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Exporters During the Trade Collapse: The (Surprising) Resiliency of the Small Exporter*

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Abstract: How did small exporters fare relative to large exporters during the 2008-09 crisis? Examining the performance of Mexican exporters reveals that the crisis did not make smaller exporters more likely to exit, grow less, or expand less their product line relative to larger exporters. Workhorse models of trade would predict the opposite. The same models, however, are consistent with the data before the crisis: within industry, (i) firm exit rate is decreasing in size; (ii) conditional on survival, export growth is decreasing in size; (iii) product line expansion is increasing in size.
Keywords: Firm level trade, firm size, crisis, margins of trade adjustment.
JEL Classification: F11, F15.

Resumen: ¿Cómo les fue a los exportadores chicos en relación a los grandes exportadores durante la crisis de 2008-2009? Examinando el desempeño de los exportadores mexicanos se revela que la crisis no causó que los exportadores pequeños fueran más propensos a salir del mercado, crecer menos, o expandir menos sus líneas de productos en relación a los grandes exportadores. Los modelos básicos de comercio predecirían lo contrario. Sin embargo estos modelos son consistentes con los datos antes de la crisis: dentro de una industria, (i) la tasa de salida decrece con el tamaño, (ii) condicional en sobrevivir, el crecimiento en las exportaciones decrece con el tamaño, (iii) la expansión de la línea de productos incrementa con el tamaño.
Palabras Clave: Comercio, tamaño de le empresa, crisis, márgenes de ajustes del comercio.

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1 Introduction

The trade collapse/crisis of 2008-2009 has led to extensive research, both theoretical and empirical, into the causes of the collapse. Most of the literature, understandably, has focused on the issue of explaining the large decline in aggregate trade, with a focus on two main explanations - a decline in aggregate demand and a negative aggregate credit shock.[1] In this paper, we look at the trade collapse from a different perspective; we ask the following question: Is the pattern observed in the margins of trade adjustment during the crisis period relative to pre-crisis period consistent with the predictions of the current workhorse models of trade when combined with an aggregate shock (to demand or credit supply)?

Drawing on the Mexican customs data for transactions with the United States (U.S.) during the period 2004-2010, we study how the margins of adjustment at the level of individual exporters and the products they exported behaved during the trade crisis of 2008-09, and importantly, then compare it to the patterns observed in the pre-crisis and post-crisis period.[2] We find that the pattern of pre-crisis correlation of firm size with firm exit, growth in exports and product line expansion is consistent with a large body of work, both empirical and theoretical, on firm level heterogeneity and international trade.[3] However, the benchmatk results show that the crisis did not make smaller exporters more likely to exit, grow less, or expand less their product line, and this is at odds with the chief mechanisms highlighted in the literature combined with an aggregate shock. This lack of adverse effect on small exporters is also observed in the post-crisis period.

Starting with firm exit (firm-level extensive margin), we find that firm exit rate is decreasing in size during the pre-crisis period.[4] Importantly, the probability of exit of exporters relative to the top size quintile of exporters is stable during the crisis and post-crisis periods, even after controlling for industry-time fixed effects. Thus, smaller firms did not become more likely to exit during the crisis.

[1] Vertical supply chains may have an amplification effect. See Bems, Johnson and Yi (2012) for a survey of the trade collapse literature.

[2] For the period under study U.S. accounted for about 80 percent of Mexican exports.

[3] Throughout the paper, we define exit as exit from the U.S. market or exit from a particular industry of the U.S market. Given the data constraint, we cannot observe whether firms exit from the market altogether.

[4] Size of an exporter is proxied by the total sales in the initial year of a period.

Second, while growth in sales of exporters (firm-level intensive margin) is decreasing in the size of exporters in all three periods, sales do not contract for exporters of all size categories during the crisis. It is only the larger exporters who suffer a contraction in their exports. After controlling for industry-time fixed effects, conditional on survival, export growth of firms up to the third quintile relative to the top quintile is significantly higher in the pre-crisis period. However, firms in the top quintile (top 20 percent exporters) have a higher growth rate than those next-to-top level exporters (fourth quintile). During the crisis period these patterns are unchanged, and, in fact, firms in the first quintile (smallest firms) exhibit an even faster growth in exports relative to firms in the top quintile. During the post-crisis period relative growth rates look like those in the pre-crisis period.

Third, product line expansion measured as the growth in number of products (within firm product level extensive margin) within the same industry is increasing in the size in the pre-crisis period, but the increase is not monotonic. The third and fourth quintile exhibit faster growth in number of products than the top quintile, whereas the bottom two quintiles exhibit slower growth in number of products than the top quintile. These patterns are unchanged during the crisis and post-crisis periods.

Ignoring the effect of size and decomposing aggregate exports into extensive and intensive margin changes confirms that the intensive margin drives the majority of changes in exports. This is consistent with the findings of other firm level studies - Bricongne et al. (2012) (for French exporters) and Behrens, Corcos and Mion (Forthcoming) (for Belgian exporters). Importantly, unlike us, they do not assess whether the behavior of margins of adjustment for small versus large firms was different in the crisis period as compared to other periods.

The pattern of pre-crisis correlation of firm size with firm exit, growth in exports and product line is consistent with a large body of work, both empirical and theoretical, on firm-level heterogeneity in international trade. The decline in exit probability with the size of exporters is consistent with the self selection of more productive firms into becoming exporters, as emphasized in Melitz (2003) and Bernard et al. (2003).[5] Arkolakis (2010)

[5]See Clerides, Lach and Tybout (1998) (for Mexico, Colombia and Morocco), Bernard and Jensen (1999) (for U.S.), and Aw, Chung and Roberts (2000) (for Taiwan) for empirical evidence.

explains the negative relationship between export growth and size by replacing the fixed cost of exporting in the Melitz/Chaney model with an increasing marginal cost of reaching additional consumers in destination markets.[6] Lastly, the increase in number of products exported with size can be generated in a multi-product generalization of the Melitz framework as done in Bernard, Redding and Schott (2011), Bernard, Redding and Schott (2010), Mayer, Melitz and Ottaviano (2011), and Arkolakis and Muendler (2011). The larger more productive firms can profitably export more products.

However, the finding that the crisis did not make smaller exporters more likely to exit, grow less, or expand less their product line is at odds with the combination of the self selection of most productive firms into exporting and an aggregate shock.

In case of a sharp reduction in aggregate demand (emphasized by Eaton et al. (2010) and Behrens, Corcos and Mion (Forthcoming)) average sales and profit margins diminish, and the least productive firms shrink and are most likely to exit the market altogether. Among the surviving firms, the same mechanism will also cause the export sales of smaller exporters to fall relative to larger exporters.[7]

Eaton et al. (2010) also emphasize the heterogeneity in demand shocks across industries. They find that the collapse in demand for durables was the most important factor behind the trade collapse. Accounting for heterogeneity in the degree of durability across industries, for firm exit and export growth we do not find any evidence that smaller firms in durable goods industries performed differently as compared to smaller firms in non-durable goods industries during the crisis and post-crisis periods. However, with respect to product line expansion, evidence suggests that smaller firms in non-durable goods industries performed worse than those in durable goods industries during the post-crisis period.

The interaction between credit constraints and firm heterogeneity is also going to cause the smaller and less productive firms to be more affected by credit restrictions as a result of their size or lack of sufficient collateral and/or credit guarantees (Greenaway, Guariglia

[6]Constant elasticity of substitution in Melitz model implies export growth is identical for all exporters. See Eaton et al. (2007) and Kehoe and Ruhl (2003) for similar findings on size and export growth.

[7]In Arkolakis (2010) the elasticity of sales with respect to destination market wage is positive and decreasing in productivity. Thus, a negative shock to the destination market wage reduces the sales of less productive smaller exporters more than the sales of more productive larger exporters.

and Kneller (2007), Muuls (2008), and Manova (2008)). But, due to the lack of firm-level data on credit constraints most of the empirical work uses industry level measures of credit dependence and focuses on implications for aggregate exports. For example, Chor and Manova (2012) and Iacovone and Zavacka (2009).[8]

Upon inclusion of a measure of financial dependence at industry level (as developed in Rajan and Zingales (1998)) we find that financial dependence does not explain the lack of poor performance of smaller firms during the crisis or post-crisis period with respect to exit and export growth. It, however, has, differential impact on the performance of small versus big exporters with respect to growth in number of products. Small exporters in industries less dependent on finance experience poor growth in products in the post-crisis period.

Lastly, we investigate the role of difference in the degree of vertical supply chain integration (at firm-level). Bems, Johnson and Yi (2011*b*), Alessandria, Kaboski and Midrigan (2010) and Levchenko, Lewis and Tesar (2010) emphasize the amplifying role of global production chains and inventory adjustment. We find that for firm exit and export growth dependence on maquiladora exports does not alter our finding of the lack of adverse effect of crisis on smaller exporters. For product line expansion, however, the evidence suggests that during the post-crisis period smaller firms that are less dependent on maquiladora exports performed worse than similar size maquila oriented firms.

The lack of monotonicity in export growth between fourth and fifth quintile observed in the benchmark findings seems to be explained by the relatively poor performance of firms in the fourth quintile in industries that are classified as financially dependent or in durable goods industries. Furthermore, the non-monotonic relationship between size and product growth (third and fourth quintile exhibit faster growth whereas the bottom two quintiles exhibit slower growth than the top quintile) is explained by the relatively poor performance of smaller firms in industries that are financially dependent or in durable goods industries,

[8]There are a few studies that use firm-level data, but they also do not investigate the issue of the differential impact of tighter credit conditions on exporters of different sizes within an economy or within sectors in an economy. For instance, Bricongne et al. (2012) for France and Paravisini et al. (2011) for Peru. Amiti and Weinstein (2011) use matched firm-bank data from Japan to show that banks transmitted financial shocks to exporters during the systemic crisis that plagued Japan in the 1990s.

and by the poor performance of smaller firms that rely heavily on maquiladora exports.[9]

The lack of a larger negative effect on small exporters' firm level intensive and extensive margin is not consistent with the workhorse models' predictions when a negative aggregate (demand or credit) shock is the source of trade collapse. In our view this inconsistency can be potentially rationalized in three different ways - (i) augment the workhorse models of trade with another dimension of heterogeneity that counters the productivity driven sorting mechanism so as to shield the smaller firms from the aggregate shock but not the larger firms; (ii) the demand or credit shock that resulted in the crisis was heterogeneous across firms, not affecting the small exporters; (iii) our findings, may well be capturing the behavior of exporters along a transition path.

The contribution of our paper lies in exploiting the rich micro structure of the current workhorse models of trade and mapping it to the data, in the context of the 2008-09 trade collapse. The literature on trade collapse has used these models, directly or indirectly, largely to understand the aggregate decline in trade and not the adjustment behavior of different sized firms.[10] In a more general context, we investigate the response of individual exporters to a large negative aggregate shock. In contrast a vast body of empirical work uses firm-level trade data to examine the behavior of individual exporters during episodes of trade liberalizations or decline in trade costs.

