KOÇ UNIVERSITY-TÜSİAD ECONOMIC RESEARCH FORUM
WORKING PAPER SERIES

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Working Paper 1411
March 2014

KOÇ UNIVERSITY-TÜSİAD ECONOMIC RESEARCH FORUM
Rumelifeneri Yolu 34450 Sarıyer/Istanbul

Exchange Rates and Firm Exit : An Examination with Turkish Firm-Level Data

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March 20, 2014

Abstract

Micro-level empirical research has begun to obtain important results on the effects of currency variations on firms' survival. To date, the literature has lacked detailed analysis of the effects of exchange rates on firms' survival behavior in emerging markets due to a scarcity of firm-level information. Using a unique firm-level dataset, we test the impact of currency appreciation on the survival behavior of Turkish firms in manufacturing industries for 2002-2009. The results suggest that real exchange rate appreciation decreases the probability of survival in manufacturing industries. We also find that high productivity firms have higher probability of survival than low productivity firms as a result of domestic exchange rate appreciation. Our results also shows that the impact of exchange rate appreciation is much higher in comparison to previous empirical studies covering developed countries, such as Baldwin and Yan (2012) and Berman et al. (2012), providing evidence for the relative vulnerability of a developing country to exchange rate movements. This evidence indicates that economic events or policies leading to appreciation in domestic currency should be cautiously managed, especially in a resource constrained emerging market economy such as Turkey.

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1 Introduction

Exchange rate movements have important implications for survival patterns, particularly for exporting firms in developing countries where exchange rates are more volatile compared to the developed world. To date, the literature has lacked a detailed analysis of the effects of exchange rates on firms' survival behavior in emerging markets due to a scarcity of firm-level information. Recent improvements in micro data provide an opportunity to test the effects of currency variations on firms. This paper exploits a detailed dataset compiled by the Central Bank of Turkey to examine the effects of exchange rates on firms' survival behavior in Turkey.

Real exchange rate movements are thought to act like tariffs in how they affect survival behavior by altering firms' competitive positions in both domestic and international markets.[1] In this context, real exchange rate appreciation acts as an increase in foreign tariffs, creating a cost disadvantage for domestic producers in the export markets and raising the level of competition. Consequently, the least productive firms exit the market. For the case of a developing country, the impact of exchange rate appreciation on firms survival is expected to be larger as transactions are generally not hedged because forward markets are not accessible to the bulk of the traders.

This paper uses a detailed dataset compiled by the Central Bank of Turkey (CBRT) that contains information on income statement and balance sheet

[1] In this framework, exchange rate appreciations (depreciations) are modeled as a decrease (increase) in domestic tariffs or an increase (decrease) in foreign tariffs. See Feenstra (1989) and Baggs et al. (2009).

items, the starting date of the establishment's operation, and industry affiliation classified according to the General Industrial Classification of Economic Activities within the European Communities Revision 1.1. This rich dataset provides a unique platform with which we empirically test the effects of exchange rates on the survival patterns of firms and compare the results with the theoretical predictions of the literature. The study covers the period 2002-2009. We treat the continuous real appreciation of Turkish Lira during this period as a natural experiment to investigate the impact of real appreciation on the survival pattern.

To the best of our knowledge, this is the first empirical study to examine the impact of currency variations on firm survival in Turkey. The literature in this field has been limited to developed countries with the exception of Li et al. (2012) which examines the impact of exchange rates on firms' survival using Chinese data. Our results show that the impact of exchange rate appreciation is much higher in comparison to previous empirical studies covering developed countries, such as Baldwin and Yan (2012) and Berman et al. (2012), providing evidence for the relative vulnerability of a developing country to exchange rate movements. Hence, this case study will contribute to our understanding how currency variations affect firm survival in developing countries. Our results also suggest that domestic currency appreciation decreases the probability of firm survival in manufacturing industries. Moreover, we find that high productivity firms have a higher probability of survival than low productivity firms.

