Effects of Presidents' Characteristics on Internationalization of Small and Medium Firms in Japan*

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Abstract

Recent heterogeneous-firm models of international trade suggest that productivity determines whether firms engage in export and foreign direct investment. In practice, however, many productive firms are not internationalized, while many unproductive firms are. This evidence suggests that factors other than productivity largely influence firms' internationalization. This study examines whether personal characteristics of the president are factors of firms' internationalization, using a unique panel data set for Japanese small and medium enterprises (SMEs). We find that SMEs are more likely to be internationalized when the president is more risk-tolerant, forward-looking, and internationally experienced. These effects are large in size, partly explaining why many productive firms are not internationalized. In addition, we find that productivity has an insignificant effect on exits from export markets, while overseas experience of the president lowers the probability of the exits. The evidence suggests that after the entry to export markets, initial costs of export become sunk, explaining why many unproductive firms are internationalized.

Keywords: trade, foreign direct investment, small and medium enterprises, risk and time preference, Japan

JEL classifications: F19; F21

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1 Introduction

Theoretical and empirical literature on international trade has grown substantially in recent years. Among theoretical literature, Melitz (2003) develops a heterogeneous-firm model of trade, indicating that only productive firms can afford initial costs of export and hence can export. Helpman et al. (2004) extend the analysis by incorporating foreign direct investment (FDI), suggesting that because of larger initial costs of FDI, FDI firms are the most productive, exporters are second-most, and firms serving only domestic markets are the least productive. Numerous empirical studies using firm-level data generally confirmed the predictions of Melitz (2003) and Helpman et al. (2004).[1]

Although existing empirical studies illuminate the role of productivity in determining internationalization of firms, they also find that the effect of productivity is often small. For example, applying ordinary least squares estimation of a linear probability model of export decisions to U.S. plant-level data, Bernard and Jensen (2004) find that a 100-percent increase in total factor productivity (TFP) raises the probability of exporting by only 1.7 percentage points. Bernard and Wagner (2001) find similar-sized effects of labor productivity on export decisions using German data. Todo (2011) using firm-level data for Japan finds a negligible effect of productivity: a 50-percent increase in productivity raises the probability of engaging in export or FDI by less than 0.1 percentage points. Greenaway and Kneller (2004) point out that, for UK firms, firm characteristics including productivity are "quantitatively far less important than experience" (p. 361).

In summary, productive firms might not export or engage in FDI, whereas unproductive firms might perform either or both. This situation can be observed in Figure 1, which reflects firm-level data for Japanese small and medium enterprises (SMEs) explained in detail later. Figure 1 shows the distribution of the log of labor productivity for two types of Japanese SME: those serving only the domestic market (domestic-only firms), and those engaging in export, FDI, or offshoring of production processes (internationalized firms). On average, domestic-only firms are less productive than internationalized firms, but the distributions of the two types of firm overlaps with each other to a large extent. Bernard,

[1] These studies include Clerides et al. (1998) for Columbia, Mexico, and Morocco; Bernard and Jensen (1999, 2004) and Bernard et al. (2003) for the United States; Head and Ries (2003), Tomiura (2007), and Todo (2011) for Japan; Barrios et al. (2003) for Spain, Greenaway and Kneller (2004) for the UK, Mayer and Ottaviano (2007) for various EU countries; Damijan et al. (2007) for Slovenia; and Eaton et al. (2011) for France. Useful surveys can be found in Bernard et al. (2007), Greenaway and Kneller (2007), and Wagner (2007).

Eaton, Jensen, and Kortum (2003, Figure 2A) and Mayer and Ottaviano (2007, Figure 4) show that this is the case for U.S. and Belgian firms, respectively. Todo (2011, Figure 1) confirms this finding using Japanese data for larger firms.

In addition, empirical studies reveal that unobserved firm characteristics largely affect firms' decision to internationalize. Todo (2011) finds that a change of one standard deviation in a firm's unobserved characteristics raises the probability of internationalization by 30 percentage points. Eaton et al. (2011) also find a sizable effect of unobserved firm characteristics in France, using a simulation approach. However, none of these studies reveals what those unobserved firm characteristics are.

This study takes advantage of a unique data set for Japanese SMEs to examine the effects of factors that have been treated as unobserved firm characteristics. In particular, we focus on characteristics of the president of each SME, such as his/her risk and time preference and overseas experience. When export and FDI are associated with uncertainty, we would expect that firms are more likely to be internationalized when the president is less risk averse or less myopic, and when he has more information on foreign markets through his international experience.

These theoretical predictions are supported by probit estimations using firm-level data for Japanese SMEs. The effect of the president's risk and time preference and international experience are large in magnitude. In addition, we find that productivity has little effect on firms' decision of exiting export markets after their entry. These findings suggest why productive firms might not be internationalized and why unproductive firms might be.

The rest of this paper is organized as follows. Section 2 shows theoretical predictions and the method to examine the predictions. Section 3 describes data used in the estimation. Section 4 presents estimation results. Section 6 concludes.

2 Theoretical Framework

In order to derive theoretical predictions, this section provides a heterogeneous–firms model of trade which is based on Melitz (2003) and incorporates uncertainty in foreign demand. In the following, we will describe the model but place the solution which mostly depends on numerical exercises in the Appendix.

2.1 The Model

Consider the set of infinitely-lived agents who run firms that may serve the foreign market via export. The representative agent has the instantaneous utility function $u(\pi, \theta) = \pi^{1-\theta}/(1-\theta)$ where π represents the profits earned by the firm which she operates and $\theta \in [0, 1)$ the coefficient of relative risk aversion.

The firms operated by the agents are heterogeneous in terms of productivity. In addition, each firm faces demand uncertainty in the foreign market. More specifically, agent i earns per-period profits $\lambda_{it}\phi_i$ from the foreign market where ϕ_i is time-invariant firm i's productivity and λ_{it} represents firm-specific idiosyncratic shocks to the demand for the firm's product. Following Dixit and Pindyck (1994) and Dixit (1989), we assume that the index of the size of the foreign market that the firm captures, λ_{it}, evolves according to a geometric Brownian motion such that

$$d\lambda_i = \mu\lambda_i dt + \sigma\lambda_i dz, \tag{1}$$

where μ denotes the drift parameter, σ the variance parameter, and dz a standard Wiener process with $E[dz] = 0$ and $E[(dz)^2] = dt$.[2] In what follows, we will drop subscripts i and t for notational brevity unless it causes any confusion.

When starting export, the firm must incur an irreversible lump-sum entry cost f_x. The firm also has to pay a per-period fixed cost f while she serves the foreign market. The former fixed cost may be interpreted as a cost of redesigning products to be accommodated to special requirements in the foreign market while the latter as a cost of maintaining sales networks in the foreign market, for example. Although exporting agents can decide to suspend export (i.e., exit from the foreign market) without any costs, they must incur the lump-sum entry cost f_x again should they re-enter the foreign market at some future time.