The rest of the paper is organized as follows. The next section discusses the data and its basic features. This is followed, in section 3, by the decomposition of Mexican exports into intensive and extensive margin changes. Section 4 discusses the margins of adjustment by firm size. In section 5, we juxtapose our findings with the workhorse models and explore importance of heterogeneity in demand collapse, credit constraints, and vertical supply chain integration. In section 6, we discuss ways of interpreting the inconsistency between our findings and the workhorse models. Section 7 concludes.

[9]Both of these pre-crisis correlations are true for industries characterized as differentiated. We examine the importance of differences in the degree of differentiation (at industry level). Results are shown in the Appendix A.3.

[10]Gopinath and Neiman (2011) look at response of different sized importers to an aggregate shock.

2 Data

The data we use for our analysis are administrative records of the Mexican customs agency on every transaction crossing the Mexican border. Prior to carrying out an international transaction, Mexican exporters and importers must fill out a customs form, called a pedimento aduanal in Spanish, on which they report the total value of the shipment (in US dollars), the products' tariff classification code[11], the price and the quantity of the products, the destination/origin country, as well as information on Mexican importers themselves such as to their name, tax payer id and address. [12]

We use data from July 2004 to June 2010. From the original transaction-level data, we, first, aggregate up to monthly firm-product level exports and then cut monthly firm-product level exports whose value is less than 2000 USD in order to focus on not-one-time exporters.[13] Then, the data are aggregated up to a yearly level. One year in our analysis starts with July of one year and ends in June of next year.[14]

Furthermore, we restrict the sample to exports to the U.S.. The U.S. accounted for more than 80 percent of Mexican exports during this period. Mexico - U.S. trade provides a good setting to study the trade collapse because most of the factors pointed out in the trade collapse literature - demand collapse, financial constraints and disruption of supply chains - play an important role in this bilateral trade relationship. Mexico relies largely on the

[11]The code is 8-digit and the first 6-digit is same as the HS code. There is a classification change in July 2007 due to the change in the HS from HS 2002 to HS 2007. We used the concordance between them to create a unified classification that can be applied to both before and after the classification change. The concordance to our own classification is available upon request. The results of our analysis do not change if we use the actual classification as the product category.

[12]We constructed our own exporter ID, taking into account the misspelling of tax payer ID, name and address. The procedure is available from the authors. The results do not change if we use tax payer id as it is as the firm ID.

[13]This significantly reduces the number of exporter-product pairs, but none of the results of our analysis change if we use the whole sample. The U.S. custom also uses the cutoff of 2000 USD to distinguish between small and non-small shipment, and the latter type of shipment is examined with more care.

[14]We also conduct our analysis at a half yearly frequency. The first half (H1) of a year covers the months from January to June, and the second half (H2) of a year covers July to December. The results at half yearly frequency are consistent with the yearly results.

US market for its exports, which was the origin of the financial crisis. Mexico has a weak financial system (see Hanson (2010) for drawbacks of the Mexican financial system). A large fraction of Mexico's exports are due to Maquiladora trade, which captures supply chains.

The period 2007-08 to 2008-09 is the crisis period. We think of the three periods before the crisis period as 'normal', and use them as benchmarks for comparison. We will refer to these as the pre-crisis periods. The period after the crisis period is the recovery period or the post-crisis period.

Basic features of the data are presented in detail in the Appendix. We summarize them here: (i) the distribution of export sales and products exported (by size) is skewed to the right; (ii) average exports per exporter per product also increases with size, implying that exporters with larger sales also have larger sales per product; (iii) consistent with the findings of Bernard, Redding and Schott (2010) for US exporters, we find support for bipolar distribution of number of products exported per exporter; (iv) multi-product firms account for the bulk of Mexican exports - exporters selling 5 or more products account for about 93 percent of Mexican exports.

3 Crisis and Margins of Adjustment

The effect of the crisis on the Mexican economy was quite severe. Between the second quarter of 2008 and the first quarter of 2009 real exports declined by 27 percent while real imports declined by 29 percent. [15] Figure 1 shows the merchandise exports and imports for Mexico from January 2006 to August 2010. The largest drop in both imports and exports took place between July 2008 and January 2009. During this period the value of exports fell by 45% whereas the value of imports fell by 42%.

[15] Data are expressed in constant 2003 Mexican Pesos and come from the Sistema de Cuentas Nacionales de Mexico, Instituto Nacional de Estadística y Geografía (INEGI).

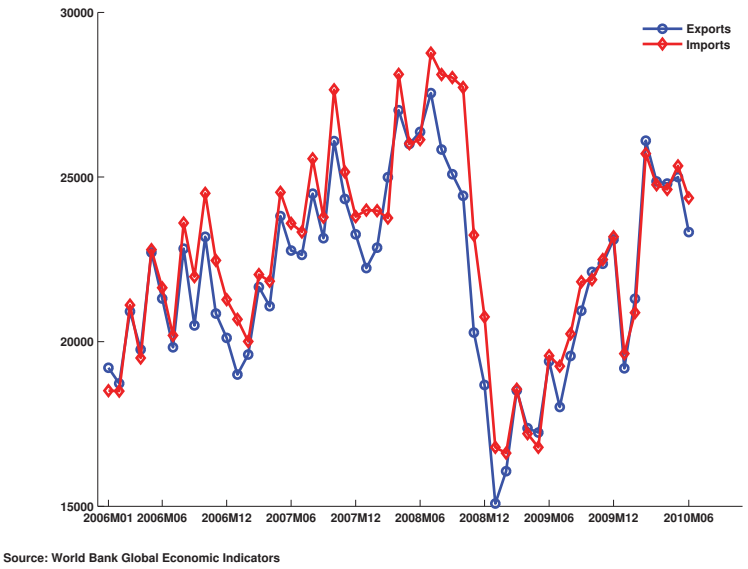

Figure 1: Merchandise exports and imports of Mexico (current US $, million)

3.1 Margins of Adjustment at Exporter-Product Level

We start by looking at the margins of adjustment of Mexican exports at the level of individual exporters and their products. Between any two time periods - t and $t-1$, we segment the total population of exporting firms and their products into (a) stayers or survivors (present in both time periods), (b) exiters (present in $t-1$ but not in t, and (c) new entrants (present in t but not in $t-1$). So, the change in the value of exports can be written as

$$\begin{aligned}\frac{X_t - X_{t-1}}{X_{t-1}} = & \underbrace{\sum_{i\in\Omega_{t-1}\bigcap\Omega_t}\ \sum_{p\in\Psi_{i,t-1}\bigcap\Psi_{i,t}} \frac{X_{p,i,t}-X_{p,i,t-1}}{X_{t-1}}}_{\text{sub-intensive margin}} \\ & + \underbrace{\sum_{i\in\Omega_{t-1}\bigcap\Omega_t}\left[\sum_{p\in\Psi_{i,t},p\notin\Psi_{i,t-1}} \frac{X_{p,i,t}}{X_{t-1}} - \sum_{p\in\Psi_{i,t-1},p\notin\Psi_{i,t}} \frac{X_{p,i,t-1}}{X_{t-1}}\right]}_{\text{sub-extensive margin}} \\ & + \underbrace{\sum_{i\in\Omega_t,i\notin\Omega_{t-1}} \frac{X_{i,t}}{X_{t-1}} - \sum_{i\in\Omega_{t-1},i\notin\Omega_t} \frac{X_{i,t-1}}{X_{t-1}}}_{\text{extensive margin}} \quad ,\end{aligned} \tag{3.1}$$

where $X_{i,t}$ is exports of firm i at time t, $X_{p,i,t}$ is exports for product p by firm i at time t, Ω_t is the set of exporting firms at time t, $\Psi_{i,t}$ is the set of products exported by firm i at time t, and $X_t = \sum_{i\in\Omega_t} X_{i,t}$ is the total exports at time t.

The change in aggregate exports has three components. First, changes in trade volume for stayer products of stayer firms; this is called the sub-intensive margin and it is the first term on the right-hand side in (3.1). The second component is the sum of the second and third term in square bracket - changes in trade volume brought about due to the adding (new entrants) and dropping (exiters) of products by stayer firms. This is called the sub-extensive margin, and it captures the effect of changes in product scope of continuing exporters on the export volume. Lastly, changes in trade volume due to exit and entry of firms is called the extensive margin. Note that changes in extensive margin also involve products, but exit of a firm will imply exit of all the products it exports, and similarly entry of a new firm will imply entry of all products that it exports. Therefore, extensive margin changes are only expressed at the firm level. This also reflects the fact that the firm makes the decisions to enter/exit/stay as well as which products to export.

Table 1: Extensive and intensive margin of exports: firm and product level (in percent)

Type of firm	Type of Product	2004/05-2005/06	2005/06-2006/07	2006/07-2007/08	2007/08-2008/09	2008/09-2009/10
Stayer	All	9.24	10.41	7.11	-16.70	8.16
	Stayers	8.09	9.13	2.90	-13.96	8.62
	Exiters	-3.16	-2.19	-3.31	-5.08	-3.48
	New Entrants	4.31	3.47	7.51	2.34	3.01
	Entry plus Exit	1.16	1.28	4.20	-2.74	-0.47
Exiters	Exiters	-2.01	-1.53	-0.59	-0.63	-0.69
New Entrants	New Entrants	1.01	1.38	1.27	2.05	1.60
Growth in Exports		8.24	10.26	7.78	-15.28	9.06

Table 1 shows the decomposition in (3.1). The row for 'All' products simply gives us the intensive margin adjustment at the firm level by ignoring entry and exit of products. This is then broken down into sub-intensive margin and sub-extensive margin. Sub-intensive margin is reflected in the numbers for the combination of stayer firms and stayer products. Sub-extenisve margin is the sum of two combinations - stayer firms and new entrant products and stayer firms and exiter products. This is shown in the row for 'Entry plus Exit'. Comparing the two, we find that the decline in exports during the crisis period was largely due to the decline in sub-intensive margin. The pre-crisis periods also show the same picture, though in

a positive direction. Again, the growth in exports in the recovery period is due to the growth in the sub-intensive margin. While the net effect of changes in product scope is negative during the crisis period, it is small compared to the effect of sub-intensive margin changes.

This is consistent with the findings of other firm level studies - Bricongne et al. (2012) (for French exporters) and Behrens, Corcos and Mion (Forthcoming) (for Belgian exporters). Importantly, unlike us, they do not compare their findings from the crisis period with those from the pre or post-crisis periods to assess whether the behavior of margins of adjustment for small versus large firms was different in the crisis period as compared to other periods. The importance of intensive margin in the pre-crisis periods is also consistent with other studies, such as Bernard et al. (2009).

4 Margins of Adjustment by Size of Exporter

Our analysis so far confirms the basic finding of many studies regarding the trade adjustment in the 2008 crisis - decline in trade was driven by intensive margin adjustment. The growth in intensive margin during the recovery period bolsters the importance of intensive margin adjustment further. However, the literature has not investigated if the dominance of intensive margin adjustment holds when one looks at exporters of different types. To be specific, in this section we investigate whether exporters of different sizes adjusted differently during the crisis period as compared to pre-crisis amd post-crisis period.