2 Literature

The micro-level empirical research has presented important results on the effects of currency variations on firms' survival, particularly for developed countries. Baggs et al. (2009) investigate the impact of real exchange rate changes on the survival and sales of firms in the manufacturing sectors for Canada. They document that real appreciation reduces real sales and the probability of firm survival. They also find that the effect of real domestic currency appreciation on firms' survival is larger for less productive firms. Similarly, Baldwin and Yan (2012) investigate the impact of different trading environments, characterized by different bilateral tariff reductions and different movements in real exchange rates, on the survival of Canadian firms. They find that a real appreciation of the Canadian dollar increases the likelihood that exporters will stop exporting. Recent work by Li et al. (2012), using detailed Chinese firm-level data for 2000-2007, examines the effect of exchange rate movements on the export behavior of Chinese firms and finds that the appreciation of domestic currency reduces the probability that a firm exports.

The theoretical literature examining the impact of current appreciation and survival patterns is partly motivated by the productivity aspect of individual firms, building on Melitz (2003). Tomlin (2010), using a dynamic structural model, investigates the effect of real exchange rate fluctuations on plant entry and exit decisions in the Canadian agricultural implement industry. The framework is based on Melitz (2003), including a capital variable.[2]

[2]In Melitz (2003), labor is the only domestic factor in production.

In this framework, exchange rate appreciation is considered in a similar way to the trade liberalization exercise introduced in Melitz (2003). Accordingly, an appreciation (which operates in a similar way to a decrease in domestic tariffs) in domestic currency opens up export opportunities for domestic plants and increases the number of foreign competitors in the domestic market. In parallel with an increase in foreign demand, the demand for domestic factors of production increases, which in turn drives up factor prices. As a result, less productive firms exit the market and new entrants are forced to be more productive. The empirical results are consistent with previous papers such as Baggs et al. (2009), where an appreciation (depreciation) of the real exchange rate decreases (increases) the probability that a given plant will stay in the market, and higher productivity plants are more likely to stay in the market than lower productivity plants.

The exchange rate and productivity link has also been noted in Berman et al. (2012). Based on a model with local distribution costs and firm heterogeneity, Berman et al. (2012) show that real depreciation reduces threshold productivity, defined as the minimum productivity level at which firms earn positive profits, leads to firm entry, and therefore has a positive impact on the extensive margin. Fung (2008) investigates the impact of large real exchange rate appreciation on continuing firms scale of production and productivity growth based on a partial equilibrium model built on Krugman (1989). [3] The

[3]On the demand side, a symmetric expenditure function in translog form as in Bergin and Feenstra (2000 and 2001) is assumed. This functional form implies a positive relationship between the price of a good relative to competing goods and demand elasticity. Accordingly, increased price causes more elastic demand, which increases the competition faced by domestic firms.

empirical results based on Taiwanese firm-level data are consistent with the predictions of the theoretical model, suggesting that real domestic currency appreciation leads to a scale expansion of surviving firms, which in turn raises industry productivity.

3 Data: Regularities and Sources

This paper exploits a dataset compiled by the Central Bank of Republic of Turkey (CBRT): the Company Sector Accounts Database. The bank surveys firms annually, and they respond on a voluntarily basis.[4] These data contain information on income statement and balance sheet items, employment, the starting date of the establishment's operation, location, industry affiliation classified according to NACE Revision 1.1., and legal status of the firms for the period $2002 - 2009$.[5]

We limit the data to the sample of firms that have complete records on employment numbers because we will rely on this variable when calculating labor productivity for each firm. By eliminating such firms, we lose almost 75% of the firms included in the original data set.[6] A comparison of descrip-

[4]Central Bank officials at the statistics department have stated that the response rate for the survey is 75% for 2009. According to the net sale criteria, manufacturing firms account for 64.7% of Turkeys total sales for the year 2009.

[5]The year 2002 is a turning point in the exchange rate regime for the Turkish Economy. A severe currency crisis occurred in February 2001, which resulted in a shift in the exchange rate regime from (managed) pegged to floating. Since that time, monetary policy has primarily focused on price stability rather than targeting exchange rate stability.