In this framework, only productive firms tend to enter the foreign market as emphasized by the literature of heterogeneous firms (e.g., Melitz, 2003). However, productive agents facing adverse demand shocks may refrain from starting export while less productive agents facing favorable demand shocks may enter the foreign market. Furthermore, even if exporting agents are hit by adverse demand shocks and earn negative profits, they may not exit from the foreign market immediately in order to avoid the future burden of the fixed cost

[2] A standard Wiener process dz is $dz = \epsilon_t(dt)^{1/2}$ where ϵ_t has zero mean and unit standard deviation.

for re-entry to the foreign market.[3]

The agent's decision problem has two state variables: the index of foreign demand λ and a discrete variable that indicates whether the agent exports ($I = 1$) or not ($I = 0$). In state $(\lambda, 0)$, the agent decides whether to become an exporter. Likewise, in state $(\lambda, 1)$, she decides whether to continue export or to exit from the foreign market. Letting ρ denote the subjective discount rate per unit time, the Bellman equation for the agent who does not export is given by

$$\rho V_0(\lambda, \phi) = \max_I E\left[\frac{dV_0}{dt}\right], \tag{2}$$

where $V_0(\lambda, \phi)$ is the expected present value of starting with a shock λ in the non-exporting state and following optimal policies when the firm's productivity parameter is ϕ. Although the agent in state $(\lambda, 0)$ earns no current profit, the firm is still valuable since it may serve the foreign market in the future. The only return of being a non-exporter is the expected capital gain since $V_0(\lambda, \phi)$ may vary according to the realization of λ. Thus, this equation is interpreted as the agent's asset holding problem: the return that the agent asks for investing V_0 must be equal to the capital gain from holding the asset V_0.

Similarly, the Bellman equation for the agent who exports is expressed by

$$\rho V_1(\lambda, \phi) = \max_I E\left[\frac{(\lambda\phi)^{1-\theta}}{1-\theta} - f + \frac{dV_1}{dt}\right], \tag{3}$$

where $V_1(\lambda_i, \phi)$ represents the expected present value of being an exporter.

We now consider the transition from a non-exporter to an exporter and vice versa. For each agent, there exists a threshold value of the market size index, λ_x, above which the agent starts to export incurring the fixed investment f_x. At λ_x, the agent is indifferent between exporting and not exporting, that is,

$$V_1(\lambda_x, \phi) - V_0(\lambda_x, \phi) = f_x. \tag{4}$$

Likewise, each exporting agent has a threshold λ_{ex} below which the agent exits from the foreign market. The value match condition is given by

$$V_1(\lambda_{ex}, \phi) - V_0(\lambda_{ex}, \phi) = 0. \tag{5}$$

[3]In order to maintain the model's tractability, we simplify the model to the extent that it may not change economic intuitions. For example, we abstract from the home market, assuming that the size of the home market is deterministic so that each firm can earn positive profits for certain.

The standard smooth pasting conditions are as follows:

$$V_1'(\lambda_x, \phi) = V_0'(\lambda_x, \phi), \tag{6}$$

and

$$V_1'(\lambda_{ex}, \phi) = V_0'(\lambda_{ex}, \phi), \tag{7}$$

where $V_1' \equiv \partial V_1/\partial\phi$ and $V_0' \equiv \partial V_0/\partial\phi$.

2.2 Theoretical predictions

Applying Ito's lemma to (2) and (3) leads to differential equations about V_0 and V_1. Those differential equations can specify the functional forms of V_0 and V_1, which contain four unknowns to be solved: i.e., two thresholds (λ_x and λ_{ex}) and two constant variables. The four equations (4) to (7) identify these four unknowns for a given ϕ. However, because the four equations are highly nonlinear and analytically insolvable, we rely on numerical computation to obtain most theoretical predictions. The details of the solution and numerical computation are provided in the Appendix.

The key theoretical predictions are as follows. First, $\lambda_x\phi$ and $\lambda_{ex}\phi$ are uniquely identified for given parameter values, and hence, λ_x, the threshold productivity for starting to export, and λ_{ex}, the threshold value for stopping to export, are decreasing in the productivity level, ϕ. That is, as widely recognized in the literature, more productive firms earn greater profits from exporting and thus are more likely to start exporting than unproductive firms. In a similar vein, productive firms tend to maintain exporting since they have lower trigger values of the foreign demand for exit.

Second, the threshold productivity for starting to export is higher than the threshold for stopping to export: $\lambda_x > \lambda_{ex}$. This indicates that exporting firms tend to remain in the foreign market due to the sunk entry cost and future demand uncertainty. In order to avoid the initial fixed cost of re-entry, exporting agents choose to stay in the foreign market even if they run deficits unless they are not too large. In other words, we expect to observe hysteresis in internationalization of firms. In the empirical estimation, we control for this hysteresis by including the previous export intensity for each firm as an explanatory variable.

Third, holding other things constant, $\lambda_x\phi$ is increasing in f, the per-period operational

fixed cost, and f_x, the entry cost, while $\lambda_{ex}\phi$ is increasing in f but decreasing in f_x. In other words, non–exporting firms are less likely to enter the foreign market as either the operational fixed cost or the entry fixed cost increases. Similarly, exporting firms are more likely to exit from the foreign market as the operational fixed cost increases. These results are quite intuitive. A less intuitive result is that exporting firms are less likely to exit as the entry fixed cost becomes greater, because a large entry cost implies difficulty to re-enter the foreign market.

In the empirical estimation, we presume that overseas experiences of the president of a firm and the educational level of workers help to obtain information on the foreign market and thus reduces the operational and entry fixed costs. Therefore, firms with presidents' overseas experience or educated workers are more likely to enter the foreign market, when the productivity level is controlled for. However, it is not clear whether such firms are more or less likely to exit the foreign market, because the lower operational fixed cost reduces the likelihood of exits while the lower entry fixed cost raises it.

Finally, $\lambda_x\phi$ and $\lambda_{ex}\phi$ are increasing in θ, the coefficient of relative risk aversion, and in ρ, the subjective discount rate. Because we assume risk-averse utility of firms, long-run utility from exporting under uncertainty of foreign markets is smaller for risk-averse firms than for risk-tolerant firms. Also, long-run utility is smaller for myopic firms. In the empirical estimation, we assume that risk and time perference of SMEs can be represented by the preference of the presidents of SMEs, which is available in our unique dataset, because SMEs are often controlled by their presidents to a large extent. Thus, we hypothesize that firms operated by risk-averse or myopic presidents are less likely to enter foreign markets and more likely to exit.

3 Estimation Procedure

To test the theoretical predictions provided in the previous section, we employ a probit model.:

$$\begin{aligned} y_i^* &= Z_i'\theta + u_i, \\ I_i &= 1 \text{ if } y_i^* \geq 0 \\ I_i &= 0 \text{ if } y_i^* < 0 \end{aligned} \tag{8}$$

where $\tilde{y}_i^* \equiv V_1(\lambda, \phi) - V_0(\lambda, \phi)$, or $\tilde{y}_i^a st$ is the long-term profit from exporting less that from non-exporting. The set of explanatory variables Z_i include productivity, firm size, workers' educational level, and indicators for risk and time preferences and international experience of the president, and u_i is a normally distributed error. To control for industry and regional heterogeneity, Z_i includes industry and region dummies.

One econometric issue in this probit estimation is that some determinants of internationalization are endogenous. For example, although productivity may determine internationalization, it can be improved by internationalization, as the literature frequently demonstrates (see Kimura and Kiyota, 2006 in the case of Japan). If so, using current productivity as a determinant of internationalization may generate a biased estimate of the effect of productivity on internationalization. Firm size also causes endogeneity if internationalized firms grow faster. To avoid these endogeneity problems, we use lagged productivity and firm size, rather than their current values, as independent variables.

Workers' education level, measured by the share of college graduates in total employment, may also be endogenous, since firms willing to be internationalized are more likely to employ educated workers. Since the data set in this study includes the current share of college graduates but not the lagged share, we estimate equation (8) together with another equation,

$$educ_i = x_i'\beta + \nu_i, \tag{9}$$

using a full information maximum likelihood (FIML) method, where *educ* is the share of college graduates. We assume that ν and u are normally distributed jointly. The set of potential determinants of *educ* includes the determinants of internationalization of firms, Z_i, as well as an additional instrument, past wages per worker in logs.

