the studies have utilized the EPU index to examine how uncertainty affects the performance of PE-backed firms.

3.4 Hypotheses

3.4.1 The role of PE in IPO performance

When it comes to private equity, it is widely believed that PE investors play a crucial role in monitoring and certifying their investee firms in developed countries, leading to improved performance (Engel et al., 2002; Gompers, 1995; Hochberg, 2012). Specifically, studies by Gohil and Vyas (2015) and Drebinger et al. (2019) find that PE-backed IPOs exhibit lower underpricing and perform better in the long run compared to non-PE-backed IPOs. However, early studies based on data prior to 2010 in China suggest that the monitoring and certifying role of PE may be compromised due to imperfect market mechanisms. For instance, using data from SMEs, Cao et al. (2013) find no significant difference in IPO underpricing between companies with private equity and those without. Similarly, Tan et al. (2013) find that the performance

of companies without PE tends to be better than that of companies with PE during the post-IPO period. Nonetheless, more recent studies taking into account the rapid development of the private equity market, along with improvements in legal systems and the maturity of financial markets, have concluded that PEs have a positive impact on their portfolio firms after IPO (Rahman and Yang, 2021; Wu and Xu, 2020). Building upon these findings, I argue that portfolio firms with PE support in China exhibited better performance than their counterparts from 2008 to 2018. Based on these arguments, I propose the following hypothesis:

H1: PE plays a certification and monitoring role for its backed firms, resulting in lower underpricing and better post-IPO performance for these firms.

3.4.2 The role of princeling-connected PE in IPO performance

Political connections are recognized as important political capital, particularly in China, where the business environment is dominated by relationships and networks rather than a formal legal system (Faccio, 2006; Nee and Opper, 2010). The benefits of political connections in the private equity industry have been verified in various aspects (Faccio and Hsu, 2017; Colombo et al., 2016; Li and Zhou, 2015; Yang, 2013). For example, in the context of IPOs, studies by Francis et al. (2009) and Feng and Johansson (2017) indicate that politically connected firms have lower underpricing and incur fewer costs during the IPO process. However, politically connected sponsors are not responsible for the issuer's post-IPO performance (Liu et al., 2013). Both Wang and Wu (2020) and Feng and Johansson (2017) suggest that firms backed by politically connected PE experience worse performance during the post-issue period. Furthermore, the value-creating effect of political connections might be offset by the value-destroying impact in the long run, such as bureaucratic costs and political interests (Cumming et al., 2017; Jääskeläinen et al., 2007). In this chapter, I examine a higher level of political connections, namely princeling connections, to investigate how PEs with princeling connections impact portfolio firms differently. Consistent with previous findings, I anticipate that princelings may offer valuable insights into IPO underpricing through their ties with government authorities but may not contribute to the better post-IPO performance of their portfolio firms. Thus, the second hypothesis is proposed:

H2: Firms backed by princeling-connected PEs have lower IPO underpricing but worse post-IPO performance.

3.4.3 The role of princeling-connected PE in mitigating policy uncertainty

In the context of China, a key characteristic of the institutional environment is the potential for severe economic restrictions resulting from policy adjustments and implementations, leading to significant uncertainty in business practices. The private equity market, as the starting point of capital formation, holds particular importance in studying the impact of policy uncertainty. Another feature of the Chinese market is that the institutional framework is relatively weak, which means that political connections have been found to provide firms with various advantages during stable periods (Akey and Lewellen, 2017; Bao et al., 2016). However, it is not guaranteed that firms backed by PEs with princeling connections can maintain their outperformance when policy uncertainty is high. Existing literature provides evidence that companies backed by PEs are more resilient during economic downturns compared to other firms. This resilience is attributed to the strategic advice, financial support, and industry-specific expertise provided by PE funds (Bernstein et al., 2019; Wilson et al., 2012). In contrast, the primary role of princeling-connected PEs is to provide political resources rather than actively supervising target firms. Therefore, it is unlikely that they can effectively assist their target companies in achieving better performance during periods of high policy uncertainty. Huang et al. (2022) point out that PE funds with government ownership are susceptible to policy uncertainty, leading to increased caution in investment and oversight. Therefore, it is plausible that princeling-connected PEs may not effectively shield the performance of target firms during periods of high policy uncertainty. Based on these observations, I propose the following hypothesis:

H3: Princeling-connected PE cannot offer support to target firms when policy uncertainty is high.

3.5 Sample selection and methodology

3.5.1 Data collection

3.5.1.1 Defining PE-backed and princeling-PE-backed firms

I utilize a comprehensive dataset of PE funds that invest in China, compiled by the ChinaVenture Group, a research and consulting firm based in China. To ensure accuracy, I cross-verify the investment information with WIND and Zero2P, two databases containing PE information[37]. These datasets also help identify the princeling connections of each private equity firm. Following the definition of Faccio and Hsu (2017) and Wang and Wu (2020), I classify a private equity firm as princeling-connected if a general partner, board member, or senior managers, such as vice-presidents, associates, and principals, have a princeling connection or have been reported as affiliated with the princelings by news media.

To collect data on princeling-related PEs, I first identify princelings working in the PE industry based on previously collected princeling-related career information in Chapter Two. Simultaneously, I search the princelings' names in news media, such as the British Broadcasting Corporation (BBC), the New York Times, China Daily, and the Financial Times, to verify their involvement in the PE industry. When I use Google to search for names of princelings and top government officials, these news media sources mention their names and provide background information. Subsequently, I verify the relevance of the information by conducting additional searches within these news sources to confirm if it pertains to the same individuals. This process is consistent with the approach described in the methodology presented by Chen and Kung (2019). It results in a complete list of princelings participating in PE, with a total of 31 princelings entering the private equity industry.

In the next step, I utilize the sub-database of investment figures in the Zero2P database, which includes the key personnel (e.g., general partners and board members) of a PE company, matching the princelings' name list to identify private equity companies with princeling connections. Since the database includes the work experience of the PE managers, it can be matched with the collected princeling background to confirm if it refers to the same person. Consequently, I identify 58 PE funds with a princeling background in the PE databases. Notably, princelings may maintain close

[37]The collected information includes the investment date by a PE fund, firm establishment date, IPO date, registered capital, stock issue price, etc.

relationships with the private equity fund even after leaving. For example, Boyu Capital officially announced that Jiang Zhicheng, the grandson of a former Chinese president, left the fund during the early stage of firm development. However, media reports indicate that Boyu Capital's development is still closely intertwined with Jiang Zhicheng[38].

Then, I proceed to identify targets backed by both PEs and princeling-connected PEs. The China Venture database provides information on successful IPOs that obtained private equity support. Therefore, I can determine whether a firm is backed by PE or princeling-connected PE when it goes public. For this study, I focus on firms that went public between 2008 and 2018 to investigate the impact of policy uncertainty on firm performance. This time frame is chosen because 2008 marks the beginning year for listed firms adopting new accounting standards, and 2018 is the latest year for which I can obtain 3-year post-IPO financial data. During this process, I discovered that out of the 2,076 listed companies in this period, a total of 999 companies received PE support, indicating that approximately 50% of the companies received PE support upon going public[39]. Furthermore, among the 999 listed companies with PE support, 45 of them are backed by princeling-connected PEs, accounting for 4.5%. This figure is slightly higher than the findings of Chen and Kung (2019), who reported that around 1% of firms have princelings serving as senior executives. This observation suggests that princelings are actively involved in the private equity industry and leverage their relationships to gain advantages.

3.5.1.2 Measuring economic policy uncertainty

The policy uncertainty index employed in this study is constructed by Baker et al. (2016)[40]. They quantify the number of newspaper articles reporting economic policy uncertainty and calculate the ratio of identified articles to the total number of articles published in a given month. This approach allows them to construct a monthly index of economic policy uncertainty for over 20 countries. However, due to media censorship in Chinese media, they are unable to perform text searches on newspapers published in mainland China. Instead, they rely on information from the South

[38] https://www.debtwire.com/info/china-%E2%80%9Cprinceling%E2%80%9D-fund-execs-spin-out-under-new-name-seek-usd-500m-boyu-raises-quiet-usd-2bn

[39] Initially, there were a total of 2,082 listed companies in this decade, but the basic information of 6 companies was incomplete. Therefore, the subsequent analysis focuses on a main sample of 2,076 companies.

[40] Recent studies have utilized this index to investigate the impact of policy uncertainty on various factors, such as stock returns (Brogaard and Detzel, 2015; Chiang, 2019, 2020), financial performance (Jory et al., 2020; Iqbal et al., 2020), investment decisions (Gulen and Ion, 2016; Liu and Zhang, 2020; Wang et al., 2014), and employment (Baker et al., 2016; Chu and Fang, 2020; Naidenova, 2021).

China Morning Post, an English newspaper based in Hong Kong, to develop the policy uncertainty index. Consequently, I utilize this index as a proxy for policy uncertainty in China.

3.5.1.3 Related financial data

The financial data regarding firms' pre- and post-IPO operating performance, as well as certain control variables, are collected from the Company Research Database, a sub-database of the China Stock Market & Accounting Research (CSMAR). The stock performance of listed firms is obtained from the Stock Market Trading Sub-Database of CSMAR. The company's IPO performance data is sourced from the WIND database.

3.5.1.4 Outliers

To account for the potential influence of outliers, the continuous variables utilized in the empirical regression undergo a process known as winsorization, following the 1 percent cut-off recommendation from Dixon (1960). In simpler terms, this involves assigning values corresponding to the 1st and 99th percentiles of each variable's distribution to any observations that fall beyond these thresholds. This method serves the purpose of minimizing the impact of outliers while allowing for a larger number of observations compared to outright outlier removal (Cleary, 1999; Bertoni et al., 2010)[41]. Following these adjustments, the sample consists of 2076 firms spanning a decade[42]. I use the Consumer Price Index from 2010 to deflate the values.

3.5.2 Variable measurement

3.5.2.1 Dependent variables

To examine the impact of PE on company IPO and post-IPO performance, this paper focuses on several key dependent variables. These variables include the market-

[41] It's worth noting that the results remain robust even when excluding the top and bottom 1 percent of outliers.

[42] For a detailed description of the data without winsorization, please refer to Tables A.4 and A.5 in the Appendix. A comparison of the results before and after winsorization reveals a reduction in the influence of outliers.

adjusted initial return (underpricing), the one to two-year post-IPO Cumulative Abnormal Stock Returns (CAR), and the post-issue operating performance of IPO firms (ROA).

The market-adjusted initial return is commonly used as a proxy for IPO underpricing (Carter et al., 1998). It is calculated using the following formula:

$$IPO\ underpricing = \frac{First\ day\ close\ price - offering\ price}{offering\ price} - \frac{M_f - M_o}{M_o} \quad (3.5.2.1)$$

Where M_f and M_o represent the closing prices of the A-share market index on the first trading day and the IPO issuing day, respectively.

Regarding the post-IPO performance, following the research of Ritter (1991), the initial return period is defined as month 0, while the aftermarket period includes the subsequent 24 months, represented by successive 21-trading-day periods relative to the IPO date. Therefore, month one encompasses event days 2-22, month two covers event days 23-43, and so on. Monthly benchmark-adjusted returns (with respect to the A-share market index) are computed as the raw return on a stock for a given month minus the benchmark return for the corresponding 21-trading-day period. The calculation of Cumulative Abnormal Stock Returns (CAR) is as follows:

$$AR_{it} = R_{it} - R_{mt} \quad (3.5.2.2)$$

$$CAR_{1,2} = \sum_{t=0}^{1,2} AR_{it} \quad (3.5.2.3)$$

In these equations, R_{it} and R_{mt} represent the raw return of stock i and the market return in month t, respectively. AR_{it} denotes the benchmark-adjusted return for stock i in event month t. CAR_1,2 indicates the sum of the benchmark-adjusted returns from IPO to one/two years after IPO.

The one to two-year post-issue ROA is utilized to assess the firm's operating performance. Specifically, ROA_1,2 is computed as the difference in ROA over a two-year period following the IPO, compared to the ROA value in the year of IPO. The formula is as follows:

$$\begin{aligned} ROA_{1,2} =& ROA\ in\ 1,2\ year\ after\ IPO \\ & - ROA\ in\ the\ year\ of\ IPO \end{aligned} \quad (3.5.2.4)$$

3.5.2.2 Independent variables

There are four primary independent variables in this study. The first variable is PE, which is a dummy variable indicating whether a target firm is backed by a private equity fund during its initial public offering. It equals one if the target firm receives PE support and zero otherwise. The second variable is Princeling, which is a dummy variable that takes a value of one if a target firm receives financing from at least one princeling-connected PE prior to its IPO application, and zero if it does not receive princeling-connected PE support. The third variable is Non-princeling, which is a dummy variable that takes a value of one if a target firm is backed by PE without princeling connections, and zero if it is not backed by PE without princeling connections[43]. The final key independent variable is the uncertainty index (EPU), which measures the level of aggregate economic policy uncertainty in China.

3.5.2.3 Control variables

To ensure the robustness of the results, several company- and region-level variables that may be correlated with a company's IPO and post-IPO performance are included as control variables, based on China's IPO listing rules and prior literature.

Consistent with the research conducted by Wang and Wu (2020), the study considers various pre-IPO firm characteristics, including Pre_size (the firm's average logarithm of total assets over the three-year period prior to the IPO application), Pre_leverage (the leverage ratio over the three-year period prior to the IPO application), Pre_sales (the firm's average logarithm of sales over the three-year period prior to the IPO application), and Pre_profitgrowth (the average annual growth rate of profits over the three-year period prior to the IPO application). I expect the coefficients of Pre_size, Pre_sales, and Pre_profitgrowth to be positively related to firm IPO performance. However, the coefficient of Pre_leverage is expected to be negatively related. This is because better pre-IPO performance could reduce information asymmetry and lead to lower underpricing.

Additionally, control variables are included to account for firm characteristics on the IPO day, following the study by Hu et al. (2021) and Wang and Wu (2020). These variables include IPO_leverage (the ratio of total leverage to total assets in the IPO year), IPO_size (the logarithm of total assets in the IPO year), IPO_sales (the log-

[43]When categorizing the private equity into Princeling (PEs with princeling connections) and non-Princeling (PEs without princeling connections) groups, the reference category comprises firms that do not receive PE support.

arithm of the firm's sales in the IPO year), and Offersize (the logarithm of firm's offering size). I expect the coefficients of IPO_size and IPO_sales to be positively related to IPO performance, and the coefficient of IPO_leverage to be negatively correlated, indicating better firm profitability and improved IPO performance. Additionally, I anticipate the coefficient of Offersize to be positively correlated with IPO performance. This is because a smaller flotation size makes it easier for some institutional investors to control the share price, leading to higher risk for the stocks and ultimately resulting in worse IPO performance, as discussed by Chi and Padgett (2005).

Several variables concerning the fundamental information of the company are also included as controls in the regression analysis. The age of the firm, defined as the number of years since its establishment, is recognized as a crucial factor influencing underpricing (Ting and Tse, 2006; Qian et al., 2021; Hu et al., 2021). The coefficient of Age is expected to be positively correlated with IPO performance. This is because older firms possess a longer history and provide more information available to the public. They maintain a lengthier track record of published financial data and are more likely to be scrutinized by financial intermediaries and the financial press (Ritter, 1984). The IPO waiting period is measured by the time lag (Lday) between the offering date and the listing date. Unlike developed markets, where only a short time elapses between the offering and the listing, it is typical in China for new issues to be offered for public subscription more than 2 months before their listing on the stock exchanges. Due to the asymmetric information distribution among the issuer, underwriters, and investors (Baron, 1982), and considering the fact that funds will be tied up, the longer time gap between the offering and the listing will increase the risk to investors, necessitating worse IPO performance (Chan et al., 2004). Therefore, I expect a negative relationship between Lday and IPO performance. The reputation of the underwriter is widely acknowledged to be a significant factor affecting IPO performance (Cho and Lee, 2013). I use a dummy variable to account for the underwriter's reputation, taking a value of one if the lead underwriter is one of the top-10 IPO underwriters with the highest revenue from underwriting stocks in the prior year, and zero otherwise. The coefficient of Reputation is expected to be positively correlated with IPO performance, as it is generally the financially sound companies that engage reputable underwriters. This engagement helps mitigate information asymmetry between issuers and public investors and reduces issuers' costs of raising capital (Trueman, 1986).

At the macro level, the study controls for the cumulative rate of return on the market index for the three months prior to the IPO, with the goal of accounting for the influence of economic and capital market conditions, following the methodology of Marcato and Zheng (2021). The coefficient of Market_return is expected to be pos-

itive regarding the IPO underpricing, which aligns with the argument of Ljungqvist et al. (2006) that the market return reflects market sentiment and is positively related to underpricing. Consistent with the approach of Wang and Wu (2020), the analysis also includes control for province-level characteristics, specifically the regional marketization index developed by Fan et al. (2011)[44]. To capture the heterogeneity in regional marketization, a dummy variable Developed is employed. It equals one if a firm is registered in a region with an above-average marketization score, and otherwise 0. I expect the coefficient of Developed to be positively related to IPO performance, indicating that in regions with stronger economic development, IPO performance should be better (Wang and Wu, 2020). Furthermore, Qian et al. (2021) suggest that the IPO performance differs when the CSRC imposes restrictions on IPO offer prices for IPOs between 2008 and after 2013. To address this, a dummy variable Restricted is introduced, taking a value of 1 if the IPO is issued during the restriction period and 0 otherwise. The coefficient of Restricted is expected to be negatively correlated with IPO performance, given that price caps are associated with worse IPO performance, as indicated by the findings of Qian et al. (2021) and Cheung et al. (2009). A comprehensive description of all variable definitions can be found in Appendix Table B.1.

3.5.3 Sample distribution and univariate test

3.5.3.1 Sample distribution

Table 3.1 presents the distribution of the sample by year and industry. Over the ten-year sample period, a total of 2,082 firms received approval from the CSRC to be listed on the stock market. There were three suspension periods: from September 2008 to July 2009, from November 2012 to November 2013, and from July 2015 to December 2015[45]. Consequently, excluding 2009 and 2013, the IPO events are evenly

[44]The index created by Fan et al. (2011) captures the attributes of every regional institutional setting by examining five key dimensions: the interplay between government and markets, the progression of non-state enterprises, the advancement of product markets, the evolution of factor markets, and the maturation of market intermediaries along with the legal framework.

[45]As an extreme measure to regulate the IPO market, the CSRC occasionally halts IPO activities. This is often attributed to unfavorable market conditions, and at times, it is linked to market reforms or regulatory changes (Qian et al., 2021). During these suspensions, all processes beyond the submission of applications come to a halt. The initiation and conclusion of these suspensions usually occur without prior announcement, and there is no indication of preferential treatment (potentially due to political connections) to expedite a firm's listing before the suspension commences. Both regulatory bodies and market participants have noted the unpredictable nature of CSRC's decisions regarding IPO suspensions (Cong et al., 2017). The study by Li et al. (2022) shows that firms affected by the suspension exhibit lower levels of CSR in their listing year. Cui and Yang (2018) demonstrate that firms subjected to IPO suspension are more likely to reduce their investments in R&D compared to those not affected by such

distributed across the remaining years[46]. Panel A, Column (4), indicates that the percentage of PE-backed IPOs has steadily increased over the period. The proportion of princeling-PE-backed IPOs remains consistently below 10% among all firms with PE support. Panel B displays the sample distribution across industries. Column (2) of Panel B reveals that most private equity-backed firms are concentrated in manufacturing and technology services, which is consistent with the findings of Liu et al. (2013). Column (3) suggests that princeling-backed PEs are most inclined to invest in firms in the manufacturing industry, followed by the Information Technology (IT) and public administration sectors. They seldom invest in other sectors. Column (4) indicates that firms in the real estate industry have the lowest probability of receiving PE investments, except for the residential sector, in which no PE investments have been observed.

3.5.3.2 Descriptive statistics

Table 3.2 reports the summary statistics. The average underpricing level is 0.43. In terms of operating performance, the cumulative abnormal return of stock performance is 5% one year after listing and 10% two years after listing. However, concerning the Return on Assets (ROA) ratio, firms perform worse compared to the pre-IPO indicator, showing an average decline of 7%. Additionally, the logarithm of pre-IPO size and pre-IPO sales averages 20.36 and 21.27, respectively. The figures on IPO-year characteristics reveal that firms, on average, have a leverage ratio of 0.27 and a logarithm of firm size averaging 21.18. The mean (standard deviation) of the logarithm of the offering size is 10.93 (0.79). The logarithm of firms' age is, on average, 2.34, and the mean (standard deviation) of the Economic Policy Uncertainty (EPU) index is 285.65 (219.19). 37% of firms hire the top 10 underwriters (Reputation). Additionally, 91% of firms are registered in regions with better than average marketization level[47].

suspension.

[46]The year 2015 was only paused for a 5 month-period, so the impact was not significant.

[47]Table B.2 displays descriptive statistics without winsorization, indicating that winsorization may influence the effects of outliers.

Table 3.1: The sample distribution of IPO firms

Panel A: Distribution of IPO firms by year					
	(1)	(2)	(3)	(4)	(5)
year	IPOs	PE-backed IPOs	Princeling-PE -backed IPOs	PE-backed IPOs (%)	Princeling-PE -backed IPOs(%)
2008	76	19	1	24.68%	5.26%
2009	99	36	0	36.36%	0.00%
2010	347	115	2	32.67%	1.75%
2011	282	123	8	43.06%	5.78%
2012	154	71	6	57.60%	8.33%
2013	2	0	0	0.00%	0.00%
2014	125	72	3	54.70%	4.17%
2015	223	122	5	54.70%	4.10%
2016	227	115	3	50.66%	2.60%
2017	438	264	11	60.27%	4.16%
2018	105	62	6	59.05%	9.68%
Total	2,076	999	44	47.89%	4.41%
Panel B: Distribution of IPO firms by industry					
Industry	IPOs	PE-backed IPOs	Princeling-PE -backed IPOs	PE-backed IPOs (%)	Princeling-PE -backed IPOs(%)
Agriculture	18	8	0	44.44%	0.00%
Mining	23	11	2	47.83%	18.19%
Manufacturing	1,447	708	17	48.69%	2.27%
Electricity	30	12	0	40.00%	0.00%
Constructing	58	27	1	46.55%	3.57%
Wholesale and retail	56	24	1	42.86%	4.17%
Transportation	32	10	2	28.58%	20.00%
Software	210	113	7	54.02%	6.14%
Finance	48	16	3	33.33%	18.75%
Real estate	9	2	0	22.22%	0.00%
Leasing and business services	29	13	0	44.83%	0.00%
Scientific research	35	15	2	42.86%	13.33%
Public facilities management	35	18	3	50.00%	16.67%
Residence	1	0	0	0.00%	0.00%
Education	6	4	0	66.67%	0.00%
Health and social work	6	2	1	33.33%	50.00%
Public administration	33	16	6	48.48%	37.50%
Total	2,076	999	44	47.89%	4.41%

Note: This table presents information on the sample of firms that went public during 2008-2018. Columns (1), (2), and (3) report the distribution of the total IPO number, the number of IPOs backed by private equity funds, and the number of IPOs supported by princeling-connected PEs. Column (4) and column (5) report the percentage of PE-backed IPOs among all IPOs and Princeling-PE-backed IPOs among all PE-backed IPOs. Panel A reports the IPO sample by year. Panel B reports the IPO sample by industry.

Table 3.2: Descriptive statistics

(N=2076)	Mean	Median	SD	Min	Max
Underpricing	0.43	0.42	0.32	-0.09	2.10
CAR_1	0.05	0.01	0.48	-0.94	1.38
CAR_2	0.10	0.06	0.69	-1.37	1.93
ROA_1	-0.07	-0.05	0.06	-0.30	0.04
ROA_2	-0.07	-0.06	0.07	-0.33	0.05
Pre_profitgrowth	0.39	0.25	0.53	-0.28	3.28
Pre_sales	21.27	21.07	1.14	19.30	25.13
Pre_size	20.36	20.09	1.26	18.36	25.62
Pre_leverage	0.47	0.47	0.17	0.11	0.90
IPO_sales	20.48	20.29	1.13	18.58	24.43
IPO_leverage	0.27	0.23	0.18	0.03	0.81
IPO_size	21.18	20.92	1.08	19.75	26.06
Offersize	10.93	10.82	0.79	9.57	13.85
Lday	21.12	20.00	5.50	13.00	43.00
Age	2.34	2.48	0.64	0.00	3.81
Market return	0.03	0.02	0.13	-0.26	0.35
Reputation	0.37	0.00	0.48	0.00	1.00
Developed	0.91	1.00	0.28	0.00	1.00
Restricted	0.55	1.00	0.50	0.00	1.00
EPU	285.65	269.35	219.19	74.86	935.31

Note: The table presents descriptive statistics for the variables used in this chapter. Mean represents the arithmetic average of the values, Median is the middle value in the sorted data, SD stands for standard deviation, Min is the smallest observed value, and Max represents the largest observed value. Table B.1 shows the definition of all variables used. All the data are winsorized at the 1st and 99th percentile values.

3.5.3.3 Univariate test

Panel A of Table 3.3 compares the differences between PE-backed IPOs and non-PE-backed IPOs[48]. It is observed that both PE-backed and non-PE-backed firms experience underpricing, although the mean initial return for the PE-backed sample is lower than that of the non-PE-backed firms, and this difference is statistically significant. This finding aligns with the results reported by Megginson and Weiss (1991) for the US market, suggesting that the presence of PE leads to lower underpricing. In terms of post-IPO market performance, the cumulative abnormal return (CAR) indicates that PE-backed firms outperform non-PE-backed firms significantly, with approximately a 10% higher CAR. This result is consistent with the findings of Otchere and Vong (2016). In terms of the ROA ratios, Panel A demonstrates that both PE-backed and non-PE-backed firms experience a decline in profitability during the post-IPO period, with PE-backed firms showing a comparatively smaller decline.

Regarding the control variables, there are no significant differences between PE-backed and non-PE-backed firms in terms of the pre-IPO financial indicators, except for the leverage ratio, which indicates that PE firms have a lower leverage ratio. On the IPO day, PE-backed firms have a higher leverage ratio. Moreover, PE-backed firms tend to have smaller issuing sizes (Offersize). Additionally, firms with PE backing are more likely to be more mature (Age), have shorter approval waiting periods (Lday), have higher-quality underwriters (Reputation), and list during restricted periods (Restricted). The presence of PE investments is influenced by the institutional environment, as indicated by the positive difference in market return. PEs tend to list portfolio firms when the market return is relatively high. There is no significant difference in the variable Developed between the two groups, suggesting that regional development is not a primary concern in PE investment.

Regarding princeling connections, Panel B of Table 3.3 shows that there are no significant differences between the two groups in terms of IPO performance and post-IPO performance, except for Underpricing, which is consistent with the findings of Feng and Johansson (2017). As for the control variables, firms backed by princeling-connected private equity exhibit better pre-IPO and IPO performance, characterized by higher sales and larger sizes. Moreover, firms connected to princeling-owned private equity have a larger offering size. The two groups do not differ significantly in their selection of underwriters (Reputation), suggesting that princeling connections may diminish the role of underwriters in the IPO process. Moreover, the macroeconomic conditions at the time of listing do not differ significantly between the two groups of companies.

[48]The univariate test without winsorization is reported in the appendix in Table B.3.

Table 3.3: Univariate test

	(1) *PE=0*			(2) *PE=1*			(3) *p-value*	
	Mean	Std.Dev.	Obs	Mean	Std.Dev.	Obs	Diff	p-value
Panel A: All listed firms								
The dependent variable								
Underpricing	0.44	0.36	1077	0.41	0.27	999	0.03*	(0.01)
CAR_1	0.01	0.45	1077	0.09	0.51	999	-0.08***	(0.00)
CAR_2	0.04	0.64	1077	0.17	0.74	999	-0.12***	(0.00)
ROA_1	-0.07	0.06	1077	-0.06	0.06	999	-0.01*	(0.04)
ROA_2	-0.08	0.07	1077	-0.07	0.07	999	-0.01*	(0.02)
Control variables								
Pre_profitgrowth	0.38	0.51	1077	0.39	0.55	999	-0.01	(0.73)
Pre_sales	21.30	1.21	1077	21.23	1.05	999	0.07	(0.14)
Pre_size	20.37	1.39	1077	20.35	1.10	999	0.02	(0.76)
Pre_leverage	0.47	0.18	1077	0.46	0.16	999	0.02*	(0.01)
IPO_sales	20.51	1.20	1077	20.45	1.04	999	0.06	(0.24)
IPO_leverage	0.26	0.18	1077	0.28	0.17	999	-0.02*	(0.04)
IPO_size	21.21	1.19	1077	21.15	0.95	999	0.06	(0.21)
Offersize	11.00	0.83	1077	10.86	0.75	999	0.13***	(0.00)
Lday	21.33	5.60	1077	20.89	5.39	999	0.43	(0.07)
Age	2.27	0.71	1077	2.42	0.55	999	-0.15***	(0.00)
Market return	0.02	0.13	1077	0.03	0.12	999	-0.01**	(0.01)
Reputation	0.37	0.48	1077	0.38	0.48	999	-0.01	(0.81)
Developed	0.90	0.29	1077	0.92	0.27	999	-0.02	(0.11)
Restricted	0.48	0.50	1077	0.62	0.48	999	-0.14***	(0.00)
	Princeling=0			***Princeling=1***			***p-value***	
	Mean	Std.Dev.	Obs	Mean	Std.Dev.	Obs	Diff	p-value
Panel B: Firms with PE								
The dependent variable								
Underpricing	0.43	0.32	2031	0.34	0.21	45	0.09**	(0.01)
CAR_1	0.05	0.48	2031	0.01	0.50	45	0.04	(0.63)
CAR_2	0.10	0.69	2031	0.08	0.72	45	0.02	(0.85)
ROA_1	-0.07	0.06	2031	-0.07	0.06	45	-0.00	(0.92)
ROA_2	-0.07	0.07	2031	-0.07	0.07	45	-0.01	(0.55)
Control variables								
Pre_profitgrowth	0.38	0.52	2031	0.62	0.83	45	-0.24	(0.06)
Pre_sales	21.24	1.12	2031	22.29	1.45	45	-1.05***	(0.00)
Pre_size	20.33	1.24	2031	21.55	1.63	45	-1.22***	(0.00)
Pre_leverage	0.46	0.17	2031	0.49	0.20	45	-0.03	(0.34)
IPO_sales	20.46	1.11	2031	21.54	1.41	45	-1.08***	(0.00)
IPO_leverage	0.27	0.17	2031	0.35	0.20	45	-0.08**	(0.01)
IPO_size	21.16	1.06	2031	22.26	1.42	45	-1.10***	(0.00)

	(1) *Princeling=0*			(2) *Princeling=1*			(3) *p-value*	
	Mean	Std.Dev.	Obs	Mean	Std.Dev.	Obs	Diff	p-value
Control variables								
Offersize	10.92	0.79	2031	11.51	0.89	45	-0.58***	(0.00)
Lday	21.10	5.50	2031	21.93	5.61	45	-0.83	(0.33)
Age	2.34	0.65	2031	2.45	0.45	45	-0.11	(0.12)
Market return	0.03	0.13	2031	0.03	0.12	45	0.00	(0.95)
Reputation	0.37	0.48	2031	0.42	0.50	45	-0.05	(0.52)
Developed	0.91	0.28	2031	0.89	0.32	45	0.03	(0.60)
Restricted	0.55	0.50	2031	0.60	0.50	45	-0.05	(0.51)

Note: This table shows the summary statistics for the main variables used in the paper from 2008 to 2018. Panel A reports the results for all firms, and Panel B reports the results for firms with PE support. The first two columns show the number of observations and the mean value for firms without private equity/without princeling-connected PE. Column (3) and Column (4) show the corresponding statistics for firms with private equity/with princeling-connected PE. The last two columns show the result of the univariate test. Underpricing is the market-adjusted percentage price movement from the offer price to the close price on the first trading day. CAR_(1,2) is the summation of the benchmark-adjusted abnormal returns for 1/2-year after IPO. ROA_(1,2) is the difference in ROA over two years after the IPO and the value of ROA in the year before the IPO. For descriptions of all other variables, please see Appendix Table B.1. *** denotes significance at a 10% level, ** denotes significance at a 10% level, and * denotes significance at a 1% level. All the data are winsorized at the 1st and 99th percentile values.

