Dissecting Risk: Exit, Default, and Export Participation*

PRELIMINARY AND INCOMPLETE

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Abstract: Many models in trade and macroeconomics treat firm default as identical to firm exit, or ignore it altogether. Using a database of Portuguese firms and export activity matched with the national credit registry, we document that default and exit are quite distinct and are consistent with a theory of option values, where re-entry costs create hysteresis. We present a structural model to motivate our empirical analysis, both of which shed light on how the risks involved in exporting affect the firm's dynamic entry and exit behavior. While default rates increase in export intensity at a decreasing rate, as an inverted u-shape, exporters are more likely to default when they exit, suggesting that both the special penalties involved in re-entry after default and the sunk nature of some trade costs can make exporters more risky for lenders than non-exporters when they exit.

Keywords: Exports, Default, Exit, Heterogeneous firms, Macroeconomic uncertainty.

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1. Introduction

What makes a firm risky? Many new models of financial frictions in the global economy model risk as the probability of firm exit, or as an exogenous variable that might be constant, or might vary according to a stochastic shock. Yet exit with orderly liquidation of assets and repayment of debts is quite different from default in the eyes of a lender. In any model of financial frictions, the possibility of default drives a wedge between the cost of funds to a lender and the interest rate it charges a borrower. Thus, default governs the outcome of any quantitative analysis of the real outcomes of financial variables— whether it is considered explicitly as an independent parameter[1] or implicitly as part of a risk premium[2]. The purpose of this paper is to quantify the riskiness involved in the export business to better understand what sort of financial constraints govern exporters.

The literature on risk and default among exporters is somewhat conflicted. For instance, Chaney (2013) asserts that less liquidity-constrained firms are more likely to be exporters, but that exporters more generally are likely to face much greater liquidity constraints than non-exporters because lenders cannot easily verify or monitor their global sales. He contrasts his argument with that of Campa and Shaver (2002), who find that exporters are less liquidity constrained than non-exporters, arguing that lenders believe exporters' sales are better diversified across markets, not that they are necessarily more reliable firms *ex ante*. Fillat and Garreto (2009) suppose that sunk costs of exporting make exporters more risky for investors because they are slower to exit the market, a form of hysteresis apparent in higher average but more volatile stock returns. More recently, Feenstra et al. (2013) argue that lenders view exporters as facing more risks related to time lags and transactions with foreign institutions and find evidence that this caution may have contributed to the collapse in exports among Chinese firms in the recent financial crisis. This discussion of risk and financial constraints is complicated by the fact that little is known about the actual behavior of exporters versus non-exporters as borrowers.

Here, we are able to use an unusually exhaustive dataset of matched Portuguese firm-employee-export-creditor dataset to look at default, exit, and export behavior all at once, so that we can see exactly how risky globally active firms are. We find—surprisingly–that all three of

[1]See models of credit constrained exporters such as Chaney (2013), Manova (2013) and Feenstra, Li, and Yu (2013) or financial accelerator models related to Carlstrom and Fuerst (1997) and Bernanke, Gertler, and Gilchrist (1998).

[2]For instance, models based on Kiyotaki and Moore (1997)

these interpretations are true. Exporters are, generally speaking, somewhat less likely to go out of business (exit) than non-exporters. In this sense, they are less risky businesses as Chaney (2013) suggests. Second, exporters' sales are better diversified and thus less sensitive to fluctuations in domestic GDP, making them a better bet in terms of risk-adjusted sales as in Campa and Shaver (2002). However, as conjectured by Feenstra et al. (2013), exporters are more risky from a lending standpoint because their default rate is higher in many cases—and up to 50 percent higher conditional on exit.

These facts fit well with a theory of sunk costs and hysteresis expanded to include the firm's option to default. Drawing from the approach that Impullitti, Irarrazabal, and Opromolla (2013), and more recently Fillat and Garreto (2009) and Fillat, Garreto, and Oldenski (2013), apply to globally active firms, we consider the implications of risk involved in trade for firms facing punishing costs of re-entry into credit markets if they default, or of rebuilding their distribution network if they exit. Globally active firms reap the benefits of diversification across markets. However, given that a firm exits, they are more likely to default because the costs involved in default are smaller compared to the costs involved in exiting and rebuilding a firm's global network. Both Impullitti et al. (2013) and Fillat and Garreto (2009) present models of exporting where the costs of exporting are sunk, making exporters less likely to exit than non-exporters. We argue that the sunk nature of some export costs makes exporters less sensitive to the future implications of default.

All firms try to avoid default even upon exit in order to avoid increases in future re-entry costs. However, for exporters, the cost of re-entry after a firm exits entirely from all activity also includes the cost of re-establishing trading relationships overseas. The re-entry cost for an exporter who exits and defaults is not just the increased re-entry cost arising due to burning its bridges with creditors, but also the cost of rebuilding bridges that it burns with trading partners. Thus, hysteresis (avoiding exit amidst negative shocks) should be stronger for exporters as in previous studies, but once a firm exits, future difficulties brought on by default are less of a deterrent. The marginal cost of defaulting once an exporter decides to exit is low relative to non-exporters since it is already so costly to ever re-build its export business in the future. More concretely, the larger sunk costs involved in establishing a global distribution network make exporters more tenacious than non-exporters. They continue to operate longer in the face of detrimental shocks, incurring greater losses and making default more likely once exit occurs. This makes exporters riskier to creditors in the sense that if they exit, they are more likely to default on their debts. Their international transactions may also make them more opaque, as Chaney (2013) conjectures, since lenders would have a difficult time discerning where an exporter is on the spectrum of diversification versus sunk-cost-induced hysteresis.

The rest of the paper describes stylized facts, our methodology and data, our preliminary results, and a discussion of future research.

