ecgi

Social Priorities, Institutional Quality, and Investment

Finance Working Paper N° 971/2024
August 2025

Amar Gande
Southern Methodist University

Kose John
New York University

Guanmin Liao
Renmin University of China

Lemma W. Senbet
University of Maryland

Xiaoyun Yu
Shanghai Advanced Institute of Finance, ABFER, CAFR and ECGI

ECGI Working Paper Series in Finance

Social Priorities, Institutional Quality, and Investment

Working Paper N° 971/2024

August 2025

Amar Gande
Kose John
Guanmin Liao
Lemma W. Senbet
Xiaoyun Yu

We thank Meghana Ayyagari (discussant), John Bai (discussant), Chun Chang, Zi Chao, Md Ismail Haidar (discussant), Tao Shen, Hong Yan, Alminas Zaldokas (discussant), and seminar participants at the Antai College of Economics and Management at Shanghai Jiao Tong University, ASSA/AFE annual meetings, China International Conference in Finance, FMA annual meetings, Frontiers in International Finance Research Conference at University of Southern Carolina, Macquarie University, Shanghai Advanced Institute of Finance, and Tsinghua University School of Economics and Management for helpful comments. All remaining errors are our own.

Abstract

We provide a theoretical framework and empirical evidence characterizing positive and negative externalities that lead corporate investments to deviate from socially optimal levels. A limited liability organizational form, combined with the optimally designed corporate taxes and subsidies, can induce socially optimal investments. A novel empirical prediction is that the quality of institutions can play an important moderating role. Our empirical work is based on the setting from China and utilizes its five-year plans, private and state-owned enterprises (SOEs), and provincial level differences in institutional quality. Our evidence shows that the level of corporate tax required to induce socially optimal investments is lower in the presence of high-quality institutions.

Keywords: social optimality, taxation, investment, legal systems, externalities, environmental protection, green investment, institutions

JEL Classifications: G3, G31, G38, H2, H21

Amar Gande
Associate Professor of Finance
Southern Methodist University
6212 Bishop Blvd.
Dallas, TX 75205, USA
e-mail: agande@cox.smu.edu

Kose John
Charles William Gerstenberg Professorship in Banking and Finance
New York University
44 West 4th Street, Suite 9-190
New York, New York 10012, USA
e-mail: kj1@stern.nyu.edu

Guanmin Liao
Professor of Accounting
Renmin University of China, School of Business
No. 59 Zhongguancun Street, Haidian District
Beijing 100872, China
e-mail: liaoguanmin@ruc.edu.cn

Lemma W. Senbet
Professor
University of Maryland
College Park, MD 20742-1815, USA
e-mail: lwsenbet@umd.edu

Xiaoyun Yu*
Professor of Finance
Shanghai Advanced Institute of Finance
211 West Huaihai Road
Shanghai 200030, China
e-mail: xyyu@saif.sjtu.edu.cn

*Corresponding Author

Social Priorities, Institutional Quality, and Investment

Amar Gande, Kose John, Guanmin Liao, Lemma Senbet, and Xiaoyun Yu*

August 2025

Abstract

We provide a theoretical framework and empirical evidence characterizing positive and negative externalities that lead corporate investments to deviate from socially optimal levels. A limited liability organizational form, combined with the optimally designed corporate taxes and subsidies, can induce socially optimal investments. A novel empirical prediction is that the quality of institutions can play an important moderating role. Our empirical work is based on the setting from China and utilizes its five-year plans, private and state-owned enterprises (SOEs), and provincial level differences in institutional quality. Our evidence shows that the level of corporate tax required to induce socially optimal investments is lower in the presence of high-quality institutions.

JEL classifications: G3, G31, G38, H2, H21

Keywords: Institutions, social optimality, taxation, investment, legal systems, externalities, environmental protection, green investment

* Gande is from the Cox School of Business, Southern Methodist University, agande@cox.smu.edu. John is from the Stern School of Business, New York University, kj1@stern.nyu.edu. Liao is from the School of Business, Renmin University, liaoguanmin@rmbs.ruc.edu.cn. Senbet is from the Smith School of Business, University of Maryland, lwsenbet@umd.edu; Yu is from Shanghai Advanced Institute of Finance, Shanghai Jiao Tong University, ECGI, and ABFER, xyyu@saif.sjtu.edu.cn. We thank Meghana Ayyagari (discussant), John Bai (discussant), Chun Chang, Zi Chao, Md Ismail Haidar (discussant), Tao Shen, Hong Yan, Alminas Zaldokas (discussant), and seminar participants at the Antai College of Economics and Management at Shanghai Jiao Tong University, ASSA/AFE annual meetings, China International Conference in Finance, FMA annual meetings, Frontiers in International Finance Research Conference at University of Southern Carolina, Macquarie University, Shanghai Advanced Institute of Finance, and Tsinghua University School of Economics and Management for helpful comments. All remaining errors are our own.

Social Priorities, Institutional Quality, and Investment

1. Introduction

Corporate investments and innovative activities, while they are central to the growth of economies, impose positive and negative social externalities. On the one hand, environmental accidents, such as those by the Fukushima Daiichi nuclear power plant and the British Petroleum oil spill, have highlighted the importance of negative externalities, in which the society bears the brunt of the negative cash flows in the poor states due to limited liability of corporations. On the other hand, innovation by private firms can also produce significant social benefits. For instance, the rapid and large-scale production of vaccines by private companies, including Pfizer and Moderna, brings home much appreciation of positive externalities in saving lives on a massive scale around the globe during Covid-19. The social impact of these private firms depends on the sharing rule between their owners and the society at large, which is governed by laws, regulations, and institutions in place. Gande, John, Nair, and Senbet (2020) [GJNS 2020 hereafter] develop an agency-based theory that characterizes investment misalignment, whereby innovative private investments deviate from the socially optimal levels. The extent of misalignment depends on the legal structure in place, the extent of liability embedded in the organizational form of business, and the taxation of the enterprise.

In this paper, we provide a theoretical framework and empirical evidence characterizing positive and negative externalities that lead corporate investments to deviate from socially optimal levels. At the theoretical level, we study the role of corporate taxation and the quality of institutions in aligning privately optimal investments with the socially optimal investment levels. We generalize the GJNS's (2020) model to characterize how non-monetized social benefits and limited liability give rise to the deviation of firms from the socially optimal investments. Importantly, our theoretical framework takes a multistakeholder perspective beyond the private sector stake and models the distorted private choices both in the form of underinvestment and overinvestment relative to social optimality.

The overinvestment incentive depends crucially on the wedge between the social benefit and the payoff to the private firm. The tradeoff can be reversed from overinvestment into underinvestment when

the social benefits are high but not internalized in the private investment decisions. A prime example of this is the pressing need to address global environmental challenges and the debate on the effectiveness of environmental regulations (e.g., Ramadorai and Zeni 2024). Despite a growing consensus on the urgency of environmental protection, attracting private capital to participate in this important endeavor remains a formidable task. This is because, while green investments bring positive externalities to society, they demand significant capital investments which entail a long-time horizon for returns while involving considerable costs. As such, profit-maximizing firms underinvest if they are unable to fully monetize the value associated with the positive externalities while simultaneously internalizing the associated costs (Flammer, Giroux, and Heal 2025).

We show that corporate taxes and subsidies can be designed to align optimally chosen private investments with socially optimal investments. In our model, corporate taxation, by reducing the cash flow of a private firm from a successful investment, acts as a deterrent to curb overinvestment rather than serving as a tax on profit. That is, by introducing an additional claimholder (i.e., society at large, or a social planner such as the government acting on behalf of society) to a firm's cash flows, corporate taxation alters the sharing rule between the corporate owners and the non-financial claimholders. In this respect, corporate taxation can be viewed as the price of corporate limited liability privilege accorded by society, thereby providing a social benefit. A notable instance in the context of environmental conservation would be the carbon tax. This government-imposed levy is designed to discourage private investments and operations that exacerbate greenhouse gas emissions.

Governments design not just taxation but also a variety of institutions. It is widely known that the quality of institutions matters (e.g., Demirgüç-Kunt and Maksimovic 1998; La Porta et al. 1998; Giannetti 2003). Our theoretical framework thus explicitly considers the interaction between corporate taxation and institutions, such as the strength of the legal system. As such, the generalized model admits taxes, subsidies, and quality of the legal system in providing an alignment between the optimally chosen private investments and socially optimal investments. In this context, we show that the quality of institutions moderates the incentive effect of corporate taxation. Specifically, while taxes bridge the gap between the private

objectives of firms and those of society at large, the level of corporate tax required to induce social optimality is attenuated in the presence of high-quality institutions. Our simple model, thus, predicts that both the level of corporate tax and the quality of institutions are at play in aligning privately and socially desirable investments.

Testing these theoretical implications, however, is empirically challenging. This is because it is difficult to observe and quantify the social planner's desired investment levels or preferred sectors carrying larger non-monetized social benefits. Moreover, economic inferences on the effectiveness of institutions, such as that of a legal regime, may be confounded by other factors, including cross-country heterogeneity in culture and technology. To address these challenges, we use China as a laboratory, exploiting the staggered designation of strategically important industries identified by the government in its Five-Year Plans (FYPs), and leveraging the within-country, cross-region variation in the quality of local institutions.[1]

Our setting offers several novel advantages. *First,* prior literature highlights the crucial role of the government as a "helping hand" in promoting economic growth in China (e.g., Li 1998). One of the prominent venues is its Five-Year Plans, a series of social and economic development initiatives established for the entire country, containing detailed guidelines for all its regions. Since 1953, the country has implemented 14 intervals of FYPs, in which the central government selects and supports a specific set of industries considered strategically important for economic and social development through a coordinated effort at the national level. While heavy industries were a focus in earlier periods, the selection of industries in more recent periods are increasingly targeted towards high technology and green sectors (KPMG China 2011; Naughton 2021; Branstetter and Li 2023). For instance, starting in 2008, China formally incorporated a national plan for environmental protection in its FYPs. China's FYPs, thus, provide a unique setting to observe the time-varying preference of the social planner for certain innovation and investment activities.

[1] Features of social planning are also commonly observed in the traditionally market-oriented countries. In the United States alone, major new industrial policies, including the Biden administration's recent *CHIPS and Science Act* and *Infrastructure Investment and Jobs Act* (IIJA), tackle changes in the green energy transition, geopolitical competition, and supply-chain resilience, and are a form of industrial policy similar to the social priorities discussed in this paper. In fact, the use of industrial policies by governments is not only widespread but also on the rise (Aghion et al. 2015 and Juhász, Lane, Oehlsen, and Pérez 2024).

Put differently, the industries selected and targeted in the FYPs capture private sectors that the government (i.e., the social planner) considers having significant and sustained social benefits for the country. While prior literature has generally identified social and economic priorities and externalities as underlying rationales for government industrial policies, the staggered introduction of FYP industrial policies in China allows us to form time-varying treatment and control groups within a consistent institutional environment.[2]

Second, we take advantage of the cross-region heterogeneity within China and measure the quality and development of local institutions in multiple dimensions. Specifically, we employ time-varying proxies to capture the strength of a legal regime and the development of a market-based financial system in local provinces.

Third, we exploit a regulatory shock that has significantly elevated the enforcement of tax collections, leading to a plausibly exogenous increase in effective corporate tax rates at different times in different regions.

Using a sample of 2,881 non-financial firms over the period of 2008-2019, we first document a negative relationship between the effective corporate tax rate and capital spending. This is consistent with existing causal evidence that taxes deter corporate investments (e.g., Mukherjee et al. 2017; Ohrn 2018; Liu and Mao 2019). A one-standard-deviation decrease in the effective tax rate is associated with a 0.18 percentage point increase in capital expenditure relative to assets, or 26.4 million RMB increase in capital spending.

While tax reduction spurs corporate investment, the effect is mitigated in the presence of strong local institutions. A one-standard-deviation increase in the strength of the legal regime moderates the marginal effect of the effective tax rate on investment by 0.83 percentage points. Importantly, the observed interaction of taxes and institutional quality in influencing corporate investment is driven by firms operating

[2] In their survey of the related literature, Juhász, Lane, and Rodrik (2024) summarize three economic rationales for industrial policies: (1) externalities, where economic activities produce positive societal benefits not captured in the revenues of those conducting the activities; (2) coordination failure, which occurs when the profitability of an individual producer depends on the extent of related economic activities by others; and (3) activity-specific public inputs, where private production relies on the provision of public goods tailored to the activity.

in the FYP industries, in which their investments would generate relatively larger social externalities. Moreover, both corporate taxation and institutional quality affect the likelihood of firms expanding into sectors that are considered socially important. These results lend support to the model's prediction that the quality of local institutions affects the desirability of taxes to align private and social investment incentives.

Our analysis controls for a host of firm-specific time-varying characteristics. The inclusion of firm and year fixed effects, as well as interaction of industry and year fixed effects, allows us to control non-parametrically for industry-specific shocks and any shocks associated with the firm's local economic environment. To further address the concern of endogeneity in corporate taxation, we conduct a difference-in-differences analysis, exploiting the implementation of Phase III of the Golden Tax System (GTS III), a regulatory event that led to staggered increases in effective corporate tax rates. Confirming the model's prediction in this regulatory setting, we continue to find that the quality of local governance institutions moderates the role of taxes in shaping corporate investment.

While our approach—using FYP industries to identify socially desirable sectors—is grounded in economic rationales related to social priorities and the role of public goods in shaping policy choices (Juhász, Lane, and Rodrik 2024), industrial policies in practice may also reflect the political incentives of policy makers. Alternatively, we consider a subset of investments that are highly likely to generate social benefits and externalities—environmental spending and green innovation. We explore the investment behavior of firms in heavily polluting industries, since the misalignment between corporate profitability and social welfare externalities is larger in these sectors. Incentivizing these firms for socially optimal investments, such as environmental investments, thus generates larger benefits for society. Also in this context, we continue to find that the quality of local institutions moderates the impact of taxes on both environmental spending and green innovation among heavily polluting firms, as well as on their propensity to expand into less-polluting sectors.

Finally, we examine the real consequences when industries are singled out by the social planner as those producing larger non-monetized social benefits. According to the model, the misalignment in

investment objectives induced by limited liability is particularly severe in the presence of large non-monetized benefits.

We show that firms alter their investments after their industries are designated as priority sectors by the government. Importantly, we provide evidence consistent with the observed changing investment policies leading to a better aligned objective in industries with high social priorities. Following the designation of the FYP industry, firms that have previously *underinvested* increase their capital spending by 2.8 percentage points more than their peers within the same industry, whereas firms that have previously *overinvested* slow down their capital expenditure.

In addition, firms that have previously underinvested and have since invested more than their peers in the same FYP industry harvest larger profits, with ROE exceeding those of their peers by 4.9 percentage points. By contrast, firms that have previously overinvested and have since boosted their investment to a lesser extent than peer firms in the same FYP industry do not experience deteriorating performance. Overall, our results lend support for a realignment in investment incentives in industries that generate larger social value. Investment misalignment declines once the industry becomes a sector considered important for sustained social and economic development of the country.

Our paper contributes to the literature that explores the interaction between taxation and corporate governance. Examining tax reporting behavior in an agency framework, prior studies emphasize that the characteristics of a tax system can mitigate or amplify the corporate governance problems, and that the nature of the corporate governance environment influences the effectiveness of the tax system (see Desai and Dharmapala 2008 for a survey). For instance, Desai et al. (2007) find that corporate tax rate hikes lead to increased (decreased) revenue in countries with strong (weak) corporate governance. Chen et al. (2010) and Bradshaw et al. (2019), among others, show that ownership structure (e.g., the presence of founding family owners or state ownership) moderates the firm's incentive to avoid taxes. These papers do not consider how taxes and institutions jointly affect the alignment between socially optimal and privately optimal investments.

Departing from the shareholder maximization perspective in this line of literature, we take a multistakeholder view of corporate taxation. In doing so, we offer a rationale for the existence of corporate taxation, which has been the subject of a longstanding debate in finance. The theoretical framework expands the model of GJNS (2020) by allowing the instruments of incentive alignment between socially and privately optimal investments to admit both taxes and subsidies. Furthermore, we generate implications on how optimal corporate taxation is related to the strength of local institutions, such as legal regimes, and derive the link between taxation and institutional development in mitigating the conflict between the private objectives of the limited liability corporation and social objectives. Our study thus adds to this literature by highlighting taxes and subsidies as alternative self-enforcing implicit contracts in aligning private and public interests, while also demonstrating the moderating effects of quality institutions.

Further, we conduct inter-regional studies within one country to explore the effect of institutions on corporate investments. The advantage of our approach, in comparison to cross-country studies, is that our results on the effect of institutions on investment are free of contamination due to country differences in accounting rules, tax system, culture, and technology (Li et al. 2009). By focusing on taxation — the most direct and commonly deployed mechanism under government control — and the quality of institutions, our findings are not specific to China and can be readily generalized to a broader economic context.

Our paper also adds to the growing literature studying the effects of China's industrial policies (e.g., Aghion et al. 2015; Kalouptsidi 2018; Branstetter and Li 2023; Han et al. 2023; Cen et al. 2025). By focusing on the FYP industries selected by the government, we provide a novel approach to identify time-varying preferences of the social planner. To the best of our knowledge, ours is the first paper using FYP data to better understand investment distortions arising from the wedge between private and social optimality.

The rest of the paper is organized as follows. Section 2 develops the theoretical framework and generates empirical predictions. Section 3 introduces the institutional background and estimation strategy. Section 4 describes the data. Sections 5-6 present empirical results. Section 7 concludes. Appendices A–C

present, respectively, additional propositions, proofs, and variable definitions. Further robustness analyses are in the Internet Appendix.