3.5.4 Methodology

3.5.4.1 The role of private equity in IPO and post-IPO performance

To test H1, I adopt the model used in the study of Wang and Wu (2020) as follows:

$$Performance\ indicators_i = \alpha_0 + \alpha_1 PE_i + \alpha_2 Controls_i + \nu_j + \delta_t + \nu_j \times \delta_t + \gamma_k + \varepsilon_i \quad (3.5.4.1)$$

In the model, the subscript i represents a specific firm, and t refers to a year. Time-specific fixed effects δ_t are included to capture all time-variant macro-level factors that are common to firms. I also control for industry effects (ν_j) and industry-by-year effects ($\nu_j \times \delta_t$). The province fixed effects are captured by γ_k. The error term ε_i captures the idiosyncratic variation. The dependent variables in the model are the firms' financial performance indicators, namely underpricing, CAR, and ROA. Underpricing is an indicator of the first-day performance (Ting and Tse, 2006), while CAR and ROA are indicators of post-IPO performance (Otchere and Vong, 2016). In the Ordinary Least Square (OLS) model, the variable PE is a dummy variable that equals 1 if firms receive private equity support during the process of going public,

and 0 otherwise.

When the dependent variable is underpricing, the coefficient α_1 is expected to be significant and negative. This is because a smaller discount, indicated by lower underpricing, is preferable from the issuer's perspective. It allows the firm to capture more value created during the offering process (Certo et al., 2001). From an investor's perspective, underpricing reflects the market's initial response to a company's stock offering (Higgins and Gulati, 2006). In both cases, lower levels of underpricing indicate a higher ability to raise capital, as the need to discount the offer and make it more attractive is reduced for firms with lower perceived risks. Regarding the post-IPO indicators, a positive and significant coefficient of PE suggests that private equity can contribute to better long-term performance for portfolio firms. In summary, the negative coefficient of α_1 when the dependent variable is Underpricing, and the positive coefficient of α_1 when the dependent variable is a long-term performance indicator (e.g., ROA and CAR), align with the first hypothesis, suggesting that PE contributes to improved performance in target firms. The equation includes several control variables, such as pre-IPO financial indicators and IPO day characteristics. To address potential heteroskedasticity, standard errors are clustered at the industry level, following the study of Wang and Wu (2020).

3.5.4.2 The role of princeling-connected private equity in IPO and post-IPO performance

To examine the effect of a private equity firm's princeling connections on a company's initial public offering performance, the PE variable is divided into two groups: princeling-connected PEs and non-princeling-connected PEs. I include all listed firms in the sample, including firms without PE (baseline group), firms with PE support but without princeling connections, and firms with princeling-connected PEs. The equation for this analysis is as follows:

$$\begin{aligned} Performance\ indicators_i =& \alpha_0 + \alpha_1 Princeling_i + \alpha_2 Non-princeling_i \\ &+ \alpha_3 Controls_i + \nu_j + \delta_t + \nu_j \times \delta_t + \gamma_k + \varepsilon_i \end{aligned} \tag{3.5.4.2}$$

In this equation, Princeling is a dummy variable that equals one if a firm receives princeling-backed PE support and 0 for non-princeling-PE support. α_1 represents the coefficient for the variable Princeling, which captures the effect of princeling-connected PEs. I expect the coefficient of α_1 to be negative when the dependent variable is Underpricing, suggesting that princeling-connected PEs can enhance portfolio IPO underpricing. For long-term performance measures such as CAR and ROA, an insignificant coefficient of α_1 would confirm that princeling-backed PEs do not

provide significant supervision to target firms, aligning with the second hypothesis.

Non-princeling is a dummy variable that equals one if a firm receives support from a non-princeling-connected PE and 0 for non-princeling and non-PE support. α_2 represents the coefficient for the variable Non-princeling, which captures the effect of non-princeling-connected PEs. I expect a negative coefficient for α_2 when the dependent variable is Underpricing, indicating that non-princeling-connected PEs can reduce portfolio firm IPO underpricing. Additionally, I anticipate a positive coefficient for α_2 in terms of CAR and ROA, demonstrating that PEs can provide long-term support, thus confirming hypothesis two. Likewise, the equation includes control variables, as well as time-specific fixed effects (δ_t), industry fixed effects (ν_j), industry by year fixed effects ($\nu j \times \delta t$), and province fixed effects (γ_K). The idiosyncratic error term is denoted by ε_i. The control variables are consistent with those in Equation 3.5.4.1, encompassing both pre-IPO and IPO-day firm characteristics, as well as market indicators.

3.5.4.3 The role of princeling-connected PE and non-princeling-connected PE in mitigating policy uncertainty

To test the impact of princeling-connected PE and non-princeling-connected PE on mitigating uncertainty for IPO underpricing, following the study of Colak et al. (2021), I add the interaction terms of princeling-connected PE and EPU_t, as well as non-princeling-connected PE and EPU_t, and employ the following model:

$$\begin{aligned} IPO\ underpricing_i = & \alpha_0 + \alpha_1 Princeling_i + \alpha_2 Non-princeling_i + \alpha_3 EPU_t + \\ & \alpha_4 Princeling_i \times EPU_t + \ \alpha_5 Non-princeling_i \times EPU_t + \\ & \alpha_6 Controls_i + \nu_j + \delta_t + \nu_j \times \delta_t + \gamma_k + \varepsilon_i \end{aligned} \tag{3.5.4.3}$$

The definitions of Princeling and *Non-princeling* are the same as mentioned above. EPU_t represents the index of China's economic policy uncertainty. Since economic policy uncertainty is a time series at the national level and does not change across firms, it is absorbed by time-specific fixed effects δ_t. Following the existing study Tian and Ye (2018), I use the monthly natural logarithm value of the EPU index in the equation to measure the policy uncertainty level in the month a firm goes public. The coefficients α_1 and α_2 are expected to be negative, indicating that both princeling-connected PEs and non-princeling-connected PEs can correctly price the stock. However, when uncertainty rises, potential investors will demand higher risk compensation to hold the asset, resulting in a lower valuation level of the IPO (Colak

et al., 2021). Additionally, uncertainty increases the difficulty of secondary market investors' IPO valuation, complicating their decision-making process and resulting in higher underpricing. Therefore, the coefficient of EPU_t is expected to be positive. The main interest lies in the coefficients of the interaction terms of princeling-connected PE and EPU_t, as well as non-princeling-connected PE and EPU_t. I expect the coefficient of α_4 is insignificant since PEs with princeling connections are negatively impacted by higher policy uncertainty and cannot provide extra assistance to their targets, leading to lower performance (Huang et al., 2022). In contrast, I anticipate a negative coefficient for α_5 because non-princeling-connected PE-backed firms may exhibit greater resilience (Bernstein et al., 2019). Therefore, the insignificant coefficient of α_4 could confirm the third hypothesis, which posits that princeling-connected PEs cannot offer support when EPU is high.

To further study the role of PE and princeling linkages in the relationship between policy uncertainty and a firm's post-IPO performance, the equation is used as follows:

$$\begin{aligned}\Delta ROA_i(CAR_i\ ) =& \alpha_0 + \alpha_1 Princeling_i + \alpha_2 Non-princeling_i + \alpha_3 \Delta EPU_t + \\ & \alpha_4 Princeling_i \times \Delta EPU_t + \alpha_5 Non-princeling_i \times \Delta EPU_t + \\ & \alpha_6 Controls_i + \nu_j + \delta_t + \nu_j \times \delta_t + \gamma_k + \varepsilon_i\end{aligned} \tag{3.5.4.4}$$

The dependent variables are ΔROA_i and CAR_i in the equation. The definitions of Princeling and Non-princeling remain unchanged. Because both ROA and CAR are calculated using data from a specific period, I need to calculate the corresponding change in the EPU index during that period. ΔEPU_t is calculated by taking the difference between the EPU one (or two) years after listing and the EPU at the year of listing. The logarithmic value of ΔEPU_t is then taken, following the study of Chiang (2019). The coefficient of α_1 is expected to be insignificant, as princeling-connected PEs may not significantly improve the post-IPO performance of their target firms (Wang and Wu, 2020; Feng and Johansson, 2017). In contrast, the coefficient of α_2 is expected to be positive, demonstrating the certification and monitoring role of non-princeling-connected PEs. The uncertainty level has been shown to be negatively associated with firms' operating performance (Chiang, 2019, 2020); thus, the coefficient α_3 is anticipated to be negative. The main interest lies in the coefficients of the two interaction terms. The coefficient of α_5 is expected to be positive, demonstrating the supportive role of non-princeling-connected PEs. I anticipate the coefficient of α_4 to be insignificant, suggesting that PEs with princeling connections are unable to add value to their portfolio firms when policy uncertainty is high, thereby confirming the third hypothesis.

3.6 Regression results

3.6.1 The role of private equity

3.6.1.1 Cross-sectional analysis of underpricing

I begin by examining whether private equity-backed firms are more likely to have better IPO performance than comparable unsponsored firms. Table 3.4 presents the results from estimating Equation 3.5.4.1, which investigates the impact of PE on IPO underpricing. In column (1), I report the results without control variables; in column (2), I present the regression results while controlling for pre-IPO firm characteristics and IPO-firm characteristics; in column (3), I further include firm characteristics; finally, in column (4), I add economic and market-level control variables. Additionally, all specifications include year, industry, industry-by-year, and province-fixed effects. I report coefficient estimates and standard errors clustered by industry. The key finding is that private equity ownership has a positive and significant effect on firms' IPO underpricing.

Consistently across all four models, the coefficients of PE are negative and significant. The negative coefficient of PE in column (1) demonstrates that PE ownership has a significant positive impact on the level of IPO underpricing, indicating that PE-owned firms are less likely to experience IPO underpricing. The positive effect of PE ownership persists from column (2) to column (4), even when controlling for firm and market characteristics. In column (4), the estimated coefficient for PE ownership is 0.02, statistically significant at the 10% level, showing that the underpricing of a firm with PE is 2% lower than that of a non-PE-backed company. This finding is consistent with studies by Megginson and Weiss (1991), Barry et al. (1990) for the US, Levis (2011) for the UK, and Johan (2010) for Canada, even though the impact of PE in developed countries is generally higher than in China. Their results show that PE-backed IPOs have approximately a 10% lower underpricing level. These findings can be explained by the theory proposed by Megginson and Weiss (1991), who suggest that when a private equity company issues a new company on the public stock exchange, the degree of underpricing is lower due to the certification that the issued company has been managed by the private equity company, thus increasing investor confidence in those IPOs.

Regarding the control variables, the signs of most control variables are in line with economic theory and prior studies (Colak et al., 2021; Huang et al., 2022; Ting and

Table 3.4: The role of PE in underpricing

	(1)	(2)	(3)	(4)
PE	-0.01*	-0.02**	-0.02*	-0.02*
	(0.01)	(0.01)	(0.01)	(0.01)
Pre_profitgrowth		0.02*	0.02**	0.02**
		(0.01)	(0.01)	(0.01)
Pre_sales		-0.10**	-0.09**	-0.08**
		(0.04)	(0.04)	(0.04)
Pre_size		0.15***	0.10***	0.09***
		(0.01)	(0.02)	(0.02)
Pre_leverage		-0.40***	-0.28***	-0.27***
		(0.04)	(0.06)	(0.07)
IPO_sales		0.10*	0.09*	0.08*
		(0.05)	(0.04)	(0.04)
IPO_leverage		0.44***	0.17*	0.14
		(0.05)	(0.09)	(0.10)
IPO_size		-0.21***	-0.06	-0.05
		(0.02)	(0.04)	(0.04)
Offersize			-0.12***	-0.12***
			(0.03)	(0.04)
Lday			0.00***	0.00***
			(0.00)	(0.00)
Age			0.04**	0.04**
			(0.02)	(0.02)
Reputation				-0.01*
				(0.01)
Developed				0.09*
				(0.05)
Market return				-0.06
				(0.05)
Restricted				-0.06***
				(0.02)
Constant	2.12***	3.72***	2.69***	2.58***
	(0.02)	(0.22)	(0.21)	(0.23)
N	2076	2076	2076	2076
Year FE	YES	YES	YES	YES
Industry FE	YES	YES	YES	YES
Industry-by-year FE	YES	YES	YES	YES
Province FE	YES	YES	YES	YES

Note: This table presents the role of PE in underpricing using equation 3.5.4.1. Underpricing is the market-adjusted percentage price movement from the offer price to the close price on the first trading day. PE is a dummy equal to 1 if the firm's IPO is backed by a private equity fund and 0 otherwise. For descriptions of all other variables, please see Appendix Table B.1. The standard errors are clustered at the industry level. *** denotes significance at a 10% level, ** denotes significance at a 5% level, and * denotes significance at a 1% level. All the data are winsorized at the 1st and 99th percentile values.

Tse, 2006). In column (4), I find that a firm's better performance before the IPO, as indicated by the negative coefficient of Pre_sales, is associated with lower underpricing. Additionally, a larger pre-IPO size and higher pre-IPO profit growth rate are positively and significantly related to IPO underpricing. Furthermore, sales in the IPO year are positively associated with IPO underpricing. The firm's leverage and size in the year of IPO do not have a substantial effect on underpricing. Additionally, the underpricing of A-share IPOs is negatively related to the offering size, suggesting that larger issues are less likely to be manipulated (Chang et al., 2008). The underpricing of A-share IPOs is positively and significantly related to the number of days between offering and listing (Lday) (Chan et al., 2004). Ritter (1984) believes that there is a positive correlation between the level of underpricing and the degree of uncertainty in the company's intrinsic value. Established firms benefit from longer histories and more public information, which tends to reduce ex-ante uncertainty about their value and thus lower pricing levels. However, the positive coefficient of Age in column (4) indicates that the level of underpricing increases as a firm's age increases. Moreover, higher quality underwriters (Reputation) significantly reduce underpricing, which is consistent with the findings of Hu et al. (2021). The positive coefficient of Developed indicates that if a company is located in a province with a higher level of marketization, it experiences higher underpricing. As the CSRC limits the IPO offer price for IPOs between 2008 and after 2013 (Restricted), underpricing is reduced during this period.

3.6.1.2 Cross-sectional analysis of long-run performance

In this sub-section, I investigate the impact of private equity backing on the long-run performance of the portfolios. The regression results using long-run performance as the dependent variable are presented in Table 3.5. I focus on the sign and significance of the variable PE, which reveals whether private equity-backed firms are more likely to have better post-IPO performance compared to non-PE-backed firms. The findings indicate that sponsored firms exhibit better performance following the IPO. In the first column, the coefficient of PE is positive and significant, indicating that the CAR of PE-backed firms demonstrates superior performance by three percentage points compared to non-PE-backed firms. In column (2), however, the coefficient of PE is positive but insignificant, indicating that the impact of PE on the company's stock performance is primarily observed in the first year after going public. The results are consistent with the study of Otchere and Vong (2016), who also find that the better stock performance differences between PE-backed and non-PE-backed firms disappear in the second year after going public. Guo and Jiang (2013) examine the long-run performance of firms listed in China during the period 1988-2007 and find

statistically significant positive net returns for holding periods. Similarly, using data from Brazil and Canada respectively, Minardi et al. (2013) and Johan (2010) also provide support for the better performance of private equity-backed IPOs compared to non-private equity-backed IPOs after listing.

For the control variables in columns (1) and column (2), it is observed that there is a negative relationship between Lday and CAR, indicating that the longer the waiting period, the lower the CAR after the IPO. It can also be seen that a larger offering size is associated with a lower CAR, consistent with the findings of Sahoo and Rajib (2010). Both IPO sales and IPO size are positively correlated with CAR after two years of IPO. Firms registered in developed regions exhibit superior stock performance. Additionally, I find that the older the firm, the better the stock performance, which aligns with the argument presented by Ritter (1984). Moreover, there exists a negative relationship between CAR and market return two years after the IPO. A stronger reputation of the underwriter is associated with enhanced stock performance (Chang et al., 2010).

Considering the operating performance, columns (3) and (4) present the results comparing the ROA ratio between PE-backed and non-PE-backed targets. Similarly, I find a positive and significant coefficient for PE, indicating that PE-backed IPOs perform better in terms of ROA compared to non-PE-backed firms. Specifically, the ROA ratio is one percentage point higher for PE targets than their control firms. This finding is consistent with Jain and Kini (1995), who find that venture-backed IPOs exhibit superior operating performance compared to non-venture IPOs. Furthermore, Coakley et al. (2007) and Levis (2011) suggest that PE-backed firms demonstrate better operational performance during non-bubble years in the UK.

For control variables in columns (3) and column (4), higher Pre_profitgrowth, Pre_sales, IPO_size lead to lower post-IPO performance, while higher Pre_size, IPO_sales, and IPO_leverage exhibit a positive relationship with post-IPO operating performance. Pre_leverage and offering size only show a significant positive correlation with ROA in the third column. Similarly, as the company's age increases, post-IPO ROA also rises (Ritter, 1984). A positive relationship between the underwriter and post-IPO operating indicators is evident in column (4) (Coakley et al., 2007). Higher market returns are associated with better post-IPO operating performance.

The literature supports the monitoring role of private equity firms in the companies they invest in, which is the primary model discussed in relation to the role of PE firms in post-IPO performance (Barry et al., 1990; Sahlman, 1990). From an agency perspective, PE firms should employ various means to monitor their portfolio companies and control the opportunistic behaviors of entrepreneurs. This can

Table 3.5: The role of PE in long-run IPO performance

	(1)	(2)	(3)	(4)
	CAR_1	CAR_2	ROA_1	ROA_2
PE	0.03**	0.02	0.01*	0.01***
	(0.01)	(0.02)	(0.00)	(0.00)
Pre_profitgrowth	0.01	-0.02	-0.02***	-0.02***
	(0.02)	(0.02)	(0.00)	(0.00)
Pre_sales	0.03	-0.08	-0.09***	-0.07***
	(0.03)	(0.06)	(0.01)	(0.01)
Pre_size	-0.05	-0.06	0.12***	0.12***
	(0.05)	(0.07)	(0.01)	(0.01)
Pre_leverage	0.04	0.00	0.03**	0.02
	(0.07)	(0.10)	(0.01)	(0.01)
IPO_sales	0.01	0.14***	0.08***	0.07***
	(0.03)	(0.04)	(0.01)	(0.01)
IPO_leverage	0.03	-0.24	0.04***	0.05***
	(0.08)	(0.15)	(0.01)	(0.01)
IPO_size	0.07	0.19*	-0.11***	-0.11***
	(0.06)	(0.10)	(0.01)	(0.01)
Offersize	-0.11**	-0.28***	-0.00*	-0.00
	(0.04)	(0.06)	(0.00)	(0.00)
Lday	-0.01***	-0.01***	0.00	0.00
	(0.00)	(0.00)	(0.00)	(0.00)
Age	0.02**	0.04***	0.00***	0.01***
	(0.01)	(0.01)	(0.00)	(0.00)
Reputation	0.02**	0.04**	0.00	0.00***
	(0.01)	(0.01)	(0.00)	(0.00)
Developed	0.15**	0.11**	0.00	0.01***
	(0.05)	(0.05)	(0.00)	(0.00)
Market return	-0.08	-0.21**	0.03***	0.03***
	(0.11)	(0.07)	(0.01)	(0.01)
Restricted	0.10	0.18	0.01***	0.00
	(0.07)	(0.15)	(0.00)	(0.02)
Constant	-0.39	-0.90	-0.06*	-0.01
	(0.30)	(0.69)	(0.03)	(0.04)
N	2076	2076	2076	2076
Year FE	YES	YES	YES	YES
Industry FE	YES	YES	YES	YES
Industry-by-year FE	YES	YES	YES	YES
Province FE	YES	YES	YES	YES

Note: This table presents the results of the long-term performance of Chinese IPOs between PE-backed and non-PE-backed IPOs using equation 3.5.4.1. CAR_(1,2) is the summation of the benchmark-adjusted abnormal returns for 1/2-year after IPO. ROA_(1,2) is the difference in ROA over two years after the IPO and the value of ROA in the year of IPO. For descriptions of all other variables, please see Appendix Table B.1. The standard errors at the industry level. *** denotes significance at a 10% level, ** denotes significance at a 5% level, and * denotes significance at a 1% level. All the data are winsorized at the 1st and 99th percentile values.

be achieved through stage financing (Gompers, 1995), board membership (Lerner, 2022), and detailed legal contracts (Gompers and Lerner, 1996). In addition to the controlling effect, PE firms can also add value to their portfolios. PEs possess experience in guiding start-ups along the development path, and even after the IPO, they may continue to hold significant equity stakes for one to two years, actively advising their portfolio companies and supporting their further growth (Wang et al., 2003). A more independent governance structure, where corporate insiders control fewer board seats before and after an IPO and CEOs of PE-backed firms own fewer shares of stock, can also explain why PE-backed firms exhibit better post-IPO performance (Bouresli et al., 2002).

Overall, the results demonstrate that private equity plays a certification role that contributes to better performance for target firms on IPO day and post-IPO. This can be attributed to private equity firms' concern for their reputation, which drives them to ensure that the offering price reflects all available and relevant inside information and reduces underpricing (Barry et al., 1990; Brav and Gompers, 1997; Wang et al., 2003). Furthermore, the market specialization and financial and strategic support provided by private equity firms can accelerate post-IPO growth for portfolio companies (Chemmanur et al., 2011; Allen and Santomero, 1997; Belden et al., 2001). As a result, portfolio firms can benefit from PE sponsorship by experiencing performance growth. Therefore, the regression results support hypothesis 1.

3.6.2 The role of princeling-connected PE

3.6.2.1 Cross-sectional analysis of underpricing and long-run performance

I will now discuss the hypothesis that relates to private equity investment, princeling connections, and IPO performance. To examine the impact of princeling connections within private equity on a company's IPO performance, the research sample still consists of all listed companies, including firms without private equity (baseline group), firms with private equity but without princeling connections, and firms with princeling-connected private equity. Table 3.6 presents the regression results showing the effect of princeling-connected private equity on IPO underpricing and long-run performance. Column (1) presents the impact of princeling-connected private equity on underpricing, while columns (2) to (5) report the impact on post-IPO performance. The main focus here is on the coefficients of princeling and non-princeling, which examine whether princeling connections can influence the role of private equity in portfolio firms.

In column (1), I find that both princeling and non-princeling dummies have negative and significant effects on IPO underpricing. This suggests that firms with private equity, regardless of princeling connections, experience lower underpricing compared to firms without private equity backing. The coefficients indicate that changing the status from non-PE-backed (baseline category) to either PE-backed with princeling connections or PE-backed without princeling connections reduces underpricing by 1% and 4%, respectively. However, the equality test reveals that there are no significant differences between princeling-connected private equity-backed firms and non-princeling-connected private equity-backed firms. This finding is consistent with the conclusions of Francis et al. (2009) and Feng and Johansson (2017), who demonstrate that issuing firms with political connections enjoy significant preferential benefits from going public, including lower underpricing and reduced fixed costs.

These results imply that private equity can accurately price the stock (Barry et al., 1990; Wang et al., 2003). There are two reasons to explain why firms with private equity perform better. First, private equity firms possess greater knowledge about the issuing firm due to their equity holdings, often holding board seats and maintaining longer and closer working relationships with the management team compared to other financial intermediaries, thus reducing information asymmetry. Second, the reputation factor can control potential false certification by private equity firms (Sahlman, 1990). Most private equity firms raise funds in limited partnerships with finite lifetimes. Therefore, the past performance and reputation of private equity firms are crucial for successfully raising new funds in the future and ensuring their survival. Moreover, private equity firms with princeling connections can leverage their identity to leave less on the table for new investors during the IPO process.

Turning to post-IPO long-run performance, as proxied by CAR, columns (2) and (3) examine the impact of princeling connections on post-IPO stock performance. The results show that firms with princeling-connected PEs have negative and insignificant coefficients. This implies that switching from being backed by non-PE to being backed by princeling-connected PE does not improve portfolio firms' performance. However, firms backed by private equity without princeling connections are more likely to exhibit better stock performance in the first year after the IPO compared to the reference group, as indicated by the positive and significant coefficient of Non-princeling in column (2). The results suggest that the role of non-princeling-PE in improving the stock performance of portfolio firms is primarily observed in the first year. The findings align with Otchere and Vong (2016) research, which similarly concludes that the superior stock performance disparities between companies backed by private equity and those without such backing vanish during the second year post-IPO. In detail, firms with non-princeling-connected private equity have 3% better stock performance than the reference group.

Table 3.6: The role of princeling connections in underpricing and long-run performance

	(1)	(2)	(3)	(4)	(5)
	Underpricing	CAR_1	CAR_2	ROA_1	ROA_2
Princeling	-0.04*	-0.02	0.01	-0.01	-0.01
	(0.02)	(0.06)	(0.10)	(0.01)	(0.00)
nonPrinceling	-0.01*	0.03**	0.02	0.01*	0.01***
	(0.01)	(0.01)	(0.02)	(0.00)	(0.00)
Constant	2.56***	-0.43	-0.91	-0.07	-0.01
	(0.23)	(0.26)	(0.64)	(0.06)	(0.04)
P-values of test statistics					
Wald	0.25	0.35	0.79	0.04	0.03
N	2076	2076	2076	2076	2076
Year FE	YES	YES	YES	YES	YES
Industry FE	YES	YES	YES	YES	YES
Industry-by-year FE	YES	YES	YES	YES	YES
Province FE	YES	YES	YES	YES	YES

Note: This table presents the result of the role of princeling connections in underpricing and post-IPO performance using equation 3.5.4.2. Underpricing is the market-adjusted percentage price movement from the offer price to the close price on the first trading day. CAR_(1,2) is the summation of the benchmark-adjusted abnormal returns for 1/2-year after IPO. ROA_(1,2) is the difference in ROA over two years after the IPO and the value of ROA in the year of IPO. Princeling is a dummy variable that equals one if a firm receives princeling-backed-PE support and 0 otherwise. Non-princelings is a dummy variable that equals one if a firm receives support from a non-princeling-connected PE and 0 otherwise. For descriptions of all other variables, please see Appendix Table B.1. The standard errors are clustered at the industry level. *** denotes significance at a 10% level, ** denotes significance at a 5% level, and * denotes significance at a 1% level. All the data are winsorized at the 1st and 99th percentile values.

This finding is in line with expectations: the primary function of princeling-connected private equity is to provide princeling relationships with government regulators rather than additional oversight of their portfolio companies. Furthermore, princeling-connected PEs are more vulnerable to local government pressure and tend to support entrepreneurs with unattractive return prospects. These findings highlight the negative consequences of private equity's princeling connections, which primarily impact minority investors in the secondary market. They are consistent with the findings of Wang and Wu (2020), Cumming et al. (2020), and Feng and Johansson (2017), who have also examined political connections. On the other hand, for private equity firms without princeling connections, the results suggest that PEs provide value during the post-exit period, such as governance structure, fundraising, and investment assessment, which contribute to better post-IPO performance (Meles, 2011). However, the results of the equality test indicate that the differences between princeling-connected private equity and non-princeling-connected private equity are not significantly different from each other.

As for the post-IPO operating performance, the results are presented in Columns (4) and (5). The coefficient on Princeling PE-backed firms is insignificant. While the coefficient of non-Princeling is positive and significant. These results suggest that targets backed by princeling-connected private equity perform no differently than the reference group. In comparison, targets backed by non-princeling-connected private equity enjoy better performance than the baseline group. This finding further indicates that private equity firms with princeling connections do not guarantee good post-IPO performance for their targets. Princeling connections are only valuable in providing relationships with government regulators (Wang and Wu, 2020). The monitoring role of private equity can explain the better performance of firms with non-connected private equity. Private equity firms not only assist portfolio firms in gaining the trust of investors and attracting funds from financial intermediaries (Mull, 1990), but also provide value-added services (Allen and Santomero, 1997; Puente, 2022; Chemmanur et al., 2011), leading to better long-term performance. Additionally, the equality test indicates that non-princeling-connected private equity has a more significant effect than princeling-connected private equity on post-IPO operating performance.

Overall, princeling-connected private equity helps targets display lower underpricing. However, the remaining coefficients of Princeling during the post-IPO are insignificant. This suggests that there is no additional value derived from being connected to princeling private equity. On the other hand, non-princeling-connected private equity firms can contribute to better performance for portfolio firms, both on IPO day and in the post-IPO period. These findings are consistent with hypothesis 2.

3.6.3 Heterogeneity

3.6.3.1 Reputation of PE

PE's reputation has long been recognized as an important factor in determining the extent of underpricing and the long-term performance of firms. Otchere and Vong (2016) demonstrate that PE reputation is associated with lower underpricing, which aligns with the reputational capital theory, stating that reputable PEs leverage their expertise and experience to minimize underpricing and safeguard their reputation. Moreover, Chemmanur et al. (2011) and Strömberg (2008) reveal that firms backed by highly reputable PEs experience significantly higher improvements in post-investment efficiency compared to those backed by less reputable PEs. Therefore,

in this section, I aim to examine if the efficiency improvement of PE-backed firms varies depending on the reputation of the PEs.

Following the approach of Gompers (1996), I categorize private equity institutions into two groups: reputable and non-reputable. A PE is classified as a reputation group if it ranks among the top 10 private equity investment institutions or top 20 Venture Capital Institutions in Mainland China one year prior to the listing of the invested company. To distinguish between the two rankings of PEs, I create two dummy variables. The dummy variable "high ranking" takes the value of 1 if a PE is considered reputable and 0 otherwise. The other dummy variable "low ranking" takes the value of 1 if a company is backed by PEs without a higher reputation and 0 otherwise. Upon examining the results presented in Table B.4 in the Appendix, panel A reveals high-ranking PE can benefit portfolio firms from columns (7) to column (10) in terms of operating performance, yet the Chow test reveals no significant difference between the operating performance in the first year after IPO for high-ranking PE and low-ranking PE. In columns (9) and column (10), it becomes evident that private equity institutions with high reputations exert a more substantial impact on the company's operating performance (ROA_2), as evidenced by the significant and positive coefficient of PE. Furthermore, a lower ranking of PE can also contribute to improved firm performance, albeit to a lesser extent, and the Chow test demonstrates a significant difference. On one hand, due to market signal transmission, high-profile private equity has a positive effect on the business development of the invested company. On the other hand, private equity reputation is built through long-term transactions in the capital market and serves as an important asset in situations of information asymmetry (Nahata, 2008). In addition, in Panel B, there is no difference between high-ranking princeling-connected PE and low-ranking princeling-connected PE in terms of underpricing and post-IPO performance.

3.6.3.2 SOE firms and non-SOE firms

Firms in China can be classified as either SOEs or non-SOEs, providing a suitable framework to examine the effect of private equity on firm behavior. SOEs play a crucial role in China's economic development and differ from non-SOEs in terms of size, industry, material and information resources, and political connections. I anticipate that the impact of private equity on IPO performance is more pronounced in non-SOEs compared to SOEs, given the unequal distribution of economic resources in China. One possible reason is that the value of private equity stems from its ability to provide funding advantages. However, SOEs have direct government ties and may have easier access to funds compared to non-SOEs (Li et al., 2009). Conversely,

non-SOEs face social discrimination, and retaining the support of private equity can assist them in addressing financing challenges.

