The impact of the Shanghai – Hong Kong stock market connection on corporate innovation: Evidence from mainland China

Guanming He*

Durham University Business School, Durham University, United Kingdom

Email: guanming.he@durham.ac.uk

Xiaorong Li

School of Public Finance and Taxation,

Central University of Finance and Economics, Beijing, China

Email: lixiaorongchina@163.com

Jingbo Luo

School of Management, Lanzhou University, Lanzhou, China

Email: luojb@lzu.edu.cn

Acknowledgements:

* We are grateful for the comments and suggestions of Ioannis Kyriakou, an anonymous reviewer, Russell Craig, Anthony Asher, Fredrick Manang, Abhishek Ganguly, William Cheung, Idan Hodor, Xuan Tian, and the participants at the 2021 Global Finance Conference (in which the paper won a top paper award), 4th Conference on Law & Macroeconomics of Yale law school, 2021 Frontiers in Development Policy Conference, 1st International conference "Frontiers in International Finance and Banking", 11th Emerging Markets Finance conference, 15th annual conference on Asia-Pacific Financial Markets, 2021 Financial Markets and Corporate Governance conference, 13th International Conference on Economics, 2021 International Conference on Recent Development in New Structural Economics and Finance, 6th Indonesian Finance Association International conference, and Central University of Finance & Economics. Xiaorong Li acknowledges financial support from the National Natural Science Foundation of China (Grant No.: 71972192; 71503283), Fok Ying Tung Education Foundation (Grant No.: 161077), and Zhongcai-CSCI Pengyuan Local Finance Investment and Funding Research Institute. Jingbo Luo thanks financial support from the National Natural Science Foundation of China (Grant No.: 71762014) and Jiangxi Provincial Department of Science and Technology (Grant No.: GJJ180258). Correspondence about the paper can be addressed to Guanming He, Xiaorong Li, and Jingbo Luo. All errors or omissions are our own.

The impact of the Shanghai – Hong Kong stock market connection on corporate innovation: Evidence from mainland China

Abstract: The Shanghai stock market and the Hong Kong stock market were connected by the Chinese government in 2014, allowing Hong Kong investors to trade on a group of stocks on the Shanghai stock market. Using a difference-in-differences approach, we examine how this stock market connection affects corporate innovation in mainland China. We argue, and find, that the stock market connection enhances the informational feedback effect of stock prices and involves more sophisticated investors' monitoring and advising on firm management, and thereby spurs corporate innovation. We further show that the positive effect of the stock market connection on innovation is more pronounced for non-state-owned firms, firms with few political connections, firms with weak intellectual property rights protection, or firms that are headquartered in non-high-tech economic zones. Our study sheds light on how the opening of a developing stock market to a more developed stock market shapes corporate innovation.

Keywords: stock market connection; corporate innovation; stock price informativeness; sophisticated investors

JEL classification: F30; F65; F68; G15; G38; O31

1. Introduction

Corporate innovation is widely regarded to be a major engine of a country's long-term economic growth and is vital for a country to maintain its competitive advantage (e.g., Solow, 1957; Romer, 1986; Nazir, Tan, & Nazir, 2021). Motivating and nurturing corporate innovation is a pressing task for developing countries where technological innovation is relatively less developed. Empirical evidence from developed countries shows that varied economic environments and firm characteristics promote firm innovation. For instance, corporate venture capital (Chemmanur, Loutskina, & Tian, 2014), hedge fund activism (Brav, Jiang, Ma, & Tian, 2018), credit supply (Amore, Schneider, & Zaldokas, 2013), private equity ownership (Ferreira, Manso, & Silva, 2014), board independence (Balsmeier, Fleming, & Manso, 2016), board diversity (Li & He, 2021), intellectual property rights protection (Fang, Lerner, & Wu, 2017), managerial competencies (e.g., Custodio, Ferreira, & Matos, 2019; Chemmanur, Kong, Drishnan, & Yu, 2019), and long-term incentive plans on executive compensation (Manso, 2011) help enhance corporate innovation. Nonetheless, evidence on how economic policy and regulatory reform spur corporate innovation is sparse, especially in developing countries such as China, where there is considerable need to innovate to promote sustainable economic growth. Understanding the role of regulatory intervention in shaping corporate innovation is important (Tan, Tian, Zhang, & Zhao, 2020; Mtar & Belazreg, 2021), because a regulatory policy, if effective in stimulating the aggregate innovation activities in an economy, would largely promote a developing country's economic development.

In this study, we focus on a regulatory reform on an emerging stock market, because nurturing corporate innovation effectively requires a better-functioning stock market that allocates resources efficiently to facilitate firm investments and innovation. Specifically, we investigate whether the Shanghai-Hong Kong stock market connection program implemented by the Chinese government would enhance innovation of Chinese listed companies. In 2014, the stock market connection program commenced, allowing Hong Kong investors to trade on the connected stocks. These consist of constituent stocks of the Shanghai Stock Exchange 180 index and 380 index, and of stocks listed on both the Shanghai Stock Exchange and the Hong Kong Stock Exchange. As a consequence, more sophisticated market participants such as institutional investors from the Hong Kong stock market enter the Shanghai stock market to trade on the connected stocks. Since the Hong Kong stock market is regarded as better-developed than the Shanghai stock market (e.g., Ke, Rui, & Wei, 2012; Hung, Wong, & Zhang, 2012; Ke, Lennox, & Xin, 2015), the implementation of the Shanghai-Hong Kong stock market connection program in 2014 provides a unique setting to examine how the opening of a developing stock market to a more developed stock market can affect corporate innovation.

We argue that the stock market connection program could influence corporate innovation through two main channels. First, as innovation is riskier, more idiosyncratic with more contingencies, than routine tasks (Holmstrom, 1989), the potential and outcome of innovative projects are hard to assess, often resulting in investors holding divergent opinions about the prospects of the projects (Allen & Gale, 1999). The stock market connection program enhances the informational feedback effects of stock prices. Stock prices in a developed stock market may contain valuable information about the prospects of firms' investments and innovation (e.g., Hsu, Tian, & Xu, 2014). Consistent with this notion, a vast literature studying the U.S. stock market (e.g., Chen, Goldstein, & Jiang, 2007; Bakke & Whited, 2010; Dutta & Reichelstein, 2003; 2005; Foucault & Fresard, 2012, 2014; Loureiro & Taboada, 2015) provides evidence that managers account for information on stock prices and actively incorporate it into their investment decisions. Since the establishment of the stock market connection, more-sophisticated investors from the Hong Kong stock market get involved in stock trades, plausibly making stock prices more efficient and more informative about the prospects of innovative research and investments. This may help research and development to progress more efficiently for innovation outputs and thereby spur corporate innovation.

Second, innovation involves a long process that is fraught with uncertainty and has a high risk of failure in the short run (e.g., Holmstrom, 1989). However, due to compensation and career concerns, managers (especially those in technology-intensive industries) tend to sacrifice long-term sustainability for short-term performance goals (e.g., Graham, Harvey, & Rajgopal, 2005). Also, managers' rent extraction may reduce corporate cash holdings or other resources that are required in pursuing innovative projects. Therefore, managers' myopia and rent extraction stifle corporate innovation. These are more salient in China where the market for financial analysts is under-developed and institutional stock ownership is relatively low (e.g., Chen, Ke, & Yang, 2013), but are less of a concern in Hong Kong where the stock market, in comparison, is more developed and mature (e.g., Hung, Wong, & Zhang, 2012; Ke, Rui, & Yu, 2012; Ke, Lennox, & Xin, 2015). Hong Kong investors are more sophisticated and can better monitor and advise firm management on innovative research and investments. Therefore, we expect that the implementation of the stock market connection program would promote corporate innovation.

To test our prediction, we utilize a difference-in-differences (DID) and propensity-score-matching research design. The numbers of different patents granted by the China National Intellectual Property Administration (CNIPA) are used as our measures of corporate innovation. The connected (non-connected) firms, on which Hong Kong investors are (are not) allowed by the regulatory stock-market-connection program to trade on the Shanghai Stock Exchange, are used as the treatment (matched control) firms for our DID regressions. We find that, compared with the non-connected firms, the connected firms become more innovative after the stock market connection, suggesting that it boosts corporate innovation. Our results and inferences continue to hold under an array of robustness checks using alternative sample, matching method, model specifications, and measures of corporate innovation.

To lend credence to the foregoing mechanisms through which the Shanghai-Hong Kong stock market connection promotes innovation, we further conduct mechanism tests. Our first mechanism postulates that the stock market connection encourages firm innovation via enhancing the informational feedback effect of stock prices. Consistent with this mechanism, we find that, after the stock market connection, stock prices reflect firm-specific information better, and that firms with highly informative stock prices are more innovative. In line with our second mechanism that the stock market connection spurs corporate innovation via enhancing the monitoring and advising on innovative strategies and activities, we find that sophisticated institutional investments increase after the establishment of the stock market connection, and that the positive effect of the stock market connection on innovation is stronger for firms that feature more Hong Kong institutional investments. Additional cross-sectional results reveal that the effect of the stock market connection is stronger for non-state-owned firms, firms with few political connections, firms with weak intellectual property rights protection, or firms that are headquartered in non-high-tech economic zones.

Our study makes four main contributions to the literature. First, the degree of innovation is significantly higher in developed countries like U.S. than in many developing countries. The latter are in greater need of innovation to promote economy. Nevertheless, while there is a vast literature examining corporate innovation in the developed U.S. market, evidence on corporate innovation in emerging countries, especially China, is scant. We contribute to this literature by providing evidence on how the Shanghai-Hong Kong stock market connection stimulates innovation of mainland Chinese listed companies. Given a set of unique institutional features of China, we also show how this stimulating impact on innovation varies for state-owned firms, firms with political connections, firms with weak protection of intellectual property rights, and firms that are in national high-tech economic zones.

Second, a large body of literature examines how corporate innovation is shaped by various firm characteristics and economic environments such as corporate venture capital (Chemmanur, Loutskina, & Tian, 2014), hedge fund activism (Brav, Jiang, Ma, & Tian, 2018), credit supply (Amore, Schneider, & Zaldokas, 2013), institutional stock holdings (Aghion, Van Reenen, & Zingales, 2013; Luong, Moshirian, Nguyen, Tian, & Zhang, 2017), debt financing (Shahzard, Luo, & Liu, 2021), independent and diversified boards (Balsmeier, Fleming, & Manso, 2016; Li & He, 2021), private equity ownership (Ferreira, Manso, & Silva, 2014), intellectual property rights protection (Fang, Lerner, & Wu, 2017), managerial capability (e.g., Custodio, Ferreira, & Matos, 2019; Chemmanur, Kong, Drishnan, & Yu, 2019), long-term managerial compensation plans (Manso, 2011), CEO overconfidence (Galasso & Simcoe, 2011; Hirshleifer, Low, & Teoh, 2012), and investors' greater tolerance for failure (Manso, 2011; Tian & Wang, 2014). Far less research attention has been paid to how economic policy and regulatory reform promote corporate innovation, especially in developing countries such as China (Tan, Tian, Zhang, & Zhao, 2020). We fill the gap in the literature by showing that stock market connections with more developed stock markets spur innovations of domestic companies.

Third, against the backdrop of the globalization of business, more and more developing countries are opening their economies and markets in various ways to the globe. There is a paucity of empirical evidence on the real economic consequences of opening an emerging stock market to a more developed stock market. Our study adds to this line of research by providing new evidence on the real effect of the connection of the Shanghai stock market with the Hong Kong stock market. While the former market is widely regarded as considerably less developed than the latter (e.g., Hung, Wong, & Zhang, 2012; Ke, Rui, & Yu, 2012; Ke, Lennox, & Xin, 2015), both are economically autonomous from each other. We show that allowing the Hong Kong investors, who are generally more sophisticated than the mainland Chinese investors, to invest in the Shanghai stock market not only makes stock prices more informative but also improves the monitoring and advising on innovation. This highlights the importance of the sophistication of investors for the improvements of innovation of domestic firms, and gives important implications for not only developing countries but also developed countries which might consider opening their stock markets to overseas investors. It is essential for the developed countries to ensure that the foreign investors allowed to invest in the domestic stock market are strong and sophisticated. To this end, it can be required, for example, that the foreign investors are institutional investors who hold a certain significant amount of cash in their securities account for trading on the domestic market.

Fourth, our study differs from, but complements, that of Moshirian, Tian, Zhang, and Zhang (2021). Using a sample of 20 economies exclusive of China, they find that stock market liberalization, through permitting foreign investments in domestic stock markets, has a positive impact on technological innovation. While this finding is important, we allow for the possibility that, due to institutional and cultural differences, foreign investors, who are generally less acquainted with domestic stock markets and local institutions, could be either more sophisticated or less sophisticated in stock investments than domestic investors. In contrast, investors from Hong Kong are not only more sophisticated than those in mainland China (e.g., Hung, Wong, & Zhang, 2012; Ke, Lennox, & Xin, 2015), but are also more conversant with the institutional setting and stock markets of mainland China, compared with foreign investors. Therefore, the establishment of the Shanghai-Hong Kong stock market connection in 2014 is a unique setting to explore how the openness of a developing stock market to generally more sophisticated investors in a more developed stock market influences firm innovation. Our study is the first to investigate this issue. Focusing on mainland China for the study not only obviates the challenge of addressing the endogeneity and unobservable heterogeneity that are associated with cross-country differences (e.g., Fang, Lerner, & Wu, 2017), but also, more importantly, adds to the research on the open-door policies pursued by mainland China, the largest developing economy and the second-largest economy in the globe.

The remainder of this paper proceeds as follows. Section 2 describes our data sources and sample. Section 3 presents our research design and main results. Section 4 conducts further analysis of how the stock market connection affects corporate innovation in various circumstances. Section 5 concludes the paper.

