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Effects of CEOs' Characteristics on Internationalization of Small and Medium Enterprises 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. However in practice, m Abstract any productive firms are not internationalized, whereas many unproductive firms are. This situation suggests that factors other than productivity influence internationalization.

This study examines a set of potential factors –personal characteristics of the chief executive officer (CEO)– using a unique panel dataset for Japanese small and medium enterprises (SMEs). We find that SMEs are more likely to be internationalized when the CEO is more risk-tolerant, forward-looking, and internationally experienced.

These factors show significant statistical relationships with SMEs' decisions to internationalize, perhaps suggesting why productive firms might not internationalize.

In addition, we find that productivity has no significant relationship with the decision of exiting international markets probably because initial costs of internationalization become sunk, whereas SMEs with internationally experienced CEOs show strongly less likelihood of exit. These empirical results are consistent with theoretical predictions of our model that incorporates the uncertainty of foreign markets into the trade theory with firm heterogeneity.

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

JEL classification: F19; F21

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1 Introduction

The body of theoretical and empirical studies regarding international trade has grown substantially. 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, Melitz, and Yeaple (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, Melitz, and Yeaple (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 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, Lach, and Tybout (1998) for Columbia, Mexico, and Morocco; Bernard and Jensen (1999, 2004) and Bernard, Eaton, Jensen, and Kortum (2003) for the United States; Head and Ries (2003), Tomiura (2007), and Todo (2011) for Japan; Barrios, Görg, and Strobl (2003) for Spain, Greenaway and Kneller (2004) for the UK, Mayer and Ottaviano (2007) for various EU countries; Damijan, Polanec, and Prasnikar (2007) for Slovenia; and Eaton, Kortum, and Kramarz (2008) for France. Useful surveys can be found in Bernard, Jensen, Redding, and Schott (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, Kortum, and Kramarz (2008) 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 dataset 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 chief executive officer (CEO) of each SME, such as his/her risk and time preference and overseas experience.

Our theoretical model integrates heterogeneous-firm models of trade developed by Melitz (2003) and Helpman, Melitz, and Yeaple (2004) and those of investment under uncertainty developed by Dixit (1989) and Dixit and Pindyck (1994) to incorporate uncertainty in foreign markets. The model predicts that firms are more likely to be internationalized when the CEO is less risk averse or less myopic, and when he has studied, worked, or lived abroad.

Probit estimations using firm-level data for Japanese SMEs, in which possible endogeneity biases are carefully controlled for, support these theoretical predictions. In fact, the effect of the CEO's risk and time preference and international experience are large in magnitude. In addition, we find that productivity has no effect on firms' decision of exiting export markets. 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 presents a theoretical model that generates empirical predictions. Section 3 shows the estimation method based on the theory. Section 4 describes data used in the estimation. Section 5 presents estimation results. Section 6 concludes.

2 Theoretical Model

To obtain empirical predictions concerning firms' decisions to enter and exit foreign markets, we incorporate uncertainty in foreign markets into a standard trade model with heteroge-

neous firms à la Melitz (2003) and Helpman, Melitz, and Yeaple (2004), closely following Dixit and Pindyck (1994) and Dixit (1989). For simplicity, we regard exporting and FDI as the same internationalization activity and assume that both require identical costs and generate identical profits. The term "export" hereafter in this section is equivalent to exporting and FDI.

2.1 Set-up

Consider monopolistically competitive firms that can potentially export to foreign markets. Demand in foreign markets is uncertain. Firms incur a lump-sum investment f_x to initiate export.[2] In addition, exporting requires a per-period fixed cost f. Thus, firm i earns a per-period profit $\lambda_{it}\phi_i - f$ from exporting, where λ_{it} captures firm-specific idiosyncratic shocks to foreign demand and ϕ_i captures the time-invariant firm characteristics, particularly representing firm i's productivity.[3] Exporting firms can decide to suspend exports (exit from the foreign market) without any costs, although they must incur the entry cost f_x again should it decide to reenter at some future time.[4]

Based on Dixit and Pindyck (1994) and Dixit (1989), we incorporate uncertainty in the foreign market by assuming that the index of the foreign market size λ_{it} follows a geometric Brownian motion:

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

where μ denotes the drift parameter, σ the variance parameter, and dz a standard Wiener process with $E[dz] = 0$ and $E[(dz)^2] = dt$.[5]

The firm's decision problem has two state variables: the current shock λ_i and a discrete variable that indicates whether the firm exports ($I = 1$) or not ($I = 0$). In state $(\lambda, 0)$, the firm decides whether to remain a non-exporter (a domestic-only firm) or to export. Likewise, in state $(\lambda, 1)$, it decides whether to continue exporting or to exit the foreign market. The net instantaneous export profit for firm i in time t depends on its status on

[2]The specification of firms' incurring fixed costs for export is quite common in the recent firm-heterogeneity literature in international trade, such as Melitz (2003). We can interpret the fixed cost f as a cost for maintaining sales networks in the foreign market and the fixed cost f_x as a cost for redesigning products according to the foreign market's special requirements, for example.

