Appendix for Trade, Innovation and Firm Financing

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Appendix A. Literature Review

Our paper is related to four strands of the literature that study the relationship between firm financing and innovation, the relationship between firm financing and trade dynamics, the relationship between trade and innovation, and the relationship between financing, innovation and trade dynamics. We list the related papers below.

1. Firm Financing and Innovation

It is widely known that in a perfect economy without financial frictions or any other distortions, firms' decisions on their real production (including the innovation and investment decisions) are independent of firm financing (Modigliani and Miller, 1958). However, when the market is no longer perfect, the problem of financing constraints arises, and firms' production decisions will be distorted.

Specifically, regarding firm financing and innovation, literature argues that innovation investment relies more on internal financing due to the long investment cycle, the high uncertainty, the information asymmetry and the lack of collateral associated with the R&D investment, and hence leads to lower leverage for firms doing more innovation (Hall and Lerner, 2010). Gorodnichenko and Schnitze (2013) provides a summary of the related papers in this strand of the literature.

In particular, it has been argued that the important role of the equity market is the provision of capital to funding R&D and innovation activities of fast-growing and young companies which are typically highly innovative, not profitable yet, but have huge growth potentials (Acharya and Xu 2017; Brown and Petersen 2009; Comin and Nanda 2019; Hsu, Tian, and Xu 2014). This is particularly true in the case of technology firms due to the high degree of uncertainty associated with R&D investments and the lack of tangible assets to be used as collateral, which causes other forms of financing, such as debt, to be limited for these firms. For example, Acharya and Xu (2017) found that the listed companies have more R&D advantages in industries with higher dependence on external financing, and may generate better patent portfolios than private companies. But Bernstein (2015) also found that although the listing status of firm can attract new human capital and obtain

external innovation support, it will lead to the resignation of skilled R&D persons, reduce the capacity of the remaining R&D persons, and decrease the quality of internal innovations.

In terms of the role of banking development in innovation, the findings are not conclusive. A cross-country comparison on the respective effects of equity markets and credit markets on technological innovation demonstrates that equity market development exerts positive influence on industries' innovation, whereas credit market development has opposite effect (Hsu, Tian, and Xu, 2014). The negative effect of credit market is attributed to the facts that bank-based financial system lacks effective price signal (Rajan and Zingales, 2001; Beck and Levine, 2002) and debt financing is ill-suited for risky and uncertain innovative projects, which involves intensive use of intangible asset with limited value as collateral (Lim et al., 2020).

However, Tadesse (2006) found in cross-country data that market-based financing systems promote innovation in all sectors, while banks-based financial systems are more helpful to technological progress in information-intensive industries. Benfratello et al. (2008) based on Italian firm-level data from 1991 to 2000 found evidence that banking development affects the probability of process innovation, particularly for firms in high-tech sectors, in sectors more dependent upon external finance, and for firms that are small, while the evidence for product innovation is much weaker and not robust. Lin, Liu, and Lai (2018) based on Asian economies also shows that credit market development in general and banking sector in particular have exerted a positive effect on the intensity and quality of innovation in industries that are more dependent on external finance or are naturally more innovative, and the predominant effect of banking sector on innovation comes from the overall depth and size of the domestic market. Additionally, Howell (2017) found that government subsidies to innovation can help reduce firms' financing constraints, improve their probability of obtaining follow-up venture capital, and promote firm innovation output.

The literature generally focuses on the impact of financing constraints on firm innovation. We differ in addressing the interaction between firm financing and innovation, not only on how financing constraint may impact innovation, but also on how innovation decisions may affect firms' financing decisions and capital structure. Additionally, the existing studies emphasize the risk mechanism associated with R&D, we instead focus on the scale effect mechanism caused by the presence of fixed costs in production.

2. Firm Financing and Trade

Numerous papers have been studying the interrelationship between firm financing and trade (See Foley and Manova (2015); Amiti and Weinstein (2011); Paravisini et al. (2015); Manova, Wei and Zhang (2015); Iacovone and Zavacka (2019); Chaney (2016); Manova (2013); Kohn et al. (2016); Campa and Shaver (2002); Greenaway et al. (2007); Xu (2012); Baggs and Brander (2006); Chen et al., 1997; Mittoo and Zhang (2008); Bergin, Feng and Lin (2018a); Chor and Manova, 2012; Feenstra, et al., 2014).