2. Data sources, sample selection, and sample matching

2.1. Data sources and sample selection

In 2014, the China Securities Regulatory Commission (CSRC) reached an agreement with the Hong Kong Securities Regulatory Commission (HKSRC) to launch a stock market connection program, under which Hong Kong investors would be permitted to trade on connected stocks on the Shanghai stock market. The connected stocks consist of (i) stocks whose prices compose the Shanghai Stock Exchange 180 index and 380 index and (ii) stocks listed on both the Shanghai Stock Exchange and the Hong Kong Stock Exchange (i.e., A+H stocks). To study how corporate innovation was affected by the stock market connection, we test how the connected firms' innovation would change in a six-year period surrounding the implementation of the stock market connection in 2014, as compared to the changes in innovations of the non-connected firms. Accordingly, our sample selection starts with the population of firms that are listed on the Shanghai Stock Exchanges over the years 2011-2016. This sample period covers the three-year pre-connection period (i.e., 2011-2013) and the three-year post-connection period (i.e., 2014-2016). In constructing our corporate innovation variables, we collect the patent grant data from the website of the Chinese State Intellectual Property Office for the period 2012-2017.[1] Then, we merge the patent data with the financial,

[1] The website is http://epub.sipo.gov.cn/gjcx.jsp. To better establish causality for the impact of the stock market connection, we measure all the independent variables at year *t*, while the corporate innovation variables are measured at year *t*+1. Therefore, the patent data are collected for the period 2012-2017, one year leading our sample period 2011-2016.

governance, and stock market data obtained from the China Stock Market and Accounting Research (CSMAR) database and the Wind database for our sample period. This data merging yields an initial sample of 15,144 firm-year observations.

Further, we do the following refinements on the initial sample. First, we remove financial institutions, because their financial characteristics and financial statements are not comparable to those of non-financial firms (e.g., He, 2016). We also eliminate firms identified by the CSRC as suffering financial distress and pending delisting during our sample period. As a result, our sample size drops to 14,295 firm-year observations. We further tease out the mainland listed companies that have issued H shares (i.e., shares traded on the Hong Kong Stock Exchange) or B shares (i.e., shares available only for foreign investors to trade) before or during our sample period; 97 firms that are listed on both the Shanghai Stock Exchange and the Hong Kong Stock Exchange (namely, A+H companies) are deleted, since these firms had already had access to finance on the Hong Kong Stock Exchange before its connection with the Shanghai Stock Exchange. This reduces our sample to 14,151 observations, and leads to our sample of connected firms consisting only of the firms whose stocks constitute the Shanghai Stock Exchange 180 index and 380 index. We further exclude observations that have negative retained earnings in 2013, the year before the stock market connection program was implemented. 238 firms that were listed during the three years since the implementation of the stock market connection are also removed. Finally, we require firm-year observations for which the data required for constructing all regressors for our multivariate analysis are not missing. As a result, our sample comprises 11,742 firm-year observations for 2,158 unique firms across the years 2011-2016.

2.2. Propensity-score matching of connected firms with non-connected firms

There might exist systematic differences in firm characteristics between connected firms (i.e., firms with stocks on which Hong Kong investors are allowed to trade under the stock market connection program) and non-connected firms (i.e., firms whose stocks are not allowed to be traded by Hong Kong investors). This might confound our analysis which involves essentially the comparison of changes in innovations between the connected firms and non-connected firms. To remediate this issue, we employ a nearest-neighborhood propensity-score-matching approach to obtain a sample composed of treatment firms (i.e., the connected firms) and matched controlled firms (i.e., the non-connected firms).

The difference-in-differences research design requires a non-random assignment of observations into the treatment group and the control group, and that covariates affecting the assignment are balanced between treatment firms and control firms in the absence of the treatment event (e.g., He, Ren, & Taffler, 2021). Therefore, our matching of firms is based on 2013, the year before the event. We match each treatment firm, without replacement, with a control firm using the closest propensity score. The propensity score is estimated from a logit regression, in which the binary variable (*dum_connect*), indicating whether or not a Chinese listed firm is connected with the Hong Kong Stock Exchange, is regressed on a vector of matching covariates. The covariates include return on assets (*roa*), sales growth (*salesgrowth*), market-to-book ratio (*mb*), firm age (*age*), firm size (*size*), financial leverage (*lev*), Qualified Foreign Institutional Investors' stock ownership (*QFII_totshares*), sales performance (*sales*), political connection (*politic_connect*), ownership attribute (*non-state-owned*), capital expenditures (*capex*), and operating cash flow (*opcash*). All the matching covariates are expected to be related to *dum_connect* and are defined in the appendix. We also include firm dummies, alongside with year dummies and industry dummies, in our matching regression to ensure that, *post* matching, we would achieve a non-random classification of the treatment firms and control firms. After the propensity-score matching, we obtain our final sample comprising 6,716 firm-year observations for 1,526 unique firms.

To check the effectiveness of our matching, we conduct both the univariate and multivariate checks of covariate balance. First, for the post-matched sample, we run two-sample t-tests and compute standardized bias, as per, e.g., Rosenbaum and Rubin (1985), for each of our matching covariates. Panel A of Table 1 reports the results for the univariate covariate balance check. All the mean differences in the covariates are not statistically significant, with *p* values all above 10%. The standardized bias is less than 10% for all the covariates. These results indicate that our post-matched sample achieves a covariate balance and that our matching substantively reduces differences between the connected firms and the non-connected firms.

To further rest assured the covariate balance, we run the foregoing logit regression based on the post-matched sample. Column (1) (Column (2)) of Panel B shows the results from running the logit regression based on the pre-matched (post-matched) sample. While almost all the covariates have statistically significant coefficients for the pre-matched sample, the coefficients for all the covariates become not statistically significant after the matching. This again corroborates the effectiveness of our propensity-score matching.

2.3. Univariate statistics

We measure corporate innovation by three types of patents granted by the China National Intellectual Property Administration (CNIPA). The first is invention patents. These are granted for a new product, a new process, or an improvement, which have new unique functions or utilities for consumers. The second type of patents are product-modeling patents, which are granted for a new solution relating to the shape and/or structure of a product. The third type of patents are product-design patents. These are granted for new product design in respect of the shape, color, and/or pattern of a product, which are aesthetically appealing to customers.

To reduce the potential problem of skewness or outliers, we take the natural logarithm of one plus the number of granted invention patents (*invention*), of granted product-modeling patents (*modeling*), and of granted product-design patents (*design*), respectively, and use them as our main measures of corporate innovation. These granted patents pertain to the patent applications filed by a firm in a year and subsequently granted by the CNIPA. Panel A of Table 2 tabulates the mean values of the three variables across different industries. Firms in the manufacturing industry have the highest mean of *invention*, *modeling*, and *design*. This suggests that the manufacturing industry is the most innovative. The innovativeness helps manufacturing in China to be eminent and competitive worldwide.

To allay the concern on outliers, we winsorize all the continuous variables, which are explanatory for corporate innovation, at the 1% and 99%, respectively. Panel B of Table 2 reports the mean, standard deviation, minimum values, maximum values, and quartiles of all variables used for our regression analysis. Panel C shows the Spearman correlation matrix among the variables used in the multivariate tests. The absolute values of all the correlation coefficients are less than 50%, suggesting that multicollinearity does not exist to pose a threat to our multivariate tests. We also run the variance inflation factors (VIF) test. The results of this test, not tabulated for brevity, show that VIF values for all independent variables are less than 5, further corroborating that multicollinearity is unlikely to affect our regression analysis (O'Brien, 2007).

3. Research design and main results

3.1. Baseline difference-in-differences regressions

To test the effect of the stock market connection on corporate innovation, we start by using the following difference-in-differences OLS regression model:

$$\begin{aligned} invention(modeling, design)_{i,t+1} &= \alpha_0 + \alpha_1 dum\_connect_t + \alpha_2 after_i * dum\_connect_t \\ &+ \sum_k \alpha_{i,t,k} controls_{i,t}^k + YearDummies + IndustryDummies + \varepsilon_{i,t} \end{aligned} \quad (1)$$

The dependent variable is *invention*, *modeling*, or *design*, which are the three proxies for corporate innovation and are defined as previously. To enhance the causality relationship between the stock market connection event and corporate innovation, we measure the dependent variable one-year ahead of all the independent variables.[2] The treatment indicator variable, *dum_connect*, is equal to 1 for a connected firm, of which stocks can be traded by Hong Kong investors, and 0 for a non-connected firm. The time indicator variable, *after*, equals 1 if a firm is in a fiscal year during the post-connection period (i.e., 2014-2016), and 0 if the firm is in the pre-connection period (i.e., 2011-2013).[3] The variable of interest to our test of the research question is the interaction term, $after_i*dum\_connect_t$. Its coefficient captures the effect of the stock market connection on corporate innovation for the connected firms relative to the non-connected firms. A larger difference-in-differences estimator (α_3) would indicate a greater impact of the stock market connection on corporate innovation.

We include a battery of control variables in Model (1), based on previous literature on corporate innovation (e.g., Hirshleifer, Low, & Teoh, 2012; Fang, Lerner, & Wu, 2017; Luong, Moshirian, Nguyen, Tian, & Zhang, 2017). These variables include return on assets (*roa*), sales growth (*salesgrowth*), market-to-book ratio (*mb*), firm age (*age*), firm size (*size*), financial leverage (*lev*), Qualified Foreign Institutional Investors' stock ownership (*QFII_totshares*), capital expenditures (*capex*), sales performance (*sales*), political connection (*politic_connect*), ownership attribute (*non-state-owned*), and operating cash flow (*opcash*), which are defined in the appendix. We further include year dummies and industry dummies in the regression, since

[2] We obtain qualitatively identical results if we measure the dependent variable to be two-year (three-year) ahead of all the independent variables. To this end, we use the corporate innovation data that cover the years till 2018 (2019).

[3] The stock market connection program took effect on 17 November 2014. It is possible that the real effect of the stock market connection takes time to materialize. To better account for this possibility, we re-define our post-event period as 2015-2017, and then re-run Model (1) based on this alternative post-event period. We get similar results, which support our prediction that the stock market connection promotes corporate innovation. Our results remain qualitatively unchanged too, if we use 2010-2013 (2014-2017) as the pre-event (post-event) period for the DID regression estimation.

corporate innovation tends to vary significantly across years and industries (e.g., Moshirian, Tian, Zhang, & Zhang, 2021).[4] We do not include the time indicator variable, *after*, in the DID regression due to its potential multicollinearity with year dummies.

Table 3 reports the OLS regression results for Model (1). In the three columns where results for the three innovation measures are tabulated, the coefficients for the interaction terms are all positive and statistically significant at conventional levels. This indicates that, following the stock market connection, innovation of connected firms increases to a larger degree than that of non-connected firms. We interpret this as suggesting that the stock market connection spurs corporate innovation. An increase in $after_i{*}dum\_connect_t$ from 0 to 1 would increase *invention* (*modeling* and *design*) by 0.214 (0.235 and 0.101), which accounts for 30.62% (27.89% and 26.01%) of the full-sample mean of *invention* (*modeling* and *design*) and hence is economically significant.

3.2. Robustness checks of baseline regression results

3.2.1. Firm-fixed-effects difference-in-differences regression

It is possible that the stock market connection event also caused exogenous changes in some unobserved firm-specific factors that affect corporate innovation. To ease this concern, we run firm-fixed-effects regression for Model (1). Because our matching of firms is based on the data of 2013 (the year before the event), there is no time-series variation in our treatment indicator variable, $dum\_connect_t$, for our sample. Thus, when including firm-fixed effects in Model (1), $dum\_connect_t$ is omitted from the regression estimation. To avoid potential confounding effects that an overlapping of regressors may have on our DID estimators, we first run a firm-fixed effects regression that includes only $after_t{*}dum\_connect_i$ and year dummies.[5]

[4] All our main results remain qualitatively identical if we include industry-year interacted dummies in the regression. Industry dummies are constructed based on the industrial classification guidance released by the CSRC in 2012.

[5] We do not include industry dummies to avoid their potential multicollinearity with firm-fixed effects. That

The regression results are shown in Columns (1)-(3) of Table 4, with the DID estimators qualitatively the same as those reported in Table 3. We then run another firm-fixed-effects regression for Model (1) including all the control variables. Results are shown in Columns (4)-(6). They elicit the same inferences as do the results in Table 3. Collectively, our firm-fixed-effects regression results corroborate our conjecture that the stock market connection promotes corporate innovation.

3.2.2. Tests of parallel trends assumption and time effect

The parallel trends assumption underlying the difference-in-differences research design requires that, in the absence of the treatment event, the outcome variable should exhibit similar trends for both treatment firms and control firms (Roberts & Whited, 2013; He, Ren, & Taffler, 2020). To test whether this assumption is tenable for our DID test, we first compare the year-on-year growth in innovation of the connected firms with that of the non-connected firms for our pre-event sample period (i.e., 2011-2013). The year-on-year growth is measured as: a change in corporate innovation from the previous year to the current year, divided by corporate innovation in the previous year. Results from standard t-tests (un-tabulated) reveal that the growth rates in innovation of the connected firms are not statistically different from those of the non-connected firms for the year 2011, year 2012, and year 2013, respectively.

Further, we conduct two multivariate tests of the parallel-trend assumption. First, in the spirit of our univariate test of the assumption, we re-run our DID regression, using 2010 and 2011 (2011 and 2012, and 2012 and 2013) as the pre- and post-treatment periods, respectively. Our un-tabulated results reveal no statistically significant change in innovation for the connected firms relative to the non-connected firms. Second, we augment Model (1) by

said, we obtain qualitatively identical results if we include industry dummies in the firm-fixed-effects regression.

including the interaction terms between year dummies and our treatment indicator variable, *dum_connect*$_t$, and run this augmented model using OLS regression. Table 5 reports the results. The interaction terms, *after11*$_i$***dum_connect*$_t$, *after12*$_i$***dum_connect*$_t$, and *after13*$_i$** *dum_connect*$_t$, all take on a coefficient that is not statistically significant. Collectively, the foregoing results all support the parallel trends assumption holding for our DID research design.

In addition, the coefficients on the interaction terms, *after14*$_i$***dum_connect*$_t$, *after15*$_i$** *dum_connect*$_t$, and *after16*$_i$***dum_connect*$_t$, are all positive and statistically significant, indicating that the stock market connection took effect on corporate innovation in each year of our post-event sample period (i.e., the years 2014-2016). The magnitude of the coefficients for *after16*$_i$***dum_connect*$_t$ is significantly larger than that for *after15*$_i$***dum_connect*$_t$ (F-stat.= 10.62, 9.97, 8.51 and p=0.002, 0.0024, 0.003 for the *invention*, *modeling*, and *design* regressions, respectively), the latter of which is in turn significantly greater than that for *after14*$_i$***dum_connect*$_t$ (F-stat.=12.56, 11.84, 6.93 and p=0.001, 0.001, 0.013). This suggests that the real effect of the stock market connection on corporate innovation materializes over time.