2. The Theoretical Framework

The essential features of the problem we analyze in this paper can be captured in a generalized version of the GJNS's (2020) model. The generalization incorporates two novel features. *First*, instead of the cutoff probability in a discrete framework, the investment policy in all states of the world is characterized by a continuous scaled technology. This allows us to directly determine the optimal investment policy and yields testable empirical predictions amenable for more direct tests of the theory. By contrast, the GJNS (2020) model can only infer from the substitution effects between tax rates and legal systems across borders and characterize the optimal investment policy through cut-off probabilities. *Second*, we introduce a symmetric treatment of both benefits and costs in our model. That is, they are binding in all states of the world instead of being binding only in the high state as in GJNS (2020).[3]

In accordance with GJNS (2020), consider a two-date, single period model with $t = 0$ denoting the initial date and $t = 1$ the final date. The representative firm in the economy has access to an investment opportunity set denoted by $\{l, h, f(.)\}$, where l and h are positive scalars, $h > 0$, $l > 0$ and $f: R_+ \rightarrow R_+$ is continuously differentiable, strictly increasing, and strictly concave, with corner conditions $f(0) = 0$, $f'(0) = 1$, and $|f''| \leq M < \infty$.

The foregoing technology has the following interpretation which is quite intuitive. If a dollar amount I is invested in the technology at $t = 0$, a random cash flow equal to $\tilde{\omega} f(I)$ will result at $t = 1$, where $\tilde{\omega}$ is a random variable distributed uniformly on the closed interval $[-l, h]$.[4] Investment decisions

[3] In addition, we use a firm-year panel to empirically analyze the effects of both subsidies and taxes on investments. By contrast, the empirical analysis in GJNS (2020) focuses on the cross-country incentive effects of corporate taxation.

[4] Here $\tilde{\omega} f(I)$ denotes the total terminal value available in the firm minus the amount required to settle all the non-financial claims. When $\tilde{\omega} f(I)$ is negative, the non-financial claims exceed the assets of the firm. The non-financial claims are interpreted broadly to include potential claims by parties outside the explicit contracting process, such as potential awardees of legal settlements among victims of future product failures and industrial accidents. In cases where the actual social costs (as judged by the social planner) exceed the limits of possible legal claims, a monetary equivalent of the actual social costs enters into the computation of $\tilde{\omega} f(I)$ for $I > 0$. For expositional ease, we have

are made by corporate insiders at $t = 0$. Consistent with a standard corporate finance assumption, corporate insiders act in the interests of the current stockholders. The cash flow resulting from investment is realized at $t = 1$, and all claims against the firm are settled according to the pre-specified sharing rules which accompany the securities in question, as well as the tax and legal structure in place. [5] Further, without loss of generality and abstraction from discounting factors, it is assumed that risk neutral valuation (with zero risk-free interest rate) is appropriate for this economy. That is, if $y(\tilde{\omega})$ is the payout to a security at $t = 1$, investors will value that security as $E[y(\tilde{\omega})]$, where $E[.]$ denotes expectation with respect to an appropriate probability measure.

Our model takes a multistakeholder perspective beyond the private sector financial claimholders. In this context, limited liability provisions introduce society at large (or a social planner acting on behalf of society) as an additional claimant. Limited liability provides a sharing rule and restricts the claims of the various claimants in the corporation to be, in the *aggregate,* the value available in the firm. For instance, in the states of the world where the claims against the corporation from non-financial claimholders, such as suppliers, customers, workers, and tort victims, exceed the value of the firm's total assets, the owners of the corporation are not obliged to use their personal wealth to pay these claims. In other words, the minimum value of their stock in the firm is zero. The incentive effects of the corporate limited liability feature will be studied below after we characterize the socially optimal investment level.

---

restricted that $\tilde{\omega}$ be distributed uniformly over $[-l, h]$. However, all the propositions can be proved for any continuous density function $g(.)$ with a compact support $[-l, h]$.

[5] A crucial feature of this theoretical framework is that it is characterized by incomplete contracting. We assume that investment levels are not contractible in the sense that writing and enforcing contracts that specify the level of investment to be undertaken by the firm is inadmissible by the legal structure. This is a commonly employed modeling strategy in contracting literature (e.g., Grossman and Hart 1986; Hart 1988; Harris and Raviv 1989; Aghion and Bolton 1992). A motivation for the inadmissibility of such contracts may be that third party verification and enforcement of these contracts are prohibitively costly. An alternative modeling strategy is to view investment decisions as optimally taken by insiders, conditional on a privately observed state realization (see, for example, Myers 1977, John and Kalay 1982, or Heinkel and Zechner 1990). However, for our technology with variable investment levels, such a strategy would make the structure cumbersome without yielding additional insights. Since "incomplete contracting," rather than informational asymmetry, is the focus of our analysis, our model choice is appropriate.

2.1 Characterizing Socially Optimal Investments: Social Benchmark

We model both positive and negative externalities described in the introduction in a simple generalized framework. In equation (1) below, parameter C captures the negative externality and $B > 1$ reflects the positive externality in terms of non-monetized benefits to society. Both externalities have a state-dependent influence on investment where $\tilde{\omega}$ denoting the state variable is distributed uniformly on the closed interval $[-l, h]$. We denote the socially optimal level of investment, I^S based on maximizing the following objective function of the social planner:

(1) $$I^S = \underbrace{argmax}_{I} \{-I + E([Bf(I) - C]\tilde{\omega})\}$$

The value of the marginal product of investment should incorporate both externalities. The first-order conditions for optimality (both necessary and sufficient) for equation (1), where the state variable $\tilde{\omega}$ is a random variable distributed uniformly on the closed interval $[-l, h]$ stipulates equation (2). That is, the socially optimal level of investment, I^S, needs to satisfy equation (2).

(2) $$f'(I^S) = \frac{2}{B(h-l)} + C$$

Note that, if complete contracting conditional on investment were admissible, the social planner would mandate an investment level of I^S.

2.2 Characterizing Privately Optimal Investments

The corporate limited liability provision enables the residual claimholders (stockholders) in the firm to walk away from it when the cash flows are insufficient to meet the primary obligations. In the case of a firm with no debt in its capital structure, stockholders walk away from it when its net value is negative. Society absorbs the losses in the negative profit states. The actual losses are often borne by specific individuals and groups, such as those living in geographical proximity to the firm, but we do not consider such distributional considerations here.

We denote the strength of the legal system by λ, $0 < \lambda < 1$. This is the fraction of the social costs (C in the model) that the corporation is held accountable as part of its liability. Thus, λC is the maximum compensation that the non-financial claimants can recover from the corporate owners through the legal

channel. In an "ideal" or "perfect" legal regime ($\lambda = 1$), the firm is held responsible for the entirety of total costs, C, that would have been borne by the society. However, in an extremely poor legal regime ($\lambda = 0$), the corporation is not held liable for any of the social costs, and the non-financial claimants bear the entire cost of the corporation's activities.

In each legal system λ that is in place, the extent to which the firm is made to pay its liability λC, may further depend on its organizational form and the availability of assets and cash in the firm. The firm, organized as a limited liability, will have its legal liability limited to the extent of cash flow available in the firm. In the success state, the firm is liable for the entire liability, λC, assuming it has sufficient cash flows in that state. However, in the failure state it walks away from legal liability all together. Note that since B captures non-monetarized benefits that cannot be accrued to the firm, hence it does not factor into the firm's objective function.

Therefore, based on the strength of the legal system, the limited liability corporation chooses to invest as per the objective function below:

$$I_\lambda^L = \underbrace{argmax}_{I} \{-I + (E\{max[0, [f(I) - \lambda C]\tilde{\omega}]\})\} \tag{3}$$

The first-order condition for private optimality based on the strength of the legal system is:

$$f'\left(I_\lambda^L\right) = \frac{2(h+l)}{h^2} + \lambda C \tag{4}$$

The private firm invests optimally at a level of investment that satisfies the above first order condition with a given legal system λ that is in place. This level of investment, while privately optimal, may not always be socially optimal. In fact, additional policy instruments, such as corporate taxes and subsidies, may be needed to ensure that privately optimal investment is also socially optimal. We next focus on how taxes and subsidies interact with the legal system.

2.3 Optimal Investment, Corporate Taxation, and Strength of the Legal System

If contractual enforcement of specific investments were possible, the social planner would optimally mandate an investment of I^S even in an environment with corporate limited liability. However, non-contractibility of investment levels precludes the design of such first-best forcing contracts. Therefore,

we seek alternative self-enforcing implicit contracts in aligning private and social interests. We argue that corporate taxation and subsidies play such a role.

We first examine the role of corporate taxation in mitigating the investment incentive gap between the private objectives of the limited liability corporation and that of the society at large. When the tax rate is positive, we show that corporate taxation affects a corporation's incentive to invest by reducing its cash flows from a successful outcome. When the corporate tax rate is negative, it is easy to see that the resultant subsidy increases the cash flows to a corporation from a successful investment. [6]

Corporate taxation and subsidies introduce an additional claimholder (the government) to a corporation's cash flows and hence alter the sharing rule between the corporate owners and the non-financial claimholders. Let the corporate tax rate be T. When the investment succeeds, the corporate owners receive only a fraction $(1 - T)$ of the cash flow absent taxation. In the failure states, because of limited liability, the owners of the corporation can walk away from any claims exceeding cash flow by non-financial claimants and do not pay any taxes.

Governments design not just taxation but also a variety of institutions. It is widely known that the quality of institutions matters. How do these institutions interact with the tax system? Do they moderate the incentive effects of corporate taxation? We focus on one such institution – the legal system and its quality, i.e., we examine the role of the legal system in mitigating the conflict between the private objectives of the limited liability corporation and that of society at large. We formalize this by examining the role of corporate taxation in a general economy characterized by the strength of the legal system (λ), with $0 < \lambda < 1$, in bridging the wedge between the private objectives of the limited liability corporation and that of the society at large. The incentive effect of corporate taxation is through reduction in the corporate cash flows from a successful investment outcome, i.e., the firm is obliged to pay taxes on its positive cash flows at a constant marginal tax rate, T, in accordance with the tax structure modeled here. Since our objective is on the incentives, we model the tax in our framework as a deterrent (i.e., to curb overinvestment) rather than

[6] However, subsidies can be provided in other ways and more directly. In this respect, our empirical analysis in Section 6 is consistent with a generalized notion of subsidies.

as a tax on profit. However, this effect can be moderated based on the quality of the legal system as we formalize below.

Thus, based on the strength of the legal system, the limited liability corporation chooses to invest as per the objective function below:

$$I^{L}_{\lambda,T} = \underbrace{argmax}_{I}\{-I + (1-T)(E\{max[0,[f(I) - \lambda C]\tilde{\omega}]\})\} \tag{5}$$

The first-order condition for private optimality with corporate taxation and based on the strength of the legal system is:

$$f'\left(I^{L}_{\lambda,T}\right) = \frac{2(h+l)}{h^2(1-T)} + \lambda C \tag{6}$$

Proposition 1. *Under a corporate tax rate of* $T^* = \left[1 - \frac{B\left(1-\left(\frac{l}{h}\right)^2\right)}{\left[1+\left(\frac{BCh}{2}\right)(1-\lambda)\left(1-\frac{l}{h}\right)\right]}\right]$*, the investment policy of the corporation is identical to the socially optimal innovation policy. This tax rate* T^* *is increasing in* $\left(\frac{l}{h}\right)$*, decreasing in* B *and* λ*.*

Proof: See Appendix B.

Policy Remarks: Proposition 1 shows the central role played by the strength of the legal system as characterized by λ, $0 < \lambda < 1$, in the design of corporate taxes and subsidies. When there is a high level of non-monetized benefits, this can spur an increased investment. We turn our attention to this matter in the next subsection.

2.4 High Level of Non-monetized Benefits

In this section, we will examine the implications for optimal investment when the level of non-monetized benefits is high. As mentioned earlier, the level of non-monetized benefits, B, is only observed by the social planner, and is neither observable nor contractible by the private firm. Nevertheless, the level of non-monetized benefits has a first-order effect on optimal investment by the private firm. The channel is through taxation. We characterize this relationship as follows.

Proposition 2. *The optimal investment policy of the private corporation is increasing in the level of non-monetized benefits,* B*.*

Proof: See Appendix B.

The intuition is straight-forward. The optimal tax rate is lower when the level of non-monetized benefits is high as shown in Proposition 1. If we combine this with the fact that investment is inversely related to taxes (as implied by equation (6)), the above proposition follows. That is, a high level of non-monetized benefits, B, induces a low optimal tax rate which in turn induces an increase in the level of optimal investment by a private firm. In Appendix A, we discuss the special case of an ideal legal system (i.e., $\lambda = 1$), and derive a few additional propositions.

In the next section, we bring these theoretical implications to the data. We test whether corporate investment increases with the level of non-monetized benefits, whether the government optimally imposes a lower tax rate when the legal system is strong, and whether investment misalignment (e.g., overinvestment and underinvestment) effects are attenuated in the presence of a high level of non-monetized benefits.

3. Empirical Strategy and Analysis

3.1 Measuring Local Institutional Quality

The empirical challenge in prior studies, which explore the governance role of institutions, stems from the use of cross-country data with little cross-time variations, which potentially confound the effectiveness of institutional variables, such as legal regimes with other factors, including cross-country heterogeneity in culture and technology. To address this challenge, we leverage China as a unique setting, which allows us to take advantage of the within-country, cross-region variation in the quality of local institutions that evolves over time. The cross-region heterogeneity within China allows us to leverage on how the quality of local institutions evolves over time in multiple dimensions.

In the main analysis, we measure the quality of local institutions ($\lambda_{p,t}$) with China's provincial marketization index, a well-known index developed by Fan et al. (2019) that tracks and ranks the relative marketization process in all provinces, autonomous regions, and municipalities across mainland China over time. This comprehensive index, which is used by many scholars to measure regional institutional development (e.g., Wang et al. 2008; Firth et al. 2009; Li et al. 2009), is composed of 18 sub-indices and

measures the local institutional quality from five dimensions: (1) the relationship between the government and market, (2) the degree of development of non-state-owned economy, (3) the degree of development of the product market, (4) the degree of development of the factor market, and (5) the development of market-oriented intermediaries and the legal system and environment.[7] The data used to construct this index comes from two main sources: the national and provincial bureaus of statistics and other government agencies, and various surveys of enterprises across the country.

From the China Market Index Database, we obtain information on the provincial marketization index for the years 2008 – 2019. For each province in each year, *Marketization* is its overall marketization index scaled by 100. A higher value of *Marketization* indicates a better institutional environment for business.

Alternatively, we consider the sub-index measuring the development of market-oriented intermediaries and of the legal system and environment, which is more closely linked to the legal enforcement aspect of local institutional quality. This index evaluates the quality of local legal system and environment from three aspects: the degree of development of local market-oriented intermediaries and organizations such as lawyers, accountants, technical services, and industry associations; whether the local public prosecutors and law enforcement agencies enforce the law fairly and effectively to protect the legitimate rights and interests of businesses; and intellectual property protection. We thus calculate *Legal* as the index for market-oriented intermediaries and legal system and environment, scaled by 100. A higher value of *Legal* implies a more developed legal system and market-oriented intermediaries in a province.

[7] "The relationship between government and market" considers (1) the proportion of economic resources allocated by the market, (2) the reduction of government intervention in enterprises, and (3) the reduction of the size of the government. "The degree of development of non-state-owned economy" considers (1) the proportion of non-state-owned economy in industrial sales revenue; (2) the proportion of non-state-owned economy in total fixed asset investment in the society; and (3) the proportion of non-state-owned economy in urban employment. "The degree of development of the product market" takes into account (1) the degree to which prices are determined by the market, (2) reduced local protection in the commodity market, and (3) fair market competition conditions. "The degree of development of factor market" considers (1) marketization of the financial industry, (2) the supply of human capital, and (3) marketization of innovations and technologies. "The development of market-oriented intermediaries and the legal system and environment" considers (1) the development of market-oriented intermediaries and services, (2) the legal system and environment that protects the market, and (3) intellectual property protection. For details, see China Market Index Database (https://cmi.ssap.com.cn/).

3.2 China's Government-Initiated Industrial Policies

Prior empirical studies are also limited by lack of observability and quantification of the socially optimal investment levels. To this end, we exploit the staggered designation of strategically important industries identified by the Chinese government in its Five-Year Plans (FYPs).

Despite the transition toward a market-oriented economy since 1978, China still preserves some centrally planned economic features. Its FYPs are a series of social and economic development initiatives established for the entire country, containing detailed guidelines for all its regions. They serve as an essential basis for the government to fulfill its responsibilities in economic regulation, market supervision, social management, and public services. Each province also formulates its own FYPs for regional development, modified from the FYPs of central government to suit its own local conditions (Wu, Zhu, and Groenewold 2019).

Since 1953, the country has implemented 14 intervals of FYPs. One key element is that each FYP identifies and supports a specific set of industries considered strategically important for economic and social development through a coordinated effort at the national level.[8]

After the 1978 economic reform, the selection of sectors became more formalized (Chen et al., 2017). At the end of each five-year period, the Politburo proposes a set of industries for government support in the next plan period. Based on these recommendations, the State Council formulates industrial policies, and the new program must then be approved by the National People's Congress (NPC) before implementation. While heavy industries were a focus in earlier periods, the selection of industries in more recent periods has incorporated input from international organizations, such as the World Bank and the International Monetary Fund (Dahlman and Aubert 2001), and are increasingly targeted towards high

[8] See, for example, Naughton (2021), Wang et al. (2022), Branstetter and Li (2023), Han et al. (2023), and https://en.wikipedia.org/wiki/Five-year_plans_of_China. The official documents for the FYPs are provided by the State Council of China and are publicly available through government and international institution websites. For instance, the English version of the 14th FYP (2021-2025) is available on the Asian Development Bank website (i.e., https://www.adb.org/publications/14th-five-year-plan-high-quality-development-prc).

technology and green sectors (KPMG China, 2011; Naughton 2021; Branstetter and Li 2023).[9] Existing studies show that the program contributes to environmental protection in China (Zhang and Crooks 2011), improves firm access to external capital (Chen et al. 2017), affects firm innovation (Han et al. 2023), strengthens corporate governance practices (Wang et al. 2022), and shapes the competitive dynamics between domestic firms and their foreign counterparts (Cen et al. 2025).

