DECOMPOSING AGGREGATE TRADE FLOWS:

NEW EVIDENCE FROM U.S. TRADERS

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Abstract

Using firm-level data on export transactions, we uncover a rich set of results about the extensive margins of exporting and exporter responses during periods of global downturns. We perform our analysis with respect to firm size, age, ownership status, and sector to emphasize the role of firm heterogeneity. We uncover a larger role for firm entry and exit in changes in annual export flows of single-unit, smaller, and younger firms. Young, small firms perform best during both periods of crises as well as non-crises periods. We also decompose the margins of U.S. imports at the U.S. importer, foreign supplier, and U.S. importer-foreign supplier pair levels. While export flows are closely correlated with global business cycles, import flows more closely approximate U.S. economic cycles. Additionally, both pair and foreign supplier flows are far more volatile than U.S. import flows, that is, U.S. importer-foreign supplier matches experience more churning on average than do either U.S. importers or foreign suppliers.

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1. Introduction

The robust empirical finding that exporting is rare and exporters are systematically different from non-exporters have marked the departure from representative firm models in the international trade literature to models featuring the existence of sunk entry costs into foreign markets and heterogeneity in underlying firm characteristics (Roberts and Tybout, 1997, Melitz, 2003, Bernard, Eaton, Jensen, Kortum, 2003). The key prediction of this class of theoretical trade models featuring firm heterogeneity is that only the most productive firms succeed at exporting while least productive firms exit entirely, especially after trade liberalization inducing a reallocation of resources towards the most productive firms in the economy. Much of the empirical literature has until recently focused on the cross-sectional heterogeneity across firms, products, and countries (Bernard, Jensen, Redding, and Schott, forthcoming). This paper extends the empirical literature on heterogeneous traders by documenting detailed firm characteristics associated with U.S. export dynamics, decomposing import flows at both the firm and trading pair level, and paying particular attention to periods of large shocks.

Our work also relates to two other lines of research - the industrial organization literature on productivity and the labor literature on employment dynamics. Extensive evidence that firm heterogeneity and reallocation play a vital role in many facets of economic activity has prompted productivity growth and labor market models to feature these effects prominently.[1] The general theme of the productivity literature featuring heterogeneity is that firms make choices involving inputs and outputs and these choices determine productivity at each firm, generating a cross-sectional distribution of productivity (Bartlesman and Doms, 2000). Market interactions between

[1] For empirical evidence see Davis, Haltiwanger, Schuh (1996); Bartlesman and Doms (2000); Foster, Haltiwanger, Krizan (2002, 2006); Haltiwanger, Scarpetta, Schweiger (2008). For theoretical evidence see Nelson (1981), Jovanovic (1982), Aghion and Howitt (1992), Caballero and Hammour (1994).

producers of various types determine output shares and aggregate productivity is determined by the share-weighted productivity of all firms in the economy.

Firm decisions that affect productivity and market share also affect job creation and destruction. Changes in the number of employees at a firm reflect many factors, including the diffusion of new products and technologies, research and development, marketing, management skill, learning by doing, input availability, ownership changes, access to financial capital, market growth, etc. (Davis and Haltiwanger, 1999). Additionally, there is strong evidence (Dunne, Roberts, and Samuelson 1989, Davis and Haltiwanger 1992, Haltiwanger, Jarmin and Miranda forthcoming) for employer life-cycle effects, that is, firm age is a key factor in determining performance.

One of the first papers to document exporter life-cycle effects is Eaton, Eslava, Kugler, and Tybout (2007). Using data from Colombia, they find that almost all export expansion and contraction comes from continuing exporters (intensive margin), despite the fact that one-third to one-half of exporters are new each year (extensive margin). Most new exporters last only one year and have very small sales but those that do survive grow rapidly and account for a large share of total export volume within a few years. This "up or out" phenomena (also recognized in Eaton, Eslava, Jinkins, Krizan, and Tybout, 2012) is remarkably similar to that documented by Haltiwanger et al. (forthcoming) in the context of gross job creation. The theoretical trade literature has tended to explain it as either a result of search and learning (Eaton et al. 2012, Bekkers, 2011) or of productivity shocks (Arkolakis, 2011).

Following on Eaton et al. (2007), Bernard, Jensen, Redding, and Schott (2009) document that there are many small U.S. exporters who tend to exit quickly but that there is a also an "up or out" pattern among the survivors. In the U.S., the extensive margin explains much of the

variation in trade across countries while the intensive margin explains changes in trade over time. They also find that the intensive margin is more important for related party (multinational) trades accounting for the majority of the export decline during the Asian financial crisis.

We use the methodology common to the job flows literature to closely examine the intensive and extensive margin of export flows from 1992 to 2009. We define entry and exit with respect to both trade participation and domestic production to generate a rich set of statistics about the extensive margins of trade. In keeping with the traditions of both the theoretical and empirical trade literatures that emphasize the role of firm heterogeneity, we uncover a significant role for the extensive margins of trade when decomposing annual export flows and relating it directly to firm characteristics. This detailed exercise is made possible by the availability of a rich dataset that links export transactions to firms operating in the United States. Following Eaton et al. (2008), we isolate and profile single-year exporters from our data who tend to be smaller, younger, single-unit firms engaging in arms-length transactions with border countries. Single-year exporters account for 40% of all exporters and less than 1% of total export value over our sample period. The remainder of our exercises excludes these trades.