Characteristics of presidents can also be endogenous. Risk and time preference of individuals is less likely to change in a short period of time, and thus we assume exogeneity of risk and time preference. However, overseas experiences of presidents can be determined by the firms' intension toward internationalization. For example, it can be the case that the president of a particular SME has studied abroad, because the former president, who is a parent of the current president, wanted to internationalize the SME and thus provided overseas education to the child. However, because we cannot find any good instrument for this variable, we assume that overseas experiences are also exogenous. Therefore, the coefficient on the dummy variable for overseas experiences may be overvalued, if the reverse

causality explained above in fact exists.

In addition to the determinants of internationalization, we also examine the determinants of exits from foreign markets. In particular, this study focuses on exits from export markets, rather than those from FDI or offshoring, because of data constraints, using a similar FIML approach. In this estimation, we assume an equation like (8) where a previous exporter i continues to export, or $I_i = 1$, if $\tilde{y}_i^* \geq 0$, and is still exporting, or $I_i = 0$, if $\tilde{y}_i^* < 0$. Since exporters have already paid the initial cost of exporting f_x, $\tilde{y}_i^*$ does not include f_x. Factors that determine exiting export markets are similar to those that determine internationalization: productivity, firm size, characteristics of the president, and industry dummies. However, unlike the previous estimation, here we use current productivity and firm size as determinants and instrument them by their previous values, because firms make exit decisions by observing current firm status. To obtain convergence in the FIML estimation, we drop workers' education, a possible endogenous variable, from the set of independent variables.

4 Data

4.1 Construction of the data set

Our data are taken from two micro-level data sets. The first is based on a confidential survey on "Internationalization and Enterprise Activities" (*Kokusaika to Kigyo Katsudo ni Kansuru Anketo Chosa*, hereafter called "the survey on internationalization") to SMEs conducted by Mitsubishi UFJ Research and Consulting in cooperation with the Small and Medium Enterprise Agency under the Ministry of Economy, Trade and Industry (METI) of Japan in December, 2009. The survey defines SMEs as firms with less than 300 employees or less than 300 million yen of paid-up capital, following the definition of the Small and Medium Enterprise Agency. This definition pertains throughout this paper.

The target of the survey was selected by the following stratified-sampling method. First, SMEs engaging in export or FDI were identified using METI's Current Survey of Production (*Kogyo Tokei Chosa*, hereafter CSP) and Current Survey of Commerce (*Shogyo Tokei Chosa*, CSC), Toyo Keizai's *Kaigai Shinshutsu Kigyo Soran* (Data Bank for Internationalized Enterprises), and confidential enterprise data from Japan External Trade Organization. These internationalized SMEs number about 8,000, and all are targeted by the survey. Second,

among domestic-only firms identified in METI's CSP and CSC, about 10,000 were randomly selected for the survey. Firm-level questionnaires were sent to 18,407 firms; 3,512, or 19.1 percent, responded.

Data from the survey on internationalization include characteristics of presidents, explained in the next subsection, and more customary variables such as sales, profits, the number of workers, the share of workers with college degrees, and the year of establishment. Whether the firm engaged in export, FDI, and/or offshoring of any production process in 2009 is also reported.

We merge the data set based on the survey on internationalization with another data set based on the CSP in order to utilize firm characteristics in earlier years. Conducted annually by METI, CSP covers all enterprises producing manufactured goods or mineral products at the establishment level. Response to CSP is compulsory, and the number of establishments exceeds 100,000 in each year. Although CSP is conducted at the establishment level, firm-level data can be aggregated using an identification code for each firm. Thus, data from CSP include standard firm-level variables which can be used to construct measures of productivity as well as the share of exports in total sales. However, no data on FDI or offshoring are available in CSP. This study uses the firm-level data from CSP for 2006 or the latest year available at the time of data collection in 2009.

The number of firms included in both data sets from the survey on internationalization and CSP is 2,167. We dropped 171 service sector firms from the sample, because we focus on manufacturing and 655 firms because they lack data necessary for this analysis. Our sample totals 1,341 firms.

4.2 Characteristics of Presidents

The survey on internationalization offers information rarely available in other firm-level data sets. First, it questioned the president of each firm about international experience: "Have you studied, worked, or lived abroad?" Since presidents of Japanese SMEs are unlikely to study, live, or work abroad during their term, we assume that the response indicates international experience before appointment as the president and hence prior to the decision of internationalizing the firm. From the theoretical argument in Section 2, we expect that international experience of the president lowers the entry and operational costs of internationalization, particularly costs of marketing and understanding business rules and

laws. As explained in Section 2.2, the low entry and operational costs increase the likelihood of firms' initiating internationalization but may or may not increase the likelihood of exiting foreign markets once firms were internationalized.

Second, the survey asked a question about presidents' risk preferences: "If there were an investment opportunity that presents a 50-percent probability of earning 1 million yen and otherwise earning nothing, what is the most you would pay for this investment?" There are 10 available choices spanned from 1 million yen to 100,000 yen plus the option "I would not even pay less than 100,000 yen for this." From the responses, we constructed a variable for risk preference that takes one if the president chose not to invest, two if 100,000 yen, three if 200,000, four if 300,000, five if 400,000, and six if 500,000 or more. A larger value for this variable implies that the president is more risk-tolerant. Since our theoretical model predicts that risk-averse firms are less likely to be internationalized, we expect that this variable for risk-taking attitude has a positive impact on internationalization.

Finally, a question in the survey inquired into presidents' time preferences: "What is the minimum amount which you would prefer receiving one year and one month from now to receiving 100,000 yen one month from now?" There are 15 available choices from 102,000 yen, 104,000, 106,000 to more than 130,000 plus the response "In any case, I would prefer receiving 100,000 yen one month from now." Since about half the sampled presidents chose the final response ("In any case, ..."), we constructed a binary variable that takes zero if the president chose it and one otherwise. We presume that this variable approximates whether the president is forward-looking (one) or myopic (zero).

Estimating risk and time preferences from hypothetical questions is standard in the literature, although it has not been done in the context of internationalization of firms. Cramer et al. (2002) use a similar question about risk aversion in a survey in the Netherlands and find a negative effect of risk aversion on entrepreneurship. Frederick et al. (2002) review many empirical studies estimating time preference. A better approach to estimate risk and time preferences than hypothetical questions is to perform experiments in which individuals actually receive a monetary reward. For example, Tanaka et al. (2010) carried out such experiments in Vietnam to estimate both risk and time preferences. However, these experiments are mostly performed in less developed countries probably because the monetary reward can be small in these countries. Such experiments are almost impossible for our purposes, since a large reward would be necessary to estimate risk and time preferences

of presidents, relatively rich individuals.

In the empirical analysis below, we assume that those characteristics of presidents are exogenous. These variables could in fact be endogenous. For example, stock holders of an SME would appoint a person with overseas experiences or a risk-loving or forward-looking person as its president with the intention that the SME should start to engage in export or FDI. However, this may not be the case in most Japanese SMEs. According to a white paper by the Japanese government (SME Agency, 2006), the average age of the president of firms with paid-up capital from 10 million yen to 50 million (i.e., average-sized SMEs) increased from 54.1 in 1990 to 58.0 in 2003. Also, among presidents who have already determined their successor, 71.3 percent appointed their child as the successor, and 12.6 percent appointed other family member. In other words, the president of most Japanese SMEs has been the president for a long time and will be succeeded by one of his/her family members, probably because the president is the owner of the SME. Therefore, assuming that characteristics of the president are exogenous may not lead a substantial bias in the estimation.