To capture the effect of private equity on both SOEs and non-SOEs, following the approach of Bortolotti and Faccio (2009), I trace the identity of the largest shareholders to determine the ultimate owner. I classify the sample into the "SOE" group and the "non-SOE" based on whether the government ultimately controls the firm. The results of this analysis are presented in the Appendix Table B.5. From the table, in Panel A, it is evident that private equity has a significant impact on non-SOEs while exhibiting limited influence on SOEs in terms of underpricing. Regarding post-IPO performance, even though private equity has a positive impact on non-SOEs in columns (4), (6), and (10), the Chow test further confirms that the role of private equity in SOEs and non-SOEs is not significantly different. In Panel B, the Chow test indicates that princeling-connected private equity has no discernible difference in its impact on SOEs and non-SOEs, despite the coefficient of princeling being significantly negative in column (2) (Underpricing).

3.6.4 The role of PE and princeling-connected PE in mitigating policy uncertainty

3.6.4.1 Cross-sectional analysis of underpricing and post-IPO performance

Having established the link between princeling connections and IPO performance, I will now investigate the role of princeling connections in firms' IPO performance in the context of policy uncertainty. The empirical results are presented in Table 3.7. In order to assess the impact of PE on IPO underpricing and performance regardless of being princeling connected, I estimate PE on its own and then distinguish between PE princeling and PE non-princeling. Columns (1) to (2) present the results for underpricing, while columns (3) to (10) display the results for post-IPO performance.

Regarding performance, it is hypothesized that PEs with princeling connections are unable to mitigate policy uncertainty for their portfolio firms, as those PEs themselves are negatively affected during periods of high economic policy uncertainty. On the other hand, targets with non-princeling PEs demonstrate greater resilience compared to other firms. To confirm this assumption, I first estimate the impact of PE and princeling connections on IPO underpricing interacting with EPU. Results are presented in columns (1) and (2). In column (1), it is shown that the positive effect of PE on underpricing becomes insignificant when the policy uncertainty is taken

into account, as indicated by the negative and insignificant coefficient of PE. However, it's important to note that the estimate is imprecise, as reflected by the large standard errors. The positive but insignificant coefficient of the interaction term between PE and EPU suggests that the underpricing of firms with PE support is not significantly different from that of firms without PE when the overall environment is unstable. On the other hand, the statistically significant positive coefficient of EPU suggests that an increase in EPU tends to lead to higher levels of IPO underpricing. This empirical result confirms the findings of Song and Kutsuna (2021) and Colak et al. (2021). One possible explanation for this phenomenon is that heightened EPU can exacerbate information asymmetry between investors and firms, thereby increasing firm risk and capital costs, as well as ex-ante uncertainty regarding firm value (Ahsan et al., 2020, 2022). Following an increase in EPU, there may be a rise in information asymmetry, which affects the offering prices of IPO firms and influences the level of IPO underpricing.

Furthermore, in column (2), it is observed that the overall effect of PE with princeling connections on underpricing remains negative and significant, as indicated by summing the coefficients of Princeling and Princeling*EPU, which shows a positive and significant impact. The interaction terms are statistically significant and positive, suggesting that PEs with princeling connections harm firm performance when EPU is high. The economic implication of the princeling*EPU coefficient is that a one-standard-deviation increase in EPU (219.19, obtained from summary statistics) corresponds to an average increase of 43% in the underpricing level[49]. This finding is consistent with the results of Huang et al. (2022), which finds that governmental VCs with greater exposure to economic policy uncertainty are more sensitive to EPU. Similarly, the coefficient of EPU remains statistically significant, indicating that higher EPU is associated with higher underpricing. The results also hold economic significance. For instance, the coefficient of EPU is 0.02, meaning that a one-standard-deviation increase in EPU (219.19, obtained from summary statistics) is associated with an average of 10% higher IPO underpricing[50]. The coefficients of non-Princeling and the corresponding interaction term with EPU are insignificant, indicating that having non-princeling-connected PE support is associated with similar performance to having no PE support when EPU is high.

Regarding the post-IPO stock performance, results are presented between columns (3) and column (6). Columns (3) and (5) investigate the role of PE, while columns (4) and (6) examine the role of princeling-connected PE and non-connected PE individually. In column (3), the coefficient of PE is significant and positive, indicating

[49] ln(219.19)(EPU std.Dev) × 0.08(interaction coefficient)=43%

[50] ln(219.19) (EPU std. Dev) × 0.02 (EPU coefficient) = 10%

Table 3.7: The role of PE and princeling-connected PE in mitigating policy uncertainty for underpricing and long-run performance

	Underpricing		CAR				ROA			
	Underpricing	Underpricing	CAR_1	CAR_1	CAR_2	CAR_2	ROA_1	ROA_1	ROA_2	ROA_2
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
PE	-0.04		0.03*		0.03		0.00*		0.01***	
	(0.07)		(0.02)		(0.03)		(0.00)		(0.00)	
PE*EPU (ΔEPU)	0.01		-0.01		-0.01		-0.00		0.01***	
	(0.01)		(0.02)		(0.02)		(0.00)		(0.00)	
EPU(ΔEPU)	0.02***	0.02***	-0.03**	-0.03**	-0.01	-0.01	-0.00	0.00	-0.00	-0.00
	(0.01)	(0.01)	(0.01)	(0.01)	(0.03)	(0.03)	(0.00)	(0.00)	(0.00)	(0.00)
Princeling		-0.45**		-0.04		-0.00		-0.00		-0.01
		(0.18)		(0.05)		(0.08)		(0.00)		(0.01)
Princeling*EPU(ΔEPU)		0.08**		0.11		0.03		-0.00		0.01
		(0.03)		(0.08)		(0.11)		(0.01)		(0.01)
nonPrinceling		-0.03		0.03**		0.03		0.00*		0.01***
		(0.06)		(0.01)		(0.02)		(0.00)		(0.00)
non-princeling*EPU(ΔEPU)		0.00		-0.02		-0.02		-0.00		0.00***
		(0.01)		(0.02)		(0.02)		(0.00)		(0.00)
Constant	2.47***	2.47***	-0.40	-0.44	-0.90	-0.90	-0.07*	-0.07*	-0.01	-0.01
	(0.23)	(0.23)	(0.30)	(0.27)	(0.70)	(0.63)	(0.03)	(0.04)	(0.04)	(0.04)
N	2076	2076	2076	2076	2076	2076	2076	2076	2076	2076
Year FE	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Industry FE	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Industry-by-year FE	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Province FE	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES

Note: This table presents the result of the cross-sectional regression of the initial returns and long-run performance of Princeling-PE-backed and non-Princeling-PE-backed IPOs interacting with policy uncertainty using equations 3.5.4.3 and 3.5.4.4. Underpricing is the market-adjusted percentage price movement from the offer price to the close price on the first trading day. CAR_(1,2) is the summation of the benchmark-adjusted abnormal returns for 1/2-year after IPO. ROA_(1,2) is the difference in ROA over two years after the IPO and the value of ROA in the year of IPO. Princeling is a dummy variable that equals one if a firm receives princeling-backed-PE support and 0 otherwise. Non-princelings is a dummy variable that equals one if a firm receives support from a non-princeling-connected PE and 0 otherwise. EPU is the log value of policy uncertainty in underpricing. In the post-IPO specifications, ΔEPU represents the log difference of EPU between one (or two) years after the IPO and the IPO year. For descriptions of all other variables, please see Appendix Table B.1. The standard errors are clustered at the industry level. *** denotes significance at a 10% level, ** denotes significance at a 5% level, and * denotes significance at a 1% level. All the data are winsorized at the 1st and 99th percentile values.

that PE can still help portfolio firms in the first year after IPO. The main focus is on the coefficient of the interaction term between PE and ΔEPU, which is found to be negative and insignificant. This suggests that there are no significant differences in stock performance between PE-backed and non-PE-backed firms during periods of high uncertainty. Therefore, the overall effects remain positive in the first year after the IPO, indicating that PE can provide assistance to targets. Additionally, the negative and significant coefficient of ΔEPU in columns (3) and column (4) indicates that higher uncertainty leads to lower abnormal stock returns. This aligns with previous literature findings by Brogaard and Detzel (2015) and Pástor and Veronesi (2013), who argue that EPU negatively forecasts log excess market returns. The observed decrease in prices with rising policy uncertainty can be attributed to negative changes in current or expected future cash flows or increases in discount rates. In columns (4) and (6), it is shown that princeling connections do not provide value-added services to portfolios in the long run. This is supported by the negative and insignificant coefficient of Princeling, as well as the insignificant coefficient of the interaction term $Princeling \times \Delta EPU$. Similarly, the insignificance of the coefficient for the interaction term between non-princeling and EPU suggests that private equity may not contribute to better performance for portfolio firms, including aspects like guidance, networking, and supervision (Gorman and Sahlman, 1989).

Concerning post-IPO operating performance (from column (7) to column (10)), where the dependent variable is the ROA ratio, the results are similar to the firms' post-IPO stock performance. In columns (7) and (9), it is observed that PE can help targets achieve better operating performance. The coefficient of the interaction term is positive and significant in column (9), indicating that PE firms have been influenced by EPU. It also holds economic significance. The coefficient of EPU*PE is 0.01, meaning that a one-standard-deviation increase in EPU (219.19, obtained from summary statistics) is associated with an average of 5.4% higher ROA ratio if the firm is backed by PE[51]. Furthermore, in columns (8) and (10), it is observed that the performance of firms backed by princeling-connected PE shows no difference compared to the performance of non-PE-backed firms, whether during normal times or in weakened economic situations. This is reflected by the insignificant coefficient of Princeling and the corresponding interaction term. In contrast, PEs without princeling connections are able to provide value-added services to their portfolio firms in the second year after IPO regarding the operating performance. In column (10), after summing the coefficients of non-princeling and the interaction term between EPU and non-princeling, it is observed that PE can assist portfolio firms. The economic significance of the coefficient of non-princeling*EPU is that a one-standard-deviation increase in EPU (219.19, obtained from summary statistics) is associated

[51] ln(219.19)(EPU std.Dev) × 0.01(interaction coefficient) = 5.4%

with an average of 2.15% higher ROA ratio[52].

The possible reason for the inability of PEs with princeling connections to help portfolio firms during periods of high policy uncertainty is that those PEs themselves are significantly impacted by such uncertainty (Litov et al., 2021). Policy uncertainty leads to an increase in the number of PE financing rounds, a decrease in the fraction of investment amount during the first round, and a reduced likelihood of successful exit through acquisition (Tian and Ye, 2018; Geronikolaou and Papachristou, 2011). Furthermore, research by Huang et al. (2022) suggests that PEs with government ownership are particularly affected by economic policy uncertainty. Governmental PEs, due to bureaucratic costs and political interests (Cumming et al., 2017), such as investing in government-favored sectors or industries, may exhibit a greater propensity to delay their investments under conditions of uncertainty (Hao and Lu, 2018). Their political mandates and risk aversion in highly uncertain circumstances can contribute to their cautious approach. Additionally, agency problems between governmental private equity and entrepreneurial firms, stemming from political pressures, rent-seeking, and bureaucratic inefficiency, may become more pronounced in the face of increased economic policy uncertainty. Consequently, princeling-connected PEs may be unable to assist portfolio firms effectively during high-uncertainty periods. On the other hand, recent literature finds that PE portfolio companies are resilient in terms of productivity, profitability, and growth during recessions and downturns (Bernstein et al., 2019; Wilson et al., 2012). The rationale for this resilience can be attributed to a number of considerations. First, private equity investors often have close ties to the banking sector (Ivashina and Kovner, 2011), which may help target firms better face times of crisis. Second, the funds raised by the private equity group are withdrawn and invested for many years. Therefore, they are able to provide funds even in difficult times. Finally, private equity groups can redeploy human capital by shifting from new deals to helping existing companies improve their operations (Bernstein and Sheen, 2016).

In summary, the findings are consistent with hypothesis 3, which suggests that princeling-connected PEs fail to promote target firm performance when uncertainty levels are high.

[52] ln(219.19)(EPU std.Dev) × 0.004(interaction coefficient)=2.15%

3.7 Robustness check

3.7.1 Alternative measurement of policy uncertainty

To ensure the validity of the main results, I conduct several robustness tests. First, I consider alternative measures of EPU. Building on the approach of Baker et al. (2016), Davis et al. (2019) rely on two leading mainland newspapers in China, namely the Renmin Daily and the Guangming Daily, to construct the monthly news-based economic policy uncertainty index for China[53]. They point out that the two EPU indices for China from their work tend to move together, with a high correlation of 0.83.

For robustness purposes, I use the natural logarithm value of the monthly EPU index of China (or the first log difference value of EPU in the post-IPO period) constructed by Davis et al. (2019) in a given year, as an alternative measure of EPU. I denote the alternative measure as EPU_D and re-estimate the main regressions in Subsection 6.3. Table B.6 in the Appendix presents the results. The results remain the same as the baseline regression. The interaction term between PE and EPU is only significant in column (10), suggesting that PE can enhance the performance of target firms when EPU is high during the second year after IPO, particularly in terms of operating performance. In relation to other performance indicators, the interaction terms are insignificant, indicating that there is no discernible difference between firms with PE backing and those without it. Regarding the interaction term between Princeling and EPU, firms with princeling-connected PEs perform similarly to their counterparts when EPU is high, with the exception of the first year after IPO, where there is a notable difference in operating performance as shown in column (8). Furthermore, the interaction coefficient of non-princeling PE and EPU is positive and significant in column (10), suggesting a positive impact of non-princeling PEs on post-IPO ROA performance during the second year after IPO. These results strengthen the validity of the main results, indicating that the relationships between PE, princeling connections, and firm performance are not dependent on the specific measurement of economic policy uncertainty. The finding that PEs with princeling connections do not enhance performance during high EPU periods further supports the conclusion drawn from the main analysis.

[53] Baker et al. (2016) use information from a Hong Kong-based English newspaper, the South China Morning Post, to deal with media censorship in Chinese media. Nevertheless, such a strategy is open to other problems. First, the Hong Kong-based newspaper is likely to choose to report news that has more relevance to the Hong Kong economy, which means that it may not fully reflect the level of economic policy uncertainty in China. Second, a change in editorial policy or preference can greatly affect the index with only one newspaper in the sample.

3.7.2 Selection bias on PSM Matching

Ritter and Welch (2002) suggests that many IPO phenomena exhibit nonstationarity. Nonrandom endogenous choices in financing provision are reflected in the nonrandom distribution and characteristics of PE-backed IPOs, such as industry clustering. Despite controlling for firm features before and at the time of listing, the performance differences between PE-backed and non-PE-backed firms may still be attributed to inherent differences in the firms themselves rather than the involvement of PE. To address this endogeneity concern, the Propensity Score Matching method is employed, which integrates economically relevant prior selection characteristics of each treatment and control group into a single-index variable, known as the propensity score (Rosenbaum and Rubin, 1983; Lee and Masulis, 2011). This approach allows for simultaneous matching across relevant factors while controlling for endogeneity.

Following the methodologies of Michala (2019) and Wang et al. (2021), I match a sample of PE-backed firms with non-PE-backed firms, as well as a sample of princeling-backed firms with non-princeling-backed firms, using kernel matching techniques[54]. The matching variables include the control variables presented in Appendix Table B.1. The matching quality is presented in Figure B.1 and as shown in Table B.7. The results of the matching procedure are reported in Appendix Table B.8 for PE firms and Table B.9 for princeling-backed firms. In panel A, the findings from propensity score matching support the previous results. They indicate that non-princeling PE improves the performance of sponsored firms regarding IPO underpricing and post-IPO performance from columns (1) to column (5). In panel B, the primary focus is on the coefficient of the interaction term between PE and EPU, which is insignificant from column (1) to column (5). This suggests that PE cannot provide support during high EPU periods.

In contrast, in Panel A of Table B.9, the Average Treatment Effect (ATT) demonstrates that princeling connections do not lead to improved performance for target firms in IPO underpricing. Furthermore, firms backed by princeling-connected entities perform worse in long-term stock performance, which is consistent with the findings of Wang and Wu (2020). They argue that princeling-connected firms exhibit lower immaturity, are more likely to engage in income-increasing earnings management at their IPO (Aharony et al., 1993), and that firms with greater earnings management in their IPO year experience poorer long-term post-IPO performance (Teoh et al., 1998). In Panel B, the coefficient of the princeling*EPU in columns (1) and (2) indicates that princeling connections negatively impact portfolio firms' IPO perfor-

[54]In this paper, I use the Epanechnikov kernel with the default bandwidth set to 0.06 following previous studies (Shen et al., 2023).

mance when facing high EPU.

3.7.3 Heckman-style two-stage regression

To investigate whether the effect of PE (princeling-connected PE) backing on company IPO performance is influenced by selection bias, I employ the Heckman (1979) correction procedure. In the first-stage model, I estimate a probit regression to determine the likelihood of a company being backed by PE (PE with princeling connections). In the second-stage model, I include the Inverse Mills Ratio (IMR) (λ), derived from the first-stage estimation, as an additional regressor in the baseline regression model. The equations for PE influence and princeling-connected PE influence are as follows:

For PE, the sample includes all listed firms:

$$\begin{aligned}\text{First stage (Probit): } \Pr(\text{PE backing} = 1) =& \alpha_0 + \alpha_1 \text{PE density} + \alpha_2 \text{Controls}_i + \\ & \nu_j + \delta_t + \nu_j \times \delta_t + \gamma_k + \varepsilon_i\end{aligned} \tag{3.7.3.1}$$

$$\begin{aligned}\text{Second stage (OLS): IPO performance} =& \beta_0 + \beta_1 \text{PE} + \beta_2 \text{Controls}_i + \beta_3 \text{IMR} + \\ & \nu_j + \delta_t + \nu_j \times \delta_t + \gamma_k + \varepsilon_i\end{aligned} \tag{3.7.3.2}$$

For princeling-connected PE, the sample includes all firms with PE support:

$$\begin{aligned}\text{First stage (Probit): } & \Pr(\text{Princeling-connected PE backing= 1}) \\ & = \alpha_0 + \alpha_1 \text{Princeling-connected PE density} + \alpha_2 \text{Controls}_i \\ & + \nu_j + \delta_t + \nu_j \times \delta_t + \gamma_k + \varepsilon_i\end{aligned} \tag{3.7.3.3}$$

$$\begin{aligned}\text{Second stage (OLS): IPO performance} & \\ = & \beta_0 + \beta_1 \text{Princeling} + \beta_2 \text{Controls}_i + \beta_3 \text{IMR} \\ & + \nu_j + \delta_t + \nu_j \times \delta_t + \gamma_k + \varepsilon_i\end{aligned} \tag{3.7.3.4}$$

In the first-stage regression, I need an instrument that is correlated with the likelihood of being backed by a PE (princeling-connected PE) but uncorrelated with the IPO performance. Following the study of Wang and Wu (2020), I use the instrument PE density (princeling-connected PE density) as the instrument variable. PE density is calculated as the number of PE-backed IPOs (princeling-connected PEs) in a company's headquarters province divided by the total number of IPOs (PE-backed IPOs)

in that province. The results are shown in Appendix B.10 and B.11. The positive and significant coefficients of PE density and Princeling-PE density in column (1) indicate that companies backed by PE or princeling-connected PEs are more likely to be located in provinces with a greater density of these PEs. The inverse mills ratio can also be obtained from this step.

When incorporating the IMR ratio into the baseline regression model in the second stage, I find that the coefficient of IMR is insignificant from column (2) to column (5), indicating its validity as an instrumental variable for the adjustment procedure proposed by Heckman (1979). In column (6), the coefficient of IMR is positive and significant, demonstrating a positive correlation between the error terms of both the selection equation and the outcome equation (Rabbi et al., 2019). From the results presented in Table B.10 in Panel A, I consistently observe negative and significant coefficients of PE for underpricing in column (2), as well as positive and significant coefficients for CAR in column (3) and ROA in columns (5) and column (6). These findings suggest that the positive role of PE in enhancing target firms' performance is robust. The positive and significant coefficients of the interaction terms between PE and EPU in Panel B indicate that PE firms perform better when facing high uncertainty in columns (5) and column (6), indicating the overall positive effect of PE. Additionally, by examining Table B.11, the coefficient of IMR is negative and significant in columns (3), column (4), and column (6), demonstrating a negative correlation between the error terms of both the selection equation and the outcome equation. This suggests that failing to correct for sample selection bias may result in an overestimation of the role of princeling connections (Osiolo, 2017). In panel A, I observe a negative and significant coefficient for Princeling in column (3), indicating that firms with princeling connections PEs underperform compared to those backed by private equity without princeling connections. In panel B, the negative and significant coefficient for Princeling suggests that princeling-connected firms generally perform worse than firms without princeling connections, except for column (5). The primary focus of interest lies in the interaction term between Princeling and EPU, which is positive in column (2) but insignificant from column (3) to column (6). Overall, I reach the same conclusion as the baseline regression, which is that princeling-connected PEs do not contribute to the improvement of portfolio firms' performance during the post-IPO and economic turmoil periods.

3.8 Concluding remarks

In this paper, I examine the IPO performance of firms and specifically investigate the influence of private equity and princeling connections on IPO outcomes. The analysis is conducted within the context of China, a country that has witnessed substantial growth in private equity investments and GDP in recent decades. Notably, the Chinese market exhibits a distinctive characteristic where political connections can have an impact on firms' performance. Additionally, as highlighted by Jingu and Kamiyama (2008), a major risk associated with private equity investments in China is the potential for authorities to alter regulations or their implementation, adding to the complexity of the market environment.

Based on this background, this study first compares the performance of PE-backed and non-PE-backed IPOs in China using data from 2008-2018. Subsequently, it investigates the impact of PE firms with princeling connections on the IPO performance of their portfolio firms. Finally, the study analyzes whether PEs or princeling-connected PEs can help target companies mitigate policy uncertainty. The findings reveal that both PE-backed and non-PE-backed IPOs in China experience underpricing in the immediate after-market and underperform in the long run. However, the cross-sectional analysis demonstrates that PE-backed IPOs exhibit lower levels of underpricing compared to non-PE-backed firms. This result is consistent with previous studies such as Megginson and Weiss (1991) and Barry et al. (1990), suggesting that private equity firms provide valuable support to their target firms, thereby enhancing IPO performance. Furthermore, the results indicate that princeling-connected PEs can offer value-added services during the IPO process but do not have a significant influence on post-IPO performance. Lastly, the study shows that princeling-connected PE cannot effectively help portfolio firms mitigate overall policy risk while targets with non-princeling PEs continue to perform better with heightened EPU.

This study contributes to the existing literature by examining the impact of private equity on IPO underpricing and post-IPO performance in a context that has received less attention—emerging markets like China. Previous studies have predominantly focused on developed markets (Leleux and Surlemont, 2003; Brander et al., 2015), which may not be directly applicable to economies with distinct business infrastructure and institutional environments (Khanna and Palepu, 2010). Additionally, this study contributes to the limited research on the influence of private equity on policy uncertainty. It is the first to investigate how policy uncertainty affects PE-backed firms. Furthermore, the study provides new insights into the realm of princeling connections—a topic that has garnered attention in recent research (Chen and Kung, 2019; Li et al., 2019).

In addition to the empirical findings regarding the performance of PE-backed and non-PE-backed IPOs, this study also carries implications for policymakers, corporate governance, and board structures. The findings demonstrate that there are some benefits and advantages that PE investments bring to the Chinese economy. Policymakers can leverage these insights to inform their strategies and decisions, advocating for PE investments as a means to enhance the performance of listed firms to some extent. During periods of heightened Economic Policy Uncertainty (EPU), both PE and princeling-PE exhibit minimal influence. As a result, the government might need to explore alternative approaches to alleviate the negative impact of EPU on firms' IPO performance. Furthermore, private equity firms often play an active role in shaping the governance of their portfolio companies, including board representation and strategic decision-making. The positive impact of PE on IPO performance suggests that their involvement during the pre-IPO and post-IPO stages can enhance corporate governance practices. However, the analysis of princeling-connected private equity firms reveals a different board implication. While they may provide political resources, their influence on improving post-IPO performance seems to be limited. This finding implies that relying solely on political connections through board representation may not necessarily lead to better corporate outcomes.

3.A Appendix

3.A.1 Figures

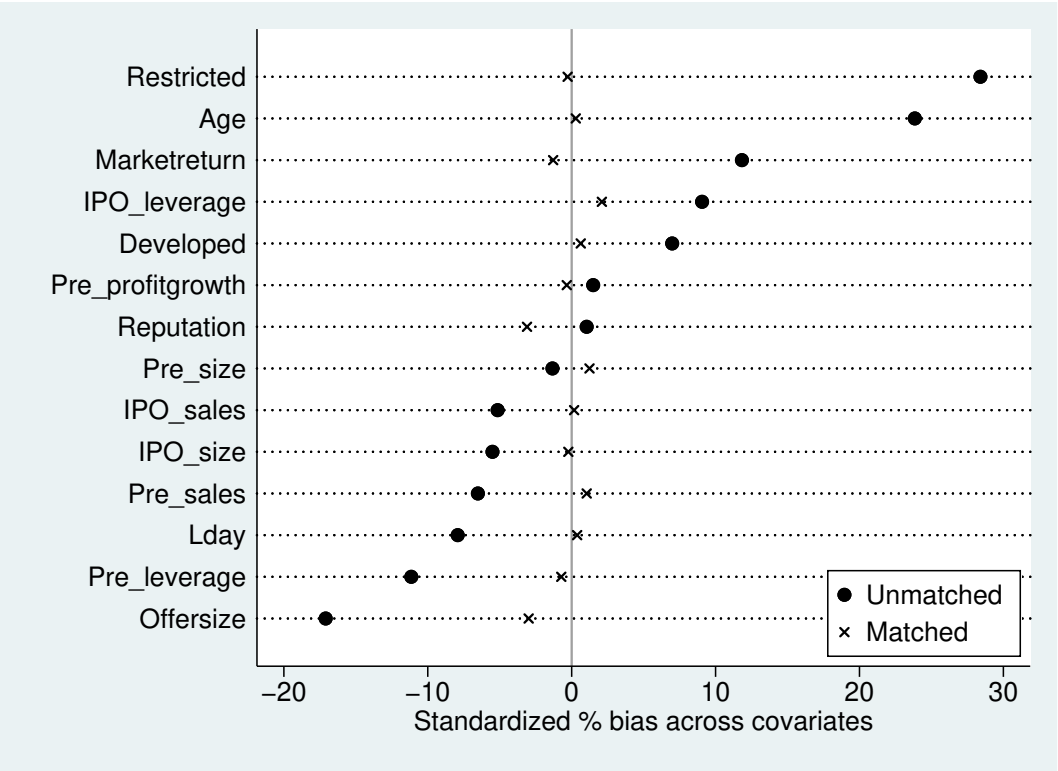


Figure B.1: Matching quality

Note: The standardised % bias is the % difference of the sample means in the treated and matched non-treated sub-samples as a percentage of the square root of the average of the sample variances in the treated and non-treated groups.

3.A.2 Tables

Table B.1: The definition of variables

Variable	Definition
Dependent variables	
Underpricing	The market-adjusted percentage price movement from the offer price to the close price on the first trading day.
CAR_1,2	The summation of the benchmark-adjusted abnormal returns for 1/2-year after IPO.
ROA_1,2	The differences in ROA over three years after IPO and the average three-year value of ROA prior to the IPO.
Independent variables	
PE	A dummy variable that equals one if a company is backed by a PE firm before its IPO application, and zero otherwise.
Princeling	A dummy variable that equals one if a firm receives financing from the princeling-connected PE firm before its IPO application and zero otherwise.
non-Princeling	A dummy variable that equals one if a firm receives financing from the non-princeling connected PE firm before its IPO application and zero otherwise.
EPU	The index measures the aggregate economic policy uncertainty in China.
Control variables	
Firm's financial characteristics	
IPO_ size	The logarithm of total assets in the IPO year. The figure is deflated based on the 2010 Consumer Price Index.
IPO_ leverage	The ratio of total leverage to total assets in the IPO year.
IPO_sales	The logarithm of firms' sales in the IPO year. The figure is deflated based on the 2010 Consumer Price Index.
offer size	The logarithm of firms' offering size. The figure is deflated based on the 2010 Consumer Price Index.
Pre_leverage	The leverage ratio over the three-year period prior to the IPO application.
Pre_profitgrowth	The average annual growth rate of profits over the three-year period prior to the IPO application.
Pre_size	The firms' average logarithm of total assets over the three-year period prior to the IPO application. The figure is deflated based on the 2010 Consumer Price Index.
Pre_sales	The firms' average logarithm of sales over the three-year period prior to the IPO application. The figure is deflated based on the 2010 Consumer Price Index.
Other characteristics	
Reputation	A dummy variable equals 1 if the lead underwriter of the firm is one of the top-10 IPO underwriters with the highest revenue in the prior year and zero otherwise.
Developed	A dummy variable equals one if a firm is registered in a region with the above-average marketization score, and otherwise 0.
Age	Firm logarithm of age at the IPO year, calculated as the number of years from a firm's founding year to its IPO year.
Restricted	The period (between 2008 and after 2013) that the government sets the offer price.
Market return	Cumulative of the three-month market return before a new offering.
Lday	The number of days between offering and listing.

Note: This table describes the definition of all the variables that have been used in this paper.

Table B.2: Descriptive statistics without winsorization

(N=2076)	Mean	Median	SD	Min	Max
Underpricing	0.44	0.42	0.38	-0.26	6.25
CAR_1	0.05	0.01	0.50	-1.53	4.21
CAR_2	0.10	0.06	0.71	-2.39	3.46
ROA_1	-0.07	-0.05	0.07	-0.56	0.22
ROA_2	-0.07	-0.06	0.07	-0.51	0.37
Pre_profitgrowth	0.42	0.25	0.87	-0.54	19.53
Pre_sales	21.27	21.07	1.18	18.63	27.80
Pre_size	20.37	20.09	1.31	17.45	29.59
Pre_leverage	0.47	0.47	0.17	0.04	1.01
IPO_sales	20.49	20.29	1.17	18.14	26.85
IPO_leverage	0.27	0.23	0.18	0.01	0.97
IPO_size	21.19	20.92	1.13	19.49	29.97
Offersize	10.94	10.82	0.83	8.26	15.74
Lday	21.60	20.00	11.37	10.00	301.00
Age	2.34	2.48	0.64	0.00	3.81
Market return	0.03	0.02	0.13	-0.38	0.35
Reputation	0.37	0.00	0.48	0.00	1.00
Developed	0.91	1.00	0.28	0.00	1.00
Restricted	0.55	1.00	0.50	0.00	1.00
EPU	285.65	269.35	219.19	74.86	935.31

Note: The table presents descriptive statistics for the variables used in this chapter. Mean represents the arithmetic average of the values, Median is the middle value in the sorted data, SD stands for standard deviation, Min is the smallest observed value, and Max represents the largest observed value. Table B.1 shows the definition of all variables used.