In the context of our analysis, the FYPs offer a unique setting to infer the time-varying preferences of social planners. While this intuition is consistent with existing literature that highlights social externalities, coordination failures, and public input provisions as rationales for government industrial policies, the FYPs in China differ from those in other countries by providing staggered, sustained, and systematic implementation of industrial policies. This allows us to form time-varying treatment and control groups within a consistent institutional environment when identifying the social planner's preferences.

3.3 Estimation Strategy

As developed earlier, the generalized theoretical framework admits taxes and quality of the legal system as instruments of incentive alignment between the optimally chosen private investments and socially optimal investments. Specifically, our model implies that the quality of local institutions, such as the strength of legal regime, affects the effectiveness of taxes to align investment incentives. In the presence of a strong governance environment, the need for taxes as a mechanism to align publicly and privately optimal incentives diminishes.

To empirically test the model's implications, we proceed as follows. Focusing on publicly listed companies in China, which are limited liability corporations, we first investigate whether the corporate tax rate and the strength of the legal system act as countervailing forces in their effect on corporate investment by estimating the regression model outlined below. Upon establishing the interaction between taxes and

[9] For instance, the 13th FYP stipulates support for the development and growth of industries in fields such as next-generation information technology, new energy efficient vehicles, biotechnology, green low-carbon technologies, high-end equipment and materials, efficient energy storage and distribution systems, high-efficiency energy conservation and environmental protection, and precision medicines. The 14th FYP (2021-2025) focuses on innovation-driven growth, low-carbon development, integration of urban and rural areas with deeper social inclusion, and addressing population aging. See also Wu et al. (2019) for more details.

institutional quality, we proceed to explore this relationship in the context of FYP industries. Specifically, we examine whether the role of taxes and institutions is more prevalent in sectors deemed by the social planner to yield higher social benefits, and whether taxes and institutional quality affect the firms' pursuit of investments with greater social significance, such as green investments. Finally, we estimate the real consequences, assessing whether the misalignment in investment is mitigated among these sectors that have gained increased social desirability.

The generalized theoretical model developed and discussed earlier leads to the following regression specification between tax and institutional quality:

$$y_{i,p,t} = \beta_0 + \beta_1 T_{i,p,t} + \beta_2 \lambda_{p,t} + \beta_3 \lambda_{p,t} \times T_{i,p,t} + \gamma \Omega_{i,p,t} + \alpha_i + \tau_t + \delta_{n,t} + \epsilon_{i,p,t}$$

where $y_{i,p,t}$ is the investment undertaken by firm i headquartered in province p in year t. $\lambda_{p,t}$ is the quality of institutions in province p in year t, which is measured in the main analysis by *Marketization* and *Legal*, respectively. $T_{i,p,t}$ is the firm i's tax rate. Our model would imply that $\beta_1 < 0$ and more importantly, that $\beta_3 > 0$, which captures the moderating effect of institutional quality in attenuating the negative impact of taxes.

We measure the firm's investment ($y_{i,p,t}$) by *Capex*, calculated as capital expenditure scaled by the lagged total assets. We capture the firm's tax obligation ($T_{i,p,t}$) by its effective tax rate (*ETR*), calculated as the current income tax expense scaled by pretax income.[10] To mitigate the impact of outliers, we censor this variable at 0 and 1.

Vector $\Omega_{i,p,t}$ includes controls for time-varying firm characteristics, such as *Size*, defined as the natural logarithm of the firm's total assets; *Leverage*, calculated as total liabilities divided by total assets;

[10] The tax legislation in China is highly centralized. Despite the fixed nature of these statutory elements, there exist substantial variations in the actual tax rates incurred by firms. Although local governments lack the authority to establish tax categories, determine tax bases, or set tax rates, they possess considerable discretion and flexibility in adjusting the effective tax burden on local firms. This discretion includes, but is not limited to, (1) altering the collection method from audit to verification, (2) implementing local tax preferential policies, (3) granting tax incentives to enterprises, and (4) deferring tax collection through the deferment of payment and filing. Moreover, local governments can employ additional methods to modify the actual tax burden, such as granting local tax authorities a certain degree of discretion in determining corporate costs, expenses, deductions, and payable income. For a detailed discussion, see Tao, Gong, and Zhu (2023).

Cash Flow, defined as cash flow from operating activities scaled by total assets at the beginning of the year; and *Market to Book*, calculated as the firm's market to book value of assets, which measures its growth opportunities. We also consider the firm's ownership characteristics, such as a dummy for state ownership (*State*) and the fraction of shares held by the largest shareholder (*Block*).

Finally, we control for a host of fixed effects, including firm fixed effects (α_i), year fixed effects (τ_t), and in some specifications, industry × year fixed effects ($\delta_{n,t}$). The latter absorbs time-varying industry-specific shocks and help narrow our comparison of investments among firms operating in the same industry during the same year.

4. Data and Descriptive Statistics

We compile a sample of 2,881 non-financial firms (26,542 firm-year observations) publicly listed on the A-share main board of Shanghai and Shenzhen Stock Exchanges for the 2008–2019 period from the China Stock Market and Accounting Research (CSMAR) database. We then remove 25 firm-year observations with missing information on the largest shareholder, 1,358 with missing financial information, 41 with missing information on capital expenditure, and 381 with missing information on the market to book value of assets. Our final sample consists of 24,737 firm-year observations (2,799 unique firms).

The financial information of firms and their industry classifications are from CSMAR. Information on ownership and industry segments is from the China Center for Economic Research (CCER)'s China Economic and Financial Database. Information on internal control is from the DIB database. Other macro data are from the China National Knowledge Infrastructure (CNKI)'s China Economic and Social Development Statistics Database. The 3-digit industry classification is based on the China Securities Regulatory Commission 2001 Industry Classifications. Information about industries encouraged and supported by the central and provincial governments in their FYPs comes from the Chinese Research Data Services Platform (CNRDS) database.[11]

[11] The CNRDS database analyzes the contents of central and provincial FYPs, using keywords to determine which industries are considered strategically important by the government. It then converts and standardizes these industries

Panel A of Table 1 shows the distribution of firm characteristics. The unit of analysis is at the firm-year level. An average firm's effective tax rate (*ETR*) is 20.1% (median 17.3%). It has a 0.469 (median 0.466) leverage ratio and 7.4% (median 7.3%) of ROE. The average market to book value of assets is 2.657 (median 1.994). Blockholders own, on average, 35.3% of shares. 46.6% of firm-year observations are state-owned firms. 64.7% of firm-year observations belong to FYP industries, among which, 48.3% are in priority industries identified in the central government's FYPs, whereas 56.1% are in priority industries identified in the local government's FYPs.

Panel B describes the distribution of FYP industries for our sample. Our sample period overlaps with three FYPs: 11th (2006-2010), 12th (2011-2015), and 13th (2016-2020). The upper part of the panel relates to industries identified and supported by the central government (industry level observations) in the three FYPs. The lower part of the panel describes FYP industries selected by provincial governments (province-industry level observations). There is evidence that the government, both at the central and provincial level, adjusts the FYP industries in these five-year plans. For instance, during the 11th FYP period, 29 industries were identified by the central government as strategically important whereas 51 did not make the list. In the 12th FYP period, 6 were dropped from the previous 29 industries while 12 were added to the list of FYP industries.

In what follows, we proceed to test the theoretical implications outlined in Section 2 in two steps. We begin by investigating whether corporate tax rate and institutional quality act as countervailing forces in their effect on corporate investment in Section 5. We then bring this interaction effect of taxes and institutional quality to the FYP industries in Section 6, postulating that the need to align privately optimal and socially desirable investments is stronger among sectors determined by the social planner to have great social benefits. We also explore the role of taxes and institutions in affecting the firms' pursuit of investments with greater social significance. Lastly, we assess whether the misalignment in investment is mitigated to a greater extent among these sectors that have gained increased social desirability.

---

according to the CSRC's 2001 industry classification system. Overall, the method of defining government-supported industries in FYPs in the CNRDS database is similar to that of Chen, Li, and Xin (2017).

5. How do Tax and Institutional Quality Affect Corporate Investment?

We provide the first step results on how tax and institutional quality affect corporate investment in Section 5.1. We then discuss how we address endogeneity concerns in Section 5.2, and we present additional validation tests in Section 5.3.

5.1 The Countervailing Effect of Taxes and Institutional Quality

Table 2 presents the regression results highlighting the role of taxes and institutions in altering corporate investments. We start with an initial correlation between the corporate effective tax rate (*ETR*) and capital spending (*Capex*) in column 1, controlling for firm and year fixed effects. In column 4, we replace year fixed effects with industry × year fixed effects, which absorb industry-specific time-varying shocks. In both cases, we observe that *Capex* is negatively and significantly associated with *ETR*, which supports an intermediate prediction of our model. This is also consistent with the existing causal evidence that taxes deter corporate investments (e.g., Mukherjee et al. 2017; Ohrn 2018; Liu and Mao 2019). Column 1 indicates that a one-standard-deviation decrease in *ETR* is associated with a 0.18 (= 0.148 × 0.012) percentage points increase in *Capex*, which accounts for approximately 3% of the sample mean. Given that *Capex* is scaled by total assets, the 0.18 percentage points increase is equivalent to 26.4 million RMB (= 0.18% × 14,670.54 million) increase in capital spending for an average sample firm.

This intermediate tax effect can be moderated by the quality of institutions. Our generalized theory has allowed us to test the direct effect of taxes and institutions on corporate investments unlike prior studies which make indirect inferences (e.g., GJNS, 2020). Thus, in columns 2-3 and 5-6 of Table 2, we include the interaction term between the effective tax rate and the two proxies for the quality of local institutions: the degree of marketization (*Marketization*) and the strength of the legal regime (*Legal*). The coefficient estimate for the interaction term is uniformly positive and statistically significant. While tax reduction spurs corporate investment, the effect varies and is moderated in the presence of strong local institutions. A one-standard-deviation increase in the degree of marketization and in the strength of the legal regime is associated with a decrease in the marginal effect of *ETR* on investment by 0.81 percentage points (column 2) and 0.83 percentage points (column 3), respectively. This outcome is *net* of the effects of control

variables which carry right signs. The results on the countervailing effect of taxes and institutions thus provide initial evidence that serves as the first step in validating our model's prediction, which suggests that the strength of local legal regime affects the desirability of taxes in aligning private and social investment incentives.

In terms of control variables, to mention some key factors, leverage effects on investments are negative and consistent with the standard debt overhang. The market-to-book effects are positive and consistent with valuation effects of growth opportunities. The positive investment – cash flow sensitivity is in line with firms facing financing constraints.

5.2 Endogeneity Concerns about the Corporate Tax Effect: The Phase III of the Golden Tax System

The effect of taxes on corporate investment we document can be subject to endogeneity concerns. Omitted variables may drive both changes in corporate tax rate and firm investment. Reverse causality could also be in play; for instance, firms anticipating larger investments may lobby local governments for lower taxes.

To address endogeneity concerns, we exploit a regulatory event that led to a staggered increase in the effective corporate tax rate. Starting in 2013, the State Administration of Taxation of China launched the Phase III of the Golden Tax System (GTS III) as the final stage of its long-standing effort to modernize and optimize the country's tax administration system. The GTS III began with a pilot program in two provinces, Shanxi and Shandong, and a municipal city, Chongqing, then gradually expanded to the rest of provinces and cities in the mainland China through 2016. Appendix D lists the timing of the adoption of the GTS III in cities and provinces, extracted from Li et al. (2020), and manually verified and updated through various Internet and news searches.

The goal of the Golden Tax System (GTS), which was originally developed in 1994, is for the Chinese tax authorities to adopt advanced information technology to curb tax avoidance and evasion, which are prevalent in China. In 2014 alone, Chinese firms avoided 52.3 billion RMB tax payments (equivalent

to $8.5 billion).[12] The first two phases, the GTS I and GTS II, focus mostly on the value-added tax enforcement and administration. The third phase, GTS III, aims to improve corporate income tax compliance and enhance the efficiency of tax enforcement and administration. Unlike the previous two phases, the GTS III extends to all types of taxes and introduces a comprehensive information reporting system. The system makes full use of big data, cloud computing, and other technologies to improve tax monitoring, processing and collection, and to expand anti-forgery capability of tax-related information. This enables tax authorities to trace the firm's economic activities from various sources and to impute its true tax liability. By modernizing tax reporting, collection, and administration, the GTS III has greatly increased tax compliance and curbed the incentive for tax evasion. In the context of our analysis, the adoption of the GTS III, directed by the central tax authorities, leads to an increase in the effective tax rate of local firms at different times in different provinces and cities.

To address the endogeneity concerns about corporate tax effect, we employ a staggered difference-in-differences approach. In estimating the effectiveness of tax and institutional quality in altering firm investment, we replace *ETR* in our regression model with *Post*, a dummy variable set to one in years after a city or a province where the firm is located adopts the GTS III, and zero otherwise.

Columns 1 and 4 of Table 3 reveal that the post-GTS III dummy (i.e., *Post*) is significantly and negatively related to corporate capital spending. After a rise in the effective tax rate brought about by the staggered reform of GTS III, firms cut their investments by 0.6 percentage points (column 1), which is 10% of the sample mean. These findings are consistent with those in columns 1 and 4 of Table 2. Moreover, the effects of control variables (Table 3), such as leverage, market-to-book, and cash flow, are similar to the baseline regression outcomes in Table 2.

Importantly, we continue to observe from Table 3 a positive coefficient associated with the interaction between the post-GTS III dummy and the degree of marketization (columns 2 and 5), and between the post-GTS III dummy and the strength of the legal regime (columns 3 and 6). Following the

[12] Press release on the 2014 Anti-Tax Avoidance Work, State Administration of Taxation of China, 2015.

adoption of GTS III, a one-standard-deviation increase in the degree of marketization and the strength of legal regime, is associated with a 0.49 percentage points (column 2) and 0.63 percentage points (column 3) increase in investment, respectively. Thus, the base-line results in Table 2 are confirmed in this regulatory setting that is plausibly exogenous to corporate investments. In particular, the quality of local governance institutions moderates the role of taxes in affecting corporate investments.

5.3 Validation Tests

In this section, we present additional test results to help further establish the causal inferences of our findings. In Section 5.3.1, we validate that the implementation of GTS III leads to a higher effective tax rate. In Section 5.3.2, we verify that GTS III was not designed to cater to the demand of local firms. In Section 5.3.3, we perform a dynamic analysis to confirm that our estimates do not capture any pre-existing trends. In Section 5.3.4, we evaluate the robustness of our results using alternative proxies for institutional quality.

5.3.1 Does GTS III Affect Taxes?

The launch of GTS III aims to enforce tax compliance and curb tax evasion, enabling more effective tax reporting and collection. A direct implication of the launch of GTS III is that Chinese firms pay more taxes, leading to a higher effective tax rate.

In Panel A of Table 4, we validate that the staggered implementation of GTS III leads to a higher effective corporate tax rate. We find that the effective tax rates facing local firms increased after their provinces launched the GTS III, compared to those of similar firms located in the provinces not exposed to the GTS III. The results corroborate the findings of Li et al. (2020), who show that the adoption of the GTS III significantly reduced corporate income tax sheltering by enhancing third-party reporting and enforcement capacity.

5.3.2 Determinants of GTS III Adoption

While the implementation of the GTS III was administered by the central government, one may remain concerned that the characteristics of the provinces and the demand from local public firms, including

their need for capital investments, drive the timing of the adoption, simultaneously leading to an increase in capital spending by local firms.

To evaluate this possibility, we test whether the GTS III is determined by the provincial economic conditions or whether it is systematically designed in response to the demand of local firms. We restrict the sample to firm-year observations up to the year of adoption and lag all independent variables by one year. In column 1 of Table 4 Panel B, we test whether local conditions, such as GDP growth, financial deficit, fiscal revenue growth, and unemployment rate drive a province or a city's adoption decision. We also consider the extent of local market development, using Fan et al.'s (2019) indices for marketization, business environment, and litigation costs.

The adoption of such a policy may not only depend on local economic conditions, but also may be driven by the characteristics of local firms. In column 2 of Panel B, we include, additionally, the average size, leverage, and effective tax rate of publicly traded companies in a province and a year. We also consider the fraction of local firms in a year that are state-owned, which may affect the tax bureau's selection of a region to implement GTS III. Finally, in column 3 of Panel B, we directly test whether the capital spending of local firms determines the project adoption by including the average of capital expenditure of firms in a province and year.

Column 3 of Panel B indicates that the implementation of the GTS III is not related to the characteristics of local public firms, nor to the provincial economic conditions. None of the coefficient estimates are statistically significant. While we cannot completely rule out that, in a few instances, the provincial leaders may have taken the demands of local firms into account, the results suggest that the adoption of the GTS III is not designed primarily to cater to the demand of local listed firms.

5.3.3 A Dynamic Analysis

Our estimates allow for a causal interpretation of the empirical evidence as long as capital investment by firms located in regions with high institutional quality did not behave differently than those in low institutional quality before the change of tax enforcement. To further mitigate the concern that omitted variables, rather than the change in the degree of tax enforcement itself, drive the differential level

of investment between firms located in regions with different degrees of institutional quality, we perform a dynamic analysis to examine how quickly the countervailing effect between taxes and institutional quality engages. Specifically, we include in the estimation, respectively, the interaction between each of the two proxies for provincial institutional quality, *Marketization* and *Legal*, and the indicator variables for each year from three years before up to two years after the implementation of GTS III.

Panel C of Table 4 provides evidence that corporate investment did not exhibit differential trend before the staggered implementation of the tax policy, suggesting that the timing of GTS III fully supports our causal interpretation of the empirical findings.