4.3 Summary statistics

In this paper, internationalized firms are defined as firms engaging in export, FDI, or off-shoring of any production process. Among the 1,341 firms in the sample, 612 (46 percent), 188 (14 percent), and 206 (15 percent) are engaged in export, FDI, and off-shoring, respectively. Accordingly, 707 firms or 53 percent of all sampled firms are internationalized. The high share of internationalization arises from our sampling strategy and does not reflect actual share of internationalized firms among all SMEs. Using CSP data, we identify 528 firms (39 percent) as exporters in 2006. Among them, 63 firms stopped exporting during the period 2007-2009, while 147 firms started exporting during that period.

The productivity measure used in this paper is value added per worker, defined as sales minus intermediate inputs divided by the number of workers. Although TFP may be a better measure of productivity, reliable data on the real value of capital stock are unavailable. When we compute productivity measures from the survey of internationalization in some specifications, we rely on sales per worker because of lack of survey data on intermediate inputs.

The upper and the lower panels of Figure 1 show the distribution of value added per

worker in 2006 in logs for domestic-only and internationalized firms, respectively. Although internationalized firms are more productive on average, the productivity distributions for the two types of firm overlap significantly, as found in existing studies such as Bernard, Eaton, Jensen, and Kortum (2003, Figure 2A), Mayer and Ottaviano (2007, Figure 4), and Todo (2011, Figure 1). This figure roughly suggests that productivity is a driving factor in internationalization, but that there likely are many other important factors.

Table 1 presents summary statistics of the variables used in this study. The mean of the number of workers and value added per worker in 2006 are 61 and 11 million yen, respectively. However, the standard deviation of these variables is quite large, indicating that sampled SMEs vary substantially in their characteristics.

The last two columns of Table 1 show the difference in the mean between internationalized and domestic-only firms. The average of the log of value added per worker in 2006 is 2.00 for domestic-only firms and 2.28 for internationalized firms, supporting the finding from Figure 1 that internationalized firms are more productive on average. In addition, internationalized firms are more likely to employ educated workers, to be risk-tolerant and forward-looking, and to have international experience, while there is no systematic difference between the two types of firm in the log of the number of workers. In the next section, we will formally test whether these factors affect internationalization of firms.

5 Estimation Results

5.1 Determinants of internationalization

To estimate the factors determining internationalization, we used FIML estimation using equation (8) and (9) in Section 3. We also performed simple probit estimation of equation (8) for reference. The probit results are presented in column (1) of Table 2 and the results obtained from the FIML estimation are in column (2). In each column, the upper and lower rows, respectively, indicate the estimates of the coefficients and the marginal effect at means.

In both results, productivity measured by the log of value added per worker in 2006 had a positive and significant effect on internationalization in 2009. The effect of productivity is large: at means, an increase in the log of productivity by one unit or a 100-percent increase in productivity raises the probability of internationalization by 9-12 percentage points. The

effect of prior exporting experience measured by the share of exports in total sales in 2006 is also positive and significant. These results are standard in the literature and also predicted by the theory explained in Section 2.

Surprisingly, the firm size measured by the log of the number of employees has no significant effect on internationalization, although a positive effect is often found in the literature. Perhaps this is because we focus on SMEs and the variation in firm size is small in our sample. In other words, although large firms outside our sample are more likely to engage in export or FDI than our sampled SMEs, their size does not affect SMEs' decisions regarding export or FDI.

Presidents' characteristics not examined in previous studies, i.e., risk preference, time preference, and international experience, show a positive, statistically significant, and economically large effect. According to the FIML results in column (2) of Table 2, if the president's preference changes from most risk-averse to most risk-taking, that is, if the indicator for risk preference changes from 1 to 6, the probability that the firm is internationalized increases by 10 percentage points. If a myopic president becomes forward-looking, that is, if the indicator for time preference changes from 0 to 1, the probability would increase by 7 percentage points. If the president had studied, lived, or worked abroad, the probability of internationalization would be about 19 percentage points higher. These findings suggest that the risk tolerance, time preferences, and international experience of the president largely determine the firm's decision to internationalize.

These empirical results on presidents' characteristics are consistent with the theoretical predictions in Section 2. Overseas experience of the president may lead to lower entry and operational fixed costs. Risk tolerance and long-term perspectives lead to larger discounted utility in the long run. Therefore, these factors influence the probability of entering foreign markets.

The share of college graduates among workers has a positive and significant effect in the probit estimations but not in the FIML estimations. The difference between the two types of estimation suggests that firms employ more educated workers to export and FDI, although employing educated workers does not lead the firm to export or FDI. We hypothesized that educated workers lower the entry and operational fixed costs of internationalization and thus raise the probability of entering foreign markets (Section 2.2), but this hypothesis turns out to be rejected.

Finally, years in business have a positive and significant effect. This finding suggests that old firms are more likely to be internationalized, implying that experiences in business improve firms' ability to obtain business information and thus lower costs of internationalization.

5.2 Psychological effect of the president's characteristics

In addition to the effects predicted by the theoretical consideration in Section 2, presidents' characteristics may have additional effects on decisions on firms' internationalization through psychological channels. In the survey on internationalization, domestic-only firms were asked a question, "Why isn't your firm not internationalized?" Of the 634 sampled domestic-only firms, 42 percent answered "We do not think our firm needs to be internationalized." The proportion is high, compared with that of the firms answering "lack of knowledge" (23 percent), "lack of credit" (15 percent), and "lack of human capital" (17 percent) as reasons.[4] This evidence implies that many domestic-only firms have psychological barriers for entering foreign markets and do not consider to be internationalized even when firms can benefit from the decision.

To investigate how this psychological unwillingness to be internationalized is determined, we perform a probit estimation in which the dependent variable is a dummy variable for choosing "no need" as a reason not to internationalize. The results in Table 3 indicate that firms feel less willing to internationalize when the president is more risk-averse or has less international experience or when the firm is larger. Interestingly, productivity has no significant effect on psychological unwillingness. Looking at the marginal effect shown in the lower rows of Table 3, we find that the president's risk preference and international experience have large effects. In short, even when productivity is high, firms may be unwilling to internationalize if the president is risk-averse or has no international experience. These results combined with those in Section 5.1 show that personal characteristics of an SME' president erect psychological barriers for entering foreign markets.

5.3 Determinants of exit from export markets

Along with the factors determining internationalization, we are also interested in disinternationalization. We focus on conditions under which previous exporters stop exporting,

[4]Multiple choices are allowed for this question.

since data limitations prevent examining determinants of exit from FDI or offshoring. Table 4 presents results from a simple probit model using the lagged productivity and firm size and from the FIML model explained in Section 3.

The results show that when the president studied, worked, or lived abroad, exporting firms are 7 percentage points more likely to continue exporting. According to the model's prediction, this indicates that international experience of the president tends to lower the operating fixed effect more than the entry fixed cost and thus increases expected long-run profits. Also, when the share of exports in total sales is larger, exporters are more likely to continue exporting. This shows hysteresis in firms' internationalization, as predicted by the model in Section 2.

By contrast, the coefficients of productivity are positive but not significant, implying that even unproductive firms remain in export markets. The model predicts that the existence of the fixed entry cost and the market uncertainty generate the hysteresis effect: once firms start exporting, they tend not to discontinue it. However, still productive exporters have more chance to continue exporting. Thus, the result implies that the hysteresis effect is so strong for SMEs that even unproductive firms have no reason to exit from export markets, explaining why many unproductive firms are internationalized (Figure 1). This finding is not necessarily consistent with the theoretical prediction that productivity affects exits because productivity determines long-term profits, suggesting that the role of the entry cost is more substantial than theoretically predicted.

The results in Table 4 also indicate that the president's risk tolerance or time preference have no significant effect on exiting export markets, although these preferences are significant for entering foreign markets (Table 2). These contrasting results also highlight the importance of the sunk entry cost on entering foreign markets.