[3]To obtain this specification, we actually suppose that firm i faces an iso-elastic demand of $q = Ap^{-\theta}$ in the foreign market. The firm follows the standard markup pricing rule and the gross profit from the foreign market is given by $\frac{A}{\theta}[\frac{\tau c}{\alpha}]^{1-\theta}\varphi_i^{\theta-1}$ where $\alpha \equiv (\theta-1)/\theta \in (0,1)$, c is the input price, $\tau > 1$ is an iceberg-type transportation cost, and φ_i is the firm-specific productivity. We assume that only A is stochastically variable. Hence, defining $\lambda \equiv \frac{A}{\theta}[\frac{\tau c}{\alpha}]^{1-\theta}$ and without loss of generality, we take λ itself as the stochastic variable. $\varphi_i^{\theta-1}$ is also redefined as ϕ_i

[4]Thus, exiting from the foreign market is costly even if there is no explicit cost for suspending exports.

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

internationalization:

$$\pi_{it}(I_t) = \begin{cases} \lambda_{it}\phi_i - f, & \text{if } I_t = 1 \text{ and } I_{t-1} = 1; \\ \lambda_{it}\phi_i - f - f_x, & \text{if } I_t = 1 \text{ and } I_{t-1} = 0; \\ 0, & \text{if } I_t = 0. \end{cases}$$

The firm maximizes the discounted sum of profits given by

$$\max_{I_t} E_t \left[\int_0^\infty e^{-\rho t} \pi_{it}(I_t) dt \right], \tag{2}$$

where ρ is the risk-adjusted subjective discount rate indicating the return rate that firms require from risky assets (including their own risky export revenues). More specifically, ρ is given by

$$\rho = r + (\text{risk adjustment}), \tag{3}$$

where r is the rate of return on the risk-free asset. For example, equation (3) implies that if firms are risk-neutral, the risk-adjustment term becomes zero and the subjective discount rate equals the risk-free return rate r. As firms become more risk-averse, they require higher returns from risky assets and hence ρ rises. As will be shown shortly, we use the standard capital asset pricing model (CAPM) to specify the risk-adjustment term.

We explicitly include the risk-adjustment term in the subjective discount rate, because we will estimate the impact of firms' risk and time preferences on internationalization, exploiting information collected from CEOs of SMEs. However, in our theoretical framework given by equations (2) and (3), a large ρ indicates that firms are more risk-averse, while it can also indicate that firms are more myopic. We lack sufficient freedom to deal with risk aversion and time preferences separately,[6] although we use separate variables for both in the empirical analysis.

2.2 Entry and Exit Decisions

In what follows, we drop subscripts i and t for notational brevity unless it causes confusion. Let $V_0(\lambda, \phi)$ be the expected present value of starting with a shock λ in the non-exporting state and following optimal policies when the firm's efficiency parameter is ϕ. $V_1(\lambda, \phi)$ can be similarly defined for the exporting state. The solution consists of these functions and the rules for optimally switching between states 0 and 1.

When the firm does not export, there is no operating profit from the foreign market. The only return to being a domestic-only firm is the expected capital gain, since the value

[6]Such restriction can be relaxed in non-expected utility frameworks studied in Epstein and Zin (1989) and Weil (1990).

$V_0(\lambda, \phi)$ changes with λ. The value of being a domestic-only firm can be expressed by

$$V_0(\lambda, \phi) = E[e^{-\rho dt} V_0(\lambda + d\lambda, \phi)]. \tag{4}$$

Expanding the right-hand side (RHS) using Ito's lemma, rearranging slightly, and taking the limit as $dt \to 0$, we obtain a familiar differential equation:

$$\rho V_0(\lambda, \phi) = \mu\lambda V_0'(\lambda, \phi) + \frac{\sigma^2\lambda^2}{2} V_0''(\lambda, \phi). \tag{5}$$

This equation implies that the expected return rate on the asset $V_0(\lambda, \phi)$ equals the firm's subjective discount rate, ρ.[7]

The expected present value of an exporting firm, $V_1(\lambda, \phi)$, can be similarly derived. The only difference is that the exporter earns an instantaneous profit $\lambda\phi - f$. The differential equation for $V_1(\lambda, \phi)$ is given by

$$\rho V_1(\lambda, \phi) = \lambda\phi - f + \mu\lambda V_1'(\lambda, \phi) + \frac{\sigma^2\lambda^2}{2} V_1''(\lambda, \phi). \tag{6}$$

Solving these two differential equations in (5) and (6) yields the following functional forms:

$$V_0(\lambda, \phi) = A_1(\lambda\phi)^{\beta_1}, \tag{7}$$

and

$$V_1(\lambda, \phi) = A_2(\lambda\phi)^{\beta_2} + \frac{\lambda\phi}{\rho - \mu} - \frac{f}{\rho}, \tag{8}$$

where A_1, A_2, $\beta_1 > 1$, and $\beta_2 < 0$ are constant. The derivation of equations (7) and (8) is standard and relegated to the Appendix.