3.2.3. Controlling potential anticipation effect

Before the Shanghai-Hong Kong stock market connection was enforced, some companies might have anticipated this governmental policy and taken advance action to pursue innovative investments and research. This might provide an alternative explanation for our baseline regression results. To alleviate this concern, we re-run the difference-in-differences regression Model (1), using 2010-2012 and 2013-2015 as pre- and post-event periods, respectively, so as to test whether there is a foregoing anticipation effect in 2012. In our regression results, tabulated in Panel A of Table 6, there is no statistically significant result for the DID estimators. This suggests that the anticipation effect is unlikely to explain our baseline results.

3.2.4. Using A+H companies as the alternative treatment sample

Though the connected firms specified by the CSRC encompass firms listed on both the Shanghai Stock Exchange and the Hong Kong Stock Exchange (i.e., A+H companies), their stocks had already been traded by Hong Kong investors before the stock market connection was enforced. Investors in Hong Kong might be conversant with, and have been monitoring, the A+H companies prior to the connection. Therefore, these firms are excluded from our sample of connected firms in the baseline regression analysis. For robustness check, we use the A+H companies as our alternative treatment sample, and match them, without replacement, with the non-connected firms utilizing the same propensity-score-matching approach as described in Section 2.2. We then re-run our DID regression based on this new matched sample. Results are reported in Panel B of Table 6. The DID estimators are not statistically significant, suggesting that the A+H companies do not exhibit an increase in innovation activities that is larger than that of non-connected firms. This, combined with our baseline regression results, substantiate the proposition that, under the connection program, entitling Hong Kong investors to invest in stocks of mainland Chinese firms is the key for stimulating corporate innovation. Also, by using the same type of control group and the same control variables as in Model (1) for the alternative DID regression, we further ease the concern that the treatment effect shown in our baseline regression results is driven by potential omitted variable(s).

3.2.5. Newly added connected firms after the implementation of the stock market connection

The constituent stocks of the Shanghai Stock Exchange 180 index and 380 index (i.e., SSE 180 stocks and SSE 380 stocks), which compose our treatment sample, change over time. Subject to changes in firm size, stock liquidity, trading volume, sales growth rate, return on equity, firms may, from year to year, drop in or drop out of the group of SSE 180 stocks and SSE 380 stocks. For our post-event sample period, 238 firms were newly included as SSE 180 stocks or SSE 380 stocks after the implementation of the stock market connection. Using the same propensity-score-matching approach as in Section 2.2, we match each newly added connected firm, without replacement, with a non-connected firm for the year 2013. This results in 1,812 firm-year observations corresponding with 476 firms. We re-run our DID regression based on the new sample of observations and report our results in Panel A of Table 7. The DID estimators all have a positive coefficient that is statistically significant at the 1% level. This supports our inference that the stock market connection enhances corporate innovation.

3.2.6. Alternative measures of corporate innovation

We use the number of granted patents to measure corporate innovation in our main tests, as we believe patent grants are powerfully reflective of a firm's degree of innovation. As a robustness check, we account for other dimensions of innovation, including the amount of R&D expenditures (*RDexp*) and the number of patent applications (*app_invention*, *app_modeling*, and *app_design*).[6] We also use productivity growth (ΔTFP) to measure a firm's innovation outcome. *TFP* is computed as the natural logarithm of year-on-year change in the firm-level total-factor productivity which is estimated per Olley and Pakes (1996). We run our DID regression where the dependent variable is replaced with these alternative measures of corporate innovation. The results are reported in Panel B of Table 7. It is shown that the amount of R&D expenditures, the number of patent applications, and productivity growth all increase as a result of the implementation of the stock market connection.

3.2.7. Alternative matching method

[6] Patents secured by mainland Chinese firms receive far less citations than patents of U.S. firms, not only because the Chinese patents have relatively shorter lifespan, lower impact, and smaller global reach, but also because the google search is banned in mainland China. Furthermore, Chinese firms in general care about the real economic benefits, rather than citation, of patents. Therefore, we do not employ patent citations as the proxy for corporate innovation in our analysis.

To reassure no substantive difference between our treatment sample and control sample for the pre-event sample period, we use an automated coarsening *k*-to-*k* coarsened exact matching, as per Iacus, King, and Porro (2012), to re-form our sample for the baseline regression analysis. To this end, we match the treatment firms, without replacement, with the control firms based on the same covariates as we use for the foregoing propensity-score matching. We then use the coarsened-exact-matched sample to run the DID regression models. The DID regression results, not tabulated for simplicity, are all quantitatively identical to our baseline results.

3.3. Tests of the channels through which the stock market connection affects corporate innovation

3.3.1. Does the stock market connection affect firm innovation by enhancing the informational feedback effect of stock prices?

The involvement of Hong Kong investors, who are more sophisticated in stock trades, may make stock prices more efficient. The prices may become more informative about the prospects of innovative investments and research, and thereby help innovative research to progress more efficiently. To the extent that the stock market connection enhances the informational feedback effect of stock prices on firm innovation, we predict that (i) stock prices become more informative about firms after the implementation of the stock market connection, and that (ii) the impact of the stock market connection on innovation is stronger for firms with highly informative stock prices. We use stock price synchronicity, as per Morck, Yeung, and Yu (2000), to capture the degree to which stock prices contain value-relevant firm-specific information. Morck, Yeung, and Yu (2000) and Durnev, Morck, Yeung, and Zarowin (2003) show that stock price synchronicity, defined as the R square from asset pricing regressions, is an inverse measure of the amount of firm-specific information reflected in stock prices. The lower the stock price synchronicity becomes, the more value-relevant firm-specific information stock prices contain, and the stronger the informational feedback effect of stock prices is expected to be.

We first regress stock price synchronicity on $dum\_connect_i$, $after_t*dum\_connect_i$, and a battery of related control variables (e.g., Zhou, Lin, Li, & Cheung, 2019). Panel A of Table 8 reports the results. The coefficient on $after_t*dum\_connect_i$ is negative and statistically significant. This result is consistent with our conjecture that, after the stock market connection was implemented, stock price synchronicity becomes lower, thus stock prices are more informative about firms. To test the moderating effect of stock price synchronicity on the baseline regression results, we split our full sample into two subsamples based on the sample median of stock price synchronicity (*synchr*), and then estimate Model (1) separately for the two subsamples. Panel B shows the results. $after_i*dum\_connect_t$ has a highly significant, positive coefficient in the low-*synchr* subsample, but has a statistically nonsignificant coefficient in the high-*synchr* subsample, for the *invention*, *modeling*, and *design* regressions, respectively. This suggests that the positive influence of the stock market connection on innovation is more evident for firms with highly informative stock prices. This lends support to our view that the stock market connection affects firm innovation via enhancing the informational feedback effect of stock prices.

3.3.2. Does the stock market connection affect firm innovation via involving more-sophisticated investors' monitoring and advising on firm management?

Under the stock market connection program, more-sophisticated Hong Kong investors, especially institutional investors, can better monitor and advise firm management on innovative investments and research. If the stock market connection influences firm innovation by involving more-sophisticated investors' monitoring and advising on firm management, we would expect that sophisticated investors' investments would increase following the implementation of the stock market connection. Also, the positive influence of the stock market connection on corporate innovation should be more pronounced for firms with more Hong Kong institutional investments. We use the Qualified Foreign Institutional Investor (hereafter, QFII) investments to proxy for Hong Kong institutional investments. The QFII system was established in 2002 by China to partially open its stock market to some specified foreign institutional investors.[7] It was headquartered in Hong Kong. Most QFIIs are also institutional investors in the Hong Kong stock market (e.g., Chen, Ke, & Yang, 2013). Thus, we regard the high-QFII-invested Chinese listed firms as characterized by more Hong Kong institutional investments.

We first do a DID regression of QFIIs' stock ownership (*QFII_totshares*) on $dum\_connect_i$, $after_t*dum\_connect_i$, and a series of related control variables (e.g., Timo, Virk, Wang, & Wang, 2019). Panel A of Table 9 reports the regression results. The variable $after_t *dum\_connect_i$ takes on a positive, statistically significant coefficient, suggesting that Hong Kong institutional investments increase following the implementation of the stock market connection. We further test the moderating effect of QFIIs' stock ownership on our baseline regression results. To this end, we divide our full sample into two subsamples based on the sample median of stock holdings by QFIIs, and then run Model (1) separately for these two subsamples. Panel B reports the results. For all the *invention*, *modeling*, and *design* regressions, the coefficients for $after_i*dum\_connect_t$ in the high-QFII-invested subsamples are positive and statistically significant, whereas the coefficients for $after_i*dum\_connect_t$ in the low-QFII-invested subsamples are not statistically significant. Thus, the stock market connection has a stronger impact on innovation for the high-QFII-invested firms than for the low-QFII-invested

[7] QFIIs need to meet specified conditions to enter the mainland Chinese stock markets. For example, institutional investors must have at least five years of experiences in asset management and at least $5 billion of assets under management for the most recent fiscal year. QFIIs' eligibility for investments in the Chinese securities market is assessed and approved by the CSRC.

firms. This is consistent with our conjecture that enhancing the monitoring and advising on firm management for innovation is an underlying channel that induces the stock market connection to promote firm innovation.

4. Further analysis

This section conducts further analysis of how the stock market connection affects corporate innovation in various circumstances. In particular, we examine whether the positive effect of the stock market connection on innovation differs for state-owned firms, firms with political connections, firms with weaker protection of intellectual property rights, and firms that are in national high-tech economic zones. To undertake the tests, we first partition our full sample into two subsamples based on the sample median of the continuous variables for intellectual property rights protection, and on the binary variables for whether a firm is state-owned, whether a firm has political connection, and whether a firm is headquartered in national high-tech economic zones, respectively. We then run Model (1) based on each pair of partitioned subsamples. Table 10 reports the regression results based on the split subsamples, where the results for the regression coefficients on the control variables are omitted for brevity. Below we set forth our cross-sectional analysis in terms of each of the foregoing moderating effects.

4.1.The moderating effect of state-owned property

The promotion and compensation of managers in the Chinese state-owned enterprises, who are often current or former government bureaucrats, are evaluated more by various social and political objectives than by corporate performance (e.g., Fan, Wong, & Zhang, 2007; Chen, Chen, Lobo, & Wang, 2010). As a result, managerial pay in the state-owned enterprises is of low upwards sensitivity to firm performance (e.g., Ke, Rui, & Yu, 2012; Chen, Guan, & Ke, 2013). Thus, managers in state-owned enterprises have weak incentives to take short-term risks to undertake innovative projects. Because of relatively high upwards sensitivity of managerial pay to corporate performance in non-state-owned firms, managers therein have strong incentives to pursue innovation for higher sustainable abnormal profits. Consistent with this notion, the significantly negative coefficients on *dum_connect* in our baseline regression results indicate that, prior to the stock market connection, the connected companies (non-connected companies), which are composed more of state-owned (non-state-owned) enterprises, are less (more) innovative. Therefore, we expect innovation to be more pronounced for non-state-owned firms than for state-owned firms after the commencement of the stock market connection.

We follow Wang, Wong, and Xia (2008) to define a listed firm as state-owned if its largest ultimate shareholder pertains to a government entity. We divide our sample firms into state-owned firms and non-state-owned firms, respectively, and run Model (1) based on these two subsample firms, respectively. Panel A reports the regression results. Consistent with our expectation, the coefficients for $after_i*dum\_connect_t$ are statistically significant and positive for non-state-owned firms but not for state-owned firms.

4.2. The moderating effect of political connection

Politically connected firms can earn substantial political rents easier than non-politically-connected firms (Fisman, 2001), and thus would likely have weaker incentives to make an effort to innovate for their products and services. Therefore, we expect that, after the enforcement of the stock market connection, innovation would increase to a larger extent for non-politically-connected firms than for politically connected firms. We follow Hung, Wong, and Zhang (2012) to define a listed firm as politically connected if the chairman of board or CEO is a current or former officer of a government entity. We divide our sample firms into politically connected firms and non-politically-connected firms, and run Model (1) based on these two types of firms, respectively. Panel B shows the regression results. The results for the *invention*, *modeling*, and *design* regressions are all consistent with our conjecture. Specifically, the stock market connection has a positive, significant effect on non-politically-connected firms but not on politically connected firms.

4.3. The moderating effect of intellectual property rights protection

Firms' incentives to innovate depend critically on the benefits and costs associated with pursuing innovation. The costs and risks of innovating are higher for firms that have lower intellectual property rights protection (e.g., Rapp & Rozek, 1990). By involving more sophisticated investors' monitoring and advising on innovating and associated intellectual property rights protection, the stock market connection reduces the costs of innovating, and thereby increases the profits from innovation, to a larger extent for firms that have weaker intellectual property rights protection. As such, these firms would be incentivized to innovate more. Accordingly, we predict that the effect of the stock market connection in promoting innovation would be stronger for firms with weaker intellectual property rights protection.

To measure the degree of a firm's intellectual property rights protection, we use the survey-based prefecture-level intellectual property rights indexes, which were published by the Chinese Academy of Social Science. The indexes vary across different provinces and years, and are the same for firms in the same province for a given year. We employ these indexes to compute the prefecture intellectual property rights protection scores (*IPR*), as per Fang, Lerner, and Wu (2017), for our sample firms. We then use the sample median of the scores to divide our full sample into the high-*IPR* subsample and the low-*IPR* subsample for our subsample DID regression analysis. The results in Panel C indicate that the coefficients on the DID estimators are positive and statistically significant only for the low-*IPR* subsamples. This is consistent with the contention that the stock market connection magnifies its positive effect on innovation for firms that are subject to weak intellectual property rights protection.

4.4. The moderating effect of establishment of national high-tech economic zones

Several national high-tech economic zones were established by China to attract foreign direct investments, foster technological innovation, and thereby promote economic growth. Firms in these high-tech zones enjoy preferential treatments in the corporate income tax rates, land use, talent recruitments, governmental financial subsidies, and simplified administrative procedures for project approval by local governments, among others. These treatments act as an incentive for firms in the high-tech zones to develop technological innovation. Given the plausibly better monitoring and advising on innovation after the implementation of the stock market connection, firms in the non-high-tech economic zones should have stronger incentives to pursue innovation, compared with firms in the high-tech zones where they have already been given an incentive to innovate. Put differently, firms in the non-high-tech economic zones have more room to improve on innovation after the connection. Therefore, we expect that the stimulating effect of the stock market connection on innovation is stronger for firms in the non-high-tech economic zones than for those in the high-tech zones.

