Exports and firm survival: Does trade regime matter?

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Abstract
New 'new trade theory' suggests that exporters with higher productivity face lower exit risks. In this paper, we use firm-level data from China to examine whether the type of exporting engaged in matters. We find that all types of exporters have higher survival probabilities in comparison with non-exporters; however, the survival probability of exporters engaged in processing trade is less positively affected by productivity.

Keywords
Export; Firm survival; Trade regime; Productivity

1. Introduction

The link between export participation and firm survival has been explored widely. As predicted by some theoretical models of firm heterogeneity, such as Melitz (2003), lower productivity firms are more likely to be forced to exit the market while more productive exporters are more likely to survive. However, existing evidence generally ignores differences in exporting regimes. Distinct from non-processing traders, processing traders first obtain intermediate inputs and raw materials from foreign commercial partners; they then process or assemble, before exporting final products to the global market. In many developing countries, processing trade explains a significant share of aggregate exports, and it is likely that these types of exporters do not have the productivity advantages of other exporters (Fernandes and Tang, 2013). This is investigated in this paper with regard to Chinese exporters in 2000-2006, given that China is the world's largest exporter of goods, and processing trade makes up a major part of its exports.

Exporters are classified into three mutually exclusive categories: processing exporters (EP) and non-processing exporters (NEP) that report respectively only processing and non-processing transactions in a given year, and partly-processing exporters (PEP) that report both processing and non-processing transactions. NEP firms are expected to have a higher survival probability than non-export firms given the evidence available showing that exporters have higher productivity (Greenaway and Kneller, 2007). But with regard to EP firms, there are two opposite effects of exporting on their survival probabilities: firstly, lower exit risks since they are usually supported by governments through tariff reductions and exemptions on processing activities. For instance, in China, EP firms are less productive even than non-exporters (Dai et al., 2012) but their use of imported materials and/or those supplied by overseas partners is duty-free (Yu, 2014), while they can also obtain raw materials from foreign commercial partners without any payment. However higher exit risks are also expected for EP firms if and when weak performance results in a discontinuation of commercial cooperation. Lastly, based on their productivity levels, we should expect PEP firms to have higher survival probabilities than non-exporters, but not as high as NEPs (although perhaps stronger than EPs).

2. Data and Methodology

We use the Annual Survey of Industrial Firms (CASIF) and the Chinese Customs Trade Statistics (CCTS) for the period 2000-6. CASIF records firms' basic information and comprehensive financial variables. CCTS reports the trade regime of each international firm. Hence, we merge two databases using 'firm name' and year. The merged dataset comprises 80,375 unique manufacturing export firms, similar in number to that used by Wang and Yu (2012). Note, the CASIF records if the firm exports, and we can match as high as 55% of these to CCTS; but there is a concern that the resulting matched

records may be biased towards larger firms, those in certain industries, or certain (eastern seaboard) provinces. Thus the matched data are weighted to ensure its distribution is representative of this 'population', where weights are based on comparing the firms in the merged dataset to the 'population' of exporters in CASIF, subdivided by employment size, industry and province.

Note, since the CASIF covers only state-owned firms (SOEs) and non-SOEs with annual sales above five million yuan (about $817,000), those that permanently fall below this threshold are deemed to have exited (although some of them may not have actually closed). We use the Cox hazard function expressed as $h(\cdot)$ in Eq.(1) including the impact of covariates $X(t)$:

$$h(t; X(t)) = P[T = t \mid T \geq t, X(t)] \tag{1}$$

As such, the probability of firm i surviving until observation time t represents the hazard rate. The effect of covariates on hazard rates it is assumed as proportional (Cox, 1972):

$$h(t) = h_0(t)e^{\beta' x_i(t)} \tag{2}$$

where $h_0(t)$ and $\exp[\beta' x_i(t)]$ gives a non-parametric base-line hazard and a parameterised function of the covariates, respectively. Descriptions of all covariates in this paper are shown in Table 1.