6 Conclusion

This paper has investigated factors influencing the internationalization of Japanese SMEs (engaging in export and FDI). Recent heterogeneous-firm models of international trade suggest that productivity determines internationalization (Melitz, 2003; Helpman, Melitz, and Yeaple, 2004). However, the distribution of productivity for internationalized and domestic-only firms is often found to overlap significantly (Bernard, Eaton, Jensen, and Kortum, 2003;

Mayer and Ottaviano, 2007; and Todo, 2011), indicating that many productive firms are not internationalized, whereas many unproductive firms are. Studies such as Eaton, Kortum, and Kramarz (2008) and Todo (2011) indicate that unobserved firm heterogeneity is a major determinant of internationalization, but these studies do not explain what actually accounts for the unobserved heterogeneity.

Using a unique panel data set for Japanese SMEs, we found that firms are more likely to be internationalized when the president is more risk-tolerant, forward-looking, and internationally experienced. We also found that the president's risk aversion and lack of international experience promote psychological unwillingness to be internationalized regardless of the firm's productivity. These personal characteristics of the president have large effects, perhaps explaining why productive firms might not be internationalized. In addition, we found that productivity has no significant relationship with the decision of exiting foreign markets, while the size of previous exports and the president's international experience have negative and significant relationships. The evidence suggests that initial costs to enter foreign markets become sunk, and hence that even unproductive firms do not exit foreign markets. This interpretation also provides an explanation to the reasons why many unproductive firms are internationalized. These empirical results mostly coincide with the predictions of our theoretical model incorporating uncertainty in foreign markets into heterogeneous-firm trade models.

This paper alleviated possible estimation biases to the extent possible, but several potentially remain. Although we treat presidents' personal characteristics as exogenous, they may be endogenous. A president's risk tolerance and time preference may change after evaluating previous decisions including those to internationalize. Moreover, although we assume that presidents acquired international experience before their decisions regarding internationalization, their experiences may have been affected by the firm's internationalization. Therefore, there may be reverse causality from the firm's internationalization to the president's characteristics. Second, our estimations are based on panel data of firms for which data are available for 2006 as well as 2009. We had to drop firms that exited the market from 2007 to 2009. This may have caused attrition biases. However, data limitation prevents correcting for these possible biases.

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Figure 1: Distribution of Productivity by Types of Firm

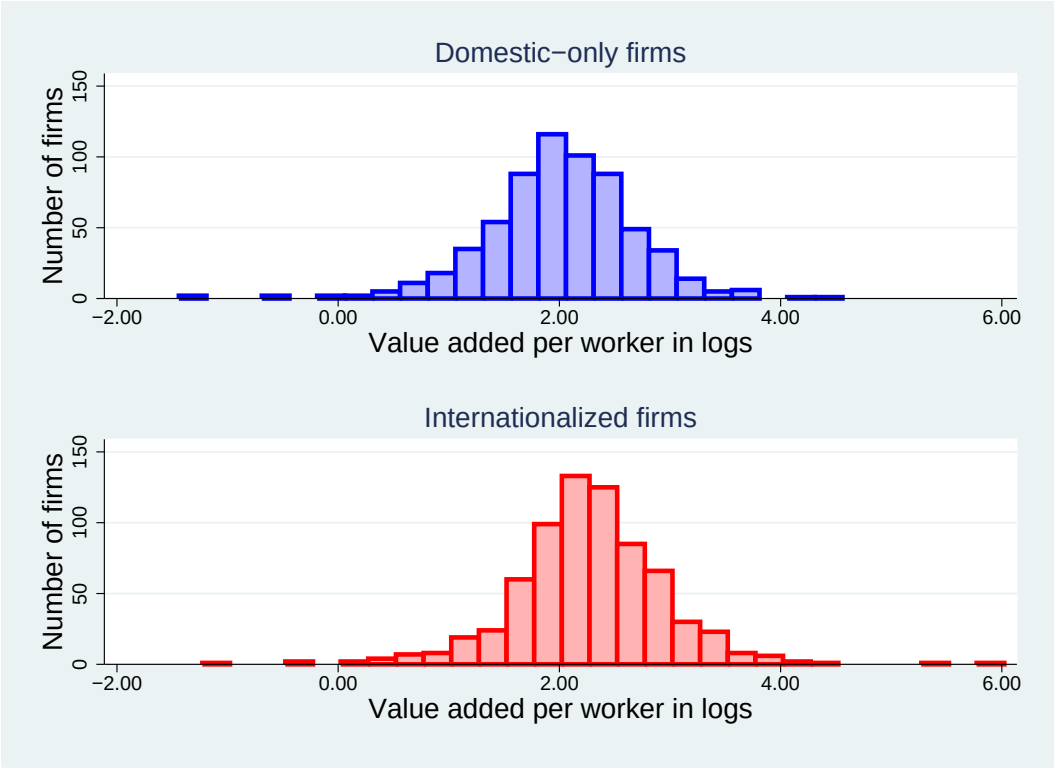

Table 1. Summary Statistics

Variable	Number of observations	Mean	Standard deviation	Mean for	
				Non-internationalized firms	Internationalized firms
Dummy for internationalization	1341	0.53	0.50	0	1
Share of exports in total sales in 2006 (%)	1341	5.75	14.65	0.51	10.45
Value added per worker in 2006 (million yen)	1341	11.01	14.66	9.16	12.67
--- (in logs)	1341	2.15	0.68	2.00	2.28
Number of workers in 2006	1341	60.87	62.82	55.50	65.68
--- (in logs)	1341	3.72	0.89	3.72	3.71
Years of operation	1341	52.15	33.95	49.03	54.95
Share of college graduates in total workers	1341	17.81	17.23	12.53	22.55
Index of president's risk preference (1-6, 6 = risk taking)	1341	3.24	2.25	2.95	3.49
Index of president's time preference (0-1, 0 = myopic)	1341	0.50	0.50	0.47	0.53
President's international experience (0-1)	1341	0.27	0.45	0.15	0.39
Sales per worker (million yen)	1291	77.49	1040.83	121.32	39.07
--- (in logs)	1291	2.87	1.05	2.76	2.97
Number of workers	1337	59.28	64.23	52.07	65.74
--- (in logs)	1337	3.65	0.96	3.63	3.67

Notes: Variables for 2006 are taken from the Current Survey of Production, while other variables are taken from the survey on "Internationalization and Enterprise Activities" conducted in 2009.

Table 2. Determinants of Internationalization of Firms

Dependent variable: The dummy which is 1 if the firm is internationalized in 2009 and 0 otherwise.

	(1)	(2)
	Probit	FIML
Coefficient		
Share of college graduates	0.0148***	-0.00274
	(0.00259)	(0.0209)
President's risk preference (1-6, 6 = risk taking)	0.0499***	0.0525***
	(0.0141)	(0.0156)
President's time preference (0-1, 0 = myopic)	0.153**	0.175**
	(0.0689)	(0.0747)
President's international experience (0-1)	0.443***	0.510***
	(0.137)	(0.142)
Years of operation	0.00501***	0.00528***
	(0.00144)	(0.00159)
Ratio of exports to total sales in 2006	0.0594**	0.0596**
	(0.0288)	(0.0281)
Value added per worker in 2006 (log)	0.257***	0.319***
	(0.0753)	(0.0763)
Number of workers in 2006 (log)	-0.0115	-0.00164
	(0.0480)	(0.0496)
Marginal effect		
Share of college graduates	0.00575***	-0.00107
	(0.00104)	(0.00812)
President's risk preference (1-6, 6 = risk taking)	0.0194***	0.0204***
	(0.00570)	(0.00635)
President's time preference (0-1, 0 = myopic)	0.0593**	0.0681**
	(0.0263)	(0.0286)
President's international experience (0-1)	0.163***	0.186***
	(0.0462)	(0.0475)
Years of operation	0.00195***	0.00205***
	(0.000550)	(0.000614)
Ratio of exports to total sales in 2006	0.0231**	0.0232**
	(0.0106)	(0.0104)
Value added per worker in 2006 (log)	0.0999***	0.124***
	(0.0302)	(0.0314)
Number of workers in 2006 (log)	-0.00446	-0.000637
	(0.0187)	(0.0193)
Observations	1341	1341
Log likelihood ratio	-684.5	-6210

Notes: A firm is defined as being internationalized if it exports, has an affiliate in a foreign country, or offshores part of its production processes. Robust standard errors are in parentheses. *, **, and *** indicate statistical significance at the 10-, 5-, and 1-percent level, respectively. Industry and region dummies are included, but the results are not shown for brevity.