As with Tian and Xu (2021), we obtain a list of 136 China national high-tech economic zones from the website of the Ministry of Science and Technology, and manually collect the dates on which the high-tech zones were established.[8] Based on this information, we divide our sample firms into those headquartered in the national high-tech economic zones and those headquartered in the non-high-tech zones. Panel D reports our subsample DID regression results. As expected, the results for the *invention*, *modeling*, and *design* regressions indicate that the coefficients on the DID estimators are positive and statistically significant for the

[8] http://www.most.gov.cn/gxjscykfq/ldjh/.

subsample of firms headquartered in the non-high-tech economic zones, but not for those headquartered in the high-tech economic zones.

5. Conclusion

The Shanghai stock market and the Hong Kong stock market were connected by the Chinese government in 2014. This stock market connection program entitles Hong Kong investors to trade on a group of stocks on the Shanghai stock market. Using a difference-in-differences regression approach, we investigate how this stock market connection affects firm innovation in mainland China. We argue that the stock market connection likely enhances the informational feedback effect of stock prices, involves more sophisticated investors' monitoring and advising on firm management, and thereby spurs corporate innovation. Consistent with this argument, we find that corporate innovation increases after the establishment of the stock market connection. This increase is greater for firms with highly informative stock prices and firms that feature more Hong Kong institutional investments; we also find that, following the stock market connection, stock price informativeness increases, and sophisticated institutional investments increase, thereby explaining why the stock market connection promotes firm innovation. The increased innovation helps firms earn abnormal profits in a long run, which would in turn be beneficial to the investors from Hong Kong who invest in the Shanghai stock market via the stock market connection program.

Further analysis reveals that the positive effect of the stock market connection on innovation is more pronounced for non-state-owned firms, firms with few political connections, firms with weak intellectual property rights protection, or firms that are headquartered in non-high-tech economic zones. Overall, our study advances understanding of the real effect of the openness of a stock market. Our analysis and results offer insight into how the opening of a developing stock market to a more developed stock market shapes corporate innovation, which should provide helpful implications for countries that are contemplating or planning on opening their stock markets to overseas stock markets.

References

Aghion, P., Van Reenen, J., & Zingales, L. (2013). Innovation and institutional ownership. *American Economic Review*, 103 (1), 277-304.

Allen, F., & Gale, D. (1999). Diversity of opinion and financing of new technologies. *Journal of Financial Intermediation*, 8 (1-2), 68-89.

Amore, M.D., Schneider, C., & Zaldokas, A. (2013). Credit supply and corporate innovation. *Journal of Financial Economics*, 109 (3), 835-855.

Bakke, T.E., & Whited, T.M. (2010). Which firms follow the market? An analysis of corporate investment decisions. *Review of Financial Studies*, 23 (5), 1941-1980.

Balsmeier, B., Fleming, L., & Manso, G. (2016). Independent boards and innovation. *Journal of Financial Economics*, 123 (3), 536-557.

Bray, A., Jiang, Wei., Song, M., & Tian, X. (2018). How does hedge fund activism reshape corporate innovation? *Journal of Financial Economics*, 130 (2), 237-264.

Chemmanur, T.J., Loutskina, E., & Tian, X. (2014). Corporate venture capital, value creation, and innovation. *Review of Financial Studies*, 27 (8), 2434-2473.

Chemmanur, T.J., Kong, L., Krishnan, K., & Yu, Q. (2019). Top management human capital, inventor mobility, and corporate innovation. *Journal of Financial and Quantitative Analysis*, 54 (6), 2383-2422.

Chen, H., Chen, J.Z., Lobo, G.J., & Wang, Y. (2010). Association between borrower and lender state ownership and accounting conservatism. *Journal of Accounting Research*, 48 (5), 973-1014.

Chen, Q., Goldstein, I., & Jiang, W. (2007). Price informativeness and investment sensitivity to stock price. *Review of Financial Studies*, 20 (3), 619-650.

Chen, Z., Guan, Y., & Ke, B. (2013). Are stock option grants to directors of state-controlled Chinese firms listed in Hong Kong genuine compensation? *The Accounting Review*, 88 (5), 1547-1574.

Chen, Z., Ke, B., & Yang, Z. (2013). Minority shareholders' control rights and the quality of corporate decisions in weak investor protection countries: A natural experiment in China. *The Accounting Review*, 88 (4), 1211-1238.

Cull, R., Li, W., Sun, B., & Xu, L.C. (2015). Government connections and financial constraints: Evidence from a large representative sample of Chinese firms. *Journal of Corporate Finance*, 32, 271-294.

Custodio, C., Ferreira, M.A., & Matos, P.P. (2019). Do general managerial skills spur innovation? *Management Science*, 65 (2), 459-576.

Durnev, A., Morck, R., Yeung, B., & Zarowin, P. (2003). Does greater firm-specific return variation mean more or less informed stock pricing? *Journal of Accounting Research*, 41

(5), 797-836.

Dutta, S., & Reichelstein, S. (2003). Leading indicator variables, performance measurement, and long-term versus short-term contracts. *Journal of Accounting Research*, 41 (5), 837-866.

Dutta, S., & Reichelstein, S. (2005). Stock price, earnings, and book value in managerial performance measures. *The Accounting Review*, 80 (4), 1069-1100.

Fan, J.P.H., Wong, T.J., & Zhang, T. (2007). Politically connected CEOs, corporate governance, and post-IPO performance of China's newly partially privatized firms. *Journal of Financial Economics*, 84 (2), 330-357.

Fang, L.H., Lerner, J., & Wu, C. (2017). Intellectual property rights protection, ownership, and innovation: Evidence from China. *Review of Financial Studies*, 30 (7), 2446-2477.

Ferreira, D., Manso, G., & Silva, A.C. (2014). Incentives to innovate and the decision to go public or private. *Review of Financial Studies*, 27 (1), 256-300.

Fisman, R. (2001). Estimating the value of political connections. *American Economic Review*, 91 (4), 1095-1102.

Foucault, T., & Fresard, L. (2012). Cross-listing, investment sensitivity to stock price and the learning hypothesis. *Review of Financial Studies*, 25 (11), 3305-3350.

Foucault, T., & Fresard, L. (2014). Learning from peers' stock prices and corporate investment. *Journal of Financial Economics*, 111 (3), 554-577.

Galasso, A., & Simcoe, T.S., (2011). CEO overconfidence and innovation. *Management Science*, 57 (8), 1469-1484.

Graham, J., Harvey, C., & Rajgopal, S. (2005). The economic implications of corporate financial reporting. *Journal of Accounting and Economics*, 40 (1-3), 3-73.

He, G. (2016). Fiscal support and earnings management. *International Journal of Accounting*, 51 (1), 57-84.

He, G., Ren, H.M., Taffler, R. (2020). The impact of corporate tax avoidance on analyst coverage and forecasts. *Review of Quantitative Finance & Accounting*, 54 (2), 447-477.

He, G., Ren, H.M., Taffler, R. (2021). Do enhanced derivative disclosures work? An informational perspective. *Journal of Futures Markets*, forthcoming.

Hirshleifer, D., Low, A., & Teoh, S.H. (2012). Are overconfidence CEOs better innovators? *Journal of Finance*, 67 (4), 1457-1498.

Holmstrom, B. (1989). Agency costs and innovation. *Journal of Economic Behavior and Organization*, 12 (3), 305-327.

Hsu, P., Tian, X., & Xu. Y. (2014). Financial development and innovation: Cross-country evidence. *Journal of Financial Economics*, 112 (1), 116-135.

Hung, M., Wong, T.J., & Zhang, T. (2012). Political considerations in the decision of Chinese SOEs to list in Hong Kong. *Journal of Accounting and Economics*, 53 (1-2), 435-449.

Iacus, S.M., King, G., & Porro, G. (2012). Causal inference without balance checking: Coarsened exact matching. *Political Analysis*, 20 (1),1-24.

Ke, B., Lennox, C., & Xin, Q. (2015). The effect of weak institutional environments on the quality of Big Four audits. *The Accounting Review*, 90 (4), 1591-1619.

Ke, B., Rui, O., & Yu, W. (2012). Hong Kong stock listing and the sensitivity of managerial compensation to firm performance in state-controlled Chinese firms. *Review of Accounting Studies*, 17, 166-188.

Koh, P., Reeb, D.M., & Zhao, W. (2018). CEO confidence and unreported R&D. *Management Science*, 64 (12), 5461-5959.

Li, Y., & He, C. (2021). Board diversity and corporate innovation: Evidence from Chinese listed firms. *International Journal of Finance & Economics*, forthcoming.

Loureiro, G., & Taboada, A.G. (2015). Do improvements in the information environment enhance insiders' ability to learn from outsiders? *Journal of Accounting Research*, 53 (4), 863-905.

Luong, H., Moshirian, F., Nguyen, L., Tian, X., & Zhang, B. (2017). How do foreign institutional investors enhance firm innovation? *Journal of Financial and Quantitative Analysis*, 52 (4), 1449-1490.

Manso, G. (2011). Motivating innovation. *Journal of Finance*, 66 (5), 1823-1860.

Mtar, K., & Belazreg, W. (2021). On the nexus of innovation, trade openness, financial development, and economic growth in European countries: New perspective from a GMM panel VAR approach. *International Journal of Finance and Economics*, forthcoming.

Morck, R., Yeung, B., & Yu, W. (2000). The information content of stock markets: Why do emerging markets have synchronous stock price movements? *Journal of Financial Economics*, 58 (1-2), 215-260.

Moshirian, F., Tian, X., Zhang, B., & Zhang, W. (2021). Stock market liberalization and innovation. *Journal of Financial Economics*, 139 (3), 985-1014.

Nazir, M.R., Tan, Y., & Nazir, M.I. (2021). Financial innovation and economic growth: Empirical evidence from China, India and Pakistan. *International Journal of Finance and Economics*, 26 (4), 6036-6059.

O'Brien, R.M. (2007). A caution regarding rules of thumb for variance inflation factors. *Quality and Quantity*, 41, 673-690.

Olley, G., & Pakes, A. (1996), The dynamics of productivity in the telecomunications equipment industry. *Econometrica*, 64 (6), 1263-1279.

Rapp, R.T., & Rozek, R.P. (1990). Benefits and costs of intellectual property protection in developing countries. *Journal of World Trade*, 24 (5), 75-102.

Roberts, M.R., & Whited, T.M. (2013). Chapter 7 – Endogeneity in empirical corporate finance1. In: Constantinides GM, Harris M, Stulz RM, eds. *Handbook of the Economics of Finance* 2 (A), 493-572.

Romer, P.M. (1986). Increasing returns and long-term growth. *Journal of Political Economics*, 94 (5), 1002-1037.

Rosenbaum, P.R. & Rubin, D.B. (1985). The bias due to incomplete matching. *Biometrics*, 41 (1), 103-116.

Shahzad, U., Luo, F., & Liu, J. (2021). Debt financing and technology investment Kuznets curve: Evidence from China. *International Journal of Finance and Economics*, forthcoming.

Solow, R. (1957). Technological change and the aggregate production function. *Review of Economics and Statistics*, 39, 312-320.

Tan, Y., Tian, X., Zhang, X., & Zhao, H. (2020). The real effect of partial privatization on corporate innovation: Evidence from China's split share structure reform. *Journal of Corporate Finance*, 64, 101661.

Tian, X., & Wang, T. (2014). Tolerance for failure and corporate innovation. *Review of Financial Studies*, 27 (1), 211-255.

Tian, X., & Xu, J. (2021). Do place-based policies promote local innovation and entrepreneurial finance? Working paper, Tsinghua University & Boston College.

Timo, K., Virk, N., Wang, H., & Wang, P. (2019). Learning Chinese: The changing investment behavior of foreign institutions in the Chinese stock market. *International Review of Financial Analysis*, 64, 190-203.

Wang, Q., Wong, T.J., & Xia, L. (2008). State ownership, the institutional environment, and auditor choice: Evidence from China. *Journal of Accounting and Economics*, 46 (1), 112-134.

Zhou, D., Zhao, Y., Lin, P.T., Li, B., & Cheung, A. (2019). Can microblogging information disclosure reduce stock price synchronicity? Evidence from China. *Australian Journal of Management*, 44 (2), 282-305.

Table 1: Propensity-score matching

Panel A: Univariate tests of covariate balance

Variables	Matching statuses	No. of firm-years	No. of firms	Mean for treatment firms	Mean for control firms	Standardized bias	t-stat.
size	Unmatched	11,742	2,158	22.991	21.477	12.170	30.27***
	Matched	6,716	1,526	22.974	22.909	5.300	0.720
opcash	Unmatched	11,742	2,158	0.070	0.043	26.000	4.500***
	Matched	6,716	1,526	0.068	0.073	-0.500	-0.090
capex	Unmatched	11,742	2,158	0.057	0.072	-16.800	-2.730***
	Matched	6,716	1,526	0.058	0.054	5.400	1.250
QFII_totshares	Unmatched	11,742	2,158	0.157	0.121	4.700	4.602***
	Matched	6,716	1,526	0.160	0.181	-2.700	-0.360
roa	Unmatched	11,742	2,158	0.058	0.049	17.000	3.280***
	Matched	6,716	1,526	0.059	0.065	-6.200	-1.243
lev	Unmatched	11,742	2,158	0.422	0.319	55.800	11.46***
	Matched	6,716	1,526	0.421	0.414	3.700	0.530
age	Unmatched	11,742	2,158	1.350	1.345	0.800	2.062**
	Matched	6,716	1,526	1.346	1.368	-3.900	-0.570
mb	Unmatched	11,742	2,158	0.894	0.549	44.300	12.21***
	Matched	6,716	1,526	0.893	0.802	4.260	1.540
salesgrowth	Unmatched	11,742	2,158	0.163	0.242	-20.900	-1.769*
	Matched	6,716	1,526	0.164	0.152	3.100	0.600
sale	Unmatched	11,742	2,158	21.378	19.003	74	2.490
	Matched	6,716	1,526	21.994	21.994	2.400	0.210
non_state_owned	Unmatched	11,742	2,158	0.312	0.274	13.72	2.152
	Matched	6,716	1,526	0.254	0.202	1.960	1.064
politic_connect	Unmatched	11,742	2,158	0.308	0.683	79.200	2.750
	Matched	6,716	1,526	0.296	0.274	2.168	0.010

Note: This table reports descriptive statistics of the covariates for the sample of connected firms and the sample of non-connected firms. These two types of samples are formed based on propensity-score matching. Specifically, the results of the two-sample tests of mean and of the standardized bias for the covariates are provided for both the pre-matched and post-matched samples. All the covariates are defined in the appendix. ***, **, * denote the two-tailed statistical significance at the 1%, 5%, and 10% levels, respectively.