We focus on (i) probability of firm exit, (ii) growth in sales, and (iii) growth in the number of products during the pre-crisis, crisis and post-crisis periods for firms of different sizes. Recent literature on firm-level heterogeneity and trade finds evidence that more productive firms self-select into becoming exporters, and they are bigger in size - have greater export sales and employment.[16] Chaney (2008) and Bernard et al. (2003) show that models with firm-level heterogeneity in productivity, fixed costs of exporting, and variable iceberg costs of exporting can replicate the size distribution of firms very well. Since we do not have data on firm characterestics like output and employment, value of exports of a firm in year $t-1$ is taken as a proxy for size of the firm for a given period.

[16] See Clerides, Lach and Tybout (1998) (for Mexico, Colombia and Morocco), Bernard and Jensen (1999) (for U.S.), and Aw, Chung and Roberts (2000) (for Taiwan and Korea).

To examine how these margins change from pre-crisis to crisis and post-crisis periods we employ the following benchmark specification:

$$
\begin{aligned}
Y_{ij,t,t-1} = \alpha + \sum_{k=1}^{4} \beta_k Quintile^k_{ij,t-1} + \sum_{k=1}^{4} \gamma_k Quintile^k_{ij,t-1} \times Crisis \\
+ \sum_{k=1}^{4} \delta_k Quintile^k_{ij,t-1} \times Post\ \ Crisis + \mu_{j,t} + \epsilon_{ij,t,t-1} \quad .
\end{aligned} \tag{4.1}
$$

i, j and t index exporters, industries (HS chapter, which is the first two digits of the HS product code), and years, respectively; $Quintile^k_{ij}$ is a dummy variable indicating whether firm i's export revenue in industry j is in the kth quintile within industry j; and $\mu_{j,t}$ is an industry-time fixed effect.[17] Y_{ij} denotes one of the three margins - dummy for exit, growth in sales (measured by the change in logarithm of export sales), or growth in the number of products (measured by the change in logarithm of number of products). The omitted category for $Quintile^k_{ij}$ is the last quintile: the top 20 percent exporters. γ_k and δ_k capture the changes in three margins for the exporters in the kth quintile compared to the top quintile of exporters within industries during the crisis and post-crisis periods, respectively.[18] We also report results for the same specification with deciles (instead of quintiles) in Table A.4 in the Appendix.

4.1 Firm Exit

Before we get to the results of our benchmark specification, we start by simply plotting, in Figure 2, the exit probabilities by firm size for the three pre-crisis periods, the crisis period and the post-crisis period. This plot ignores the compositional differences captured by industry fixed effects that the econometric specification takes into account. The first thing to note is that for every period the exit probability is declining in size of the firm. This is consistent with models of trade that emphasize that more productive larger firms are able to pay the sunk costs of entry into export markets and remain profitable. Therefore, they face a lower probability of exit. Comparing the exit probabilities across different time

[17] This means that firms may not necessarily be exiting altogether from the U.S. market in case firms export in more than one HS chapter.

[18] Standard errors are clustered at the firm level.

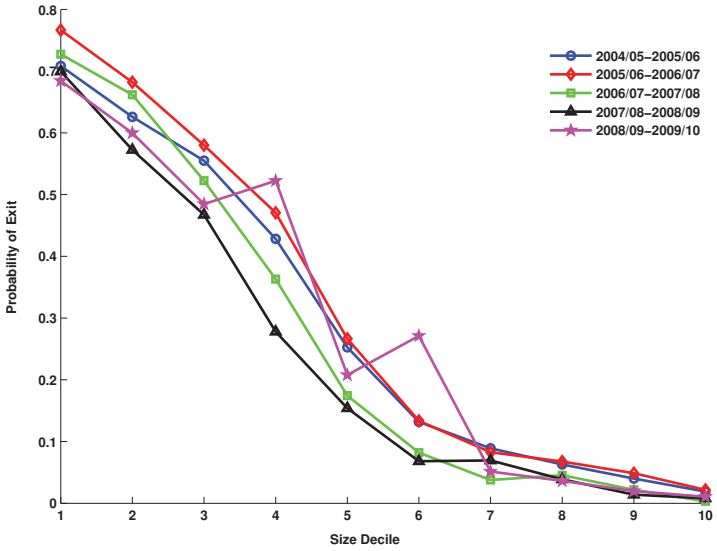

Figure 2: Probability of Firm Exit by Size

periods, we find that firm exit probabilities did not exhibit any significant change during the crisis period as compared to pre and post-crisis periods for any size category. In particular, the exit probabilities for smaller firms do not increase during the crisis period.

Table 2 shows the results for the benchmark specification in (4.1). Column (1) shows the result for exporters' exit from the U.S. market (in a certain industry). The coefficient on kth quintile is higher than that of $(k+1)$th quintile. This suggests the exit probability is monotonically decreasing in size within industries.[19]

Does the trade crisis make smaller exporters even more likely to exit from the export market? The interaction of the kth quintile with the dummy for the crisis period shows the effect on exit probability of a firm in the kth quintile during the crisis. Barring the coefficient on third quintile the crisis does not have an impact on the exit probability of firms. For the third quintile we see a statistically significant change but that of a decline in exit probability relative to the top 20 percent firms. The coefficients for the interaction of quintiles with the dummy for the post-crisis period also show that there was no statistically significant impact on exit probabilities of firms during the post-crisis period. The trade crisis, therefore, did not make smaller exporters more likely to exit from the export market.

[19]This is also consistent with the literature on industry dynamics. For example, see Klette and Kortum (2004).

Table 2: Regression of Exit, Export Growth and Product Line Expansion on Relative Size of Exporters

	(1) Probability of Exit	(2) Export Growth $\ln X_{i,j,t} - \ln X_{i,j,t-1}$	(3) Product Growth $\ln Products_{i,j,t} - \ln Products_{i,j,t-1}$
1st Quintile	0.695***	1.404***	-0.229***
	(0.005)	(0.023)	(0.007)
2nd Quintile	0.585***	0.568***	-0.071***
	(0.006)	(0.018)	(0.007)
3rd Quintile	0.428***	0.119***	0.015***
	(0.007)	(0.016)	(0.006)
4th Quintile	0.226***	-0.032**	0.023***
	(0.008)	(0.014)	(0.005)
1st Quintile*Crisis	-0.015	0.090**	-0.015
	(0.013)	(0.044)	(0.016)
2nd Quintile*Crisis	-0.019	0.030	0.006
	(0.013)	(0.034)	(0.014)
3rd Quintile*Crisis	-0.033***	0.015	-0.023*
	(0.013)	(0.030)	(0.014)
4th Quintile*Crisis	-0.010	0.005	-0.001
	(0.013)	(0.026)	(0.012)
1st Quintile*Post-Crisis	0.009	-0.030	-0.017
	(0.014)	(0.043)	(0.015)
2nd Quintile*Post-Crisis	-0.002	0.003	-0.022
	(0.014)	(0.035)	(0.014)
3rd Quintile*Post-Crisis	0.005	0.011	-0.022*
	(0.014)	(0.030)	(0.013)
4th Quintile*Post-Crisis	0.003	-0.007	0.003
	(0.014)	(0.027)	(0.011)
N	142147	92636	92636

The table reports coefficients on quintile dummies from exporter-industry-level analysis of exit, sales growth and product growth with respect to the U.S. market, and includes industry-time fixed effect. Crisis and Post-crisis are dummies for the crisis and post-crisis periods. The omitted category is the top quintile, so each coefficient reveals the relative performance of the exporters in the k-th quintile compared to the top 20% exporters within industries. Robust standard errors in parentheses. Significance: * 10 percent, ** 5 percent, *** 1 percent.

4.2 Export Growth

Now, we analyze the growth in exports of firms of different sizes between two years in a period. As in the case of firm exit, we first examine the relationship between growth in exports and size without using the econometric specification. Table 3 shows the exports in year t relative to year $t-1$ by size (in year $t-1$) for the three pre-crisis periods, the crisis period and the post-crisis period. Growth in exports is declining in size in all time periods. What stands out is the performance of firms of different sizes during the crisis period. The smaller firms - bottom 60 percent - continued to expand their exports even during the crisis, and the effect of the crisis is seen largely on the top 40 percent firms. Even among these firms the brunt of the crisis is felt by the top 10 percent exporters whose sales declined by 19 percent. This implies that the decline in Mexican exports to the United States was due

Table 3: Growth in Exports by Size

Size(t-1)	$Exports(t)/Exports(t-1)$				
	2004/05-2005/06	2005/06-2006/07	2006/07-2007/08	2007/08-2008/09	2008/09-2009/10
0-20	35.80	8.63	21.54	11.38	16.66
20-40	4.99	1.96	3.25	2.52	4.63
40-60	1.90	1.31	2.04	1.43	1.53
60-80	1.26	1.28	2.70	1.07	1.21
80-90	1.15	1.08	1.04	0.96	1.02
90-100	1.05	1.08	1.01	0.81	1.07

to decline in exports of the largest 10 percent exporters.

Column (2) of Table 2 shows the result for the change in the log of exports based on (4.1). Since this variable is defined for only those exporter-industry pairs that survived, the analysis shows that how exporters of different initial relative size grow conditional on survival. During the pre-crisis periods export growth and size show the following patterns: (i) smallest exporters are growing at the highest rate; (ii) the growth rate is decreasing in size up to the fourth quintile; (iii) but exporters in the top quintile (top 20 percent exporters) have a higher growth rate than those next-to-top level exporters.

Does the trade crisis reduce smaller exporters' export growth? The coefficients on the interaction between quintiles and crisis dummy suggest that patterns (i),(ii) and (iii) are unchanged. Similar conclusion is drawn for the post-crisis periods. If anything, during the crisis, the growth rate of exports for the smallest exporters (bottom 20 percent) relative to exporters in the top quintile became slightly higher.

4.3 Expansion of Product Line

Next, we examine the expansion in product line. Columns (3) of Table 2 shows that the growth in number of products within the same industry is increasing in the size in the pre-crisis period, but the increase is not monotonic. The third and fourth quintile exhibit faster growth in number of products than the top quintile, whereas the bottom two quintiles exhibit slower growth in number of products than the top quintile. Comparison with the coefficients on crisis and post-crisis interactions with quintiles suggests that the patterns are statistically similar across different periods. There is, however, some decrease in the growth in number

of products for the third quintile both during crisis and post-crisis periods. Overall, we do not observe that smaller exporters expand their product line less during or after the crisis.

4.4 Robustness Check for Margins of Adjustment by Size

The benchmark specification in 4.1 focuses on the relative position of a firm in the size ranking within an industry. This is taken as a proxy for the productivity of the firm within the industry. However, the performance of the firm within an industry could also be affected by its total size or its relative position in the size ranking across all industries. This would capture the effect of overall productivity of the firm on its performance in an industry. Another dimension that may be important in the context of multi-product firms is how diversified a firm is. It has been found in the literature that the bigger firms tend to export more products, something that we document for our data as well in Table A.3. This would tend to make bigger firms to be more diversified as compared to smaller firms. The extent of diversification could also affect the relative performance of a firm within an industry.

In order to address these concerns, we test the robustness of the results by using an alternative specification. We augment our benchmark specification with the log of total exports of firm i in year $t-1$ and the number of HS chapters (first two digits of the HS product code) in which firm i exports in year $t-1$ as explanatory variables on the right hand side. The number of HS chapters captures how diversified a firm is across industries.