[6]The Company Sector Accounts Database reports employment information only if a given firm declares its employment numbers for 3 consecutive years. Otherwise, employment information is represented as a missing value in the database. Because the time span of our study covers a period longer than 3 years, for some firms, the employment data for the

tive statistics between the firms with missing employment data and the firms with complete employment data shows that firms with missing employment numbers have smaller real assets and are younger than the firms that we use in our analysis.

We also excluded companies that do not have complete records for all variables (in addition to employment data) used in the subsequent regression analysis or that possess inconsistent values for certain variables. Accordingly, less than 1% of the observations have been dropped. Additionally, to control for the potential influence of outliers, we exclude observations in the 0.5% of the upper and lower tails of the distribution.

In our analysis, we only take into consideration manufacturing industries. Consequently, we end up with 4821 firm-year observations consisting of 616 firms belonging to 14 industries, defined on the 2-digit NACE Revision 1.1. level.[7]

In principle, firm exit can be identified on the basis of missing values in our data set. Unfortunately, this is not a reliable procedure because missing values can result from failure to report items or failure to respond to the survey for reasons other than exit. Therefore, information in the Company Sector Accounts Database is supplemented with an additional data source from the Central Bank that contains information on the identity numbers of exited firms. However, because this additional data source does not provide us the exact date of the exit, we assumed that the exit date is the last year

intermediate years are not available.

[7]These industries can be found in Table 2.

that the firm has non-missing values on its balance sheet or income statement items. Based on this assumption, 5% of the 616 firms in the Company Sector Accounts Database (30 out of 616) exited during the period of 2002-2009.

Based on their exit status, firms are categorized into two groups: survivors and exiters. Table 1 provides descriptive statistics of firm-specific variables such as labor productivity (real sales[8] per employee), age, number of employees, export share (export sales as a share of total sales), and real assets (the sum of current and fixed assets divided by sectoral producer price index (PPI). As shown in Table 1, on average, exiters have lower employment, real assets, export shares, and labor productivity than survivors. Table 2 provides information on the rates of exit, which range between 25% (for medical precision and optical instruments) and 2% (for manufacture of machinery and equipment n.e.c.).

Table 1 and 2 are here

All the real values are deflated using the sectoral-level producer price index (PPI) obtained from the Turkish Statistical Institute (TURKSTAT). All the remaining data were obtained from the IMF's International Financial Statistics. GDP with constant prices and three-month deposit rates for Turkey are used for the domestic GDP and interest rate, respectively. For foreign GDP, we used the weighted average of OECD countries' GDPs (constant prices), where bilateral trade flows as shares in total trade of Turkey are used as weights. To examine the impact of currency variation on firm survival, we used CPI based

[8]total sales divided by sectoral level producer price index (PPI)

US Dollar/Turkish Lira real exchange rates. An increase (decrease) in the real exchange rate represents a depreciation (appreciation) of Turkish Lira.

4 Empirical Analysis

We follow Baggs et al.s (2009) methodology to investigate the firms' survival behavior as a result of exchange rate movements. This method involves regressing the survival status of a given firm on the real exchange rate and a set of firm and industry level control variables. Using the specification given below, we investigate i) whether exchange rate appreciation has any effect on firm survival, ii) whether appreciation has a lower impact on more productive firms, and iii) the impact of control variables on firm survival. The equation under investigation is as follows:

$$P(Surv_{it}) = \phi(\beta_1 Q_t + \beta_2 P_{it} + \beta_3 GDP^f{}_t + \beta_4 GDP^d{}_t + \beta_5 r_t + \beta_6 AGE_{it} + \beta_7 EMP_{it} + \beta_8 t + \epsilon_{it}) \tag{1}$$

where the subscript i indexes firms, and t indexes time. $Surv_{it}$ is a dummy variable equal to 1 if firm i is in operation in year t, and 0 otherwise. Q is the logarithm of the real exchange rate. P_{it}, AGE_{it}, and EMP_{it} represent the logarithm of labor productivity, age, and employment. GDP_t^d and GDP_t^f are domestic and foreign GDP growth, and they are used to control country-specific and international business cycles and the expansion of domestic and

foreign demand. r_t is the interest rate and time trend; t, is used to control for time-specific effects.