We find that U.S. gross and net export flows are comparable in magnitude to domestic job flows but that they follow a different (international) business cycle pattern. Akin to the job flows literature, negative net growth tends to be driven by a disproportionate increase in negative flows accompanied by a smaller reduction in positive ones.[2] However, the reasons behind these changes more closely approximate the findings of Bernard et al. (2009) than the job flows literature. The changes to the negative flows, as well as the levels, are driven by incumbent exporters.

[2] The main exception we are aware of is Haltiwanger (2011) which shows that during the recent "Great Recession", the job creation rate dropped sharply and was at a historic low. The downturn was especially hard on start-ups, young and small businesses.

Numerous papers have documented that job flows vary dramatically across firm characteristics. Similarly, we find that the extensive margin is a much bigger factor in annual dynamics for younger, smaller, single-unit (SU), non-manufacturing firms than for older, larger, multi-unit (MU), manufacturing firms who tend to dominate the aggregate statistics. Interestingly, we also find that, especially for older, larger, MU firms, firm death is the biggest reason for exiting the market. Once these firms establish themselves as exporters, they tend not to stop or pause. Almost all of their adjustment is at the intensive margin unless the firm itself ceases to exist.

We extend Bernard et al. (2009) and examine the intensive and extensive margins during several global downturns. Our base regressions show that during non-crisis years large multi-unit firms have the best net export growth. However, during crisis years this margin disappears or reverses itself. Interestingly, once we interact firm size and age, we find that small young exporters have the best growth and it is the older large plants that have the worst performance overall. These results approximate those of Haltiwanger et al. (forthcoming) who find that controlling for age, employment growth rates do not vary systematically between small and large plants.

Next, following Bernard et al. (2009) who find that importers display many of the same patterns as exporters – and as a preview of our anticipated future work – we decompose import flows. We find that the gross flow rates are comparable to exports but that the birth and death shares are larger for importers. The biggest difference between export and import flows is the timing of the negative net changes. Both imports and exports fell during the great recession but import flows were not negative during the Asian financial crisis. While export flows closely

track global business cycles, import flows behave more like job flows in closely tracking domestic business cycles, with an additional negative bout in 2003.

The import data uniquely identifies both the domestic importer and the foreign supplier. Following Eaton et al. (2012), we make use of this information to study the dynamics of trading pairs. This work closely parallels the worker flows literature that examines firm-worker matches (Abowd, Haltiwanger, and Lane, 2005, Bjelland, Fallick, Haltiwanger, and McEntarfer, 2011). Like Eaton et al. (2012), we find tremendous churning among pair matches and as with job versus worker flows, we find greater turmoil among matched pairs than among importing firms.

Finally, noting Eaton et al.'s (2012) finding that 80% of matches between importers and suppliers are monogamous – but do not last more than one period, we calculate the gross and net flows for the foreign suppliers. They lie between the pairs and importers in magnitude with smaller contributions from the extensive margin than pair-level flows but bigger than the importer flows. This may indicate that despite the large-scale matching turmoil, once a foreign supplier enters the U.S. market, they stay on for a longer period even if their original match dissolves indicating the existence of sunk exporting costs.

This paper is one of the first to document detailed firm characteristics associated with U.S. export dynamics. Understanding how exports grow, which types of firms contribute to the changes and the margins of adjustments, can directly inform export promotion programs such as President Obama's National Export Initiative (NEI) that targets to double U.S. exports by the end of 2014.[3] Our findings suggest that smaller, younger firms are more likely to contribute to annual export growth relative to their larger, older counterparts. However, older and larger firms are more stable and tend to experience fewer interruptions in their exporting life cycle. This indicates that effective export programs should consider the role of firm size and age. Our

[3] For details about NEI see http://trade.gov/nei/.

findings can also inform dynamic trade models that incorporate business cycles such as Alessandria and Choi (2008).

2. Data

The data used in this study is drawn from the Linked/Longitudinal Trade Transactions Database (LFTTD) that links individual trade transaction to firms operating in the United States between 1992 and 2009.[4] We focus mostly on export flows in this paper. Each export transaction provides information on (i) the ten-digit Harmonized System (HS) classification of the product which we aggregate to the two-digit HS level and henceforth product will refer to two-digit HS; (ii) nominal values that we convert to real terms using the annual CPI; (iii) destination country; (iv) the transaction date that we aggregate to the annual level; and (v) whether the transaction takes place between related parties or at arm's length[5]. Therefore, our unit of observation is an export transaction at the firm, product, country, related or unrelated party, year level.

We study export dynamics by four key firm characteristics of size (measured as average employment at time t and $t-1$), age, ownership (single or multi-unit status), and sector (manufacturing, wholesale and retail, and all others). If a firm is present in multiple sectors, it is assigned to the sector that accounts for the largest share of its total employment. We define firm size using average employment to circumvent issues related to regression to the mean (Davis and Haltiwanger, 1992, Schuh, Haltiwanger, and Krizan, 1999, Haltiwanger et al., forthcoming). For

[4] See Bernard, Jensen, Schott (2009) for an overview of the dataset including match rates. On average, 75% of the total value of exports are matched to a firm. Export transactions are linked to firms and not establishments, including both domestic U.S. firms and foreign subsidiaries operating in the U.S. We can identify if a transaction takes place with a related party. However, we cannot distinguish between U.S. multinationals and U.S. subsidiaries of foreign multinationals.

[5] Exports are considered to be between related parties if either party owns, directly or indirectly, 10 percent or more of the other party.

multi-unit or firms with multiple plants, age is calculated as the difference between the year of interest and the first observed year of its oldest plant.