2. Stylized Facts on Exit and Default

Our explicit consideration of default behavior in the context of heterogeneous firms is new. The profession knows a lot about the default behavior of large firms who issue bonds or use syndicated loans, for which detailed data is available in proprietary databases such as Bondware, Loanware, and Dealogic. Studies in trade and industrial organization have documented rates of exit in some cases (most notably Dunne, Roberts, and Samuelson (1989) and Das, Roberts, and Tybout (2007)). However, much less is known about default among the larger population of firms or its relationship to exit. For example, Dunne, Roberts, and Samuelson (1988) show that 6-7% of plants in the U.S. exit in any given year, but other studies demonstrate that the firm default rate fluctuates widely and can be as little as 2.5%, depending on the year (Maltby, 2009). Fort and Miranda (2013) show that the U.S. financial crisis accelerated exit rates among firms, especially small ones, but less is known about firm default rates under different macroeconomic conditions. There is some evidence that small firms have higher default rates that are possibly more sensitive to macroeconomic conditions than larger firms[3], but it is derived from a patchwork of separate studies, not a uniform time series. Work by Antunes, Mata, and Portugal (2011) and Antunes, Mata, and Portugal (2013) examines for the first time both firm default and exit within a closed economy setting. The purpose of this paper is to analyze firm default and exit within an open economy framework with exporters and non-exporters.

Using differences in risk faced by exporters versus non-exporters helps us disentangle the effects of risk in the market for firm output from risk associated with sunk costs that may affect globally active firms differently from their domestic counterparts. To see this, we present basic stylized facts from Portuguese national firm census, credit, and trade databases regarding, exit, default, and export status in Tables 1, 2, and 3. The data sources are described in detail below.

[3] See Russ and Valderrama (2012) for a survey.

A firm is considered as exiting in period t if t is the last year the firm appears in the matched employer-employee dataset. A firm is considered as defaulting in t if the defaulted amount in t is greater than or equal to 10 percent of the borrowed amount. Table 1 shows our key findings in raw form. Among all Portuguese borrowers engaged in manufacturing, we see in Table 1 that raw exit rates in are considerably lower than default rates regardless of export status and that raw exit rates are somewhat lower for exporters than non-exporters. However, we also see in Table 1 that (1) the default rate has an inverted 'u' shape, lowest for non-exporters and firms with more than 90 percent of their sales in export markets, and (2) although exit rates are lowest for the most export-intensive firms, the probability of default once a firm is exiting is close to 50 percent higher for exporters than for non-exporters. Thus, while exporting firms in general have a lower probability of exit, they appear to be a more risky bet for lenders, especially when exiting.

Tables 2 and 3 show that the inverted u-shaped relationship between exporting and default and the higher probability of default conditional on exit for exporters hold up even when controlling for firm size (represented by sales in Table 2 and employment in Table 3) and the degree of export intensity. The coefficients are normalized to basis points. In Table 3, for instance, non-exporters belonging to the lowest sales quintile have a default rate captured by the 'Constant' term (i.e. 8.6 percent). In contrast, a firm with export intensity belonging to the 5th quintile (i.e. between 80 percent and 100 percent) and the 3rd quintile of the sales distribution has a default rate of 8.6 + 2.9 - 2 = 9.5 percent. In both tables, we see the same inverted u-shaped relationship between export intensity and the probability of default. Controlling for size, a u-shaped relationship between export intensity and the probability of exit also emerges in both tables. The relationships are not accounted for by firm size, as both exit and default are decreasing in firm size, especially when firm size is measured by sales as in Table 2.

3. A Model of Firm Heterogeneity, Exit and Default

The model involves a choice between savings and investment by the household. A household that invests does so in its own firm, which it runs according to its own ability. Not all households are equally effective entrepreneurs, so some choose to abstain from entrepreneurship and engage themselves as production workers.

3.1 Households and production

There is a continuum of households with mass 1 within the interval [0,1]. Each household i has one unit of labor and an endowment of entrepreneurial ability, ϕ_t^i. Each period, the household has the option of supplying its unit of labor as a factory worker producing a good X, or using its unit of labor to operate its own firm producing good Y. If it chooses to operate a firm, it runs the firm according to its entrepreneurial ability, so that the output of the firm is governed by the technology

$$Y_t^i = I_{Yt}^i \phi_t^i K_t^i, \tag{1}$$

where I_{Yt}^i is an indicator variable which takes the value of one if household i operates its own firm or zero otherwise. Operating the firm precludes the household from working in sector X, but its labor yields no direct return in the firm other than to keep it running.

The household may accumulate savings from its wages or firm profits. In either case, it can deposit its savings in an account with a financial intermediary, which lends to firms in sector Y or elsewhere. Deposits earn a return of r. We are building a model to guide our interpretation of Portuguese data and Portugal is a small open economy, so we assume that r is the exogenous world interest rate (or ECB policy rate). Alternatively, the household can invest its capital to start or expand a firm. Investment by the household is illiquid and irreversible. This element of irreversibility will be important when we specify the household's decision rules.

Financial intermediaries are able to liquidate capital by exiting firms but lose a fraction μ in the process, with $0 < \mu \leq 1$. We define firm exit as the liquidation of all of a firm's capital, with no portion recovered if the firm owner exits without intermediated liquidation by a lender, or some portion recovered by the financial intermediary if the firm exits and surrenders its assets to its creditor. The intermediary transfers any proceeds from the liquidation to the firm in excess of its debts in the case of exit by a debtor firm. Exit by a debtor firm where recovered capital is insufficient to cover the full amount owed (with interest) is called exit with default.

Capital depreciates at rate δ, $0 < \delta \leq 1$. In each period, the household decides whether to continue the firm's operation or exit. If it continues operation, it may invest I_t^i units. The law of motion for capital is

$$K_{t+1}^i = (1 - \delta) K_t^i + I_t^i. \tag{2}$$

The fraction of households n, $0 < n < 1$, which do not operate firms work as laborers to produce a homogeneous good X. The X sector operates under perfect competition and uses only labor and functions as our numeraire, with $P_X = 1$. We keep the labor market very simple to focus on the behavior of borrowing, exit and default. Thus, the wage in the economy is given by the marginal product of labor in the X sector, an exogenous parameter ω.[4] Perfectly competitive final goods assemblers compile the goods X and Y into a final product,

$$Q = \left(X^{\frac{\rho-1}{\rho}} + Y^{\frac{\rho-1}{\rho}}\right)^{\frac{\rho}{\rho-1}}, \tag{3}$$

where X is the total amount of production in sector X, Y is the sum of all production in sector Y, and ρ is the elasticity of substitution, $\rho > 1$. The aggregate price index is then

$$P = (P_X^{1-\rho} + P_Y^{1-\rho})^{\frac{1}{1-\rho}}$$

and P_Y is the production-weighted average of prices charged by firms in sector Y.