We now consider the transition from a domestic-only firm to an exporter and vice versa. For each firm, there exists a threshold λ_1 above which it starts to export, such that

$$V_1(\lambda_1, \phi) - V_0(\lambda_1, \phi) = f_x. \tag{9}$$

[7] Ito's lemma gives the differential dV_0 as

$$\begin{aligned} dV_0 &= V_0'(\lambda)d\lambda + (1/2)V_0''(\lambda)(d\lambda)^2 \\ &= [\mu\lambda V_0'(\lambda) + (1/2)(\sigma\lambda)^2 V_0''(\lambda)]dt + \sigma\lambda V_0'(\lambda)dz, \end{aligned}$$

where (1) is substituted into $d\lambda$ and $(d\lambda)^2$. The per-period flow of the expected capital gain is

$$E[dV_0] = [\mu\lambda V_0'(\lambda) + (1/2)(\sigma\lambda)^2 V_0''(\lambda)]dt.$$

Thus, expanding the RHS of (4), we obtain

$$V_0(\lambda) = (1 - \rho dt)V_0(\lambda) + [\mu\lambda V_0'(\lambda) + (1/2)(\sigma\lambda)^2 V_0''(\lambda)]dt + o(dt),$$

where $o(dt)$ collects the terms that approach zero faster than dt. The derivation of (5) is immediate.

Likewise, for each firm, there exists a threshold λ_0 above which firms keep exporting and below which firms quit exporting, such that

$$V_1(\lambda_0, \phi) - V_0(\lambda_0, \phi) = 0. \tag{10}$$

We also have smooth pasting conditions as follows:

$$V_1'(\lambda_s, \phi) = V_0'(\lambda_s, \phi), \quad s = 0, 1. \tag{11}$$

Applying the functional forms of V_0 and V_1 in equations (7) and (8) to the two threshold conditions in (9) and (10) and the two smooth pasting conditions in (11), we have four equations for solving four unknowns $A_1, A_2, \lambda_1(\phi)$, and $\lambda_0(\phi)$ for given ϕ.

2.3 Empirical Predictions

The simple model above generates several intuitive predictions about firms' entry and exit. Most results are studied in Dixit (1989) except for those related to firm heterogeneity in productivity ϕ. Thus, rather than the derivations of those predictions, we focus on the intuitions of those predictions and the interpretations in our estimations.[8]

First, from equations (7)-(11), we notice that $\lambda_1\phi$ and $\lambda_0\phi$ are constants and independent of the productivity parameter ϕ. This implies that more-productive firms have a lower trigger value of λ for both entering and exiting foreign markets. In other words, productive firms are more likely to serve foreign markets and less likely to exit, because profits from foreign markets are larger. This is a standard result obtained from heterogeneous-firm models of trade, such as Melitz (2003).

Second, the trigger value for entering foreign markets, λ_1, is greater than that for exiting, λ_0. Thus, once having entered foreign markets, firms tend to remain unless they face a large decline in foreign demand. This result indicates hysteresis in internationalization of firms, predicting that incumbent internationalized firms are more likely to remain internationalized. In the empirical estimation, we control for this hysteresis by including the previous export intensity for each firm.

Third, the distance between λ_1 and λ_0 is shorter for more-productive firms, since $\lambda_1\phi - \lambda_0\phi = C$, where C is a constant such that $\lambda_1 - \lambda_0 = C/\phi$. The trigger values for entries and exits are decreasing in the productivity measure, but the trigger value for entries declines

[8]Some basic results can be analytically derived, but many other results cannot since equations (9), (10), and (11) are highly nonlinear. Numerical solutions are common for performing comparative statics.

more substantially as productivity rises. Therefore, productivity affects entering foreign markets more than it affects exiting.

Fourth, the entry cost f_x is related to the gap between λ_1 and λ_0, as an increase in entry cost f_x raises λ_1 and lowers λ_0. One determinant of entry cost is the firm's knowledge of foreign markets. We assume that this knowledge can be enhanced by experience with the foreign country. Another determinant of entry cost is the level of workers' education, since educated workers can learn foreign markets more easily. Therefore, we hypothesize that workers' international experience and education level raise the likelihood that SMEs will internationalize.