We impose several restrictions on the raw data to generate our analysis dataset.[6] First, we exclude transactions of agricultural, mineral, precious metals and stones, and special classification products.[7] These products are produced in resource intensive industries where barriers to entry and exit are high and therefore not suitable for our analyses. Second, we filter the raw data to exclude inconsistent observations, in particular, where the first year a firm exports product i to country c is earlier than the year of birth and where the last year a firm exports product i to country c is later than the year of death.

Given Eaton et al.'s (2007) findings that single year exporters are very common, we isolate this group and examine their characteristics. Table A1 reports that they tend to be smaller, younger, non-manufacturing firms that engage in arms-length transactions with a border country. In unreported data, we found that third of their trade, measured either by number of transactions or value is with Canada and Mexico. This is broadly in line with Bernard, Jensen, Redding, and Schott's (2010) finding that the extensive margin declines with distance. Less than a quarter of these transactions (by value) are between related parties; and half their exports, by value, are of electrical machinery including cars and aircrafts. We follow Eaton et al. and drop these firms from the rest of our analysis.

[6] We note that the LFTTD data for 1995 are incomplete as in Bernard et al. (2009). The 1995 file excludes data for June of that year. Therefore, changes between 1995 and other years should be interpreted with caution.
[7] Agricultural, mineral, precious metals and stones, and services products are classified as products within two digit HS codes (HS2) equal to or below 10, HS2 between 25 and 27, HS2 equal to 71, and HS2 greater than or equal to 98, respectively.

3. Measuring Trade Flows

We adopt Davis and Haltiwanger's (1992) measure of mid-point growth to analyze changes in real annual trade flows as follows,

$$\Delta E_{ft} = \frac{E_{ft} - E_{f,t-1}}{\frac{1}{2}\left(E_{ft} + E_{f,t-1}\right)} \tag{1}$$

where E represents the total value of exports (imports) so that ΔE_{ft} is the net export (import) growth rate for firm f at time t. Annual changes can be decomposed as follows:

$$\Delta E_t = \sum_{f \in N} \Delta E_{ft} - \sum_{f \in E} \Delta E_{ft} + \sum_{f \in C} \Delta E_{ft} \tag{2}$$

where N is the set of new firms entering the foreign market, E is the set of firms exiting the foreign market, and C is the set of incumbent firms. We further decompose firms in N and E as follows:

$$\Delta E_t = \left[\sum_{f \in B} \Delta E_{ft} + \sum_{f \in F} \Delta E_{ft} + \sum_{f \in R} \Delta E_{ft}\right] - \left[\sum_{f \in D} \Delta E_{ft} + \sum_{f \in S} \Delta E_{ft} + \sum_{f \in P} \Delta E_{ft}\right] + \sum_{f \in C} \Delta E_{ft}$$

where B is the set of firms that are established at time t and start trading immediately, F is the set of firms that start trading for the first time, R is the set of firms that start trading after a temporary break (a year at minimum), D is the set of firms that go out of business and stop trading, S is the set of firms that stop trading permanently but continue to have U.S. employment, and P is the set of firms that stop trading temporarily (a year at minimum). B, F, and R make up

the entry margin while D, S, and P make up the exit margin and together define the extensive margin.

Finally, we can classify traders according to whether they increase or decrease their exports over time and define the following terms:

$$Positive_t = \left[\sum_{f \in B} \Delta E_{ft} + \sum_{f \in F} \Delta E_{ft} + \sum_{f \in R} \Delta E_{ft}\right] + \sum_{f \in C+} \Delta E_{ft}$$

$$Negative_t = \left[\sum_{f \in D} \Delta E_{ft} + \sum_{f \in S} \Delta E_{ft} + \sum_{f \in P} \Delta E_{ft}\right] + \sum_{f \in C-} \Delta E_{ft}$$

$$Net_t = Positive_t - Negative_t$$

Where C+ is the set of continuing firms that increase their trades and C- is the set of continuing traders that decrease their exports. "Positive" (POS) is equal to total gross export creation, "Negative" (NEG) is total gross export destruction, and "Net" is the net growth rate.

4. Export Flows

Table 1 provides the overall gross and net export creation rates. Notice first that the number of firms is quite low. The Census Bureau's Business Dynamic Statistics (BDS) program reports that in the 2008-2009 period, there were 5,071,965 firms in the U.S. economy but our sample includes fewer than 200,000 for the same period.[8] As discussed above, this is the result both of the less than perfect match rate to the firm-level data and our data restrictions but largely because exporting is a rare acitivity (Bernard and Jensen, 1995).

[8] Unless noted elsewhere, all BDS statistics come from the Census Bureau's BDS Web site. See http://www.census.gov/ces/dataproducts/bds/data_firm.html for the raw data.

The gross and net export growth rates are roughly comparable to the BDS gross and net flows for the entire economy, even though the BDS data are computed at the establishment level. The average BDS positive (negative) change for the time period is 16.2% (14.7%) compared to the average export increase (decrease) rate of 18% (14.1%). Notice, however, that the export net growth rates are much more volatile than the job creation and destruction rates and that while there were two years (2002, 2009) with negative net employment growth, there were four instances of negative export growth (1998, 2000, 2001, and 2009). As can be expected, the negative net job flows track the 2001 and 2008-9 U.S. recessions while the negative net export flows correspond approximately to the 1998 Asian financial crisis, the 2001-2002 U.S. recession and the 2008-2009 global recession.