Panel B: Multivariate tests of covariate balance

Variables	*dum_connect*	
	pre-matched sample	post-matched sample
	(1)	(2)
roa	5.673***	1.129
	(3.256)	(0.731)
salesgrowth	-0.921***	-0.838
	(-3.968)	(-0.154)
mb	0.103	0.352
	(1.249)	(0.936)
age	-2.549***	-2.107
	(-8.710)	(-1.428)
size	2.300***	2.145
	(3.359)	(0.329)
lev	-2.415***	-2.326
	(-4.905)	(-1.194)
QFII_totshares	-0.125	-0.152
	(-1.520)	(-1.507)
capex	-1.859**	-1.182
	(-2.069)	(-0.613)
opcash	2.898***	3.107
	(3.860)	(0.125)
sales	0.035*	0.014
	(1.928)	(1.086)
politic_connect	0.0377**	-0.049
	(2.022)	(0.732)
non_state_owned	-0.027***	-0.034
	(-3.125)	(-1.615)
constant	-50.60***	-43.21
	(-2.363)	(-0.356)
industry-fixed effects	Yes	Yes
year-fixed effects	Yes	Yes
firm-fixed effects	Yes	Yes
No. of obs.	11,742	6,716
Pseudo R^2	0.37	0.32

Notes: This table reports the logistic regression result for the determinants of the stock market connection. The sample period is 2011-2016. The regression is run for propensity-score matching and involves the full sample of firm-year observations for all mainland Chinese listed firms. The dependent variable, *dum_connect*, equals 1 if a firm is a connected firm on which Hong Kong investors are entitled to trade under the stock market connection program, and 0 otherwise. All the determinant variables for whether firms listed in the Shanghai stock market are connected with the Hong Kong stock market are defined in the appendix. Year dummies, industry dummies, and firm dummies are included in the regressions but not reported for simplicity. *t*-statistics in parentheses are based on robust standard errors clustered by firm. ***, **, * represent the two-tailed statistical significance at the 1%, 5%, and 10% levels, respectively.

Table 2: Univariate statistics

Panel A: Statistics of corporate innovation across industries

Industry types	*invention*	*modeling*	*design*
Agriculture, forestry, animal husbandry, and fishery	0.7921	1.6351	0.9916
Mining	3.2264	4.3638	0.2883
Manufacturing	21.939	32.1774	16.2176
Electricity, heat, gas, and water	0.6745	1.1836	0.1154
Construction	0.6386	1.9928	0.6374
Wholesale and retail	0.0448	0.0843	0.0061
Transportation	0.4677	1.3814	0.6936
Accommodation and catering	1.2589	0.4827	0.5603
Information technology	0.5754	0.3012	0.4896
Real estate	0.0098	0.0032	0.0057
Leasing and business service	0.7580	1.1314	0.1029
Scientific research and technical service	1.0159	1.4399	0.0298
Water conservancy, environment, and public facilities management	0.0785	0.1425	0.0014
Resident service	0.0348	0.4149	0.0217
Education	0.0892	0.1718	0.0468
Health and social work	0.071	0.022	0.001
Culture, sports, and entertainment	0.192	0.081	0.022
Others	0.0245	0.0179	0.0326

Notes: This table reports the mean values of three corporate innovation variables across industries for the post-matched sample. These variables are the natural logarithm of one plus the number of granted invention patents (*invention*), the number of granted product-modeling patents (*modeling*), and the number of granted product-design patents (*design*), respectively. The observations are at the firm-year level for the sample period 2011-2016.

Panel B: Descriptive statistics of variables

Variables	n	Mean	Min.	25%	Median	75%	Max.	Std.
invention	6,716	0.6987	0	0	0	4.098	8.033	1.3032
modeling	6,716	0.8424	0	0	0	7.505	8.173	1.3067
design	6,716	0.3883	0	0	0	3.764	6.9246	0.9849
app_invention	6,716	0.136	0	0.028	0.124	0.304	2.286	0.395
app_modeling	6,716	0.075	0	0.002	0.061	0.275	2.319	0.298
app_design	6,716	0.026	0	0.011	0.019	0.378	2.170	0.173
RDexp	6,716	17.50	0	16.504	17.656	18.744	23.083	2.227
TFP	6,716	8.188	2.435	3.709	8.095	8.743	12.578	0.969
EBIT	6,716	0.056	0.016	0.037	0.052	0.169	0.783	0.748
after	6,716	0.414	0	0	0	1	1	0.493
dum_connect	6,716	0.228	0	0	0	0	1	0.420
roa	6,716	0.049	0.463	0.016	0.039	0.069	0.345	0.795
salesgrowth	6,716	0.232	0.007	0.211	0.534	0.727	1.655	0.609
mb	6,716	1.902	0	0.325	0.566	1.328	14.38	1.473
age	6,716	1.134	0	0.693	1.099	1.792	2.303	0.709
size	6,716	13.87	3.564	13.781	16.810	19.080	23.510	1.610
lev	6,716	0.458	0.051	0.248	0.415	0.592	0.946	0.228
QFII_shares (%)	6,716	0.078	0	0	0	0	34.130	0.548
capex	6,716	0.043	0	0	0.013	0.053	1.217	0.689
opcash	6,716	13.071	1.610	10.030	15.340	18.790	26.420	1.688
indp	6,716	0.169	0	0	0.076	0.247	1.989	0.221
synchr	6,716	-2.560	-4.280	-2.815	-2.276	-1.744	5.956	3.259
top1_ownership	6,716	58.450	1.320	47.140	59.500	60.400	91.800	1.616
high_techzone	6,716	0.019	0	0	0	0	1	0.136
compet1	6,716	1.620	0.065	1.032	1.340	1.519	3.612	1.272
compet2	6,716	7.328	1.470	6.041	7.395	9.716	12.770	1.901
compet3	6,716	10.030	1.628	2.043	8.962	12.453	15.328	2.33

non_state_owned	6,716	0.571	0	0	0	1	1	0.167
tobin_q	6,716	2.760	0.070	0.973	1.768	2.081	3.460	2.240
state_owned	6,716	0.428	0	0	0	1	1	1.019
IPR	6,716	6.336	0.230	4.950	6.220	7.390	9.264	1.865
politic_connect	6,716	0.296	0	0	0	1	1	0.469
Dual	6,716	0.474	0	0	0	1	1	0.812
sales	6,716	21.782	19.265	20.909	21.677	22.545	26.207	1.231
politic_connect	6,716	0.003	0	0	0	1	1	0.050
TFP	6,716	1.966	0	0	0	10.120	12.510	3.529

Notes: This table tabulates descriptive statistics of the variables used for the difference-in-differences regression tests. The sample consists of a post-matched sample of 6,716 firm-years that cover the years 2011-2016. All the variables are defined in the appendix.

Panel C: Correlation matrix

Variables	*invention*	*modeling*	*design*	*dum_connect*	*after*	*state_owned*	*IPR*
invention	1						
model	0.124***	1					
design	0.378***	0.263***	1				
dum_connect	-0.049***	-0.084***	-0.048***	1			
after	-0.004	-0.031***	-0.032***	-0.022**	1		
state_owned	0.049***	0.083***	0.062***	-0.265***	0.037***	1	
IPR	0.008	0.001	0.024***	-0.138***	-0.038***	0.146***	1

Variables	*size*	*opcash*	*capex*	*QFII _totshares*	*roa*	*lev*	*age*	*mb*	*salesgrowth*
size	1								
opcash	0.000	1							
capex	-0.087***	0.531***	1						
QFII_totshares	0.078***	0.041***	0.025**	1					
roa	-0.054***	0.257***	0.072***	0.080***	1				
lev	0.150***	-0.120***	0.003	0.003	-0.336***	1			
age	0.334***	0.038***	-0.150***	0.004	-0.175***	0.204***	1		
mb	0.391***	-0.045***	0.032***	0.010	-0.207***	0.485***	0.079***	1	
salesgrowth	0.021*	0.100***	0.130***	0.021*	0.169***	0.107***	0.043***	-0.035***	1

Notes: This table presents the results for the Spearman correlations. The correlation matrix involves the variables used for the difference-in-differences regression tests. The sample consists of a post-matched sample of 6,716 firm-years that cover the years 2011-2016. All the variables are defined in the appendix. ***, **, * represent the two-tailed statistical significance at the 1%, 5%, and 10% levels, respectively, for the correlation coefficients.

Table 3: Baseline difference-in-differences OLS regressions of corporate innovation

Variables	*invention*	*modeling*	*design*
	(1)	(2)	(3)
after*dum_connect	**0.214*** **	**0.235*** **	**0.101** **
	(2.796)	**(3.405)**	**(2.103)**
dum_connect	-0.314***	-0.345***	-0.284***
	(-4.905)	(-5.568)	(-4.565)
roa	0.741***	0.597***	0.623***
	(2.967)	(2.771)	(3.286)
salesgrowth	-0.035	-0.036	-0.019
	(-1.164)	(-1.482)	(-0.938)
mb	0.105***	0.037	0.045
	(2.891)	(0.711)	(0.704)
age	0.056	0.048	0.067***
	(0.436)	(1.552)	(2.826)
size	-0.013	-0.065	-0.030*
	(-0.361)	(-0.201)	(-1.727)
lev	0.094	0.085	0.133*
	(0.070)	(0.702)	(1.669)
QFII_totshares	0.018	0.025	0.017
	(1.041)	(1.495)	(1.096)
capex	0.096	0.174	0.302*
	(0.212)	(1.265)	(1.747)
opcash	-0.038	-0.047	-0.060
	(-0.332)	(-0.464)	(-1.590)
sales	0.038	0.012	0.016
	(1.037)	(0.379)	(0.913)
politic_connect	-0.165	-0.154	-0.089
	(-1.183)	(-1.270)	(-1.041)
non_state_owned	0.116***	0.021	0.013
	(4.084)	(0.889)	(0.917)
constant	0.582	0.724	0.620**
	(0.905)	(0.553)	(2.151)
industry-fixed effects	included	included	included
year-fixed effects	included	included	included
firm-fixed effects	excluded	excluded	excluded
No. of obs.	6,716	6,716	6,716
Adj.R^2	0.127	0.185	0.135
F-stat.	18.510	15.730	12.025

Notes: This table reports the results of difference-in-differences OLS regressions for the impact of the stock market connection on corporate innovation. The sample period covers six years from 2011 to 2016. The dependent variables are three corporate innovation variables: the natural logarithm of one plus the number of granted invention patents (*invention*), the number of granted product-modeling patents (*modeling*), and the number of granted product-design patents (*design*), respectively. These granted patents pertain to the patent applications filed by a firm in a year and eventually granted by the CNIPA. The treatment variable, *dum_connect*, equals 1 if a firm is a connected firm on which Hong Kong investors are entitled to trade under the stock market connection program, and 0 otherwise. *after* equals 1 (0) if a firm is in the post-stock-connection (pre-stock-connection) period (i.e., 2014-2016 (2011-2013)). The interaction term, *after*dum_connect*, is the variable of interest. It captures the impact of the stock market connection on innovation for the connected firms (*dum_connect* =1) relative to the non-connected firms (*dum_connect* = 0). All the variables are defined in the appendix. Industry dummies and year dummies are included in all the regressions but are not reported for brevity. *t*-statistics in parentheses are based on robust standard errors clustered by firm. *, **, and *** indicate the two-tailed statistical significance at the 10%, 5%, and 1% levels, respectively.

Table 4: Difference-in-differences firm-fixed-effects regressions of corporate innovation

Variables	*invention*	*modeling*	*design*	*invention*	*modeling*	*design*
	(1)	(2)	(3)	(4)	(5)	(6)
after*dum_connect	**0.060***** **(2.8261)**	**0.082***** **(3.390)**	**0.095***** **(2.634)**	**0.242***** **(3.174)**	**0.307***** **(2.914)**	**0.275*** **(1.825)**
roa				0.737*** (2.802)	0.625*** (3.018)	0.228** (2.126)
salesgrowth				-0.031 (-1.164)	-0.034 (-1.470)	-0.010 (-0.767)
mb				0.113*** (2.891)	0.205 (0.681)	0.194 (0.780)
age				0.024 (0.436)	0.082 (1.520)	0.012 (0.336)
size				-0.013 (-0.361)	-0.012 (-0.039)	0.059 (0.328)
lev				0.073 (0.070)	0.081 (0.659)	0.046 (0.671)
QFII_totshares				0.016 (1.041)	0.023 (1.336)	0.054 (0.813)
capex				0.037 (0.212)	0.053 (1.103)	0.064 (0.832)
opcash				-0.042 (-0.332)	-0.036 (-0.355)	-0.056 (-0.649)
sales				0.019*** (3.218)	0.016*** (2.720)	0.043* (1.925)
politic_connect				-0.029 (-0.168)	-0.017 (-0.810)	-0.012 (-0.295)
non_state_owned				0.066 (1.149)	0.080 (1.236)	0.074 (1.323)
constant	0.325*** (7.070)	0.417*** (6.325)	0.186*** (4.315)	0.524 (1.320)	0.361 (1.540)	0.277 (1.362)
year-fixed effects	included	included	included	included	included	included
firm-fixed effects	included	included	included	included	included	included
No. of obs.	6,716	6,716	6,716	6,716	6,716	6,716
Within-R^2	0.170	0.164	0.210	0.190	0.164	0.156
F-stat	27.04	35.14	19.763	25.432	17.831	19.260

Notes: This table reports the results of the difference-in-differences tests, after including firm-fixed effects in the regressions, for the impact of the stock market connection on corporate innovation. The sample period covers six years from 2011 to 2016. The dependent variables are the corporate innovation variables: *invention*, *modeling*, and *design*, respectively. *dum_connect* equals 1 if a firm is a connected firm on which Hong Kong investors are entitled to trade under the stock market connection program, and 0 otherwise. *after* equals 1 (0) if a firm is in the post-stock-connection (pre-stock-connection) period (i.e., 2014-2016 (2011-2013)). The interaction term, *after*dum_connect*, is the variable of interest. It captures the impact of the stock market connection on innovation for the connected firms relative to the non-connected firms. All the variables are defined in the appendix. Industry dummies and year dummies are included in all the regressions but are not reported for simplicity. *t*-statistics in parentheses are based on robust standard errors clustered by firm. *, **, and *** indicate the two-tailed statistical significance at the 10%, 5%, and 1% levels, respectively.