5.3.4 Alternative Proxies for Local Institutional Quality

In our main analysis, we measure time-varying local institutional quality with Fan et al.'s (2019) provincial index for marketization and for market-oriented intermediaries and legal system. We now consider several alternative measures for the quality of local institutions. Specifically, we use Fan et al.'s (2019) index for the relationship between government and market, index for the degree of development of factor markets, a sub-index evaluating the extent to which the local public prosecutors and law enforcement agencies enforce the law fairly and effectively to protect the legitimate rights and interests of businesses, as well as a sub-index for business environment.

Lastly, we adopt the World Bank's Doing Business Index, "The Proportion of the Cost of Enforcing Contracts to the Value of the Subject Matter", to ensure that our measures are not biased by data sources. For ease of interpretation, we multiply this index by -1 and divide by 100. A higher value of this variable indicates a lower enforcement cost for the contract. This index, while coming from a different source (World Bank), is only available for 2008.

We re-estimate the results in Tables 2 and 3, replacing *Marketization* and *Legal* with these alternative proxies. Table 5 reveals that our findings are unlikely to be driven by the specific proxies we adopt to measure local institutional quality. For instance, column 9 of Panel B suggests that, following the adoption of GTS III, a one-standard-deviation increase in the enforcement cost is associated with a 0.4 percentage points (= 0.094 × 0.043) increase in investment, which is approximately 7% of the sample mean.

6. Social Priorities and Corporate Investment Realignment

Our analysis so far establishes that corporate taxes and the quality of institutions interact to affect corporate investments. Although these findings provide first-step evidence for our theoretical prediction, they do not directly speak to the drivers of the underlying social objective function for investment decisions. This is because the level of non-monetized benefits is not observable. Consequently, it is particularly difficult to determine the factors driving social priorities (e.g., non-monetized benefits in our framework) and how the social planner implements these priorities.

To summon these challenges, we form our inferences based on the observed actions of the social planner and leverage a unique institutional feature in China. As described previously, China's FYP industries offer a novel setting to infer the preferences of the social planner across industries and time. They help form time-varying treatment and control groups within a consistent institutional environment.

In this section, we bring the interplay between taxes and institutions into the context of FYP industries. We investigate whether the social planner employs taxes as a pivotal instrument to drive corporate investment in sectors that yield significant non-monetized benefits, and to what extent the strength of local institutions affects the desirability of taxes in aligning private and social investment incentives. Finally, we evaluate the degree to which misalignment of investment is mitigated in sectors with high social priorities.

6.1 Taxes and Institutions in Industries with High Social Priorities

The "helping hand" theory of government suggests that it can directly spur investment by providing subsidies and tax credits. In the context of our analysis, since the optimal corporate tax rate is a declining function of the non-monetized social benefits of a successful innovation (Proposition 1), the social planner may encourage corporate investments in certain sectors by providing sector-specific tax incentives, essentially lowering the corporate tax rate for firms in these sectors from the baseline economy wide tax rate. Note that our theoretical framework essentially views subsidies as negative taxes.

In this section, we first examine whether government policies, such as taxes (as well as subsidies), are directed to these preferred sectors to induce optimal firm investment. As described previously, we use

FYP industries to identify sectors considered by the social planner to carry higher social benefits (i.e., industries with a higher B in the model). Specifically, we construct indicator variables for whether the firm's industry becomes strategically important as selected by the central government (*FYP* (*Central*)) and by the provincial governments (*FYP* (*Provincial*)) in their FYPs. Alternatively, *FYP* is an indicator variable for an industry that belongs to either central or provincial government's FYPs.

In columns 1-3 of Table 6 Panel A, we estimate whether the government deploys sector-specific tax benefits after establishing an FYP industry. The unit of observation is province-industry-year. The dependent variable is the average effective tax rate of firms in an industry and in a province each year. Control variables include *Market to Book*, *ROA*, *Size*, and *Leverage*, averaged by industry-province-year. To mitigate the concern that a sector belonging to a low tax bracket in the past drives its current low tax rate, we also control for the average effective tax rate in the previous year.

Columns 1-3 of Table 6 Panel A show that an industry in general experiences a lower tax rate after becoming an FYP industry, as the coefficients associated with dummies for FYP industries are negative and are statistically significant at the 1% level. This suggests that the social planner deploys industry-specific tax policies once a sector is determined to carry significant priorities.

In columns 4-9 of Table 6 Panel A, we repeat the analysis at firm-year level. Since the firm's pre-tax losses can lead to a lower effective tax rate mechanically, and the statutory tax rate applicable to the firm is related to its effective tax rate, we control for the firm's accumulated pre-tax losses in the previous five years, scaled by revenue (*NOL*), and its statutory tax rate (*STR*), in addition to the firm's previous year's effective tax rate and the set of control variables used on Table 2.

Columns 4-6 of Table 6 Panel A show that after their industries become FYP industries, firms experience lower effective tax rates. This is consistent with the province-industry-year level evidence in columns 1-3. Column 4 suggests that the average effective tax rate declines by 1.7 percentage points after the industry is designated as an FYP industry by the central government. This increase accounts for 8.46% (= 0.017/0.201) of the sample mean of tax rates.

In columns 7-9, we explore whether the FYP industry policy favors state-owned firms by including the interaction terms between the dummies for FYP industries with the dummy variable for state-owned firms. In columns 10-12, we consider whether the FYP industry policy leans towards large firms by interacting the dummies for FYP industries with the dummy variable for large firms. The dummy for large firm is set to one if the firm size falls above the sample medium, and zero otherwise.

Columns 7-12 reveal that the FYP industry dummies remain negative and highly significant. However, the coefficients for the interaction terms are insignificant, indicating that the sector-specific tax policy is applied consistently to all firms within the industry, without differentiating between state-owned and privately-owned enterprises, nor discriminating between large and medium/small firms.

In Panel B of Table 6, we repeat the analysis for government subsidies. In columns 1-3, our estimates are based on a province-industry-year panel. To mitigate the concern that a sector, that has been highly subsidized in the past, continues to receive large subsidies, we also control for the average government subsidies in the previous year. In columns 4-9, our estimates are based on a firm-year panel, and we include a firm's previous government subsidies in addition to these controls used in Table 2.

Consistent with the results in Table 6 Panel A, we find that an industry's government subsidies increase after it becomes an FYP industry (columns 1-3). Column 3 indicates that an FYP sector experiences a 0.2 percentage points increase in subsidies, accounting for 17% (= 0.002/0.012) of the sample mean. At firm-year level, after their industries become FYP industries, firms receive more government subsidies (columns 4-6). The sector-specific increase in subsidies is applied consistently to all firms within the industry, regardless of their ownership structure (columns 7-9) or firm size (columns 10-12).

Overall, the findings in Table 6 highlight taxes and subsidies as potential economic channels through which the government's industrial policies lead to a change in corporate investment strategies. In addition, the tax (subsidy) policies in FYP industries do not favor state-owned enterprises (SOEs) over non-SOEs, or large firms over medium or small firms.

6.2 Taxes and Institutions in Shaping Corporate Investments in FYP Industries

Our theoretical framework indicates that the role of taxes in aligning socially optimal and privately optimal investments can be moderated by the quality of local institutions. One direct implication is that we should observe such effects where social priorities are of high importance, and hence the need for an incentive alignment for investment is more desirable.

To assess this implication, we split the sample into firms operating in industries identified by the central or provincial government as key sectors supported in their FYPs and those operating in the non-FYP industries. We then re-estimate columns 2-3 and 5-6 of Table 3, leveraging the plausibly exogenous increase in the effective tax rate due to the staggered implementation of the GTS III.

Columns 1-4 of Table 7 Panel A provide evidence that the reduction in investment, attributable to a rising tax rate, being moderated by the presence of strong local institutions is prominent among FYP industries. We observe no such effect in industries that are not in the social planner's priority.

Alternatively, we confirm the role of taxes and institutions in incentivizing firms to pursue more socially desirable investments in terms of entry into the FYP industry. We manually collect information on the top five industries in which each sample firm operates and match them to the industry classifications in CSMAR. We capture the likelihood that the firm expands into a highly socially desirable sector (measured by an FYP industry) by *Enter an FYP Industry*, a dummy variable set to one if the firm adds an FYP industry in its top five industry segment operations in a year, and zero otherwise.

In columns 5-6 of Table 7 Panel A, we continue to observe evidence consistent with the proposition that taxes and institutions are substitutes in aligning socially and privately optimal investments. The deterrence of taxes on the firm's propensity to expand to a sector with social priorities is mitigated if local institutions and legal environment are better developed. Following an increase in the tax rate, firms located in provinces with a one-standard-deviation higher degree of marketization (column 5) and stronger legal regimes (column 6) are 1.5% and 1.6%, more likely, respectively, to expand into an FYP industry.

For this set of analysis, besides firm fixed effects and industry × year fixed effects, we control for government subsidies, which may induce corporate investment in FYP industries in the absence of taxes

and institutions. We also control for the firm's political connections, as it is possible that firms with strong political ties move into an FYP industry to harvest tax and subsidy benefits associated with these preferred industries. We identify a politically connected firm if the CEO or the chairman of the board was previously employed as a bureaucrat by the central or a local government. It is comforting that the amount of government subsidies that the firm receives, as well as its political connections, do not fully explain the effect of taxes and institutions on the firm's decision to invest in an FYP industry.

6.3 Taxes and Institutions in Shaping Corporate Environmental Investments

To explore how tax policies and institutional quality influence investments that align with the social and corporate responsibility goals, we have so far relied on FYP industries to identify more socially desirable sectors. While this approach is supported by well-grounded economic rationales concerning social priorities and public goods input shaping policy choices (Juhász, Lane, and Rodrik 2024), in reality, industrial policies may also be influenced by political incentives of policy makers.

In this section, instead of industrial policies, we validate our findings by zooming into a subset of investments that are highly likely to generate social benefits and externalities – environmental spending and output. In Panel B of Table 7, we confirm the role of taxes and institutions in affecting firms' pursuit of more socially important investments. For this set of analysis, we begin by exploring the investment behaviors of firms in heavily polluting industries. Intuitively, the misalignment between corporate profitability and social welfare externalities is larger in these sectors. Incentivizing firms for socially optimal investments, such as environmental investments, thus generates larger benefits for society.

Heavily polluting industries are classified by the Ministry of Ecology and Environment.[13] For each heavily polluting firm in each year, we obtain its annual report from the CSMAR database and extract information on fixed assets and on-going project investments. We use environment-related keywords to

[13] The heavily polluting industries include thermal power, steel, cement, electrolytic aluminum, coal, metallurgy, chemicals, petrochemicals, building materials, papermaking, brewing, pharmaceuticals, fermentation, textiles, and tanning and mining. See "Notice on Environmental Protection Verification of Companies Applying for Initial Listing and Listed Companies Applying for Refinancing". Formerly the Ministry of Environmental Protection of China, and prior to 2008 known as the State Environmental Protection Administration, the Ministry of Ecology and Environment is a department of the State Council of China.

identify the firm's environmental investment (Wu et al. 2023).[14] We then compute the capital environmental spending, and scale it by the firm's total assets at the beginning of the year. In columns 1-2 of Table 7 Panel B, we replace the outcome variable *Capex* by *Environmental Capex* and repeat the regression specifications in columns 5-6 of Table 3.

In columns 3-4 of Table 7 Panel B, we consider an outcome for environmental investments in the form of green patents. We obtain information on green patents from the CNRDS database and construct a variable *Green Innovation*, which is the natural logarithm of one plus the number of green patents filed in year t and granted within three years.

In both sets of tests, we observe the positive coefficient estimates associated with the two interaction terms, suggesting that the effect of taxes on environmental spending and green innovation output by firms in the heavily polluting sectors is moderated by the quality of local institutions. Following an increase in the tax rate, heavily polluting firms located in provinces with a one-standard-deviation higher degree of marketization invest 1.66 percentage points (= 0.019 × 0.872) more in environmental capital (column 1) and generate 1.48 percentage points (= 0.019 × 0.781) more green patents (column 3). Put differently, columns 1-4 of Table 7 Panel B provide evidence largely corroborating those in columns 1-2 of Table 7 Panel A.

Next, we estimate the likelihood of firms expanding into non-heavily polluting sectors. For this set of the analysis, we use the full sample. To mitigate the concern for possible green washing and window dressing, we only consider each non-polluting industry that accounts for at least 1% of the firm's annual sales, so that the cross-sector expansion is materially meaningful.

The results in columns 5-6 of Table 7 Panel B largely corroborate those about the expansion to FYP industries in columns 5-6 of Table 7 Panel A. Following an increase in the tax rate, heavily polluting firms located in provinces with a one-standard-deviation higher degree of marketization are 1.21% more

[14] Keywords include environmental protection projects, low-carbon projects, environmental protection transformation, emission reduction transformation, green transformation, environmental protection projects, green projects, low-carbon projects, pollution control projects, pollution control projects, pollution control investment, etc. See Wu et al. (2023) for details.

likely to expand into non-polluting sectors (column 5). Nevertheless, the coefficient estimate for the interaction term *Post* × *Legal*, which preserves the positive sign, is not significant at the conventional level.

6.4 Firm Investment Responses to Industrial Priority Designation

As described in Section 3, we infer the priorities of the social planner using the industries selected by each of China's FYPs, which reveal a time-varying preference of sectors that are considered strategically important for the country. In this section, we examine whether and how firms alter their investments when their industry becomes a prioritized sector as designated by the government.

We first regress the year-on-year change in capital spending, Δ *Capex*, on the dummies for priority sectors. Consistent with Proposition 2, columns 1-3 of Table 8 Panel A show that firms speed up their investment after their industry becomes an FYP industry. Column 3 indicates that after their industry is designated as an FYP industry, *Capex* growth of these firms increases by 0.3 percentage points.

Nevertheless, this investment behavior does not rule out a perverse incentive. In particular, an increase in investment following the government's designation of priority industries does not necessarily render a closer alignment between socially and privately optimal investments. This is because firms may appropriate the various incentive schemes accompanied by their industrial priority designations aggravating further deviations from social optimality and generating resource misallocation.

We take a closer look at this phenomenon by sharpening our tests based on within-industry variation of firm investment behavior before priority designation. Since our sample period overlaps with the initiations of two FYPs, we restrict the sample to the six-year window centered around 2011 – the implementation of the 12th FYP, and the six-year window centered around 2016 – the implementation of the 13th FYP. The treatment group thus includes firms whose industries are not FYP industries in the 3-year window prior to 2011 or 2016, but nevertheless become FYP industries after 2011 or 2016. The control group includes firms belonging to non-FYP industries both before and after 2011 or 2016. To ensure comparability, we require firms in both treatment and control groups to share the same level one industry classification.

In columns 4-5 of Table 8 Panel A, we explore within-industry variation and examine how firms, that have previously underinvested, behave differently from the rest of the firms when facing the same industry shock. We employ two proxies to capture *ex ante* underinvestment. *Low Capex* ($t = 0$) is an indicator variable for whether the firm's *Capex* falls in the bottom sample quartile in 2010 – one year prior to the implementation of the 12th FYP, or in 2015 – one year prior to the beginning of the 13th FYP. Following Biddle et al. (2009), we also calculate *Underinvestment* ($t = 0$), which is a dummy variable set to 1 if, in year 2010 or 2015, respectively, the residual from regressing capital expenditures on sales estimated for each industry and year falls in the bottom quartile, and zero otherwise. We then interact the dummy for an FYP industry with each of the two measures for *ex ante* underinvestment.

Columns 4-5 provide evidence consistent with the introduction of priority industry policy spurring corporate investment, particularly for these firms that have previously underinvested. The coefficients for the interaction terms, *FYP* × *Low Capex* ($t = 0$) and *FYP* × *Underinvestment* ($t = 0$), are positively and significantly linked to *Capex*. The inclusion of industry × year fixed effects in this set of tests allows us to narrow our comparison to firms within the *same* industry and year. Column 5 of Panel A suggests that, after their industry becomes an FYP industry, previously underinvested firms increase capital spending by 2.8 percentage points more than the comparable firms without such prior underinvestment.

Similarly, we compare the reactions between firms that have previously overinvested with the rest of the firms in the same industry. *High Capex* ($t = 0$) is a dummy variable set to one if the firm's capital spending falls in the top sample quartile in 2010 or in 2015, and zero otherwise. Following Biddle et al. (2009), we also calculate *Overinvestment* ($t = 0$), which is a dummy variable set to one if, in year 2010 or 2015, the residual from regressing capital expenditures on sales estimated for each industry and year falls in the top quartile, respectively, and zero otherwise.

In columns 6-7, we interact the dummy for an FYP industry with each of the two measures for *ex ante* overinvestment. We observe negative and significant coefficients associated with the interaction terms, *FYP* × *High Capex* ($t = 0$) and *FYP* × *Overinvestment* ($t = 0$). Following the government's selection of their

industry as a priority sector, firms that were previously overinvesting boost their investment to a lower extent in comparison to the rest of the firms in the same industry. Taken together, columns 4-7 present evidence consistent with the prediction that the changing investment strategy does not lead to distorted outcomes (i.e., over-investment or under-investment), but rather generates a realignment of investment to the elevated industry priority deemed by the social planner.

To further alleviate the concern that firms alter their investment strategy to take undue advantage of incentives accompanied with the new industry policies, we re-estimate the regressions in columns 4-7 of Panel A, replacing *Capex* with *ROE*. By speeding up capital spending, a previously underinvested firm may end up with over-investment, in which case we should observe a decline in performance brought about by suboptimal spending. Instead, columns 1-2 of Panel B indicate that firms that have previously underinvested experience a bigger gain in profitability compared to other firms in the same industry. Column 2 of Panel B suggests that after their industry becomes an FYP industry, the *ROE* of previously underinvested firms is 4.9 percentage points higher than that of comparable firms with no such prior underinvestment.