Several studies, such as Davis, Haltiwanger, and Schuh (1996) and Davis and Haltiwanger (1999), note that negative net growth rates are usually a result of both an increase in job destruction and a decline in creation, but that the increase in destruction is disproportionately larger. We see similar patterns in the export flows. For example, during the Asian financial crisis of 1998, POS declines by 38% but NEG increases by 79%. Similarly, in 1999-2000, POS dropped by 21% but NEG increased by 67%. The most dramatic net change however is during the great recession/trade collapse of 2008-2009. In our sample, exports declined during this period by almost 20%, fueled by a disproportionate increase in NEG (101%) relative to a smaller decline in POS (49%).

Table 2 compares the contributions of the intensive and extensive margins to the annual growth in U.S. exports between 1992 and 2009. Clearly annual export flows are largely driven by the activities of incumbent exporters (intensive margin). On average, the intensive margin accounts for 90% (85%) of increases (decreases) in annual export flows while the entry and exit

margins account for about 10% and 15% of increases and decreases in annual export flows, respectively. Within the extensive margin, firms that begin exporting for the first time account for the largest share of increases in annual export flows while firms that go out of business account for the largest share of decreases in annual export flows. These results are in line with those of Bernard et al. (2009) who find that the intensive margin is largely responsible for year-to-year changes.[9]

Davis et al. (1996) note that during good periods, job flow dynamics largely reflect turmoil at young and small plants as they and their workers make temporary adjustments. However, during recessions the flows are dominated by older and larger plants experiencing large-scale changes in employment, often involving shutdowns. Interestingly however, the contribution of incumbents is more constant for POS than for NEG. The intensive margin for POS stays consistently around 90% while for NEG it increases by roughly 5% during recessions. Like job flows, negative net changes to export flows are driven by disproportionately large changes in NEG, but unlike for job flows, the large changes to NEG are driven by continuers and not firm deaths (or pauses or stops).

Influential papers such as Dunne et al. (1989), Davis et al. (1996) and Haltiwanger et al. (forthcoming) have shown that there is substantial variation in job flows when cut by firm age, size, ownership (MU versus SU) status and industry. Figures 1-4 summarize the contribution of the various components of the extensive margin according to these characteristics. The figures show the average contribution of each component over our sample years. The contribution of the intensive margin for each group can be obtained by summing the three figures and subtracting the total from 100%.

4.1 Multi versus Single-unit Firms

[9] Because of sampling and methodology differences, our results are not directly comparable.

Figure 1a shows that the entry margin accounts for about 5.06% of POS for multi-unit firms between 1992-2009. For single-unit firms, it was closer to 19.1%. Clearly, the entry margin is far more important component of POS for single unit than multi-unit firms. Notice also that, as one would expect, births play a larger role for single-unit than multi-unit exporters. For both groups though, starts are the biggest component of the entry margin.

Figure 1b shows that there is an analogous story for NEG. The contribution of the exit margin is much larger for single than for multi-unit firms. Interestingly, for both groups but especially for multi-units, firm deaths are the biggest contributing factor to the exit margin. That is, for both groups and particularly for MUs, the biggest reason to stop exporting is because the firm ceases to exist.[10]

4.2 Small versus Large Firms

Figures 2a and 2b categorize firms into three distinct size groups - less than 100 employees, 100 to 249 workers, and 250+ employees. As we saw with the multi/single unit distinction that can approximate firm size, the entry margin is far more important for small firms than large ones. It contributes more than a quarter of POS for small firms but less than 3% for large ones. Starts are the biggest single contributing factor for both groups while births play either a small or nearly non-existent role.

The exit margin is a bigger factor in large firms' NEG compared to the contribution of the entry margin in their POS, but it is still a much smaller component than it is for smaller firms. Notice, however, that the exit margin for large firms is almost entirely driven by firm deaths. Stops and pauses are nearly zero. These results imply that once a big firm starts to export, it does not stop unless it ceases to exist.

[10] Recall that we have omitted single-year traders who tend to be small, young, non-manufacturing firms conducting arms-length trades to border countries.

4.3 Young versus Old Firms

Figures 3a and 3b categorizes firms into three distinct age groups of those less than 5 years old, those between 5 and 9, and those more than or equal to 10 years old. Again, we see a great deal of heterogeneity in the flows by firm characteristics. From Figure 3a, we can see that newly established firms that start exporting immediately account for 10% of increases in annual export flows (by definition all births are in this category). In general, the importance of starts declines with firm age in accounting for increases in annual export flows. Similarly, in Figure 3b we see that the exit margin accounts for a smaller share of decreases in annual export flows as firm age increases but note also that deaths remain the single largest component for all age groups. Interestingly, the contribution of pausing to young firms' NEG is not trivial. Young firms that exit exporting most likely do so because of firm death but conditional on survival, they are more likely to try again than stop exporting altogether.

4.4 Sector

Bernard et al. (2010) show that there are important differences in trade pattern by the sector a firm operates in. Figures 4a and 4b categorizes firms into those that operate in the manufacturing, retail and wholesale, and all other sectors of the economy. The entry margin, depicted in Figure 4a, accounts for double the share of increases in annual export flows within retail/wholesale and other sectors compared to within the manufacturing sector and nearly all the births seem to be concentrated in non-manufacturing industries. Interestingly, the magnitudes of all three components are very similar for the two non-manufacturing sectors.

The extensive margin for NEG is much larger than that for POS for all three sectors but the similarities end there. While births are essentially zero for manufacturing, deaths are the biggest contributing factor to annual decreases in export flows. Moreover, the manufacturing

death share lies between the other two sectors in magnitude. It seems that for manufacturing firms in particular, stopping exports is associated with firm death. These results suggest that manufacturing exporters may face relatively higher entry costs while exit costs are more similar across the various sectors.