Table 3. Determinants of Unwillingness to Internationalize

Dependent variable: The dummy which is 1 if the non-internationalized firm thought in 2009 that it did not need to be internationalized and 0 if the non-internationalized firm did not think so.

	(1)
	Probit
Coefficient	
President's risk preference (1-6, 6 = risk taking)	-0.0806***
	(0.0234)
President's time preference (0-1, 0 = myopic)	-0.106
	(0.0823)
President's international experience (0-1)	-0.312**
	(0.139)
Year of establishment	-0.00124
	(0.00218)
Value added per worker in 2006 (log)	-0.0475
	(0.0812)
Number of workers in 2006 (log)	0.0966*
	(0.0568)
Marginal effect	
President's risk preference (1-6, 6 = risk taking)	-0.0316***
	(0.00917)
President's time preference (0-1, 0 = myopic)	-0.0414
	(0.0321)
President's international experience (0-1)	-0.118**
	(0.0500)
Year of establishment	-0.000488
	(0.000853)
Value added per worker in 2006 (log)	-0.0186
	(0.0318)
Number of workers in 2006 (log)	0.0379*
	(0.0223)
Observations	723
Log likelihood ratio	-457.9

Notes: Marginal effects at means, not coefficients, are shown. Robust standard errors are in parentheses. *, **, and *** indicate statistical significance at the 10-, 5-, and 1-percent level, respectively. Industry and region dummies are included, but the results are not shown for brevity.

Table 4. Determinants of Exits from Exporting

Dependent variable: The dummy which is 1 if the exporter in 2006 continued to export in 2009 and 0 if the exporter in 2006 did not export in 2009.

	(1)	(2)
	Probit	FIML
Coefficient		
President's risk preference (1-6, 6 = risk taking)	-0.0176	-0.00596
	(0.0332)	(0.0338)
President's time preference (0-1, 0 = myopic)	0.199	0.138
	(0.149)	(0.152)
President's international experience (0-1)	0.404**	0.451**
	(0.201)	(0.203)
Years of operation	0.00266	0.00233
	(0.00232)	(0.00219)
Ratio of exports to total sales in 2006	0.0188***	0.0174***
	(0.00535)	(0.00503)
Value added per worker in 2006 (log)	0.115	
	(0.122)	
Number of workers in 2006 (log)	0.0209	
	(0.0722)	
Sales per worker (log)		0.229
		(0.157)
Number of workers (log)		0.0324
		(0.0696)
Marginal effect		
President's risk preference (1-6, 6 = risk taking)	-0.00304	-0.00106
	(0.00575)	(0.00604)
President's time preference (0-1, 0 = myopic)	0.0346	0.0248
	(0.0261)	(0.0274)
President's international experience (0-1)	0.0599**	0.0682***
	(0.0250)	(0.0255)
Years of operation	0.000459	0.000416
	(0.000398)	(0.000393)
Ratio of exports to total sales in 2006	0.00325***	0.00310***
	(0.000847)	(0.000814)
Value added per worker in 2006 (log)	0.0199	
	(0.0209)	
Number of workers in 2006 (log)	0.00362	
	(0.0125)	
Sales per worker (log)		0.0410
		(0.0301)
Number of workers (log)		0.00579
		(0.0124)
Observations	584	556
Log likelihood ratio	-197.1	-1149

Notes: Robust standard errors are in parentheses. *, **, and *** indicate statistical significance at the 10-, 5-, and 1-percent level, respectively. The sample consists of firms that reported a positive share of exports in total sales in 2006. Industry and region dummies are included, but the results are not shown for brevity.

A Appendix

Expanding the right hand side of equations (2) and (3) using Ito's lemma and taking the limit as $dt \to 0$, we obtain a set of familiar differential equations about the value of the status of non-exporting and exporting:

$$\rho V_0(\lambda, \phi) = \mu \lambda V_0'(\lambda, \phi) + \frac{\sigma^2 \lambda^2}{2} V_0''(\lambda, \phi), \tag{A.1}$$

and

$$\rho V_1(\lambda, \phi) = \frac{(\lambda\phi)^{1-\theta}}{1-\theta} - f + \mu \lambda V_1'(\lambda, \phi) + \frac{\sigma^2 \lambda^2}{2} V_1''(\lambda, \phi). \tag{A.2}$$

These two differential equations yield the following functional forms about V_0 and V_1, respectively:

$$V_0(\lambda, \phi) = A_1 (\lambda\phi)^{\beta_1}, \tag{A.3}$$

and

$$V_1(\lambda, \phi) = A_2 (\lambda\phi)^{\beta_2} + \frac{(\lambda\phi)^{1-\theta}}{(1-\theta)[\rho - \mu(1-\theta) + \frac{\sigma^2}{2}\theta(1-\theta)]} - \frac{f}{\rho}, \tag{A.4}$$

where A_1 and A_2 are constant variables to be solved and β_1 and β_2 are the roots of the corresponding auxiliary equation

$$\beta^2 - \left[1 - \frac{2\mu}{\sigma^2}\right] \beta - \frac{2\rho}{\sigma^2} = 0.$$

Letting $G(\lambda, \phi) \equiv V_1(\lambda, \phi) - V_0(\lambda, \phi)$ and using (A.3) and (A.4), we obtain

$$G(\lambda\phi) = A_2 (\lambda\phi)^{\beta_2} - A_1 (\lambda\phi)^{\beta_1} + \frac{(\lambda\phi)^{1-\theta}}{(1-\theta)\Omega} - \frac{f}{\rho},$$

where $\Omega \equiv \rho - \mu(1-\theta) + \frac{\sigma^2}{2}\theta(1-\theta)$. The smooth pasting conditions imply that $G'(\lambda_x \phi) = 0$ and $G'(\lambda_{ex}\phi) = 0$. Also, the threshold conditions imply that $G(\lambda_x \phi) = f_x$ and $G(\lambda_{ex}\phi) = 0$. Thus, the $G(\lambda\phi)$ schedule is tangent to the horizontal line f_x at $\lambda_x \phi$ and tangent to the horizontal line 0 at $\lambda_{ex}\phi$. $G(\lambda\phi)$ becomes infinitely large as λ approaches 0 since $A_2 > 0$ and $\beta_2 < 0$. Therefore, $\lambda_x > \lambda_{ex}$. Since $\lambda_x \phi$ and $\lambda_{ex}\phi$ are uniquely determined, it is immediate that as ϕ is higher (lower), both λ_x and λ_{ex} are lower (higher).