3.2 *Markups and the decision to produce*

Firms are heterogeneous in their costs of production due to the different entrepreneurial abilities of their owner/managers. However, in our simple model, they produce identical goods. Many firms can coexist because consumers must search for low prices, in the spirit of Burdett and Judd (1983), Head, Liu, Menzio, and Wright (2012), De Blas and Russ (2013), and more recently, Herrenbrueck (2013). We suppose that each buyer checks prices at k different firms.[5] Given the k different price quotes, the buyer bargains with all k firms in Bertrand fashion. The buyer purchases from the firm with the lowest cost among its pool of k final offers. He or she pays a markup equal to the ratio of the two most efficient firms that the buyer encounters in the restricted case (with two very close offers), or $\frac{\rho}{\rho-1}$, the markup which sets marginal cost equal to marginal revenue for the firm in the unrestricted case (the best offer is much better than the second best).

[4]To keep the focus on credit rather than wages, we assume that whenever n changes, a population of immigrants enters or exits the X sector to keep the wage rate constant in our benchmark model. In the full model, we can endogenize the wage by adding the condition $X = n\omega \equiv \left(\frac{P_X}{P}\right)^{-\rho} Q$.

[5]De Blas and Russ (2013) detail how the cost of checking governs the intensity of search by the consumer in a related model. We take it as exogenous here. We can provide a micro-foundation for search intensity by supposing that firms send out advertisements revealing their location but not their price. The probability that a buyer responds to its add by visiting to check a firm's price is given by η, $0 < \eta < 1$. Since there is a countably infinite number of firms in the measure [0,1], the number of price checks k by any particular buyer is Poisson distributed, with Poisson parameter η, which would yield an average number of visits to each firm.

For simplicity, we assume that the search is a one-shot game each period, with no memory.[6] The result of the search process is that firms can charge different markups to different buyers, as in a wholesale market or other setting where buyers and sellers negotiate.

The owner's entrepreneurial savvy affects the markups that firms can charge, with the most cost-efficient firms charging higher markups on average. The distribution of markups conditional on the efficiency of the firm can be derived according to the method shown in Bernard, Eaton, Jensen, and Kortum (2003). Suppose that ϕ is drawn from a cumulative distribution $F(\phi)$, where $F(\phi)$ is a Frechét distribution with shape parameter θ and technology parameter T, $F(\phi) = \phi^{-T\theta}$. De Blas and Russ (2012) derive the unconditional cumulative distribution of markups as a function of k,

$$H(m) = Pr\left[M \leq m\right] = 1 - \frac{k}{1 + (k-1)m^{\theta}} \tag{4}$$

for $1 \leq m < \frac{\rho}{\rho-1}$ and $H(m) = 1$ for $m \geq \frac{\rho}{\rho-1}$. Bernard, Eaton, Jensen, and Kortum (2003) present a template for calculating the cumulative distribution of markups that a firm will charge conditional on its cost efficiency,

$$H\left(m|\phi\right) = Pr\left[1 - e^{-(k-1)T(r^{l})^{\theta}\phi^{-\theta}(m^{\theta}-1)}\right] \tag{5}$$

for $1 \leq m < \frac{\rho}{\rho-1}$ and $H(m|\phi) = 1$ for $m \geq \frac{\rho}{\rho-1}$. Taking the derivative of $1 - H(m'|\phi)$ with respect to ϕ, one sees that the probability of charging a markup greater than some value m', $1 \leq m' \leq \frac{\rho}{\rho-1}$, is increasing in ϕ.

The probability that a firm is the best firm of the k chosen by any consumer depends on the distribution of firms' marginal costs. Then, the probability that a firm is the best one of any k sampled by a prospective buyer is given by $F(\phi)^k$, which is also the share of consumers served by the firm owned by a household with entrepreneurial ability ϕ. $F(\phi)$ is of course increasing on ϕ; thus, market share is increasing in ϕ, so the firms owned by the best entrepreneurs will be the largest.[7]

In the initial period, where households have no savings and are deciding whether to be production workers or entrepreneurs, the conditional cumulative distribution gives us a cutoff rule. Households will borrow to start firms if the return to capital– the efficiency-weighted

[6]This can be generalized, as in Head et al. (2012) or Bremer, Buch, Russ, and Schnitzer (2013). We keep things simple here to maintain the focus on borrowing, exit and default behavior.

[7]Note that instead of price, we could model firms as competing in quality when quality can be judged and verified only by an in-person visit, with similar results. So ability could translate into a lower absolute price, or a lower quality-adjusted price.

markup $E[m|\phi]$, is at least as high as the interest rate r. In the initial period, before households save or invest their own wealth, firms all exclusively rely on borrowed funds, so the cost of capital is the same for all firms and we have a well defined $H(m|\phi)$.

In later periods, with varying degrees of self financing, the cost of capital differs across firms and the distributions can be computed numerically but no longer characterized analytically, unless the lending rate equals the deposit rate for all borrowers. However, given that the largest firms on average would have higher markups and therefore higher profit and liquid wealth to invest, their costs of capital would become progressively lower than for smaller, less profitable firms and thus afford the large firms even higher markups on average. So the qualitative implications of the analytical distributions from the initial period are relevant even in later periods.