Analyzing the entry and exit margins by the above four firm dimensions indicates that single-unit, smaller, younger, and non-manufacturing firms face relatively low sunk costs of trade or relatively volatile cost or demand shocks leading us to observe regular adjustments at the extensive margin.

4.5 Volatility

The importance and heterogeneity of volatility, usually measured as excess reallocation across firm characteristics is well known (Dunne et al., 1989, Davis and Haltiwanger 1992, Davis et al. 1996, Haltiwanger et al., forthcoming etc.). Table 3 displays excess reallocation rates both in aggregate and according to several key firm characteristics.[11] The first column in Table 3 shows that annual export flows are characterized by substantial churning, ranging from about 17% to 33%. The other columns display the reallocation measure by the four firm characteristics of ownership, size, age, and sector. The heterogeneity in export volatility is striking and in line with that found in other literatures.

On average, single-unit firms exhibit three times the volatility in export growth relative to multi-unit firms. Small (less than 100 workers) and medium (between 100 and 249 workers) firms exhibit almost three times higher volatility compared to large firms (250 or more workers).

[11] Reallocation = Positive + Negative - |Net|. Intuitively, we can think about reallocation using a simple example. Suppose net change is 5% in a given period. We can arrive at this by either a 5% increase in export flows only or a 25% increase accompanied by a 20% decrease in export flows. In the latter case, reallocation is 40% compared to 0%. Therefore, reallocation measures the excess amount of churning required within a given period to arrive at the same net change, compared to the base case where net change is driven entirely by an increase or decrease in export flows.

Export growth of younger compared to older firms is characterized by about two and a half times more volatility. Finally, along the sectoral dimension, firms in the retail and wholesale or all other sectors are more volatile with respect to export growth than manufacturing firms. The wide range of volatility in export growth across different firm characteristics is consistent with earlier findings of a greater role for firm entry and exit for single-unit, smaller, and younger firms. Taken together, these results suggest that discussions of the relative importance of the intensive versus extensive margins or of churning in general for export growth should recognize how it varies along these firm characteristics.

5. Macroeconomic Shocks

As noted by Bernard et al. (2009), the availability of transactions data linked to firm level data for a long time horizon permits a focus on periods of both global and domestic shocks. The notable periods in our data include the 1998 Asian financial crisis, 2001 U.S. recession, and the 2009 great recession that was also a period of global trade collapse. We carry out simple regression analyses to gain a better understanding of the role of firm characteristics in explaining annual export growth rate, g_{ft}, at firm f between two time periods denoted simply as t, during both crises and non-crises periods. Our basic specification is given by,

$$g_{ft} = \alpha_{ft} + \beta_1 size_{ft} + \beta_2 age_{ft} + \beta_3 ownership_{ft} + \beta_4 sector_{ft} + \gamma_t + e_{ft} \quad (3)$$

where γ_t are year dummies.

Tables 4a and 4b report results from (3) for each of the three crisis episodes separately, all non-crises years, and the total sample period. Focusing on the firm size categories in Table 4a, we see that controlling for firm age, single or multi-unit status, and sector, the average difference in export growth between medium sized firms (100 to 250 workers) and small firms

(less than 100 workers) is positive and statistically significant during both the Asian financial crisis and the non-crises years. The average difference in export growth between large firms (250 or more workers) and small firms (less than 100 workers) is also positive and statistically significant during the Asian financial crisis, the 2001 U.S. recession, and the non-crises years.

Relative to young firms (less than 5 years old), older firms exhibit lower export growth in both crises and non-crises years. This result is highly statistically significant and the age coefficients are much larger than those for the size terms. We also find that during crises years, the average difference in export growth between single and multi-unit firms is positive and statistically significant. This difference is reversed during non-crises years and remains when we consider all years together. Average export growth tends to be greater for manufacturing businesses, though less so during crises periods.

The results from Table 4a indicate that during non-crises years large, young, multi-unit manufacturing plants have the best export performance but that there is some variability during crises years. Given the importance of the interaction between firm age and size identified by studies such as Haltiwanger, Jarmin, and Miranda (2010), Table 4b uses a different categorization of firm size and age to allow us to look more closely at the connection between these two important characteristics. Firms are categorized as small if they have fewer than fifty workers and large otherwise. Firms are categorized as young if they are less than five years in age and old otherwise. We include an interaction term between firm age and size.

While the results for the age and size coefficients are generally similar to those in Table 4a, the interaction term provides additional insights. The coefficients for the interaction term are generally positive and significant, except during the 2001 recession. Note also that the coefficient, when significant, is larger in absolute magnitude than the level effect for size and

that the coefficients for young firms are mostly large, positive and significant. This means that small young firms grow faster than large old firms and often even faster than young large firms.

These results are similar in spirit to those of Haltiwanger, Jarmin and Miranda (2010). Once we fully control for age, the size effects largely disappear. They are also in-line with the findings in Eaton et al. (2007, 2012) that showed a strong "up or out" pattern among exporters. That is, most entrants stopped exporting but those that continued grew quickly and eventually accounted for a large share of overall trade. This is a departure from Gibrat's Law which states that firm growth rate is independent of its size. Our additional insight is that firm age plays a critical role in this pattern. Small young firms have higher export growth rates, small old firms do not.