Table B.3: Univariate test without winsorization

	(1)			(2)			(3)	
	PE=0			***PE=1***			***p-value***	
	Mean	Std.Dev.	Obs	Mean	Std.Dev.	Obs	Diff	p-value
Panel A: All listed firms								
Dependent variables								
Underpricing	0.45	0.43	1077	0.42	0.32	999	0.04*	(0.02)
CAR_1	0.01	0.46	1077	0.09	0.53	999	-0.08***	(0.00)
CAR_2	0.04	0.66	1077	0.17	0.76	999	-0.13***	(0.00)
ROA_1	-0.07	0.07	1077	-0.06	0.06	999	-0.01*	(0.05)
ROA_2	-0.08	0.07	1077	-0.07	0.07	999	-0.01*	(0.02)
Control variables								
Pre_profitgrowth	0.41	0.80	1077	0.43	0.94	999	-0.02	(0.62)
Pre_sales	21.31	1.27	1077	21.23	1.08	999	0.09	(0.10)
Pre_size	20.38	1.47	1077	20.35	1.12	999	0.03	(0.58)
Pre_leverage	0.47	0.18	1077	0.46	0.16	999	0.02*	(0.01)
IPO_sales	20.52	1.26	1077	20.45	1.06	999	0.07	(0.18)
IPO_leverage	0.26	0.19	1077	0.28	0.17	999	-0.01	(0.06)
IPO_size	21.23	1.27	1077	21.15	0.96	999	0.07	(0.14)
Offersize	11.01	0.88	1077	10.86	0.76	999	0.14***	(0.00)
Lday	22.03	13.70	1077	21.13	8.11	999	0.90	(0.07)
Age	2.27	0.71	1077	2.42	0.55	999	-0.15***	(0.00)
Market return	0.02	0.13	1077	0.03	0.12	999	-0.02**	(0.01)
Reputation	0.37	0.48	1077	0.38	0.48	999	-0.01	(0.81)
Developed	0.90	0.29	1077	0.92	0.27	999	-0.02	(0.11)
Restricted	0.48	0.50	1077	0.62	0.48	999	-0.14***	(0.00)
	Princeling=0			***Princeling=1***			***p-value***	
	Mean	Std.Dev.	Obs	Mean	Std.Dev.	Obs	Diff	p-value
Panel B: Firms with PE								
The dependent variable								
CAR_1	0.09	0.53	955	0.01	0.51	44	0.08	(0.31)
CAR_2	0.18	0.76	955	0.08	0.72	44	0.10	(0.40)
ROA_1	-0.06	0.06	955	-0.06	0.06	44	-0.00	(0.87)
ROA_2	-0.07	0.07	955	-0.06	0.07	44	-0.01	(0.56)
Control variables								
Pre_profitgrowth	0.41	0.86	955	0.84	1.94	44	-0.43	(0.15)
Pre_sales	21.18	1.03	955	22.28	1.50	44	-1.10***	(0.00)
Pre_size	20.30	1.06	955	21.55	1.68	44	-1.26***	(0.00)
Pre_leverage	0.45	0.16	955	0.49	0.21	44	-0.04	(0.22)
IPO_sales	20.41	1.01	955	21.51	1.43	44	-1.10***	(0.00)
IPO_leverage	0.27	0.17	955	0.35	0.21	44	-0.08*	(0.02)
IPO_size	21.10	0.90	955	22.26	1.47	44	-1.16***	(0.00)

	(1) *Princeling=0*			(2) *Princeling=1*			(3) *p-value*	
	Mean	Std.Dev.	Obs	Mean	Std.Dev.	Obs	Diff	p-value
Offersize	10.84	0.75	955	11.48	0.89	44	-0.64***	(0.00)
Lday	21.02	7.64	955	23.59	15.00	44	-2.58	(0.26)
Age	2.42	0.56	955	2.45	0.46	44	-0.03	(0.68)
Market return	0.03	0.12	955	0.02	0.12	44	0.01	(0.61)
Reputation	0.38	0.48	955	0.41	0.50	44	-0.03	(0.67)
Developed	0.93	0.26	955	0.89	0.32	44	0.04	(0.43)
Restricted	0.62	0.48	955	0.61	0.49	44	0.01	(0.89)

Note: This table shows the summary statistics for the main variables used in the paper from 2008 to 2018. Panel A reports the results for all firms, and Panel B reports the results for firms with PE support. The first two columns show the number of observations and the mean value for firms without private equity/without princeling-connected PE. Column (3) and Column (4) show the corresponding statistics for firms with private equity/with princeling-connected PE. The last two columns show the result of the univariate test. Underpricing is the market-adjusted percentage price movement from the offer price to the close price on the first trading day. CAR_(1,2) is the summation of the benchmark-adjusted abnormal returns for 1/2-year after IPO. ROA_(1,2) is the difference in ROA over two years after the IPO and the value of ROA in the year before the IPO. For descriptions of all other variables, please see Appendix Table B.1. *** denotes significance at a 10% level, ** denotes significance at a 10% level, and * denotes significance at a 1% level.

Table B.4: The heterogeneity test of the reputation of PE in IPO performance

	Underpricing		CAR				ROA			
	(1) High ranking	(2) Low ranking	(3) High ranking	(4) Low ranking	(5) High ranking	(6) Low ranking	(7) High ranking	(8) Low ranking	(9) High ranking	(10) Low ranking
Panel A: The role of PE in all listed firms										
PE	-0.03	0.00	-0.07	0.01	0.03	0.01	0.02**	0.00	0.02**	0.00***
	(0.16)	(0.01)	(0.12)	(0.01)	(0.12)	(0.02)	(0.01)	(0.00)	(0.01)	(0.00)
Constant	1.47**	3.00***	-1.82	-0.17	-0.67	-0.45	-0.15	-0.02	-0.15	0.03
	(0.52)	(0.21)	(2.20)	(0.33)	(2.58)	(0.88)	(0.19)	(0.03)	(0.10)	(0.03)
Chow test	0.22		0.56		0.29		0.44		0.00	
N	345	1731	345	1731	345	1731	345	1731	345	1731
Panel B: The role of princeling connections in firms with PE support										
Princeling	-0.09	-0.00	-0.12	-0.11	-0.10	-0.20	-0.01	-0.01	-0.00	-0.00
	(0.07)	(0.03)	(0.11)	(0.07)	(0.25)	(0.12)	(0.01)	(0.01)	(0.01)	(0.01)
Constant	1.24*	1.33***	-3.12	-0.21	-0.96	-1.04	-0.01	0.08	-0.01	0.15
	(0.71)	(0.24)	(1.89)	(0.75)	(2.37)	(1.52)	(0.17)	(0.08)	(0.12)	(0.09)
Chow test	0.32		0.71		0.54		0.71		0.62	
N	335	664	335	664	335	664	335	664	335	664
Year FE	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Industry FE	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Industry-by-year FE	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Province FE	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Control	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES

Note: This table presents the result of the cross-sectional heterogeneity regression of the IPO performance of PE-backed firms. In panel A, I include all listed firms. In panel B, I only include firms with PE support. Underpricing is the market-adjusted percentage price movement from the offer price to the close price on the first trading day. CAR_(1,2) is the summation of the benchmark-adjusted abnormal returns for 1/2-year after IPO. ROA_(1,2) is the difference in ROA over two years after the IPO and the value of ROA in the year of IPO. For descriptions of all other variables, please see Appendix Table B.1. The standard errors are clustered at the industry level. *** denotes significance at a 10% level, ** denotes significance at a 5% level, and * denotes significance at a 1% level. All the data are winsorized at the 1st and 99th percentile values.

Table B.5: The role of PE and princeling-connected PE in in SOEs and non-SOEs

	Underpricing		CAR				ROA			
	(1) SOE	(2) non-SOE	(3) SOE	(4) non-SOE	(5) SOE	(6) non-SOE	(7) SOE	(8) non-SOE	(9) SOE	(10) non-SOE
Panel A: The role of PE in all listed firms										
PE	0.04	-0.01**	-0.16	0.03**	-0.13	0.03*	0.00	0.00	0.00	0.00***
	(0.03)	(0.01)	(0.12)	(0.01)	(0.24)	(0.02)	(0.00)	(0.00)	(0.01)	(0.00)
Constant	-0.84	2.44***	-0.07	-0.13	1.66	-1.25**	0.22	-0.12**	0.10	-0.04
	(0.85)	(0.28)	(0.93)	(0.39)	(1.95)	(0.48)	(0.16)	(0.04)	(0.22)	(0.04)
Chow test	0.00		0.92		0.85		0.97		0.99	
N	226	1850	226	1850	226	1850	226	1850	226	1850
Panel B: The role of princeling connections in firms with PE support										
Princeling	-0.12	-0.06*	0.45	-0.16	0.50	-0.14	-0.01	-0.01	-0.00	-0.01
	(0.58)	(0.03)	(0.43)	(0.09)	(0.82)	(0.18)	(0.02)	(0.01)	(0.04)	(0.01)
Constant	-3.47	0.60**	0.25	-0.78	6.23	-2.03***	-0.17	0.02	0.17	0.10
	(5.88)	(0.22)	(6.74)	(0.64)	(11.96)	(0.61)	(0.26)	(0.07)	(0.16)	(0.13)
Chow test	0.65		0.94		0.93		0.99		0.99	
N	75	924	75	924	75	924	75	924	75	924
Year FE	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Industry FE	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Industry-by-year FE	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Province FE	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Control	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES

Note: This table presents the result of the cross-sectional heterogeneity regression of the IPO performance of PE-backed firms. In panel A, I include all listed firms. In panel B, I only include firms with PE support. Underpricing is the market-adjusted percentage price movement from the offer price to the close price on the first trading day. CAR_(1,2) is the summation of the benchmark-adjusted abnormal returns for 1/2-year after IPO. ROA_(1,2) is the difference in ROA over two years after the IPO and the value of ROA in the year of IPO. For descriptions of all other variables, please see Appendix Table B.1. The standard errors are clustered at the industry level. *** denotes significance at a 10% level, ** denotes significance at a 5% level, and * denotes significance at a 1% level. All the data are winsorized at the 1st and 99th percentile values.

Table B.6: The role of PE and princeling-connected PE in mitigating policy uncertainty using alternative measurement of EPU

	Underpricing		CAR				ROA			
	Underpricing	Underpricing	CAR_1	CAR_1	CAR_2	CAR_2	ROA_1	ROA_1	ROA_2	ROA_2
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
PE	0.01		0.02**		0.01		0.00*		0.01***	
	(0.05)		(0.01)		(0.02)		(0.00)		(0.00)	
PE*EPU_D (ΔEPU_D)	-0.01		0.01		0.02		0.00		0.00***	
	(0.01)		(0.01)		(0.02)		(0.00)		(0.00)	
EPU_D (ΔEPU_D)	1.28***	1.26***	-0.80**	-0.93	-0.31*	-0.29	-0.13*	-0.12**	-0.06**	-0.06**
	(0.07)	(0.08)	(0.29)	(0.60)	(0.17)	(0.21)	(0.06)	(0.05)	(0.02)	(0.03)
Princeling		-0.24		-0.04		-0.00		-0.00		-0.00
		(0.27)		(0.05)		(0.09)		(0.01)		(0.00)
Princeling*EPU_D(ΔEPU_D)		0.04		0.09		0.01		-0.01*		0.01
		(0.04)		(0.13)		(0.13)		(0.00)		(0.01)
nonPrinceling		0.02		0.03**		0.01		0.01***		0.01***
		(0.05)		(0.01)		(0.02)		(0.00)		(0.00)
non-princeling*EPU_D(ΔEPU_D)		-0.01		0.00		0.02		0.00		0.00**
		(0.01)		(0.01)		(0.02)		(0.00)		(0.00)
Constant	9.31***	9.21***	-1.20**	-1.32*	-1.26	-1.27*	0.03	0.02	0.03	0.03
	(0.25)	(0.30)	(0.42)	(0.68)	(0.72)	(0.71)	(0.08)	(0.08)	(0.05)	(0.05)
N	2076	2076	2076	2076	2076	2076	2076	2076	2076	2076
Year FE	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Industry FE	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Industry-by-year FE	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES
Province FE	YES	YES	YES	YES	YES	YES	YES	YES	YES	YES

Note: This table presents the result of the cross-sectional regression of the initial returns and long-run performance of Princeling-PE-backed and non-Princeling-PE-backed IPOs interacting with policy uncertainty using equations 3.5.4.3 and 3.5.4.4. Underpricing is the market-adjusted percentage price movement from the offer price to the close price on the first trading day. CAR_(1,2) is the summation of the benchmark-adjusted abnormal returns for 1/2-year after IPO. ROA_(1,2) is the difference in ROA over two years after the IPO and the value of ROA in the year of IPO. Princeling is a dummy variable that equals one if a firm receives princeling-backed-PE support and 0 otherwise. Non-princelings is a dummy variable that equals one if a firm receives support from a non-princeling-connected PE and 0 otherwise. EPU is the log value of policy uncertainty in underpricing. In the post-IPO specifications, ΔEPU represents the log difference of EPU between one (or two) years after the IPO and the IPO year. For descriptions of all other variables, please see Appendix Table B.1. The standard errors are clustered at the industry level. *** denotes significance at a 10% level, ** denotes significance at a 5% level, and * denotes significance at a 1% level.

Table B.7: Test of covariate balancing

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Variable	Unmatched	Mean		% bias	% reduction	t-test		VT/VC
	Matched	Treated	Control		of bias	t	P>|t|	
Pre_profitgrowth	Unmatched	0.39	0.38	1.50		0.34	0.73	1.16*
	Matched	0.39	0.39	-0.30	77.20	-0.07	0.94	0.94
Pre_sales	Unmatched	21.23	21.30	-6.50		-1.48	0.14	0.76*
	Matched	21.21	21.19	1.00	84.00	0.24	0.81	0.91
Pre_size	Unmatched	20.35	20.37	-1.30		-0.30	0.76	0.63*
	Matched	20.32	20.31	1.20	7.00	0.30	0.77	0.81*
Pre_leverage	Unmatched	0.46	0.47	-11.10		-2.53	0.01	0.84*
	Matched	0.45	0.45	-0.70	93.50	-0.16	0.87	0.85*
IPO_sales	Unmatched	20.45	20.51	-5.10		-1.17	0.24	0.74*
	Matched	20.43	20.43	0.20	96.70	0.04	0.97	0.85*
IPO_leverage	Unmatched	0.28	0.26	9.10		2.06	0.04	0.87*
	Matched	0.27	0.27	2.10	76.80	0.47	0.64	0.92
IPO_size	Unmatched	21.15	21.21	-5.50		-1.25	0.21	0.63*
	Matched	21.13	21.13	-0.20	95.80	-0.06	0.96	0.81*
Offersize	Unmatched	10.86	11.00	-17.10		-3.88	0.00	0.80*
	Matched	10.86	10.88	-3.00	82.50	-0.70	0.49	0.99
Lday	Unmatched	20.89	21.33	-7.90		-1.80	0.07	0.93
	Matched	20.89	20.87	0.40	95.20	0.08	0.93	0.93
Age	Unmatched	2.42	2.27	23.80		5.40	0.00	0.61*
	Matched	2.42	2.42	0.30	98.80	0.07	0.95	0.87*
Reputation	Unmatched	0.38	0.37	1.00		0.24	0.81	.
	Matched	0.38	0.39	-3.10	-197.90	-0.68	0.50	.
Developed	Unmatched	0.92	0.90	7.00		1.59	0.11	.
	Matched	0.93	0.93	0.60	91.00	0.15	0.88	.
Market return	Unmatched	0.03	0.02	11.80		2.69	0.01	0.87*
	Matched	0.03	0.03	-1.30	89.10	-0.29	0.77	0.93
Restricted	Unmatched	0.62	0.48	28.40		6.46	0.00	.
	Matched	0.62	0.62	-0.30	99.00	-0.06	0.95	.

Note: The table presents balancing tests for the covariates used in the PSM matching. Unmatched refers to the treated group and control group before applying PSM, while matched indicates the groups after the matching process. % bias quantifies the difference in means of a covariate as a percentage of the mean in the treated group. % reduction of bias presents the percentage reduction in the difference of covariate means between the treated and control groups, before and after applying the matching. T-Test is used to compare the means of the two groups. VT/VC stands for Variance of Treatment / Variance of Control. Table A.3 shows the definition of all variables used. *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively. All the data are winsorized at the 1st and 99th percentile values.

Table B.8: The role of PE in IPO performance using kernel PSM

	(1) Underpricing	(2) CAR_1	(3) CAR_2	(4) ROA_1	(5) ROA_2
Panel A: The effect of PE on firms IPO performance					
ATT	-0.02**	0.03**	0.03**	0.01***	0.01***
	(0.01)	(0.02)	(0.02)	(0.00)	(0.00)
Panel B: The effect of PE on firms IPO performance interacting with policy uncertainty					
PE	-0.12	0.03	0.03	0.00	0.00
	(0.07)	(0.02)	(0.03)	(0.01)	(0.01)
EPU (ΔEPU)	0.00	-0.02	-0.12**	0.00	-0.01**
	(0.01)	(0.01)	(0.05)	(0.01)	(0.00)
PE*EPU (ΔEPU)	0.02	0.02	0.00	0.00	0.00
	(0.01)	(0.02)	(0.03)	(0.01)	(0.00)
Constant	0.41***	0.05***	0.06	-0.07***	-0.08***
	(0.07)	(0.01)	(0.03)	(0.01)	(0.01)
N	1848	1848	1848	1848	1848
Year FE	YES	YES	YES	YES	YES
Industry FE	YES	YES	YES	YES	YES
Industry-by-year FE	YES	YES	YES	YES	YES
Province FE	YES	YES	YES	YES	YES

Note: This table presents the result of the role of PE in IPO performance firms using PSM among all listed firms. Underpricing is the market-adjusted percentage price movement from the offer price to the close price on the first trading day. CAR_(1,2) is the summation of the benchmark-adjusted abnormal returns for 1/2-year after IPO. ROA_(1,2) is the difference in ROA over two years after the IPO and the value of ROA in the year of IPO. EPU is the log value of policy uncertainty in underpricing. In the post-IPO specifications, ΔEPU represents the log difference of EPU between one (or two) years after the IPO and the IPO year. For descriptions of all other variables, please see Appendix Table B.1. The standard errors are clustered at the industry level. *** denotes significance at a 10% level, ** denotes significance at a 5% level, and * denotes significance at a 1% level. The research sample includes all listed firms. All the data are winsorized at the 1st and 99th percentile values.

Table B.9: The role of princeling-connected PE in IPO performance using kernel PSM

	(1) Underpricing	(2) CAR_1	(3) CAR_2	(4) ROA_1	(5) ROA_2
Panel A: The effect of princeling-connected PE on firms IPO performance					
ATT	-0.03	-0.13**	-0.13**	-0.01	-0.00
	(0.05)	(0.05)	(0.05)	(0.01)	(0.01)
Panel B: The effect of princeling-connected PE on firms IPO performance interacting with policy uncertainty					
Princeling	-0.05	-0.17***	-0.18*	-0.01	-0.01
	(0.05)	(0.03)	(0.09)	(0.02)	(0.03)
EPU (ΔEPU)	0.10***	-0.03	-0.27*	-0.00	0.00
	(0.02)	(0.03)	(0.13)	(0.00)	(0.01)
Princeling*EPU (ΔEPU)	0.08***	-0.21**	0.03	0.02	0.03
	(0.02)	(0.08)	(0.14)	(0.02)	(0.04)
Constant	-0.16	0.09**	0.05	-0.06***	-0.07***
	(0.09)	(0.03)	(0.07)	(0.01)	(0.01)
N	703	703	703	703	703
Year FE	YES	YES	YES	YES	YES
Industry FE	YES	YES	YES	YES	YES
Industry-by-year FE	YES	YES	YES	YES	YES
Province FE	YES	YES	YES	YES	YES

Note: This table presents the result of the role of PE in IPO performance firms using PSM among all listed firms with PE support. Underpricing is the market-adjusted percentage price movement from the offer price to the close price on the first trading day. CAR_(1,2) is the summation of the benchmark-adjusted abnormal returns for 1/2-year after IPO. ROA_(1,2) is the difference in ROA over two years after the IPO and the value of ROA in the year of IPO. EPU is the log value of policy uncertainty in underpricing. In the post-IPO specifications, ΔEPU represents the log difference of EPU between one (or two) years after the IPO and the IPO year. For descriptions of all other variables, please see Appendix Table B.1. The standard errors are clustered at the industry level. *** denotes significance at a 10% level, ** denotes significance at a 5% level, and * denotes significance at a 1% level. The research sample includes all listed firms with PE support. All the data are winsorized at the 1st and 99th percentile values.

Table B.10: The role of PE in IPO performance using Heckman two-stage

	(1)	(2)	(3)	(4)	(5)	(6)
	First stage	Second stage				
		Underpricing	CAR_1	CAR_2	ROA_1	ROA_2
Panel A: The effect of PEs on firms IPO performance						
PE density	2.88**					
	(1.27)					
PE		-0.02**	0.03**	0.02	0.00*	0.00***
		(0.01)	(0.01)	(0.02)	(0.00)	(0.00)
imr		0.09	-0.09	0.15	0.01	0.07**
		(0.07)	(0.23)	(0.30)	(0.02)	(0.03)
Constant	-0.79***	0.79**	-0.72	-1.86*	0.07	-0.02
	(0.23)	(0.31)	(0.52)	(0.88)	(0.04)	(0.05)
Panel B: The effect of PEs on firms IPO performance interacting with policy uncertainty						
PE density	2.88***					
	(1.27)					
PE		-0.05	0.03*	0.03	0.00**	0.01***
		(0.06)	(0.01)	(0.03)	(0.00)	(0.00)
PE*EPU		0.01	-0.01	-0.01	0.00*	0.00**
		(0.01)	(0.02)	(0.02)	(0.00)	(0.00)
imr		0.08	-0.08	0.16	0.01	0.07**
		(0.07)	(0.23)	(0.30)	(0.02)	(0.03)
EPU (ΔEPU)		0.02***	-0.03***	-0.00	0.00	0.00
		(0.01)	(0.01)	(0.02)	(0.00)	(0.00)
Constant	-0.79***	0.68*	-0.74	-1.86*	0.06	-0.00
	(0.23)	(0.32)	(0.53)	(0.88)	(0.04)	(0.04)
N		1968	1968	1968	1968	1968
Year FE	YES	YES	YES	YES	YES	YES
Industry FE	YES	YES	YES	YES	YES	YES
Industry-by-year FE	YES	YES	YES	YES	YES	YES
Province FE	YES	YES	YES	YES	YES	YES
Control	YES	YES	YES	YES	YES	YES

Note: This table applies the Heckman two-stage model, with PE Density as the instrument variable, among all listed firms. Underpricing is the market-adjusted percentage price movement from the offer price to the close price on the first trading day. CAR_(1,2) is the summation of the benchmark-adjusted abnormal returns for 1/2/3-year after IPO. ROA_(1,2) is the difference in ROA over two years after the IPO and the value of ROA in the year of IPO. EPU is the log value of policy uncertainty in underpricing. In the post-IPO specifications, ΔEPU represents the log difference of EPU between one (or two) years after the IPO and the IPO year. For descriptions of all other variables, please see Appendix Table B.1. The standard errors are clustered at the industry level. *** denotes significance at a 10% level, ** denotes significance at a 5% level, and * denotes significance at a 1% level. The research sample includes all listed firms. All the data are winsorized at the 1st and 99th percentile values.

Table B.11: The role of princeling-connected PE in IPO performance using Heckman two-stage

	(1)	(2)	(3)	(4)	(5)	(6)
	First stage			Second stage		
		Underpricing	CAR_1	CAR_2	ROA_1	ROA_2
Panel A: The effect of princeling-backed PEs on firms IPO performance						
Princeling-PE density	14.78**					
	(6.02)					
Princeling		-0.04	-0.14*	-0.23	-0.01	-0.01
		(0.03)	(0.07)	(0.13)	(0.01)	(0.01)
imr		-0.01	-0.14**	-0.53**	-0.01	-0.10**
		(0.10)	(0.06)	(0.20)	(0.01)	(0.03)
Constant	-0.26	2.16***	-2.53**	-5.09***	-0.08*	-0.00
	(0.48)	(0.17)	(1.06)	(1.19)	(0.04)	(0.06)
Panel B: The effect of princeling-backed PEs on firms IPO performance regarding policy uncertainty						
Princeling-PE density	14.78**					
	(6.02)					
Princeling		-0.67*	-0.16**	-0.23**	-0.01	-0.02*
		(0.31)	(0.05)	(0.08)	(0.01)	(0.01)
Princeling*EPU(ΔEPU_D)		0.12*	0.13	0.01	0.01	0.02
		(0.05)	(0.12)	(0.20)	(0.01)	(0.01)
IMR		0.00	-0.20**	-0.53*	-0.02*	-0.10***
		(0.10)	(0.09)	(0.25)	(0.01)	(0.03)
EPU (ΔEPU)		0.04***	-0.01**	-0.03*	-0.00***	-0.01***
		(0.01)	(0.00)	(0.01)	(0.00)	(0.00)
Constant	-0.26	2.13***	-2.67**	-5.10***	-0.09*	-0.01
	(0.48)	(0.16)	(1.10)	(1.18)	(0.04)	(0.07)
N		703	703	703	703	703
Year FE	YES	YES	YES	YES	YES	YES
Industry FE	YES	YES	YES	YES	YES	YES
Industry-by-year FE	YES	YES	YES	YES	YES	YES
Province FE	YES	YES	YES	YES	YES	YES
Control	YES	YES	YES	YES	YES	YES

Note: This table applies the Heckman two-stage model, with princeling-connected PE Density as the instrument variable among firms with PE support. Underpricing is the market-adjusted percentage price movement from the offer price to the close price on the first trading day. CAR_(1,2) is the summation of the benchmark-adjusted abnormal returns for 1/2-year after IPO. ROA_(1,2) is the difference in ROA over two years after the IPO and the value of ROA in the year of IPO. EPU is the log value of policy uncertainty in underpricing. In the post-IPO specifications, ΔEPU represents the log difference of EPU between one (or two) years after the IPO and the IPO year. For descriptions of all other variables, please see Appendix Table B.1. The standard errors are clustered at the industry level. *** denotes significance at a 10% level, ** denotes significance at a 5% level, and * denotes significance at a 1% level. The research sample only includes listed firms with PE support. All the data are winsorized at the 1st and 99th percentile values.

4 The impact of Universal Credit on child mental health

4.1 Introduction

Childhood is the critical phase for mental health, characterized by rapid brain growth and development. During this period, children acquire cognitive skills that shape their future mental well-being and are essential for assuming adult roles in society. Mental health conditions, including depression, anxiety, and behavioral disorders, are significant contributors to illness and disability among young individuals. Globally, approximately 10% of children and adolescents experience a mental disorder, but a majority of them do not seek or receive the necessary help. In the UK, the survey "Mental Health of Children and Young People in England" reveals a concerning trend of worsening mental health among children. The survey reports a significant increase in the number of children and young people facing mental health issues[55]. One contributing factor to this phenomenon is welfare reform (Barr et al., 2015, 2016). The primary goals of an effectively functioning welfare state are to improve the well-being of recipients while encouraging self-sufficiency through employment (Hartley et al., 2022). Nevertheless, a failure to find the appropriate equilibrium can lead to unintended outcomes, such as mental health problems, illness, or involvement in criminal activities among individuals depending on welfare programs (Blank, 1997, 2002).

Universal Credit (UC) is a monumental welfare reform that has drastically changed the social security system in the United Kingdom. UC is designed to replace six benefits for working-age people with low income, which are currently administered separately. It has introduced major changes to the previous benefit schemes, including a fully digitized service, monthly payments in arrears instead of prospectively each

[55]For instance, in 2022, approximately 18.0% of children aged 7 to 16 years and 22.0% of young people aged 17 to 24 years were estimated to have a probable mental disorder.

week or fortnight, increased conditionality, a tougher regime of sanctions, and reduced payments to certain claimant groups (Brewer et al., 2019). The main objective of UC is to reduce welfare dependency by providing greater incentives for claimants to enter employment and take greater responsibility for their finances. The impact of UC has been widely criticized, generating enormous controversy. Mounting evidence from sociology, political science, and medical literature suggests that UC has led to an increase in food bank usage, crime rate, and landlord repossession rates (Arie, 2018; Loopstra et al., 2018; Cheetham et al., 2018a; Hardie, 2021).

Doctors have raised concerns about the detrimental impact of the UC reform on mental health and the increased workload it imposes on general practitioners (Arie, 2018). While there are several papers in the literature discussing the effects of UC on mental health, both of them focus on adult mental health (Brewer et al., 2022; Wickham et al., 2020). However, greater attention should be directed toward understanding the impact of UC on the mental health of children. The implementation of UC involves sub-policies that include significant cuts in support for disabled children and the cancellation of free school meals, which can diminish the well-being of children and potentially harm their mental health. This aspect is crucial not only because having a child with poor health is associated with reduced employment for both mothers and fathers (Kuhlthau and Perrin, 2001), indicating that the condition of child health is pivotal to the success of Universal Credit in encouraging employment and achieving its objectives (Davey and Hirsch, 2011), but also because poor health during childhood is linked to lower educational attainment, worsened health outcomes, and inferior labor market prospects in adulthood (Case et al., 2005; Currie, 2004; Graham et al., 2004). Therefore, conducting a comprehensive evaluation of the reform necessitates examining the mental health costs incurred by children.

Using the UK Household Longitudinal Study (UKHLS) data from 2009-2019, I classify the children into two groups: children with employed parents who are not eligible for UC (comparison group) and children with unemployed parents who are eligible for UC (treatment group). In May 2016, families with less than 2 children also became eligible. To first examine the impact of the UC reform on children's mental health, I create a parallel graph that compares the proportion of children with mental health problems (Strengths and Difficulties Questionnaire (SDQ) scores equal to or greater than 17) before and after 2016. Next, I employ a two-way fixed effects model (with fixed effects at the individual and year levels) to identify the treatment effect of UC on children's mental health between 2009-2019. The identification strategy is based on comparing the mental health of two children with different parents' employment statuses. I also explore the mechanisms behind the treatment's effect on children's mental health. The implementation of UC is accompanied by sub-policies that may have individual positive or negative consequences for mental health. One

of the objectives of UC is to strongly incentivize claimants towards self-sufficiency through policy rules, such as compulsory intensive job searches of up to 30 hours per week for unemployed or low-income claimants. This is likely to have a detrimental impact on children's mental health due to reduced time spent with their parents. To investigate the mechanism through which UC impacts children's mental health, I use the utilization of childcare services as a proxy for reduced time spent with children. If parents need to allocate more time to fulfill UC requirements, they may rely more on childcare services, with 70% of the fees being covered by the government. Additionally, I examine the causal relationship between entering unemployment under UC and household income.

The parallel trend graph suggests that a greater number of children in the treatment group experience mental health issues compared to the comparison group following the implementation of UC. Furthermore, the regression results indicate that UC exacerbates children's mental health problems in households with unemployed parents. The treatment effect corresponds to a 9% likelihood increase in mental health issues. To investigate the mechanism by which UC negatively impacts children's mental health, I find that increased usage of childcare services is the main contributing factor. Other results related to the mechanism suggest that the reform does not significantly reduce household income, which is consistent with previous research findings (Brewer et al., 2022). This suggests that the primary pathway through which UC worsens children's mental health is through conditionality rather than changes in household income. Additionally, the treatment effect of the UC welfare reform on children's mental health may vary based on factors such as households with one child versus multiple children and households headed by lone parents compared to households with couples. The results also underscore that Universal Credit has a more pronounced impact on younger children. Overall, the findings demonstrate that the implementation of Universal Credit reform has indeed resulted in worse mental health outcomes for children. Future government policies in the UK and elsewhere, aimed at improving the efficiency of the welfare system while safeguarding children's mental health, should consider households with multiple children as well as lone-parent households to mitigate the negative mental health effects.

This paper contributes to several strands of the economics literature. Firstly, it addresses the central question of the consequences of welfare reforms (Blank, 2002). Previous studies on this research topic have primarily focused on employment, which is typically the direct target of welfare reforms (Brewer and Hoynes, 2019), such as increasing labor supply among the affected working-age population, including lone parents' labor supply (Brewer et al., 2002; Francesconi and Van der Klaauw, 2007; Gregg et al., 2009), and immigrant labor participation (Borjas, 2003). Secondly, I contribute to this research by focusing on children's mental health as the main

outcome, which is understudied in the literature. Wickham et al. (2020) study the mental health of adults by comparing a group of unemployed individuals who claim UC to employed individuals who do not, before and after the UC rollout. Brewer et al. (2022) specifically focus on individuals within a rollout area who become eligible for UC due to a change in unemployment status, evaluating the relative impact of UC in mitigating the mental health effects of entering unemployment. Furthermore, this paper contributes to the growing literature in economics that employs mediation analysis to decompose the main effect of treatment into different mechanisms (Celli, 2022)[56]. In this paper, I exploit exogenous variation in potential mediators that are strongly influenced by policy changes under the welfare reform of UC.