One strand of the literature examines how financial factors affect trade. On the empirical side, some papers use firm-level data from different countries to provide evidence that firms' financial health and financial market access increase export market participation (the extensive margin) and/or export size (the intensive margin). For example, Amiti and Weinstein (2011) found that the health of Japanese banking sector was an important determinant of the exports of Japanese firms, suggesting that financial shocks are passed onto exporters through the banking sector. Paravisini et al. (2015) found that credit shocks reduced exports of specific products and to specific destination markets (the intensive margin), but had no significant impacts on firm entry or exit of new products or from new markets (the extensive margin). Using Chinese firm-level data, Manova, Wei and Zhang (2015) found that in industries with high dependence on external financing, the export performance of foreign firms and joint ventures was better than that of domestic private firms, which indicates that financing constraints affect the export performance of Chinese firms. There are also papers using sector-level or aggregated trade data to provide evidence that financial status affects export decisions. For example, Iacovone and Zavacka (2019) analyzed 147 banking crisis events using data from 160 developed and developing countries from 1970 to 2012, and found that during the banking crisis, sectors that were more reliant on bank financing experienced significantly lower export growth than other sectors.

On the theoretical side, some papers provide theoretical mechanism under which financial factors may affect trade dynamics. For example, Chaney (2016) introduced financing constraints into the Melitz (2003) heterogeneous firm trade model, assuming that firms must rely on domestic market sales and their own liquidity to pay for export fixed costs, point out that liquidity is also a source of firm heterogeneity, and only firms with sufficient liquidity can overcome the entry cost of entering foreign markets and have the opportunity to export. Manova (2013) introduced the financial sector into the Melitz (2003) model, assuming that firms can rely on external financing to cover the fixed costs of exports, and found that the development of external financial markets can alleviate the financing constraints faced by firms, and with the improvement of financing conditions, the possibility of firms entering export markets increases. The paper then exploited differences in financial development and financial vulnerabilities across sectors, and found that credit

constraints limit firms' export entry and reduce exporters' foreign sales, and financially advanced economies export more in financially vulnerable sectors, enter more markets, export to more destinations, and sell more individual products. Kohn et al. (2016) argued that even without sunk export costs, the existence of financing constraints will form a hysteresis effect, because the accumulated assets of exporting firms help these firms maintain export status, so the export dynamics of these firms actually reflect the financing constraints behind international trade.

From an opposite direction, another strand of the literature emphasizes how trade and internationalization may affect firm financing status. Some papers argue that trade dynamics can help improve the financing status of export firms. For instance, Campa and Shaver (2002) found that Spanish manufacturing exporters have more stable cash flow and capital investment than non-exporters, and that exports can help firms reduce their financial constraints as the investment of continuous exporters are less sensitive to cash flow than those that never export. They argued that, the financial advantage of exporters stems from the risk diversification mechanism, because exporters expect to have more stable cash flow by selling in markets that are not completely correlated with economic cycles, and thus, exports send a signal to external investors that exporting firms are more productive and competitive, and that firms will be able to service their debts. Based on the panel data of UK manufacturing firms in 1993-2003, Greenaway et al. (2007) found that exporters were in better financial position than non-exporters, a result driven by continuous exporters, instead of start-ups who typically exhibit low liquidity and high leverage. The paper argued that participation in export markets can improve the financial status of firms, but firms with less constraints do not necessarily choose to export on their own.

A few papers further argue that trade dynamics may affect firms' capital structure, but there are country differences. For example, Xu (2012) used data from US manufacturing firms from 1989 to 2004, and found that increased import competition caused by falling import tariffs and exchange rate appreciations will induce US companies to increase equity financing to repay debt, which reduces the leverage ratio of US companies. The paper argues that such a finding is consistent with the classical trade-off theory, which states that there is a positive correlation between book leverage and expected profits, as import competition reduces expected profits of domestic firms. However, Baggs and Brander (2006), based on Canadian firm-level data after the 1989 free trade agreement (FTA), had an opposite finding that the decline in Canadian import tariffs was accompanied by an increase in the leverage ratio of Canadian firms, while the decline in export tariffs was accompanied by a decline in leverage, which tends to support the pecking order theory of capital structure. There are also papers empirically examining the impact of internationalization on firm leverage ratio. Evidence based on U.S. firm-level data found

that there may be a nonlinear relationship between the internationalization level of enterprises and their leverage ratio: the initial internationalization level will reduce the leverage ratio, but with the increase of internationalization, there is a positive correlation between the internationalization level and leverage ratio (Chen et al., 1997). Evidence from other countries found that internationalization may increase firm leverage compared to domestic firms, such as Mittoo and Zhang (2008) based on Canadian firm data.