Another way to measure the performance of small and large exporters is to look at the impact of global recessions on firm exit - which in this context means to stop exporting. Table 4c reports the results of a linear probability model of the probability of exiting the export market (death, stop, or pause) controlling for the same four firm characteristics as Table 4b. These results give us a sense of which firms are more likely to exit given that they have exported in the past. We find that small firms (less than 50 workers) are more likely to exit the export market in crises years, whether they are young or old. However, during non-crises years small young firms show no greater tendency (very slightly less) than other firms to stop exporting. As we saw in the analysis of the flows above, large old firms are least likely to stop exporting.

6. Import Flows

Bernard et al. (2009) show that importers display many of the same patterns found among exporters. While a full treatment of this topic is outside the scope of this paper, Table 5 shows our basic gross and net flow analyses for importing firms. The first thing we notice is that the

average magnitudes of positive, negative, and net changes are only slightly smaller than the export flows. The share of POS accounted for by births is slightly larger for importers, as is the death share of NEG. The biggest difference is in the timing of the negative net changes. While both imports and exports fell dramatically during the great recession, import flows were not negative during the Asian financial crisis. This seems reasonable since U.S. demand for imports is likely somewhat insulated from foreign demand. Note also that while export flows were negative in 2000 and 2001, import flows were negative in 2001 and 2003. This points to some independence between importing and exporting turmoil and growth.

While the export data contain only a U.S. firm identification number, the import data also contain a field that uniquely identifies the foreign exporter. The variable is the foreign manufacturer's identification code.[12] This variable is essentially an amalgamation of the exporting (to the U.S.) firm's country, street address, name, and city. Since the import data are subject to both Homeland Security and IRS regulations, and are usually filled out by professional customs brokers who have all this information at hand in the form of the shipping manifest, we believe the data to be of high quality. Because we are among the first (see also Eaton et al., 2012) to use this field for academic research, we ensured that the information in this field was populated and agreed with another field in the data that identifies the exporting country and we are satisfied with the results.

Since we have variables that can uniquely identify both the U.S. importer and the foreign exporter, we follow Eaton et al. (2012) and identify trading pairs. Next we decompose changes in trade flows using pairs as the unit of observation instead of the U.S. exporter or importer. This is somewhat analogous to worker flows in the labor literature that look at changes in worker-firm

[12] See Question 13 on Customs and Border Patrol (CBP) form 7501 and Appendix 2 for variable construction details. http://www.cbp.gov/xp/cgov/trade/trade_programs/entry_summary/cbp7501/

matches (Abowd et al., 2004, Hyatt and McEntarfer, 2012, Bjelland et al., 2011). Table 6 reports the results. Note that there are no "births" or "deaths" columns in the table. Unlike when we observe U.S. firms in the domestic economy and then observe them beginning to export, the start of a U.S. buyer-foreign seller relationship is the same as its "birth".

The most striking feature of Table 6 is that the magnitudes of the gross flows are greater than the U.S. importer based measures.[13] This also parallels the worker flows literature (Davis, Faberman, and Haltiwanger, 2006) which shows that worker flows can be larger than job flows. In our case, the Start and Stop shares of POS and NEG respectively are fueling much of the volatility. This reflects the fluid nature of pair-matching described in Eaton et al. (2012) who find a great deal of match making and breaking between U.S. and Colombian firms.

Eaton et al. (2012) show that about 80% of the matches between importers and suppliers are monogamous (one importer pairs with one supplier) but among the remaining polygamous matches, the average foreign supplier pairs with about 1.4 U.S. buyers while the average U.S. importer is engaged in 4 relationships. To look more closely at this dynamic, and to describe the volatility among foreign suppliers to U.S. markets, our final cut of the data uses the variable that uniquely identifies the foreign firm as the unit of analysis.

Table 7 reports these results. Interestingly, the flows are large but smaller than the U.S. importer-foreign supplier pair flows. The average reallocation rate for the foreign supplier flows is 55.5% compared to 69.4% for the pair flows. Also note that the start and stop shares are much smaller in Table 7 than in Table 6 (23.0% versus 38.2% and 18.6% versus 33.9% respectively). That is, there is more volatility among pairs than there is for either foreign suppliers or for U.S. importers.

[13] Because there are a few observations that have firm identifiers but missing foreign ids, the sample is slightly different than in Table 5 so the Net flows differ very slightly.

7. Conclusions

This paper is one of the first to consider both the trade participation and domestic production decision to characterize firm exit and entry to generate a rich set of statistics on the extensive margins of trade. Additionally, we uncover wide variation in these margins by various firm characteristics. Our long time horizon also permits a focus on firm responses along these dimensions to large shocks.

Specifically, we decompose changes in aggregate exports into positive (export creation), negative (export destruction) and net changes between one-year intervals during 1992-2009 using detailed transaction level trade data linked to firms operating in the U.S. We identify the contribution to positive and negative rates of changes from one year to the next by incumbents, entering, and exiting exporters. We further decompose the entry margin into newly established firms who begin exporting immediately (births), firms that start exporting for the first time (starts), and firms that restart exporting after a temporary hiatus (restarts). We decompose the exit margin into firms that go out of business (deaths), firms that stop exporting temporarily (pauses), and firms that stop exporting permanently but continue domestic production (stops).