The rest of the chapter is set out as follows. In section 2, I provide the institutional background of Universal Credit. Section 3 describes the related literature. In section 4 I lay out the data. Sections 5 and 6 illustrate the econometric modeling strategy and the main empirical results. Section 8 concludes.

4.2 Institutional background

4.2.1 Background of Universal Credit

4.2.1.1 The rollout of Universal Credit

Universal Credit was first introduced for new claimants in October 2013. In what is arguably the biggest overhaul of the welfare system in the United Kingdom (UK) since the Beveridge reforms of the 1940s. Income Support, Income-based Jobseeker's Allowance, Income-based Employment and Support Allowance, Housing Benefits, and Working and Child Tax Credits were all abolished and replaced with a single payment. Figure 4.1 shows the differences between Universal Credit and legacy reform. Detailed information about legacy reform is shown in the Appendix C.1.

UC has been gradually implemented across the UK, both in terms of the areas where it is available and the eligible claimants. Figure 4.2 illustrates the national expansion of the UC rollout coverage from April 2013 to December 2024. In April 2013, the

[56] Celli (2022) provides a summary of various methods used for causal identification of mediators separately from the treatment effect, including difference-in-difference methods (e.g., Deuchert et al. (2019)), instrumental variables (e.g., Nicoletti et al. (2020)), randomized control trials (e.g., Heckman and Pinto (2015)), and synthetic control methods (Celli, 2022).

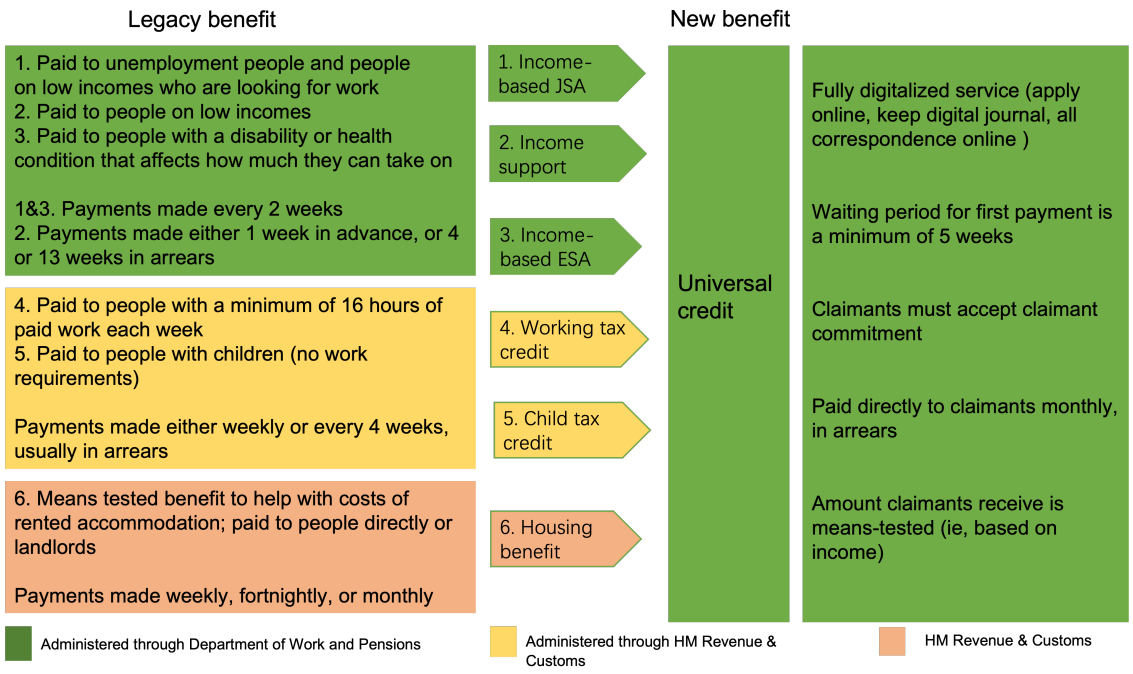


Figure 4.1: Outline of Universal Credit, and the legacy welfare benefits it replaces in the UK

Note: The implementation of UC rollout is managed by the Department of Work and Pensions (DWP). Source: Wickham et al. (2020)

government initiated the rollout of UC 'live service' in the North West[57]. During this phase, only single, childless, unemployed adults without housing costs were eligible, representing the simplest claims to manage. The live service did not involve online applications; claimants made their claims through their local Jobcentre, similar to the process for legacy benefits[58]. However, the live service was always intended to be a temporary arrangement and was deactivated in January 2018.

By April 2016, the national rollout of Universal Credit was completed, making UC available for new claims from single unemployed individuals at Jobcentres across the country. Subsequently, the rollout of the Full Service commenced and concluded in December 2018. When the Full Service was introduced in an area, new claims were accepted from all types of claimants, and existing Live Service claimants were transitioned to the new system[59]. Existing claimants of legacy benefits and tax credits in the area were also migrated to UC if they experienced a change in circumstances.

[57]Universal Credit was launched as a Pathfinder in certain areas of the North West, starting in April 2013. The initial Pathfinder offices were Ashton-under-Lyne, Oldham, Warrington, and Wigan. Six additional sites were rolled out between October and the spring of 2014.

[58]Jobcentres are government-funded employment agencies run by the DWP (Department for Work and Pensions).

[59]A new claim may arise when a claimant's financial situation changes (e.g., unemployment, reduction in wages), they move to a new area, or their household composition changes (e.g., a partner moves in or out).

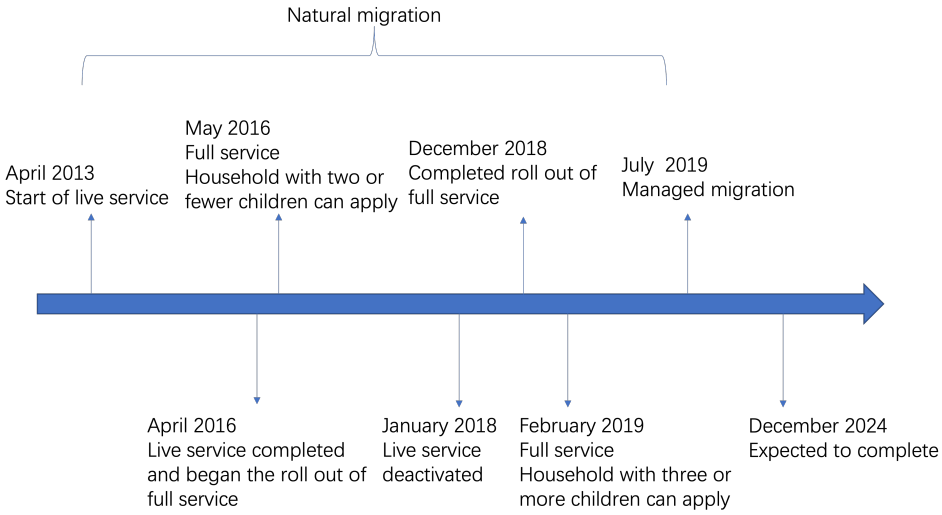


Figure 4.2: Timeline of universal credit

Note: This figure depicts the timeline of universal credit during the period 2014–2023. Source: National Audit Office (2018), Figure 4 2018

This process was known as natural migration. Specifically, it applied to families already entitled to some form of support whose circumstances changed to the extent that their current entitlements could be affected, prompting them to claim other benefit entitlements. For example, if a single person receiving income-based Jobseeker's Allowance had a child, they would no longer be eligible to claim Child Tax Credit or Income Support and would need to apply for UC instead. However, individuals responsible for three or more children were unable to claim Universal Credit and were directed to tax credits and legacy benefits by 31 January 2019. Consequently, the number of people on UC in a particular area significantly increased following the introduction of the Full Service (Kennedy and Keen, 2018). The remaining claimants of legacy benefits and tax credits will be transferred to UC through a process called managed migration. DWP initially began by testing the managed migration process in July 2019 through a pilot. The pilot was initially expected to last for 12 months before being evaluated and the process gradually scaled up. During the 12-month test period, up to 10,000 existing legacy benefit claimants (including some tax credit claimants) were expected to be moved across to UC through the new process. However, due to the impacts of the coronavirus outbreak in the UK (March 2020 onwards) the pilot was suspended. Starting from May 2022, the DWP began sending notices to small groups of legacy benefit claimants in certain areas, as part of a 'discovery' phase to test approaches to managed migration. This process is expected to be completed by the end of 2024.

Overall, Universal Credit represents a significant transformation in the UK's social security system and, upon full implementation, is expected to impact approximately eight million households (House of Commons Work and Pensions Select Committee ,

2014) and half of all children (Finch, 2016).

4.2.1.2 The features of Universal Credit

Figure 4.3 illustrates the distinctive features of Universal Credit. In general, Universal Credit differs from the legacy system in four main ways.

Firstly, it aims to promote work participation by reducing the marginal deduction rate. As claimants start earning or increase their earnings, the reduction in benefit payments occurs at a slower rate compared to the legacy system. This is intended to facilitate the transition into employment and ensure that even taking on a small number of working hours is financially rewarding, addressing a known issue with the legacy system.

Secondly, Universal Credit includes conditionality as a means to discourage individuals from not working[60]. All Universal Credit claimants, regardless of their employment status, disability, or caring responsibilities, and their partners, are required to fulfill a 'Claimant Commitment'. This commitment serves as an individual action plan, similar to a Jobseeker's Agreement, which imposes greater work-related pressure and job-seeking expectations on most claimants (Dwyer and Wright, 2014). The specific actions outlined in the Commitment vary, ranging from exempting severely disabled claimants and carers from the requirement to find work, to mandating others to dedicate up to 35 hours per week to job searching. Notably, the payment conditionality introduced through the Claimant Commitment is accompanied by a more stringent system of sanctions. Persistent non-compliance with the Commitment can result in the maximum sanction of disqualification from receiving any benefits for up to three years.

Thirdly, Universal Credit has made changes to the payment structure to resemble a regular salary. Instead of weekly or fortnightly payments, Universal Credit payments are made on a monthly basis. Additionally, the calculation of benefits includes the integration of Housing Benefits, which is included in the monthly payment. Unlike the legacy system where Housing Benefit was paid directly to the landlord, under Universal Credit, the housing rental payment is typically paid to the claimant. Moreover, Universal Credit is usually paid as a single payment to the household as a whole, rather than to individual household members. Furthermore, claimants are required to wait between 5 and 12 weeks for their first Universal Credit payment, a require-

[60]Conditionality entails the payment of welfare benefits on the condition that recipients undertake specified activities and behave in certain ways (Deacon, 1994).

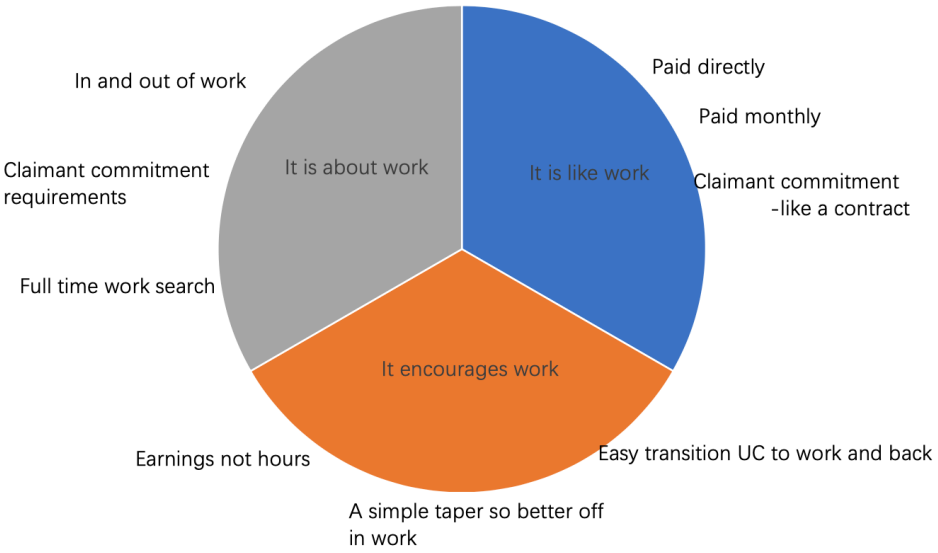


Figure 4.3: What's different about Universal credit?

Note: Source: Department for Work and Pensions, 2015.

ment that has been the subject of extensive debate (Griffiths et al., 2020).

Fourthly, there is a connection with the HMRC PAYE system, allowing Real Time Information on the claimant's earnings to be utilized in the calculation of Universal Credit. This integration enables more precise and accurate assessments of UC entitlement, aiming to reduce instances of under and overpayments of benefits (Millar and Bennett, 2017). Furthermore, Universal Credit operates on a monthly assessment basis, and the decision to use a month as the primary time period carries significant implications for recipients.

4.2.1.3 The composition of Universal Credit

Figure 4.4 illustrates the composition of Universal Credit. Universal Credit awards consist of a standard allowance along with additional amounts for children, housing, and other needs and circumstances such as childcare and caring. The specific amount a family receives, however, depends on their income and savings. Unearned income, such as income from certain benefits or an occupational pension, typically reduces the maximum UC award on a one-to-one basis. Earned income, which includes income from employment or self-employment, reduces the UC award at a fixed rate known as the "single taper". However, families are allowed to retain a portion of their earned income known as the "work allowance" before it starts to affect their UC. The taper rate was initially set at 65 pence for each additional pound of net earnings, but it

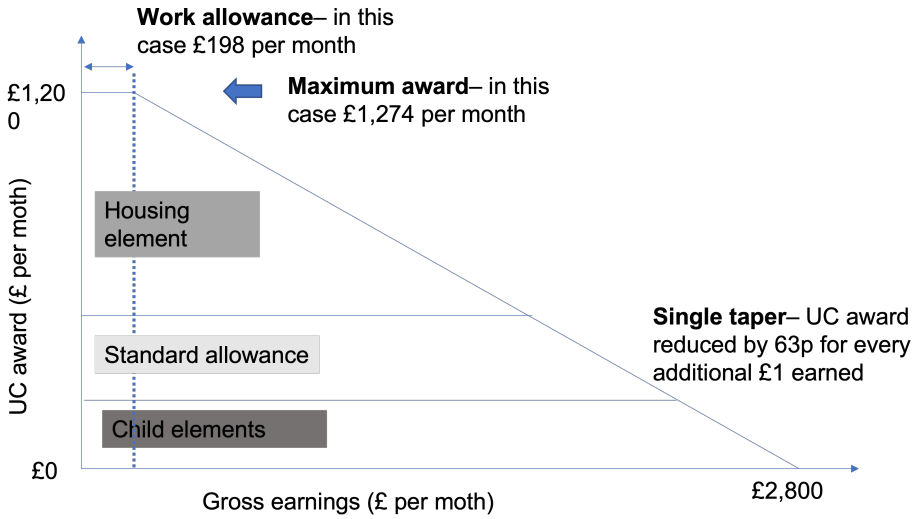


Figure 4.4: UC composition

Note: UC award of a lone parent with two children and housing costs, 2018-2019. Single adult households with two dependent children, no childcare costs. Renting a property at the average local housing allowance rate for a three-bedroom tenancy in England (£724 per month). Source: House of Commons (2018).

was reduced to 63 pence per pound in April 2017.

4.2.1.4 The consequences of Universal Credit

Universal Credit brings about a radical restructuring of means-tested benefits for working-age individuals, leading to significant impacts on claimants' incomes. By consolidating six different legacy benefits into a single payment, UC results in changes to claimants' entitlements, both naturally and as a result of policy decisions. Research by Brewer et al. (2019) indicate that 76% of those entitled to means-tested benefits experience changes in their entitlements, either gaining or losing at least £100 per year due to the switch to UC. The direction of these income changes under UC depends on individual circumstances. Additionally, modeling the impact of UC on claimant incomes over eight years suggests that approximately 4.2 million people experience income gains, while around 4.6 million people face income losses. Importantly, the analysis shows that the poorest 10% adults are the most adversely affected.

An analysis by Finch (2016) reveals that, compared to entitlements under the tax credit system, a majority of working families (2.5 million out of 4.5 million eligible in either system or both) are worse off under UC, with an average loss of entitlement of £41 per week for those affected. Table 4.1 illustrates the average income losses for different types of working families. The table shows that the number of

families experiencing gains or losses is roughly balanced between single-parent and couple-parent households, with an additional 100,000 couples and single parents experiencing reduced entitlements. Families without children are more likely to have lower entitlements, with 300,000 more families facing losses than gains. Overall, couple parents experience a net loss, albeit by a small margin of £3 per week, and approximately 400,000 couples who are currently receiving UC will no longer be eligible. Single parents, on the other hand, are the largest overall losers, facing an average weekly loss of £15, with an additional 100,000 families no longer receiving UC. Despite these losses, the majority of working single parents remain entitled to UC. Furthermore, families with children have suffered even greater losses due to substantial cuts in 2020 under UC. On average, families with children were worse off by £960 per year in 2020 compared to the income they could have expected without cuts to Universal Credit. Single-parent families faced an even more substantial average loss of £2,380. These cuts to Universal Credit have been shown to push around a million children into poverty (Child Poverty Action Group, 2017).

Table 4.1: The average loss of income for working families entitled to either UC or the current system, 2020-21

Millions of families		Couple parents	Single parents	Non-parents	All
Gainers		0.8m	0.4m	0.8m	0.2m
	of which				
	receive UC	0.7m	0.4m	0.6m	1.7m
	do not receive UC	0.1m	*	0.2m	0.2m
Losers		0.9m	0.5m	1.1m	2.5m
	of which				
	receive UC	0.5m	0.4m	0.3m	1.2m
	do not receive UC	0.4m	0.1m	0.8m	1.3m
Total population entitled to UC		1.3m	0.8m	0.9m	3.0m
Change in entitlement (£ per week,2016-17 CPI terms)					
Mean gain		£46	£25	£27	£34
	of which				
	receive UC	£49	£25	£32	£38
	do not receive UC	£10	*	£8	£9
Mean loss		-£46	-£43	-£37	-£41
	of which				
	receive UC	-£44	-£41	-£36	-£41
	do not receive UC	-£48	-£50	-£38	-£42
Net change in income		-£3	-£15	-£10	-£8

Note: Table includes all families entitled to either UC or the current tax credit system or both assuming full take-up of benefit entitlements in two scenarios where UC (with tax cuts and the National Living Wage) or the current system (without tax cuts and the National Living Wage) are fully in place in April 2020, as cut to the child element for new claims/families. * Denotes where the sample size is too small to report an estimate. Source: Resolution Foundation analysis using IPPR tax-benefit model (Finch, 2016).

4.2.2 How does Universal Credit affect children's health?

4.2.2.1 Two-child limit policy

Universal Credit awards can include additional amounts for each child or 'qualifying young person' up to the age of 19 in the claimant's household. However, with some exceptions, households with a third or subsequent child born from April 6, 2017, claiming Universal Credit or Child Tax Credit no longer received additional amounts for these children starting from February 2019[61]. As of April 2021, there were 3.69 million families with children claiming Universal Credit or Child Tax Credit (Frank, 2022). Among these families, 30% had three or more children. This policy change is expected to result in significant increases in the number of children living in poverty, with certain minority groups disproportionately impacted (Machin, 2017). The Resolution Foundation estimates that nearly half of the families with three or more children were in relative poverty in 2021/22, up from a third in 2012/13 (Resolution Foudation, 2022)[62].

4.2.2.2 Reductions in help with childcare costs for some groups

The government announced its plans for addressing childcare costs under Universal Credit. It aimed to introduce a childcare element comparable to the one provided through Working Tax Credit. However, unlike the previous system, Universal Credit did not offer additional assistance for childcare costs when calculating Housing Benefits and Council Tax Benefits. Consequently, households relying on these benefits experienced a reduction in their support for childcare expenses, decreasing from 95.5% to 70%. This change resulted in them having to pay more than six times the amount they were currently contributing towards their childcare costs out of their own pockets (Royston, 2012). Since April 2016, UC has increased the proportion of childcare costs that can be claimed back through Universal Credit from 70% to 85% (Child Poverty Action Group, 2017). Additionally, in England, starting from 2025, working parents of children aged nine months and above will be provided with 30 hours of free childcare services (The Guardian, 2023)[63].

[61] Exceptions are made for certain claimants who did not choose to have a third or subsequent child, such as in cases of multiple births or non-consensual conception, as well as to encourage adoption when children might otherwise be in the care of a local authority.

[62] The UK government is considering the Removal of Two Child Limit. Source: https://lordslibrary.parliament.uk/research-briefings/lln-2022-0019/

[63] https://www.theguardian.com/uk-news/2023/mar/15/budget-2023-jeremy-hunt-says-uk-will-avoid-recession-this-year

4.2.2.3 Substantial cuts in support for disabled children

Families with disabled children who were receiving any of the three rates of Disability Living Allowance for assistance with the extra costs associated with disability were eligible for additional support through the disability element of the Child Tax Credit. This extra support, which was valued at up to £53.70 per week, helped families address the supplementary needs of a disabled child. The disability element was provided per child, so a household with two disabled children would have received up to £107.40. However, the disability addition in Universal Credit was being introduced at approximately half the level of the disability element in Child Tax Credit, totaling £26.75 per week. The government had estimated that around 100,000 disabled children would be negatively impacted by this change[64]. In 2022/2023, the Disability Living Allowance is £26.9 per week. However, if the child's condition is more severe, additional allowances may be available[65].

4.2.2.4 Free School Meals and other passported benefits

Some key benefits that served as 'passporting' criteria for entitlement to other benefits were being incorporated into Universal Credit. One of the most crucial changes planned by the government was the incorporation of benefits that had been previously used to determine eligibility for Free School Meals. These benefits ceased to exist upon the introduction of Universal Credit. Consequently, new eligibility criteria for Free School Meals needed to be developed within the framework of the new system. One proposed alternative to address the challenge of providing assistance with the cost of school meals under Universal Credit was the implementation of an earnings threshold. This threshold would have resulted in the loss of Free School Meals entitlement once earnings exceeded a certain level. However, this approach could have created a significant 'cliff edge' effect, undermining the progressive work incentives inherent in the Universal Credit system. A household would have needed an additional £88 per week in earnings to compensate for the loss of Free School Meals entitlement (The Budget Responsibility Committee, 2018). In England, since 1 April 2018, a child could be qualified for free school meals if the parent/guardian receives Universal Credit and the household's net income does not exceed £616.67

[64]Chris Grayling, 8 June 2011, in response to a parliamentary question: www.theyworkforyou.com/wrans/?id=2011-06-08a.57941.h&s=curran+section%3Awrans+section%3Awms#g57941.q0

[65]https://www.gov.uk/disability-living-allowance-children

in the assessment period[66][67].

4.2.2.5 Conditionality for families with children

Couples are required to designate the person in the household primarily responsible for the care of dependent children as the 'responsible carer'. Lone parents are automatically designated as the 'responsible carer'. The responsible carer is subject to different levels of conditionality, which vary based on the age of the youngest child, and may face benefit sanctions for non-compliance (Andersen, 2020). Table 4.2 provides an overview of the specific requirements. If the age of the children is under 1, parents are not required to seek work in order to receive Universal Credit. However, when the children are 13 or above, parents are expected to spend 35 hours a week searching for employment.

Table 4.2: The conditionality regime for the main carers of children

Work-related requirements for responsible carers	
Age of your youngest child	Your responsibilities
Under 1	You don't need to look for work in order to receive Universal Credit
Age 1	You will be asked to attend work-focused interviews with your work coach to discuss plans for a future move into work
Age 2	You will be expected to take active steps to prepare for work
Age 3 or 4	You will be expected to work a maximum of 16 hours a week (or spend 16 hours a week looking for work)
Age between 5 and 12	You will be expected to work a maximum of 25 hours a week (or spend 25 hours a week looking for work)
Age 13 and above	You will be expected to work a maximum of 35 hours a week (or spend 35 hours a week looking for work)

Note: Source: Department for Work and Pensions (2017)

4.2.2.6 The abolition of the Severe Disability Premium for adults

The Severe Disability Premium (SDP), which was worth £55.30 per week on legacy benefits, was paid to disabled adults who had no non-dependent adult in the household and no one else receiving Carer's Allowance to care for them. However, under Universal Credit, the government had eliminated the SDP and Enhanced Disability Premium (EDP). One particular group affected by the loss of the SDP was young carers who cared for disabled lone parents. This is because Carer's Allowance could not be granted to children under the age of 16 who are in full-time education (Royston, 2011).

[66] https://www.gov.uk/apply-free-school-meals

[67] Under legacy benefits, eligibility for free school meals was often contingent on the type of benefits a household receives. These benefits might include Income Support, Income-based Jobseeker's Allowance, and Child Tax Credit, among others. With the introduction of Universal Credit, eligibility criteria for free school meals have undergone changes. Families with a net earned income of up to £7,400 (after taxes, deductions, and certain allowances) are now eligible for free school meals.

4.2.2.7 Introduction of a capital limit of £16,000

There is a capital limit of £16,000, meaning that households with savings exceeding this limit will no longer be eligible for any support. These capital rules will have a significant impact on savers who currently receive substantial tax credit awards, especially working parents with high childcare costs, as it is their tax credit award that will be at risk (Royston, 2011).

4.3 Literature review

4.3.1 Universal Credit

4.3.1.1 The impact of Universal Credit on the mental health of quantitative studies

The study conducted by Wickham et al. (2020) investigates the effects of introducing Universal Credit reform on psychological distress. To measure this impact, they employ the General Health Questionnaire (GHQ)-12 and the mental component summary of the 12-item Short Form Health Survey. Individuals who are unemployed and eligible for Universal Credit benefits constitute the intervention group. This group is then compared to changes in distress observed in a control group of employed individuals. The researchers adopt a difference-in-difference methodology to effectively account for differences between the two groups. The findings of the study reveal that subsequent to the policy change and the implementation of Universal Credit, psychological distress begins to increase among those who are eligible for the benefits. This increase in psychological distress is not mirrored in the comparison group of employed individuals. Specifically, the prevalence of psychological distress in the intervention group, in comparison to the comparison group, experiences an increase of 6.57 percentage points (95% Confidence Interval (CI) 1.69 to 11.42). Moreover, the average score on the GHQ-12 scale shows an increase of 1.28 points (0.61 to 1.95), while the average score on the Short Form Health Survey-12 mental component summary registers a decrease of 1.45 points (–2.58 to –0.32).

Also focusing on the mental health of adults, Brewer et al. (2022) estimate the differing effect of entering unemployment under UC versus the former system by exploiting a staggered rollout. Their results show that groups with fewer insurance

possibilities - single adults and lone parents - experience a mental health deterioration of 8.4% to 13.9% standard deviations. This underperformance is caused by reduced benefit income and strict job search requirements, which offset any positive welfare effects of the reduced administrative burden of claiming benefits. On the other hand, for couples without or with children, the differential effect on mental health is negligible or even positive. This is because, for two newly unemployed individuals living with a partner under the two benefit systems, benefit income decreased for those without children and slightly increased for those with children due to the varying policy rules. However, in both cases, there was evidence of intrahousehold insurance to mitigate the impact of Universal Credit.

In the study of Gascoigne et al. (2023), they use a Bayesian hierarchical model to evaluate the impact of policies on population well-being, accounting for spatial/temporal dependencies. They explore the effect of a contextual awareness to UC on self-reported psychological distress for exposed and control groups based on self-reported employment response. Overall, in England, UC causes a 15.30% (95%) increase in psychological distress in the exposed population (after adjustment for the change in the control population). When considering the effect at a subnational level, they highlight the large variation between different lower tier local authorities of residence with some having an increase in psychological distress within its exposed population and others having a decrease.

Pybus et al. (2021) reveal that between 2013 and 2020, there has been an increase in antidepressant prescribing associated with a higher number of people claiming Universal Credit. Specifically, for every 1% rise in individuals claiming Universal Credit, there is a corresponding 5.6% (95%CI 4.78, 6.52) increase in antidepressant prescriptions across Local Authorities in England. This correlation holds even after adjusting for the Index of Multiple Deprivation 2015 score of each area, which is ranked from 1 (least deprived) to 5 (most deprived).

4.3.1.2 The impact of Universal Credit on the mental health of the qualitative studies

There are several qualitative studies examining the impact of Universal Credit on the mental health of adults. Qualitative papers report participants receiving Universal Credit experiencing low mood, depression, and/or anxiety. This has been described as self-harming (Cheetham et al., 2019), suicidality (Veasey and Parker, 2022), and leads to hospitalization (Cheetham et al., 2019).

Focusing on the negative effects of conditionality on mental health, the findings of Dwyer and Bright (2016) demonstrate a relationship between sanctions and conditionality leading to destitution. This argument is further supported by Wright et al. (2018) and Williams (2021), whose findings suggest that the constant threat of sanctions under UC induces significant stress and anxiety among claimants. The study by Wright et al. (2022) reveals that the ongoing fear of sanctions, financial hardship, surveillance, and social isolation associated with digital design have adverse effects on mental health. Furthermore, Cheetham et al. (2018a) find that Universal Credit has exacerbated long-term health conditions and significantly affected claimants' mental health, with some individuals even contemplating suicide (Redman and Fletcher, 2022; Barr et al., 2016; Dwyer et al., 2020).

An important aspect identified in the harm to mental health caused by UC is the resulting worsened financial position stemming from Universal Credit. The financial implications, which contribute to recipients' distress, encompass income insecurity and reduction to the extent that individuals describe their situations as being unable to meet their own basic needs (Cheetham et al., 2018a; Koch and Reeves, 2021). Additionally, the anxiety caused by arrears in utilities or rent and eviction threats is evident among claimants (Dwyer and Bright, 2016). According to Britain Thinks (2018), the long waiting periods for UC can also contribute to a spiral of depression.

The digitization of claims is also identified as contributing to difficulties (Veasey and Parker, 2022; Griffiths et al., 2020; Pybus et al., 2021). For some, digital literacy is an issue, while others face challenges accessing the necessary digital hardware, internet, and/or digital devices. Moreover, administrative and system errors are reported, potentially leading to delays, sanctions, and heightened distress.

Overall, there are a total of four quantitative analyses examining the impact of Universal Credit on the mental well-being of adults, along with one report. Collectively, these sources provide insights into the adverse effects of Universal Credit on mental health. Additionally, there are qualitative studies focused on specific demographic groups, further demonstrating the adverse effects of Universal Credit on the mental health of adults. The primary factors identified as causing poorer mental health include the complex process of managing Universal Credit claims, the heightened conditionality requirements, reductions in benefit income, and challenges associated with sanctions and delays in payment processing (Dwyer, 2018; Wright et al., 2018; Watts and Fitzpatrick, 2018).

4.3.1.3 The impact of Universal Credit on other aspects

The impact of Universal Credit on employment outcomes National Audit Office (2016) suggests that Jobseekers Allowance sanctions are associated with an increased likelihood of claimants being employed in later months, but had no impact on earnings. This finding is further supported by Loopstra et al. (2015), who analyze local authority level data and find that Jobseekers Allowance sanctions are more likely to push claimants into non-work destinations (remaining out-of-work but not claiming benefits) rather than into employment. In examining the ability of UC, Department for Work and Pensions (2018) finds no evidence that a higher frequency of receiving UC support and sanctions motivates UC claimants to progress in work. For qualitative studies, Wright et al. (2018) show that for the majority, the extensive and stringent conditionality of UC does not ensure a move into paid work and has little impact on meaningful in-work progression or sustainability. Wright and Dwyer (2022) identify a series of welfare conditionality mismatches and conclude that conditionality for in-work claimants is largely counterproductive. Additionally, financial and housing insecurity under UC pushes claimants further away from the labor market (Cheetham et al., 2018a). Overall, existing studies suggest that the impact of Universal Credit on employment promotion is limited.