From (A.1) and (A.2), the following differential equation about $G(\lambda\phi)$ is obtained:

$$\frac{(\lambda\phi)^{1-\theta}}{1-\theta} - f = \rho G(\lambda\phi) - \mu\lambda G'(\lambda\phi) - \frac{\sigma^2\lambda^2}{2}G''(\lambda\phi).$$

Evaluating this at λ_x leads to

$$\frac{(\lambda_x\phi)^{1-\theta}}{1-\theta} - f = \rho f_x - \frac{\sigma^2\lambda^2}{2}G''(\lambda_x\phi), \tag{A.5}$$

where $G(\lambda_x\phi) = f_x$ and $G'(\lambda_x\phi) = 0$ are used. Since $G''(\lambda_x\phi) < 0$, (A.5) implies that

$$\frac{(\lambda_x\phi)^{1-\theta}}{1-\theta} > f + \rho f_x. \tag{A.6}$$

This result tells that the utility level for starting export must be greater than the operational fixed cost plus the amortized per–period portion of the fixed entry cost. In a similar vein, it can be shown that the utility at the threshold for exit λ_{ex} is below the operational fixed cost. If there is no uncertainty about the demand in the foreign market, (A.6) becomes equality, namely, the threshold profits for starting export exactly cover the operational fixed cost and the amortized fixed entry cost. Thus, the foreign market uncertainty raises the threshold foreign market size for export and lowers that for exit.

The agents' entry-exit decisions are influenced by the model's parameters, such as the entry fixed cost f_x. Although the influences are easily guessed as for some parameters, this is not the case for some other parameters. Above all, it is not easy to show formal comparative statics for most parameters. Hence, we here perform numerical calculations in order to grasp the sense of comparative statics.

First, using the functional forms in (A.3) and (A.4), we specify the system of equations which simultaneously determine the endogenous variables. The threshold conditions in (4) and (5) are expressed by

$$\begin{aligned} A_2(\lambda_x\phi)^{\beta_2} + \frac{(\lambda_x\phi)^{1-\theta}}{(1-\theta)\Omega} - \frac{f}{\rho} &= A_1(\lambda_x\phi)^{\beta_1} + f_x, \\ A_2(\lambda_{ex}\phi)^{\beta_2} + \frac{(\lambda_{ex}\phi)^{1-\theta}}{(1-\theta)\Omega} - \frac{f}{\rho} &= A_1(\lambda_{ex}\phi)^{\beta_1}. \end{aligned}$$

The smooth pasting conditions in (6) and (7) are

$$A_2\beta_2(\lambda_x\phi)^{\beta_2-1} + \frac{(\lambda_x\phi)^{-\theta}}{\Omega} = A_1\beta_1(\lambda_x\phi)^{\beta_1-1},$$
$$A_2\beta_2(\lambda_{ex}\phi)^{\beta_2-1} + \frac{(\lambda_{ex}\phi)^{-\theta}}{\Omega} = A_1\beta_1(\lambda_{ex}\phi)^{\beta_1-1}.$$

These functional forms reveal that $\lambda_x\phi$ and $\lambda_{ex}\phi$, productivity-adjusted threshold foreign market size, are common across the agents and conveniently solved.

As a bench mark, we set the model's parameters as shown in Table A1. In the benchmark, we set θ equal to zero, which means that agents' utility is linear in profits. Before performing comparative statics, we show two distributions of firms with the demand uncertainty of the foreign market. Without the demand uncertainty, only firms for which the productivity level is greater than a certain threshold productivity would start export and those firms with a productivity level lower than the threshold would remain as non–exporters. There would be no exit. With the demand uncertainty, a productivity range where exporters and non–exporters co–exist. Figure A1 presents simulated distributions of firms' productivity ϕ, in which the upper panel is exporters and the lower panel non–exporters.[5] The figure shows that the distribution of exporters is skewed toward right relative to that of non–exporters while there exists a substantial range of productivity where exporters and non–exporters are overlapped. Thus, the simulated distributions reproduce the empirically observed coexistence of exporting and non–exporting SMEs in the same productivity range (see Figure 1).

Turning to comparative statics, Figure A2 presents changes in the productivity-adjusted thresholds of the size of the foreign market. As expected, the thresholds increases as the fixed operating cost f increases. In contrast, Figure A3 shows that as the entry cost f_x increases, the entry threshold increases but the exit threshold declines, because after entering the foreign market, firms are reluctant to exit when the cost of re-entry is high.

As the coefficient of risk aversion, θ, rises, both thresholds increase (Figure A4). Intuitively, the risk–averse agent asks a more favorable demand shock to start exporting. Similarly, the agent as an exporter does not wait for favorable demand shocks so long. Agents tend to prolong the decision to enter the foreign market while they are likely to

[5]The productivity level are drawn from a Pareto distribution for which the Pareto index is set to 6. The Brownian motion with the benchmark parameters is used for generating each firm's foreign demand which faces monthly demand shocks. The distributions of firms presented here are a simulation after 20 years (240 months). The number of firms is 1500.

easily exit from the foreign market.

The result of changes in the discount rate ρ is similar to the impact of changes in θ (Figure A5). For more myopic agents, the option value of starting export as well as the option value of suspending export are less attractive because myopic agents are shortsighted on future profit flows.

Figure A1. Distribution of Exporters and Non–exporters

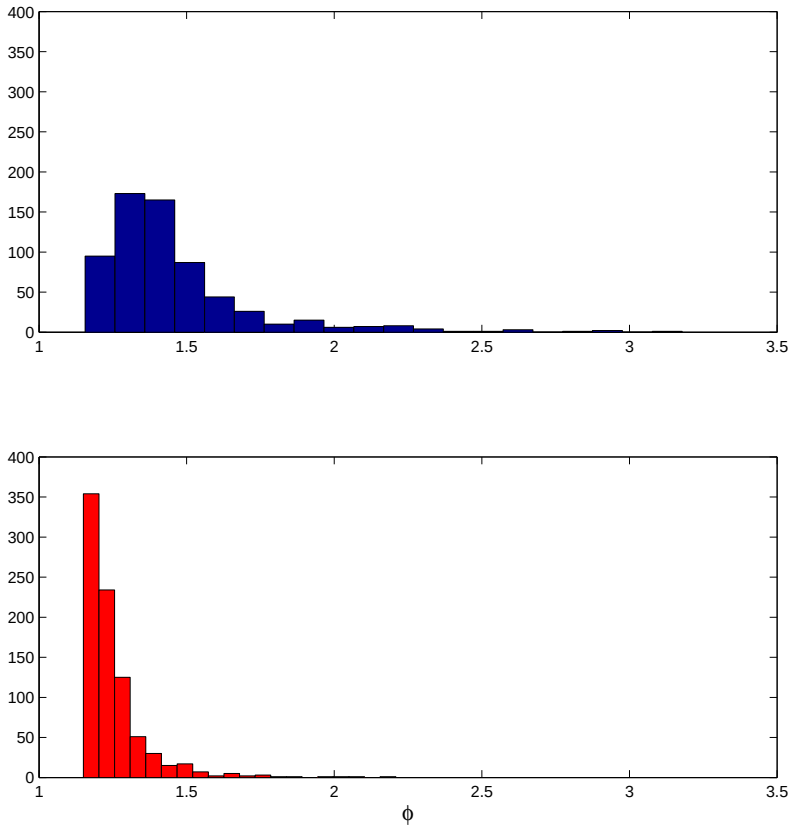

Figure A2. Relation between Entry and Exit Thresholds and the Operational Fixed Cost