3.3 *Credit constraints, default, and exit*

Let S_t^i denote the amount that a household borrows (if negative) or saves (if positive) in a given period. We define liquid wealth as $L_t^i = I_{Y,t}^i \Pi_t^i + (1 - I_{Y,t}^i)\omega + S_{t-1}^i(1+r)$. Financial intermediaries are willing to lend firm owners some fixed portion $\underline{s}$ of their expected profit calculated before the loan,

$$E_{t-1}\left[\Pi^i(\phi_t^i)\right] = E_{t-1}\left[(M_t^i - 1)\left(\frac{r}{\phi_t^i}\right)Y_t^i\right], \tag{6}$$

where M_t^i is the markup charged by the firm owned by household i in period t and the expectation is taken over the distribution of phi_t^i. Expected profit before the loan takes place is analogous to the permanent income process in Kaboski and Townsend (2011). In this case, current profit is a linear function of profit in the previous period,

$$\Pi_t^i(\phi^i) = (M_{t-1}^i - 1)\frac{r}{\phi_{t-1}^i}Y_{t-1}^i + \left[(M_t^i - 1)\frac{r}{\phi_t^i}Y_t^i - (M_{t-1}^i - 1)\frac{r}{\phi_{t-1}^i}Y_{t-1}^i\right] \tag{7}$$

$$= \Pi_{t-1}^i(\phi_{t-1}^i) + r(\tilde{K}_t - \tilde{K}_{t-1}) \tag{8}$$

$$= \Pi_{t-1}^i(\phi_{t-1}^i) + r\tilde{I}_{t-1}^i, \tag{9}$$

where $\tilde{I}_{t-1}^i$ is firm i's new investment in period $t-1$ that becomes part of the capital stock in period t, measured in terms of the market value of capital in each period, $\tilde{K}_t = \frac{M_{t-1}}{\phi_t}$.

Households consume at a minimum a fixed fraction of their current income, $\underline{c}$. Given the limitations on borrowing and the drive to smooth consumption, firm owners default whenever

S_{t-1} is negative and

$$(\underline{c} + \underline{s})E\left[\Pi_t^i(\phi_t^i)\right] \geq L_t^i, \tag{10}$$

or, more intuitively,

$$\Pi_t^i - \underline{s}E\left[\Pi_t^i(\phi^i)\right] \leq \underline{c}E\left[\Pi_t^i(\phi^i)\right] - S_{t-1}^i(1+r),$$

Recall that the fraction s is negative, $-1 < \underline{s} < 0$. The equation implies that a firm will default whenever it's current income plus the maximum amount it can borrow ($\Pi_t^i - (\underline{c} + \underline{s})E\left[\Pi_t^i(\phi^i)\right]$) is too little to support both a minimum level of consumption for its owner-household and the discharge of its debt from the previous period $S_{t-1}(1+r)$. If a firm exits when in debt, the household's total assets from the point of view of the lender include its liquid wealth, plus the value of its capital after liquidation by the lender. We call this valuation of household wealth W_t, which is given by

$$W_t = L_t + (1-\mu)K_t. \tag{11}$$

Firm exit with default occurs whenever S_t is negative and

$$(\underline{c} + \underline{s})E\left[\Pi_t^i(\phi^i)\right] \geq W_t^i. \tag{12}$$

The equation implies that a debtor firm will exit with default whenever it's current income plus the maximum amount it can borrow combined with the liquidated value of its assets is too little to support but a minimum level of consumption for its owner and the discharge of its debt from the previous period.

Thus, a firm that merely defaults may be merely running into a liquidity constraint, while a firm that exits with default is insolvent.

3.4 *Exports*

In each period, a firm finds an opportunity to serve the world (foreign) market with probability f_x, $0 < f_x < 1$, which it must use or lose in the next period. Foreign buyers search across the home exporters in the same manner described above for domestic buyers. This simplified search friction is in the spirit of Drozd and Nosal (2012), but has the effect of giving exit a higher opportunity cost for exporters than for non-exporters. For an exiting exporter to attain the same level of profit it had before exit, it would have to re-enter and then wait until it has the opportunity to export. This expected span of time with foregone export income after re-entry gives a sunk nature to export activity, in addition to the span of time it takes to accumulate capital incrementally due to credit constraints for production more generally.

One benefit of gaining entry into the world market is that it increases the firm's potential profits, the household's permanent income. Since the credit constraint is a fixed fraction of expected profit, the firm suddenly can borrow more. We assume that the new, higher credit limit applies only if the firm actually engages in exporting. The lender sets this fraction to be equal to the fraction of exports in the new level of expected profit,

$$E_{t-1}[\Pi_t^i(\phi_t^i, x_t^i) | x_t^i = 1] = E_{t-1}\left[(M_t^i - 1)\left(\frac{r}{\phi_t^i}\right) Y_t^i \left(1 + \left(\frac{\alpha Y_t^{ix}}{\eta_t^i Y_t^i}\right)\right)\right] \tag{13}$$

where Y_t^{ix} is firm i's intended production for export in period t and η_t^i is a shock applying to export transactions, described below. This increases the leverage ratio of the firm, measured as S_t^i / K_t^i and thus the probability of default in the periods soon after beginning to export.

Another benefit of exporting is that firm's production for export is subject to an additional foreign shock to its productivity, η_t^i, which we interpret generally as a taste-related shock, a high-frequency exchange-rate shock, or a hang-up involved in shipping or transacting with foreign customers. It has a firm-specific component and a macro component affecting all of the home country's exporters. It can be correlated at either level with the domestic productivity shock ϕ_t^i. We make the Armington assumption—that foreign consumers have a higher elasticity of substitution within goods from a particular country, but a lower elasticity across different source countries—and the further assumption of unit elasticity between goods from different source countries. Total foreign consumption, Q^f, is taken as exogenous by the small open economy. In this case, the export demand for the country's goods is a constant proportion of world output. Let α be the proportion of foreign expenditure spent on the home economy's goods. Then demand for firm i's exports, Q_t^{ix}, as a function of the price it charges on exported goods, $P^{ix}(\phi_t^i, \eta_t^i)$, is given by

$$Q_t^{ix} = \alpha \left(\frac{P^{ix}(\phi_t^i, \eta_t^i)}{P}\right)^{-\rho} Q_t^f.$$

While the rate of default-only may increase for firms beginning to export due to their higher leverage ratios and small export volumes, firms exporting a large fraction of their output can benefit from a diversification effect that lowers their raw rate of default. However, the wait involved for export opportunities after exit and re-entry makes exporters less likely to exit pre-emptively to prevent exit with default, increasing their probability of exit with default.

4. The dynamic problem

When a firm defaults, it is excluded from the credit market in the next period with probability ζ, as in Krebs, Moritz, and Wright (2012). Thus, if a firm sees that it is at risk of exit with default, it may exit preemptively to allow orderly liquidation by the lender if the expected gains of borrowing and producing in the next period are less than the expected losses if the firm exits and does not have a sure source of financing.