In sum, the existing papers study how financial factors affect international trade from either empirical or theoretical perspective. Literature also provides evidence that trade dynamics and firm internationalization will affect the financial status of firms and their capital structure. Although the empirical literature finds that trade dynamics and financing are causal to each other, there is still a lack of theoretical papers to discuss the dynamic relationship between the two, especially the impact of trade dynamics on the financing structure of firms. Bergin, Feng and Lin (2018a) is one of the few papers that simultaneously discuss capital structure decisions and firm export decisions. Our difference is that, we further introduce innovation to explore the interaction between firm financing, trade and innovation.

3. Trade and Innovation

There are many papers investigating the joint impacts of trade and R&D activities (see Costantini and Melitz, 2007; Atkeson and Burstein, 2010; Lileeva and Trefler, 2010; Bustos, 2011; Peters et al., 2022; Maican et al., 2023; Akcigi and Melitz, 2022; Aghion et al., 2024; and etc).

For example, Lileeva and Trefler (2010) examined how improved access to foreign markets will encourage domestic firms to simultaneously export and invest in raising productivity. The paper first constructs a simple model of exporting and investing in productivity that features heterogeneity in initial productivity and heterogeneity in the productivity gains from investing, and finds that improved access to foreign markets raises productivity for some firms but not all firms since productivity responses are heterogeneous. The paper then empirical tests these predictions using the responses of Canadian plants to the elimination of U.S. tariffs, and finds that Canadian plants that were induced by the tariff cuts to start exporting or to export more, increased their labor productivity, engaged in more product innovation, and had higher adoption rates for advanced manufacturing technologies.

Similarly, Bustos (2011) introduced joint decisions of technology and exporting choices in the model of trade with heterogeneous firms in Melitz (2003). The model predicts that, the increase in revenues produced by trade integration can induce exporters to upgrade technology. The paper then finds supportive evidence to these theoretical

predictions by examining the effect of the differential reductions in Brazilian tariffs for imports from Argentina across four-digit ISIC industries, on entry in the export market and technology upgrading by Argentinian firms.

Peters et al. (2022) uses German firm-level data from the high-tech manufacturing sector, and finds that R&D investment leads to a higher rate of product and process innovation among exporting firms and these innovations have a larger impact on productivity improvement in export market sales. As a result, exporting firms have a higher payoff from R&D investment, invest in R&D more frequently than firms that only sell in the domestic market, and, subsequently, have higher rates of productivity growth. From their findings, R&D is more efficient in generating innovations for exporters. So exporting makes a difference in their findings.

Maican et al. (2023) estimates a dynamic structural model of firm R&D investment in twelve Swedish manufacturing industries, and finds that export market profits are a substantial source of the expected return to R&D. R&D spending is found to have a larger impact on firm productivity in the export market than in the domestic market.

Aghion et al. (2024) specifically examined the effect of export shocks on innovation. In a theoretical model, the paper shows that, on one hand, a positive shock will increase market size and therefore innovation incentives for all firms, but on the other hand it will increase competition as more firms enter the export market, which in turn will reduce profits and therefore innovation incentives particularly for firms with low productivity. Overall, the positive impact of the export shock on innovation is magnified for high productivity firms, whereas it may negatively affect innovation in low productivity firms. The paper then tests these theoretical predictions with patent, customs and production data covering all French manufacturing firms. In particular, the paper constructs firm-level export proxies to address potential endogeneity issues, which respond to aggregate conditions in a firm's export destinations but are exogenous to firm-level decisions. The paper finds that patenting robustly increases more with export demand for initially more productive firms, and the effect is reversed for the least productive firms as the negative competition effect dominates.

Although a large number of papers explore the relation between innovation and trade, only a few discuss the relation under financial frictions, and none of these papers examine how innovation and trade may feedback to firm financing decisions. Our paper will complement literature through this line.

4. Firm Financing, Trade and Innovation

There are only a very few papers that simultaneously consider the joint decisions of innovation and exports simultaneously under the presence of financial frictions.