β_1 is the main coefficient of interest and is expected to be positive. A positive and significant value for β_1 implies that real exchange rate appreciation leads to an increase in the probability of survival for the firms in general. Put differently, a real appreciation of Turkish Lira decreases the probability of survival for the average Turkish firm. We estimate Equation (1) both using a pooled probit model and a linear probability model with fixed effects. The results are illustrated in Tables 3 and 4, respectively.

Table 3 and 4

As can be followed from the first column of Table 3, the coefficient of the real exchange rate is positive and significant. To evaluate the magnitude of the effect of real appreciation on the probability of survival, we use the marginal effects calculated at the mean of the explanatory variables. The marginal effects, given in the second column of Table 3, indicate that a 1% real appreciation of the Turkish Lira for a given firm increases the probability of survival by 4%. In comparison to previous empirical studies covering developed countries, such as Baldwin and Yan (2012), the impact of currency appreciation on firms survival is much higher, providing evidence for the relative vulnerability of a developing country. For the Canadian manufacturing sector, Baldwin and Yan (2012) reported that a 1% rise in the real exchange rate increases the likelihood that exporters will stop exporting by approximately 0.1%. Similarly for the US manufacturing sector, Bernard and Jensen (2004) find that 1% of

appreciation leads 1% of firms to stop exporting; Berman et al. (2012), using French data, document that 1% of appreciation decreases export probability by 0.2%. Our findings are also greater than the Chinese case. Li et al. (2012) find that 1% of appreciation decreases the probability of existence by 0.1%.

Labor productivity is also significant and correctly signed. As its marginal effect indicates, calculated at the mean, a 1% change in productivity leads to an increase in the probability of survival by 0.2%. Surprisingly, age appears to be negative and significant. The counterintuitive result that younger firms are less affected by exchange rate appreciation may stem from the fact that we have dropped the many young firms due to a lack of available data on employment. Employment is positive and significant, suggesting that being a small firm decreases the probability of survival by 0.4%. The coefficient of the growth in domestic and foreign GDP and interest rate are insignificant.

We also add an interaction term to the model to test the hypothesis of whether being a high or low productivity firm increases or decreases the probability of survival in the context of exchange rate appreciation. We therefore create a dummy for high and low productivity firms, those belonging to the highest and lowest 50%, respectively, and include it among the regressors. Then, we create an interaction term between the real exchange rate and the dummy for high and low productivity firms as an additional regressor.[9] The results of the regressions including the productivity dummy and the interaction effect are presented in column 3 of Table 3.

[9]Obviously, we drop the labor productivity variable, which is now captured by the categorical dummy variables.

The productivity dummy appears to be not significant, as does the interaction term. However, the interpretation of interactions in the context of a non-linear model is more complex than in a linear model, where the marginal effect of the interaction term is basically equal to the coefficient of the interaction term. [10] As has been stressed in Ai and Norton (2003), the interaction effect cannot be evaluated simply by looking at the sign, magnitude, or statistical significance of the coefficient on the interaction term when the model is nonlinear. Moreover, the interaction effect is conditional on the value of the independent variables. Consequently the magnitude and statistical significance of the interaction effect can differ with the observation. For example, the interaction effect can be positive for some observations and negative for others, which makes the interaction effect, calculated at the means of the explanatory variables, less accurate.

According to the results presented in column 4 of Table 3, the marginal effect of the interaction term between the real exchange rate and the dummy for high and low productivity is not statistically significant. Despite the lack of statistical significance for the marginal effect of the interaction term in the regression results presented in Table 3, the correct interaction effect, calculated based on Ai and Norton's (2003) methodology, is statistically significant for all of the observations (see Figure 1). We find that the marginal effect of the interaction term between the real exchange rate and the dummy for high

[10] In our case, we interact a continuous variable, the exchange rate, with a dummy variable (high vs. low productivity). The interaction term is the discrete difference with respect to the dummy variable of the single derivative of the cumulative distribution function with respect to the exchange rate, Q.

productivity firms is negative and significant, meaning that high productivity firms have a higher probability of survival than low productivity firms in the presence of exchange rate variation.