We measure these six different components of the extensive margin by various firm characteristics and document a set of facts highlighting the role of firm heterogeneity along the size, age, ownership, and industry dimensions and the margins of export adjustments during periods of large shocks. First, within the exit margin, firm deaths on average account for the largest share of decreases in aggregate export flows compared to firms that stop exporting, temporarily or permanently. Second, within the entry margin, new exporters on average account for the largest share of increases in aggregate export flows compared to newly established firms that begin exporting right away or firms that restart exporting. Third, on average, the extensive margin only accounts for 10% (15%) of increases (decreases) annual exports, however, the

shares jump to as high as 37% (30%) when we consider heterogeneous firm characteristics. Fourth, small firms are more likely while young firms are less likely to stop exporting, however, small firms that are young are less likely to stop exporting. Fifth, during periods of large shocks, single-unit relative to multi-unit firms as well as small and young relative to large and old firms experience higher export growth.

We also analyze import flows and find that the gross flow rates are comparable to exports but that the birth and death shares are larger for importers. We also find tremendous churning among U.S. importer and foreign supplier pair matches. Finally, we analyze foreign supplier's trade flows into the U.S. and find smaller contributions from the extensive margin than pair-level flows but bigger than the importer flows. This suggests that despite the large-scale matching turmoil, once a foreign supplier enters the market, they stay on even after their original match terminates.

References

Abowd, J., Haltiwanger, J. C., Lane, J., 2004. Integrated Longitudinal Employer-Employee Data for the United States. American Economic Review 94(2), 224-229.

Aghion, P., Howitt, P., 1992. A Model of Growth through Creative Destruction. Econometrica 60(2), 323-351.

Alessandria, G., Choi, H., 2008. The Role of Exporting and Trade for Entry over the Business Cycle. Mimeo.

Arkolakis, C., 2011. A Unified Theory of Firm Selection and Growth. Yale University, mimeo.

Bartelsman, E. J., Doms, M., 2000 Understanding Productivity: Lessons from Longitudinal Microdata. Journal of Economic Literature 38(3), 569-594.

Bekkers, E., 2011. Heterogeneous Popularity and Exporting Uncertainty. Open Economies Review 22(5), 797-824.

Bernard, A. B., Jensen, J. B., Redding S. J., Schott, P. K., forthcoming. The Empirics of Firm Heterogeneity and International Trade. Annual Review of Economics.

Bernard, A. B., Jensen, J. B., Redding S. J., Schott, P. K., 2010. Wholesalers and Retailers in US Trade. American Economic Review Papers and Proceedings 100(2), 408-413.

Bernard, A. B., Jensen, J. B., Schott, P. K., 2009. 'Importers, Exporters, and Multinationals: A Portrait of Firms in the U.S. that Trade Goods,' in Dunne, T., Jensen, J. B., and Roberts, M. J. (eds.), *Producer Dynamics: New Evidence from Micro Data*. University of Chicago Press, pp. 513-552.

Bernard, A. B., Jensen, J. B., Redding S. J., Schott, P. K., 2009. The Margins of US trade. American Economic Review Papers and Proceedings 99(2), 487-493.

Bernard, A. B., Eaton, J., Jensen, J. B., Kortum, S. S., 2003. Plants and Productivity in International Trade. American Economic Review 93(4), 1268-1290.

Bernard, A. B., Jensen, J. B., 1995. Exporters, Jobs and Wages in U.S. Manufacturing, 1976-87. Brookings Papers on Economic Activity: Microeconomics.

Bjelland, M., Fallick, B., Haltiwanger, J. C., McEntarfer, E., 2011. Employer-to-Employer Flows in the United States: Estimates Using Linked Employer-Employee Data. Journal of Business and Economic Statistics 29(4), 493-505.

Caballero, R., Hammour, M., 1994. The Cleansing Effect of Recessions. American Economic Review 84(5), 1350-1368.

Davis, S. J., Faberman, R. J., Haltiwanger, J. C., 2006. The Flow Approach to Labor Markets: New Data Sources and Micro-Macro Links. Journal of Economic Perspectives 20(3), 3-26.

Davis, S. J., Haltiwanger, J. C., 1999. 'Gross Job Flows,' in Ashenfelter, O., Card, D. (eds.), *Handbook of Labor Economics*. Volumes 3 and 4, pp. 2711-2805.

Davis, S. J., Haltiwanger, J. C., Schuh, S., 1996. Job Creation and Destruction. MIT Press, MA.

Davis, S. J., Haltiwanger, J. C., 1992. Gross Job Creation, Gross Job Destruction, and Employment Reallocation. Quarterly Journal of Economics 107(3), 819-863.

Dunne, T., Roberts, M. J., Samuelson, L., 1989. The Growth and Failure of U.S. Manufacturing Plants. Quarterly Journal of Economics 104(4), 671-698.

Eaton, J., Eslava, Jinkins, D., Krizan, C. J., M., Kugler, M., Tybout, J., 2012. A Search and Learning Model of Export Dynamics. Mimeo.

Eaton, J., Eslava, M., Kugler, M., Tybout, J., 2007. Export Dynamics in Colombia: Firm-level Evidence. NBER working paper number 13531.

Foster, L., Haltiwanger, J. C., Krizan, C. J., 2006. Market Selection, Reallocation, and Restructuring in the U.S. Retail Trade Sector in the 1990s. Review of Economics and Statistics 88(4), 748-758.

Foster, L., Haltiwanger, J. C., Krizan, C. J., 2002. The Link Between Aggregate and Micro Productivity Growth: Evidence from Retail Trade. NBER working paper number 9120.

Haltiwanger, J. C., Jarmin, R. S., Miranda, J., forthcoming. Who Creates Jobs? Small vs. Large vs. Young. Review of Economics and Statistics.

Haltiwanger, J. C., 2011. Job Creation and Firm Dynamics in the U.S. University of Maryland, mimeo.