For example, Gorodnichenko and Schnitze (2010) constructed a simple theoretical model where firms make decisions about whether to innovate and/or to export under the presence of financial constraints. The model shows that a firm's decision to invest into innovative and exporting activities is sensitive to financial frictions which can prevent firms from developing and adopting better technologies. The model demonstrates that in a world without financial frictions, innovation and exporting goods are complementary activities, and hence easing financial frictions can have an amplified effect on firms' innovation effort and consequently the level of productivity. However, as financial frictions become increasingly severe, these activities become effectively substitutes since both exporting and innovation rely on internal funds of firms. The paper then tests the theoretical predictions using data from the Business Environment and Enterprise Performance Surveys (BEEPS) which covers 27 countries in Eastern Europe and Commonwealth of Independent States (CIS) in 2002 and 2005. The paper finds that innovative activities of firms are strongly influenced by financial frictions, and that domestically owned firms are more likely to be affected by financial constraints than foreign firms, which helps explain why domestically owned firms do not catch up. The paper also finds that financial frictions affect export status and the joint incidence of export and innovation activities decreases in the severity of financial constraints. The paper measures the substitutability between exports and innovation with the falling joint incidence of export and innovation activities in response to adverse financial shocks. However, it is more often the substitutability occurs within the intensive margin, rather than at the extensive margin. Additionally, the paper does not consider the potential feedback from innovation or exports to firm financing.

Altomonte et al. (2016) is an empirical paper that considers the joint decisions of innovation and exports under financial frictions. Based on a sample of manufacturing firms from France, Germany, Italy and Spain, the paper found empirical evidence on the mutual relationships between credit constraints, total factor productivity, Research and Development (R&D) investments and exporting, by jointly considering them in a simultaneous equation framework. The paper confirms the well-known mutual positive correlation among exporting, R&D and firm’s productivity. The paper also shows the existence of a mutual relationship between exporting, productivity and credit constraints: exporters and high productivity firms are less likely to be credit constrained, while better access to credit is associated with larger productivity and a higher probability of exporting. Different from Gorodnichenko and Schnitze (2010), the paper finds complementarity between export and innovation activities rather than substitutability even under the presence of financial constraints. But similar to Gorodnichenko and Schnitze (2010), the paper defines export and innovation activities at the extensive margin, rather than at the

intensive margin, and does not consider the potential feedback from innovation or exports to firm financing.

There are a few papers that study how trade liberalization affects innovation and firm financing constraints as well. For example, Egger et al. (2015) constructed a theoretical model and demonstrated that trade liberalization would tighten financing constraints on firms' R&D and subsequent expansion investments. The paper assumes that financing constraints in early-stage R&D root in a moral hazard problem in the relationship between entrepreneurs and outside investors, while in late-stage come from the potential diversion of funds by mature firms. Hence, the early-stage R&D is financed by venture capitalists (VCs), specialized investment banks, or other intermediaries engaged in relationship banking, while the late-stage R&D is financed by standard banks. Depending on early-stage earnings as a result of R&D, firms end up either cash-rich or cash-poor when they move to the expansion stage. In the late stage, cash-rich firms are able to invest at a first-best level, while cash-poor firms are finance constrained. The paper finds that, import tariffs raise domestic price and earnings per firm, and boost earnings and capacity of constrained firms. Consequently, import protection relaxes financing constraints, allows more firms to enter the innovative sector and realize unexploited investment opportunities, and raise domestic welfare.

Similar to Egger et al. (2015), Föllmi et al. (2015) also examined how trade liberalization affects firm investments in R&D. The paper first constructed a model where entrepreneurs differ in their wealth endowment, and the heterogeneous access to external funds causes the poor entrepreneurs to run smaller firms, be less likely to invest in R&D, and be more likely to exit the market. Trade liberalization worsens access to finance for small firms and exacerbates these characteristics. As in Egger and Keuschnigg (2015), the paper does not study the firm decision of whether to export, or compare exporting firms to non-exporting firms, which is a central distinction to our empirical result and theoretical explanation.

Additional references not listed in main text:

Beck, T., and R. Levine (2002). Industry growth and capital allocation: Does having a market- or bank-based system matter? Journal of Financial Economics 64, 147-180.

Rajan, R.G. and L. Zingales (2001). Financial systems, industrial structure, and growth. *Oxford Review of Economic Policy* 17, 467–482.

Modigliani, F. and M. Miller (1958). The Cost of Capital, Corporation Finance and the Theory of Investment. *American Economic Review* 48, 261-297.