Figure 1 here

We also incorporate fixed effects into our methodology in the context of the linear model. The fixed effects estimator has been relatively little used in nonlinear models because there is no feasible way to remove the heterogeneity in the probit model in the presence of fixed effects (Greene, 2001).[11] The results of the linear probability model are presented in Table 4. We estimate a linear probability model first without including any fixed effects. Later, we include industry and firm fixed effects in the regression equations. The results of the linear probability model without any fixed effect are presented in column 1 of Table 4, while the results of the estimation using industry and firm fixed effects are presented in columns 3 and 5, respectively. We include the productivity and interaction dummies, as in the probit estimation, to specification and provide results in the corresponding columns. The estimation results for productivity and real exchange rate obtained through the linear probability model are consistent with the previous findings obtained through the pooled probit. The results suggest that real exchange rate appreciation

[11]Robert and Tybout (1997) also stress this issue and state that they do not control firm-specific heterogeneity by using plant-specific dummy variables because of the incidental-parameters problem" stressed in J. Neyman and E. Scott (1948). Note that in Girma, Greenaway and Kneller (2004) probit regression, in Bernard and Jensen (2004) linear probability model with and without fixed effect, and in Roberts and Tybout (1997) probit model, random effects are employed.

decreases the probability of survival in specifications 1 and 2. The effect on the probability of a 1% increase in the exchange rate increases the probability of survival between 6 and 7%.

Productivity appears to be positive and significant (in all specifications). The coefficient of employment appears to be significant and positive, suggesting that larger firms in terms of employment are more likely to survive. Other covariates, more specifically the interest rate and growth in domestic and foreign GDP are insignificant in all specifications, while the coefficient of age is significant and negative in specifications 1 and 2. The marginal effects of the interaction terms obtained through the linear probability model are insignificant in all specifications (columns 2, 4, and 6 of Table 4), in contrast to the probit model (Figure 1).

To further test the impact of exchange rate appreciation on firms with different productivity levels, we split the data between high and low productivity firms as described above and run separate regressions for each of them. The results of the probit and linear probability models for the high and low productivity samples are presented in Tables 5 and 6. According to the estimation results, exchange rate appreciation does not have any effect on the survival behavior of the high productivity firms (columns 1, 3, 4, and 5 of Table 5). However, the coefficient of the real exchange rate appears to be positive and significant in the sample of low productivity firms, meaning that appreciation decreases the probability of survival for the low productivity firms (columns 1, 3, 4, and 5 of Table 6). The results are consistent with the probit

model with the inclusion of the interaction variable (Figure 1). The linear probability models (columns 3-5 of Table 6) imply that a 1% decrease in the real exchange rate (appreciation) decreases the probability of survival of low productivity firms between 9% and 13%.

Table 5 and 6

5 Conclusion

The results of the empirical research presented in this paper provide important implications for real exchange rate variations on the survival behavior of firms in the Turkish manufacturing industries. Consistent with the implications of the Melitz (2003) model, real exchange rate appreciation puts domestic producers at a cost disadvantage in the export markets, raising the level of competition faced by these exporting firms. Consequently, the least productive firms exit the market. The results of the empirical section of this paper suggest that real exchange rate appreciation decreases the probability of survival for firms belonging to manufacturing industries. We find that high productivity firms have higher probability of survival than low productivity firms in the presence of exchange rate variation. The results of our study are consistent with the previous findings in this line of research such as Baggs et al. (2009). Our results also suggest that the impact of currency appreciation on the survival patterns of exporting firms is much higher in Turkey compared to previous studies covering both developing and developed countries.

From an economic development policy point, these results emphasize the danger involved domestic currency appreciation following a surge of capital inflows and relying on internal demand, through the expansion of domestic credits, as the main driver of economic growth. The case of Turkey constitutes such an example with its highly volatile GDP growth depending on the intensity of capital inflows (see, for example, Akat and Yazgan (2012)). Especially in a resource constrained emerging market economy such as Turkey (due to low domestic savings), tradable sector should play an important role as the engine of a sustainable and employment creating growth given its capacity to create foreign resources. However, the evidence presented in this papers indicates that continuing appreciation of domestic currency may have detrimental effects on the development of resilient and strong tradable sector firms.