By the same token, if the firm's investment were previously already at an optimal level, any deceleration in such investment could undermine its performance. Columns 3-4 of Panel B suggest otherwise. Firms that have previously overinvested do not suffer deteriorating profitability when scaling down their investment.

Overall, the results in Table 8 provide evidence supporting a realignment in investment incentives in industries that generate larger social benefits. In particular, there is a reduction in investment misalignment, be it overinvestment or underinvestment, once the industry becomes a sector that is important for sustained social and economic development of the country.

6.5 Discussion and Extensions

Throughout the main analysis, we interpret FYP industries as sectors with high social priorities identified by the social planner. One may argue that rent-seeking behavior drives the selection and timing of FYP industries. For instance, firms in industries with high effective tax rates or firms in heavily subsidized industries lobby for the adoption of FYP industries. Since FYP industries bring tax and subsidy

benefits, industries with strong political ties or with a higher level of spending to entertain government bureaucrats may be more likely to be assigned as FYP industries.

Note that the test results on environmental investments and green patent outputs in Section 6.3, while do not rely on the designations of FYP industries, are consistent with the findings using the FYP industries. Nevertheless, we compare certain *ex ante* characteristics between FYP and non-FYP industries. Specifically, we compare, in year 2010 and year 2015 (prior to the implementation of the 12th and 13th FYPs respectively), industry average tax rate and subsidiaries, political ties, the presence of state-owned firms, and firms' growth opportunities (captured by Tobin's Q). In the Internet Appendix, Panel A of Table IA.1 shows that the industry average effective tax rate and government subsidies, respectively, are both economically and statistically similar between the two types of industries. In addition, prior to the implementation of new industry policies, FYP industries do not have significantly more politically connected firms, more SOEs, or are more corrupt (e.g., as proxied by the entertainment and travel expenses) than non-FYP industries. As such, it is unlikely that designation of FYP sectors is driven by rent-seeking, or by favoritism, for industries dominated by SOEs.

Lastly, Panel A of Table IA.1 shows that firms in FYP sectors do not possess *ex ante* superior growth opportunities compared to those in non-FYP sectors. Therefore, FYP designations do not appear to solely cater to regional development strategies, nor to sector-specific growth potentials. Additionally, our baseline analysis includes industry × year fixed effects, which help to mitigate the potential impact of sector-specific dynamics in driving the results.

While the government intends to identify industries with social priorities, it is possible that the incentive schemes associated with its industrial policy produce overinvestment relative to social optimality. The results from Panel B of Table IA.1 dispel such an explanation, suggesting that the instruments are overall applied properly. Moreover, we directly estimate the effect of FYP industries on the firm's overinvestment measure based on Biddle et al. (2009). We find no evidence that these industry policies lead to overinvestment. If anything, column 1 of Panel B indicates that the FYP industries supported by the central government experience a decrease in the extent of overinvestment.

Another possible explanation is that the observed change in firms' investment strategies reflects empire-building by powerful executives, rather than being brought about by the designation of priority sectors supported by the social planner. In Panel C of Table IA.1 of the Internet Appendix, we consider three proxies for CEO power. Our main findings are robust to controlling for these proxies for CEO power.

It is also possible that industrial policies facilitate investment by poorly governed firms to a greater extent. For instance, since FYP industries are associated with tax and subsidy benefits, poorly governed firms, through bribes and connections, may appropriate more resources and harvest more benefits than better governed industry peers. Doing so allows them to invest more and profit more. In Panels D and E of Table IA.1 of the Internet Appendix, we address this concern by considering two common proxies for corporate governance: institutional holding and board independence. We find no evidence that the results are driven by poorly governed firms.

Finally, our theoretical and empirical analyses focus on tax as a mechanism employed by the social planner in inducing socially optimal investment by private firms. This is because taxation is the most direct and commonly deployed regulatory mechanism across both developed and developing economies, and improving the quality of institutions remains one of the primary tasks for social planners. As such, our findings are not specific to China and can be readily generalized to a broader economic context. Nevertheless, we acknowledge that the social planner may employ other mechanisms, such as through direct ownership of the firm. The "social view" about state-owned firms in prior research argues that the state pursues non-commercial objectives beyond maximizing profits or shareholder value (Toninelli 2000). While state-ownership of firms is a common practice in many countries (Pargendler 2012), the effectiveness and frictions surrounding state-owned firms have been subject to intense debate. In particular, state ownership may influence tax policies and corporate tax practices (e.g., Bradshaw et al. 2019). For this reason, we directly control for state-owned firms in all our regressions. The effectiveness of state ownership and how it contrasts with tax in aligning socially and privately optimal investments, while interesting, are beyond the scope of this paper. We leave it for future research.

7. Conclusion

In this paper, we examine the role of corporate taxation and the quality of institutions in aligning privately optimal investments by the limited liability corporations with socially optimal investments. We provide both a theoretical framework and empirical evidence. Our theoretical framework generalizes the model of GJNS (2020) through two novel features, namely introduction of continuous scaled technology and symmetric treatment of both negative and positive externalities. When such externalities are not internalized in private investment choices, distortions arise in the form of underinvestment or overinvestment relative to social optimality. The overinvestment incentive depends crucially on the wedge between the social cost and the private payoff. The tradeoff can be reversed from overinvestment into underinvestment when the social benefits are high but not internalized in the private investment decisions.

We show that corporate taxes and subsidies can be optimally designed to align private investments with socially optimal investments. Taking account of the interaction between corporate taxation and the strength of the legal system, we further predict that the level of corporate tax required to induce social optimality is attenuated in the presence of high-quality institutions.

To test these theoretical predictions, we exploit the staggered designation of strategically important industries by the Chinese government in its Five-Year Plans and a regulatory event that led to an increase in the effective corporate tax rate. We show that the government lowers taxes to spur corporate investment to a lesser extent if there is a strong local legal regime or a well-developed market-based system. The results are driven by the FYP industries which reflect upon the social priorities that generate larger non-monetized benefits. Both corporate taxation and institutional quality also affect the likelihood of firms expanding into industries that are considered socially important. Importantly, investment misalignment decreases in these industries, as previously underinvested (overinvested) firms speed up (slow down) their investment to a greater extent compared to their peers in the same FYP industry. Our findings highlight taxes and subsidies as alternative self-enforcing implicit contractual instruments in aligning private and public interests. The quality of institutions, particularly the strength of the legal system in our framework, has a moderating influence on the effects of taxation and subsidies.

References

Aghion, P. and P. Bolton, 1992. An incomplete contracts approach to bankruptcy and the optimal financial structure of the firm. *Review of Economic Studies* 59: 473–494.

Aghion, P., J. Cai, M. Dewatripont, L. Du, A. Harrison, and P. Legros, 2015. Industrial Policy and Competition. *American Economic Journal: Macroeconomics* 7(4): 1-32.

Biddle, G.C., G. Hilary, and R. S. Verdi, 2009. How Does Financial Reporting Quality Relate to Investment Efficiency? *Journal of Accounting and Economics* 48: 112-131.

Bradshaw, M., G. Liao, and M. Ma, 2019. Agency costs and tax planning when the government is a major shareholder. *Journal of Accounting and Economics* 67(2-3): 255-277.

Branstetter, L. and G. Li, 2023. The Challenges of Chinese Industrial Policy. In B. Johnes and J. Lerner (eds.) *Entrepreneurship and Innovation Policy and the Economy*, Volume 3, University of Chicago Press.

Cai, H., H. Fang, and L. Xu, 2011. Eat, Drink, Firms, Government: An Investigation of Corruption from the Entertainment and Travel Costs of Chinese Firms. *Journal of Law and Economics* 54, 55–78.

Cen, X., V. Fos, and W. Jiang, 2025. How Do U.S. Firms Withstand Foreign Industrial Policies? Working Paper, Emory University.

Chen, D., O. Li, and F. Xin, 2017. Five-year plans, China finance and their consequences. *China Journal of Accounting Research* 10: 189-230.

Chen, S. X. Chen, Q. Cheng, and T. Shevlin, 2010. Are family firms more tax aggressive than non-family firms? *Journal of Financial Economics* 95(1): 41-61.

Dahlman, C. J. and J.-E. Aubert, 2001. *China and the Knowledge Economy: Seizing the 21st Century*, World Bank Institute: WBI development studies, Washington, D.C.

Demirgüç-Kunt, A. and V. Maksimovic, 1998. Law, Finance, and Firm Growth. *Journal of Finance* 53(6): 2107-2137.

Desai, M.A. and D. Dharmapala, 2008. Tax and Corporate Governance: An Economic Approach. In: W. Schön (ed.) *Tax and Corporate Governance. MPI Studies on Intellectual Property, Competition and Tax Law*, vol 3. Springer, Berlin, Heidelberg.

Desai, M.A., A. Dyck, and L. Zingales, 2007. Theft and taxes. *Journal of Financial Economics* 84(3): 591-623.

Fan, G., X. Wang, and G. Ma, 2008-2019. *NERI Index of Marketization for China's Provinces: 2001-2019 Report*, [in Chinese], Beijing: Economic Science Press.

Firth, M. C. Lin, P. Liu, and S. Wong, 2009. Inside the black box: Bank credit allocation in China's private sector. *Journal of Banking & Finance* 33(6): 1144-1155.

Flammer, C., T. Giroux, and G. Heal, 2025. Biodiversity finance. *Journal of Financial Economics* 164, 103987.

Gande, A., K. John, V. Nair, and L. W. Senbet, 2020. Taxes, Institutions and Innovation: Theory and International Evidence. *Journal of International Business Studies* 51: 1413-1442.

Giannetti, M., 2003. Do Better Institutions Mitigate Agency Problems? Evidence from Corporate Finance Choices. *Journal of Financial and Quantitative Analysis* 38(1): 185-212.

Giannetti, M., G. Liao, J. You, and X. Yu, 2021. The Externalities of Corruption: Evidence from Entrepreneurial Firms in China. *Review of Finance* 25(3): 629-667.

Grossman, S. J., and O. D. Hart. 1986. The costs and benefits of ownership: a theory of vertical and lateral integration. *Journal of Political Economy* 94: 691–719.

Han, P., W. Jiang, and D. Mei, 2023, Mapping US-China Technology Decoupling, Innovation, and Firm Performance. *Management Science* forthcoming.

Harris, M. and A. Raviv, 1989. The design of securities. *Journal of Financial Economics* 24: 255–87.

Hart, O. D., 1988. Incomplete contracts and the theory of the firm. *Journal of Law, Economics, & Organization* 4: 119–139.

Heinkel, R. and J. Zechner, 1990. The role of debt and preferred stock as a solution to adverse investment incentives. *Journal of Financial and Quantitative Analysis* 25: 1–24.

John, K. and A. Kalay, 1982. Costly contracting and optimal payout constraints. *Journal of Finance* 37: 457–470.
Juhász, R., N. Lane, E. Oehlsen, and Verónica C. Pérez, 2024. The Who, What, When, and How of Industrial Policy: A Text-Based Approach, Working Paper, University of British Columbia.
Juhász, R., N. Lane, and D. Rodrik, 2024. The New Economics of Industrial Policy. *Annual Review of Economics* 16: 213–242.
Kalouptsidi, M. 2018. Detection and Impact of Industrial Subsidies: The Case of Chinese Shipbuilding. *Review of Economic Studies* 85(2) 1111-1158.
K.P.M.G. China, 2011. China's 12th five-year plan: Overview. KPMG Insight Series, KPMG Advisory.
La Porta, R. F. Lopez-de-Silanes, A. Shleifer, and R. Vishny, 1998. Law and Finance. *Journal of Political Economy* 106(6): 1113-1155.
Li, D., 1998. Changing Incentives of the Chinese Bureaucracy. *American Economic Review* 88(2): 383-397.
Li, K., H. Yue, and L. Zhao, 2009. Ownership, institutions, and capital structure: Evidence from China. *Journal of Comparative Economics* 37(3): 471-490.
Li, J., X. Wang, and Y. Wu, 2020. Can government improve tax compliance by adopting advanced information technology? Evidence from the Golden Tax Project III in China. *Economic Modelling* 93: 384-397.
Liu, Y. and J. Mao, 2019. How Do Tax Incentives Affect Investment and Productivity? Firm-Level Evidence from China. *American Economic Journal: Economic Policy* 11(3): 261-91.
Mukherjee, A., M. Singh, and A. Žaldokas, 2017. Do corporate taxes hinder innovation? *Journal of Financial Economics* 124(1): 195-221.
Myers, S. C., 1977. Determinants of corporate borrowing. *Journal of Financial Economics* 5: 147–175.
Naughton, B., 2021. *The Rise of China's Industrial Policy, 1978 to 2020*. Lynne Rienner Publishers.
Ohrn, E., 2018. The Effect of Corporate Taxation on Investment and Financial Policy: Evidence from the DPAD. *American Economic Journal: Economic* Policy 10 (2): 272-301.
Pargendler, M., 2012. State ownership and corporate governance. *Fordham Law Review* 80(6): 2917-2973.
Ramadorai, T., and F. Zani, 2024. Climate regulation and emissions abatement: Theory and evidence from firms' disclosures. *Management Science* 70 (12): 8366-8385.
Tao, P., F. Gong, and K. Zhu, 2023. Tax competition among local governments: Evidence from the spillovers of location-based tax incentives in China. *China Economic Review* 82: 102077.
Toninelli, P., 2000. The Rise and Fall of Public Enterprise: The Framework. In: P.A. Toninelli (ed.), *The Rise and Fall of Public Enterprise in the Western World*, Cambridge: Cambridge University Press.
Wang, Q., T. J. Wong, and L. Xia, 2008. State ownership, the institutional environment, and auditor choice: Evidence from China. *Journal of Accounting and Economics* 46: 112-134.
Wang, Q., E. Lee, K. Wang, and X. Zhang, 2022. The effect of government industrial policies on corporate accounting conservatism, *Journal of Accounting and Public Policy* 41(5): 106960.
Wu, X., J. You, X. Yu, and C. Zhou, 2023. Levelling-up Your Green Mojo: The Benefits of Beneficent Investment, Working Paper, Shanghai Advanced Institute of Finance.
Wu, Y., X. Zhu, and N. Groenewold, 2019. The determinants and effectiveness of industrial policy in China: A study based on Five-Year Plans. *China Economic Review* 53, 225-242.
Zhang, Q. and R. Crooks, 2011. Environmental Strategy for the 12th Five-Year Plan Period: What Can the People's Republic of China Learn from the 11th Five-Year Plan? *ADB Briefs* No. 8, Asian Development Bank.

Appendix A: A Special Case - An Ideal Legal Regime ($\lambda = 1$)

In an "ideal" legal regime ($\lambda = 1$), the firm is held responsible for the entirety of total costs, C, that would have been borne by the society. There is no conflict between the social planner and the private firm in terms of the social cost, C, since it is completely internalized. As a result, the C effect drops out, and the expression from Proposition 1 simplifies, which we discuss in the next two Propositions.

Due to the absence of contractually stipulated levels of investment, the stockholders treat investment choices as discretionary private actions. At $t = 0$ they choose an investment level to maximize the value of equity, given the limited liability provision by solving:

$$I^L = \underbrace{argmax}_{I} \{-I + E(max[0, [f(I) - C]\tilde{\omega}])\} \tag{7}$$

The first order condition for the privately optimal level of investment

$$f'(I^L) = \frac{2(h+l)}{h^2} + C \tag{8}$$

From the concavity of f, overinvestment (i.e., $I^L > I^S$) and underinvestment (i.e., $I^L < I^S$) follow (see Proposition 3 below).

Proposition 3. In an ideal legal regime ($\lambda = 1$), *with limited liability of corporate claims, for* $B < \frac{h^2}{h^2 - l^2}$, *equity holders will choose to overinvest, whereas for* $B > \frac{h^2}{h^2 - l^2}$, *equity holders will choose to underinvest in risky technologies relative to socially optimal levels.*

Proof: See Appendix B.

Proposition 3 has a straightforward interpretation. In the case of the social objective function, the optimal investment policy is characterized by the level of investment such that the marginal product is high enough for the integral over the positive states *minus* that over the negative states adds up to 1. In the case of the private objective function under corporate limited liability, the marginal product in the negative states is ignored, and the level of investment is chosen such that its integral only over the positive states equals 1. This is equivalent to a subsidy to the firm in the negative states. That is, for all $\tilde{\omega}$ distributed uniformly on the closed interval $[-l, 0]$, which in turn allows the incremental investment, $I^L > I^S$, a positive net present

value is generated from the standpoint of stockholders when parameter restrictions for B are satisfied as shown in the earlier part of Proposition 3.

Note that the overinvestment incentive is crucially dependent on the wedge between the social benefit and the private payoff (B versus $\frac{h^2}{h^2-l^2}$). The tradeoff can be reversed from overinvestment into underinvestment when the social benefits are high but not internalized in the private investment decisions. In other words, when the level of non-monetized benefit is very high, the firm will invest less than the socially desired optimal level, because it does not capture (i.e., monetize) the full benefit of the investment. In fact, the social planner may need to incentivize the firm through subsidies. Below we provide a simple characterization of subsidies in our model. Intuitively, a subsidy is equivalent to a negative tax rate.

In the presence of corporate taxation, the limited liability corporation chooses to invest as per the objective function below:

$$I_T^L = \underbrace{argmax}_{I}\{-I + (1-T)(E\{max[0,[f(I)-C]\tilde{\omega}]\})\} \tag{9}$$

The first-order condition for private optimality with corporate taxation is:

$$f'(I_T^L) = \frac{2(h+l)}{h^2(1-T)} + C \tag{10}$$

Proposition 4. *A. In an ideal legal system ($\lambda = 1$) and a corporate tax rate of $T^* = \left[1 - B\left(1 - \left(\frac{l}{h}\right)^2\right)\right]$, the investment policy of the corporation is identical to the socially optimal investment policy. This tax rate T^* is increasing in $\left(\frac{l}{h}\right)$ and decreasing in B. In other words, for lower levels of non-monetized benefits, i.e., $B < \frac{h^2}{h^2-l^2}$, the optimal solution is corporate taxation, and for higher levels of non-monetized benefits, i.e., $B > \frac{h^2}{h^2-l^2}$, the optimal solution is a corporate subsidy.*

Proof: See Appendix B.