Table 5: Tests of parallel trends assumption

Variables	*invention*	*modeling*	*design*
	(1)	(2)	(3)
after11*dum_connect_	**0.132**	**0.237**	**0.104**
	(0.832)	**(1.518)**	**(1.156)**
after12*dum_connect	**0.255**	**0.338**	**0.248**
	(1.285)	**(0.619)**	**(1.272)**
after13*dum_connect	**0.321**	**0.375**	**0.294**
	(0.579)	**(3.099)**	**(1.421)**
after*dum_connect	**0.511****	**0.516****	**0.381****
	(2.059)	**(2.140)**	**(2.124)**
after14*dum_connect	**0.693*****	**0.627*****	**0.432***
	(2.593)	**(2.439)**	**(1.926)**
after15*dum_connect	**0.771*****	**0.745****	**0.569*****
	(2.706)	**(2.196)**	**(2.794)**
after16*dum_connect	**0.845****	**0.812*****	**0.627****
	(2.234)	**(2.482)**	**(2.118)**
dum_connect	-0.648***	-0.517***	-0.202***
	(-6.292)	(-6.040)	(-4.088)
roa	0.262***	0.638***	0.316***
	(5.543)	(3.372)	(2.888)
salesgrowth	-0.042	-0.028	-0.017
	(-1.570)	(-1.254)	(-1.341)
mb	-0.022	-0.075	-0.023
	(-0.775)	(-0.310)	(-1.643)
age	0.060**	0.066***	0.016
	(2.386)	(3.138)	(0.949)
size	0.064***	-0.038	0.031***
	(3.571)	(-0.257)	(3.586)
lev	0.078	0.090	0.014
	(0.928)	(1.255)	(0.327)
QFII_totshares	0.035**	0.011	0.012
	(2.125)	(0.846)	(1.497)
capex	0.196	0.211*	0.101
	(1.358)	(1.763)	(1.461)
opcash	-0.101	-0.112	-0.278
	(-0.901)	(-1.199)	(-0.514)
sales	0.040	0.012	0.017
	(1.071)	(0.400)	(0.927)
politic_connect	-0.166	-0.150	-0.071
	(-1.165)	(-1.262)	(-1.035)
non_state_owned	0.023***	0.015	0.010
	(4.348)	(0.654)	(0.737)
constant	-0.831**	0.368	-0.512***
	(-2.080)	(1.108)	(-2.670)
F-stat. and its p-value for	12.56	11.84	6.93
β(*after14*dum_connect*) = β(*after15*dum_connec*)	0.001	0.001	0.013
F-stat. and its p-value for	10.62	9.97	8.51
β(*after15*dum_connec*) =β(*after16*dum_connec*)	0.002	0.0024	0.003
year-fixed effects	included	included	included
industry-fixed effects	included	included	included
No. of obs.	6,716	6,716	6,716
Adj.R^2	0.12	0.17	0.13
F-stat.	8.600	7.275	10.137

Notes: This table presents the results for the multivariate test of parallel trends assumption. The multivariate test is done based on Model (1) augmented by the interaction terms between year dummies and the treatment indicator variable, *dum_connect*. The sample period covers six years from 2011 to 2016. The dependent variables are the corporate innovation variables: *invention*, *modeling*, and *design*, respectively. The treatment indicator variable, *dum_connect*, equals 1 if a firm is a connected firm on which Hong Kong investors are entitled to trade under the stock market connection program, and 0 otherwise. *after* equals 1 (0) if a firm is in the post-stock-connection (pre-stock-connection) period (i.e., 2014-2016 (2011-2013)). *after11*, *after12*, *after13*, *after14*, *after15*, *after16* are the year dummies for the years 2011-2016, respectively. For instance, *after11* equals 1 if a firm is in year 2011, and 0 if a firm is in other years over the sample period 2011-2016. All the other variables are defined in the appendix. Industry dummies and year dummies are included in all the regressions but are not reported for simplicity. *t*-statistics in parentheses are based on robust standard errors clustered by firm. *, **, and *** indicate the two-tailed statistical significance at the 10%, 5%, and 1% levels, respectively.

Table 6: Using alternative samples in difference-in-differences regression analysis

Panel A: Control for potential anticipation effects

Variables	*invention*	*modeling*	*design*
	(1)	(2)	(3)
after*dum_connect	**0.074**	**0.053**	**0.039**
	(0.756)	**(0.917)**	**(0.977)**
dum_connect	0.302***	0.226***	0.153***
	(4.199)	(3.806)	(3.515)
roa	1.037***	0.612***	0.404***
	(4.950)	(2.722)	(3.020)
salesgrowth	-0.093***	-0.029	-0.014
	(-2.989)	(-1.183)	(-0.967)
mb	-0.067**	-0.034	-0.028*
	(-2.001)	(-0.907)	(-1.879)
age	0.039	0.081***	0.098
	(1.298)	(3.366)	(0.728)
size	0.015***	-0.017	0.043***
	(2.617)	(-0.104)	(3.056)
lev	0.184*	0.217*	0.154
	(1.873)	(1.923)	(1.207)
QFII_totshares	0.031	0.089	0.017
	(1.639)	(0.607)	(1.219)
capex	0.211	0.198	0.231
	(1.515)	(0.903)	(0.501)
opcash	-0.014	-0.093	-0.170
	(-0.060)	(-0.154)	(-0.384)
sales	0.020***	0.065***	0.043**
	(5.355)	(3.205)	(2.460)
politic_connect	-0.142	-0.136	-0.169
	(-0.967)	(-1.125)	(-0.991)
non_state_owned	0.413	0.115***	0.047***
	(1.470)	(5.015)	(3.594)
constant	-0.307***	-0.147	-0.812***
	(-6.186)	(-0.379)	(-3.631)
year-fixed effects	included	included	included
industry-fixed effects	included	included	included
No. of obs.	6,716	6,716	6,716
Adj.R^2	0.17	0.124	0.136
F-stat.	12.478	10.153	12.640

Notes: This table reports the results from the robustness test, which is done by re-defining the post-event sample period (pre-event sample period) as spanning the years 2013-2015 (2010-2012) for estimating Model (1). The sample period covers six years from 2010 to 2015. The dependent variables are the corporate innovation variables: *invention*, *modeling*, and *design*, respectively. The treatment indicator variable, *dum_connect*, equals 1 if a firm is a connected firm on which Hong Kong investors are entitled to trade under the stock market connection program, and 0 otherwise. *after* equals 1 (0) if a firm is in the period 2013-2015 (2010-2012). The interaction term, *after*dum_connect*, is the variable of interest. All the variables are defined in the appendix. Industry dummies and year dummies are included in all the regressions but are not reported for simplicity. *t*-statistics in parentheses are based on robust standard errors clustered by firm. *, **, and *** indicate the two-tailed statistical significance at the 10%, 5%, and 1% levels, respectively.

Panel B: Use the A+H listed firms as the alternative treatment sample

Variables	*invention*	*modeling*	*design*
	(1)	(2)	(3)
after*dum_connect1	**0.314**	**0.228**	**0.154**
	(0.006)	**(0.364)**	**(0.710)**
dum_connect1	-0.234	-0.136	-0.258
	(-0.404)	(-0.046)	(-0.525)
roa	0.623*	0.307	0.215
	(1.706)	(1.385)	(0.845)
salesgrowth	-0.326	-0.219	-0.173
	(-0.932)	(-0.987)	(-0.436)
mb	-0.210**	-0.072	-0.038
	(-2.015)	(-1.025)	(-0.639)
age	0.260	0.234	0.205
	(1.542)	(1.058)	(1.042)
size	-0.062	-0.034	-0.058
	(-0.614)	(-0.290)	(-0.458)
lev	0.737	0.620	0.515
	(0.778)	(0.988)	(1.564)
QFII_totshares	0.105	0.087	0.092
	（1.237）	（1.614）	（0.875）
capex	0.203	0.154	0.436
	(0.591)	(0.651)	(0.229)
opcash	-0.416	-0.350	-0.674
	(-1.380)	(-1.219)	(-1.521)
sales	0.092	0.048	0.032
	(0.145)	(0.125)	(1.034)
politic_connect	-0.491	-0.228	-0.163
	(-1.460)	(-1.186)	(-1.075)
non_state_owned	0.163***	0.501*	0.437
	(3.520)	(1.873)	(1.623)
constant	0.361	0.126	0.762
	(0.978)	(0.542)	(0.383)
year-fixed effects	included	included	included
industry-fixed effects	included	included	included
No. of obs.	485	485	485
Adj.R^2	0.346	0.130	0.153
F-stat.	11.375	9.824	12.156

Notes: This table reports the results from the robustness test, which is done by using the A+H listed companies as the alternative treatment sample. This sample is re-matched, without replacement, with the control firms of non-connected firms using the propensity-score-matching approach elaborated in Section 2.2. The sample period covers the years 2011-2016. The dependent variables are the corporate innovation variables: *invention*, *modeling*, and *design*, respectively. The treatment indicator variable, *dum_connect1*, equals 1 if a firm is an A+H listed firm on which Hong Kong investors are entitled to trade under the stock market connection program, and 0 otherwise. *after* equals 1 (0) if a firm is in the post-stock-connection (pre-stock-connection) period (i.e., 2014-2016 (2011-2013)). The interaction term, *after*dum_connect1*, is the variable of interest. It captures the impact of the stock market connection on innovation for the A+H listed firms relative to the non-connected firms. All the variables are defined in the appendix. Industry dummies and year dummies are included in all the regressions but are not reported for simplicity. *t*-statistics in parentheses are based on robust standard errors clustered by firm. *, **, and *** indicate the two-tailed statistical significance at the 10%, 5%, and 1% levels, respectively.

Table 7: Alternative sample/measures for running the baseline regression

Panel A: Newly added connected firms after the implementation of the stock market connection

Variables	*invention*	*modeling*	*design*
	(1)	(2)	(3)
dum_connect*after	**0.415*** **	**0.327*** **	**0.206*** **
	(3.210)	**(2.809)**	**(3.427)**
dum_connect	-0.235***	-0.276***	-0.436**
	(-3.117)	(-2.841)	(-2.151)
roa	0.530***	0.329*	0.612***
	(4.026)	(1.874)	(3.626)
salesgrowth	-0.057	-0.039	-0.042
	(-1.566)	(-1.208)	(-1.159)
mb	-0.081***	0.090	-0.065***
	(-2.745)	(1.186)	(-3.177)
age	0.062***	0.053**	0.078***
	(3.212)	(2.036)	(5.926)
size	-0.033	-0.051	-0.034
	(-0.973)	(-1.120)	(-1.425)
lev	0.371***	0.284*	0.426**
	(2.689)	(1.935)	(2.119)
QFII_totshares	0.036	0.052	0.074
	(1.572)	(0.693)	(1.156)
capex	0.202	0.335**	0.464
	(1.358)	(2.136)	(1.539)
opcash	-0.071	-0.068	-0.052
	(-1.005)	(-1.239)	(-1.164)
sales	0.028	0.034	0.026
	(1.325)	(0.957)	(0.779)
politic_connect	-0.257	-0.404	-0.369
	(-1.048)	(-1.523)	(-1.237)
non_state_owned	0.244***	0.278	0.155
	(3.169)	(1.320)	(1.438)
constant	0.530	0.624*	0.416
	(1.368)	(1.826)	(1.292)
Year-fixed effects	included	included	included
Industry-fixed effects	included	included	included
No. of obs.	1,812	1,812	1,812
Adj.R^2	0.32	0.29	0.35
F-stat.	20.94	24.55	23.76

Notes: This table reports the results of the difference-in-differences OLS regressions for Model (1), using an alternative sample. This sample consists of the connected firms that are newly added after the enforcement of the stock market connection program, and of the control firms that are re-matched, without replacement, with the newly added connected firms using the propensity-score-matching approach elaborated in Section 2.2. The sample period covers the years 2011-2016. The dependent variables are the corporate innovation variables: *invention*, *modeling*, and *design*, respectively. The treatment indicator variable, *dum_connect*, equals 1 if a firm is a connected firm on which Hong Kong investors are entitled to trade under the stock market connection program, and 0 otherwise. *after* equals 1 (0) if a firm is in the post-stock-connection (pre-stock-connection) period (i.e., 2014-2016 (2011-2013)). The interaction term, *after*dum_connect*, is the variable of interest. It captures the impact of the stock market connection on innovation for the newly-added connected firms relative to the non-connected firms. All the variables are defined in the appendix. Industry dummies and year dummies are included in all the regressions but are not reported for simplicity. *t*-statistics in parentheses are based on robust standard errors clustered by firm. *, **, and *** indicate the two-tailed statistical significance at the 10%, 5%, and 1% levels, respectively.