Fifth and most important, the firm's subjective discount rate, ρ, positively affects the trigger value for entry. Thus, firms are less likely to enter foreign markets when their discount rate is high. To further clarify the relationship between ρ and the degree of risk aversion, we employ the result of the capital asset pricing model (CAPM), in which risk adjustment is given by multiplying the total amount of risk by the price of risk, and rewrite equation (3) as:

$$\rho = r + \frac{cov(dV_0/V_0, r_m)}{var(r_m)}[\bar{r}_m - r], \tag{12}$$

where r_m is the rate of return on the market portfolio and $\bar{r}_m$ is its average. Defining $\xi \equiv \frac{cov(dz/V_0, r_m)}{var(r_m)}[\bar{r}_m - r]$ and substituting equation (12) into the differential equation (5), the option value of export can be expressed in terms of the rate of return of the risk-free asset r such that

$$rV_0(\lambda, \phi) = (\mu - \sigma\xi)\lambda V_0'(\lambda, \phi) + \frac{\sigma^2\lambda^2}{2}V_0''(\lambda, \phi). \tag{13}$$

Assuming that V_0 and the market portfolio are positively correlated, $\xi > 0$, the above differential equation implies that the expected rate of return on the risky assets should be lower than the rate of return on the risk-free asset. The value of V_1 is analogous to V_0, substituting ρ and μ in (6) with r and $\mu - \sigma\xi$, respectively. Accordingly, highly risk-averse firms are more readily deterred from exporting and more easily encouraged to quit exporting. As explained earlier, our theoretical framework cannot distinguish between the degree of risk aversion and the discount rate. Therefore, we expect that myopic firms are less likely to enter foreign markets. In our estimation, we use data on CEOs' risk and time preferences to test these hypotheses.

3 Estimation Method

To test the predictions provided in the previous section, we employ a probit model. Let us first define the difference in the long-term profit between the domestic and the exporting states: $y_i^* \equiv V_1(\lambda, \phi) - V_0(\lambda, \phi) - f_x$. Firm i is internationalized ($y_i = 1$) if $y_i^* \geq 0$, and not internationalized ($y_i = 0$) if $y_i^* < 0$. On the basis of our theoretical arguments, we assume that y_i^* is determined by a set of explanatory variables Z_i including productivity, firm size, workers' educational level, and indicators for risk and time preferences, and international experience of the CEO:

$$y_i^* = Z_i'\theta + u_i, \tag{14}$$

where 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 dataset in this study includes the current share of college graduates but not the lagged share, we estimate equation (14) together with another equation,

$$educ_i = x_i'\beta + \nu_i, \tag{15}$$

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.

Besides the determinants of internationalization, we also examine the determinants of dis-internationalization, i.e., how exits from foreign markets are determined. 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 (14) where a previous exporter i stops exporting, or $\tilde{y}_i = 1$, if $\tilde{y}_i^* \equiv -(V_1(\lambda, \phi) - V_0(\lambda, \phi)) \geq 0$, and is still exporting, or $\tilde{y}_i = 0$, if $\tilde{y}_i^* < 0$. Factors that determine exiting export markets are similar to those that determine internationalization: productivity, firm size, characteristics of the CEO, 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. 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 dataset

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 CEOs, 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 dataset based on the survey on internationalization with another dataset 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 CEOs

The survey on internationalization offers information rarely available in other firm-level data sets. First, it questioned the CEO of each firm about international experience: "Have you studied, worked, or lived abroad?" Since CEOs 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 CEO and hence prior to the decision of internationalizing the firm. A related question concerns international experience of the firm's other workers: "Has any worker studied, worked, or lived abroad?" However, since firms willing to be internationalized are more likely to employ workers with international experience, this indicator may be endogenous and will be dropped in some specifications in our estimation. From the theoretical argument in Section 2, we expect that international experience of the CEO and other workers lowers the initial cost of internationalization, particularly costs of marketing and understanding business rules and laws, and thus raises the probability of internationalization.

Second, the survey asked about CEOs' 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 CEO 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 CEO 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 inquired into CEOs' 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 CEOs chose the final response ("In any case, ..."), we constructed a binary variable that takes zero if the CEO chose it and one otherwise. We presume that this variable approximates whether the CEO 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, Hartog, Jonker, and Van Praag (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, Loewenstein, and O'Donoghue (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, Camerer, and Nguyen (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 CEOs, relatively rich individuals.