The impact of Universal Credit on income and debt Research by Drake (2017), which involves quantitative analysis of Citizens Advice's service data and qualitative interviews with their clients, suggests that individuals on UC are more likely to struggle with debt problems compared to those on legacy benefits. Qualitatively, research from the debt charity Stepchange (2020) also highlights the negative impact of the Universal Credit rollout on personal debt problems. This argument is supported by Robertson et al. (2020), Drake (2019), and Britain Thinks (2018). Claimants of UC are about one and a half times more likely to seek support for debt issues compared to those on other benefits (Foley, 2017). Focusing on UC claimants in Rochdale and North Tyneside, the study by Bush et al. (2019) suggests that the combined costs of housing, bills, and food often push claimants to their income limits, further exacerbated by the long wait period between UC payments.

The impact of Universal Credit on food bank usage Concerns have been raised by Trussell Trust (2019) regarding the impact of UC on food bank usage, attributing it not only to increased conditionality and sanctions but also to the long wait periods associated with a lack of income. Research conducted by Thompson et al. (2019), using food bank parcel data from 414 food bank centers, suggests that food bank usage

increased by 30% in the months following UC rollout locally, reaching 40% after 18 months and 48% after 24 months. Similarly, Reeves and Loopstra (2021) find that the prevalence of Universal Credit is associated with higher levels of food parcel distribution, with a stronger relationship observed in areas where food banks are active. Qualitative studies by Cheetham et al. (2018b) and Arie (2018) further highlight the impact of the long wait period (ranging from 5 to 12 weeks) for claimants before receiving their first Universal Credit payment. This delay often leads to an inability to pay rent, forcing individuals to turn to food banks and loan sharks. Therefore, these studies collectively conclude that Universal Credit is associated with a rise in food bank usage in the UK.

Overall, Universal Credit has been a subject of significant controversy in the UK. Numerous studies, encompassing both qualitative and quantitative approaches, have consistently indicated that Universal Credit exacerbates claimants' financial insecurity, contributes to food and housing insecurity, and hampers prospects for employment. These findings collectively indicate that the reform has not achieved its intended goals.

4.3.2 The impact of welfare reforms on child well-being

4.3.2.1 Welfare reforms in the UK

Several studies investigate the impact of welfare reform on child health in the UK. Waldfogel (2007) study the reform conducted between October 1998 and April 2000 in the UK and argue that welfare reform has a positive effect on child poverty, family expenditure, and child health and development. Low-income families affected by the reforms spend more money on items related to children and are more likely to own a car and a phone. Another study by Bywaters et al. (2020) reports on a large quantitative, descriptive study that focuses on children in contact with children's services on a single date in 2015 in the four nations of the UK. It finds that children's chances of receiving a child protection intervention are related to family socio-economic circumstances, measured by neighborhood deprivation, within all four countries. There is a strong social gradient that is significantly steeper in some countries. While there are considerable inequalities in patterns of intervention between the four countries, they do not mirror relative levels of deprivation in the child population.

4.3.2.2 Welfare reforms in other countries

The Earned Income Tax Credit (EITC) in the United States helps low- to moderate-income workers and families receive a tax break. Exploiting this policy and employing a difference-in-differences plus mother fixed effects framework, Averett and Wang (2018) find significant improvements in the quality of the home environment for children of unmarried mothers, regardless of their race/ethnicity. They also observe lowered probabilities of accidents and improved mother-rated health for children of married white mothers. Using the Panel Study of Income Dynamics and a cohort of individuals born between 2000 and 2011, the findings of Michelmore and Lopoo (2021) suggest that a $1,000 increase in EITC exposure during early childhood increases overall family wealth in middle childhood by around 4 percent. They also observe an increase in credit card debt (3 to 4 percent) and evidence that the EITC improves the position of low-income families in wealth distribution. On the other hand, Hamad et al. (2018) suggest that EITC refunds are not strongly associated with most short-term health outcomes among recipients' children, although numerous previous studies have demonstrated impacts on longer-term outcomes. Using variation in the federal and state EITC, Braga et al. (2020) evaluate the long-term impact of EITC exposure during childhood on the health of young adults. They find that an additional $100, or a 3% increase, in the average annual EITC exposure between birth and age 18 increases the likelihood of reporting very good or excellent health by 2.6% and decreases the likelihood of being obese by 4.1% between ages 22 and 27. Additionally, Bastian and Michelmore (2018) estimate the impact of exposure to EITC expansions in childhood on education and employment outcomes in adulthood. Their reduced-form results suggest that an additional $1,000 in EITC exposure when a child is 13–18 years old increases the likelihood of completing high school (1.3%), completing college (4.2%), being employed as a young adult (1.0%), and earnings by 2.2%.

In conclusion, poor child health limits children's potential development across a range of areas, leading to poor health and life chances in adulthood, which then has knock-on effects on future generations. Welfare reform can have a significant impact on children's health and future development. After systematically reviewing the current research on Universal Credit, it shows that there is a significant absence of economic analysis regarding the effects of UC on children's mental health outcomes. Consequently, delving into the impact of UC on children's mental health becomes a pivotal and essential contribution of this paper.

4.4 Hypothesis

In this section, I present hypotheses regarding the potential impact of Universal Credit on children's mental health. Universal Credit, a significant welfare reform in many countries, has the potential to affect various aspects of family dynamics and socioeconomic conditions. Given its wide-reaching effects, it is important to investigate its potential consequences on vulnerable populations, specifically children and their mental health.

The literature demonstrates that Universal Credit has a negative impact on the mental health of adults, with both quantitative and qualitative studies (Koch and Reeves, 2021; Veasey and Parker, 2022; Wickham et al., 2020; Brewer et al., 2022). For instance, Wickham et al. (2020) use the UKHLS survey data to examine the effect of UC on adults' psychological distress by exploiting the quasi-experimental event. Their findings suggest that UC's introduction increases the prevalence of distress by 6.57 percentage points amongst unemployed individuals. In addition, the findings of Dwyer and Bright (2016) demonstrate a relationship between sanctions and conditionality leading to destitution using qualitative data. However, as of now, there are no published articles investigating the impact of Universal Credit on children's mental health.

In the doctoral thesis by Francis (2022), the study suggests that children's mental health under Universal Credit is not worse than that under legacy benefits, based on a small subset of interviewees. In contrast, the Earned Income Tax Credit (EITC), a welfare reform implemented in the United States that increases household income, has been demonstrated to improve children's mental health. For instance, utilizing this policy and applying a difference-in-differences framework with mother fixed effects, Averett and Wang (2018) identify notable enhancements in the quality of the home environment for children of unmarried mothers, irrespective of their racial or ethnic background. Additionally, they note reduced probabilities of accidents and improved maternal-rated health for children of married white mothers. Therefore, considering the reduction in child subsidies as emphasized by Child Poverty Action Group (2017), there is a likelihood that children's mental health could be adversely affected. Thus, the following hypothesis is proposed:

H1: The implementation of Universal Credit leads to a deterioration in the mental health status of children.

The introduction of Universal Credit has the potential to bring about shifts in family financial stability, household income, and broader socioeconomic conditions. Re-

search conducted by Brewer et al. (2019) indicates that Universal Credit disproportionately affects lower-income adults, resulting in an average income reduction of 1.9% among those in the bottom 10% of the income distribution, equivalent to £150 per year per adult. Moreover, a report by Child Poverty Action Group (2017) reveals that families with children experienced an average income reduction of £960 per year in 2020 due to Universal Credit cuts, compared to what they might have expected without these reductions. For single-parent families, the impact was even more significant, with an average reduction of £2380. Consequently, these alterations in household income have the potential to influence children's living conditions, access to essential resources, and the overall quality of family life.

Furthermore, the literature demonstrates a link between household income and children's mental health. Akee et al. (2023) use data from a long-running experiment in which American Indian households receive income transfers from a casino, while other households do not. They find that the treated children have fewer symptoms of depression and anxiety at age 30. The untreated children, in adulthood, show strong persistence in measures of mental health from adolescence through age 30, while in treated children, persistence is greatly attenuated. Another study by Strohschein (2005) shows similar results, indicating that low household income is linked to higher levels of depression and antisocial behavior in children using longitudinal data from the Child Supplement of the National Longitudinal Study of Youth. Other studies also underscore the significance of household income and child mental health (Case et al., 2002; Currie and Stabile, 2003).

Therefore, I hypothesize that the implementation of Universal Credit may impact children's mental health through changes in household income. The following hypothesis is proposed:

H2: Household income serves as one mediator through which Universal Credit negatively affects child mental health.

Universal Credit (UC) introduces the 'claimant commitment,' which imposes stringent job search requirements on individuals who are unemployed, earning low incomes, or working only a few hours. Specific requirements are detailed in Table 4.2. Failure to meet these work-related commitments without valid reasons can lead to benefit sanctions, including non-payment. Furthermore, UC aims to address the issue of sudden reductions in child support that used to occur within the tax credit system when certain work-hour thresholds were reached. In the past, eligibility for working tax credits and childcare cost support began at 16 hours of work per week for lone parents, providing limited incentives for those working fewer hours. However, since April 2016, UC has increased the proportion of childcare costs that can be reclaimed

through the program, from 70% to 85%. Consequently, in order to meet these requirements, parents are likely to spend less time with their children and increasingly rely on childcare services.

In the literature, it has been observed that multiple childcare arrangements are associated with communicable illnesses and diagnosed asthma in early childhood, and they appear to be risk factors for health problems during this period (Chen, 2013). Additionally, Stein et al. (2013) demonstrate that children who spend more time in group care, especially nursery care, are more likely to exhibit behavioral problems, particularly hyperactivity. Furthermore, in the research conducted by Eryigit-Madzwamuse and Barnes (2014), they show that girls who entered center-based care after the age of 3 experienced negative impacts on their cognitive scores. Therefore, increased usage of childcare services may serve as a pathway leading to poor mental health outcomes in children. Based on these arguments, I propose the third hypothesis as follows:

H3: Using childcare service is one mediator through which Universal Credit negatively affects child mental health

4.5 Data

The main data source for this study is the UKHLS, also known as Understanding Society. The UKHLS is a large and nationally representative panel survey that replaced the former British Household Panel Survey (BHPS). The study utilizes a panel of UKHLS data, including ten waves[68]. Each wave of data was collected over a period of 3 years, with the majority of data collected within 1 year and a small proportion collected on either side of this period. This survey design is well-suited for evaluating the effects of Universal Credit, which was implemented between 2013 and 2018. Each wave of the UKHLS contains information on socio-economic and demographic status, health, employment, and social benefits for approximately 4,000 households across the United Kingdom.

Individuals are eligible for UC if they reside in a rollout area and meet certain gateway conditions. Initially, UC only applied to unemployed individuals with low

[68]Wave 1 (2009-2010), Wave 2 (2010-2011), Wave 3 (2011-2012), Wave 4 (2012-2013), Wave 5 (2013-2014), Wave 6 (2014-2015), Wave 7 (2015-2016), Wave 8 (2016-2017), Wave 9 (2017-2018), and Wave 10 (2018-2019).

income or in need of assistance with living costs[69]. Since May 2016, households with children have also become eligible, and the health of children has been affected by Universal Credit since then. In May 2016, the live service was implemented in all regions, which means that all children were affected simultaneously. Couples must make a joint claim for the household, even if one of the partners is not eligible[70]. Due to Universal Credit not having a specific threshold of household income that renders one eligible for UC, and considering that there were very few responses regarding the receipt of UC in the Understanding Society study (only 0.01% of respondents answered), it becomes challenging to precisely define which children were impacted by UC and which were not. Therefore, based on the findings of Wickham et al. (2020), I propose substituting the unemployment status as an indicator of whether one is affected by UC. In my view, parents who are unemployed would be influenced by UC, and subsequently, their children would also be affected by UC[71]. Therefore, children with unemployed parents are treated as the treatment group, while others are considered the comparison group. Wickham et al. (2020) argue that unemployed individuals are most likely to be affected based on the time scale of Universal Credit rollout and transition. Although a small proportion (2%) of the comparison group may have become eligible for Universal Credit during the rollout process, it is not possible to identify these respondents in the data[72]. Their inclusion in the comparison group provides a more conservative estimate of the intervention effect.

To examine the impact of Universal Credit on children's health, I begin by matching parents' job status and household characteristics with child survey data. I do not differentiate between natural, adoptive, and stepparents. The effect of UC on children's health is contingent upon their parents' employment status. I restrict the intervention group (children affected by Universal Credit) to those households where at least one parent is unemployed. The composition of the treatment group varies for each period. Specifically, if survey respondents transition into unemployment in

[69] https://www.gov.uk/universal-credit/eligibility

[70] https://www.gov.uk/government/publications/universal-credit-and-couples-an-introduction/universal-credit-further-information-for-couples

[71] Due to data limitations, I can only estimate the impact of UC on children whose parents are unemployed. In fact, children affected by UC are those whose parents are already eligible for some form of support, and there has been a significant change in their circumstances that may affect their current entitlements. These changes may include alterations to the claimant's financial situation, such as job loss or a reduction in wages, relocation to a new area, or modifications in household composition, such as a partner moving in or out.

[72] If I examine the end of 2018 when the full service of UC had been implemented, I find that the total number of employed people in the UK was 32,597,000, and the number of employed people on UC was 601,315. Therefore, the proportion of employed people on UC in the entire workforce was approximately 1.8% (601,315/32,597,000). If I look at the year 2016, the proportion was even smaller. Calculating as follows: the number of employed people on UC was 104,017, and the total number of employed people was 31,845,000. So, in 2016, the proportion of employed people on UC was 0.3%. Source: Office for National Statistics.

subsequent waves, they are assigned to the intervention group for that wave. Conversely, if respondents exit unemployment in subsequent waves, they are assigned to the comparison group for that wave. I exclude individuals from Northern Ireland as data on the availability of Universal Credit is not accessible to these local authorities. Furthermore, I exclude children whose parents' employment information is missing. If information regarding the date of the interview and the SDQ score is missing, the corresponding observations are also dropped. In the third step, in relation to the introduction of UC, observations are evenly distributed from 4 years before UC to 2 years after UC, with around 1200 observations. However, there are fewer observations in the 5th year before UC and the 3rd and 4th years after UC, so this data is removed. Also, because UC interviews for a single wave span three years, there are cases where individuals were interviewed twice in the same year but for different waves. Redundant information within the same year has been removed. A flowchart of participants and details of the study sample can be found in Figure 4.5.

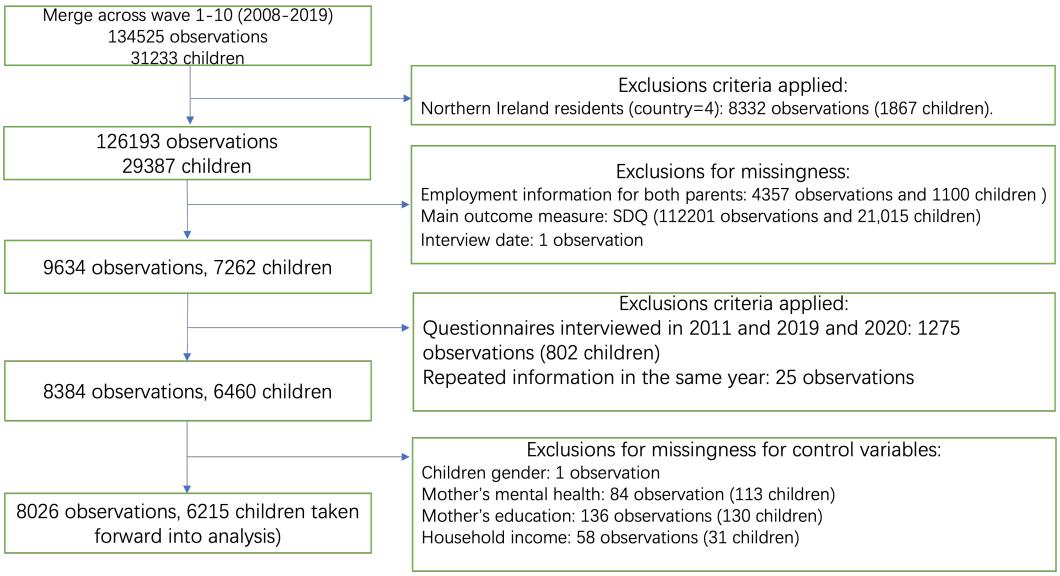


Figure 4.5: Flowchart of the child population and sample size

Note: This figure depicts the flowchart illustrating the selection process of the child population and the resulting sample size. The flowchart is similar to the study of Wickham et al. (2020)

4.5.1 Variable measurement

4.5.1.1 Dependent variable

The primary outcome for children is parent-reported psychological distress measured using the SDQ. The SDQ is a brief behavioral screening questionnaire designed for children aged 3 to 16. It consists of 25 items, each scored on a 3-point Likert-type

scale. These items can be summed up into five subscales: emotional problems, conduct problems, hyperactivity/inattention, peer relationship problems, and pro-social behavior. The detailed composition of the SDQ can be found in Table C.1 in Appendix. A total difficulties score is calculated by summing the scores of the first four subscales, resulting in a range of 0 to 40. To identify those who are considered to be at clinical risk, a dichotomized score is used. Scores ranging from 0 to 16 indicate no difficulties (scored as 0), while scores ranging from 17 to 40 indicate psychological distress (scored as 1)[73]. As a secondary outcome, the SDQ score is included as a continuous measure, and the results are presented in the robustness checks.

4.5.1.2 Independent variable

As Universal Credit was implemented nationwide in the UK, individuals became eligible for UC if they experienced changes in their circumstances, such as changes in employment status. Since May 2016, households with children can apply for UC if their circumstances change. In this study, children are assigned to the intervention group for a given wave if at least one of their parents is identified as unemployed, while they are assigned to the comparison group if at least one of their parents is identified as anything other than unemployed.

To measure parents' unemployment status, I utilize a question from the UKHLS survey that asks respondents about their current employment situation. The question is as follows: "Which of these options best describes your current employment situation? (1) Self-employed (2) In paid employment (3) Unemployed (4) Retired (5) On maternity leave (6) Looking after family or home (7) Full-time student (8) Long-term sick or disabled (9) On a government training scheme (10) Unpaid worker in a family business (11) Working in an apprenticeship (97) Doing something else" I construct an indicator variable, denoted as Elig, which takes a value of 1 for children if at least one of their parents in the household answers (3) (unemployed) to the above question, and 0 otherwise.

4.5.1.3 Control variables

Following the study by Batra and Hamad (2021), continuous covariates include the child's age and age-squared, inflation-adjusted income, and the mother's mental

[73] https://terapia.co.uk/wp-content/uploads/2020/05/SDQ-scoring_Instructions_4-18-years.pdf

health score. The inclusion of age-squared allows for the possibility of non-linear relationships between the covariates and the outcomes, as suggested by Boyd-Swan et al. (2016). I anticipate that the coefficients of age and age square are negative because the study by Dahl and Lochner (2012) shows that younger children are more affected by welfare reform. A negative coefficient of household income is expected, as suggested by the study of Akee et al. (2023), which indicates a negative relationship between household income and children's mental health. The characteristics of the mothers have also been included to control for potential differences, such as the mother's mental health. The mental health of the mother is measured using the UKHLS 12-item General Health Questionnaire (GHQ-12), which is employed to construct the mental health score for adults (Jackson, 2007)[74]. The coefficient of the mother's mental health is expected to be positive, as demonstrated by the study of Kahn et al. (2004), which shows a positive correlation between the mother's mental health and children's mental health.

Categorical covariates include the child's gender, the presence of a long-term health condition in the child, the mother's education, whether there is only one child in the family (Single child), and household structure (single or couples). The child's gender is included as a binary variable, where male is coded as 1 and female is coded as 0, to account for potential gender differences in the outcomes. I anticipate that the coefficient for gender is positive, in line with the findings of Dahl and Lochner (2012), who also suggest that boys are more affected by welfare reform. The presence of a long-term health condition in the child is captured as a dummy variable, equal to 1 if the child has a long-term health condition and 0 otherwise. Following the study of Hartas (2016), the other indicator is the mothers' educational degree. The highest educational qualifications are classified into several categories, including degree, other higher degree, A-level, GCSE/O-level, other qualifications, and no qualifications. I construct a dummy variable equal to 1 if the mother has a degree and 0 otherwise. I anticipate that the coefficient for the mother's degree will be negative, indicating that high maternal education is associated with better mental health in both girls and boys, consistent with previous studies (Meyrose et al., 2018). Furthermore, Goodarzi et al. (2003) demonstrate that the number of children in the household is a factor that affects children's mental health. I anticipate that the coefficient of the Single child is negative because Goodarzi et al. (2003) show that children living in households with multiple children are more vulnerable. Lastly, I use a dummy variable Single that equals one for single-parent households and zero otherwise. The coefficient for Single is expected to be positive, as suggested by Kellam et al. (1977), indicating that children's mental health is worse for those living in

[74]The GHQ-12 provides short self-reported measures of mental well-being in non-clinical settings, with various scores indicating the severity of symptoms related to anxiety, mental health issues, and depression. A higher mental health score represents poorer mental health.

single households.

4.5.2 Mechanisms

While the overall objective of Universal Credit was to consolidate six benefits into one, in practice, the implementation of UC was accompanied by several other individual policy changes. These additional policy changes will be taken into account in the analysis to estimate the mechanisms behind the treatment effect on mental health.

4.5.2.1 Household income

UC aims to strengthen incentives to work and transition out of the benefits system, partially through changes in household income, such as reductions in taper rates and modifications in benefit income. The overall expectation is that the total benefits paid out increase through UC as more individuals claim their full benefit entitlement with a single application compared to several applications under the legacy system. However, there are distributional changes in benefit income received by different groups of individuals, designed to strengthen incentives to work where they were previously weakest, including low-income households (Brewer and Hoynes, 2019). For example, employed couples receive the greatest increase in benefits, while single parents face the greatest loss. In practice, households with children might experience a decrease rather than an increase in income. Therefore, UC directly affects claimants' household income, and whether income increases or decreases depends on the claimants' situation.

Recent studies using Canadian and US data have documented a positive relationship between family income and child health, with a steeper slope of the gradient observed for older children compared to younger children (Case et al., 2002; Currie and Stabile, 2003). Based on these findings, I hypothesize that changes in household income serve as one mechanism that influences the mental health of children. Household income is measured as the current monthly net income derived from the labor market and all other sources, adjusted for taxes, deductions, and benefits. The logarithm of household income is measured in GB 2010 prices.

4.5.2.2 Usage of childcare

To be eligible for UC, individuals, including non-parents or single parents of a child aged three or over (or five or over before April 2017), are expected to fulfill the full work-related requirements, which involve actively dedicating 30 hours per week to job searching. When offered a job, claimants are obligated to accept it if they are unemployed or if the job increases their work hours and earnings, for those who are already employed. Failure to adequately meet the work-related commitment without acceptable reasons can result in benefit sanctions, including non-payment. Furthermore, UC is designed to eliminate the abrupt reduction in the support provided by the tax credit system at specific thresholds of work hours. Under the tax credit system, eligibility for working tax credit and support with childcare costs began at 16 hours of work per week for lone parents, resulting in inadequate rewards for individuals working fewer hours. Since April 2016, UC has increased the proportion of childcare costs that can be claimed back through Universal Credit from 70% to 85%. Consequently, to meet these conditions, parents are likely to spend less time with their children and rely more on childcare.

In the literature, it has been observed that multiple childcare arrangements are associated with communicable illnesses and diagnosed asthma in early childhood, and they appear to be risk factors for health problems during this period (Chen, 2013). Stein et al. (2013) also demonstrate that children who spend more time in group care, especially nursery care, are more likely to exhibit behavioral problems, particularly hyperactivity. Hence, increased usage of childcare services may be a pathway leading to poor mental health outcomes in children. For my analysis, I use a dummy variable that takes the value 1 if parents utilize childcare services and 0 otherwise.

In conclusion, the policy regulations regarding household income and the utilization of childcare services serve as two mediators through which the treatment effect (entering unemployment) may impact the mental health of children.

4.6 Methodology

4.6.1 Parallel trend

To assess the impact of Universal Credit on children's outcomes, I first examine whether the trends are parallel before the intervention. This involves comparing the trends in the outcomes of interest between the intervention and comparison groups during the pre-intervention period. Figure 4.6 displays the trend in the proportion of children with psychological distress in both the intervention and comparison groups before and after the introduction of Universal Credit. While the intervention and comparison groups may differ in terms of their mental health experiences prior to Universal Credit, this difference does not introduce bias in the difference-in-differences analysis. Upon the implementation of the policy change, the prevalence of psychological distress begins to increase among those eligible for Universal Credit. Conversely, the prevalence remains constant among individuals not affected by the change (comparison group).

The figure showing the proportion of children with mental health problems using event studies is shown in Figure 4.7 and the corresponding regression table is shown in Table C.3. From Figure 4.7, it can be seen that before the implementation of UC, there are no significant differences between the control group and the treatment group. However, in the first and second years after the policy, a greater proportion of children are experiencing mental health issues. This also suggests a parallel trend before the introduction of Universal Credit.

4.6.2 Descriptive statistics

Table 4.3 reports the descriptive statistics. The mean (SD) SDQ is 8.50 (5.87). The mean (SD) age of the children is 6.52 (1.5) years and the corresponding mean(SD) of age square is 44.77(19.57). On average, approximately 48% of families utilize childcare services, while 6% of children experience one parent's unemployment during this period (Elig). On average, about 10% of children have mental health issues. The average monthly household income stands at approximately £4,000[75]. On average, 3% of children deal with long-term health conditions. 51% of the children are boys.

[75]Household income is winsorized at the 1st and 99th percentile values. In other words, values corresponding to the 1st and 99th percentiles of its distribution are assigned to all observations that fall beyond those thresholds. The results remain the same if the data is not winsorized.

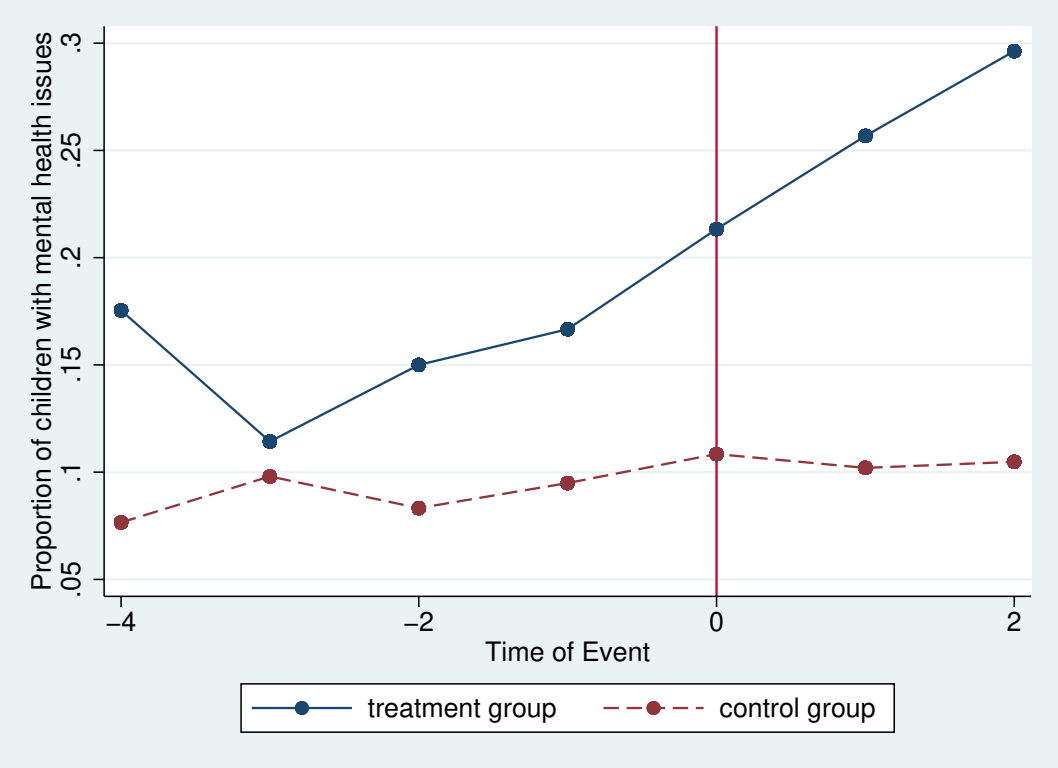


Figure 4.6: Graphical representation of parallel trends assumption in the intervention and comparison groups before and after the Universal Credit was introduced

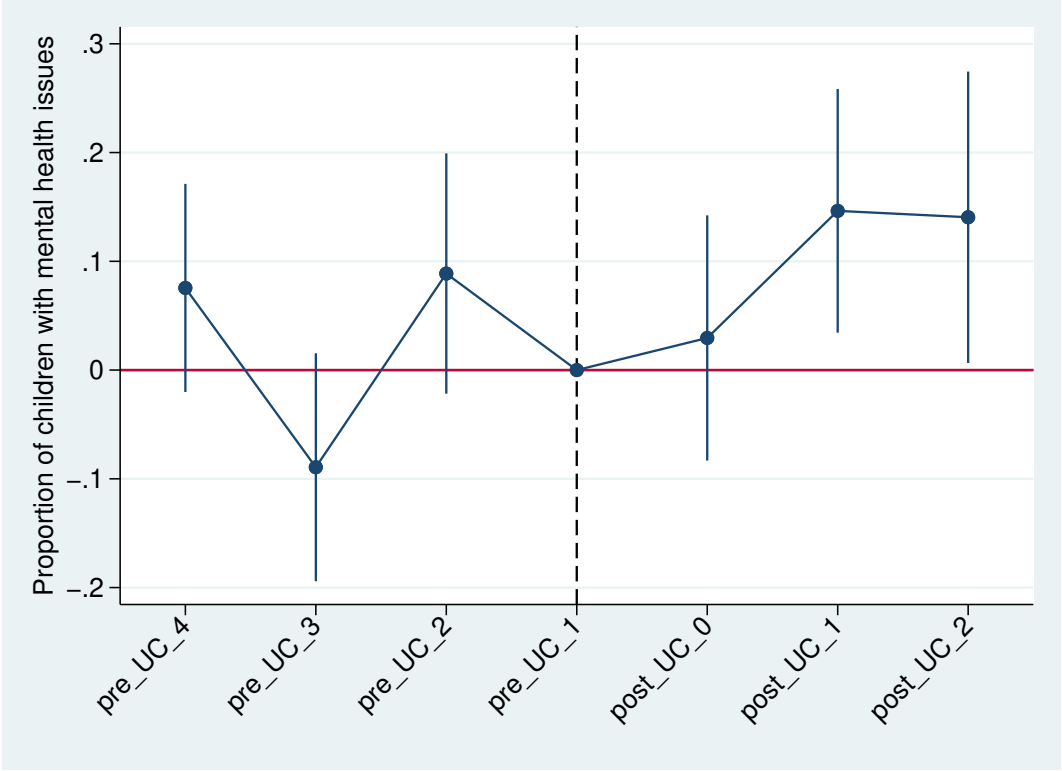
Note: This figure illustrates the parallel trends assumption in both the intervention and comparison groups before and after the introduction of Universal Credit. The Y-axis shows the proportion of children with psychological distress (%). The x-axis represents the time relative to the introduction of Universal Credit in 2016.

48% of mothers hold a degree. Additionally, the mean score for mothers' mental health is 2.01 (3.21). 18% of families consist of only one child.