For each of the three outcome variables - firm exit, export growth, and product growth - we use the following specification

$$\begin{aligned} Y_{ij,t,t-1} = \alpha + \sum_{k=1}^{4} \beta_k Quintile^k_{ij,t-1} + \sum_{k=1}^{4} \gamma_k Quintile^k_{ij,t-1} \times Crisis + \sum_{k=1}^{4} \delta_k Quintile^k_{ij,t-1} \\ \times Post\ Crisis + \theta_1 \ln X_{i,t-1} + \zeta_1\ Number\ \ HS2_{i,t-1} + \theta_2 \ln X_{i,t-1} \\ \times Crisis + \zeta_2\ Number\ \ HS2_{i,t-1} \times Crisis + \theta_3 \ln X_{i,t-1} \times Post\ Crisis \\ + \zeta_3\ Number\ \ HS2_{i,t-1} \times Post\ \ Crisis + \mu_{j,t,t-1} + \epsilon_{ij,t} \quad , \end{aligned} \tag{4.2}$$

where $\ln X_{i,t-1}$ is the log of exports of firm i in year $t-1$, and $Number\ \ HS2_{i,t-1}$ is the number of HS chapters in which firm i exported in year $t-1$. Table 4 shows the results.

For all three outcome variables, we find that performance of small firms relative to the big firms is qualitatively the same as seen in the benchmark specification. Furthermore, the

Table 4: Regression of Exit, Export Growth and Product Line Expansion on Relative Size of Exporters: Robustness Check

	(1) Probability of Exit	(2) Export Growth $\ln X_{i,j,t} - \ln X_{i,j,t-1}$	(3) Product Growth $\ln Products_{i,j,t} - \ln Products_{i,j,t-1}$
1st Quintile	0.638***	1.475***	-0.248***
	(0.006)	(0.024)	(0.008)
2nd Quintile	0.520***	0.630***	-0.087***
	(0.007)	(0.019)	(0.007)
3rd Quintile	0.366***	0.169***	0.002
	(0.008)	(0.017)	(0.006)
4th Quintile	0.181***	0.002	0.015***
	(0.008)	(0.014)	(0.005)
Log(Firm Exports)	-0.023***	0.022***	-0.007***
	(0.001)	(0.003)	(0.001)
Number HS2	-0.006***	0.001	0.001**
	(0.001)	(0.001)	(0.000)
1st Quintile*Crisis	0.017	0.032	0.002
	(0.014)	(0.046)	(0.017)
2nd Quintile*Crisis	0.008	-0.024	0.022
	(0.014)	(0.037)	(0.015)
3rd Quintile*Crisis	-0.014	-0.028	-0.010
	(0.013)	(0.032)	(0.014)
4th Quintile*Crisis	0.004	-0.026	0.008
	(0.013)	(0.027)	(0.012)
Log(Firm Exports)*Crisis	0.009***	-0.014**	0.005*
	(0.002)	(0.006)	(0.003)
Number HS2*Crisis	-0.000	-0.005**	0.001
	(0.001)	(0.002)	(0.001)
1st Quintile*Post-Crisis	0.023	-0.057	-0.004
	(0.015)	(0.047)	(0.016)
2nd Quintile*Post-Crisis	0.010	-0.025	-0.009
	(0.015)	(0.038)	(0.015)
3rd Quintile*Post-Crisis	0.014	-0.012	-0.011
	(0.014)	(0.032)	(0.013)
4th Quintile*Post-Crisis	0.010	-0.026	0.012
	(0.014)	(0.028)	(0.012)
Log(Firm Exports)*Post-Crisis	0.003	-0.005	0.002
	(0.002)	(0.007)	(0.003)
Number HS2*Post-Crisis	0.002*	-0.006**	0.003***
	(0.001)	(0.003)	(0.001)
N	142147	92636	92636

The table reports coefficients on quintile dummies, total firm exports, and number of HS 2 industries in which a firm exports, from exporter-industry-level analysis of exit, sales growth and product growth with respect to the U.S. market, and includes industry-time fixed effect. Crisis and Post-crisis are dummies for the crisis and post-crisis periods. The omitted category is the top quintile, so each coefficient reveals the relative performance of the exporters in the k-th quintile compared to the top 20% exporters within industries. Robust standard errors in parentheses. Significance: * 10 percent, ** 5 percent, *** 1 percent.

finding from the benchmark specification that this relative performance of small firms does not change significantly during the crisis period also survives in the robust specification.

In the pre-crisis period total firm size and number of HS 2 chapters affect exit probability negatively and export growth positively. While total firm size slows product line expansion, number of HS 2 chapters improves it. During the crisis period, the effect of total firm size on three margins is opposite to that in the pre-crisis period. The effects in the

post-crisis period are the same as those in the crisis period, but statistically insignificant. The effect of number of HS 2 chapters during the crisis period is significant only for export growth, but the direction is opposite of that observed in the pre-crisis period. In the post-crisis period the effects are significant for all three margins, and the direction of the effects is the same as that in the pre-crisis period.

5 Performance of Big versus Small Exporters in Workhorse Models of Trade

To summarize, we find that: (i) firm exit probability is decreasing in size in all periods, and small firms' exit probability (relative to large firms) does not increase during the crisis period; (ii) smaller firms' exports grow faster than those of the larger firms, and it is only the large exporters who suffer a contraction in exports during the crisis period; (iii) growth in the number of products exported is increasing in firm size in all periods, though non-montonically, and relative to the top decile this growth rate during the crisis is no different from that in the pre-crisis and post-crisis period.

Patterns of pre-crisis (and even post-crisis) correlations of firm size with firm exit, growth in exports and product line expansion is consistent with a large body of work. Decreasing exit probability with size of exporters is consistent with the self selection of more productive firms into becoming exporters by paying a fixed cost of entry into foreign markets - Melitz (2003), Chaney (2008) and Bernard et al. (2003). Faster growth of exports for smaller exporters is consistent with Arkolakis (2010), wherein the fixed cost of exporting is replaced with an increasing marginal cost of reaching additional consumers in destination markets (advertising costs). Smaller firms decide to reach fewer consumers, but a decline in trade costs or an increase in destination market size allows them to add additional consumers at lower marginal costs than larger firms. Lastly, the multi-product generalization of the Melitz framework - Bernard, Redding and Schott (2011) and Bernard, Redding and Schott (2010) - show that larger more productive firms can profitably export more number of products.

The facts that smallest firms grow the fastest and export growth rate is decreasing in size are consistent with many models of firm size distribution, but non-monotonicity in

export growth between the fourth and the top quintile is not. For example, stylized fact 8 of Klette and Kortum (2004) says "Smaller firms have a lower probability of survival, but those that survive tend to grow faster than larger firms. Among larger firms, growth rates are unrelated to past growth or to firm size". Arkolakis (2010), on the other hand, predicts a monotonically declining relationship between firm productivity and export growth. Why does export growth exhibit this u-shaped pattern in normal years is left to future research?[20] Similarly, the slower growth in the number of products exported by the top quintile relative to third and fourth quintile does not seem consistent with the multi-product generalizations of the Melitz model.

In what follows we examine the predictions of theory about the performance of small versus big exporters during the trade crisis, within this class of new trade models that feature firm-level heterogeneity in productivity. We focus on two main factors that have been highlighted in the literature as the main causes of the trade crisis - demand collapse and credit collapse -, and an amplification mechanism - vertical specialization. The question we ask is - does the main mechanism - reallocation of resources (and market shares) across firms with different productivity levels - that generates the correct pre-crisis correlations between firm size and margins of adjustment also predict the correlations consistent with the data during the crisis.

5.1 Demand Collapse

A negative shock to aggregate demand would cause cut-off productivity level to rise. The least productive smaller firms, that are closest to cut-off productivity level, are most likely to exit the market altogether. Larger, more productive, firms are more likely to survive by contracting profit margins. Thus, the survival probabilities of smaller exporters relative to larger exporters should fall. A decline in foreign demand reduces export sales (conditional on survivial). In Arkolakis (2010), the elasticity of sales with respect to foreign wage is decreasing in productivity, implying that less productive smaller exporters suffer greater decline in sales than the more productive larger exporters.

Thus, in the worksorse models of trade a negative aggregate demand shock would imply

[20]The analysis by Sutton (2007) on persistence of leadership may provide a possible framework.

relatively poor performance of smaller firms.

Eaton et al. (2010) have emphasized the role of heterogeneity in demand shock across industries as the most important factor in explaining the trade collapse. In line with their central finding that bulk of the decline in international trade is attributable to a decline in demand for durables, we test for a differential impact of the crisis on exporters of different sizes in durable versus non-durable goods industries using the following specification

(5.1)

$$Y_{ij,t,t-1} = \alpha + \sum_{k=1}^{4} \beta_k Quintile^k_{ij,t-1} + \sum_{k=1}^{4} \widetilde{\beta}_k Quintile^k_{ij,t-1} \times Durable_j + \sum_{k=1}^{4} \gamma_k Quintile^k_{ij,t-1} \times Crisis + \sum_{k=1}^{4} \widetilde{\gamma}_k Quintile^k_{ij,t-1} \times Crisis \times Durable_j + \sum_{k=1}^{4} \delta_k Quintile^k_{ij,t-1} \times Post\ Crisis + \sum_{k=1}^{4} \widetilde{\delta}_k Quintile^k_{ij,t-1} \times Post\ Crisis \times Durable_j + \mu_{j,t,t-1} + \epsilon_{ij,t} \quad .$$

i, j and t index exporters, industries, and years, respectively; 'Durable' takes value one for firms whose industry j is classified as durable goods industry. The classification of industries into durable and non-durable is taken from Eaton et al. (2010). The results for the three margins are shown in Table 5.

Segmenting industries into durable and non-durable goods industries brings out differences in all three margins of adjustment. In the pre-crisis period all size quintiles exhibit higher probability of exit in durable goods industries. With respect to export growth, the bottom two quintiles exhibit faster growth in durable goods industries, whereas the firms in the fourth quintile exhibit statistically significant slower growth as compared to the top quintile of exporters. One can also observe that exporters in non-durable goods industries in the fourth quintile tend have slightly higher but insignificant growth rate as compared to the top quintile. Thus, the slower growth of exports observed for the fourth quintile in the benchmark specification seems to be driven by exporters in the durable goods industries. With respect to product line expansion the difference between product growth of the third and fourth quintile and the top quintile is statistically insignificant for the non-durable industries. For the durable goods industries the non-monotonic relationship between size and product growth appears to be stronger. Bottom two quintiles' product expansion is slower

while that of the third and fourth quintile is faster, relative to the top quintile.

During the crisis as well as the post-crisis period most of these differences between durable and non-durable goods industries' exporters with respect to firm exit and export growth remain unchanged. Also, for product growth the pre-crisis patterns remain unchanged during the crisis period.

But, during the post-crisis period we do observe some differences for product growth. There is a statistically significant worsening of product growth of every size category (except fourth quintile) relative to the top quintile in the non-durable goods industries. This worsening is proportionally larger for the firms belonging to the bigger size categories. In the durable goods industries we see an improvement in product growth for all size categories, but the effect is statistically significant only for the second and third quintile.

Overall, during the crisis and post-crisis periods, for firm exit and export growth, we do not find any evidence that smaller firms in durable goods industries performed differently as compared to smaller firms in non-durable goods industries. However, with respect to product line expansion, evidence suggests that smaller firms in non-durable goods industries performed worse than those in durable goods industries during the post-crisis period.