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Table and Figures

Table 1: Descriptive Statistics

Sample	Variable	mean	N
Survivors	Age	30.3	4680
	Employment	399.6	4680
	Labour Productivity	37.7	4680
	Export Share	0.31	4680
	Real Assets	1150000	4680
Exiters	Age	31.4	141
	Employment	241.3	141
	Labour Productivity	35	141
	Export Share	0.27	141
	Real Assets	637981	141
Whole Sample	Age	30.3	4821
	Employment	395	4821
	Labour Productivity	37.7	4821
	Export Share	0.31	4821
	Real Assets	1140000	4821

Table 2: Number of Firms and Exit Year

Industry	Nace Rev.1.1. Code	Number of Firms								Exit Rate
		2002	2003	2004	2005	2006	2007	2007	2009	
Food products and beverages	15	116	116	116	116	114	114	112	112	0.03
Tobacco products	16	5	5	5	4	4	4	4	4	0.20
Textiles	17	109	109	108	106	105	105	104	102	0.06
Wearing apparel	18	45	45	44	43	42	42	41	41	0.09
Wood and of products of wood	20	10	10	10	9	9	9	9	9	0.10
Publishing printing and reproduction of recorded media	22	9	9	9	9	9	9	9	8	0.11
Chemicals and chemical products	24	70	70	70	69	69	68	68	68	0.03
Rubber and plastic products	25	38	38	37	37	37	37	37	37	0.03
Other non-metallic mineral products	26	57	57	57	56	55	55	54	54	0.05
Fabricated metal products except machinery and equipment	28	38	38	38	38	38	38	38	37	0.03
Machinery and equipment n.e.c.	29	48	48	48	48	48	47	47	47	0.02
Electrical machinery and apparatus n.e.c.	31	26	26	26	26	25	25	24	24	0.08
Medical precision and optical instruments	33	4	4	4	4	4	4	4	3	0.25
Motor vehicles trailers and semi-trailers	34	41	41	41	41	40	39	39	39	0.05
Sum		616	616	613	606	600	596	589	586	0.05

Table 3: Probit Estimation - Firm survival (Dependent variable: = 1 if survives to end of year t; 0 otherwise.)

	(1) Pooled Probit	(2) Marginal Effect	(3) Model with Interaction	(4) Marginal Effect
Real exchange rate	5.689*	0.042*	5.084*	0.040*
	(2.592)	(0.017)	(2.562)	(0.018)
Labour productivity	0.213**	0.002**		
	(0.072)	(0.001)		
Foreign GDP growth rate	0.018	0.000	0.006	0.000
	(0.275)	(0.002)	(0.275)	(0.002)
Domestic GDP growth rate	-0.039	-0.000	-0.020	-0.000
	(0.203)	(0.002)	(0.203)	(0.002)
Interest rate	-0.004	-0.000	0.002	0.000
	(0.040)	(0.000)	(0.040)	(0.000)
Age	-0.517*	-0.004*	-0.506*	-0.004*
	(0.204)	(0.002)	(0.203)	(0.002)
Employment	0.198***	0.001**	0.210***	0.002***
	(0.053)	(0.000)	(0.055)	(0.000)
Time trend	0.452	0.003	0.468	0.004
	(0.295)	(0.002)	(0.292)	(0.002)
Dummy for high-productivity firms			0.013	0.000
			(0.281)	(0.002)
Real Exchange Rate×			0.872	0.007
Dummy for high-productivity firms			(0.849)	(0.006)
Observations	4821	4821	4821	4821
Log lik.	-164.478	-164.478	-166.970	-166.970
Chi-squared	58.141	58.141	52.021	52.021
Pseudo R-squared	0.122	0.122	0.109	0.109

Marginal effects are calculated at the mean.
Standard errors in parentheses.
Real exchange rate, labour productivity, age, and employment are in logarithmic form.
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 4: Linear Probability Model (LPM)

