

## Response to Reviewer #2's Comments

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We appreciate your time and comments. Reviewer #2 indicates the concerns on (1) the “motivation” and (2) the depth of our study. We further revised the paper in order to clearly address these concerns. Following is our reply to the two comments. Hopefully, this can help reviewers and readers to better acknowledge the position of this study.

**Comment 1:** *“The need for a stronger motivation of this study at both levels of policy and theory. Introduction section of this paper has cited a great number of early contributions across management and economics. This undoubtedly raises the reader’s concern over the extent to which the author can well position this work. Moreover, the policy implications of the results obtained in the present paper is far too simple and lack of the analytical richness on the issues at hand.”.*

**Response:** Many thanks for pointing out this issue, which may also be the concern of some other readers. Actually, the primary motivation for this study was to understand the validity of an interesting government policy and the driving forces of enterprise innovation in China. In other words, to explore China’s progress towards innovation-driven growth from a new perspective. More specifically, we explain our motivation at the policy level and at the theory level respectively (Similar interpretation can be found in the introduction part of the revised manuscript).

First, in the absence of the detailed data, the high-tech certification policy has received far less attention in the research field before our research, even though it plays such an important role of the innovation strategy in China. This study, according to the reviewer, “has cited a great number of early contributions across management and economics,” is trying to indicate that there is further study needed. As has been mentioned above, studies related to this policy is scarce. Even though there are few relevant studies currently, they are problematic since they lack enough focus on the firm-level innovation and R&D manipulation as well as the comprehensive dataset.

Second, there are arguments about whether or not the “visible hand” can promote innovation. Similarly, the policy effect of the high-tech enterprise certification has also been controversial, with the scandals that enterprises engage in R&D manipulation to obtain the high-tech enterprise certificates being revealed frequently. This study seeks to provide comprehensive empirical evidence to explain the policy, with it placed in the context of the broader literature on government intervention and technological innovation.

Based on the Reviewer’s comments, we revised the paper to clearly address the “motivation”. Following is an example how we proposed our research question (Several similar changes can be found in the revised manuscript).

*The abovementioned economic transition of China along with its unique innovation strategy has helped to bring this emerging star to the attention of a growing community of policy makers and researchers. The objective of this research is, accordingly, to identify the impact of the HTE*

*certification policy, one of China's crucial innovation policies, on its technological innovation. Moreover, the study will provide micro-level evidence on how the government's "visible hand" can influence innovation as well as derive policy implications for the policymakers in China and other countries' stakeholders who also have an interest in promoting technological innovation.*

Third, as for the policy implications drawn from our main findings, we summarized them concisely in the original manuscript. In order to explain them more concretely to avoid misunderstanding as well as follow the advice from the reviewer, we rewrite this part as follows.

*First, the HTE certification policy indeed promotes innovation in "real" HTEs, but based on the findings of this study, there also exist noises from "pseudo" HTEs. The current procedures of the high-tech certification still have downsides and the government does not always make the right choices in the certification process. Hence, the design of the HTE certification policy should be enhanced. For instance, the certification criteria and audit procedures should evaluate companies' innovation capabilities from composite perspectives to leave less space for R&D manipulation. Meanwhile, in order to avoid the misallocation of market resources, the follow-up tracking and supervising governance need to be strengthened, in order to identify unqualified HTEs as early as possible and increase the cost of fraudulent practices. In other words, if China decides to fully exploit the certification policy, the government would have to create a more comprehensive system of incentives and penalties to elicit more innovations.*

*Second, the caution being offered here is that deploying policy instruments such as tax preferences and R&D subsidies could be challenging, but not impossible, for the Chinese firms have been facing serious innovative resource constraints so far. Nevertheless, it is unlikely that these instruments will keep inducing firms' innovations due to the existence of "resource curse". All of these policy instruments, if needed, should further be put in place to cultivate orientation with regard to indigenous innovation among enterprises. That is, in the long run, the government should foster the enterprises to invest more in R&D out of their own will, without relying so heavily on a wide range of policy tools.*

*Third, this study showed that only innovation policies based on corporate characteristics can have a more beneficial effect. There is no one-size-fits-all strategy for all firms and we suggest the need for a high degree of flexibility to accommodate different situations in the set-up and implementation of the policy. As confirmed by our empirical study, for example, the governments should pay more attention to private enterprises, enterprises in more competitive industries, and equity-inspired enterprises.*

*Fourth, based on this study, one can conjecture that the financial system inside China is still underdeveloped. The uncertainty and high risk of corporate innovation activities have caused serious information asymmetry between enterprises and investors. We emphasize that guiding external investors to correctly understand and support corporate innovation is substantially important. Firms may have insufficient incentive to invest in its own innovative capabilities unless their longer-term potential can be truly acknowledged by the financial market as well. Public-private partnership is the backbone of any successful policy. In creating an enabling environment*

*for innovation domestically, there is a tendency in China to go for making private and civil society actors engage in the innovations rather than just the government itself.*

**Comment 1:** *The present paper fails to provide an empirical model with well-thought mechanism on the relationships between certification policy and firm-level innovation. The model description shown in Sections 2-3 essentially reveals that this model does not much more than a textbook exercise on causal relations. The wealth of analyses on innovation (be it the headquarter innovation or the affiliated-entity innovation) is left unexploited.*

**Response:** We really appreciate that the reviewer's comments which helped us further address the question regarding mechanism analysis. There are some overlapping parts between the two channels in the original manuscript (the "tangible" channel related to the capacity for innovation and the "intangible" related to the incentive for innovation), which may lead to the confusion by the reviewer. Considering that it is hard to distinct innovation capacity from innovation incentive in practice, the revised manuscript proposes two new channels which easily can be told apart (the "direct" channel which refers to the direct economic gains given by the governments, such as tax preferences; and the "indirect" channel which refers to some indirect benefits, such as extra support from the financial market and more human capital engagement). The detailed analysis is as follows (Several similar changes can be found in the revised manuscript).