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 differ-

ence 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 (14) and (15) in Section 3. We also performed simple probit estimation of equation (14) 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 columns (3) and (4), we drop the indicator for workers' international experience and focus on the indicator for the CEO's international experience, since the former is more likely to be endogenous, as explained in Section 4. In each column, the upper and lower rows, respectively, indicate the estimates of the coefficients and the marginal effect at means.

In all 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 internationalization experience measured by share of exports in total sales in 2006 is also positive and significant. These results are standard in the literature.

Surprisingly, the firm size measured by the log of the number of employees has no significant effect on internationalization, although a positive effect is 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.

CEOs' 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 columns (2) and (4) of Table 2, if the CEO'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 CEO becomes forward-looking, that is, if the indicator for time preference changes from 0 to 1, the probability would increase by

6-7 percentage points. If the CEO had studied, lived, or worked abroad, the probability of internationalization would be about 12 and 19 percentage points higher in columns (2) and (4), respectively. If other workers have international experience, the increase in probability increases by 23 percentage points. These findings suggest that the risk tolerance, time preferences, and international experience of the CEO and other workers largely determine the firm's decision to internationalize.

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. Finally, years in business has a positive and significant effect. This finding suggests that old firms are more likely to be internationalized, implying that internationalization requires experience.

5.2 Psychological effect of the CEO's characteristics

Having found new evidence that CEOs' characteristics and experiences substantially influence SMEs' internationalization, we further examine how these characteristics psychologically affect decision on internationalization. To do so, we ask a question to domestic-only firms: "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.[9]

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 CEO 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 CEO's risk preference and international experience have large effects. In short, even when productivity is high, firms may be unwilling to internationalize if the CEO is risk-averse or has no international experience. These results combined with those in Section 5.1 show that personal characteristics of an SMEs CEO erect psychological barriers for entering foreign markets.

[9]Multiple choices are allowed for this question.

5.3 Determinants of exit from export markets

Along with the factors determining internationalization, we are also interested in dis-internationalization. We focus on conditions under which previous exporters stop exporting, 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 in Section 3. As in Section 5.1, we use the indicator of international experience of other workers in columns (1) and (2) but drop it in (3) and (4) to avoid endogeneity.

The results show that when the CEO has studied, worked, or lived abroad, exporting firms are 5-7 percentage points less likely to stop exporting. Other workers' international experience shows a similar effect, as does the share of exports in total sales, indicating that firms engaged in exporting are less likely to stop exporting.

By contrast, productivity has no significant effect on exits, implying that even unproductive firms remain in export markets. This is probably because after entry, initial costs of export become sunk and unproductive firms have no reason to exit export markets. This finding explains why unproductive firms might be internationalized (Figure 1). However, it remains puzzling that productivity has no significant effect at all, rather than having a small effect. Perhaps other factors neutralize productivity in the decision to exit export markets, but data limitations prevent the investigation of this issue.

The results in Table 4 also indicate that the CEO's risk tolerance and 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 sunk costs on entering and exiting foreign markets. The CEO's risk and time preferences affect the entry decision but not the exit decision after initial costs become sunk.

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 dataset for Japanese SMEs, we found that firms are more likely to be internationalized when the CEO is more risk-tolerant, forward-looking, and internationally experienced. We also found that the CEO'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 CEO 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 CEO's international experience have negative and significant relationships. The evidence suggests that initial export costs become sunk costs, and hence, even unproductive firms do not exit export markets, explaining why unproductive firms are internationalized. These empirical results 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 CEOs' personal characteristics as exogenous, they may be endogenous. A CEO's risk tolerance and time preference may change after evaluating previous decisions including those to internationalize. Moreover, although we assume that CEOs 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 firms internationalization to the CEO'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.

A Computation of Differential Equations

The second-order homogenous differential equation in (5) is linear in the dependent variable V_0 and its derivatives. This equation has the general solution

$$V_0(\lambda, \phi) = A_1(\lambda\phi)^{\beta_1} + A_2(\lambda\phi)^{\beta_2}, \tag{A.1}$$

where A_1 and A_2 are constants to be determined and β_1 and β_2 are the roots of the corresponding auxiliary equation

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

The solutions of this auxiliary equation are

$$\beta_1 = \left[\frac{1}{2} - \frac{\mu}{\sigma^2}\right] + \sqrt{\left[\frac{1}{2} - \frac{\mu}{\sigma^2}\right]^2 + \frac{2\rho}{\sigma^2}}, \tag{A.3}$$

and

$$\beta_1 = \left[\frac{1}{2} - \frac{\mu}{\sigma^2}\right] - \sqrt{\left[\frac{1}{2} - \frac{\mu}{\sigma^2}\right]^2 + \frac{2\rho}{\sigma^2}}. \tag{A.4}$$

By assumption, $\mu < \rho$. The quadratic equation of the left-hand side of (A.2) takes the value $2(\mu - \rho)/\sigma^2 < 0$ at $\beta = 1$ and the minimum value at $\beta = (1/2) - \mu/\sigma^2 < (1/2)$. Therefore, $\beta_1 > 1$ and $\beta_2 < 0$.