The credit constraint has a purpose other than to produce default– it produces a hysteresis effect. It takes time for large firms to accumulate capital under credit constraints. So they prefer to default rather than exit, generating a default rate that is higher than the exit rate. The length of time it takes to access credit again after default, or other punishments for default, can mitigate this differential effect.

Each household maximizes expected discounted utility with respect to a sequence of consumption, savings, and the decision of whether to engage in production work or entrepreneurship by investing I_t units in a firm, Let $V_t^z(*)$ be the current value of the problem with the option to default or exit. The firm chooses the default variable $d_t \in \{0,1\}$ and the exit variable $e_t \in \{0,1\}$ to maximize

$$V_t^z(*) = \max_{d_t \in \{0,1\}, e_t \in \{0,1\}} (1-d_t)(1-e_t)V_t^{cz}(*) + d_t(1-e_t)V^{Dz}(*)$$

$$+ e_t(1-d_t)V_t^E(*) + d_t e_t V^{ED}(*), \qquad \text{subject to}$$

$$C_t^i + S_t + I_t \leq L_t,$$

where V^{Cz} is the continuation value of a firm with export status z,

$$V_t^{Cz} = \max_{c_t \geq \underline{\mathrm{C}}, s_t \geq \underline{\mathrm{S}}} \{\ln c_t + \beta E_t [W_{t+1}^z(*)]\}, \tag{14}$$

V_t^{Dz} is the value of default for a firm of export status z,

$$V_t^{Dz}(*) = \max_{c_t \geq \underline{\mathrm{C}}, s_t \geq \underline{\mathrm{S}}} \left\{\ln c_t + \beta E_t \left[p W_{t+1}^z(*) + (1-p) V_{t+1}^{Dz}(*)\right]\right\},$$

V_t^E is the value of exiting without default, which is independent of export status,

$$V_t^E(*) = \max_{c_t \geq \underline{\mathrm{C}}, s_t \geq \underline{\mathrm{S}}} \left\{\ln C_t + \beta E_t \left[f W_{t+1}^0(*) + (1-f) V_t^H(*)\right]\right\},$$

and $V^{DE}(*)$ is the value of exiting and defaulting simultaneously, which again is independent of export status,

$$V_t^{DE}(*) = \max_{c_t \geq \underline{\mathrm{C}}, s_t \geq \underline{\mathrm{S}}} \left\{\ln C_t + \beta E_t \left[f \left[p W_{t+1}^0(*) + (1-p) V_t^{D0}(*)\right] + (1-f) V_t^H(*)\right]\right\}.$$

$$V_t^H = \ln(C_t) + \beta E_t[fW^0 + (1-f)V_{t+1}^H]$$

5. Theoretical Context and Empirical Approach

The work of Impullitti et al. (2013) and Fillat and Garreto (2009) provide a foundation for our analysis. However, neither study explicitly considers the mechanics of external financing with the possibility of default, which is key to our analysis here. The stylized facts in the previous section establish that exit rates are lower than default rates regardless of export status. Thus, we infer that firms avoid exit more energetically than they avoid default. This can be explained within the theory of hysteresis only if sunk costs involved in entry are lower than sunk costs involved in securing a loan. The u-shaped relationship between exit and export intensity, and default and export intensity, could arise if sunk costs are involved in exporting, making it a very risky activity for small firms who weather adverse demand shocks tenaciously so as not to forego their sunk cost of foreign trade, but less risky for the largest exporters, who export to more destinations and thus enjoy greater diversification of demand-side risk across markets. The fact that exporters are more likely to default upon exit than non-exporters regardless of export intensity suggests that the sunk costs involved in exporting are considerable, greater than the cost of securing a new lender after default. In our model, this corresponds to $f_x < p$

Naturally, there are some alternative explanations for some of these patterns. Exporting and export intensity naturally could be correlated with firm age or size, which many studies suggest are negatively correlated with borrower risk. Smaller exporters may incur a greater level of debt relative to assets in order to upgrade technology or cover other costs involved with selling in world markets. The largest exporters, who have the lowest exit and default rate, might be foreign-owned, and thus be privy to a large pool of cheap credit from a deep-pocketed parent firm. For this reason, we use the following estimating equation, where i indexes the firm, j the industry, k the region of the firm's location within Portugal, t the year, and I_f is an indicator function equal to one for $f \in \{$exit,default,exit with default$\}$ and zero otherwise:

$$I_f(i,t) = \alpha_1(j) + \alpha_2(k) + \Theta X(i,t) + \Gamma Z(i,t) + \epsilon(i,t)$$

Here, α_1 is a set of industry fixed effects; α_2 is a set of regional fixed effects; $X(i,t)$ is a vector of variables related to hysteresis, including demand shocks as measured by the Portuguese output gap and export-weighted output gap for exporters, along with export intensity; $Z(i,t)$ is a vector of other firm-level variables commonly cited as factors in firm performance, namely sales, size (number of employees), age, and foreign ownership, and $\epsilon(i,t)$ is an error term. Our regressions seek to confirm the positive, u-shaped relationship between export participation and both exit and default, as well as the positive relationship between export activity and the simultaneous occurrence of exit and default.

6. Data

The analysis is based on a rare combination of four matched datasets that allow us to link firms with their lending institutions, customs data, and balance sheet information.

1. **Central de Balancos (CB)**: The first data set is the Central de Balancos, which is a repository of yearly balance sheet data for non financial firms in Portugal, spanning 1995 to 2009. Data for 2010 are not yet available. It must be noted that prior to 2005 reporting was not mandatory and the sample was biased towards large firms. However, the value added and sales coverage rate was high. For instance, in 2003 firms in the CB data set accounted for 88.8 percent of the national accounts total non financial firms' sales.

2. **Central de Responsabilidades de Credito (CRC)**: Credit data is from a very detailed monthly data set, the Central de Responsabilidades de Credito (CRC), which is the Portuguese credit register. The dataset has monthly information on all legal entities with any type of credit relationship with a participating credit institution. Legal entities can be either firms or households, including the self-employed in the latter case. Reporting is mandatory for all credit institutions under the scope of Banco de Portugal's supervision mandate. There has been a major change in the way the data are organized within the data set in January 2009; however, that change does not have an impact on our procedures. In the case of credit granted to firms, the information available starts in January 1995 and ends in August 2010.