	(1) LPM	(2) Model with Interaction	(3) LPM - FE	(4) Model with Interaction	(5) LPM - Firm FE	(6) Model with Interaction
Real Exchange Rate	0.069*	0.068	0.069*	0.068	0.051	0.061*
	(0.035)	(0.036)	(0.035)	(0.036)	(0.028)	(0.030)
Labour productivity	0.004*		0.004*		0.017**	
	(0.002)		(0.002)		(0.006)	
Foreign GDP growth rate	0.004	0.004	0.004	0.004	0.002	0.003
	(0.004)	(0.004)	(0.004)	(0.004)	(0.003)	(0.003)
Domestic GDP growth rate	-0.003	-0.003	-0.003	-0.003	-0.003	-0.003
	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)
Interest rate	-0.000	-0.000	-0.000	-0.000	-0.000	-0.000
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Age	-0.009*	-0.008*	-0.009*	-0.009*	0.046	0.050
	(0.004)	(0.004)	(0.004)	(0.004)	(0.036)	(0.038)
Employment	0.004**	0.004**	0.004**	0.004**	0.016**	0.009**
	(0.001)	(0.001)	(0.001)	(0.001)	(0.005)	(0.004)
Time trend	0.002	0.002	0.002	0.003	-0.004	-0.003
	(0.003)	(0.003)	(0.003)	(0.003)	(0.004)	(0.004)
Dummy for high-productivity firms		0.004		0.002		0.009
		(0.004)		(0.004)		(0.006)
Real Exchange Rate×		0.002		0.002		-0.012
Dummy for high productivity firms		(0.008)		(0.009)		(0.011)
Observations	4821	4821	4821	4821	4821	4821
R-squared	0.009	0.007	0.011	0.010	0.264	0.259

Column (1) is linear probability model with no fixed effects (FE).
Column (3) is linear probability model with industry fixed effects (FE).
Column (5) is linear probability model with firm fixed effects (FE).
Marginal effects are calculated at the mean.
Standard errors in parentheses.
Real exchange rate, labour productivity, age, and employment are in logarithmic form.
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 5: High Productivity Firms

	(1) Pooled Probit	(2) Marginal Effect	(3) LPM - No Fixed Effect	(4) LPM - Industry FE	(5) LPM - Firm FE
Real Exchange Rate	3.578	0.009	0.018	0.017	0.002
	(3.654)	(0.008)	(0.043)	(0.043)	(0.037)
Foreign GDP growth rate	0.369	0.001	0.002	0.002	0.001
	(0.515)	(0.001)	(0.005)	(0.005)	(0.005)
Domestic GDP growth rate	-0.541	-0.001	-0.003	-0.003	-0.002
	(0.510)	(0.002)	(0.003)	(0.003)	(0.003)
Interest rate	-0.056	-0.000	-0.000	-0.000	-0.000
	(0.095)	(0.000)	(0.001)	(0.001)	(0.001)
Age	-0.317	-0.001	-0.004	-0.003	0.040
	(0.324)	(0.001)	(0.004)	(0.004)	(0.051)
Employment	0.161	0.000	0.002	0.003	0.007
	(0.091)	(0.001)	(0.001)	(0.001)	(0.005)
Time trend	-0.604	-0.001	-0.003	-0.003	-0.007
	(0.822)	(0.002)	(0.002)	(0.002)	(0.004)
Observations	2534	2534	2534	2534	2534
Log lik.	-67.788	-67.788	3198.224	3203.088	3657.442
Chi-squared	295.620	295.620			
Pseudo R-squared	0.110	0.110			

Column (3) is linear probability model with no fixed effects (FE).
Column (4) is linear probability model with industry fixed effects (FE).
Column (5) is linear probability model with firm fixed effects (FE).
Marginal effects are calculated at the mean.
Standard errors in parentheses.
Real exchange rate, labour productivity, age, and employment are in logarithmic form.
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 6: Low Productivity Firms