Table 1: Covariates and measurements

Covariates	Measurements
NE	Dummy=1 for non-exporter, 0 otherwise
EP	Dummy=1 for processing firms, 0 otherwise
PEP	Dummy=1 for partly-processing firms, 0 otherwise
NEP	Dummy=1 for non-processing firms, 0 otherwise
Size	*ln* no. employees
Size^2	Squared value of Size
Age	*ln* number of years since firm started
Age^2	Squared value of Age
TFP	Total factor productivity, based on approach used by Head and Ries (2003)
Innovation	New product value per unit of sales
Finance	*ln* value of interest payments
Politics_high	Dummy=1 for firms with central or provincial governments links, 0 otherwise
Politics_mid	Dummy=1 for firms with local government links, 0 otherwise
State	% State-owned capital of total
Foreign	% Foreign-owned capital of total
Private	% Private-owned capital of total
East	Dummy=1 for firms locate in eastern region of China, 0 otherwise
Industry dummies	Dummy=1 for each 2-digit industry that firm operates, 0 otherwise

Mean values are reported in Table 2. *T*-tests (not reported in Table 2) indicate that the differences between surviving and exit firms are all statistically significant.

Table 2: Summary Statistics (based on weighted data)

Covariates	Total sample (1)	Surviving firms (2)	Exit firms (3)
NE	0.705	0.692	0.793
EP	0.034	0.036	0.023
PEP	0.076	0.081	0.047
NEP	0.184	0.191	0.137
Size	4.531	4.562	4.319
Age	0.903	0.924	0.754
TFP	2.714	2.733	2.583
Innovation	0.069	0.073	0.042
Finance	4.672	4.717	4.347
Politics_high	0.018	0.017	0.023
Politics_mid	0.195	0.185	0.259
State	0.020	0.017	0.034
Foreign	0.101	0.106	0.070
Private	0.515	0.512	0.538
East	0.703	0.709	0.663

3. Results

Table 3 shows the estimated coefficients, $\hat{\beta}$, are remarkably robust across the different specifications of equation (2).[1] The positive coefficients for *NE* in columns 1-3 show that (cet. par.) exporters have a lower exit risk than non-exporters (for example, non-exporters were 33% more likely to exit when a full range of covariates are included – column 3). The estimated models reported in columns 4-6

Table 3: Estimation of weighted Cox model

	(1)	(2)	(3)	(4)	(5)	(6)
NE	0.638***	0.437***	0.287***			
	(37.08)	(22.80)	(9.85)			
EP				-0.678***	-0.515***	-0.466***
				(-19.85)	(-13.77)	(-7.51)
PEP				-0.826***	-0.584***	-0.425***
				(-32.99)	(-21.64)	(-10.87)
NEP				-0.564***	-0.376***	-0.243***
				(-25.61)	(-15.98)	(-7.61)
TFP			-0.137***			-0.138***
			(-19.95)			(-20.06)
Size		-0.757***	-0.823***		-0.767***	-0.837***
		(-32.73)	(-22.71)		(-33.15)	(-23.11)
$Size^2$		0.061***	0.068***		0.062***	0.070***
		(23.14)	(17.33)		(23.72)	(17.86)
Age		0.220***	0.280***		0.222***	0.281***
		(8.12)	(7.73)		(8.20)	(7.78)
Age^2		-0.787***	-0.782***		-0.788***	-0.783***
		(-48.54)	(-37.13)		(-48.72)	(-37.21)
Innovation			-0.276***			-0.283***
			(-5.00)			(-5.15)
Finance			-0.033***			-0.034***
			(-7.89)			(-8.02)
Politics_high			0.202***			0.193***
			(3.75)			(3.60)
Politics_mid			0.268***			0.266***
			(14.54)			(14.45)
State			0.231***			0.224***
			(4.96)			(4.83)
Foreign			-0.302***			-0.271***
			(-8.43)			(-7.50)
Private			-0.001			-0.009
			(-0.05)			(-0.52)
East			-0.143***			-0.139***
			(-8.23)			(-8.11)
Industry dummies	Yes	Yes	Yes	Yes	Yes	Yes
Observations	429,531	385,104	245,726	429,531	385,104	245,726
Log likelihood	-707,982.03	-597,479.36	-344,686.87	-707912.69	-597,437.07	-344,663.25

Notes: *, ** and *** indicates significant at 10%, 5% and 1%, respectively. Robust *t*-statistics are in parentheses. Omitted group in columns 4-6 is non-exporters.

provide strong evidence that *EP* and *PEP* (processing exports and mixed exporting, respectively) have higher survival probabilities than firms solely engaged in the non-processing of exports (NEP). This is a surprising result, and it suggests that the benefits to firms engaged in processing, from the support of governments and foreign partners, outweighs any deficiencies in their productivity.