3. **Quadros de Pessoal**: The third source, Quadros de Pessoal, is a longitudinal dataset matching virtually all firms and workers based in Portugal. Currently, the data set collects data on about 350,000 firms and 3 million employees. The data are made available by the Ministry of Employment, drawing on a compulsory annual census of all firms in Portugal that employ at least one worker. Each year, every firm with wage earners is legally obliged to fill in a standardized questionnaire. Reported data cover the firm itself, each of its plants, and each

of its workers. Variables available in the dataset include the firm's location, industry, total employment, sales, ownership structure (equity breakdown among domestic private, public or foreign), and legal setting. The worker-level data cover information on all personnel working for the reporting firms in a reference week. They include information on gender, age, occupation, schooling, hiring date, earnings, hours worked (normal and overtime), etc. The information on earnings includes the base wage (gross pay for normal hours of work), seniority-indexed components of pay, other regularly paid components, overtime work, and irregularly paid components. It does not include employers' contributions to social security.[8]

4. **Trade data**: As for the trade data, we were able to gain access to information from 1995 to 2005. Statistics Portugal collects data on export and import transactions by firms that are located in Portugal on a monthly basis. These data include the value and quantity of internationally traded goods (i) between Portugal and other Member States of the EU (intra-EU trade) and (ii) by Portugal with non-EU countries (extra-EU trade). Data on extra-EU trade are collected from customs declarations, while data on intra-EU trade are collected through the Intrastat system, which, in 1993, replaced customs declarations as the source of trade statistics within the EU. The same information is used for official statistics and, besides small adjustments, the merchandise trade transactions in our dataset aggregate to the official total exports and imports of Portugal. Each transaction record includes, among other information, the firm's tax identifier, an eight-digit Combined Nomenclature product code, the destination/origin country, the value of the transaction in euros, the quantity (in kilos and, in some case, additional product-specific measuring units) of transacted goods, and the relevant international commercial term (FOB, CIF, FAS, etc.). We were able to gain access to data from 1995 to 2005 for the purpose of this research. We use data on export transactions only, aggregated at the firm-destination-year level.

[8]Each firm entering the database is assigned a unique, time-invariant identifying number which we use to follow it over time. The Ministry of Employment implements several checks to ensure that a firm that has already reported to the database is not assigned a different identification number. Similarly, each worker also has a unique identifier, based on a worker's social security number, allowing us to follow individuals over time. The administrative nature of the data and their public availability at the workplace—as required by the law—imply a high degree of coverage and reliability. The public availability requirement facilitates the work of the services of the Ministry of Employment that monitor the compliance of firms with the law (e.g., illegal work). Firms which disappear from the Quadros de Pessoal and reappear later in our sample are omitted from the analysis.

Data for the output gap is computed from a seasonally adjusted quarterly GDP series in the International Monetary Fund *International Financial Statistics*, as current GDP minus trend GDP computed using the HP filter with the standard $\lambda = 1600$. A negative output gap indicates that current GDP is below trend, a macroeconomic slowdown.

7. Results

The regression results make several facts clear. First, in Table 4, we see that being an exporter (when the "Exporter" dummy variable equals 1) is negatively correlated with exit, so exporters in general have lower exit rates as seen in Table 1. All coefficients are normalized However, export intensity is positively correlated with exit, with a negative coefficient estimate on the quadratic term for export intensity ("expint2"), producing a u-shape. The result emerges despite controls for firm size (employees), sales, debt, age, and foreign ownership.

Surprisingly, there is a positive correlation with the output gap. We believe this is due to the fact that exit is an annual variable, so our results are identified off of only 8 observations. In Table 5, default rates go down when Portuguese output rises above trend. Again, the export identifier by itself is negatively correlated with default, but export intensity has a u-shaped relationship– rising for firms exporting less than half and then falling across the population of firms exporting progressively more. Again, these patterns are robust to the inclusion of measures for debt, firm age, and foreign ownership.

The incidence of default conditional on exit demonstrates identical patterns in Table 6. A one standard deviation increase in export intensity is associated with a 6 percentage point increase in the default rate. Again, it is decreasing in the quadratic term, but the coefficient on the quadriatic term for export intensity in column (5) is only about one-forth the size in column (5) of Table 5. Thus, the probability of default given exit does not fall rapidly enough to overcome the positive impact of export intensity on the probability of default for exitors. We also see in Table 6, at the bottom of column (5), the first hint that the export-weighted output gap may be significantly associated with exit or default. In tables up to now, it has been difficult to discern due to the annual records for exit and we compressed the data for default to an annual frequency to maintain comparability across the tables.

However, our measure of default can be seen at a quarterly frequency. We employ the quarterly data in Table 7 to unearth the diversification introduced by exporting. In this case, a one standard deviation increase in the number of destinations to which a firm exports reduces its default rate by 1.8 percent. Thus, diversifying sales across markets does seem to help firms improve their risk profile.

8. Conclusion

In this preliminary draft, we have established that exporting is associated with a lower risk of exit and an increased risk of default, with the risk of either being u-shaped in the degree of export intensity– highest for firms that export a minority of their output. The probability of default given exit is much higher for exporters than for non-exporters. These facts are robust to the inclusion of a number of other potential explanatory variables. They are consistent with the theory of hysteresis, where the sunk costs involved in establishing a global distribution network are higher than those involved in securing a relationship with an outside lender, or the costs involved in finding a new one while carrying the mark of a flawed credit history.

The study is the first to explicitly measure the riskiness of exporting firms using their record of repayment. In addition to demonstrating the subtle risks involved in exporting, it also shows that the probability of exit and default are decreasing in firm size, which to the best of our knowledge had never been established in a nationwide panel of firm-level data. The findings are useful to model the special risks facing exporters and the banks who lend to them.