Policy Remarks: Based on Proposition 3, we know that in the absence of corporate taxes and when the non-monetized benefits are low (*i.e.,* $B < \frac{h^2}{h^2-l^2}$), the limited liability firm invests more relative to the socially optimal level. The optimal rate of corporate taxation T^*, which is applied to the profits in the

successful states, alters the *ex-ante* investment incentives of the limited liability corporation to be in line with social optimality.[15] Thus, corporate taxation can be viewed as the price that a corporation must pay for the benefit it receives in the form corporate limited liability.

In addition, from Proposition 3, we also know that in the absence of subsidy when the non-monetized benefits are high (*i.e.,* $B > \frac{h^2}{h^2-l^2}$), the limited liability firm invests less relative to the socially optimal level. Proposition 4 captures the essence of the above in terms of the model parameters. That is, Proposition 4 shows that the optimal tax rate is a declining function of B, the non-monetized social benefits of a successful outcome. In terms of implementation, the social planner may choose to encourage (i.e., subsidize) investment on the part of private firms in certain sectors by providing sector-specific tax incentives.[16]

[15] As discussed in GJNS (2020), the role of corporate taxation can be viewed in the same manner as the government taking claims in private firms during the global financial crisis. The government, in exchange for bailing out failing financial institutions, is known to have taken equity-like claims, such as preferred stock and warrants, as a mechanism for repaying the taxpayer. In this respect, we wish to make two observations. First, taxation of profitable states works in a fashion similar to holding equity or warrants in the private firms in a setting of ex post resolution of crisis. Second, corporate taxation has *ex ante* incentive effects, since as we show, it can play a role in realigning the incentives of private firms with the goals of the government. Interestingly, taxation plays such a role even in good times, and unlike equity claims in the bailout schemes, it does not entail voting rights for the government. Thus, incentives are realigned in the right way without mandating specific innovation levels through invasive regulation.

[16] This can be done in several ways. Examples include sector-specific depreciation tax shields, research and development tax credits, and energy investment tax credits. These features in the tax code are consistent with observed corporate tax systems characterized by a uniform corporate tax code with constant tax rates but deductions varying across sectors. In other words, they essentially lower the corporate tax rate for firms in certain sectors from the baseline economy wide tax rate.

Appendix B: Proofs of Propositions

Proof of Proposition 1

Let $\Delta = f'(I^S) - f'\left(I^L_{\lambda,T}\right)$. Substituting equation (2) for $f'(I^S)$ and equation (6) for $f'\left(I^L_{\lambda,T}\right)$ and setting $\Delta = 0$, after some algebraic simplification yields the optimal tax rate as stated in the proposition. The comparative statics results with respect to $\left(\frac{l}{h}\right)$, B and λ follow readily from the form of the expression for T^*.

Proof of Proposition 2

We know from equation (6) that investment is inversely related to taxes. Combining it with Proposition 1, i.e., optimal tax rate is decreasing in B yields the result as stated in this proposition.

Proof of Proposition 3

Let $\Delta = f'(I^S) - f'(I^L)$. Substituting equation (2) for $f'(I^S)$ and equation (4) for $f'(I^L)$ and after some algebraic simplification yields $\Delta = \frac{2h^2(1-B)+2Bl^2}{B(h-l)h^2}$. Given that f is a concave function of investment, it is easy to see that when $\Delta > 0$, $I^S < I^L$, and when $\Delta < 0$, $I^S > I^L$. In other words, $\Delta > 0$ yields overinvestment by the private firm, and $\Delta < 0$ yields underinvestment by the private firm relative to the socially optimal investment level. Setting $\Delta = 0$ and simplifying produces the region for overinvestment and underinvestment as stated in the proposition.

Proof of Proposition 4

Let $\Delta = f'(I^S) - f'(I^L_T)$. Substituting equation (2) for $f'(I^S)$ and equation (6) for $f'(I^L_T)$ and setting $\Delta = 0$, after some algebraic simplification yields the optimal tax rate as stated in the proposition. The comparative statics results with respect to $\left(\frac{l}{h}\right)$ and B follow readily from the form of the expression for T^*. Since subsidy is negative tax rate, the cut off value, i.e., where the optimal solution where the tax rate becomes negative can be found by setting the optimal tax rate to be zero, i.e., $\left[\frac{h^2}{h^2-l^2}\right]$. In other words, for non-monetized benefit below the cut-off value, the optimal solution is a positive tax rate, and for non-monetized benefit above the cut-off value, the optimal solution is a subsidy (i.e., negative tax rate) as stated in the proposition.

Appendix C: Variable Definitions

Variable	Definitions and Data Sources
Block	The fraction of shares held by the largest shareholder. Winsorized at the 1% and 99% levels. *Source*: CSMAR database.
Capex	Capital expenditure scaled by the lagged total assets. Winsorized at the 1% and 99% levels. *Source:* CSMAR database.
Cash Flow	Cash flow from operating activities, scaled by the lagged total assets. Winsorized at the 1% and 99% levels. *Source:* CSMAR database.
Enter an FYP Industry	A dummy variable set to one if a firm expands into an FYP industry in a given year and zero otherwise. *Source*: Manual collection.
ETR	Effective tax rate, calculated as current income tax expense scaled by pretax income, censored at 0 and 1. The variable is set as missing if the pretax income is negative. *Source*: CSMAR database.
FYP	A dummy variable set to one if in a given year, a firm operates in an industry identified by the central and/or provincial governments as a key industry to support in their 11^{th} (2006-2010), 12^{th} (2011-2015), and/or 13^{th} (2016-2020) Five-Year Plans, and zero otherwise. *Source*: CNRDS database.
FYP (Central)	A dummy variable set to one if in a given year, a firm operates in an industry identified by the central government as a key industry to support in its 11^{th} (2006-2010), 12^{th} (2011-2015), and/or 13^{th} (2016-2020) Five-Year Plans, and zero otherwise. *Source:* CNRDS Database.
FYP (Provincial)	A dummy variable set to one if in a given year, a firm operates in an industry identified by the government of the province where it is headquartered as a key industry to support in its 11^{th} (2006-2010), 12^{th} (2011-2015), and/or 13^{th} (2016-2020) Five-Year Plans, and zero otherwise. *Source:* CNRDS Database.
Government Subsidies	The amount of government subsidies scaled by sales revenue. Winsorized at the 1% and 99% levels. *Source*: CSMAR database.
Green Innovation	The natural logarithm of one plus the number of green patents filed in year t and granted within three years. *Source*: CNRDS database.
High Capex (t=0)	A dummy variable set to one if *Capex* measured in year 2011 or 2016 fall above sample quartile and zero otherwise. *Source:* CSMAR database.
Legal	Fan et al.'s (2008-2019) provincial index of market-oriented intermediaries and legal systems, divided by 100. *Source:* China Market Index Database.
Leverage	Total liabilities divided by total assets. Winsorized at the 1% and 99% levels. *Source:* CSMAR database.
Low Capex (t=0)	A dummy variable set to one if *Capex* measured in year 2011 or 2016 fall below sample quartile and zero otherwise. *Source:* CSMAR database.
Market to Book	The sum of the market value of equity and book value of total liabilities, divided by the book value of total assets. Winsorized at the 1% and 99% levels. *Source*: CSMAR database.
Marketization	The Fan et al.'s (2008-2019) provincial index of marketization, divided by 100. *Source:* China Market Index Database.
NOL	The accumulated pre-tax losses reported in the prior five years, scaled by sales revenue. It is set to 0 if the accumulated earnings in the prior five years are positive. *Source:* CSMAR database.
Overinvestment (t=0)	A dummy variable set to one if Biddle et al.'s (2009) measure of overinvestment at year 2010 and 2015, respectively, calculated as the residual from regressing capital expenditure on sales estimated for each industry and year, falls to the top quartile, and zero otherwise. *Source:* CSMAR database.

Political Connection	A dummy variable set to one if the CEO or the chairman of the board was previously employed as a bureaucrat by the central or a local government, and zero otherwise. *Source:* Manual collection.
Post	A dummy variable set to one if the firm is headquartered in a province or a city in the years following the adoption of the Third-phase Golden Tax Project, and zero otherwise. *Source*: Manual collection.
ROA	The sum of operating income and financial expenses, divided by the lagged total assets. Truncated at -1 and 1. *Source*: CSMAR database.
ROE	Net income divided by the lagged total equity. Truncated at -1 and 1. *Source:* CSMAR database.
Size	The natural logarithm of total assets. Winsorized at the 1% and 99% levels. *Source:* CSMAR database.
State	A dummy variable set to one if a firm is government controlled or owned, and zero otherwise. *Source:* CSMAR database.
STR	The statutory tax rate applicable to a firm. Winsorized at the 1% and 99% levels. *Source*: CCER database.
Underinvestment (t=0)	A dummy variable set to one if Biddle et al.'s (2009) measure of underinvestment at year 2010 and 2015, respectively, calculated as the residual from regressing capital expenditure on sales estimated for each industry and year, falls to the bottom quartile, and zero otherwise. *Source:* CSMAR database.

Appendix D: Implementation of Phase III of the Golden Tax System

This table reports the year of the implementation of Phase III of the Golden Tax System for each province and for two cities. The sample period is 2008-2019.

Province/City	Year
Chongqing	2013
Shanxi	2013
Shandong (except for Qingdao)	2013
Inner Mongolia	2015
Henan	2015
Guangdong (except for Shenzhen)	2015
Ningxia	2015
Hebei	2015
Guangxi	2015
Guizhou	2015
Yunnan	2015
Tibet	2015
Hunan	2015
Hainan	2015
Gansu	2015
Qinghai	2015
Jilin	2016
Anhui	2016
Sichuan	2016
Xinjiang	2016
Liaoning	2016
Shanghai	2016
Fujian	2016
Jiangxi	2016
Qingdao	2016
Beijing	2016
Tianjin	2016
Heilongjiang	2016
Hubei	2016
Shaanxi	2016
Jiangsu	2016
Zhejiang	2016
Shenzhen	2016

Table 1: Descriptive Statistics

This table provides summary statistics for the variables of interest in our sample. Panel A shows the summary statistics for the firm-year panel. The upper part of Panel B relates to FYP industries identified and supported by the central government (industry level observations). The lower part describes FYP industries selected by provincial governments (province-industry level observations). Variable definitions are reported in Appendix C.

Panel A: Sample Characteristics

	Firm-Year Observations	Mean	Median	Std. Dev.
Capex	24,737	0.06	0.038	0.067
Post	24,737	0.357	0	0.479
ETR	21,842	0.201	0.173	0.148
Marketization	24,737	0.09	0.092	0.017
Legal	24,737	0.09	0.09	0.031
FYP	24,737	0.647	1	0.478
FYP (Central)	24,737	0.483	0	0.5
FYP (Provincial)	24,737	0.561	1	0.496
Size	24,737	22.07	21.92	1.335
Leverage	24,737	0.469	0.466	0.218
ROA	24,650	0.056	0.05	0.092
ROE	24,150	0.074	0.073	0.151
Cash Flow	24,737	0.051	0.049	0.094
Market to Book	24,737	2.657	1.994	2.102
State	24,737	0.466	0	0.499
Block	24,737	0.353	0.332	0.153
NOL	24,702	0.137	0	0.637
STR	22,537	0.185	0.15	0.049

Panel B: Central and Provincial Government Industrial Policies

	11th FYP (2006-2010)	12th FYP (2011-2015)	13th FYP (2016-2020)
Central government's industry policies			
Strategically important	29	35	27
Existing		23	22
Newly added		12	5
Dropped		6	13
Non-strategically important	51	48	54
Provincial government's industry policies			
Strategically important	982	1,333	1,110
Existing		682	845
Newly added		651	265
Dropped		300	488
Non-strategically important	402	321	454

Table 2: Tax and Local Institutional Quality

This table examines how the effect of tax on firm investment varies with the quality of local institutions. The sample period is 2008-2019. The unit of observation is firm-year. The dependent variable is *Capex*. *Marketization* and *Legal* are, respectively, provincial indices for "marketization" and for "market-oriented intermediaries and legal systems". A detailed definition of variables is provided in Appendix C. Robust standard errors clustered at firm level are reported in parentheses. *, **, and *** indicate significance at the 10%, 5%, and 1% level, respectively.

	Dependent Variable: *Capex*					
	(1)	(2)	(3)	(4)	(5)	(6)
ETR × Marketization		0.475**			0.438**	
		(2.51)			(2.43)	
Marketization		0.003			0.005	
		(0.02)			(0.03)	
ETR × Legal			0.268***			0.214**
			(2.65)			(2.17)
Legal			-0.007			-0.004
			(-0.10)			(-0.07)
ETR	-0.012***	-0.053***	-0.035***	-0.011***	-0.049***	-0.029***
	(-3.51)	(-3.05)	(-3.51)	(-3.30)	(-2.97)	(-3.06)
Market to Book	0.005***	0.005***	0.005***	0.004***	0.004***	0.004***
	(9.10)	(9.07)	(9.05)	(8.06)	(8.03)	(8.02)
Cash Flow	0.081***	0.081***	0.081***	0.077***	0.077***	0.077***
	(9.95)	(9.94)	(9.94)	(9.42)	(9.42)	(9.42)
Size	-0.008***	-0.008***	-0.008***	-0.010***	-0.010***	-0.010***
	(-5.40)	(-5.39)	(-5.39)	(-6.76)	(-6.75)	(-6.74)
Leverage	-0.045***	-0.045***	-0.045***	-0.043***	-0.043***	-0.043***
	(-8.24)	(-8.23)	(-8.24)	(-7.90)	(-7.89)	(-7.89)
State	-0.006	-0.006	-0.006	-0.007	-0.007	-0.007
	(-1.36)	(-1.29)	(-1.30)	(-1.52)	(-1.45)	(-1.48)
Block	0.067***	0.066***	0.066***	0.067***	0.066***	0.066***
	(6.02)	(6.00)	(6.00)	(6.06)	(6.05)	(6.05)
Observations	21,740	21,740	21,740	21,740	21,740	21,740
R-squared	0.481	0.482	0.482	0.493	0.494	0.494
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	No	No	No
Industry × Year FE	No	No	No	Yes	Yes	Yes

Table 3: GTS III and the Effect of Tax on Investment

This table examines how the effect of tax on firm investment varies with the quality of local institutions. The sample period is 2008-2019. The unit of observation is a firm-year. The dependent variable is *Capex*. *Marketization* and *Legal* are, respectively, Fan et al.'s provincial indices for marketization and for market-oriented intermediaries and legal systems. *Post* is an indicator variable for firms operating in provinces or cities in years that the GTS III was implemented. A detailed definition of variables is provided in Appendix C. Robust standard errors clustered at firm level are reported in parentheses. *, **, and *** indicate significance at the 10%, 5%, and 1% level, respectively.

	Dependent Variable: *Capex*					
	(1)	(2)	(3)	(4)	(5)	(6)
Post × Marketization		0.286***			0.202***	
		(4.02)			(2.78)	
Marketization		-0.019			0.007	
		(-0.14)			(0.05)	
Post × Legal			0.202***			0.144***
			(5.19)			(3.59)
Legal			-0.021			-0.012
			(-0.36)			(-0.20)
Post	-0.006***	-0.031***	-0.023***	-0.004*	-0.022***	-0.016***
	(-2.69)	(-4.63)	(-5.61)	(-1.81)	(-3.20)	(-3.88)
Market to Book	0.004***	0.004***	0.004***	0.004***	0.004***	0.004***
	(9.15)	(9.00)	(9.02)	(7.96)	(7.89)	(7.91)
Cash Flow	0.084***	0.084***	0.084***	0.080***	0.080***	0.080***
	(10.81)	(10.78)	(10.80)	(10.21)	(10.21)	(10.23)
Size	-0.005***	-0.006***	-0.006***	-0.007***	-0.008***	-0.008***
	(-4.02)	(-4.19)	(-4.23)	(-5.50)	(-5.57)	(-5.59)
Leverage	-0.050***	-0.051***	-0.051***	-0.048***	-0.048***	-0.048***
	(-9.91)	(-10.01)	(-10.01)	(-9.45)	(-9.51)	(-9.50)
State	-0.005	-0.006	-0.006	-0.007	-0.007	-0.007
	(-1.19)	(-1.25)	(-1.27)	(-1.42)	(-1.46)	(-1.48)
Block	0.071***	0.073***	0.074***	0.069***	0.071***	0.071***
	(7.01)	(7.19)	(7.24)	(6.84)	(6.97)	(7.01)
Observations	24,657	24,657	24,657	24,657	24,657	24,657
R-squared	0.455	0.456	0.457	0.467	0.468	0.468
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	No	No	No
Industry × Year FE	No	No	No	Yes	Yes	Yes

Table 4: Validation Tests

Panel A examines the effect of the GTS III on the corporate effective tax rate. The sample period is 2008-2019. The unit of observation is a firm-year. The dependent variable is *ETR*. *Post* is an indicator variable for firms operating in provinces or cities in years that the GTS III was implemented. Panel B examines the effect of provincial characteristics on the implementation of Phase III of the Golden Tax Project. The sample includes years up to the implementations of the GTS III. The dependent variable is *Post*. Panel C reports the results from a dynamic analysis. The sample period is 2008-2019. The unit of observation is a firm-year. The dependent variable is *Capex*. *Marketization* and *Legal* are, respectively, Fan et al.'s provincial indices for marketization and for market-oriented intermediaries and legal systems. Control variables include indicator variables for years $t-3$, $t-2$, …, t, up to year $t+2$, where t is the year of implementation of GTS III, as well as *Market to Book*, *Cash Flow*, *Size*, *Leverage*, *State*, and *Block*, but the coefficients are not tabulated. Detailed definition of variables is provided by Appendix C. Robust standard errors clustered at firm level are reported in parentheses. *, **, and *** indicate significance at the 10%, 5%, and 1% level, respectively.