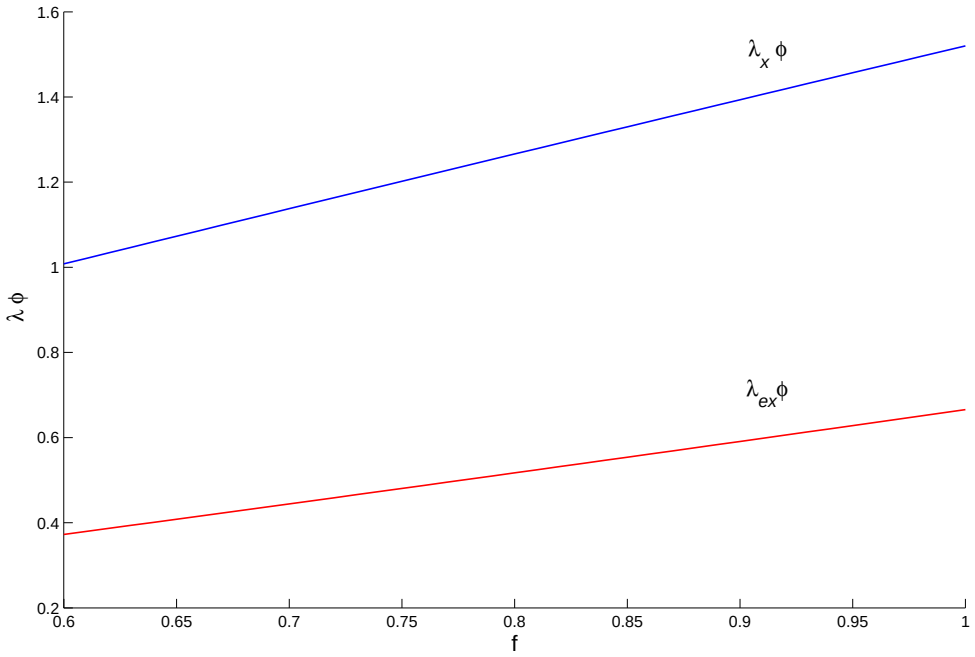

Figure A3. Relation between Entry and Exit Thresholds and the Entry Fixed Cost

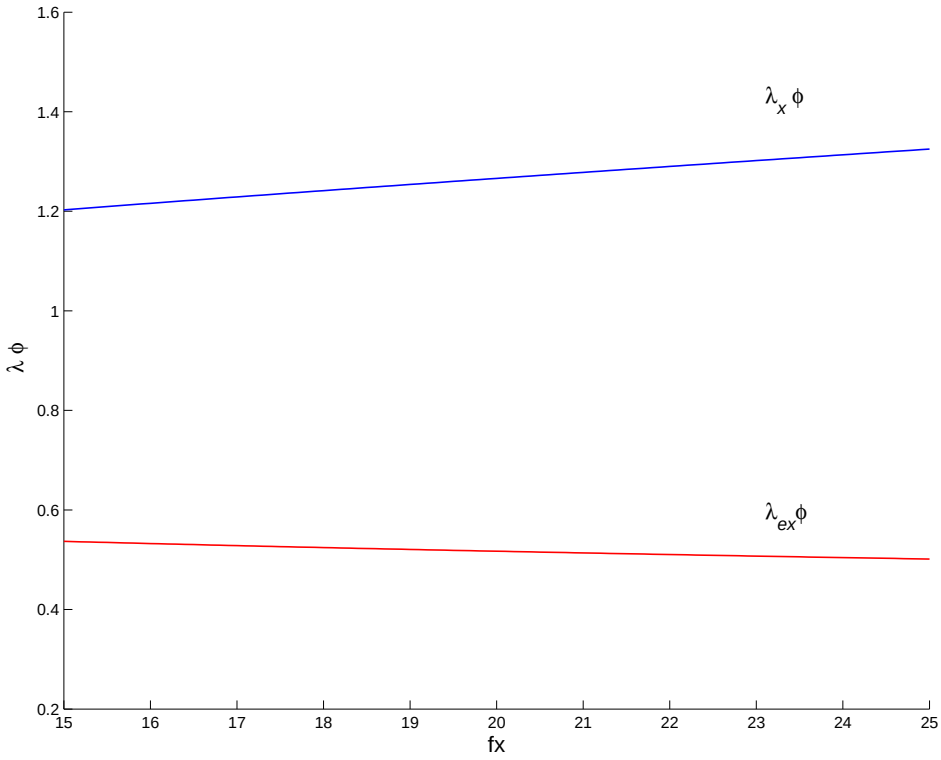

Figure A4. Relation between Entry and Exit Thresholds and the Degree of Risk Aversion

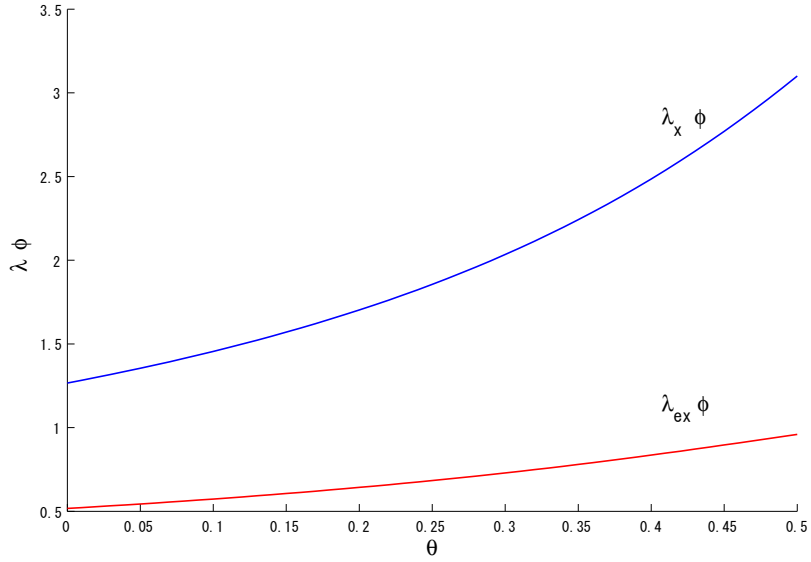

Figure A5. Relation between Entry and Exit Thresholds and the Discount Rate

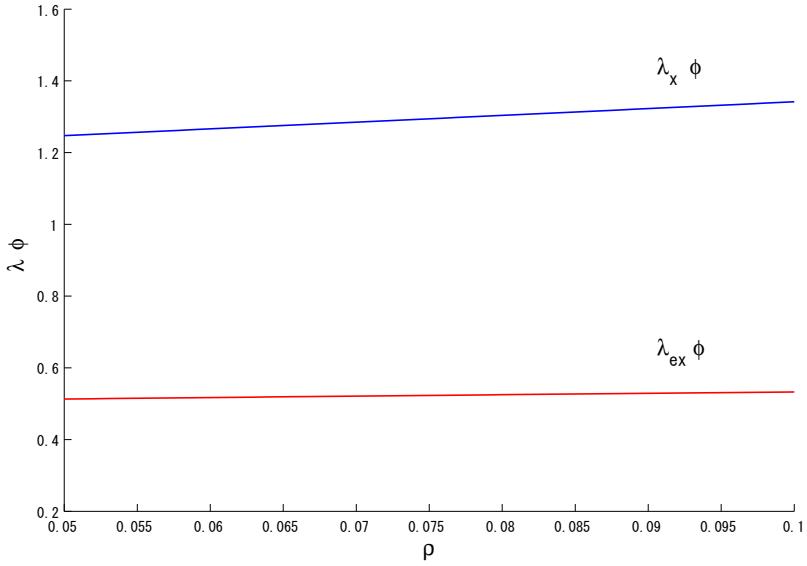

Table A1. Benchmark Parameters

Subjective discount rate ρ	0.06
Coefficient of relative risk aversion θ	0
Average growth rate of the foreign market μ	0.03
Volatility of the foreign market σ	0.2
Operating fixed cost f	0.8
Entry fixed cost f_x	20