Since when λ is very small, the option to export is virtually worthless, which implies that $A_2 = 0$ (we abandon the negative root β_2). Thus, the solution of $V_0(\lambda, \phi)$ can be expressed by

$$V_0(\lambda, \phi) = A_1(\lambda\phi)^{\beta_1}. \tag{A.5}$$

The differential equation in (6), rewritten below for reference, is non-homogenous:

$$\frac{\sigma^2\lambda^2}{2}V_1''(\lambda, \phi) + \mu\lambda V_1'(\lambda, \phi) - \rho V_1(\lambda, \phi) = f - \lambda\phi. \tag{A.6}$$

Since the RHS is the first order of λ, we try to find a particular solution of the form $V_1(\lambda) = A\lambda + B$. Since $V_1'' = 0$ and $V_1' = A$, the differential equation (A.6) becomes

$$\mu\lambda A - \rho(A\lambda + B) = f - \lambda\phi. \tag{A.7}$$

Equating coefficients, we obtain $A = \phi/(\rho - \mu)$ and $B = -f/\rho$. Therefore, abusing notations slightly, the general solution of V_1 can be expressed by

$$V_1(\lambda, \phi) = A_1(\lambda\phi)^{\beta_1} + A_2(\lambda\phi)^{\beta_2} + \frac{\lambda\phi}{\rho - \mu} - \frac{f}{\rho}. \tag{A.8}$$

In a vein similar to the $V_0(\lambda, \phi)$, we have $A_1(\phi) = 0$ in this case, so the value function becomes

$$V_1(\lambda, \phi) = A_2(\lambda\phi)^{\beta_2} + \frac{\lambda\phi}{\rho - \mu} - \frac{f}{\rho}. \tag{A.9}$$

With the functional forms in (A.5) and (A.9), the conditions in (9) and (10) can be written by

$$A_2(\lambda_x\phi)^{\beta_2} + \frac{\lambda_x\phi}{\rho - \mu} - \frac{f}{\rho} = A_1(\lambda_x\phi)^{\beta_1} + f_x, \tag{A.10}$$

$$A_2(\lambda_{ex}\phi)^{\beta_2} + \frac{\lambda_{ex}\phi}{\rho - \mu} - \frac{f}{\rho} = A_1(\lambda_{ex}\phi)^{\beta_1}. \tag{A.11}$$

The smooth pasting conditions in (11) can be expressed by

$$A_2\beta_2(\lambda_x\phi)^{\beta_2 - 1} + \frac{1}{\rho - \mu} = A_1\beta_1(\lambda_x\phi)^{\beta_1 - 1}, \tag{A.12}$$

$$A_2\beta_2(\lambda_{ex}\phi)^{\beta_2 - 1} + \frac{1}{\rho - \mu} = A_1\beta_1(\lambda_{ex}\phi)^{\beta_1 - 1}. \tag{A.13}$$

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Figure 1: Distribution of Productivity by Types of Firm