Panel A: The Effect of GTS III

	Dependent Variable: *ETR*	
	(1)	(2)
Post	0.013**	0.011*
	(2.02)	(1.78)
Market to Book	-0.001	-0.001
	(-0.81)	(-0.83)
ROA	-0.193***	-0.188***
	(-9.34)	(-9.08)
Size	0.007**	0.009**
	(2.14)	(2.43)
Leverage	0.038***	0.037***
	(2.89)	(2.88)
State	0.019*	0.021**
	(1.84)	(2.03)
Block	-0.006	-0.013
	(-0.29)	(-0.61)
NOL	-0.033***	-0.032***
	(-7.24)	(-7.10)
STR	0.099***	0.112***
	(3.01)	(3.34)
Observations	19,716	19,716
R-squared	0.393	0.400
Firm FE	Yes	Yes
Year FE	Yes	No
Industry × Year FE	No	Yes

Table 4 (continued)

Panel B: Determinants of GTS III

	Dependent Variable: *Post*		
	(1)	(2)	(3)
GDP Growth	0.179	0.046	0.063
	(0.27)	(0.08)	(0.11)
Fiscal Revenue Growth	-0.016	-0.006	-0.000
	(-0.11)	(-0.04)	(-0.00)
Financial Deficit	0.001	0.006	0.002
	(0.04)	(0.30)	(0.10)
Unemployment Rate	-0.889	-1.000	-0.922
	(-1.09)	(-1.11)	(-1.05)
Marketization	-0.010	-0.011	-0.012
	(-0.60)	(-0.61)	(-0.69)
Business Environment	-0.184*	-0.182	-0.157
	(-1.99)	(-1.66)	(-1.39)
Litigation	0.083	0.028	0.029
	(0.62)	(0.20)	(0.22)
Average Size		0.025	0.014
		(0.58)	(0.29)
Average Leverage		0.057	0.057
		(1.33)	(1.28)
Average ETR		0.378	0.415
		(1.06)	(1.10)
% State		-0.067	-0.066
		(-0.80)	(-0.77)
Average Capex			0.247
			(0.87)
Observations	294	294	294
R-squared	0.680	0.687	0.690
Year FE	Yes	Yes	Yes

Table 4 (continued)

Panel C: Dynamic Analysis

	Dependent Variable: *Capex*	
	(1)	(2)
Marketization × t-3	0.139	
	(1.46)	
Marketization × t-2	0.169	
	(1.59)	
Marketization × t-1	0.115	
	(1.10)	
Marketization × t	0.190*	
	(1.71)	
Marketization × t+1	0.313***	
	(2.69)	
Marketization × t+2	0.260**	
	(2.57)	
Marketization	-0.047	
	(-0.33)	
Legal × t-3		0.088
		(1.49)
Legal × t-2		0.078
		(1.32)
Legal × t-1		0.073
		(1.19)
Legal × t		0.108*
		(1.77)
Legal × t+1		0.201***
		(3.20)
Legal × t+2		0.226***
		(3.36)
Legal		-0.044
		(-0.63)
Control Variables	Yes	Yes
Observations	24,657	24,657
R-squared	0.468	0.468
Firm FE	Yes	Yes
Industry × Year FE	Yes	Yes

Table 5: Alternative Proxies for Local Institutional Quality

This table report the results from estimating the baseline regressions using alternative proxies for local institutional quality. The sample period is 2008-2019. The unit of observation is a firm-year. The dependent variable is *Capex*. *Post* is an indicator variable for firms operating in provinces or cities in years that the GTS III was implemented. *Government-Market Relation, Factor Market Development, Law* and *Business Environment* are, respectively, Fan et al.'s (2019) provincial index for the relationship between the government and capital market, factor market development index, sub-index for maintaining the rule of law environment in the market, and business environment index. *Enforcement Cost* is the World Bank's Doing Business Index – The Proportion of the Cost of Enforcing Contracts to the Value of the Subject Matter ("Doing Business in China 2008"). Control variables include *Market to Book*, *Cash Flow*, *Size*, *Leverage*, *State*, and *Block*, but the coefficients are not tabulated. Detailed definition of variables is provided by Appendix C. Robust standard errors clustered at firm level are reported in parentheses. *, **, and *** indicate significance at the 10%, 5%, and 1% level, respectively.

Panel A: Effective Tax Rate

	Dependent Variable: *Capex*									
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
ETR × Government-Market Relation	0.248	0.360**								
	(1.49)	(2.24)								
Government-Market Relation	-0.108	-0.121								
	(-1.24)	(-1.40)								
ETR × Factor Market Development			0.284***	0.241**						
			(2.89)	(2.53)						
Factor Market Development			0.092	0.072						
			(1.47)	(1.16)						
ETR × Law					0.173*	0.102				
					(1.73)	(1.03)				
Law					-0.015	-0.004				
					(-0.30)	(-0.08)				
ETR × Business Environment							2.364**	1.198		
							(2.37)	(1.21)		
Business Environment							-0.691	-0.608		
							(-0.81)	(-0.72)		
ETR × Enforcement Cost									0.088**	0.090**
									(2.30)	(2.35)
ETR	-0.031**	-0.038***	-0.040***	-0.035***	-0.023***	-0.018**	-0.094***	-0.052	0.004	0.006

	(-2.27)	(-2.97)	(-3.65)	(-3.31)	(-2.89)	(-2.25)	(-2.65)	(-1.50)	(0.56)	(0.72)
Control Variables	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	21,740	21,740	21,740	21,740	21,740	21,740	21,740	21,740	21,650	21,650
R-squared	0.482	0.494	0.482	0.494	0.482	0.493	0.482	0.493	0.482	0.494
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No
Industry × Year FE	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes

Table 5 continued.

Panel B: GTS III

	Dependent Variable: *Capex*									
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Post × Government-Market Relation	0.336***	0.232**								
	(3.38)	(2.30)								
Government-Market Relation	-0.026	-0.025								
	(-0.38)	(-0.36)								
Post × Factor Market Development			0.192***	0.136***						
			(5.14)	(3.49)						
Factor Market Development			0.065	0.065						
			(1.14)	(1.15)						
Post × Law					0.225***	0.173***				
					(5.14)	(3.86)				
Law					-0.090*	-0.066				
					(-1.77)	(-1.33)				
Post × Business Environment							3.580***	2.464***		
							(3.93)	(2.65)		
Business Environment							-1.463*	-1.259		
							(-1.76)	(-1.50)		
Post × Enforcement Cost									0.043***	0.030***
									(4.05)	(2.74)
Post	-0.031***	-0.021***	-0.024***	-0.017***	-0.021***	-0.015***	-0.135***	-0.093***	0.002	0.001
	(-3.93)	(-2.68)	(-5.44)	(-3.71)	(-5.60)	(-4.10)	(-4.11)	(-2.77)	(0.76)	(0.51)
Control Variables	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	24,657	24,657	24,657	24,657	24,657	24,657	24,657	24,657	24,558	24,558
R-squared	0.456	0.468	0.457	0.468	0.457	0.468	0.456	0.468	0.457	0.468
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	No	Yes	No	Yes	No	Yes	No	Yes	No
Industry × Year FE	No	Yes	No	Yes	No	Yes	No	Yes	No	Yes

Table 6: Taxes and Subsidies in the FYP Industries

This table examines whether government industrial policies affect taxes and subsidiaries. The sample period is 2008-2019. For both panels, the unit of observation is a province-industry-year in columns 1-3 and is a firm-year in columns 4-12. The dependent variable is *ETR* in Panel A and *Government Subsidies* in Panel B. Control variables are lagged *Market to Book*, *ROA*, *Size*, *Leverage*, *State* and *NOL* in columns 1-3, and are identical to those in Table 2 for columns 4-12. We also control for lagged *ETR* in regressions for columns 1-12 in Panel A and lagged *Government Subsidies* in regressions for columns 1-12 in Panel B, respectively. Variable definitions are in Appendix C. Robust standard errors clustered at industry level for columns 1-3 and at firm level for columns 4-12 are reported in parentheses. *, **, and *** indicate significance at the 10%, 5%, and 1% level, respectively.

Panel A: Taxes

Dependent Variable:	*ETR*											
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
FYP (Central)	-0.018***			-0.017***			-0.016***			-0.016***		
	(-3.76)			(-8.94)			(-6.93)			(-5.90)		
FYP (Provincial)		-0.020***			-0.016***			-0.017***			-0.015***	
		(-5.16)			(-7.91)			(-7.27)			(-5.71)	
FYP			-0.020***			-0.018***			-0.019***			-0.018***
			(-4.30)			(-8.58)			(-7.47)			(-6.05)
FYP (Central) × State							-0.003					
							(-0.78)					
FYP (Provincial) × State								0.004				
								(1.03)				
FYP × State									0.002			
									(0.61)			
FYP (Central) × Large Firm										-0.004		
										(-0.99)		
FYP (Provincial) × Large Firm											-0.000	
											(-0.07)	
FYP × Large Firm												-0.000
												(-0.07)
Control Variables	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	8,365	8,365	8,365	18,197	18,197	18,197	18,197	18,197	18,197	18,197	18,197	18,197
R-squared	0.250	0.255	0.255	0.296	0.295	0.296	0.296	0.295	0.296	0.293	0.295	0.296

Table 6 continued.

Panel B: Government Subsidies

Dependent Variable:	*Government Subsidies*											
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
FYP (Central)	0.002*			0.003***			0.003***			0.003***		
	(1.87)			(6.34)			(5.90)			(4.66)		
FYP (Provincial)		0.001			0.002***			0.003***			0.002***	
		(1.19)			(5.39)			(5.51)			(3.81)	
FYP			0.002*			0.003***			0.003***			0.003***
			(1.93)			(7.12)			(5.98)			(4.68)
FYP (Central) × State							-0.001					
							(-1.43)					
FYP (Provincial) × State								-0.001				
								(-1.56)				
FYP × State									-0.000			
									(-0.45)			
FYP (Central) × Large Firm										0.000		
										(0.52)		
FYP (Provincial) × Large Firm											0.000	
											(0.07)	
FYP × Large Firm												0.001
												(0.98)
Control Variables	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	9,496	9,496	9,496	24,617	24,617	24,617	24,617	24,617	24,617	24,617	24,617	24,617
R-squared	0.043	0.048	0.051	0.044	0.043	0.045	0.044	0.043	0.045	0.039	0.043	0.045

Table 7: How Taxes and Institutional Quality Affect Socially Desirable Investments

This table compares the effect of tax on corporate investment between industries classified by the social planner to be strategically important and unimportant for the country. The sample period is 2008-2019. The unit of observation is a firm-year. In columns 1-2, the sample includes firms operating in industries identified by the central and/or provincial government as key industries supported in their Five-Year Plans. In columns 3-4, the sample includes firms operating in industries excluded by their FYPs. The dependent variable is *Capex* in columns 1-4 and is a dummy variable set to one if a firm enters an FYP industry in a year and zero otherwise in columns 5-6. *Marketization* and *Legal* are, respectively, Fan et al.'s provincial indices for marketization and for market-oriented intermediaries and legal systems. *Post* is an indicator variable for firms operating in provinces or cities in years that GTS III was implemented. All models include a set of control variables (*Market to Book*, *Cash Flow*, *Size*, *Leverage*, *State*, *Block*, and in columns 5-6, we control additionally, *Government Subsidy* and *Political Connection*), a constant, and fixed effects as indicated in the table, but the coefficients are not tabulated. Variable definitions are in Appendix C. Robust standard errors clustered at firm level are reported in parentheses. *, **, and *** indicate significance at the 10%, 5%, and 1% level, respectively.

Panel A: FYP Industries as a Proxy for Highly Socially Desirable Sectors

Dependent Variable:	*Capex*				*Enter an FYP Industry*	
	FYP Industries		Non-FYP Industries			
	(1)	(2)	(3)	(4)	(5)	(6)
Post × Marketization	0.363***		0.040		0.887***	
	(3.67)		(0.33)		(3.07)	
Marketization	-0.040		0.020		-0.189	
	(-0.27)		(0.09)		(-0.40)	
Post × Legal		0.192***		0.094		0.516***
		(3.62)		(1.37)		(2.93)
Legal		-0.045		0.068		0.237
		(-0.69)		(0.64)		(1.02)
Post	-0.035***	-0.019***	-0.010	-0.014*	-0.088***	-0.053***
	(-3.79)	(-3.56)	(-0.82)	(-1.81)	(-3.14)	(-2.73)
Control Variables	Yes	Yes	Yes	Yes	Yes	Yes
Observations	15,920	15,920	8,683	8,683	24,622	24,622
R-squared	0.477	0.477	0.536	0.537	0.174	0.174
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes
Industry × Year FE	Yes	Yes	Yes	Yes	Yes	Yes

Table 7 continued.

Panel B: Environmental Investment as a Proxy for Highly Socially Desirable Investments

This table examines the effect of tax and local institutional quality on firm's decision of industry entry. The sample period is 2008-2019. The unit of observation is a firm-year. The estimates in columns 1-4 are based on the sample of firms operating in heavily polluting industries. The dependent variable is a firm's environmental investment (Capex) in columns 1-2 and is a firm's green patents (Green Innovation) in columns 3-4. The estimates in columns 5-6 are based on the full sample. The dependent variable is a dummy variable set to one if a firm enters a non-heavily polluting industry in a year and zero otherwise. *Marketization* and *Legal* are, respectively, Fan et al.'s provincial indices for marketization and for market-oriented intermediaries and legal systems. *Post* is an indicator variable for firms operating in provinces or cities in years that GTS III was implemented. All models include a set of control variables (*Market to Book*, *Cash Flow*, *Size*, *Leverage*, *State*, *Block*, and in columns 5-6, we control additionally, *Government Subsidy* and *Political Connection*), a constant, and fixed effects as indicated in the table, but the coefficients are not tabulated. Variable definitions are in Appendix C. Robust standard errors clustered at firm level are reported in parentheses. *, **, and *** indicate significance at the 10%, 5%, and 1% level, respectively.

Dependent Variable:	*Environmental Capex*		*Green Innovation*		*Enter Non-Heavily Polluting Industry*	
	(1)	(2)	(3)	(4)	(5)	(6)
Post × Marketization	0.872***		0.781*		0.712**	
	(2.78)		(1.81)		(2.15)	
Marketization	0.163		-0.374		0.360	
	(0.21)		(-0.36)		(0.71)	
Post × Legal		0.079		0.609**		0.307
		(0.22)		(2.03)		(1.50)
Legal		0.622***		0.205		0.329
		(3.28)		(0.46)		(1.33)
Post	-0.087***	-0.062***	-0.058	-0.039	-0.065**	-0.027
	(-2.72)	(-2.76)	(-1.49)	(-1.35)	(-2.00)	(-1.24)
Control Variables	Yes	Yes	Yes	Yes	Yes	Yes
Observations	9,077	9,077	9,077	9,077	24,622	24,622
R-squared	0.270	0.271	0.545	0.545	0.198	0.198
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes
Industry × Year FE	Yes	Yes	Yes	Yes	Yes	Yes

Table 8: Industrial Policies and Corporate Investment

Panel A: Does the Establishment of FYP Industry Realign Corporate Investment?

This table examines the effect of government industrial policies on firm investment. The unit of observation is a firm-year. The sample period is 2008-2019 for columns 1-3 and is the six-year-window centered around 2011 (the implementation of the 12th FYP) and 2016 (the implementation of the 13th FYP), respectively, for columns 3-7. The treatment group includes firms whose industries are not FYP industries in the 3-year window prior to the implementation of FYP but become FYP industries in the 3-year window after the implementation. The control group includes firms belonging to non-FYP industries before and after the implementation of FYP. The dependent variable is the year-on-year change of *Capex* in columns 1-3, *Capex* in columns 4-7. *Low Capex* (t = 0) and *Underinvestment* (t = 0) are, respectively, a dummy variable set to one if *Capex* and *Underinvestment* measured at the beginning of each FYP, i.e., 2010 or 2015, fall into bottom sample quartile. *High Capex* (t = 0) and *Overinvestment* (t = 0) are, respectively, a dummy variable set to one if *Capex* and *Underinvestment* measured at the beginning of each FYP, i.e., 2010 or 2015, fall into top sample quartile. Control variables include *Market to Book*, *Cash Flow*, *Size*, *Leverage*, *State*, *Block*, *Government Subsidies*, and *Political Connection*, but the coefficients are not tabulated. Detailed definition of variables is provided by Appendix C. Robust standard errors clustered at firm level are reported in parentheses. *, **, and *** indicate significance at the 10%, 5%, and 1% level, respectively.

Dependent Variable:	Δ *Capex*			*Capex*			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
FYP (Central)	0.005***						
	(3.32)						
FYP (Provincial)		0.003**					
		(2.32)					
FYP			0.003*	-0.011*	-0.011*	0.007	0.008
			(1.95)	(-1.75)	(-1.76)	(1.25)	(1.25)
FYP × Low Capex (t=0)				0.035***			
				(3.63)			
FYP × Underinvestment (t=0)					0.028***		
					(3.11)		
FYP × High Capex (t=0)						-0.042***	
						(-3.88)	
FYP × Overinvestment (t=0)							-0.040***
							(-4.06)
Low Capex (t=0)				-0.021***			
				(-3.68)			

Underinvestment (t=0)					-0.017***		
					(-3.01)		
High Capex (t=0)						0.031***	
						(6.39)	
Overinvestment (t=0)							0.029***
							(6.39)
Control Variables	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	23,251	23,251	23,251	3,471	3,346	3,471	3,346
R-squared	0.116	0.116	0.116	0.472	0.472	0.478	0.479
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry × Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Table 8 continued.