Panel B: Alternative measures of corporate innovation

Variables	*app_invention*	*app_modeling*	*app_design*	*RDexp*	*ΔTFP*
	(1)	(2)	(3)	(4)	(5)
after*dum_connect	**0.069***	**0.061****	**0.037*****	**0.137*****	**0.053****
	(1.777)	**(2.182)**	**(2.929)**	**(2.679)**	**(2.287)**
dum_connect	-0.357***	-0.223***	-0.120***	-0.086**	-0.034
	(-4.465)	(-3.572)	(-3.337)	(-2.156)	(-1.604)
roa	0.135***	0.651***	0.371***	0.757***	0.707***
	(5.099)	(3.152)	(3.114)	(3.099)	(2.747)
salesgrowth	-0.088***	-0.029	-0.015	-0.103***	-0.207***
	(-2.821)	(-1.189)	(-1.037)	(-3.574)	(3.623)
mb	-0.078**	-0.020	-0.027*	-0.074	-0.421***
	(-2.329)	(-0.746)	(-1.751)	(-0.240)	(-5.973)
age	0.089***	0.072***	0.016	0.068**	0.024
	(2.728)	(2.837)	(1.109)	(2.258)	(1.034)
size	0.149***	0.064	0.034***	0.066***	0.369***
	(7.202)	(1.039)	(3.651)	(3.467)	(8.501)
lev	0.135	0.115	0.021	0.062	0.193
	(1.348)	(1.473)	(0.465)	(0.671)	(1.195)
QFII_totshares	0.386**	0.239*	0.035	0.173***	0.274
	(2.300)	(1.824)	(0.469)	(3.145)	(1.278)
capex	0.206	0.201**	0.064	0.303***	0.146***
	(1.577)	(1.966)	(0.108)	(1.033)	(4.146)
opcash	0.052	0.015	0.052	0.031	0.065
	(0.121)	(0.435)	(0.269)	(0.772)	(0.236)
sales	0.195	0.022	0.062	0.128	0.011
	(1.176)	(0.170)	(0.835)	(0.834)	(1.203)
politic_connect	-0.123***	-0.030	-0.023	-0.064**	-0.381
	(-3.724)	(-1.167)	(-1.519)	(-2.116)	(-1.095)
non_state_owned	0.123***	0.030	0.023	0.064**	0.093*
	(3.724)	(1.167)	(1.519)	(2.116)	(1.848)
constant	-0.281***	0.037	-0.713***	0.523	-0.126***
	(-5.982)	(0.102)	(-3.368)	(1.204)	(-8.499)
industry-fixed effects	included	included	included	included	included
year-fixed effects	included	included	included	included	included
No. of obs.	6,716	6,716	6,716	6,716	6,716
Adj.R^2	0.172	0.184	0.131	0.248	0.322
F-stat.	16.456	15.676	13.489	26.21	35.39

Notes: This table reports the results of the difference-in-differences OLS regressions for Model (1), using alternative measures of corporate innovation. The sample period covers the years 2011-2016. The dependent variables, *app_invention*, *app_modeling*, and *app_design*, are the natural logarithm of one plus the number of applied invention patents, the number of applied product-modeling patents, and the number of applied product-design patents, respectively. The other two dependent variables, *RDexp* and *ΔTFP*, are research and development expenditures, scaled by sales revenue, and change in firm-level total factor productivity, respectively. The latter is estimated per Olley and Pakes (1996). The treatment indicator variable, *dum_connect*, equals 1 if a firm is a connected firm on which Hong Kong investors are entitled to trade under the stock market connection program, and 0 otherwise. *after* equals 1 (0) if a firm is in the post-stock-connection (pre-stock-connection) period (i.e., 2014-2016 (2011-2013)). The interaction term, *after*dum_connect*, is the variable of interest. It captures the impact of the stock market connection on innovation for the connected firms relative to the non-connected firms. All the variables are defined in the appendix. Industry dummies and year dummies are included in all the regressions but are not reported for simplicity. *t*-statistics in parentheses are based on robust standard errors clustered by firm. *, **, and *** indicate the two-tailed statistical significance at the 10%, 5%, and 1% levels, respectively.

Table 8: Test of mechanism: Does the stock market connection impact firm innovation via enhancing the informational feedback effect of stock prices?

Panel A: Does the stock price synchronicity become lower after the stock market connection?

Variables	*synchr*
after*dum_connect	**-0.217***** **(-2.501)**
dum_connect	0.037 (0.903)
roa	-0.122*** (-3.447)
salesgrowth	0.350*** (3.146)
size	-0.539*** (-2.514)
QFII_totshares	-0.116*** (-4.003)
lev	0.267*** (2.418)
capex	-0.054 (-0.872)
opcash	-0.315** (-2.117)
sales	-0.047 (-1.352)
politic_connect	0.475 (1.203)
non_state_owned	-0.340*** (-2.829)
constant	0.183*** (3.280)
Year-fixed effects	included
Industry-fixed effects	included
Adj.R^2	0.18
No. of obs.	6,716
F-stat.	12.69

Notes: This table reports the results of the difference-in-differences OLS regressions for whether stock price synchronicity is reduced after the stock market connection. The sample period covers the years 2011-2016. The dependent variable is stock price synchronicity (*synchr*), which is measured per Morck, Yeung, and Yu (2000). A higher value of *synchr* indicates a larger extent of stock price synchronicity and a lower level of stock price informativeness. The treatment variable, *dum_connect*, equals 1 if a firm is a connected firm on which Hong Kong investors are entitled to trade under the stock market connection program, and 0 otherwise. *after* equals 1 (0) if a firm is in the post-stock-connection (pre-stock-connection) period (i.e., 2014-2016 (2011-2013)). The interaction term, *after* dum_connect*, captures the impact of the stock market connection on stock price synchronicity for the connected firms relative to the non-connected firms. All the variables are defined in the appendix. Industry dummies and year dummies are included in all the regressions but are not reported for simplicity. *t*-statistics in parentheses are based on robust standard errors clustered by firm. *, **, and *** indicate the two-tailed statistical significance at the 10%, 5%, and 1% levels, respectively.

Panel B: The moderating effect of stock price synchronicity

Variables	*invention*		*modeling*		*design*	
	Low-*synchr*	High-*synchr*	Low-*synchr*	High-*synchr*	Low-*synchr*	High-*synchr*
	(1)	(2)	(3)	(4)	(5)	(6)
after*dum_connect	**0.374*****	**0.084**	**0.255*****	**0.130**	**0.128****	**0.026**
	(3.228)	**(0.729)**	**(2.766)**	**(1.125)**	**(2.109)**	**(0.915)**
dum_connect	-0.271***	-0.362***	-0.251***	-0.329***	-0.271***	-0.186***
	(-3.106)	(-4.137)	(-2.848)	(-3.541)	(-3.526)	(-2.904)
roa	1.365***	1.724***	0.670***	0.526	0.419***	0.104
	(4.186)	(3.215)	(3.148)	(1.504)	(2.827)	(0.826)
salesgrowth	-0.036	-0.024	-0.018	-0.067	-0.068	-0.053
	(-1.296)	(-0.130)	(-0.767)	(-0.950)	(-0.558)	(-1.313)
mb	-0.065*	0.052	-0.015	0.012	-0.024	-0.039
	(-1.689)	(0.977)	(-0.447)	(0.298)	(-1.285)	(-1.423)
age	0.045	0.049	0.063***	0.018	0.011	-0.066
	(1.604)	(0.762)	(2.655)	(0.346)	(0.849)	(-0.212)
size	0.037*	0.013***	0.046	0.081	0.022**	0.060***
	(1.780)	(3.603)	(0.262)	(0.027)	(2.256)	(3.328)
lev	0.026	0.036	0.094	0.012	0.038	0.074
	(1.206)	(0.186)	(1.152)	(0.743)	(0.083)	(0.789)
QFII_totshares	0.045**	0.014	0.012	0.013	0.059	0.027*
	(2.372)	(0.415)	(0.879)	(0.487)	(0.646)	(1.674)
capex	0.186	0.964**	0.183	0.329	0.647	0.428**
	(0.110)	(2.492)	(1.140)	(1.210)	(0.090)	(2.389)
opcash	-0.025	-0.024	-0.063	-0.015	-0.019	-0.014
	(-0.209)	(-0.703)	(-0.617)	(-0.539)	(0.324)	(-0.083)
sales	0.032	0.039	0.014	0.015	0.016	0.033
	(0.897)	(0.778)	(0.468)	(0.044)	(0.966)	(0.132)
politic_connect	-0.196	-0.110	-0.142	-0.150	-0.086	-0.065
	(-1.097)	(-0.446)	(-0.933)	(-0.747)	(-1.004)	(-0.545)
non_state_owned	0.097***	0.157***	0.097	0.028	0.073	0.057*
	(2.983)	(2.667)	(0.350)	(0.583)	(0.463)	(1.982)
constant	-0.411	-0.258***	0.278	0.142	-0.359	-0.127***
	(-0.896)	(-2.901)	(0.715)	(0.197)	(-1.643)	(-2.952)
Industry-fixed effects	included	included	included	included	included	included
Year-fixed effects	included	included	included	included	included	included
No. of obs.	3,350	3,366	3,350	3,366	3,350	3,366
Adj.R^2	0.10	0.17	0.13	0.12	0.15	0.134
F-stat.	7.79	9.85	10.17	8.962	9.815	12.820

Notes: This table reports the results from testing the moderating effect of stock price synchronicity on the regression estimations of Model (1). The sample period spans the years 2011-2016. The moderating variable is stock price synchronicity (*synchr*), which is measured per Morck, Yeung, and Yu (2000). A higher value of *synchr* indicates a larger extent of stock price synchronicity and a lower level of stock price informativeness. The difference-in-differences regressions are run separately in the low-*synchr* subsample and the high-*synchr* subsample, which are split based on the full-sample median of *synchr*. The dependent variables are the corporate innovation variables: *invention*, *modeling*, and *design*, respectively. The treatment variable, *dum_connect*, equals 1 if a firm is a connected firm on which Hong Kong investors are entitled to trade under the stock market connection program, and 0 otherwise. *after* equals 1 (0) if a firm is in the post-stock-connection (pre-stock-connection) period (i.e., 2014-2016 (2011-2013)). The interaction term, *after**dum_connect*, captures the impact of the stock market connection on innovation for the connected firms relative to the non-connected firms. All the variables are defined in the appendix. Industry dummies and year dummies are included in all the regressions but are not reported for simplicity. *t*-statistics in parentheses are based on robust standard errors clustered by firm. *, **, and *** indicate the two-tailed statistical significance at the 10%, 5%, and 1% levels, respectively.

Table 9: Test of mechanism: Does the stock market connection affect firm innovation via involving more-sophisticated investors' monitoring and advising on firm management?

Panel A: Do QFIIs' stock holdings increase after the stock market connection?

Variables	*QFII_totshares*
	(1)
after*dum_connect	**0.016***
	(1.953)
dum_connect	-0.024**
	(-2.209)
roa	0.013***
	(3.547)
salesgrowth	-0.059**
	(-2.125)
mb	-0.032***
	(-2.469)
age	0.457
	(1.285)
size	0.018***
	(2.640)
lev	-0.096*
	(-1.818)
capex	-0.087
	(-1.359)
opcash	0.024***
	(2.528)
sale	0.029
	(0.451)
politic_connect	-0.042***
	(-2.628)
non_state_owned	0.015
	(0.930)
constant	-0.373***
	(-2.604)
Industry-fixed effects	included
year-fixed effects	included
No. of obs.	6,716
Adj.R^2	0.15
F-stat.	9.78

Notes: This table reports the results of the difference-in-differences OLS regressions for whether QFIIs' stock holdings increase after the stock market connection. The sample period covers the years 2011-2016. The dependent variable, *QFII_totshares*, is the shares held by foreign qualified institutional investors (QFIIs), divided by total shares outstanding, for a firm at the end of a year. The treatment variable, *dum_connect*, equals 1 if a firm is a connected firm on which Hong Kong investors are entitled to trade under the stock market connection program, and 0 otherwise. *after* equals 1 (0) if a firm is in the post-stock-connection (pre-stock-connection) period (i.e., 2014-2016 (2011-2013)). The interaction term, *after**dum_connect*, captures the impact of the stock market connection on QFIIs' stock ownership for the connected firms relative to the non-connected firms. All the variables are defined in the appendix. Industry dummies and year dummies are included in all the regressions but are not reported for simplicity. *t*-statistics in parentheses are based on robust standard errors clustered by firm. *, **, and *** indicate the two-tailed statistical significance at the 10%, 5%, and 1% levels, respectively.

Panel B: The moderating effect of QFIIs' stock ownership

Variables	*invention*		*modeling*		*design*	
	High-QFII	Low-QFII	High-QFII	Low-QFII	High-QFII	Low-QFII
	(1)	(2)	(3)	(4)	(5)	(6)
after*dum_connect	**0.509*****	**0.420**	**0.315*****	**0.304**	**0.432****	**0.280**
	(3.296)	**(0.754)**	**(3.209)**	**(1.435)**	**(2.126)**	**(1.258)**
dum_connect	-0.325***	-0.318	-0.254***	-0.295	-0.176***	-0.373
	(-2.848)	(-0.832)	(-4.156)	(-1.370)	(-3.515)	(-1.428)
roa	1.261***	1.750	0.656***	0.148	0.253***	0.234**
	(5.460)	(0.867)	(3.290)	(0.743)	(2.584)	(2.026)
salesgrowth	-0.031	-0.078	-0.018	-0.016	-0.012	-0.014
	(-1.134)	(-0.455)	(-0.795)	(-0.751)	(-0.887)	(-1.584)
mb	-0.019	0.013	-0.025	0.098	-0.023	0.015
	(-0.637)	(0.569)	(-0.103)	(0.046)	(-1.615)	(0.119)
age	0.035	0.036**	0.048**	0.029*	0.032	0.082
	(1.364)	(2.170)	(2.169)	(1.948)	(0.256)	(0.971)
size	0.065***	0.024	0.065	0.031	0.030***	0.078
	(3.582)	(1.217)	(0.426)	(1.351)	(3.293)	(0.929)
lev	0.060	0.236	0.071	0.264	0.065	0.171
	(0.913)	(0.697)	(1.148)	(0.538)	(0.261)	(0.573)
capex	0.132	0.345***	0.150	0.274***	0.118*	-0.816
	(1.235)	(3.168)	(1.248)	(2.762)	(1.690)	(-1.384)
opcash	-0.076	-0.093	-0.087	-0.037	-0.040	-0.028
	(-0.584)	(-0.726)	(-1.055)	(-0.849)	(-0.951)	(-1.137)
sales	0.036	0.095	0.099	0.040	0.015	0.020
	(-0.946)	(0.724)	(0.318)	(0.268)	(0.896)	(1.053)
politic_connect	-0.183	-0.632	-0.179	-0.761	-0.261	-0.239
	(-0.872)	(-1.264)	(-0.952)	(-1.130)	(-0.875)	(-1.105)
non_state_owned	0.135***	0.242	0.428	0.137	0.115	0.243
	(3.124)	(1.426)	(1.137)	(0.854)	(0.837)	(0.461)
constant	-0.108***	0.176	0.325	-0.114	-0.546***	-0.203
	(-2.624)	(0.700)	(0.970)	(-0.503)	(-2.759)	(-0.154)
Industry-fixed effects	included	included	included	included	included	included
Year-fixed effects	included	included	included	included	included	included
No. of obs.	3,367	3,349	3,367	3,349	3,367	3,349
Adj.R^2	0.19	0.16	0.17	0.15	0.13	0.098
F-stat.	8.67	9.78	12.06	12.34	8.843	10.265

Notes: This table reports the results from testing the moderating effect of QFIIs' stock holdings on the regression estimations of Model (1). The sample period spans the years 2011-2016. The moderator variable is QFIIs' stock holdings (*QFII_totshares*), calculated as the shares held by foreign qualified institutional investors, divided by total shares outstanding, for a firm at the end of a year. High-QFII-invested Chinese listed firms are regarded as characterized by more Hong Kong institutional investments. The difference-in-differences regressions are run separately in the low-*QFII* subsample and the high-*QFII* subsample, which are split based on the full-sample median of *QFII*. The dependent variables are the corporate innovation variables: *invention*, *modeling*, and *design*, respectively. The treatment indicator variable, *dum_connect*, equals 1 if a firm is a connected firm on which Hong Kong investors are entitled to trade under the stock market connection program, and 0 otherwise. *after* equals 1 (0) if a firm is in the post-stock-connection (pre-stock-connection) period (i.e., 2014-2016 (2011-2013)). The interaction term, *after*dum_connect*, captures the impact of the stock market connection on innovation for the connected firms relative to the non-connected firms. All the variables are defined in the appendix. Industry dummies and year dummies are included in all the regressions but are not reported for simplicity. *t*-statistics in parentheses are based on robust standard errors clustered by firm. *, **, and *** indicate the two-tailed statistical significance at the 10%, 5%, and 1% levels, respectively.