	(1) Pooled Probit	(2) Marginal Effect	(3) LPM - No Fixed Effect	(4) LPM - Industry FE	(5) LPM - Firm FE
Real Exchange Rate	9.199	0.087*	0.133*	0.130*	0.094*
	(4.828)	(0.038)	(0.056)	(0.055)	(0.046)
Foreign GDP growth rate	0.238	0.002	0.007	0.007	0.003
	(0.440)	(0.004)	(0.007)	(0.007)	(0.006)
Domestic GDP growth rate	-0.061	-0.001	-0.003	-0.003	-0.002
	(0.272)	(0.003)	(0.005)	(0.005)	(0.004)
Interest rate	-0.008	-0.000	-0.000	-0.000	0.000
	(0.057)	(0.001)	(0.001)	(0.001)	(0.001)
Age	-0.617*	-0.006	-0.012	-0.014	0.122*
	(0.256)	(0.003)	(0.007)	(0.008)	(0.061)
Employment	0.243***	0.002**	0.005*	0.005*	0.017*
	(0.068)	(0.001)	(0.002)	(0.002)	(0.008)
Time trend	0.795*	0.008*	0.009	0.008	0.000
	(0.340)	(0.003)	(0.007)	(0.007)	(0.006)
Observations	2287	2287	2287	2287	2287
Log lik.	-95.943	-95.943	2254.888	2264.308	2722.581
Chi-squared	74.123	74.123			
Pseudo R-squared	0.127	0.127			

Column (3) is linear probability model with no fixed effects (FE).
Column (4) is linear probability model with industry fixed effects (FE).
Column (5) is linear probability model with firm fixed effects (FE).
Marginal effects are calculated at the mean.
Standard errors in parentheses.
Real exchange rate, labour productivity, age, and employment are in logarithmic form.
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

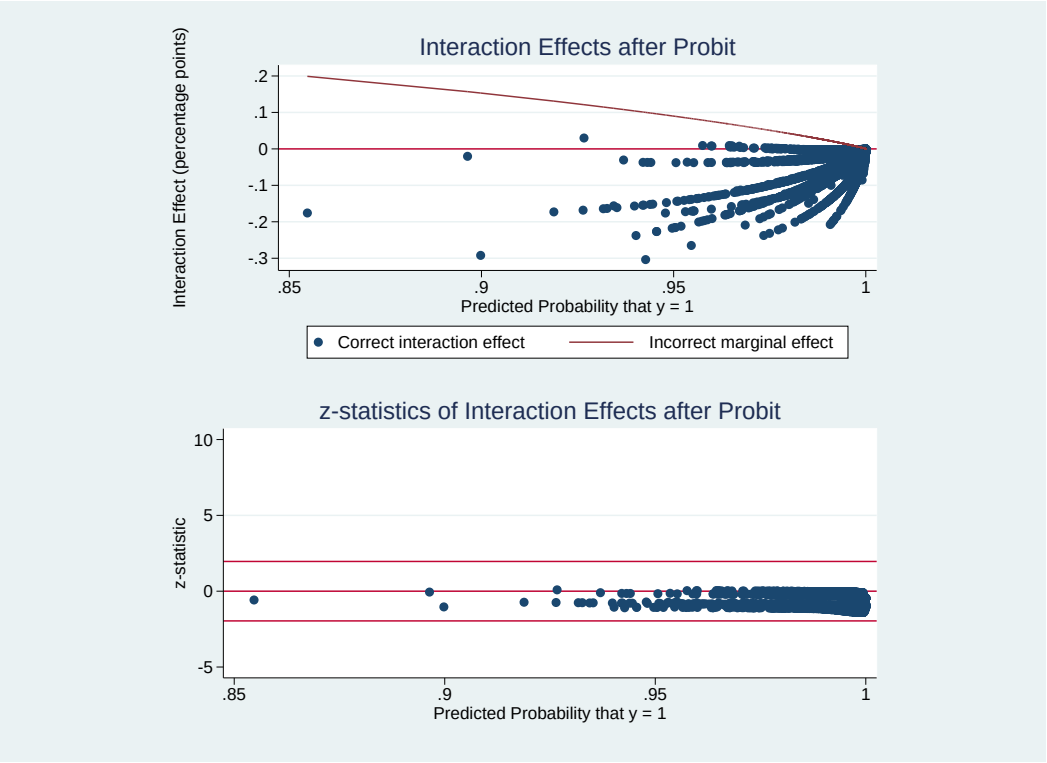

Figure 1: Interaction Effect between Real Exchange Rate and High Productivity Firms