Panel B: Does the Change in Corporate Investment Policies Destroy Value?

This table examines the effect of government industrial policies on firm performance. The unit of observation is a firm-year. The sample period is the six-year-window centered around 2011 (the implementation of the 12th FYP) and 2016 (the implementation of the 13th FYP), respectively. The treatment group includes firms whose industries are not FYP industries in the 3-year window prior to the implementation of FYP but become FYP industries in the 3-year window after the implementation. The control group includes firms belonging to non-FYP industries before and after the implementation of FYP. The dependent variable is a firm's *ROE*. *Low Capex* ($t = 0$) and *Underinvestment* ($t = 0$) are, respectively, a dummy variable set to one if *Capex* and *Underinvestment* measured at the beginning of each FYP, i.e., 2010 or 2015, fall into bottom sample quartile. *High Capex* ($t = 0$) and *Overinvestment* ($t = 0$) are, respectively, a dummy variable set to one if *Capex* and *Underinvestment* measured at the beginning of each FYP, i.e., 2010 or 2015, fall into top sample quartile. Control variables include *Market to Book*, *Cash Flow*, *Size*, *Leverage*, *State*, *Block*, *Government Subsidies*, and *Political Connection*, but the coefficients are not tabulated. Detailed definition of variables is provided by Appendix C. Robust standard errors clustered at firm level are reported in parentheses. *, **, and *** indicate significance at the 10%, 5%, and 1% level, respectively.

Dependent Variable:	*ROE*			
	(1)	(2)	(3)	(4)
FYP	-0.006	-0.005	0.010	0.010
	(-0.52)	(-0.43)	(0.73)	(0.76)
FYP × Low Capex (t=0)	0.058**			
	(2.35)			
FYP × Underinvestment (t=0)		0.049**		
		(2.23)		
FYP × High Capex (t=0)			-0.007	
			(-0.53)	
FYP × Overinvestment (t=0)				-0.008
				(-0.60)
Low Capex (t=0)	-0.025**			
	(-2.01)			
Underinvestment (t=0)		-0.030*		
		(-1.73)		
High Capex (t=0)			0.011	
			(0.85)	
Overinvestment (t=0)				-0.003
				(-0.17)
Control Variables	Yes	Yes	Yes	Yes
Observations	3,324	3,200	3,324	3,200
R-squared	0.489	0.490	0.487	0.488
Firm FE	Yes	Yes	Yes	Yes
Industry × Year FE	Yes	Yes	Yes	Yes

Internet Appendix for

"Social Priorities, Institutional Quality, and Investment"

This online appendix consists of the following discussions and supplemental tables:

IA.1: Considering Alternative Explanations

Throughout the main analysis, we interpret FYP industries as sectors with high social priorities identified by the social planner. One may argue that rent-seeking behavior drives the selection and timing of FYP industries. For instance, firms in industries with high effective tax rates or firms in heavily subsidized industries lobby for the adoption of FYP industries. Since FYP industries bring tax and subsidy benefits, industries with strong political ties or spending more to entertain government bureaucrats may be more likely to be assigned as FYP industries.

To consider this possibility, we compare *ex ante* characteristics between FYP and non-FYP industries in the year 2010 and year 2015, prior to the implementation of the 12th and 13th FYPs. Panel A of Table IA.1 shows that the industry average effective tax rate and government subsidies, respectively, are both economically and statistically similar between the two types of industries.

To identify an industry with strong political ties, we calculate the fraction of politically connected firms in that industry. We also consider industry-wide corruption through firms' efforts to obtain political favors. An item on all Chinese firms' profit and loss accounts, the "entertainment and travel expenses", is highly correlated with the grease money firms spend to secure better government services and lower tax payments (Cai, Fang, and Xu, 2011). Following Giannetti et al. (2021), we construct variable *ETC* to capture the extent of corruption in an industry. Specifically, *ETC* is the total entertainment and travel expenses of listed firms in an industry, scaled by their total sales.

Panel A of Table IA.1 reveals that prior to the implementation of new industry policies, FYP industries do not have significantly more politically connected firms or are more corrupt than non-FYP industries. As such, rent seeking does not appear to drive the establishment of FYP industries.

While the government intends to identify industries with social priorities, it is possible that the incentive schemes associated with its industrial policy produce over-investment, instead of better motivating socially optimal investment. While the results from Table 8 dispel such an explanation, suggesting that the instruments are applied properly, rather than being abused (overshooting or undershooting), in this section we also directly estimate the effect of FYP industries on Biddle et al.'s

(2009) overinvestment. We estimate this set of tests using both the full sample and a balanced sample in which we restrict firm-year observations to the six-year-windows centered around 2011 and 2016.

Panel B of Table IA.1 shows that these industry policies do not lead to overinvestment. If anything, the FYP industries supported by the central government see a decrease in the extent of overinvestment (column 1).

Another possible explanation behind our findings is that the observed change in firm investment strategies reflects empire-building by powerful executives, rather than being brought about by the designation of priority sectors supported by the social planner. We re-estimate Table 8, including additional controls for CEO power. We consider three proxies for CEO power: (*i*) *CEO Duality*, which is a dummy variable set to one if a CEO also serves as the chairman of the board; (*ii*) *CEO Tenure*, which is the number of years that an individual serves as the CEO of the firm; and (*iii*) *Entrenched CEO*, a dummy variable set to one if an individual becomes a CEO prior to the arrival of the chairman of the board. Panel C of Table IA.1 reveals that controlling for the three proxies for CEO power does not alter our main findings.

Finally, it is possible that industrial policies facilitate investment by poorly governed firms to a greater extent. For instance, since FYP industries are associated with tax and subsidy benefits, poorly governed firms, through bribes and connections, may appropriate more resources and harvest more benefits than better governed industry peers. Doing so allows them to invest more and profit more.

To address this concern, we consider two common proxies for corporate governance: institutional holding and board independence. In Panels D and E of Table IA.1, we find no consistent evidence that the results in Table 8 are driven by poorly governed firms.

Table IA.1: Considering Alternative Explanations

Panel A: Does Rent-Seeking Drive the Selection of FYP Industries?

This table compares ex-ante characteristics between FYP industries and non-FYP industries measured in year 2010 (prior to the implementation of the 12th FYP) or 2015 (prior to the implementation of the 13th FYP). The unit of observation is an industry-province-year. *ETR* and *Government Subsidies*, are, respectively, the average ETR and government subsidies of listed firms in an industry in a province. *Political Connection* is the fraction of politically connected firms in an industry-province. *ETC* is the total entertainment and travel expenses of listed firms in an industry-province scaled by total sales of these firms in the industry-province. *State* is the fraction of state-owned enterprises in an industry-province. *Tobin's Q* is the average Tobin's Q of listed firms in an industry-province.

	FYP Industries	Non-FYP Industries	*T*-Statistics
ETR	0.179	0.192	0.885
Government Subsidies	0.024	0.023	-0.126
Political Connection	0.219	0.212	-0.17
ETC	0.014	0.011	-1.116
State	0.480	0.429	-0.988
Tobin's Q	3.477	3.524	0.178

Table IA.1 continued.

Panel B: Do Industrial Policies Lead to Firm Overinvestment?

This table examines the effect of government industrial policies on firm overinvestment. The sample period is 2008-2019. The unit of observation is a firm-year. The dependent variable is a dummy variable set to one if the Biddle et al.'s (2009) measure of overinvestment, calculated as the residual from regressing capital expenditure on sales estimated for each industry and year, falls to the top quartile, and zero otherwise. Columns 1-3 use the full sample. Column 4 uses a balanced sample restricting to the six-year-window centered around 2011 (the implementation of the 12th FYP) and 2016 (the implementation of the 13th FYP), respectively. Control variables include *Market to Book*, *Cash Flow*, *Size*, *Leverage*, *State*, *Block*, *Government Subsidies*, and *Political Connections*. Variable definitions are in Appendix B. Robust standard errors clustered at firm level are reported in parentheses. *, **, and *** indicate significance at the 10%, 5%, and 1% level, respectively.

Dependent Variable:	*Overinvestment*			
Sample:	Full Sample			Balanced Panel
	(1)	(2)	(3)	(4)
FYP (Central)	-0.052***			
	(-3.47)			
FYP (Provincial)		0.001		
		(0.06)		
FYP			-0.018	-0.039
			(-1.13)	(-1.08)
Control Variables	Yes	Yes	Yes	Yes
Observations	23,238	23,238	23,238	3,723
R-squared	0.385	0.385	0.385	0.443
Firm FE	Yes	Yes	Yes	Yes
Industry × Year FE	Yes	Yes	Yes	Yes

Table IA.1 continued.

Panel C: Do Powerful CEOs Drive the Change in Investment?

This table examines whether firm investment and performance reflect empire-building by powerful CEOs. The unit of observation is a firm-year. The sample period is 2008-2019 for columns 1-3 and is the six-year-window centered around 2011 (the implementation of the 12th FYP) and 2016 (the implementation of the 13th FYP), respectively, for columns 3-7. The treatment group includes firms whose industries are not FYP industries in the 3-year window prior to the implementation of FYP but become FYP industries in the 3-year window after the implementation. The control group includes firms belonging to non-FYP industries before and after the implementation of FYP. The dependent variable is the year-on-year change of *Capex* in columns 1-3, *Capex* in columns 4-5, and *ROE* in columns 6-7. *Low Capex* ($t = 0$) and *Underinvestment* ($t = 0$) are, respectively, *Capex* and *Underinvestment* measured prior to the beginning of each FYP, i.e., 2010 or 2015, respectively. *CEO Duality* is a dummy variable set to one if a CEO also serves as the chairman of the board. *CEO Tenure* is the natural logarithm of one plus the number of years that the executive serves as the CEO of the firm. *Entrenched CEO* is a dummy variable set to one if the tenure of the CEO is longer than that of the chairman of the board. Other control variables include *Market to Book*, *Cash Flow*, *Size*, *Leverage*, *State*, *Block*, *Government Subsidies*, and *Political Connections*. Variable definitions are in Appendix B. Robust standard errors clustered at firm level are reported in parentheses. *, **, and *** indicate significance at the 10%, 5%, and 1% level, respectively.

Dependent Variable:	Δ *Capex*			*Capex*		*ROE*	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
FYP (Central)	0.005***						
	(3.31)						
FYP (Provincial)		0.003**					
		(2.14)					
FYP			0.003*	-0.010*	-0.010*	-0.002	-0.001
			(1.90)	(-1.70)	(-1.67)	(-0.21)	(-0.06)
FYP × Low Capex (t=0)				0.036***		0.061**	
				(3.80)		(2.47)	
FYP × Underinvestment (t=0)					0.028***		0.050**
					(3.05)		(2.29)
Low Capex (t=0)				-0.021***		-0.029**	
				(-3.63)		(-2.24)	
Underinvestment (t=0)					-0.018***		-0.034*
					(-3.03)		(-1.92)
CEO Duality	-0.001	-0.001	-0.001	0.001	0.002	0.033**	0.034**
	(-0.54)	(-0.49)	(-0.50)	(0.22)	(0.38)	(2.47)	(2.48)

CEO Tenure	0.001**	0.001**	0.001**	-0.003	-0.002	-0.001	-0.001
	(2.24)	(2.14)	(2.17)	(-1.04)	(-0.71)	(-0.11)	(-0.20)
Entrenched CEO	-0.001	-0.001	-0.001	-0.001	-0.002	-0.017	-0.017
	(-1.13)	(-1.08)	(-1.09)	(-0.24)	(-0.40)	(-1.32)	(-1.24)
Other Control Variables	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	22,857	22,857	22,857	3,412	3,287	3,275	3,151
R-squared	0.119	0.119	0.119	0.475	0.475	0.497	0.498
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry × Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Table IA.1 continued.

Panel D: Do Industrial Policies Facilitate Investment by Poorly Governed Firms? – Institutional Ownership

This table examines how the effect of government industrial policies on firm investment and performance varies with institutional ownership. The unit of observation is a firm-year. The sample period is 2008-2019 for columns 1 and 6, and is the six-year-window centered around 2011 (the implementation of the 12th FYP) and 2016 (the implementation of the 13th FYP), respectively, for columns 2-5 and 7-10. The treatment group includes firms whose industries are not FYP industries in the 3-year window prior to the implementation of FYP but become FYP industries in the 3-year window after the implementation. The control group includes firms belonging to non-FYP industries before and after the implementation of FYP. The dependent variable is the year-on-year change of *Capex* in columns 1 and 6, *Capex* in columns 2, 4, 7, and 9, and *ROE* in columns 3, 5, 8, and 10. *Low Capex* ($t = 0$) and *Underinvestment* ($t = 0$) are, respectively, *Capex* and *Underinvestment* measured at the beginning of each FYP, i.e., 2010 or 2015, respectively. Control variables include *Market to Book*, *Cash Flow*, *Size*, *Leverage*, *State*, *Block*, *Government Subsidies*, and *Political Connections*. Variable definitions are in Appendix B. Robust standard errors clustered at firm level are reported in parentheses. *, **, and *** indicate significance at the 10%, 5%, and 1% level, respectively.

Dependent Variable:	Δ *Capex*	*Capex*	*ROE*	*Capex*	*ROE*	Δ *Capex*	*Capex*	*ROE*	*Capex*	*ROE*
	Low Institutional Holding					High Institutional Holding				
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
FYP	0.002	0.004	0.016	0.003	0.019	0.004*	-0.021*	0.000	-0.019*	0.001
	(1.08)	(0.54)	(0.94)	(0.39)	(1.01)	(1.70)	(-1.80)	(0.01)	(-1.67)	(0.06)
FYP × Low Capex (t=0)		0.020**	0.021				0.009	0.006		
		(2.23)	(0.64)				(0.52)	(0.17)		
FYP × Underinvestment (t=0)				0.018**	0.011				0.004	0.007
				(2.10)	(0.36)				(0.22)	(0.22)
Low Capex (t=0)		-0.011*	0.002				-0.022**	-0.034**		
		(-1.78)	(0.11)				(-2.35)	(-2.44)		
Underinvestment (t=0)				-0.001	0.014				-0.025**	-0.032*
				(-0.10)	(0.37)				(-2.46)	(-1.86)
Control Variables	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	11,449	1,703	1,610	1,630	1,538	11,559	1,695	1,639	1,644	1,588
R-squared	0.130	0.546	0.533	0.550	0.536	0.187	0.561	0.561	0.561	0.559
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry × Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Table IA.1 continued.

Panel E: Do Industrial Policies Facilitate Investment by Poorly Governed Firms? – Board Independence

This table examines how the effect of government industrial policies on firm investment and performance varies with board independence. The unit of observation is a firm-year. The sample period is 2008-2019 for columns 1 and 6, and is the six-year-window centered around 2011 (the implementation of the 12th FYP) and 2016 (the implementation of the 13th FYP), respectively, for columns 2-5 and 7-10. The treatment group includes firms whose industries are not FYP industries in the 3-year window prior to the implementation of FYP but become FYP industries in the 3-year window after the implementation. The control group includes firms belonging to non-FYP industries before and after the implementation of FYP. The dependent variable is the year-on-year change of *Capex* in columns 1 and 6, *Capex* in columns 2, 4, 7, and 9, and *ROE* in columns 3, 5, 8, and 10. *Low Capex* ($t = 0$) and *Underinvestment* ($t = 0$) are, respectively, *Capex* and *Underinvestment* measured at the beginning of each FYP, i.e., 2010 or 2015, respectively. Control variables include *Market to Book*, *Cash Flow*, *Size*, *Leverage*, *State*, *Block*, *Government Subsidies*, and *Political Connections*. Variable definitions are in Appendix B. Robust standard errors clustered at firm level are reported in parentheses. *, **, and *** indicate significance at the 10%, 5%, and 1% level, respectively.

Dependent Variable:	Δ *Capex*	*Capex*	*ROE*	*Capex*	*ROE*	Δ *Capex*	*Capex*	*ROE*	*Capex*	*ROE*
	Low Board Independence					High Board Independence				
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
FYP	0.004*	0.001	0.003	0.003	0.005	0.004*	-0.014	-0.002	-0.018*	-0.002
	(1.75)	(0.08)	(0.16)	(0.32)	(0.32)	(1.79)	(-1.47)	(-0.15)	(-1.88)	(-0.13)
FYP × Low Capex (t=0)		0.017	0.066**				0.037***	0.034		
		(1.45)	(2.10)				(3.01)	(0.83)		
FYP × Underinvestment (t=0)				0.007	0.052*				0.037***	0.026
				(0.56)	(1.71)				(3.26)	(0.78)
Low Capex (t=0)		-0.022***	0.008				-0.012**	-0.073***		
		(-3.04)	(0.57)				(-2.05)	(-4.89)		
Underinvestment (t=0)				-0.022**	0.016				-0.008	-0.061***
				(-2.21)	(0.55)				(-1.12)	(-3.14)
Control Variables	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	11,277	1,718	1,656	1,635	1,574	11,586	1,652	1,563	1,611	1,522
R-squared	0.161	0.556	0.559	0.553	0.561	0.160	0.529	0.542	0.536	0.538
Firm FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry × Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

european corporate governance institute

about ECGI

The European Corporate Governance Institute has been established to improve *corporate governance through fostering independent scientific research and related activities.*

The ECGI will produce and disseminate high quality research while remaining close to the concerns and interests of corporate, financial and public policy makers. It will draw on the expertise of scholars from numerous countries and bring together a critical mass of expertise and interest to bear on this important subject.

www.ecgi.global

Electronic Access to the Working Paper Series

The full set of ECGI working papers can be accessed through the Institute's Web-site (www.ecgi.global/content/working-papers) or SSRN:

Finance Paper Series	http://www.ssrn.com/link/ECGI-Fin.html
Law Paper Series	http://www.ssrn.com/link/ECGI-Law.html