4.6.3 Univariate test

Table 4.4 presents the baseline characteristics of the intervention and comparison groups. Panel A displays the mean values across all time periods, while Panel B shows the mean values before UC, and Panel C shows the mean values after 2016. The variable Excess is a dummy variable that takes the value of 1 if the SDQ score for children is equal to or above 17, and 0 otherwise. It indicates that psychological distress is more prevalent in the intervention group compared to the comparison group. Furthermore, this disparity becomes more pronounced after the introduction of UC, with a 6% to 15% higher prevalence in the treatment group. Consistently, the average SDQ scores for the treatment group are 2.28 points higher than those of the comparison group over the entire period. After the introduction of UC, the

Figure 4.7: Trends in the proportion of children experiencing mental health issues



Note: The figure provides event study estimates of dynamic effects of participating in the treatment coming from using the introduction of Universal Credit. I use the period prior to the introduction of Universal Credit as the baseline (Year 2015). Ordinary Least Square (OLS) coefficient estimates and their 90% confidence intervals are reported.

$$Excess_{it} = \alpha + \sum_{j=2}^{J} \beta_j (\text{Pre\_UC\_j})_{it} + \sum_{k=1}^{K} \gamma_k (\text{Post\_UC\_k})_{it} + \mu_i + \lambda_t + \varepsilon_{st}$$

μ_i and λ_t are individual and time-fixed effects, and ε_{it} is an unobserved error term. J and K Pre_UC lags and Post_UC leads are included respectively. In equation 1, Pre_UC_j and Post_UC_k to the event of interest are defined as follows:

$$\begin{aligned}
(\text{Pre_UC_J})_{it} &= 1\left[t \leq \text{ Event } - J\right] \\
(\text{Pre_UC_j})_{it} &= 1\left[t = \text{ Event } - j\right] \text{ for } j \in \{1, \ldots, J-1\} \\
(\text{Post_UC_k})_{it} &= 1\left[t = \text{ Event } + k\right] \text{ for } k \in \{1, \ldots, K-1\} \\
(\text{Post_UC_k})_{it} &= 1\left[t \geq \text{ Event } + K\right].
\end{aligned}$$

Table 4.3: Descriptive statistics

(N=8026)	Mean	Median	SD	Min	Max
SDQ	8.50	7.00	5.87	0.00	37.00
Excess	0.10	0.00	0.30	0.00	1.00
Elig	0.06	0.00	0.25	0.00	1.00
Childcare	0.48	0.00	0.50	0.00	1.00
Household income	3997.89	3212.76	8172.97	0.00	655277.75
Age	6.52	8.00	1.50	4.00	10.00
Age square	44.77	64.00	19.57	16.00	100.00
Longtime health	0.03	0.00	0.17	0.00	1.00
Male	0.51	1.00	0.50	0.00	1.00
Mothers degree	0.48	0.00	0.50	0.00	1.00
Mothers mental health	2.01	0.00	3.21	0.00	12.00
Single child	0.16	0.00	0.36	0.00	1.00
Single	0.18	0.00	0.38	0.00	1.00

Note: The table presents descriptive statistics for the variables used in this chapter. Mean represents the arithmetic average of the values, Median is the middle value in the sorted data, SD stands for standard deviation, Min is the smallest observed value, and Max represents the largest observed value. Table C.2 shows the definition of all variables used. Household income is winsorized at the 1st and 99th percentile values.

SDQ scores in the treatment group are 0.6 points higher than before. There are no differences between participants in the intervention group and the comparison group in terms of age and gender. The average age of the children is 6.5 years old, with an equal distribution of males and females. Following previous studies (e.g., Rishel et al. (2006); Booker et al. (2014)), I also include the characteristics of mothers in the analysis. The results indicate that there are significant differences between UC-eligible and ineligible children, and these differences persist both before and after the implementation of UC. Mothers who are less educated, have mental health issues, and have lower household incomes are more likely to be affected by Universal Credit. The control group utilizes childcare services more frequently. Furthermore, children living in single-parent households within the treatment group are more likely to be affected by the implementation of Universal Credit. The two-way fixed effects method is employed to control for these fixed differences in the analysis.

4.6.4 Estimation of the treatment effect

To estimate the treatment effect on the mental health outcome Excess_{it} of child i observed in year t, I employ the following regression model:

$$\textit{Excess}_{it} = \alpha_0 + \alpha_1 \textit{Elig}_{it} + \alpha_2 \textit{Post}_t + \alpha_3 \textit{Elig}_{it} \times \textit{Post}_t + \alpha_4 X_{it} + \delta_t + \gamma_i + \varepsilon_{it} \quad (4.6.4.1)$$

Table 4.4: Univariate test

	(1) *Elig=0*			(2) *Elig=1*			(3) *p-value*	
	Mean (1)	Std.Dev. (2)	Obs (3)	Mean (4)	Std.Dev. (5)	Obs (6)	T-test (7)	P-value (8)
Panel A: The mean difference over the entire period								
SDQ	8.38	5.80	7511	10.21	6.56	515	-2.28***	(0.00)
Excess	0.09	0.29	7511	0.18	0.39	515	-0.15***	(0.00)
Elig	0.00	0.00	7511	1.00	0.00	515	-0.96***	(0.00)
Childcare	0.50	0.50	7495	0.20	0.40	511	0.29***	(0.00)
Household income	4127.89	8423.82	7511	2101.92	1499.88	515	1846.22***	(0.00)
Age	6.52	1.50	7511	6.53	1.50	515	-0.04	(0.74)
Age square	44.76	19.57	7511	44.92	19.56	515	-0.52	(0.73)
Longtime health	0.03	0.17	7511	0.05	0.21	515	-0.01	(0.48)
Male	0.51	0.50	7510	0.50	0.50	515	-0.02	(0.69)
Mothers degree	0.50	0.50	7511	0.25	0.43	515	0.22***	(0.00)
Mothers mental health	1.95	3.15	7511	2.90	3.78	515	-0.81**	(0.01)
Single child	0.16	0.36	7511	0.17	0.38	515	-0.04	(0.24)
Single	0.17	0.37	7511	0.30	0.46	515	-0.14***	(0.00)
Panel B: The mean difference before 2016								
SDQ	8.29	5.63	4564	9.94	6.20	343	-1.65***	(0.00)
Excess	0.09	0.28	4564	0.15	0.36	343	-0.06**	(0.00)
Elig	0.00	0.00	4564	1.00	0.00	343	-1.00	(.)
Childcare	0.49	0.50	4560	0.20	0.40	340	0.28***	(0.00)
Household income	4142.17	10305.70	4564	2057.13	1125.82	343	2085.03***	(0.00)
Age	6.48	1.50	4564	6.52	1.50	343	-0.04	(0.60)
Age square	44.19	19.57	4564	44.74	19.53	343	-0.55	(0.61)
Longtime health	0.03	0.17	4564	0.05	0.22	343	-0.02	(0.07)
Male	0.51	0.50	4564	0.48	0.50	343	0.03	(0.27)
Mothers degree	0.49	0.50	4564	0.24	0.43	343	0.25***	(0.00)
Mothers mental health	1.86	3.06	4564	2.95	3.81	343	-1.09***	(0.00)
Single child	0.16	0.37	4564	0.16	0.37	343	-0.00	(0.86)
Single	0.18	0.38	4564	0.29	0.45	343	-0.11***	(0.00)
Panel C: The mean difference after 2016								
SDQ	8.51	6.04	2947	10.73	7.23	172	-2.22***	(0.00)
Excess	0.10	0.30	2947	0.25	0.43	172	-0.15***	(0.00)
Elig	0.00	0.00	2947	1.00	0.00	172	-1.00	(.)
Childcare	0.51	0.50	2935	0.19	0.40	171	0.31***	(0.00)
Household income	4105.79	4048.61	2947	2191.24	2053.07	172	1914.55***	(0.00)
Age	6.59	1.50	2947	6.56	1.51	172	0.03	(0.81)
Age square	45.65	19.54	2947	45.28	19.68	172	0.37	(0.81)
Longtime health	0.03	0.17	2947	0.04	0.20	172	-0.01	(0.50)
Male	0.50	0.50	2946	0.52	0.50	172	-0.02	(0.62)
Mothers degree	0.52	0.50	2947	0.27	0.44	172	0.25***	(0.00)
Mothers mental health	2.08	3.29	2947	2.80	3.72	172	-0.72*	(0.01)
Single child	0.15	0.36	2947	0.19	0.39	172	-0.04	(0.18)
Single	0.16	0.36	2947	0.31	0.47	172	-0.16***	(0.00)

Note: This table presents summary statistics for the main variables used for the analysis. Columns (1) to column (3) and columns (4) to column (6) show the mean, standard deviation, and number of observations for the treatment group and control group respectively. Column (7) and column (8) compare the mean of two groups using a t-test. Table C.2 shows the definition of all variables used. Household income is winsorized at the 1st and 99th percentile values.

In this model, the variable Elig_{it} is a dummy variable that takes the value 1 if one of the children's parents is unemployed and 0 otherwise. The coefficient α_1 captures the differences in children's mental health when their parents enter a state of unemployment. The variable Post_t indicates whether year t occurs after or before the intervention (post-intervention (2016 and thereafter)=1; pre-intervention (before 2016)=0). The variable of interest, $\text{Elig}_{it} \times \text{Post}_t$, represents the interaction term between the policy exposure period and the intervention group. This interaction term is set to zero in the years before the adoption of Universal Credit in 2016 and takes the value of one if one of the children's parents becomes unemployed after the introduction of UC in 2016. As Universal Credit has reduced benefits for children and their households, the interaction term is expected to amplify children's mental health problems, displaying a negative sign, thereby confirming the first hypothesis. To account for unobserved individual and time-specific factors, the model includes individual fixed effects (γ_i) and year-fixed effects (δ_t). The set of covariates X_{it} in the model includes children's age, children's age squared, gender, mothers' education, mothers' mental health, household income, household type, and the number of children in the household. The error term ε_{it} is assumed to have a conditional mean of zero. To address potential correlation within the same primary sampling unit, standard errors are clustered at the primary sampling unit level.

The underlying idea of the identification strategy is to compare the mental health of two children whose parents have different employment statuses. The assumption is that adults who become unemployed are affected by the UC welfare reform, which, in turn, may impact children's mental health within the household. A potential concern is that children with unemployed parents are more likely to have mental health problems, which introduces endogeneity. However, Bun and Harrison (2019) demonstrate that when the functional form identification is not valid, the interaction term between endogenous regressors and exogenous covariates remains consistent, and standard ordinary least squares inference can be applied. Therefore, while the coefficient of Elig_{it} may not be interpreted causally, I can still interpret the interaction term $\text{Elig}_{it} \times \text{Post}_t$ consistently and estimate the effect of the UC welfare reform on children's mental health.

4.6.5 Mediators for the estimated treatment effects

While estimating the total treatment effect is crucial, understanding the underlying mechanisms behind the effect is equally important for future policy reform in the UK and other countries (Gelman and Imbens, 2013). Which aspects of welfare reform contribute to the exacerbation of children's mental health in households with unem-

ployed parents? To shed light on this question, the framework aims to estimate the causal effects of the welfare reform on two mediators that reflect the specific sub-policy rules of Universal Credit: household income and the use of childcare services.

To analyze the causal treatment effect on mediator M_{it} for child i in period t, I estimate the benchmark equation 4.6.4.1 with M_{it} as the dependent variable. By applying the same identification assumptions as equation (1), I can identify the causal treatment effect on each mediator by estimating the following equation:

$$M_{it} = \beta_0 + \beta_1 Elig_{it} + \beta_2 Post_t + \beta_3 Elig_{it} \times Post_t + \beta_4 X_{it} + \delta_t + \gamma_i + \varepsilon_{it} \quad \text{(4.6.5.1)}$$

Where M_{it}^k represents mediator k for individual i in year t. In this regression, M_{it}^k represents household income and childcare usage. The definitions of the variables Elig_{it}, Post_t, and $\text{Elig}_{it} * \text{Post}_t$ remain the same as before. I also include individual fixed effects (γ_i) and year-fixed effects (δ_t). The set of control variables X remains the same as in Equation 4.6.4.1. Standard errors are clustered at the primary sampling unit. When the dependent variable is the logarithm of the household income, I expect the coefficient of $\text{Elig}_{it} * \text{Post}_t$ to be negative and significant. This is because unemployed parents may receive lower benefit payments based on UC policy, leading to a reduction in household income. Regarding childcare usage, I anticipate the coefficient of the interaction term (β_3) to be positive. This is because UC requires parents to spend more time on job searching and meet job search requirements, potentially resulting in increased childcare usage. This increase in childcare usage may have a negative impact on the mental health of children. If the coefficient of β_3 in the regression results aligns with the expected sign, I can separately validate hypotheses 2 and 3.

4.7 Results

4.7.1 Treatment effect on mental health

Did the UC welfare reform worsen mental health problems for children in households with unemployed parents? I employ a two-way fixed effects model to estimate the effects of the introduction of Universal Credit on children's mental health. This longitudinal method allows me to compare changes in outcomes in the intervention population with changes in outcomes in the comparison population before and after the introduction of Universal Credit across the UK. The two-way fixed effects model controls for all time-invariant differences between the intervention and comparison

populations. I have previously tested the parallel trends assumption, which confirms that the difference between the change in outcomes between the two populations provides an unbiased estimate of the intervention effect.

I present the baseline results in Table 4.5. Columns (1-3) represent the parameters of interest from the benchmark model in Equation 4.6.4.1, which include an indicator for eligibility, an indicator for before or after 2016, and an interaction between the two. In column (1), neither the individual nor the year-fixed effects are included. Then, I include the year-fixed effects in column (2) and both the individual and year-fixed effects in column (3). The results are consistent across different identification strategies. The coefficient of the interaction term Eligpost represents the treatment effect and identifies the effect of a child being in a household with unemployed parents.

In column (3), the results indicate that as an adult enters unemployment, the likelihood of children experiencing mental health problems increases by 1%, although the coefficient of Elig is not statistically significant. This finding is consistent with the literature that estimates the negative impact of parents' unemployment on the mental health of children from low-income families (Dockery et al., 2009; Vahedi et al., 2019; Strazdins et al., 2010). The coefficient of Post suggests that there are no significant changes in mental health for the comparison group after the introduction of UC. Moving to the parameter of interest, the positive coefficient on the interaction between unemployment and post in column (3) indicates that the UC system exacerbates the deterioration of mental health in children living in households with unemployed parents, compared to children with employed parents. Specifically, the effect of UC is to increase the likelihood of mental health issues by 9% among eligible children. After controlling for individual and year-fixed effects, only household income shows a negative correlation with mental health, which is consistent with the findings in the literature(Case et al., 2002; Currie and Stabile, 2003). Therefore, the results are consistent with the first hypothesis, demonstrating that UC has a negative impact on children's mental health.

4.7.2 Mediation analysis

In this section, I aim to estimate the causal treatment effect of welfare reform on a set of mediators associated with the policy rules. Firstly, I will examine whether there are significant changes in household income following the implementation of Universal Credit that could potentially contribute to adverse effects on children's mental health. Secondly, the government has implemented specific job search re-

Table 4.5: Treatment effect on mental health

	(1)	(2)	(3)
Elig	0.01	0.01	0.01
	(0.02)	(0.04)	(0.04)
Eligpost	0.09**	0.09*	0.09*
	(0.04)	(0.05)	(0.05)
Post	0.01**	0.03*	0.00
	(0.01)	(0.02)	(.)
Age	0.10	-0.32	-0.34
	(0.15)	(0.33)	(0.32)
Agesquare	-0.01	0.02	0.03
	(0.01)	(0.03)	(0.02)
Longtime health	0.26***	0.09	0.09
	(0.03)	(0.06)	(0.06)
Male	0.03***	0.00	0.00
	(0.01)	(.)	(.)
Mothers degree	-0.05***	0.10	0.09
	(0.01)	(0.07)	(0.07)
Mothers mental health	0.01***	0.00	0.00
	(0.00)	(0.00)	(0.00)
Single child	-0.00	0.03	0.03
	(0.01)	(0.03)	(0.03)
Single	0.01	-0.05	-0.05
	(0.01)	(0.03)	(0.03)
Household income	-0.03***	-0.05***	-0.04**
	(0.01)	(0.02)	(0.02)
Constant	-0.03	1.37	1.43
	(0.45)	(1.03)	(1.01)
N	8025	8025	8025
Individual fixed effects	No	YES	YES
Year fixed effects	No	No	YES

Note: This table reports the impact of Universal Credit on children's mental health using equation 4.6.4.1. The dependent variable, Excess, is equal to 1 for children with SDQ scores higher than 17, and 0 otherwise. The coefficient for Elig*Post is the parameter of interest and measures the differential effect of entering unemployment under UC on children's mental health. Standard errors are clustered as the primary sampling units. Individual and year-fixed effects are controlled in the regression. *** denotes significance at a 1% level, ** denotes significance at a 5% level, and * denotes significance at a 10% level. Data source: UKHLS (2009-2019). Household income is winsorized at the 1st and 99th percentile values.

quirements that adults must meet to qualify for benefits. Moreover, since April 2016, the government has increased the coverage of childcare costs from 70 percent to 85 percent. Consequently, it is anticipated that there might be an increase in childcare utilization, which has been linked to poorer mental health outcomes for children.

4.7.2.1 Household income

Analysis conducted by Finch (2016) reveals that, in comparison to entitlements in the tax credit system, the majority of working families (2.5 million out of 4.5 million entitled in either or both systems) experience a decrease in their financial benefits, with an average loss of £41 per week for those who are negatively affected after the implementation of Universal Credit. Hence, Table 4.6 aims to investigate whether reduced household income is one of the mechanisms leading to worsened mental health conditions in children. The dependent variable used in the regression is the logarithm of household income.

Regarding the control variables, Strohschein (2005) conducts a study on Household Income Histories and Child Mental Health Trajectories, incorporating control variables such as family structure, the child's age, gender, and maternal education. Cooper and Stewart (2021) also demonstrate in the study that maternal mental health influences household income. Furthermore, there is evidence suggesting a correlation between the number of children and household income (Akee et al., 2018). Therefore, the control variables introduced in the baseline analysis remain in this regression model. In addition, based on their research, I include government office region fixed effects[76]. Moreover, other studies propose that factors such as working hours, occupation, and housing status (renting or owning) impact household income (Murfin et al., 2020). However, it's worth noting that these variables have limited data availability, resulting in the exclusion of approximately half of the dataset.

In Table 4.6 in column (3), the negative and significant coefficient of Elig suggests that, when comparing two children with different parental employment statuses, children in the intervention group (under UC) have lower household incomes. However, the coefficient of interest, Eligpost, is negative and insignificant, indicating that there is a negligible decrease (0.04 percentage points) in log household income for the intervention group relative to the comparison group, and this difference is statistically insignificant under UC. Therefore, a small reduction in household income

[76]The government region includes North East, North West, Yorkshire and the Humber, East Midlands, West Midlands, East of England, London, South East, South West, Wales, and Scotland, as indicated by GOR_DV in the Understanding Society dataset.

Table 4.6: The treatment effect on household income as a mediator

	(1)	(2)	(3)
Elig	-0.39***	-0.24***	-0.23***
	(0.03)	(0.06)	(0.06)
Eligpost	-0.01	-0.03	-0.04
	(0.05)	(0.07)	(0.07)
Post	0.00	-0.04	0.00
	(0.01)	(0.02)	(.)
Age	-0.25	-0.06	-0.03
	(0.23)	(0.29)	(0.31)
Age square	0.02	0.01	0.01
	(0.02)	(0.02)	(0.02)
Longtime health	-0.06**	0.04	0.03
	(0.03)	(0.04)	(0.04)
Male	-0.00	0.00	0.00
	(0.01)	(.)	(.)
Mothers degree	0.29***	0.13	0.15
	(0.01)	(0.09)	(0.09)
Mothers mental health	-0.01***	-0.00	-0.00
	(0.00)	(0.00)	(0.00)
Single child	0.00	0.04	0.04
	(0.02)	(0.04)	(0.04)
Single	-0.60***	-0.62***	-0.63***
	(0.02)	(0.05)	(0.05)
Constant	8.71***	8.63***	8.62***
	(0.73)	(0.92)	(0.95)
N	8019	8019	8019
Government office region FE	YES	YES	YES
Individual FE	NO	YES	YES
Year FE	NO	NO	YES

Note: This table reports the treatment effect -the differential effect of entering unemployed on household income mediator using equation 4.6.5.1. Standard errors are clustered at the primary sampling unit. Specification includes fixed effects for individuals, years, and regions. *** denotes significance at a 1% level, ** denotes significance at a 5% level, and * denotes significance at a 10% level. Data source: UKHLS (2009-2019). Household income is winsorized at the 1st and 99th percentile values.

does not seem to be the primary factor contributing to worse mental health in children. One potential explanation is that a minor change in household income does not significantly impact overall quality of life. After controlling for individual fixed effects, only the coefficient for Single is statistically significant and negative. These results indicate that the income of single-parent households is lower than couples.

This finding is consistent with the results reported by Finch (2016), who demonstrates only a minimal weekly change in household income for various household types. Furthermore, Brewer et al. (2022) even find positive changes in household income for couples with children under UC, while single households experience losses. Moreover, the study conducted by Propper et al. (2007) indicates that there is nearly no direct impact of income on child health. Kuehnle (2014) also suggests that family income is not a major determinant of child health in the UK. Overall, I have not found evidence that UC has significantly decreased household income before and after 2016.

4.7.2.2 Childcare

Table 4.7 presents the estimated causal treatment effect of Universal Credit using the benchmark model 4.6.5.1 and identifies the differential impact on childcare service usage when considering households with unemployed parents.

According to Chen (2013), who studies childcare arrangements and their impact on children's health outcomes, the research includes controls for family structure, the child's age, gender, maternal education, maternal health status, and the number of children in the household. Kim and Gallien (2016) demonstrate that household income is also a factor influencing childcare choices. Therefore, the controls introduced in the baseline analysis are included in this regression. Additionally, based on their study, I have included race as an additional control variable. Furthermore, other studies suggest that extended family plays a role in affecting childcare choices (Shang, 2008). However, the data for this variable is constrained, resulting in the exclusion of nearly half of the data points.

In column (3) of Table 4.7, the focus is on investigating whether more frequent usage of childcare is a potential mechanism underlying the negative mental health effects of UC. The coefficient for Elig indicates that prior to the implementation of UC, children with unemployed parents used significantly less childcare compared to the control group. This disparity may be attributed to the high cost of childcare. The positive and significant coefficient of Eligpost suggests that the introduction of

Table 4.7: The treatment effect on childcare usage as a mediator

	(1)	(2)	(3)
Elig	-0.12***	-0.15***	-0.15***
	(0.03)	(0.05)	(0.05)
Eligpost	0.03	0.15**	0.16**
	(0.04)	(0.07)	(0.07)
Post	0.02**	0.02	0.00
	(0.01)	(0.03)	(.)
Age	-0.25	-0.08	-0.00
	(0.21)	(0.32)	(0.31)
Age square	0.02	0.01	0.00
	(0.02)	(0.02)	(0.02)
Longtime health	-0.06**	-0.02	-0.01
	(0.03)	(0.06)	(0.06)
Male	-0.00	0.00	0.00
	(0.01)	(.)	(.)
Mothers degree	0.18***	0.32***	0.32**
	(0.01)	(0.12)	(0.13)
Mothers mental health	0.00	-0.00	-0.00
	(0.00)	(0.00)	(0.00)
Single child	0.06***	0.09	0.08
	(0.02)	(0.05)	(0.05)
Single	0.17***	-0.03	-0.03
	(0.02)	(0.05)	(0.05)
Household income	0.21***	0.08***	0.08***
	(0.01)	(0.03)	(0.03)
race	-0.08***	0.00	0.00
	(0.01)	(.)	(.)
Constant	-0.42	-0.05	-0.34
	(0.65)	(1.02)	(0.98)
N	7892	7892	7892
Individual FE	NO	YES	YES
Year FE	NO	NO	YES

Note: This table reports the treatment effect -the differential effect of entering unemployed on childcare service mediator using equation 4.6.5.1. Standard errors are clustered at the primary sampling unit. Specification includes fixed effects for individuals and years. *** denotes significance at a 1% level, ** denotes significance at a 5% level, and * denotes significance at a 10% level. Data source: UKHLS (2009-2019). Household income is winsorized at the 1st and 99th percentile values.

UC led to an increased usage of childcare among unemployed parents. Specifically, under UC, parents who became unemployed are 16 percentage points more likely to use childcare compared to before, in comparison with the control group. This finding indicates that increased childcare utilization is a pathway through which children's mental health worsens.

One possible explanation is that parents are required to allocate time to job searching, resulting in less time available to spend with their children, thereby negatively impacting their mental health. This conclusion aligns with the findings of Chen (2013), which demonstrate that an increase in the total number of childcare arrangements is associated with a higher risk of ear infections, gastrointestinal illness, and diagnosed asthma in children. He further highlights that both center-based care and non-relative care arrangements can contribute to a greater likelihood of health problems in young children. Similarly, Baker et al. (2019) examine the effects of the introduction of very low-cost childcare for children aged 0–4 in Quebec in 1997, which serves as the largest experiment with universal child care in North America in recent years. Their study reveals substantial increases in maternal labor supply and the utilization of childcare. They also find that the negative effects on noncognitive outcomes persist into school age, and cohorts with increased childcare access experience worse health, lower life satisfaction, and higher crime rates later in life. Overall, the results align with the third hypothesis, indicating that increased childcare usage is one mediator through which UC affects children's mental health.

In column (3), the positive coefficient of Mother's degree shows that mothers with higher levels of education are more likely to use childcare services, which aligns with the findings of Chen (2013). Additionally, other studies have shown that families utilizing multiple childcare arrangements tend to have mothers with higher levels of education compared to those relying on single arrangements (Folk and Yi, 1994). Furthermore, the coefficient of Household income is positive and significant, indicating that wealthier families are more likely to choose childcare services. This finding aligns with the results of Gable and Cole (2000). A study conducted by the Network et al. (1997) has demonstrated that family economics primarily influence the amount and type of childcare that children receive. In comparison to low-income families, those with higher incomes possess greater financial capacity when making childcare arrangements (Hofferth, 1991), and they tend to opt for more organized and formal childcare arrangements (Hofferth and Wissoker, 1992).

In conclusion, UC does not substantially reduce family income; however, to be eligible for UC, parents are required to dedicate significant amounts of time to meet the program's conditions (such as spending 30 hours per week searching for employment). This can result in a lack of parental companionship for children and an in-

creased reliance on childcare support, ultimately leading to a decline in children's mental health.

4.7.3 Robustness checks

4.7.3.1 Using SDQ scores

In this section, I present several robustness checks. Firstly, I employ SDQ scores as a continuous measure, similar to the approach used by Wickham et al. (2020). The results are displayed in Table C.4. In column (1), in the overall sample, the changes in SDQ score are not significant as reflected by the insignificant coefficient of Eligpost. However, when I divide the sample into age groups of 5 (column 2) and 8 (column 3), it becomes evident that the score significantly increases for the age group of 5, while there is no significant change for the age group of 8. In detail, the SDQ score of children aged 5 experiences an increase of 4.85 compared to before the introduction of UC. This suggests that younger children experience a greater impact on their mental health due to UC-induced issues. The results are consistent with the findings of Duncan and Brooks-Gunn (2000). A potential explanation could be that children at younger ages rely heavily on their parents for basic necessities such as food, shelter, and healthcare. Any changes in household income can have an immediate and direct effect on their well-being.

As for controls, in column (1), it can be observed that the SDQ score is significantly affected by maternal mental health scores. To address potential endogeneity issues arising from the impact of maternal mental health, I examined whether there are significant changes in maternal mental health before and after 2016. The regression results, presented in Table C.5, indicate that the interaction term is not statistically significant. Therefore, it can be concluded that changes in maternal mental health do not significantly contribute to the variations in children's mental health during this period.

4.7.3.2 Using stable treatment status

Difference-in-Difference (DiD) estimation has gained widespread popularity as a valuable method for assessing causal relationships (Ashenfelter and Card, 1984; Bertrand et al., 2004; Angrist and Pischke, 2009). This approach involves the identification of specific interventions or treatments, followed by a comparison of the differences

in outcomes before and after the intervention between groups affected by the intervention and unaffected groups. The framework typically employs a 2x2 design, where Group 1 (the Treatment Group) is evaluated before and after the intervention, as is Group 2 (the Control Group). This design allows researchers to evaluate the causal impact of an intervention or policy change by contrasting how outcomes evolve over time in the treatment group in comparison to the control group.

To address the issue of treatment status staggering and provide unbiased results, I define the treatment group as children whose parents are unemployed for at least one period and consider them as belonging to the treatment group for the entire period. Children whose parents are always employed are considered the control group. This stable treatment status approach allows for the implementation of the difference-in-difference methodology. The results, presented in Table C.6, confirm the baseline conclusions, showing that children in the treatment group are 8% more likely to experience a mental health issue. I also consider the treatment group based on the treatment irreversibility principle, meaning that once treated, the children are considered ever treated. The results remain consistent, supporting the robustness of the baseline findings.

4.7.3.3 Propensity score matching

The utilization of Propensity Score Matching (PSM) holds great significance in empirical research and policy evaluation (Persson et al., 2003; Lavy, 2002; Jalan and Ravallion, 2003). PSM represents a distinct nonexperimental evaluation technique that leverages data from a group of units unaffected by the intervention to estimate the hypothetical outcomes of participating units in the absence of the intervention. This approach enables the comparison of outcome disparities between participants and nonparticipants who share similar observational characteristics, facilitating the approximation of intervention effects (Heinrich et al., 2010).

Based on the methods outlined by Dehejia and Wahba (1998); Imbens (2000); Heckman et al. (1997), I use three different techniques to match between samples from the intervention and control groups: the tenth-nearest neighbor, kernel, and local linear matching algorithms. Dehejia and Wahba (1998) use a 1-1 nearest neighbor matching method to ensure that each treatment unit is paired with the closest unit in the control group based on parametric propensity scores. Kernel matching methods involve matching processing units to all control units while assigning weights proportional to the degree of similarity between processing units and control units (Imbens, 2000). As suggested by Heckman et al. (1997), local linear matching ex-

tends the concept of kernel matching by introducing a linear term in the weighting function, aiming to enhance the matching process and mitigate potential biases.

The matching variables encompass the control variables detailed in Appendix C.2. The efficacy of the matching is visually represented in Figure C.1, with further details provided in Table C.7. The regression results can be found in Table C.8. The results obtained through propensity score matching corroborate the earlier findings. The coefficient of Eligpost is consistently positive and statistically significant across various matching techniques, with a magnitude similar to the baseline. In other words, the treatment group exhibits a 9% higher likelihood of experiencing mental health issues following the introduction of Universal Credit.

4.7.4 Heterogeneity tests

4.7.4.1 By children gender

Understanding potential gender differences in the effects of Universal Credit on children's outcomes holds significant importance for elucidating and addressing gender disparities in social and economic outcomes later in life, as underscored in the research conducted by (Baker and Milligan, 2016). This exploration can shed light on how policy interventions like Universal Credit may impact boys and girls differently during their formative years, potentially influencing their educational attainment, employment prospects, and overall well-being in adulthood.

To examine if Universal Credit has a differential impact based on children's gender, I construct a dummy variable, Male, which equals 1 if the child is male and 0 otherwise. The results, as presented in Table C.9 in columns (1) and column (2), indicate that there are no discernible differences between boys and girls regarding the impact of UC on their mental health. One possible reason is that UC may have implemented similar measures in its policy approach for boys and girls, resulting in a comparable policy impact on both. This suggests that the policy may not have been specifically designed to address gender differences, or its effects on both genders might be relatively balanced.

4.7.4.2 By number of children in the household

The impact of Universal Credit can be influenced by the number of children within a household. This variation in impact arises from UC's two-child limit policy, which may have a more pronounced effect on families with multiple children, as discussed in the study by Child Poverty Action Group (2017). Consequently, I posit a hypothesis that children's mental well-being in households with more than one child experiences a greater degree of impact compared to those in single-child households. This hypothesis is rooted in the policy's inherent constraints on larger families and its potential consequences on their access to vital resources and support systems.

Columns (3) and column (4) in Table C.9 display the results. The negative treatment effect of parental unemployment is more pronounced for children in households with multiple children compared to those in households with only one child. This finding aligns with the study by Goodarzi et al. (2003), which shows that children from multiple-child households have a higher prevalence of conduct disorder and other behavioral disorders compared to children from single-child families, based on parents' and teachers' reports. However, the Chow test indicates that there is no significant difference between the two groups.