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Table 1: Summary Statistics, 1995-2003

VARIABLES	(1) Number of firms	(2) Percentage
Non-exporters	80927	
Exits	4396	5.43
Defaults	5587	6.90
Simultaneous exit and default	1832	2.26
Exitors who default		41.67
$0.10 < \frac{\text{Exports}}{\text{Total Sales}} \leq 0.5$	13372	
Exits	656	4.91
Defaults	1121	8.38
Simultaneous exit and default	382	2.86
Exitors who default		59.23
$0.50 < \frac{\text{Exports}}{\text{Total Sales}} \leq 0.90$	7617	
Exits	384	5.04
Defaults	612	8.03
Simultaneous exit and default	234	3.07
Exitors who default		60.94
$\frac{\text{Exports}}{\text{Total Sales}} > 0.90$	2484	
Exits	113	4.55
Defaults	150	6.04
Simultaneous exit and default	65	2.62
Exitors who default		57.52

Standard errors in parentheses
^{a} p<0.01, ^{b} p<0.05, ^{c} p<0.1

Notes: All regressions contain industry and regional fixed effects.

Table 2: Means, 1995-2003

VARIABLES	(1) Exit	(2) Default	(3) Exit and Default	(4) Default Given Exit
sales 2	-0.038[a]	-0.011[a]	-0.006[a]	0.096[a]
	(0.002)	(0.003)	(0.002)	(0.019)
sales 3	-0.048[a]	-0.020[a]	-0.008[a]	0.154[a]
	(0.002)	(0.003)	(0.002)	(0.020)
sales 4	-0.056[a]	-0.024[a]	-0.009[a]	0.215[a]
	(0.002)	(0.003)	(0.002)	(0.021)
sales 5	-0.067[a]	-0.031[a]	-0.016[a]	0.188[a]
	(0.003)	(0.003)	(0.002)	(0.024)
export intensity 2	0.008[a]	0.018[a]	0.006[a]	0.044[c]
	(0.003)	(0.003)	(0.002)	(0.026)
export intensity 3	0.008[c]	0.026[a]	0.006[b]	0.060
	(0.004)	(0.005)	(0.003)	(0.047)
export intensity 4	0.024[a]	0.051[a]	0.018[a]	0.096[b]
	(0.005)	(0.006)	(0.003)	(0.045)
export intensity 5	0.016[a]	0.042[a]	0.012[a]	0.077[c]
	(0.005)	(0.006)	(0.003)	(0.046)
export intensity 6	0.017[a]	0.029[a]	0.015[a]	0.123[a]
	(0.004)	(0.004)	(0.003)	(0.036)
Constant	0.095[a]	0.086[a]	0.030[a]	0.314[a]
	(0.002)	(0.002)	(0.001)	(0.013)
Observations	102,112	102,112	102,112	5,405
Adjusted R^2	0.008	0.002	0.001	0.036

Standard errors in parentheses

[a] p<0.01, [b] p<0.05, [c] p<0.1

Notes: All regressions contain industry and regional fixed effects.

Table 3: Means, 1995-2003

VARIABLES	(1) Exit	(2) Default	(3) Exit and Default	(4) Default Given Exit
size 2	-0.033^a	-0.007^a	-0.008^a	0.053^a
	(0.002)	(0.003)	(0.002)	(0.020)
size 3	-0.043^a	-0.010^a	-0.008^a	0.139^a
	(0.002)	(0.003)	(0.002)	(0.021)
size 4	-0.043^a	-0.009^a	-0.008^a	0.157^a
	(0.002)	(0.003)	(0.002)	(0.020)
size 5	-0.041^a	0.005	-0.006^a	0.183^a
	(0.002)	(0.003)	(0.002)	(0.021)
export intensity 2	-0.001	0.005	0.002	0.054^b
	(0.003)	(0.003)	(0.002)	(0.026)
export intensity 3	-0.003	0.010^c	0.001	0.064
	(0.004)	(0.005)	(0.003)	(0.047)
export intensity 4	0.014^a	0.035^a	0.012^a	0.101^b
	(0.005)	(0.006)	(0.003)	(0.045)
export intensity 5	0.005	0.025^a	0.006^b	0.089^c
	(0.005)	(0.006)	(0.003)	(0.046)
export intensity 6	0.005	0.011^a	0.009^a	0.128^a
	(0.004)	(0.004)	(0.003)	(0.036)
Constant	0.086^a	0.074^a	0.029^a	0.333^a
	(0.002)	(0.002)	(0.001)	(0.012)
Observations	102,112	102,112	102,112	5,405
Adjusted R^2	0.005	0.001	0.001	0.032

Standard errors in parentheses

^{a} p<0.01, ^{b} p<0.05, ^{c} p<0.1

Notes: All regressions contain industry and regional fixed effects.

Table 4: Exit, 1995-2006

VARIABLES	(1) basic	(2) exp dummy	(3) exp inte	(4) exp dummy i	(5) exp inte i
Output gap	0.001^b	0.001	0.001	0.001	0.001
	(0.000)	(0.001)	(0.001)	(0.001)	(0.001)
Ext. Output gap		0.001^b	0.001^b	0.001	0.001
		(0.000)	(0.000)	(0.001)	(0.001)
Export intensity			0.015^a		0.015^a
			(0.002)		(0.002)
l1_expint2			-0.003^a		-0.003^a
			(0.001)		(0.001)
ln_debt	0.003^a	0.003^a	0.003^a	0.003^a	0.003^a
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Lagged Sales (log)	0.000	-0.001	-0.001	-0.001	-0.001
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Size (log)	-0.024^a	-0.025^a	-0.025^a	-0.025^a	-0.025^a
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Firm age (log)	-0.002^a	-0.002^a	-0.002^a	-0.002^a	-0.002^a
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Foreign (0/1)	0.004^a	0.003^a	0.003^a	0.003^a	0.003^a
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Exporter		0.005^a		0.005^a	
		(0.001)		(0.001)	
c.eoutput_gap#c.exporter				-0.000	
				(0.000)	
c.eoutput_gap#c.l1_expint					0.002^c
					(0.001)
c.eoutput_gap#c.l1_expint2					-0.001^b
					(0.000)
Constant	0.048^a	0.064^a	0.059^a	0.064^a	0.059^a
	(0.008)	(0.008)	(0.008)	(0.008)	(0.008)
Observations	160,653	160,653	160,653	160,653	160,653
Adjusted R^2	0.015	0.015	0.015	0.015	0.015

Robust standard errors in parentheses

^{a} p<0.01, ^{b} p<0.05, ^{c} p<0.1

Notes: All regressions contain industry and regional fixed effects.