Table 5: Regression of Exit, Export Growth and Product Line Expansion on Relative Size of Exporters: Durable versus Non-Durable

	(1) Probability of Exit	(2) Export Growth $\ln X_{i,j,t} - \ln X_{i,j,t-1}$	(3) Product Growth $\ln Products_{i,j,t} - \ln Products_{i,j,t-1}$
1st Quintile	0.692***	1.258***	-0.161***
	(0.007)	(0.032)	(0.010)
2nd Quintile	0.563***	0.487***	-0.035***
	(0.009)	(0.025)	(0.009)
3rd Quintile	0.406***	0.109***	0.012
	(0.012)	(0.021)	(0.008)
4th Quintile	0.209***	0.003	0.008
	(0.013)	(0.019)	(0.007)
1st Quintile*Durability	0.006	0.272***	-0.125***
	(0.015)	(0.045)	(0.014)
2nd Quintile*Durability	0.046***	0.158***	-0.067***
	(0.015)	(0.036)	(0.013)
3rd Quintile*Durability	0.040***	0.022	0.006
	(0.015)	(0.031)	(0.011)
4th Quintile*Durability	0.028*	-0.062**	0.028***
	(0.016)	(0.027)	(0.010)
1st Quintile*Crisis	-0.039**	0.038	-0.014
	(0.019)	(0.062)	(0.021)
2nd Quintile*Crisis	-0.019	-0.072	0.001
	(0.019)	(0.049)	(0.019)
3rd Quintile*Crisis	-0.050***	-0.023	-0.005
	(0.018)	(0.041)	(0.018)
4th Quintile*Crisis	-0.019	-0.019	0.014
	(0.020)	(0.037)	(0.017)
1st Quintile*Durability*Crisis	0.048*	0.111	-0.009
	(0.029)	(0.086)	(0.031)
2nd Quintile*Durability*Crisis	-0.002	0.174**	0.009
	(0.027)	(0.068)	(0.029)
3rd Quintile*Durability*Crisis	0.031	0.069	-0.032
	(0.028)	(0.059)	(0.026)
4th Quintile*Durability*Crisis	0.015	0.045	-0.028
	(0.028)	(0.053)	(0.024)
1st Quintile*Post-Crisis	0.010	0.009	-0.042**
	(0.022)	(0.060)	(0.020)
2nd Quintile*Post-Crisis	-0.006	0.039	-0.070***
	(0.021)	(0.047)	(0.018)
3rd Quintile*Post-Crisis	0.011	-0.008	-0.047***
	(0.022)	(0.042)	(0.017)
4th Quintile*Post-Crisis	0.003	0.003	-0.014
	(0.023)	(0.036)	(0.015)
1st Quintile*Durability*Post-Crisis	-0.004	-0.048	0.038
	(0.027)	(0.084)	(0.029)
2nd Quintile*Durability*Post-Crisis	0.004	-0.070	0.086***
	(0.027)	(0.069)	(0.027)
3rd Quintile*Durability*Post-Crisis	-0.012	0.036	0.046*
	(0.027)	(0.059)	(0.024)
4th Quintile*Durability*Post-Crisis	-0.003	-0.021	0.030
	(0.029)	(0.053)	(0.022)
N	139765	91100	91100

The table reports coefficients on quintile dummies, their interactions with the industry-level indicator of durability, from exporter-industry-level analysis of exit, sales growth and product growth with respect to the U.S. market, and includes industry-time fixed effect. Crisis and Post-crisis are dummies for the crisis and post-crisis periods. The omitted category is the top quintile, so each coefficient reveals the relative performance of the exporters in the k-th quintile compared to the top 20% exporters within industries, while the coefficients on the quintile dummies interactions with durability index reveal how this relative performance is different in durable industries. Robust standard errors in parentheses. Significance: * 10 percent, ** 5 percent, *** 1 percent.

5.2 Credit Constraints

In the presence of credit constrained firms, the interaction between a negative aggregate shock to credit supply and firm heterogeneity is also going to cause the smaller and less productive firms to be more affected as a result of their size or lack of sufficient collateral and/or credit guarantees (Greenaway, Guariglia and Kneller (2007), Muuls (2008)). Therefore, they are less likely to survive in tighter credit conditions. The interaction between credit constraints and firm heterogeneity also sharpens the reallocation of market shares from the least productive (and hence smaller) firms to the most productive (and larger) exporters - Manova (2008). Hence, smaller firms should experience a greater decline in sales.

The existing literature on the importance of credit shock in driving the trade crisis is primarily focused on the aggregate implications. For instance, Paravisini et al. (2011) use matched firm-bank data from Peru, and find that exports of firms who borrowed from banks with a higher level of foreign debt suffered. Chor and Manova (2012), using data on monthly US imports, find that countries with higher inter-bank rates (tighter credit conditions) exported less to the U.S.

In the absence of firm-bank matched data, we test the implications of credit constraints for performance of exporters of different size using the specification

(5.2)

$$\begin{aligned} Y_{ij,t,t-1} = \alpha &+ \sum_{k=1}^{4} \beta_k Quintile^k_{ij,t-1} + \sum_{k=1}^{4} \widetilde{\beta}_k Quintile^k_{ij,t-1} \times RZ_j + \sum_{k=1}^{4} \gamma_k Quintile^k_{ij,t-1} \\ &\times Crisis + \sum_{k=1}^{4} \widetilde{\gamma}_k Quintile^k_{ij,t-1} \times Crisis \times RZ_j + \sum_{k=1}^{4} \delta_k Quintile^k_{ij,t-1} \\ &\times Post\ Crisis + \sum_{k=1}^{4} \widetilde{\delta}_k Quintile^k_{ij,t-1} \times Post\ Crisis \times RZ_j + \mu_{j,t,t-1} + \epsilon_{ij,t} \quad , \end{aligned}$$

where the notation is the same as in (5.1), except that 'RZ' denotes the Rajan and Zingales index of financial dependence at the HS 2 level. The construction of this index is explained in Rajan and Zingales (1998).[21]

[21]The index captures the demand for external financing due to structural reasons at the level of the industry. The idea is that due to the nature of the production and sale processes some industries need more external financing than others. They focus on the US as the benchmark unconstrained case, and use the

Column (1) of Table 6 shows that during the pre-crisis periods firms in financially dependent industries were more likely to exit as compared to firms of the same size in industries that operated in less financially dependent industries. Importantly, the increase in exit probability is proportionally larger for bigger exporters.[22] Export growth as a function of size is faster for the first two quintiles and slower for the next two quintiles (though significant only for the fourth quintile) in financially dependent industries. Thus, as seen in the case of durable goods industries, the slower growth of exports observed for the fourth quintile in the benchmark specification seems to be driven by the exporters in the financially dependent industries. The increasing, but non-monotonic relationsip between growth in number of products and size is also more pronounced in financially dependent industries.

During the crisis these patterns are virtually unchanged. During the post-crisis period there are significant changes on the product margin. There is a statistically significant decline in the growth of products for the first three quintiles in industries that are less dependent on finance. On the other hand, in financially dependent industries, we see that there is an increase in product growth for all quintiles, with the effect being significant for the second and fourth quintile.

Thus, as in the case of durable versus non-durable industry segmentation, we find that financial dependence does not explain the lack of poor performance of smaller firms with respect to exit and export growth. It, however, has, differential impact on the performance of small versus big exporters with respect to growth in number of products. Small exporters in industries less dependent on finance experience poor growth in products in the post-crisis period.

difference between investment and cash generated as a measure of the demand for external financing.

[22] Also true for industries characterized as differentiated. We examine the importance of differences in the degree of differentiation (at industry level). We do not find any support for its role in explaining our main finding. Results are shown in the Appendix A.3. See Levchenko, Lewis and Tesar (2011) and Gopinath, Itskhoki and Neiman (2011) for role of product differentiation during the crisis.

Table 6: Regression of Exit, Export Growth and Product Line Expansion on Relative Size of Exporters: Financial Dependence

	(1) Probability of Exit	(2) Export Growth $\ln X_{i,j,t} - \ln X_{i,j,t-1}$	(3) Product Growth $\ln Products_{i,j,t} - \ln Products_{i,j,t-1}$
1st Quintile	0.684***	1.336***	-0.168***
	(0.008)	(0.037)	(0.012)
2nd Quintile	0.543***	0.495***	-0.037***
	(0.010)	(0.029)	(0.010)
3rd Quintile	0.383***	0.141***	-0.004
	(0.012)	(0.025)	(0.009)
4th Quintile	0.181***	0.020	0.009
	(0.013)	(0.022)	(0.008)
1st Quintile*Fin Dep	0.073**	0.237***	-0.198***
	(0.029)	(0.087)	(0.030)
2nd Quintile*Fin Dep	0.163***	0.240***	-0.111***
	(0.029)	(0.073)	(0.028)
3rd Quintile*Fin Dep	0.150***	-0.072	0.059**
	(0.029)	(0.062)	(0.025)
4th Quintile*Fin Dep	0.133***	-0.166***	0.041*
	(0.030)	(0.056)	(0.022)
1st Quintile*Crisis	-0.020	0.018	0.026
	(0.022)	(0.072)	(0.025)
2nd Quintile*Crisis	0.010	-0.018	0.011
	(0.022)	(0.056)	(0.023)
3rd Quintile*Crisis	-0.032	-0.060	0.003
	(0.021)	(0.048)	(0.021)
4th Quintile*Crisis	0.005	0.020	-0.013
	(0.023)	(0.044)	(0.019)
1st Quintile*Fin Dep*Crisis	0.034	0.210	-0.123*
	(0.056)	(0.167)	(0.064)
2nd Quintile*Fin Dep*Crisis	-0.069	0.144	-0.005
	(0.055)	(0.137)	(0.061)
3rd Quintile*Fin Dep*Crisis	0.005	0.240**	-0.083
	(0.055)	(0.121)	(0.056)
4th Quintile*Fin Dep*Crisis	-0.033	-0.057	0.040
	(0.058)	(0.109)	(0.049)
1st Quintile*Post-Crisis	0.022	0.059	-0.041*
	(0.024)	(0.069)	(0.024)
2nd Quintile*Post-Crisis	0.009	0.081	-0.080***
	(0.023)	(0.056)	(0.022)
3rd Quintile*Post-Crisis	0.011	0.011	-0.043**
	(0.023)	(0.049)	(0.020)
4th Quintile*Post-Crisis	0.011	0.027	-0.030
	(0.024)	(0.045)	(0.018)
1st Quintile*Fin Dep*Post-Crisis	-0.046	-0.246	0.074
	(0.054)	(0.155)	(0.060)
2nd Quintile*Fin Dep*Post-Crisis	-0.045	-0.240*	0.177***
	(0.053)	(0.135)	(0.057)
3rd Quintile*Fin Dep*Post-Crisis	-0.035	0.011	0.061
	(0.054)	(0.118)	(0.054)
4th Quintile*Fin Dep*Post-Crisis	-0.035	-0.099	0.100**
	(0.055)	(0.109)	(0.047)
N	138199	89825	89825

The table reports coefficients on quintile dummies, their interactions with the industry-level indicator of financial dependence (Fin Dep), from exporter-industry-level analysis of exit, sales growth and product growth with respect to the U.S. market, and includes industry-time fixed effect. Crisis and Post-crisis are dummies for the crisis and post-crisis periods. The omitted category is the top quintile, so each coefficient reveals the relative performance of the exporters in the k-th quintile compared to the top 20% exporters within industries, while the coefficients on the quintile dummies interactions with financial dependence index reveal how this relative performance is different in financially dependent industries. Robust standard errors in parentheses. Significance: * 10 percent, ** 5 percent, *** 1 percent.