4.7.4.3 By household type

Analyzing differential treatment effects across various household compositions is essential for policies aimed at mitigating the unintended negative consequences of welfare reform. Such analysis enables policymakers to customize their approaches to meet the unique challenges and requirements of different types of households, thereby ensuring that welfare reform efforts are both effective and equitable for a broad range of beneficiaries. The study by Brewer et al. (2022) highlights that Universal Credit affects different household structures disproportionately, particularly impacting single households more negatively than couples. Consequently, I hypothesize that children's mental health in single-parent households is more significantly affected.

In columns (5) and column (6) of Table C.9, it reveals clear heterogeneity in the treatment effects by household type. Lone parents, who lack spousal income or support, experience a significant exacerbation of their children's mental health issues. In contrast, couples can potentially buffer against income changes or stress from stricter job search requirements through adjustments in the spouse's labor supply or increased support (Tominey, 2016; Brewer et al., 2022). Thus, children living with

couples are less affected by Universal Credit.

4.8 Concluding remarks

This paper examines the unintended consequences of welfare reform in the UK, specifically the transition from a system where individuals or households apply for multiple benefits to the Universal Credit system, which consolidates six benefit applications into one. The aim of this reform is to reduce administrative burden and incentivize employment with a sustainable income.

The study utilizes data from the UK Household Longitudinal Study (UKHLS) from 2009 to 2018, including 8,026 children in England, Wales, and Scotland. Following the approach of Wickham et al. (2020), the treatment group consists of children with unemployed parents, while the comparison group consists of children with employed parents. Eligibility for UC is determined by the unemployment status of at least one parent in the household. To assess the impact of UC on children's mental health, the study employs a parallel trend analysis, demonstrating that the gap in mental health prevalence between the intervention and comparison groups remained constant until the introduction of Universal Credit. A two-way fixed effects model is then estimated, controlling for individual and time-fixed effects. The results indicate that children with unemployed parents under UC experience a significant decline in their mental health compared to comparable children. Specifically, eligible children experience a 9% increase in psychological distress. Further analysis examines the mediating factors associated with UC sub-policies. The findings suggest that lower household income is not the primary driver of deteriorating mental health among children. Instead, increased use of childcare services by parents may contribute to worsened mental health outcomes. The strict job search requirements of UC reduce parents' availability to care for their children, leading to negative mental health effects. The robustness tests support the main findings, and heterogeneity analyses reveal that single households and households with multiple children are more adversely affected by UC.

This study has several implications for various institutions. Firstly, it contributes to the existing body of knowledge by providing valuable longitudinal evidence of the significant mental health effects experienced by children at a young age when transitioning to Universal Credit. It enriches the understanding of the impact of welfare reform on children's mental health. Furthermore, it is crucial for policymakers to consider the potential health consequences when assessing the costs and benefits

of new welfare policies. Currently, the national evaluation framework for Universal Credit primarily focuses on labor market outcomes, neglecting the assessment of health and well-being effects on children. Given the evidence from this study and previous analyses highlighting the adverse health effects of welfare changes, it is imperative to incorporate robust health impact assessments into any evaluation of welfare reforms, including Universal Credit. Health effects should be given due consideration when redesigning welfare systems. Countries contemplating significant changes to their welfare systems should take note of the results concerning mental health outcomes. Lastly, this study underscores the importance of the government considering the unique needs and challenges faced by specific groups, such as single households and households with multiple children, when evaluating the impact of Universal Credit on their mental health. Tailored support, accessible healthcare, and additional resources can help mitigate the adverse effects and promote better mental well-being for these vulnerable children.

4.A Appendix

4.A.1 Details on legacy benefits

UC replaced the previous benefits system known as the legacy system. The legacy system was common in most OECD countries and involved separate applications for different benefits. Under the legacy system, individuals would apply for housing benefits, income-based Jobseeker's Allowance (JSA), income-related Employment and Support Allowance (ESA), income support (including support for mortgage interest), child tax credit, and working tax credit separately. Other benefits not included in the reform were disability living allowance, contribution-based JSA, contribution-based ESA, carer's allowance, and child benefit. Generally, benefit payments under the legacy system were made every 1-2 weeks to individual claimants, except for housing benefits, which were paid directly to landlords.

Income-based JSA provided financial support for individuals seeking employment. Eligible individuals had previously worked as employees, paid national insurance in the last 2 to 3 years, were aged 18 to pension age, not in full-time education, and available for work but currently unemployed.

Income support was available for individuals with low or no income and savings below £16,000. The eligibility criteria included being aged 16 up to the pension age, not in full-time work, and meeting one of the following conditions: lone parent, lone foster parent, carer, on parental leave, unable to work, and receiving benefits for sickness or disability, in full-time education (not university) aged 16-20 and a parent or not living with a parent, a refugee learning English, in custody, or due to attend court or a tribunal.

Income-based ESA was provided for individuals with disabilities or health conditions that affected their ability to work. It offered financial support for living costs if the individual was out of work and provided support for returning to work when possible, regardless of whether the individual was employed, self-employed, or unemployed.

Working tax credits had eligibility requirements based on working a certain number of hours per week, which varied across demographic groups. For example, single individuals with at least one child, individuals over 60 or with disabilities, and individuals aged 25-59 were required to work at least 16 hours, while others were required to work at least 30 hours.

Child tax credits were an extension of working tax credits for individuals with children. However, since 2017, payments were only made for the first two children.

Housing benefits provided assistance in paying rent for those who were unemployed had low income or were claiming benefits. This benefit was not available for individuals paying a mortgage instead of rent. Importantly, housing benefit payments were made directly to landlords.

4.A.2 Figures

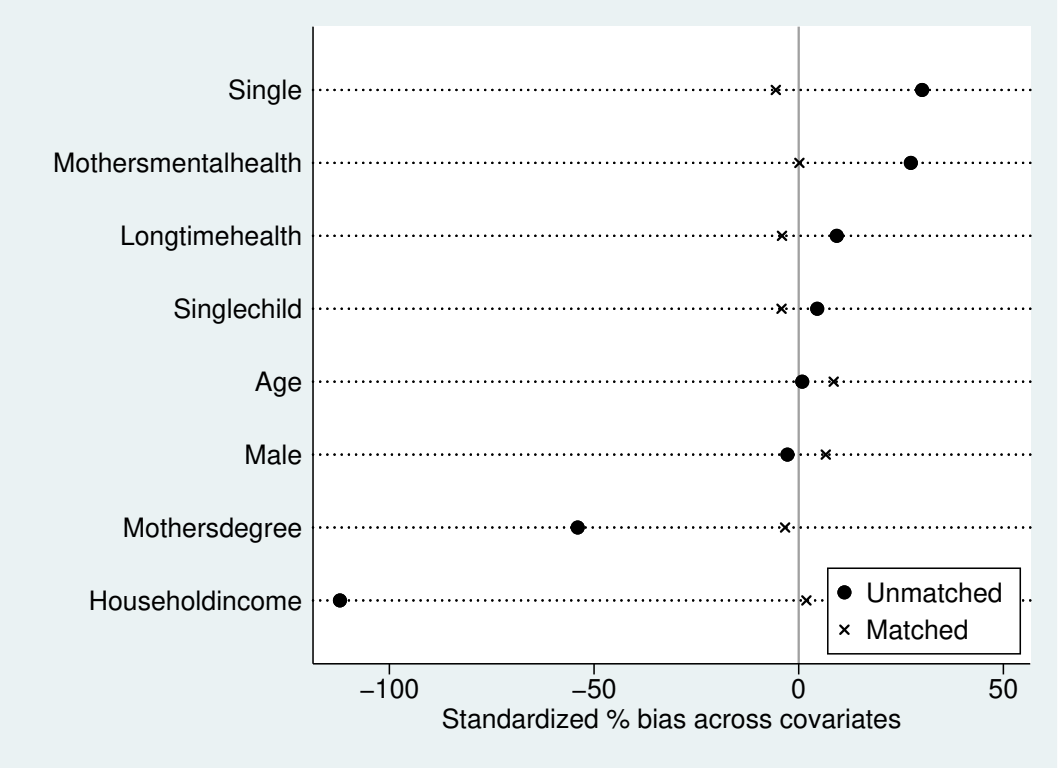


Figure C.1: Matching quality

Note: The standardised % bias is the % difference of the sample means in the treated and matched non-treated sub-samples as a percentage of the square root of the average of the sample variances in the treated and non-treated groups.

4.A.3 Tables

Table C.1: Composition of SDQ score

Emotional problems scale
ITEM 3: Often complains of headaches… (I get a lot of headaches…)
ITEM 8: Many worries… (I worry a lot)
ITEM 13: Often unhappy, downhearted… (I am often unhappy….)
ITEM 16: Nervous or clingy in new situations… (I am nervous in new situations…)
ITEM 24: Many fears, easily scared (I have many fears…)
Conduct problems Scale
ITEM 5: Often has temper tantrums or hot tempers (I get very angry)
ITEM 7: Generally obedient… (I usually do as I am told)
ITEM 12: Often fights with other children… (I fight a lot)
ITEM 18: Often lies or cheats (I am often accused of lying or cheating)
ITEM 22: Steals from home, school, or elsewhere (I take things that are not mine)
Hyperactivity scale
ITEM 2: Restless, overactive… (I am restless…)
ITEM 10: Constantly fidgeting or squirming (I am constantly fidgeting….)
ITEM 15: Easily distracted, concentration wanders (I am easily distracted)
ITEM 21: Thinks things out before acting (I think before I do things)
ITEM 25: Sees tasks through to the end… (I finish the work I am doing)
Peer problems scale
ITEM 6: Rather solitary, tends to play alone (I am usually on my own)
ITEM 11: Has at least one good friend (I have one good friend or more)
ITEM 14: Generally liked by other children (Other people my age generally like me)
ITEM 19: Picked on or bullied by other children… (Other children or young people pick on me)
ITEM 23: Gets on better with adults than with other children (I get on better with adults than with people my age)
Prosocial scale
ITEM 1: Considerate of other people's feelings (I try to be nice to other people)
ITEM 4: Shares readily with other children… (I usually share with others)
ITEM 9: Helpful if someone is hurt… (I am helpful if someone is hurt…)
ITEM 17: Kind to younger children (I am kind to younger children)
ITEM 20: Often volunteers to help others… (I often volunteer to help others)

Note: This table shows the composition of the SDQ score. The 25 items in the SDQ comprise 5 scales of 5 items each. It is usually easiest to score all 5 scales first before working out the total difficulties score.

Table C.2: The definition of variables

Variable	Definition
Age	Age refers to the age of the children.
Age square	Age square represents the squared value of the children's age.
Childcare	Childcare usage is represented as a dummy variable, taking the value 1 if parents use the childcare service and 0 otherwise.
Elig	Eig is a dummy that equals 1 if one of the children's parents is unemployed and 0 otherwise.
Excess	Excess is a dummy variable that equals 1 if the children's SDQ score is larger than 17, and 0 otherwise.
Household income	Household income is measured as the current monthly net income derived from the labor market and all other sources, adjusted for taxes, deductions, and benefits. The household income is measured in GB 2010 prices. I use the logarithm of the household income.
Long-term health	Long-term health is a dummy variable equal to 1 if the children have long-term health conditions and 0 otherwise.
Male	Male is a dummy variable that equals 1 if the child's gender is male and 0 if female.
Mother's degree	Mother's education is represented as a dummy variable that equals 1 if the mother has a degree and 0 otherwise
Mother's mental health	The score of the mother's mental health is derived from the General Health Questionnaire.
Post	Post is a dummy variable that equals 1 if it's the year after the introduction of Universal Credit in 2016, and 0 otherwise.
Single child	Single child is a dummy variable that equals 1 if there is only one child in the family and 0 otherwise.
Single	Single is a dummy variable equal to 1 for single households and 0 otherwise
SDQ	The score measures children's mental health, which is derived from the Strengths and Difficulties Questionnaire.
Race	Race is a multi-valued dummy variable. It assumes a value of 1 if the child's mother is white, 2 if the child's mother is of mixed race, 3 if the child's mother is Asian or British, and 4 if the child's mother is Black or British.

Note: This table describes the definition of all the variables that have been used in this paper.

Table C.3: Parallel trenad assumption regression

	(1)
pre_UC_4	0.08
	(0.06)
pre_UC_3	-0.09
	(0.06)
pre_UC_2	0.09
	(0.07)
post_UC_0	0.03
	(0.07)
post_UC_1	0.15**
	(0.07)
post_UC_2	0.14*
	(0.08)
Constant	0.07***
	(0.02)
N	8026
Individual FE	YES
Year FE	YES

Note: This table presents the regression results of the parallel trend assumption. Standard errors are clustered at the primary sampling unit. Specification includes fixed effects for individuals and years. *** denotes significance at a 1% level, ** denotes significance at a 5% level, and * denotes significance at a 10% level. Data source: UKHLS (2009-2019).

Table C.4: Robustness checks using SDQ scores

	(1) All sample	(2) Age=5	(3) Age=8
Elig	0.38	-1.22	0.84
	(0.54)	(1.49)	(1.51)
Eligpost	0.87	4.85**	-1.11
	(0.72)	(1.99)	(1.94)
Longtime health	2.87***	0.00	0.10
	(0.91)	(.)	(1.46)
Male	0.00	0.00	0.00
	(.)	(.)	(.)
Mothers degree	-0.82	0.00	0.00
	(0.74)	(.)	(.)
Mothers mental health	0.11***	-0.12	0.06
	(0.04)	(0.15)	(0.14)
Single child	-0.16	-1.03	0.00
	(0.47)	(2.06)	(.)
Single	-0.50	2.19	-0.77
	(0.54)	(2.98)	(1.76)
Household income	0.13	-1.77	1.22
	(0.26)	(1.42)	(1.04)
Constant	19.15*	23.10*	-1.43
	(11.47)	(12.03)	(8.82)
N	8025	3951	4032
Year fixed effects	YES	YES	YES
Individual fixed effects	YES	YES	YES

Note: This table reports the treatment effect using the SDQ score as one of the robustness checks. Standard errors are clustered at the primary sampling unit. Specification includes fixed effects for individuals and years. *** denotes significance at a 1% level, ** denotes significance at a 5% level, and * denotes significance at a 10% level. Data source: UKHLS (2009-2019). Household income is winsorized at the 1st and 99th percentile values.

Table C.5: The effect of Universal Credit on mother's mental health

	(1)	(2)	(3)
Elig	0.78***	0.30	0.30
	(0.24)	(0.41)	(0.41)
Post	0.24***	0.08	0.00
	(0.08)	(0.19)	(.)
Eligpost	-0.39	-0.01	-0.00
	(0.37)	(0.59)	(0.59)
Constant	7.33*	3.15	1.87
	(4.28)	(5.67)	(5.69)
N	8025	8025	8025
Year fixed effects	No	No	YES
Individual fixed effects	No	YES	YES
Controls	YES	YES	YES

Note: This table reports the treatment effect of UC on mothers' mental health. Standard errors are clustered at the primary sampling unit. Specification includes fixed effects for individuals and years. Further controls include the mother's age, mother's age square, mother's education, number of children in the household, household structure, and household income. For brevity, controls are not reported. *** denotes significance at a 1% level, ** denotes significance at a 5% level, and * denotes significance at a 10% level. Data source: UKHLS (2009-2019). Household income is winsorized at the 1st and 99th percentile values.

Table C.6: Stable treatment status

	(1)	(2)	(3)
Elig	0.02	0.00	0.00
	(0.02)	(.)	(.)
Post	0.01**	0.03	0.00
	(0.01)	(0.02)	(.)
Eligpost	0.06*	0.08**	0.08**
	(0.03)	(0.04)	(0.04)
Constant	-0.01	1.41	1.47
	(0.45)	(1.04)	(1.01)
N	8025	8025	8025
Year fixed effects	No	No	YES
Individual fixed effects	No	YES	YES
Controls	YES	YES	YES

Note: This table shows the results using a comparison group that only includes those who are always employed, and the treatment group includes children whose parents change employment statuses. Standard errors are clustered at the primary sampling unit. Specification includes fixed effects for individuals and years. *** denotes significance at a 1% level, ** denotes significance at a 5% level, and * denotes significance at a 10% level. Data source: UKHLS (2009-2019). Household income is winsorized at the 1st and 99th percentile values.

Table C.7: Test of covariate balancing

Variable	(1) Unmatched / Matched	(2) Mean: Treated	(3) Mean: Control	(4) % bias	(5) % reduction of bias	(6) t-test: t	(7) t-test: P>|t|	(8) VT/VC
Age	Unmatched	6.53	6.52	0.90		0.19	0.85	1.00
	Matched	6.54	6.41	8.50	-877.90	1.37	0.17	1.01
Longtime	Unmatched	0.05	0.03	9.30		2.28	0.02	.
health	Matched	0.05	0.05	-4.10	56.10	-0.57	0.57	.
Male	Unmatched	0.50	0.51	-2.80		-0.60	0.55	.
	Matched	0.50	0.46	6.60	-140.10	1.06	0.29	.
Mothers'	Unmatched	0.25	0.50	-54.00		-11.18	0.00	.
degree	Matched	0.25	0.26	-3.30	93.80	-0.57	0.57	.
Mothers'	Unmatched	2.90	1.95	27.40		6.55	0.00	1.44*
mental health	Matched	2.89	2.88	0.20	99.40	0.02	0.98	0.93
Single child	Unmatched	0.17	0.16	4.50		1.01	0.31	.
	Matched	0.17	0.19	-4.20	7.10	-0.65	0.52	.
Single	Unmatched	0.30	0.17	30.10		7.26	0.00	.
	Matched	0.30	0.32	-5.60	81.50	-0.81	0.42	.
Household	Unmatched	7.53	8.11	-112.10		-22.79	0.00	0.68*
income	Matched	7.53	7.52	1.90	98.30	0.33	0.74	0.91

Note: The table presents balancing tests for the covariates used in the PSM matching. Unmatched refers to the treated group and control group before applying PSM, while matched indicates the groups after the matching process. % bias quantifies the difference in means of a covariate as a percentage of the mean in the treated group. % reduction of bias presents the percentage reduction in the difference of covariate means between the treated and control groups, before and after applying the matching. T-Test is used to compare the means of the two groups. VT/VC stands for Variance of Treatment / Variance of Control. Table A.3 shows the definition of all variables used. *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively. All the data are winsorized at the 1st and 99th percentile values.

Table C.8: The impact of Universal Credit on children's mental health after PSM

	(1) Nearest neighbour	(2) Kernel	(3) Local linear
Elig	0.01	0.01	0.01
	(0.02)	(0.02)	(0.03)
Eligpost	0.09**	0.08*	0.08*
	(0.04)	(0.05)	(0.05)
Constant	0.14***	0.14***	0.14***
	(0.01)	(0.01)	(0.01)
N	3121	6755	6732

Note: This table examines the impact of Universal Credit on children's mental health using Propensity Score Matching (PSM). The key dependent variable is Excess, which is equal to 1 if the child's SDQ score is greater than 17 and 0 otherwise. *, *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively. The definition of all variables used is shown in Appendix Table C.2. Household income is winsorized at the 1st and 99th percentile values.

Table C.9: The heterogeneous impact of UC on children's mental health

	(1)	(2)	(3)	(4)	(5)	(6)
	Female	Male	Multi-child	One child	Single	Couples
Elig	-0.01	0.03	-0.02	0.16	0.03	-0.07
	(0.05)	(0.05)	(0.03)	(0.14)	(0.04)	(0.10)
Eligpost	0.09	0.08	0.11*	-0.04	0.14**	-0.02
	(0.07)	(0.08)	(0.06)	(0.12)	(0.07)	(0.10)
Constant	1.89	-0.03	1.42	-0.05	1.45	-0.15
	(1.69)	(0.22)	(1.22)	(0.84)	(1.23)	(1.04)
Chow test: P-value	0.16		0.31		0.00	
N	3948	4077	6764	1261	6602	1423
Year FE	YES	YES	YES	YES	YES	YES
Individual FE	YES	YES	YES	YES	YES	YES
Controls FE	YES	YES	YES	YES	YES	YES

Note: This table shows the household heterogeneity for the treatment effect of parents entering unemployment under UC on children's mental health. Equation 4.6.4.1 is used for estimation. Standard errors are clustered at the primary sampling unit. Specification includes fixed effects for individuals and years. Further controls include children's age, age square, mothers' mental health score, mothers' education, and household income. For brevity, controls are not reported. *** denotes significance at a 1% level, ** denotes significance at a 5% level, and * denotes significance at a 10% level. Data source: UKHLS (2009-2019). Household income is winsorized at the 1st and 99th percentile values.

5 Conclusion

This thesis comprises three chapters in Finance and Applied Microeconomics. Chapters 1 and 2 investigate the causes and consequences of princeling connections in a developing country context, while Chapter 3 explores the consequences of welfare reform in a developed country. To provide a comprehensive analysis in my thesis, I employ a diverse range of research methods and utilize various datasets. Specifically, I utilize key research methods for causal evaluation in Applied Microeconomics, such as the difference-in-differences approach, in both Chapter 1 and Chapter 3.

Chapter 2 investigates the role of princeling connections in regulatory enforcement. Using a sample of listed firms in China from the 2008-2018 period, I first find evidence that princelings prefer to join firms with better financial performance, poorer governance structure, fewer CSR activities, and higher innovation investment. These characteristics make it easier for princelings to transfer firm profits to their own accounts without detection. Next, I explore whether princeling-connected firms are less likely to face punishments using various PSM methods. The findings consistently show that princeling-connected firms have a lower probability of being punished compared to non-princeling-connected firms, providing robust evidence of the benefits of princeling connections. Furthermore, the effect of princeling connections is found to be stronger for firms registered in underdeveloped regions, privately owned firms, and firms with below-average ROA ratios. This suggests that improving regional legal development, promoting SOEs, and enhancing firm performance can serve as effective deterrents to princeling connections. Lastly, I examine the impact of the anti-corruption campaign launched at the end of 2012 and test whether princeling connections continue to protect firms from legal punishments. Surprisingly, the empirical results suggest that even after the anti-corruption campaign, princeling-connected firms still face lower punishments from regulatory bodies. This finding raises questions about the effectiveness of the anti-corruption campaign in curbing the advantages of princeling connections. Overall, these findings contribute to the existing literature on princeling connections, regulatory enforcement, and anti-corruption policies.

Focusing on the same research period and data sample, the third chapter of my thesis explores the role of princeling connections in the PE industry. I begin by investigating whether PE plays a certification role in the Chinese context. The findings indicate that firms with PE support experience lower IPO underpricing and exhibit better post-IPO performance compared to firms without PE support. This suggests that the involvement of PE provides firms with professional expertise and enhances their prospects. Next, I examine the specific role of princeling connections within the PE industry. I divide PE firms into two groups: those with princeling connections and those without. The results reveal that princeling-connected PEs contribute to lower IPO underpricing for portfolio firms but do not necessarily lead to better post-IPO performance. This aligns with existing literature, which suggests that political connections primarily facilitate access to political relationships rather than actively supervising target firms. Furthermore, by interacting with the policy uncertainty index, I demonstrate that targets with non-princeling PEs continue to perform better while princeling-connected PEs are unable to enhance the performance of invested firms compared to firms without PE support. This could be attributed to the fact that princeling-connected PEs are more adversely affected by heightened uncertainty, leading them to exercise caution in providing funds or support to portfolio firms. In the heterogeneity test, I delve deeper to reveal that PEs or princeling-connected PEs with a higher reputation offer better IPO performance for portfolio firms. Moreover, PE has a more pronounced impact on non-SOEs, indicating that PE can play a vital role in facilitating financing for non-SOEs and enhancing their performance.

In the fourth chapter, I employ a quasi-experimental study design to investigate the impact of the introduction of UC on the mental health of children with unemployed parents who became eligible for UC. This study takes advantage of the roll-out of Universal Credit for families with children in May 2016. A comparison group of children with employed parents who were not eligible for UC is used for comparison. To establish a parallel trend between the treatment and control groups, I plot the proportion of children with mental health problems over the pre-reform period. The parallel trend analysis shows that the treatment group initially had a higher proportion of children with mental health problems compared to the control group. However, the trends remain fairly parallel until the periods affected by the implementation of UC. Using panel data with individual and year-fixed effects, I find robust and precisely estimated evidence of a negative effect of UC on the mental health of eligible children. The impacts are particularly significant for single-parent households and households with multiple children. I also explore the mediating factors through which UC affects children's mental health. The results suggest that the main channel is a reduction in the time parents can spend with their children, as they need to allocate more time to job searching due to the requirements of UC. Additionally, the availability of childcare services supported by the government also contributes to parents spending

less time with their children. Changes in household income are not found to be the primary driver of worsened mental health conditions in children. The findings of this study reveal that the recent welfare reform, Universal Credit, in the UK has had a significant negative impact on children's mental health. This highlights the importance of considering the unintended consequences of welfare reform, such as mental health costs, in addition to the commonly assumed income changes. Policymakers implementing welfare reforms should take into account how changes in the application process and payment system can affect the mental well-being of claimants. These results serve as a cautionary note for policymakers to be mindful of the broader impacts of welfare reform on vulnerable individuals and families.

The findings in Chapter 2 hold implications for the policymaking community. They highlight the crucial need for continuous efforts to promote accountability among government officials. Strengthening mechanisms that ensure officials are held responsible for their actions and decisions is essential in combating corruption. This may involve the implementation of transparent reporting systems, the enhancement of oversight procedures, and the advocacy for a zero-tolerance approach towards unethical conduct. Furthermore, the research indicates that improving the legal framework can be an effective strategy for enhancing regulatory enforcement. This includes a review of existing laws, regulations, and policies to ensure their alignment with contemporary challenges. Strengthening legal provisions against bribery, nepotism, and other corrupt practices, while simplifying the legal processes for reporting and prosecuting such cases, can contribute to a more robust anti-corruption environment. Additionally, the study underscores the importance of reinforcing law enforcement mechanisms in present-day China to create a more favorable business environment for investors. Lastly, the research calls for a nuanced perspective that acknowledges the inherent limitations of an anti-corruption campaign in fully achieving desired outcomes.

The discoveries unveiled in Chapter 3 shed light on the potential benefits and advantages that private equity (PE) investments bring to the Chinese economy. These insights offer valuable guidance to policymakers as they formulate strategies and decisions, emphasizing the role of PE investments as a means to enhance the performance of listed firms to some extent. Furthermore, private equity firms frequently assume an active role in shaping the governance of their portfolio companies, including involvement in board representation and strategic decision-making. The positive effect of PE on IPO performance suggests that their engagement during the pre-IPO and post-IPO stages can enhance corporate governance practices. However, the analysis of PE firms connected to princelings yields different insights regarding board implications. While they may offer political resources, their capacity to improve post-IPO performance appears limited. This observation implies that relying exclu-

sively on political connections through board representation may not necessarily lead to superior corporate outcomes.

Chapter four carries several implications for various stakeholders. Firstly, it extends the current knowledge base by offering valuable longitudinal evidence on the significant mental health impacts experienced by children during their transition to Universal Credit. It enhances our comprehension of how welfare reform affects children's mental well-being. Additionally, it emphasizes the importance of policymakers considering potential health consequences when evaluating the costs and benefits of new welfare policies. Presently, the national evaluation framework for Universal Credit primarily focuses on labor market outcomes, overlooking assessments of health and well-being effects on children. Given the findings of this study and previous research highlighting adverse health effects resulting from welfare changes, it is imperative to incorporate robust health impact assessments into the evaluation of welfare reforms, including Universal Credit. Health effects should be given due consideration when reshaping welfare systems. Countries contemplating significant alterations to their welfare systems should take heed of these results concerning mental health outcomes. Lastly, this study underscores the government's responsibility to address the unique needs and challenges faced by specific groups, such as single households and households with multiple children, when assessing the impact of Universal Credit on their mental health. Tailored support, accessible healthcare, and additional resources can mitigate adverse effects and promote better mental well-being for these vulnerable children.

The presence of data limitations is evident in every chapter: for the second chapter, despite extensive efforts to compile the name list of princelings using various methods and having richer data compared to existing literature Chen and Kung (2019), the impact of those princelings who lack any online information is still overlooked. Moreover, due to the unobservable nature of whether princeling-connected firms are involved in fraud, the choice is made to use whether princeling-connected firms commit fraud and face punishment as the dependent variable. However, this approach neglects the possibility that princeling-connected firms may commit fraud without facing punishment.

For the third chapter, the potential impact of an incomplete princeling name list may still persist and influence the results. Additionally, it should be noted that China lacks a consistently available private equity (PE) database. Despite utilizing the most comprehensive database employed in recent literature, discrepancies with other databases remain.

For the fourth chapter, as the research focuses on the psychological well-being

impact on children, the Strengths and Difficulties Questionnaire (SDQ) data are filled out by parents on behalf of the children. Therefore, children's psychological scores could be influenced by their parents' mental health. Additionally, due to Universal Credit not having a specific threshold of household income that renders one eligible for UC, and considering that there are very few responses regarding the receipt of UC in the Understanding Society study (only 0.01% of respondents answer), it becomes challenging to precisely define which children are impacted by UC and which are not. Therefore, based on the findings of Wickham et al. (2020), I propose substituting the unemployment status as an indicator of whether one is affected by UC. I define parents who are unemployed as being impacted by UC. However, this definition approach overlooks that a small proportion (2%) of the comparison group may become eligible for Universal Credit during the rollout process (Wickham et al., 2020). Their inclusion in the comparison group provides a more conservative estimate of the intervention effect.

This thesis endeavors to contribute to the existing literature by addressing a gap in research. In the second chapter, I shed light on an avenue involving financial regulatory enforcement for listed firms with political connections to China's highest political authorities, commonly referred to as "princelings". Currently, only two studies have conducted empirical analyses to investigate the influence of princeling connections (Li et al., 2019; Chen and Kung, 2019), focusing on land transactions and bank loans. Consequently, this article fills the research void pertaining to princeling connections within the literature.

For the third chapter, this paper represents the first attempt to examine the influence of princeling connections in the private equity (PE) industry. Currently, there exists only one article that delves into the implications of politically connected PE on the likelihood of success for PE-backed initial public offerings (IPOs) and their post-IPO performance (Wang and Wu, 2020). Furthermore, this study uses the CVsource PE database to explore the role of PE within the A-share market. Earlier research either employs data from 2010 (Lee and Wahal, 2004), focuses exclusively on a subset of listed firms in China to analyze the influence of PE (Tan et al., 2013), or utilizes outdated databases (Otchere and Vong, 2016). Lastly, this paper aims to examine the effect of economic policy uncertainty (EPU) on IPOs involving PE-backed firms. Current research provides empirical evidence of increased IPO underpricing when EPU is high (Song and Kutsuna, 2021), as well as insights into the investment decisions of PE funds during periods of high EPU (Huang et al., 2022). However, there remains a gap in the literature concerning how EPU impacts PE-backed firms specifically.

For the fourth chapter, there are two studies examining the impact of UC on adults' mental health (Wickham et al., 2020; Brewer et al., 2022). This is the first study to in-

vestigate the effects of Universal Credit on children's mental health in the literature. It suggests that UC could have implications for children's psychological well-being and provides recommendations for future policy-making by the government.

Moreover, this study paves the way for potential future research endeavors that could explore the wider-reaching effects of princeling connections on various facets of China's economic landscape. For instance, forthcoming studies may delve into the impact of these connections in areas like green finance, including their intersection with factors such as corporate carbon emissions and Environmental, Social, and Corporate Governance (ESG) performance. Such investigations hold the promise of offering valuable insights into the complex interplay between political affiliations, economic behaviors, and sustainability considerations within the Chinese context.

Regarding Universal Credit, research can explore whether the impact on the mental health of both children and adults is consistent across different stages of UC as it reaches completion in 2024. This investigation can shed light on whether the psychological well-being effects remain consistent or vary at various phases of UC implementation.

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