Table 10: Further cross-sectional analyses of the impact of the stock market connection on corporate innovation

Panel A: Does the stock market connection have stronger impact on non-state-owned firms than on state-owned firms?

Variables	*invention*		*modeling*		*design*	
	state-owned	non-state-owned	state-owned	non-state-owned	state-owned	non-state-owned
	(1)	(2)	(3)	(4)	(5)	(6)
after*dum_connect	**0.278**	**0.375***	**0.150**	**0.269****	**0.174**	**0.191***
	(1.235)	**(1.977)**	**(1.491)**	**(2.258)**	**(0.853)**	**(1.876)**
dum_connect	-0.425***	-0.507***	-0.610	-0.377***	-0.653	-0.972***
	(-3.521)	(-4.310)	(-0.736)	(-4.143)	(-1.275)	(-3.618)
controls	included	included	included	included	included	included
constant	-0.185**	-0.149**	-0.934	-0.426	-0.815*	-0.826***
	(-2.107)	(-1.853)	(-1.283)	(-0.840)	(-1.904)	(-2.877)
industry-fixed effects	included	included	included	included	included	included
year-fixed effects	included	included	included	included	included	included
No. of obs.	2,928	3,788	2,928	3,788	2,928	3,788
Adj.R^2	0.12	0.13	0.162	0.18	0.175	0.140
F-stat.	9.25	8.62	9.73	11.38	9.71	10.55

Notes: This table reports the results from testing whether the regression estimations of Model (1) vary across state-owned firms versus non-state-owned firms. The sample period spans the years 2011-2016. The moderating variable is a binary variable indicating whether a mainland Chinese listed firm is state-owned (i.e., whether its largest ultimate shareholder is a government entity). The difference-in-differences regressions are run separately for the state-owned subsample and the non-state-owned subsample. The dependent variables are the corporate innovation variables: *invention*, *modeling*, and *design*, respectively. The treatment indicator variable, *dum_connect*, equals 1 if a firm is a connected firm on which Hong Kong investors are entitled to trade under the stock market connection program, and 0 otherwise. *after* equals 1 (0) if a firm is in the post-stock-connection (pre-stock-connection) period (i.e., 2014-2016 (2011-2013)). The interaction term, *after*dum_connect*, captures the impact of the stock market connection on innovation for the connected firms relative to the non-connected firms. The results for the regression coefficients on the control variables are omitted for brevity. All the variables are defined in the appendix. Industry dummies and year dummies are included in all the regression but are not reported for simplicity. *t*-statistics in parentheses are based on robust standard errors clustered by firm. *, **, and *** indicate the two-tailed statistical significance at the 10%, 5%, and 1% levels, respectively.

Panel B: Does the stock market connection have stronger impact on firms with political connection?

Variables	*invention*		*modeling*		*design*	
	Politically connected	Non-politically connected	Politically connected	Non-politically connected	Politically connected	Non-politically connected
	(1)	(2)	(3)	(4)	(5)	(6)
after*dum_connect	**0.236**	**0.274****	**0.137**	**0.185****	**0.346**	**0.582***
	(1.2761)	**(2.213)**	**(0.992)**	**(2.143)**	**(0.925)**	**(1.943)**
dum_connect	-0.380*	-0.344***	-0.256*	-0.270***	-0.135	-0.246***
	(-1.793)	(-3.005)	(-1.894)	(-3.241)	(-1.364)	(-2.513)
controls	included	included	included	included	included	included
constant	-0.194*	-0.168**	-0.724	0.531	-0.135***	-0.428
	(-1.856)	(-2.239)	(-0.985)	(1.247)	(-2.691)	(-1.464)
industry-fixed effects	included	included	included	included	included	included
year-fixed effects	included	included	included	included	included	included
No. of obs.	2,226	4,490	2,226	4,490	2,226	4,490
Adj.R^2	0.170	0.15	0.16	0.11	0.14	0.13
F-stat.	11.36	8.78	10.27	8.94	8.35	9.65

Notes: This table reports the results from testing whether the regression estimations of Model (1) vary across politically connected firms versus non-politically-connected firms. The sample period spans the years 2011-2016.

The moderating variable is a binary variable indicating whether a mainland Chinese listed firm is politically connected (i.e., whether the chairman of board or CEO in the listed firm is a current or former officer of a government entity). The difference-in-differences regressions are run separately for the politically-connected subsample and the non-politically-connected subsample. The dependent variables are the corporate innovation variables: *invention*, *modeling*, and *design*, respectively. The treatment indicator variable, *dum_connect*, equals 1 if a firm is a connected firm on which Hong Kong investors are entitled to trade under the stock market connection program, and 0 otherwise. *after* equals 1 (0) if a firm is in the post-stock-connection (pre-stock-connection) period (i.e., 2014-2016 (2011-2013)). The interaction term, *after*dum_connect*, captures the impact of the stock market connection on innovation for the connected firms relative to the non-connected firms. The results for the regression coefficients on the control variables are omitted for brevity. All the variables are defined in the appendix. Industry dummies and year dummies are included in all the regressions but are not reported for simplicity. *t*-statistics in parentheses are based on robust standard errors clustered by firm. *, **, and *** indicate the two-tailed statistical significance at the 10%, 5%, and 1% levels, respectively.

Panel C: Does the stock market connection have stronger impact on firms with weaker intellectual property rights protection?

Variables	*invention*		*modeling*		*design*	
	High-*IPR*	Low-*IPR*	High-*IPR*	Low-*IPR*	High-*IPR*	Low-*IPR*
	(1)	(2)	(3)	(4)	(5)	(6)
after*dum_connect	**0.127**	**0.326*** **	**0.258**	**0.274** **	**0.161**	**0.193***
	(0.854)	**(3.258)**	**(1.263)**	**(2.125)**	**(0.843)**	**(1.860)**
dum_connect	-0.477***	-0.504***	-0.316***	-0.343***	-0.202***	-0.143**
	(-3.123)	(-2.620)	(-2.347)	(-3.248)	(-3.160)	(-2.135)
controls	included	included	included	included	included	included
constant	-1.365	-1.729**	0.465	-0.826	-0.727*	-1.134***
	(-1.147)	(-2.364)	(0.826)	(-0.943)	(-1.928)	(-2.837)
industry-fixed effects	included	included	included	included	included	included
year-fixed effects	included	included	included	included	included	included
No. of obs.	3,351	3,365	3,351	3,365	3,351	3,365
Adj.R^2	0.135	0.126	0.150	0.174	0.150	0.124
F-stat.	11.33	9.62	10.73	8.95	10.62	12.81

Notes: This table reports the results from testing the moderating effect of intellectual property rights protection on the regression estimations of Model (1). The sample period spans the years 2011-2016. The moderating variable is intellectual property rights protection (*IPR*), which is measured per Fang, Lerner, and Wu (2017). The difference-in-differences regressions are run separately in the low-*IPR* subsample and the high-*IPR* subsample, which are split based on the full-sample median of *IPR*. The dependent variables are the corporate innovation variables: *invention*, *modeling*, and *design*, respectively. The treatment indicator variable, *dum_connect*, equals 1 if a firm is a connected firm on which Hong Kong investors are entitled to trade under the stock market connection program, and 0 otherwise. *after* equals 1 (0) if a firm is in the post-stock-connection (pre-stock-connection) period (i.e., 2014-2016 (2011-2013)). The interaction term, *after*dum_connect*, captures the impact of the stock market connection on innovation for the connected firms relative to the non-connected firms. The results for the regression coefficients on the control variables are omitted for brevity. All the variables are defined in the appendix. Industry dummies and year dummies are included in all the regressions but are not reported for simplicity. *t*-statistics in parentheses are based on robust standard errors clustered by firm. *, **, and *** indicate the two-tailed statistical significance at the 10%, 5%, and 1% levels, respectively.

Panel D: Does the stock market connection have stronger impact on firms that are in the non-high-tech economic zones?

Variables	*invention*		*modeling*		*design*	
	High-tech zones	Non-high-tech zones	High-tech zones	Non-high-tech zones	High-tech zones	Non-high-tech zones
	(1)	(2)	(3)	(4)	(5)	(6)
after*dum_connect	**0.328**	**0.415*** **	**0.260**	**0.473*** **	**0.139**	**0.471** **
	(0.626)	**(2.931)**	**(0.707)**	**(3.626)**	**(0.755)**	**(2.240)**
dum_connect	0.216	-0.421***	-0.535	-0.328***	-0.674*	-0.213**
	(0.725)	(-3.736)	(-0.991)	(-4.626)	(-1.836)	(-2.074)

controls	included	included	included	included	included	included
constant	-0.334	-0.617**	0.540	0.364	0.108	-0.446***
	(-0.927)	(-1.824)	(1.137)	(0.971)	(1.128)	(-3.930)
industry-fixed effects	included	included	included	included	included	included
year-fixed effects	included	included	included	included	included	included
No. of obs.	3,022	3,694	3,022	3,694	3,022	3,694
Adj.R^2	0.16	0.21	0.15	0.19	0.17	0.20
F-stat.	10.91	12.80	8.42	11.52	12.73	10.64

Notes: This table reports the results from testing whether the regression estimations of Model (1) vary across firms in the national high-tech economics zones versus firms in the non-high-tech economics zones. The sample period spans the years 2011-2016. The moderating variable is a binary variable indicating whether a mainland Chinese listed firm is headquartered in the national high-tech economics zones. The difference-in-differences regressions are run separately in the high-tech-zones subsample and the low-high-tech-zones subsample. The dependent variables are the corporate innovation variables: *invention*, *modeling*, and *design*, respectively. The treatment indicator variable, *dum_connect*, equals 1 if a firm is a connected firm on which Hong Kong investors are entitled to trade under the stock market connection program, and 0 otherwise. *after* equals 1 (0) if a firm is in the post-stock-connection (pre-stock-connection) period (i.e., 2014-2016 (2011-2013)). The interaction term, *after** *dum_connect*, captures the impact of the stock market connection on innovation for the connected firms relative to the non-connected firms. The results for the regression coefficients on the control variables are omitted for brevity. All the variables are defined in the appendix. Industry dummies and year dummies are included in all the regressions but are not reported for simplicity. *t*-statistics in parentheses are based on robust standard errors clustered by firm. *, **, and *** indicate the two-tailed statistical significance at the 10%, 5%, and 1% levels, respectively.

Appendix: Summary of variable definitions

Variables	Definitions
invention	the natural logarithm of one plus the number of invention patents filed by a listed firm in a year and eventually granted by the China National Intellectual Property Administration.
modeling	the natural logarithm of one plus the number of product-modeling patents filed by a listed firm in a year and eventually granted by the China National Intellectual Property Administration.
design	the natural logarithm of one plus the number of product-design patents filed by a listed firm in a year and eventually granted by the China National Intellectual Property Administration.
app_invention	the natural logarithm of one plus the number of invention patents applied by a listed firm to the China National Intellectual Property Administration in a year.
app_modeling	the natural logarithm of one plus the number of product-modeling patents applied by a listed firm to the China National Intellectual Property Administration in a year.
app_design	the natural logarithm of one plus the number of product-design patents applied by a listed firm to the China National Intellectual Property Administration in a year.
dum_connect	1 if a firm is a connected firm on which Hong Kong investors are entitled to trade under the stock market connection program, and 0 otherwise.
after	1 if a firm is in the post-stock-connection period (i.e., 2014-2016), and 0 if a firm is in the pre-stock-connection period (i.e., 2011-2013).
size	the natural logarithm of total assets for a firm at the end of a year.
lev	total liabilities, divided by total assets, for a firm at the end of a year.
roa	net income in a year, divided by total assets at the end of a year, for a firm.
opcash	net operating cash flow in a year, divided by total assets at the end of a year, for a firm.
mb	the market value of equity, divided by the book value of equity, for a firm at the end of a year.
QFII_totshares	the shares held by foreign qualified institutional investors (QFIIs), divided by total shares outstanding, for a firm at the end of a year.
capex	capital expenditures in a year, scaled by total assets at the end of a year, for a firm.
salesgrowth	the difference between sales revenue for the current year and that for the previous year, divided by sales revenue for the previous year, for a firm.
tobin_q	the ratio of the market value of assets to the book value of assets for a firm at the end of a year.
EBIT	earnings before taxes and interests in a year, divided by total assets at the end of a year, for a firm.
age	the natural logarithm of the number of years since a firm was listed on the Shanghai stock market.
non_state_owned	1 if a mainland Chinese listed firm is non-state-owned (i.e., if its largest ultimate shareholder is a non-government entity), and 0 otherwise.
indp	the number of independent non-executive directors, divided by the total number of directors, for the board of a firm at the end of a year.
top1_ownership	the shares held by the largest shareholder, divided by the total shares held by all investors, for a firm in a year.
dual	1 if the CEO holds the position of the chair of the board for a firm in a year, and 0 otherwise.
synchr	stock price synchronicity, which is measured per Morck, Yeung, and Yu (2000). It is equal to $\log((R^2/(1-R^2))$, where R^2 is derived from the market model of regressing daily stock returns of a firm on the daily stock market index for a year.
politic_connect	1 if a listed firm is politically connected (i.e., if the chairman of board or CEO in a listed firm is a current or former officer of a government entity), and 0 otherwise.
IPR	intellectual property rights protection, which is measured per Fang, Lerner, and Wu (2017).
high_techzone	1 if a listed firm is headquartered in the national high-tech economics zones, and 0 otherwise.
TFP	firm-level total factor productivity estimated per Olley and Pakes (1996).
RDexp	research and development expenditures, divided by sales revenue, of a firm in a year.
sales	the natural logarithm of a firm's total revenues in a year.