5.3 Vertical Supply Chains

According to Bems, Johnson and Yi (2011*a*) vertical specialization trade fell by more than value-added trade (12.9 percent versus 10.3 percent).[23] A large fraction of exports from Mexico to the U.S. is part of vertical supply chains - often referred to as maquiladora exports. Our data allow us to classify exports, at the firm-product level, into processed versus non-processed.[24] The last column of the Table 7 shows that maquiladora exports accounted for about 82 to 85 percent of all exports between 2004 and 2010. It also shows that maquiladora exports are much larger than non-maquiladora exports. Figure 3 shows the evolution of maquiladora and non-maquiladora exports from January 2006 to December 2010, with January 2006 normalized to 1. During the crisis maquiladora exports see a much bigger decline as compared to non-maquiladora exports.

Table 7: Maquiladora and Non-maquiladora Exports (US $)

Period	Non-maquiladora			Maquiladora			Maquiladora as
	Total	Mean	Median	Total	Mean	Median	Ratio of All Exports
2004-2005	19401639072	159604	17148	126738383628	771112	44581	0.87
2005-2006	23965069071	188368	18570	134221917019	817141	46950	0.85
2006-2007	26045946340	199296	18766	148365306461	906120	48189	0.85
2007-2008	29775158668	222400	19817	158205412298	954166	46740	0.84
2008-2009	28733849161	214619	19469	130532475328	811113	42479	0.82
2009-2010	30835930559	227743	19669	142860070212	867585	41123	0.82

Given these facts, we investigate whether firm exit, product growth, and sub-intensive margin growth behaved differently for maquila versus non-maquila exporters. We adopt the

[23] Because declines in demand were largest in more vertically specialized sectors.

[24] Processing includes maquila exports as well as re-exports of temporary imports.

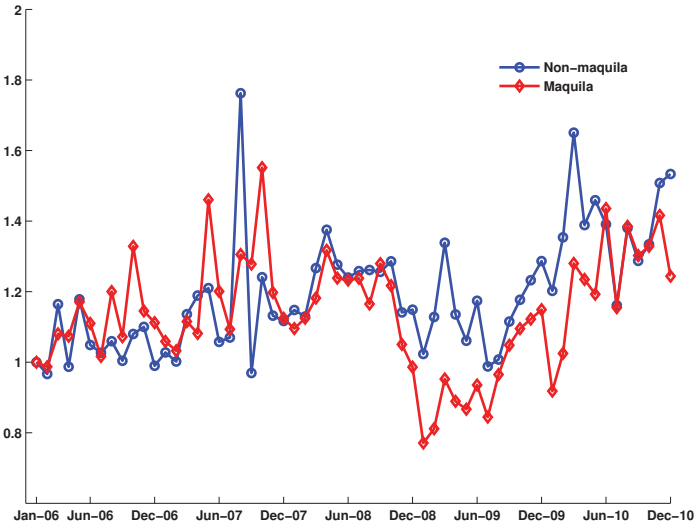

Figure 3: Growth of Maquiladora and Non-maquiladora Exports (January 2006 = 1)

following specification

(5.3)

$$
\begin{aligned}
Y_{ij,t,t-1} = \alpha &+ \sum_{k=1}^{4} \beta_k Quintile^k_{ij,t-1} + \sum_{k=1}^{4} \widetilde{\beta}_k Quintile^k_{ij,t-1} \times Maquilaexportratio_{i,j,t-1} \\
&+ \sum_{k=1}^{4} \gamma_k Quintile^k_{ij,t-1} \times Crisis + \sum_{k=1}^{4} \widetilde{\gamma}_k Quintile^k_{ij,t-1} \times Crisis \\
&\times Maquilaexportratio_{i,j,t-1} + \sum_{k=1}^{4} \delta_k Quintile^k_{ij,t-1} \times Post\ \ Crisis \\
&+ \sum_{k=1}^{4} \widetilde{\delta}_k Quintile^k_{ij,t-1} \times Post\ Crisis \times Maquilaexportratio_{i,j,t-1} + \mu_{j,t,t-1} + \epsilon_{ij,t} \quad ,
\end{aligned}
$$

So, now, we have included interaction terms of each quintile dummy with the maquiladora ratio. Maquiladora ratio is defined as the fraction of each firm's total exports classified as processed within a HS2 industry. The omitted category is again the top quintile dummy. The coefficients on the interaction terms capture the extent to which maquiladora export dependent exporters in a given quintile are performing differently as compared to all exporters in the top quintile. The results for the three margins are shown in Tables 8.

During the pre-crisis period, dependence on maquiladora exports at the firm level seems to affect all three margins. Exporters that are more dependent on maquiladora exports

exhibit faster growth in exports as compared to the exporters in top quintile. On the other hand, higher maquiladora dependence also increases exit probabilties of all quintiles. But, interestingly, this increment in exit probability is increasing in size. Product growth correlations show that smaller firms (bottom two quintiles) that are more dependent on maquiladora exports show slower growth in products relative to the top quintile.

These pre-crisis patterns, across firms that have greater and smaller dependence on maquiladora exports, do not show any consistent and statistically significant change during the crisis period. During the post-crisis period the only margin where we see differential effect of maquiladora dependence is product line expansion. Smaller firms that are less dependent on maquiladora exports are more adversly affected during this period as compared to similar sized maquila oriented firms.

Thus, for firm exit and export growth dependence on maquiladora exports does not alter our finding of the lack of adverse effect of crisis on smaller exporters. For product line expansion, however, the evidence suggests that during the post-crisis period smaller firms that are less dependent on maquiladora exports performed worse than similar sized maquila oriented firms.

Table 8: Regression of Exit, Export Growth and Product Line Expansion on Relative Size of Exporters: Maquiladora versus Non-maquiladora

	(1) Probability of Exit	(2) Export Growth $\ln X_{i,j,t} - \ln X_{i,j,t-1}$	(3) Product Growth $\ln Products_{i,j,t} - \ln Products_{i,j,t-1}$
1st Quintile	0.672***	1.348***	-0.227***
	(0.007)	(0.028)	(0.010)
2nd Quintile	0.554***	0.524***	-0.067***
	(0.009)	(0.024)	(0.009)
3rd Quintile	0.393***	0.100***	0.011
	(0.011)	(0.021)	(0.008)
4th Quintile	0.187***	-0.053***	0.024***
	(0.012)	(0.020)	(0.008)
1st Quintile*Maquila Ratio	0.026*	0.232***	-0.030*
	(0.016)	(0.052)	(0.017)
2nd Quintile*Maquila Ratio	0.033**	0.164***	-0.031**
	(0.015)	(0.041)	(0.014)
3rd Quintile*Maquila Ratio	0.038**	0.070**	-0.000
	(0.015)	(0.035)	(0.013)
4th Quintile*Maquila Ratio	0.051***	0.055*	-0.010
	(0.015)	(0.029)	(0.011)
Maquila Ratio	-0.092***	0.023	-0.019**
	(0.014)	(0.021)	(0.008)
1st Quintile*Crisis	-0.018	0.104*	-0.017
	(0.018)	(0.054)	(0.021)
2nd Quintile*Crisis	-0.018	0.001	-0.000
	(0.018)	(0.044)	(0.019)
3rd Quintile*Crisis	-0.029	-0.025	-0.022
	(0.018)	(0.041)	(0.019)
4th Quintile*Crisis	-0.010	0.015	0.001
	(0.019)	(0.039)	(0.017)
1st Quintile*Maquila Ratio*Crisis	0.019	-0.054	-0.000
	(0.030)	(0.101)	(0.034)
2nd Quintile*Maquila Ratio*Crisis	-0.000	0.089	0.017
	(0.029)	(0.076)	(0.032)
3rd Quintile*Maquila Ratio*Crisis	-0.010	0.104	-0.005
	(0.029)	(0.067)	(0.028)
4th Quintile*Maquila Ratio*Crisis	0.001	-0.027	-0.006
	(0.029)	(0.057)	(0.025)
Maquila Ratio*Crisis	0.004	-0.012	-0.004
	(0.025)	(0.040)	(0.019)
1st Quintile*Post-Crisis	0.013	0.043	-0.044**
	(0.019)	(0.054)	(0.019)
2nd Quintile*Post-Crisis	0.003	0.038	-0.041**
	(0.019)	(0.044)	(0.018)
3rd Quintile*Post-Crisis	0.017	0.029	-0.035**
	(0.020)	(0.041)	(0.017)
4th Quintile*Post-Crisis	0.021	0.026	-0.034**
	(0.021)	(0.039)	(0.016)
1st Quintile*Maquila Ratio*Post-Crisis	-0.016	-0.181*	0.057*
	(0.031)	(0.102)	(0.034)
2nd Quintile*Maquila Ratio*Post-Crisis	-0.020	-0.043	0.031
	(0.030)	(0.083)	(0.030)
3rd Quintile*Maquila Ratio*Post-Crisis	-0.037	-0.004	0.015
	(0.030)	(0.066)	(0.027)
4th Quintile*Maquila Ratio*Post-Crisis	-0.046	-0.048	0.074***
	(0.031)	(0.058)	(0.024)
Maquila Ratio*Post-Crisis	-0.005	0.076*	-0.037**
	(0.026)	(0.041)	(0.017)
N	142147	92636	92636

The table reports coefficients on quintile dummies, their interactions with firm-level dependence on Maquila-type exports (ratio of Maquila-type exports over total exports at the firm level), from exporter-industry-level analysis of exit, sales growth and product growth with respect to the U.S. market, and includes industry-time fixed effect. Crisis and Post-crisis are dummies for the crisis and post-crisis periods. The omitted category is the top quintile, so each coefficient reveals the relative performance of the exporters in the k-th quintile compared to the top 20% exporters within industries, while the coefficients on the quintile dummies interactions with maquila ratio reveal how this relative performance is different for exporters with high maquila ratio. Robust standard errors in parentheses. Significance: * 10 percent, ** 5 percent, *** 1 percent.

6 Discussion

Our analysis shows that even though the aggregate decline in Mexican exports during the 2008-09 crisis was driven by the intensive margin there is a significant difference between the performance of small (less than median) and large exporters with respect to three margins

of adjustment - exit probability, growth in export sales, and product line expansion - during the pre-crisis, crisis and post-crisis periods.

During the pre-crisis period (2004-2008) (i) exit rates are monotonically declining in size, (ii) export growth is declining in size and (iii) growth in number of products is increasing in size. These correlations are consistent with the new trade models of firm level heterogeneity in productivity, in which more productive firms self-select into exporting (by paying a fixed cost or increasing cost of advertising). However, the non-monotonicity of the relationship between size and export growth (export growth of fourth quintile is slower than that of the top quintile), and that between size and product growth (first and second quintile have slower product growth as compared to the top quintile, while the third and fourth quintile have a higher rate as compared to the top quintile) is not observed in the workhorse models.