### *2.1. "Direct" Channel*

*At the current stage, the market mechanism in China is not mature enough, and the government still controls the allocation of important resources required for the survival and development of an enterprise. HTE certification can ensure that enterprises have enough "direct" financial support, which smooths R&D expenditure path and decentralizes the risk of corporate innovation activities.*

*Broadly, certified HTEs can obtain economic gains directly at two levels. The first level involves unified national polices. It is stated in the "Certification Measures" that in accordance with the "Enterprise Income Tax Law and its Implementation Regulations", the "Law of the People's Republic of China on the Administration of Tax Collection and its Implementation Regulations", enterprises that have obtained HTE certificates are entitled to such preferential taxation policies as 15% preferential income tax rates, R&D expenses deductions, and deductible taxes for using energy-saving and environmental-friendly equipment. The second level involves local policies, which allows Certified HTEs to enjoy various rewarding policies provided by the local governments, such as government subsidies, preferential land allocation, and etc.*

*A great number of scholars believe that tax incentives and R&D subsidies have a significant impact on R&D expenditure. Tax credits and subsidies are beneficial to increase the R&D investment of enterprises (Takalo et al., 2017). The reduction of tax burden cuts down enterprises' cash outflow to a certain extent, which improves their intrinsic capacity of financing innovation activities (Duchin et al. 2010). As a compensation for technology pioneers trying to innovate, government subsidies directly "transfer" some economic benefits to micro market players, which reduces corporate innovation costs and increases the funds available for research and development (Tether 2002; Chen*

*et al. 2014).*

*Based on the above analysis, we proposed Hypothesis one.*

*H1: HTE certification can promote enterprise innovation through the “direct” channel characterized based on tax preferences and R&D subsidies.*

## *2.2. “Indirect” Channel*

*On top of “direct” capital support, HTE certification can exert “indirect” impact on corporate innovation as well.*

*First, HTE certificates are jointly awarded by three government departments, which makes it a good message to indicate the scientific and technological stance for those certified enterprises. Hence, HTE certificates can be used as authoritative “brands,” which is beneficial for HTEs to enhance their reputation in the external financial market. Besides, HTE certification requires enterprises to increase the disclosure of relevant innovation details through information disclosure mechanisms jointly established by various departments, which may reduce information asymmetry for other investors. As a result, HTEs are more likely to access external financing such as bank credits, and accumulate higher innovation capacities.*

*Second, enterprise innovation as an investment decision essentially depends on companies’ power structure. In many cases, the failure of a corporate entity to innovate is not due to the absence of favorable conditions, but due to the lack of motivation (Frenkel 2000). HTE certification policy helps corporate executives and other staff recognise the long-term benefits inherent in innovation activities, thus reducing their short-sightedness and encouraging them to look beyond limited personal interests. The mandatory provisions under the “Certification Measures” also have a compelling effect, making more people within HTEs engage in innovation projects for complying with government guidance and achieving policy goals. Eventually, HTEs can increasingly train or attract more scientific research talents and management personnel with higher professional skills, who are more likely to support independent innovation activities (Holmstrom 1989). Consequently, there will be massive human capital engagement in HTEs, which is pivotal to corporate innovation.*

*Based on the above analysis, we proposed Hypothesis two.*

*H2: HTE certification can promote corporate innovation through the “indirect” channel characterized based on external financial support and human capital engagement.*

It should also be noted that the impact of macroeconomics on micro-subjects has always been regarded as a black box by the researchers. While this study is trying to provide two channels to explain part of this relationship, it could be plausible with the restriction of our available data, information, and methods.

Particular attention was given to the exogeneous issues in this study. We provide the following reasons to account for it.

The biggest challenge to study the high-tech certification policy, similar to study other policies based

on ex-ante information, is the sample-selection problem and the inverse causal problem, which could be the biggest downside of the innovation policies as well. Our model description shown in Sections 2-3 working on causal relationship can help reveal the true impact of the high-tech certification policy with R&D manipulation taken into account. This should also be considered as one of the contributions by this research, given that the few previous studies on the HTE certification policy left this issue unaddressed.

Finally, we treat the headquarter innovation or the affiliated-entity innovation as a whole, which is another little contribution of this study, considering that the policy would influence all the related entities rather than simply the certified ones. This study did not specifically analyze the mechanism with respect to the headquarter innovation or the affiliated-entity innovation, because it involves another research field, i.e., innovation within business group. As a matter of fact, “Business Group, Industrial Policy, and Corporate innovation” is also the title of our current research project granted by National Natural Science Foundation of China (Grant No. 71874061), which allows us to further explore the mechanism of business group.

In summary, the authors would like to take this opportunity to express our sincere thanks to the editor and reviewers for their time and valuable comments, which allow us to further improve this manuscript. We hope that the revised manuscript addresses the concerns by the reviewers. Also, we hope this study can provide a meaningful insight for those who are interested in the interaction between policies and innovations in China as well as propose some important unexploited questions for further research.