Appendix B: Counterfactual exporting firm

(1) Firms with marginal export productivity

We run a counterfactual exercise where the marginal exporter ($z = z_x$ =2.2075) chooses $k^{nx}(\hat{z}_x^{nx}) = 0.16288$, the optimal innovation level when choosing to be a non-exporter, instead of $k^{x}(\hat{z}_x^{x}) = 0.13704$, the optimal innovation level when choosing to be an exporter. We want to show that, to satisfy the financial constraints, the firm has to raise its equity value by decreasing its bond issuance. Such a capital structure adjustment is not sufficient to cover the export entry cost, causing export entry impossible.

The solution procedure is described in Appendix Table 1 below, where we report for three cases, the new exporter choosing the optimal level of innovation $k^{x}(\hat{z}_x^{x}) = 0.13704$, the counterfactual new exporter choosing the level of innovation at $k^{con}(\hat{z}_x^{nx}) = 0.16288$, and the non-exporter choosing the level of innovation at $k^{nx}(\hat{z}_x^{nx}) = 0.16288$. It is clear that $k^{nx}(\hat{z}_x^{nx}) > k^{x}(\hat{z}_x^{x})$.

The solution procedure is as follows. We first fix the firm's productivity at the export cutoff level, z_x, set the innovation investment at the level we want it to be, and assume financial constraint to be bind. Then, we calculate the post-innovation productivity, the shadow price of financial constraint, and the pricing. Next, we calculate the equity value from the binding financial constraint, and the bond value from the dividend equation. Finanlly, we calculate the total firm value, and compare it with that of the non-exporter. Appendix Table 1 below reports the detailed solution procedure and the calculation.

We show that, given the choice of the innovation at $k^{nx}(\hat{z}_x^{nx}) = 0.16288$, this counterfactual new exporter is not able to satisfy the entry condition. As we plug the values of $q^{x}(\hat{z}_x^{nx})$ and $b^{x}(\hat{z}_x^{nx})$ solved from the case of higher R&D (at $k^{nx}(\hat{z}_x^{nx})$) than optimal level ($k^{x}(\hat{z}_x^{x})$), the export entry cost is higher than the newly increased value of being an exporter.

(2) The role of financial constraint

The binding financial constraint accounts for the lower innovation of new exporter than its peer non-exporter. In Appendix Table 1, there are two conditions directly related to capital structure and R&D for the marginal firm with the cutoff productivity, z_x =2.2075: the financial constraints and export entry condition**.**

In steady state, the enforcement constraints for not exporting and exporting are respectively given by,

$$\xi q_{\square}^{nx}(\hat{z}_x^{nx}) = \phi^{xd} w_{\square}\left[l_{\square}^{nx}(\hat{z}_x^{nx}) + f_{\square}^{d}\right] + \phi^{RD,d} w_{\square}\left[f_{\square}^{RD} + \left(c_I k_{\square}^{nx}(\hat{z}_x^{nx}) + \frac{1}{2} c_I [k_{\square}^{nx}(\hat{z}_x^{nx})]^2\right)\right]$$

$$\xi q_{\square}^{x}(\hat{z}_x^{x}) = \phi^{xd} w_{\square}\left[l_{\square}^{xd}(\hat{z}_x^{x}) + f_{\square}^{d}\right] + \phi^{xx} w_{\square}[l_{\square}^{xx}(\hat{z}_x^{x}) + f_{\square}^{x}] + \phi^{RD,x} w_{\square}\left[f_{\square}^{RD} + \left(c_I k_{\square}^{x}(\hat{z}_x^{x}) + \frac{1}{2} c_I [k_{\square}^{x}(\hat{z}_x^{x})]^2\right)\right]$$

and the export entry condition is,

$$V_{\square}^{x}\left(b_{\square}^{x}(\hat{z}_x^{x})\right) - V_{\square}^{nx}\left(b_{\square}^{nx}(\hat{z}_x^{nx})\right) + b_{\square}^{x}(\hat{z}_x^{x}) - b_{\square}^{nx}(\hat{z}_x^{nx}) = K_{\square}^{EX}.$$

Combing with the firm value function

$$V_{\square}^{j}(\hat{z}_i) = d_{\square}^{j}(\hat{z}_i) + q_{\square}^{j}(\hat{z}_i)$$

the entry condition can be re-written as:

$$(1+r)q_{\square}^{nx}(\hat{z}_x^{nx}) + b_{\square}^{nx}(\hat{z}_x^{nx}) = (1+r)q_{\square}^{x}(\hat{z}_x^{x}) + b_{\square}^{x}(\hat{z}_x^{x}) - K_{\square}^{EX}$$

When the counterfactual new exporter chooses the same level of R&D as the non-exporters with identical cutoff productivity ($k^{con}(\hat{z}_x^{nx}) = k^{nx}(\hat{z}_x^{nx})$), the new exporter would have identical post-innovation productivity as the non-exporters ($\hat{z}_x^{con\_x} = \hat{z}_x^{nx}$) and hence charge identical prices in the domestic market.