Coming to the crisis, productivity driven selection into exporting in the workhorse models implies that in case of a negative aggregate shock - demand or credit - the less productive smaller firms will be worst hit, i.e. exit more, grow less and reduce their product line the most. However, we do not observe this among the Mexican exporters during the 2008-09 crisis or the post-crisis period for firm exit and export growth. There is evidence of poor performance of small exporters with respect to product line expansion, especially in the post-crisis period. Smaller firms in industries classified as non-durable or financially less dependent (or less differentiated) had a larger negative effect on product line expansion. Smaller firms that were less dependent on maquiladora exports were also more negatively affected.

These findings underscore the importance of the within firm product margin adjustment. However, the contribution of the change in number of products to the change in total exports is subsumed in our measure of growth in exports. And, growth in exports of smaller firms did not decline in the crisis or post-crisis period relative to that of larger firms. The same is true for firm exit. Thus, even after accounting for the negative effect on the product margin of smaller firms, our findings on the effect of the crisis on firm level intensive margin and firm level extensive margin appear to be inconsistent with the workhorse models' predictions. How do we interpret this inconsistency?

Given the view that the demand or credit shock was aggregate in nature, one way to

explain this inconsistency is to incorporate another dimension of heterogeneity at the level of firms in the workhorse trade models. For example, Holmes and Stevens (2012) develop an alternative theory in which industries are made up of large firms producing standardized goods and small firms making customized or speciality goods. The crisis could have affected the standardized goods more than customized goods, and hence affected larger firms more than smaller firms. Another example would be where within industries larger firms are more connected to international financial market and thus more affected by the credit crunch resulting from the financial crisis. More generally, this other dimension of heterogeneity must offset the effects of the productivity based sorting mechanism present in the workhorse models so as to shield the smaller firms from the aggregate shock but not the larger firms. The challenge lies in the identification of this other dimension at the firm level, and then showing its importance during the 2008-09 or a similar trade crisis episode.

An alternative view could be that the demand or credit shock that resulted in the crisis was not aggregate in nature. It was, in fact, heterogeneous across firms. In particular, small exporters did not face a negative shock whereas the large exporters did. Accounting for sectoral differences in the degree of durability of goods and the extent of financial dependence is an attempt to address this issue. And, we find that this heterogeneity across sectors does not explain our findings. However, our measures are sectoral and not at the firm level, and therefore, provide an imperfect measurement of heterogeneity in the shock across firms. With respect to the role of vertical supply chains, our measure of share of maquiladora exports in total exports is constructed the firm level. Even then, during the crisis, heterogeneity in exposure to supply chains does not have a differential impact on small and large exporters. Our results suggest that more works needs to be done to examine this view. Gabaix (2011) provides a promising framework for such an analysis.

Lastly, we could rationalize this inconsistency between our findings and the theory by recognizing that the workhorse models of trade are static in nature, i.e. they represent a steady-state. And, our findings, may well be capturing the behaviour of exporters along a transition path. If this is the case, then what we need is a dynamic version of the workhorse model to compare our findings with theory. Though there are some dynamic models of trade with firm level heterogeneity (Arkolakis (2013), Burstein and Melitz (Forthcoming),

and Choi and Alessandria (2007)) the stylized facts motivating these models need to be validated for many more countries. Furthermore, our findings raise the following question: along the transition path what is the order of adjustment - do firms adjust along the pure intensive margin first or do they adjust their product scope first?

7 Conclusion

There exists a large body of literature on the causes of the trade collapse of 2008-09, and it focuses on explaining the aggregate decline in trade. On the other hand, the current workhorse models of trade feature a rich micro structure which allows us to analyze not only aggregate trade but also the behavior of individual firms. In this paper, we focus on the firm/firm-product level implications of the models during the crisis period and compare them with pre and post-crisis periods.

We find that the pattern of pre-crisis correlation of firm size with three margins of adjustment - firm exit, growth in exports and product line expansion - is broadly consistent with the workhorse models of trade that feature firm-level heterogeneity in productivity. However, comparison of the behavior of margins of adjustment for firms of different sizes during the crisis and post-crisis period with that in the pre-crisis period reveals that small exporters' exit probabilities and export growth rates relative to those of large exporters were not affected much by the crisis; it was only the large exporters' export growth that bore the brunt of the crisis.

Though these findings underscore the importance of the within firm product margin adjustment, the lack of a relatively larger negative effect on small exporters' firm level extensive and intensive margin is not consistent with the workhorse models' predictions when a negative aggregate (demand or credit) shock is the source of trade collapse. In these models there would be reallocation of resources and market shares from the smaller less productive firms to larger more productive firms during the trade crisis, resulting in relatively poor performance of smaller firms both, along the intensive and the extensive margin.

In our view the inconsistency between the workhorse models of trade and our findings can be potentially rationalized in three different ways. First, by augmenting the workhorse

models of trade with another dimension of heterogeneity that counters the productivity driven sorting mechanism so as to shield the smaller firms from the aggregate shock but not the larger firms; second, by positing that the demand or credit shock that resulted in the crisis was heterogeneous across firms, not affecting the small exporters; third by arguing that our results correspond only to an adjustment period whereas the models we have cited are better viewed as long run equilibria.

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A Appendix A

A.1 Basic Data Features

We start by presenting some basic features of the data. Table A.1 shows the mean/median exports and mean/median products per exporter for every period. The gap between mean exports and median exports points to skewness in export sales. This skewness is also evident in the number of products per exporter. Exports were rising briskly in periods before the crisis, and then in the crisis period mean exports declined by about 24 percent while median exports declined by 32 percent. Exports did not recover fully by 2010. The effect of the crisis on products per exporter was not so drastic.

Next, we examine the average exports, average number of products exported and average exports per exporter per product by size in Table A.2, where size of an exporter is proxied by its total exports. In any period exporters are segmented by size decliles, 1 being the smallest 10 percent while 10 being the largest 10 percent. The numbers reveal a couple of interesting facts. First, the distribution of exports sales is highly skewed. The mean exports in the ninth decile are 15 percent of the mean exports in the top decile. Second, the average number of products exported per exporter rises with size, and also shows a high degree of skewness. The average number of products exported by exporters in the top decile are more than twice than that exported by those in the ninth decile. Third, average exports per exporter per product also increases with size, implying that exporters with larger sales also have larger sales per product. The skewness observed in average exports and average number of products per exporter is also evident in average exports per exporter per product.

Lastly, we look at the importance of multi-product exporters in Mexican exports. The top panel of Table A.3 shows the fraction of exporters who export a certain number of products. During the entire sample period - 2004 to 2010 - about 40 percent of exporters export only one product, 14 percent export two products. Thus about 54 percent of Mexican exporters sell one or two products. But, about 30 percent of Mexican exporters sell five or more products. This is consistent with the findings of Bernard, Redding and Schott (2010) for US exporters. Looking at the bottom panel of Table A.3, it is evident that multi-product firms account for the bulk of Mexican exports, especially those who export more than 30

products. Exporters selling 5 or more products account for about 93 percent of Mexican exports. This is, again, in line with Bernard, Redding and Schott (2010).

Table A.1: Summary Statistics on Exports and Products

Period	Mean Export	Median Export	Products per exporter Mean	Products per exporter Median
2004-2005	12900000	164221	6	2
2005-2006	14800000	200486	6	2
2006-2007	18600000	296302	7	3
2007-2008	20100000	316257	7	3
2008-2009	15300000	213820	6	2
2009-2010	15700000	177928	6	2

Table A.2: Summary Statistics on Exports and Products by Size

Average Exports

Decile	2004-2005	2005-2006	2006-2007	2007-2008	2008-2009	2009-2010
1	3509	3582	3751	3931	3920	3711
2	9135	9581	11223	11754	10713	10323
3	21605	23275	29008	32796	26126	25084
4	48083	54030	73409	81310	60826	55028
5	110465	131128	192839	205286	141973	120850
6	273696	331220	489259	509572	346486	293061
7	685986	853552	1228342	1325456	908435	793466
8	1964794	2416300	3496666	3683505	2642824	2261190
9	7073742	8536578	11400000	12100000	9296784	8357435
10	119000000	135000000	170000000	183000000	139000000	146000000

Average Number of Products per Exporter

Decile	2004-2005	2005-2006	2006-2007	2007-2008	2008-2009	2009-2010
1	1	1	1	1	1	1
2	1	1	1	1	1	1
3	2	2	2	2	2	2
4	2	2	2	2	2	2
5	3	3	3	3	3	3
6	3	4	4	4	4	3
7	5	5	6	6	5	5
8	6	7	8	8	8	7
9	10	11	12	12	11	10
10	26	27	30	31	29	26

Average Exports per Exporter per Product

Decile	2004-2005	2005-2006	2006-2007	2007-2008	2008-2009	2009-2010
1	3355	3431	3590	3757	3737	3550
2	6926	7351	8016	8656	7932	7693
3	13383	13557	16586	17677	15465	14803
4	23967	25755	32103	34374	27170	26310
5	41892	48758	57520	64122	49858	47914
6	78209	89800	114030	113522	94013	86824
7	152292	177493	205273	220555	183695	167726
8	321367	354104	417193	436851	351814	336630
9	729943	801542	979834	992990	842885	846177
10	4621201	4972341	5610659	5832645	4854471	5548635

Table A.3: Importance of Multi-Product Exporters

Percentage of Exporters						
Products Exported	2004-2005	2005-2006	2006-2007	2007-2008	2008-2009	2009-2010
1	41.31	40.61	36.77	35.83	40.03	41.70
2	14.98	13.92	13.08	13.79	14.57	14.96
3	8.83	8.74	8.58	8.39	8.36	8.68
4	5.78	5.77	6.17	6.09	5.50	5.71
5	4.31	4.39	4.75	5.04	4.52	4.45
6	3.45	3.30	3.62	3.57	3.38	3.24
7	2.54	2.75	2.94	3.01	2.72	2.38
8	2.29	2.26	2.64	2.75	2.42	2.45
9	1.93	2.05	2.19	2.43	2.05	1.72
10	1.61	1.72	2.04	1.80	1.36	1.37
11-20	7.44	8.37	9.92	9.91	8.63	7.55
21-30	2.62	2.80	3.35	3.14	2.92	2.52
> 30	2.91	3.32	3.95	4.23	3.53	3.27
Percentage of Total Value of Exports						
Products Exported	2004-2005	2005-2006	2006-2007	2007-2008	2008-2009	2009-2010
1	1.16	1.29	0.85	0.75	1.30	1.85
2	1.88	1.20	0.84	1.23	1.61	2.01
3	1.99	1.34	0.94	1.39	2.11	4.24
4	2.09	1.30	1.36	1.11	1.74	1.69
5	1.46	1.55	1.31	1.09	2.19	2.52
6	1.63	1.32	1.43	1.68	1.35	1.19
7	1.64	1.84	1.42	1.55	1.68	2.16
8	1.53	1.45	1.74	1.36	2.27	1.99
9	2.02	1.90	1.67	1.61	1.38	1.68
10	1.48	1.35	1.78	2.04	2.38	1.67
11-20	13.60	13.62	12.73	14.85	14.63	13.13
21-30	11.97	12.18	14.12	10.48	11.18	11.50
> 30	57.55	59.67	59.79	60.84	56.18	54.36