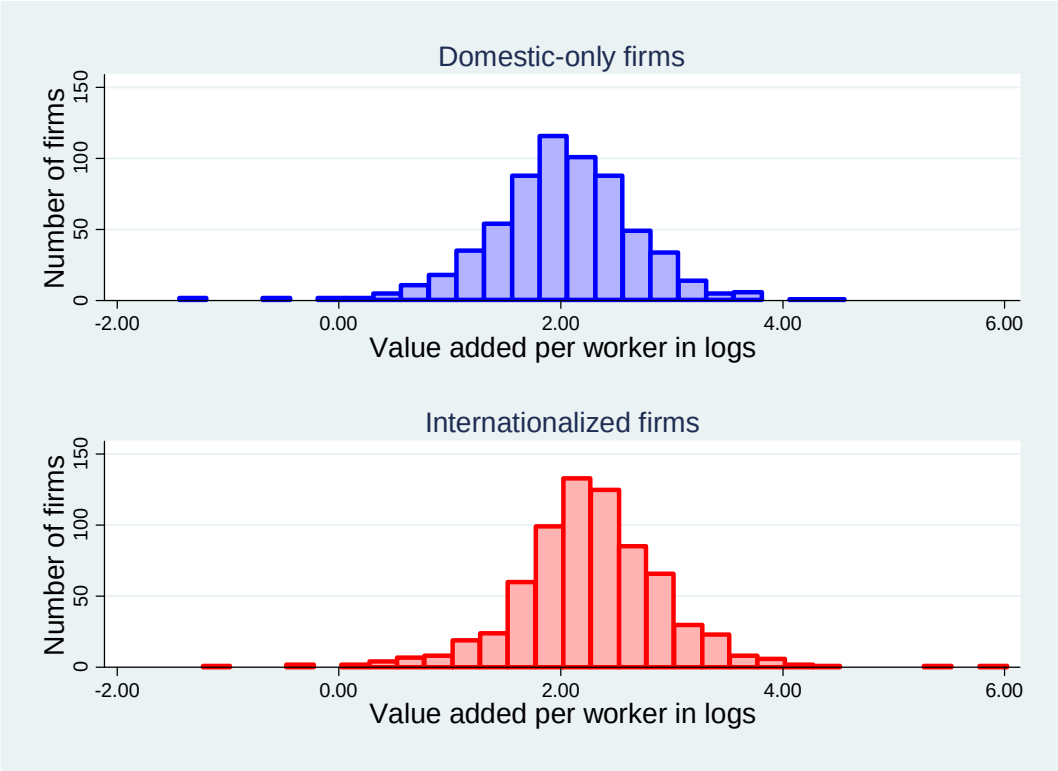

Table 1: Summary Statistics

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 risk preference (1-6, 6 = risk taking)	1341	3.24	2.25	2.95	3.49
Index of time preference (0-1, 0 = myopic)	1341	0.50	0.50	0.47	0.53
President's overseas experience (0-1)	1341	0.27	0.45	0.15	0.39
Workers' overseas experience (0-1)	1341	0.16	0.36	0.09	0.21
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

	(1)	(2)	(3)	(4)
	Probit	FIML	Probit	FIML
Coefficient				
Share of college graduates	0.0141***	0.000775	0.0148***	-0.00274
	(0.00259)	(0.0227)	(0.00259)	(0.0209)
Risk preference (1-6, 6 = risk taking)	0.0520***	0.0544***	0.0499***	0.0525***
	(0.0141)	(0.0153)	(0.0141)	(0.0156)
Time preference (0-1, 0 = myopic)	0.137*	0.155*	0.153**	0.175**
	(0.0746)	(0.0852)	(0.0689)	(0.0747)
President's overseas experience (0-1)	0.282**	0.331**	0.443***	0.510***
	(0.138)	(0.154)	(0.137)	(0.142)
Workers' overseas experience (0-1)	0.617***	0.638***		
	(0.155)	(0.140)		
Years of operation	0.00505***	0.00529***	0.00501***	0.00528***
	(0.00148)	(0.00170)	(0.00144)	(0.00159)
Ratio of exports to total sales in 2006	0.0598**	0.0602**	0.0594**	0.0596**
	(0.0282)	(0.0278)	(0.0288)	(0.0281)
Value added per worker in 2006 (log)	0.238***	0.286***	0.257***	0.319***
	(0.0735)	(0.0748)	(0.0753)	(0.0763)
Number of workers in 2006 (log)	-0.0596	-0.0542	-0.0115	-0.00164
	(0.0516)	(0.0538)	(0.0480)	(0.0496)
Marginal effect				
Share of college graduates	0.00548***	0.000300	0.00575***	-0.00107
	(0.00103)	(0.00881)	(0.00104)	(0.00812)
Risk preference (1-6, 6 = risk taking)	0.0202***	0.0211***	0.0194***	0.0204***
	(0.00566)	(0.00619)	(0.00570)	(0.00635)
Time preference (0-1, 0 = myopic)	0.0531*	0.0599*	0.0593**	0.0681**
	(0.0285)	(0.0328)	(0.0263)	(0.0286)
President's overseas experience (0-1)	0.106**	0.123**	0.163***	0.186***
	(0.0495)	(0.0551)	(0.0462)	(0.0475)
Workers' overseas experience (0-1)	0.221***	0.228***		
	(0.0509)	(0.0454)		
Years of operation	0.00195***	0.00205***	0.00195***	0.00205***
	(0.000564)	(0.000655)	(0.000550)	(0.000614)
Ratio of exports to total sales in 2006	0.0231**	0.0233**	0.0231**	0.0232**
	(0.0104)	(0.0102)	(0.0106)	(0.0104)
Value added per worker in 2006 (log)	0.0922***	0.111***	0.0999***	0.124***
	(0.0294)	(0.0307)	(0.0302)	(0.0314)
Number of workers in 2006 (log)	-0.0231	-0.0210	-0.00446	-0.000637
	(0.0201)	(0.0209)	(0.0187)	(0.0193)
Observations	1341	1341	1341	1341
Log likelihood ratio	-670.1	-6193	-684.5	-6210

Notes: The dependent variable is whether the firm is internationalized (=1) or not (=0). 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