As shown in Table 3 (columns 3 and 6), more productive firms are more likely to survive; older firms have lower exit rates; and firms that invest more in innovation and have higher financial health levels are more likely to survive. Larger firms and those with stronger political connections and those with higher proportion of state-owned capital have higher (cet. par.) exit risks; while the stronger is foreign

[1] The unweighted results are available (here).

ownership, the lower is the likelihood of closure. In China, firms who locate in the more economically developed eastern area, which was the first to open markets and introduce more capitalist-style practices, are around 13% more likely to survive. All of these results are in line with prior expectations based on the extant literature.

Given these results on the relative benefits of different types of exporting, we introduce interaction terms between productivity and export type based on model (6) in Table 3. For brevity, we only report the results for core covariates as shown in Table 4. In addition to the continuous-time Cox model, we also employ the discrete-time complimentary log-log model (Rodríguez, 2008). The negative coefficients for the interaction term *NE×TFP* in columns 1-2 indicate that compared to exporters, an increase in productivity has (cet. par.) a stronger positive effect on non-exporters' survival probabilities. By contrast, the interaction terms *EP×TFP* and *PEP×TFP* in columns 3-4 are significant and positive, implying that an increase in productivity reduces a firm's exit risk *less* for exporters engaged partly or only in processing trade relative to non-exporters. The interaction of *TFP* and *NEP* is not significant.

Table 4: Estimation of weighted Cox and Cloglog models

	(1) Cox	(2) Cloglog	(3) Cox	(4) Cloglog
NE	0.447***	0.431***		
	(6.40)	(6.24)		
NE*TFP	-0.063***	-0.070***		
	(-2.83)	(-3.71)		
EP			-0.920***	-0.924***
			(-6.62)	(-6.49)
EP*TFP			0.195***	0.205***
			(3.77)	(3.86)
PEP			-0.667***	-0.638***
			(-7.39)	(-7.11)
PEP*TFP			0.098***	0.103***
			(3.02)	(3.17)
NEP			-0.306***	-0.294***
			(-3.44)	(-3.36)
NEP*TFP			0.025	0.033
			(0.83)	(1.12)
TFP	-0.088***	-0.113***	-0.151***	-0.182***
	(-4.15)	(-5.37)	(-22.94)	(-27.94)
Log likelihood	-344,676.68	-96,538.32	-344646.23	-96,504.44

Notes: See Table 3. Only exporting and TFP estimates are reported in this table.

To observe more specifically the estimations of survival probability across different types of exporters, we classify firms into four quartiles using their TFP levels as shown in Table 5. Based on estimations of models (3) and (4) in Table 4, we calculate the predicted coefficients of different types of exporters. For instance, for processing exporters, coefficients ($\hat{\beta}$) in Table 5 are obtained from summing the estimates of EP, EP×TFP and TFP. As shown, exit hazards of different types of exporters all fall in response to the improvement of TFP in different quartiles. Moreover, NEPs have the largest positive effects on firm's survival probability in different quartiles, which is followed by PEPs and EPs. These are in line with the prediction that exporters with higher productivity have lower hazard rates.

Table 5: Mean value of predicted coefficients ($\hat{\beta}$) and standard errors

		TFP quartiles			
		0-25%	25-50%	50-75%	75-100%
$\hat{\beta}$(Cox)	EPs	-0.216***	-0.313***	-0.369***	-0.454***
	PEPs	-0.224***	-0.325***	-0.379***	-0.461***
	NEPs	-0.229***	-0.336***	-0.389***	-0.470***
$\hat{\beta}$(Cloglog)	EPs	-0.249***	-0.363***	-0.426***	-0.518***
	PEPs	-0.255***	-0.372***	-0.434***	-0.523***
	NEPs	-0.258***	-0.381***	-0.441***	-0.529***

4. Conclusion

Employing firm-level data from China, we reveal that exporters engaged in different trade regimes are all more likely to survive than non-exporters. Ceteris paribus, higher productivity firms also have a greater likelihood of survival. However for exporting firms, productivity has a smaller impact on survival for those firms engaged in (part) processing, implying that export processing firms – with lower productivity levels – rely on government assistance (e.g., reduced tariffs) and more favourable treatment from their overseas partners (who supply materials at a reduced or zero cost) in order to survive. As such, we suggest that processing trade acts as a mechanism through which exporters with weak productivity can decrease exit risks, although they typically locate in a low value-added position of the global value chain.

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