A.2 Benchmark Specification with Deciles

Table A.4: Regression of Exit, Export Growth and Product Line Expansion on Relative Size of Exporters by Deciles

	(1) Probability of Exit	(2) Export Growth $\ln X_{i,j,t} - \ln X_{i,j,t-1}$	(3) Product Growth $\ln Products_{i,j,t} - \ln Products_{i,j,t-1}$
1st Decile	0.722***	1.671***	-0.265***
	(0.005)	(0.032)	(0.010)
2nd Decile	0.700***	1.111***	-0.181***
	(0.005)	(0.029)	(0.010)
3rd Decile	0.661***	0.683***	-0.101***
	(0.006)	(0.026)	(0.009)
4th Decile	0.605***	0.412***	-0.029***
	(0.008)	(0.024)	(0.009)
5th Decile	0.551***	0.175***	0.007
	(0.009)	(0.022)	(0.009)
6th Decile	0.456***	0.010	0.039***
	(0.011)	(0.020)	(0.008)
6th Decile	0.362***	-0.037**	0.027***
	(0.012)	(0.019)	(0.007)
8th Decile	0.264***	-0.093***	0.037***
	(0.013)	(0.019)	(0.007)
9th Decile	0.144***	-0.069***	0.018***
	(0.013)	(0.016)	(0.007)
1st Decile*Crisis	-0.019	0.164**	-0.011
	(0.020)	(0.064)	(0.022)
2nd Decile*Crisis	-0.027	0.072	-0.008
	(0.020)	(0.057)	(0.021)
3rd Decile*Crisis	-0.028	0.009	0.031
	(0.020)	(0.051)	(0.020)
4th Decile*Crisis	-0.026	0.086*	-0.004
	(0.020)	(0.046)	(0.019)
5th Decile*Crisis	-0.043**	0.005	-0.016
	(0.019)	(0.043)	(0.019)
6th Decile*Crisis	-0.040**	0.063	-0.018
	(0.020)	(0.041)	(0.018)
6th Decile*Crisis	-0.025	0.009	0.026
	(0.020)	(0.037)	(0.017)
8th Decile*Crisis	-0.011	0.044	-0.016
	(0.021)	(0.036)	(0.016)
9th Decile*Crisis	-0.012	0.045	0.011
	(0.022)	(0.035)	(0.016)
1st Decile*Post-crisis	0.035	-0.037	-0.016
	(0.023)	(0.064)	(0.021)
2nd Decile*Post-crisis	0.012	-0.000	-0.024
	(0.022)	(0.056)	(0.020)
3rd Decile*Post-crisis	0.015	0.059	-0.016
	(0.022)	(0.051)	(0.019)
4th Decile*Post-crisis	0.008	-0.037	-0.030
	(0.021)	(0.046)	(0.018)
5th Decile*Post-crisis	0.008	-0.009	-0.007
	(0.021)	(0.042)	(0.018)
6th Decile*Post-crisis	0.031	0.031	-0.038**
	(0.022)	(0.039)	(0.017)
6th Decile*Post-crisis	0.023	-0.046	-0.003
	(0.023)	(0.038)	(0.016)
8th Decile*Post-crisis	0.008	0.035	0.006
	(0.022)	(0.036)	(0.015)
9th Decile*Post-crisis	0.021	0.005	-0.003
	(0.023)	(0.034)	(0.015)
N	142147	92636	92636

The table reports coefficients on decile dummies from exporter-industry-level analysis of exit, sales growth and product growth with respect to the U.S. market, and includes industry-time fixed effect. Crisis and Post-crisis are dummies for the crisis and post-crisis periods. The omitted category is the top decile, so each coefficient reveals the relative performance of the exporters in the k-th decile compared to the top 10% exporters within industries. Robust standard errors in parentheses. Significance: * 10 percent, ** 5 percent, *** 1 percent.

A.3 Differentiated versus Non-differentiated Goods

A relatively unexplored area in the trade crisis literature is the importance of product differentiation or quality differences in determining firm level performance. Gopinath, Itskhoki and Neiman (2011) find that that differentiated manufactures exhibited marked stability in their trade prices while non-differentiated manufactures experienced a sharp reduction

in their prices. Levchenko, Lewis and Tesar (2011) examine the hypothesis that increased search for cheaper products induced a disproportionate decline of exports of higher-quality products, but do not find evidence supporting it.

Since we do not have firm-level indicators of product differentiation, we explore the importance of product differentiation channel by modifying the Rauch index of differentiation (see Rauch (1999)) in order to use it at the HS 2 level of industry classification.[25] We regard 'traded in organized market' and 'reference priced' as non-differentiated goods. If all the products corresponding to a given HS 2 code are differentiated then our measure is 1. On the other hand if none of the products corresponding to a given HS 2 are differentiated then our measure is zero. If some products in a HS 2 industry are differentiated and others are non-differentiated, we compute the differentation index to be number of differentiated products divided by the total number of products. Thus, by construction this variable takes values between 0 and 1. The specification we employ is given by

(A.1)

$$\begin{aligned} Y_{ij,t,t-1} = \alpha &+ \sum_{k=1}^{4} \beta_k Quintile^k_{ij,t-1} + \sum_{k=1}^{4} \widetilde{\beta}_k Quintile^k_{ij,t-1} \times Differentiated_{j,t-1} \\ &+ \sum_{k=1}^{4} \gamma_k Quintile^k_{ij,t-1} \times Crisis + \sum_{k=1}^{4} \widetilde{\gamma}_k Quintile^k_{ij,t-1} \times Crisis \\ &\times Differentiated_{j,t-1} + \sum_{k=1}^{4} \delta_k Quintile^k_{ij,t-1} \times Post\ \ Crisis \\ &+ \sum_{k=1}^{4} \widetilde{\delta}_k Quintile^k_{ij,t-1} \times Post\ Crisis \times Differentiated_{j,t-1} + \mu_{j,t,t-1} + \epsilon_{ij,t} \quad , \end{aligned}$$

where the only difference in notation as compared with (5.1), (5.2) and (5.3) is the variable 'Differentiated' which captures the index of differentiation of an industry.

For firm exit, in column (1) of Table A.5, the interactions of the differentiation index with size quintiles have positive coefficients. This means that in differentitated industries firms have higher exit rates compared to the top firms in the industries. Again, as we saw in the case of durables and financial dependence, the contribution of differentiation to

[25] If size is correlated with quality, using information on prices and distinguishing between differentiated and non-differentiated sectors may reveal the importance of this channel. See Verhoogen (2008) and Kugler and Verhoogen (2012).

overall exit probability of firms in bigger size quintiles seems to be proportionally higher. However, the surviving smaller firms (bottom two quintiles) in differentiated industries also exhibit faster growth in exports relative to the top quintile in their industry. The growth rate of exports for the fourth quintile is smaller relative to the top quintile. Smaller firms in differentiated industries tend to have smaller product expansion rates as compared to similar sized firms in non-differentiated industries.

During the crisis and post-crisis periods there is no differential effect between differentiated and non-differentiated industries for firm exit and export growth. But, with respect to product line expansion we find that smaller firms in differentiated industries have higher product expansion rate than similar sized firms in non-differentiated industries.

Table A.5: Regression of Exit, Export Growth and Product Line Exoansion on Relative Size of Exporters: Differentiated versus non-Differentiated

	(1) Probability of Exit	(2) Export Growth $\ln X_{i,j,t} - \ln X_{i,j,t-1}$	(3) Product Growth $\ln Products_{i,j,t} - \ln Products_{i,j,t-1}$
1st Quintile	0.665***	1.285***	-0.156***
	(0.009)	(0.043)	(0.013)
2nd Quintile	0.532***	0.492***	-0.037***
	(0.012)	(0.032)	(0.011)
3rd Quintile	0.366***	0.107***	0.011
	(0.014)	(0.029)	(0.010)
4th Quintile	0.159***	0.011	0.008
	(0.015)	(0.025)	(0.009)
1st Quintile*Differentiated	0.084***	0.222***	-0.135***
	(0.021)	(0.067)	(0.021)
2nd Quintile*Differentiated	0.110***	0.142***	-0.062***
	(0.020)	(0.050)	(0.018)
3rd Quintile*Differentiated	0.108***	0.022	0.008
	(0.021)	(0.045)	(0.016)
4th Quintile*Differentiated	0.110***	-0.079**	0.028*
	(0.022)	(0.038)	(0.015)
1st Quintile*Crisis	0.017	0.189**	-0.088***
	(0.026)	(0.083)	(0.027)
2nd Quintile*Crisis	0.016	0.080	-0.038
	(0.026)	(0.065)	(0.025)
3rd Quintile*Crisis	-0.008	-0.053	-0.046**
	(0.025)	(0.054)	(0.023)
4th Quintile*Crisis	0.012	0.030	-0.007
	(0.028)	(0.048)	(0.021)
1st Quintile*Differentiated*Crisis	-0.058	-0.183	0.135***
	(0.040)	(0.130)	(0.044)
2nd Quintile*Differentiated*Crisis	-0.064	-0.093	0.082**
	(0.039)	(0.101)	(0.041)
3rd Quintile*Differentiated*Crisis	-0.047	0.130	0.044
	(0.039)	(0.085)	(0.037)
4th Quintile*Differentiated*Crisis	-0.042	-0.047	0.010
	(0.042)	(0.075)	(0.034)
1st Quintile*Post-Crisis	0.030	0.003	-0.063**
	(0.027)	(0.080)	(0.027)
2nd Quintile*Post-Crisis	0.023	0.036	-0.061**
	(0.026)	(0.063)	(0.024)
3rd Quintile*Post-Crisis	0.025	0.017	-0.035
	(0.026)	(0.054)	(0.022)
4th Quintile*Post-Crisis	0.026	0.014	-0.017
	(0.028)	(0.049)	(0.020)
1st Quintile*Differentiated*Post-Crisis	-0.037	-0.053	0.080*
	(0.040)	(0.128)	(0.045)
2nd Quintile*Differentiated*Post-Crisis	-0.046	-0.058	0.072*
	(0.039)	(0.098)	(0.039)
3rd Quintile*Differentiated*Post-Crisis	-0.036	-0.009	0.023
	(0.039)	(0.086)	(0.035)
4th Quintile*Differentiated*Post-Crisis	-0.041	-0.040	0.038
	(0.042)	(0.077)	(0.032)
N	142147	92636	92636

The table reports coefficients on quintile dummies, their interactions with the industry-level differentiation index, from exporter-industry-level analysis of exit, sales growth and product growth with respect to the U.S. market, and includes industry-time fixed effect. Crisis and Post-crisis are dummies for the crisis and post-crisis periods. The omitted category is the top quintile, so each coefficient reveals the relative performance of the exporters in the k-th quintile compared to the top 20% exporters within industries, while the coefficients on the quintile dummies interactions with differentiation index reveal how this relative performance is different in differentiated industries. Robust standard errors in parentheses. Significance: * 10 percent, ** 5 percent, *** 1 percent.