	(1)	(2)
	Probit	Probit
Coefficient		
Risk preference (1-6, 6 = risk taking)	-0.0791***	-0.0806***
	(0.0232)	(0.0234)
Time preference (0-1, 0 = myopic)	-0.109	-0.106
	(0.0804)	(0.0823)
President's overseas experience (0-1)	-0.221*	-0.312**
	(0.130)	(0.139)
Workers' overseas experience (0-1)	-0.385*	
	(0.226)	
Year of establishment	-0.00130	-0.00124
	(0.00214)	(0.00218)
Value added per worker in 2006 (log)	-0.0342	-0.0475
	(0.0824)	(0.0812)
Number of workers in 2006 (log)	0.105*	0.0966*
	(0.0581)	(0.0568)
Marginal effect		
Risk preference (1-6, 6 = risk taking)	-0.0310***	-0.0316***
	(0.00908)	(0.00917)
Time preference (0-1, 0 = myopic)	-0.0425	-0.0414
	(0.0314)	(0.0321)
President's overseas experience (0-1)	-0.0847*	-0.118**
	(0.0482)	(0.0500)
Workers' overseas experience (0-1)	-0.144*	
	(0.0785)	
Year of establishment	-0.000511	-0.000488
	(0.000840)	(0.000853)
Value added per worker in 2006 (log)	-0.0134	-0.0186
	(0.0323)	(0.0318)
Number of workers in 2006 (log)	0.0412*	0.0379*
	(0.0228)	(0.0223)
Observations	723	723
Log likelihood ratio	-456.1	-457.9

Notes: This table is based on a probit model in which the dependent variable is a dummy variable equal to one if the firm stated "The firm does not need to be internationalized" and zero otherwise. 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

	(1)	(2)	(3)	(4)
	Probit	FIML	Probit	FIML
Coefficient				
Risk preference (1-6, 6 = risk taking)	0.00908	-0.000437	0.0176	0.00596
	(0.0338)	(0.0341)	(0.0332)	(0.0338)
Time preference (0-1, 0 = myopic)	-0.186	-0.116	-0.199	-0.138
	(0.151)	(0.153)	(0.149)	(0.152)
President's overseas experience (0-1)	-0.275	-0.337	-0.404**	-0.451**
	(0.208)	(0.212)	(0.201)	(0.203)
Other worker's overseas experience (0-1)	-0.554***	-0.473**		
	(0.200)	(0.200)		
Years of operation	-0.00257	-0.00242	-0.00266	-0.00233
	(0.00231)	(0.00222)	(0.00232)	(0.00219)
Ratio of exports to total sales in 2006	-0.0189***	-0.0172***	-0.0188***	-0.0174***
	(0.00549)	(0.00560)	(0.00535)	(0.00503)
Value added per worker in 2006 (log)	-0.148		-0.115	
	(0.125)		(0.122)	
Number of workers in 2006 (log)	0.0195		-0.0209	
	(0.0748)		(0.0722)	
Sales per worker (log)		-0.291		-0.229
		(0.212)		(0.157)
Number of workers (log)		0.00594		-0.0324
		(0.0735)		(0.0696)
Marginal effect				
Risk preference (1-6, 6 = risk taking)	0.00150	-7.68e-05	0.00304	0.00106
	(0.00557)	(0.00599)	(0.00575)	(0.00604)
Time preference (0-1, 0 = myopic)	-0.0308	-0.0205	-0.0346	-0.0248
	(0.0252)	(0.0271)	(0.0261)	(0.0274)
President's overseas experience (0-1)	-0.0407	-0.0522*	-0.0599**	-0.0682***
	(0.0273)	(0.0287)	(0.0250)	(0.0255)
Other worker's overseas experience (0-1)	-0.0781***	-0.0727***		
	(0.0235)	(0.0264)		
Years of operation	-0.000423	-0.000425	-0.000459	-0.000416
	(0.000379)	(0.000395)	(0.000398)	(0.000393)
Ratio of exports to total sales in 2006	-0.00312***	-0.00301***	-0.00325***	-0.00310***
	(0.000826)	(0.000879)	(0.000847)	(0.000814)
Value added per worker in 2006 (log)	-0.0244		-0.0199	
	(0.0205)		(0.0209)	
Number of workers in 2006 (log)	0.00321		-0.00362	
	(0.0123)		(0.0125)	
Sales per worker (log)		-0.0510		-0.0410
		(0.0408)		(0.0301)
Number of workers (log)		0.00104		-0.00579
		(0.0129)		(0.0124)
Observations	584	556	584	556
Log likelihood ratio	-192.9	-1145	-197.1	-1149

Notes: The dependent variable is whether the firm stopped exporting (=1) or is still exporting (=0). 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.