To check if firm $\hat{z}_x^{con\_x}$ are able to pay the entry cost and enter the export market when it satisfies the enforcement constraints, we substitute the enforcement constraints into the export entry condition, and have

$$\begin{aligned}&(1+r)q_{\square}^{con\_x}(\hat{z}_x^{con\_x}) + b_{\square}^{con\_x}(\hat{z}_x^{con\_x}) - K_{\square}^{EX} - (1+r)q_{\square}^{nx}(\hat{z}_x^{nx}) - b_{\square}^{nx}(\hat{z}_x^{nx}) \\ &= (1+r)\left(q_{\square}^{con\_x}(\hat{z}_x^{con\_x}) - q_{\square}^{nx}\left(\hat{z}_x^{\square}\right)\right) + b_{\square}^{con\_x}(\hat{z}_x^{con\_x}) - b_{\square}^{nx}(\hat{z}_x^{nx}) - K_{\square}^{EX} \\ &= -1.9189e-05\end{aligned}$$

This suggests that the counterfactual new exporter cannot generate enough value to pay the entry costs, and that the firm with higher R&D won't enter the export market. R&D and exporting are substitute for the marginal firms.

(3) The substitution between innovation and exporting for small exporters

To further elaborate the substitution between innovation and exporting among small exporters, we calculate a measure $F(z_i) = V_x^{new}(z_i) - V_x^{non}(z_i)$ for each firm z_i, which is defined as the new exporters' firm value subtracting the non-exporters firm value, assuming they have identical productivity. We assume firm z_i can choose its optimal level

of innovation as a non-exporter. However, if it chooses to be an exporter, this new exporter must set its innovation investment at the optimal level of the non-exporters (k_x^{nx}), but pay entry cost K^{EX} to export.

From Figure 4 in the text, if z_i is small, $F(z_i)<0$, implying R&D and exporting are substitute for small exporters. However, if z_i is higher, $F(z_i)>0$. The firm can enter the export market, even if it chooses $k^{nx}(\hat{z}_x^{nx}) > k^x(\hat{z}_x^x)$, indicating that R&D and exporting are not substitute for large exporters.

Appendix Table 1 Counterfactual New Exporter

	new exporter	***Counterfactual new exporter***	*non-exporter*
Given conditions	z_x =2.2075		
	$k^x(\hat{z}_x^x) = 0.13704$	$k^{con}(\hat{z}_x^{nx}) \equiv k^{nx}(\hat{z}_x^{nx}) = 0.16288$	$k^{nx}(\hat{z}_x^{nx}) = 0.16288$
Post-innovation productivity	$\hat{z}_x^x = 2.20777$	$\hat{z}_x^{con\_x} = 2.20783 = \hat{z}_x^{nx}$	$\hat{z}_x^{nx}$=2.20783
Equity value	$q_{\square}^x(\hat{z}_x^{nx})$ =1.89092	$q^{con\_x}(\hat{z}_x^{nx})$=1.891140	$q_{\square}^{nx}(\hat{z}_x^{nx}) = 1.71146$
Bond value	$b_{\square}^x(\hat{z}_x^{\square}) = 1.16991$	$b_{\square}^{con\_x}(\hat{z}_x^{nx})$ =1.16966	$b_{\square}^{nx}(\hat{z}_x^{nx}) = 1.19789$
Firm value (V=d+q)	vxzxhd= 1.97960	vxzxkdxhd= 1.97983	vdzdxhd= 1.79173
New exporter's firm value (V+b)	3.14951	3.14949	2.98962
Exporter's firm value subtracting non-exporter's firm value and foreign market entry cost	0	-0.000019189	\
Findings	*Satisfy the entry condition*	Since higher R&D than optimal level, equity has to be higher to pay higher R&D cost. $b^x(\hat{z}_x)$ is lower than the optimal level because of higher dividend payout (d), so that the extra value of exporting is *not enough to pay off the entry cost*.	\