Table 5: Default, 1995-2006

VARIABLES	(1) basic	(2) exp dummy	(3) exp inte	(4) exp dummy i	(5) exp inte i
Output gap	-0.002^b	-0.002^a	-0.002^a	-0.002^a	-0.002^a
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Ext. Output gap		0.001^c	0.001^c	0.000	-0.000
		(0.001)	(0.001)	(0.001)	(0.001)
Export intensity			0.019^a		0.020^a
			(0.004)		(0.004)
l1_expint2			-0.004^a		-0.004^a
			(0.001)		(0.001)
ln_debt	0.018^a	0.018^a	0.018^a	0.018^a	0.018^a
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Lagged Sales (log)	-0.025^a	-0.027^a	-0.027^a	-0.027^a	-0.027^a
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
Size (log)	-0.004^b	-0.004^a	-0.004^a	-0.004^a	-0.004^a
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
Firm age (log)	-0.003^a	-0.003^a	-0.003^a	-0.003^a	-0.003^a
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Foreign (0/1)	0.001	0.000	0.000	0.000	0.000
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Exporter		0.006^a		0.006^a	
		(0.001)		(0.001)	
c.eoutput_gap#c.exporter				0.001	
				(0.001)	
c.eoutput_gap#c.l1_expint					0.005^a
					(0.002)
c.eoutput_gap#c.l1_expint2					-0.001^a
					(0.000)
Constant	0.083^a	0.103^a	0.100^a	0.103^a	0.100^a
	(0.011)	(0.011)	(0.011)	(0.011)	(0.011)
Observations	160,653	160,653	160,653	160,653	160,653
Adjusted R^2	0.018	0.019	0.019	0.019	0.019

Robust standard errors in parentheses
^{a} p<0.01, ^{b} p<0.05, ^{c} p<0.1

Notes: All regressions contain industry and regional fixed effects.

Table 6: Exit with Default, 1995-2006

VARIABLES	(1) basic	(2) exp dummy	(3) exp inte	(4) exp dummy i	(5) exp inte i
Output gap	0.001^{c}	0.000	0.000	0.000	0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Ext. Output gap		0.001^{b}	0.001^{c}	0.000	0.000
		(0.000)	(0.000)	(0.001)	(0.000)
Export intensity			0.006^{a}		0.006^{a}
			(0.002)		(0.002)
l1_expint2			-0.001^{a}		-0.001^{a}
			(0.000)		(0.000)
ln_debt	0.006^{a}	0.006^{a}	0.006^{a}	0.006^{a}	0.006^{a}
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Lagged Sales (log)	-0.003^{a}	-0.004^{a}	-0.004^{a}	-0.004^{a}	-0.004^{a}
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Size (log)	-0.009^{a}	-0.009^{a}	-0.009^{a}	-0.009^{a}	-0.009^{a}
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Firm age (log)	-0.002^{a}	-0.002^{a}	-0.002^{a}	-0.002^{a}	-0.002^{a}
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Foreign (0/1)	0.001^{a}	0.000^{c}	0.000^{c}	0.000^{c}	0.000^{c}
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Exporter		0.002^{a}		0.002^{a}	
		(0.000)		(0.000)	
c.eoutput_gap#c.exporter				0.000	
				(0.000)	
c.eoutput_gap#c.l1_expint					0.002^{b}
					(0.001)
c.eoutput_gap#c.l1_expint2					-0.001^{a}
					(0.000)
Constant	0.002	0.009^{c}	0.008	0.009^{c}	0.008
	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)
Observations	160,653	160,653	160,653	160,653	160,653
Adjusted R^2	0.009	0.009	0.009	0.009	0.009

Robust standard errors in parentheses
^{a} p<0.01, ^{b} p<0.05, ^{c} p<0.1

Notes: All regressions contain industry and regional fixed effects.

Table 7: Exit given Default, 1995-2006

VARIABLES	(1) basic	(2) exp dummy	(3) exp inte	(4) exp dummy i	(5) exp inte i
(mean) output_gap	0.004	0.003	0.003	0.003	0.004
	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)
(mean) eoutput_gap		0.002	0.002	-0.007	0.002
		(0.006)	(0.006)	(0.013)	(0.009)
l1_expint			0.003		0.005
			(0.025)		(0.025)
l1_expint2			0.002		0.001
			(0.006)		(0.006)
ln_debt	0.117^a	0.117^a	0.116^a	0.116^a	0.116^a
	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)
l1_ln_sales	-0.066^a	-0.067^a	-0.069^a	-0.067^a	-0.069^a
	(0.010)	(0.010)	(0.010)	(0.010)	(0.010)
(max) ln_size	0.028^a	0.028^a	0.028^a	0.028^a	0.028^a
	(0.009)	(0.009)	(0.009)	(0.009)	(0.009)
(max) ln_firmage	-0.029^a	-0.029^a	-0.029^a	-0.029^a	-0.029^a
	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)
(max) foreign	-0.021^a	-0.021^a	-0.022^a	-0.021^a	-0.023^a
	(0.006)	(0.006)	(0.006)	(0.006)	(0.006)
exporter		0.006		0.006	
		(0.007)		(0.007)	
c.eoutput_gap#c.exporter				0.004	
				(0.006)	
c.eoutput_gap#c.l1_expint					0.013
					(0.013)
c.eoutput_gap#c.l1_expint2					-0.004
					(0.003)
Constant	-0.193^a	-0.176^b	-0.164^b	-0.176^b	-0.163^b
	(0.073)	(0.076)	(0.075)	(0.076)	(0.075)
Observations	6,115	6,115	6,115	6,115	6,115
Adjusted R^2	0.181	0.180	0.181	0.180	0.181

Robust standard errors in parentheses
^{a} p<0.01, ^{b} p<0.05, ^{c} p<0.1

Notes: All regressions contain industry and regional fixed effects.

Table 8: Default (quarterly data, large firms only) 1995-2005

VARIABLES	(1) exporter	(2) num.dest.
exporter	0.091^{b}	
	(0.041)	
Number of destinations		-0.016^{a}
		(0.005)
Observations	33,213	33,213

Standard errors in parentheses

^{a} p<0.01, ^{b} p<0.05, ^{c} p<0.1

Notes: All regressions contain industry and regional fixed effects.