Haltiwanger, J. C., Scarpetta, S., Schweiger, H., 2008. Assessing Job Flows Across Countries: The Role of Industry, Firm Size and Regulations. NBER working paper number 13920.

Hyatt, H.R, McEntarfer, E., 2012. Job-to-Job Flows and the Business Cycle. US Census Bureau Center for Economic Studies Paper No. CES-WP-12-04.

Jovanovic, B. 1982. Selection and the Evolution of Industry. Econometrica 50(3), 649-670.

Melitz, Marc J., 2003. The Impact of Trade on Intra-Industry Reallocations and Aggregate Industry Productivity. Econometrica 71(6), 1695-1725.

Nelson, R. R, 1981. Research on Productivity Growth and Productivity Differences: Dead Ends and New Departures. Journal of Economic Literature 19(3), 1029-1064.

Tybout, J., Roberts, M., 1997. The Decision to Export in Colombia: An Empirical Model of Entry with Sunk Costs. American Economic Review 87(4), 545-563.

Table 1: Annual changes in export flows (in percentage), 1992 – 2009.

Year	Firms	Net Δ	Positive Δ	Negative Δ
1992-1993	108,449	7.32	18.38	11.07
1993-1994	127,742	14.25	24.27	10.02
1994-1995	132,603	4.84	18.10	13.26
1995-1996	140,713	12.12	21.09	8.97
1996-1997	153,732	11.43	21.22	9.79
1997-1998	148,400	-4.49	13.01	17.51
1998-1999	153,099	7.47	20.57	13.11
1999-2000	166,491	-5.68	16.22	21.90
2000-2001	174,490	-2.67	16.75	19.42
2001-2002	187,392	6.72	20.01	13.28
2002-2003	187,355	1.59	14.71	13.12
2003-2004	193,463	9.10	20.72	11.63
2004-2005	199,313	6.17	17.38	11.22
2005-2006	207,080	10.84	21.22	10.38
2006-2007	211,825	5.25	17.81	12.56
2007-2008	214,113	2.52	16.60	14.08
2008-2009	199,173	-19.85	8.52	28.37
Average		**3.94**	**18.03**	**14.10**

Notes: This table decomposes annual aggregate U.S. export flows. 'Year' refers to the change period under consideration and shown as *t-1- t*; 'Firms' refer to the number of firms in the sample as of the time period indicated under 'Year'; 'Net Δ' is the percentage change in annual exports between *t* and *t-1*; 'Positive Δ' is the percentage increase in annual exports between *t* and *t-1*; 'Negative Δ' is the percentage decrease in annual exports between *t* and *t-1*.

Table 2: Export margins (in percentage), 1992 – 2009.

	Increase				Decrease			
Year	**Incumbents**	**Births**	**Starts**	**Restarts**	**Incumbents**	**Deaths**	**Pauses**	**Stops**
1992-1993	90.78	1.18	5.90	2.14	94.88	NA	5.12	NA
1993-1994	94.01	0.91	4.32	0.76	84.34	6.77	6.13	2.76
1994-1995	90.83	1.40	5.82	1.95	87.73	5.75	4.44	2.08
1995-1996	90.82	0.91	5.97	2.30	83.31	6.81	6.48	3.40
1996-1997	88.25	1.22	8.23	2.30	82.84	7.97	7.00	2.19
1997-1998	91.32	1.14	4.67	2.87	91.31	2.89	4.12	1.68
1998-1999	91.81	0.89	4.32	2.98	87.46	7.08	3.06	2.40
1999-2000	90.23	1.39	5.63	2.75	92.39	3.99	2.43	1.19
2000-2001	90.74	0.90	5.07	3.29	90.90	4.59	2.42	2.09
2001-2002	85.14	3.76	7.79	3.31	77.40	13.78	5.46	3.36
2002-2003	89.28	3.27	3.83	3.62	86.47	7.81	3.42	2.30
2003-2004	91.65	1.83	3.36	3.16	84.35	8.91	4.32	2.42
2004-2005	90.65	1.82	4.12	3.41	82.34	11.81	3.25	2.60
2005-2006	87.17	2.13	6.67	4.03	71.75	21.39	3.69	3.17
2006-2007	86.93	2.60	6.98	3.49	82.32	12.32	2.44	2.92
2007-2008	87.23	2.84	5.55	4.38	84.51	11.91	1.22	2.36
2008-2009	93.67	NA	NA	6.33	92.97	4.82	NA	2.21
Average	**90.03**	**1.66**	**5.19**	**3.12**	**85.72**	**8.15**	**3.82**	**2.30**

Notes: ‘Incumbents’, ‘Births’, ‘Starts’, and ‘Restarts’ denotes the percentage share of increases in annual exports accounted for by each category respectively; ‘Incumbents’, ‘Deaths’, ‘Pauses’, and ‘Stops’ denotes the percentage share of decreases in annual exports accounted for by each category respectively.

Table 3: Export volatility, 1992-2009.

Year	**All**	**Ownership**		**Size**			**Age**			**Sector**		
		Multi	Single	1-99	100-249	250+	0-4	5-9	10+	Manufacturing	Retail/Wholesale	Others
1992-1993	22.13	16.80	56.00	59.20	40.80	15.20	44.00	49.60	19.20	15.20	44.00	42.40
1993-1994	20.03	14.40	58.40	59.20	44.80	12.80	32.00	61.60	17.60	15.20	38.40	32.00
1994-1995	26.52	21.60	63.20	64.00	42.40	20.00	29.60	60.80	24.80	23.20	37.60	36.00
1995-1996	17.93	12.80	53.60	59.20	40.00	11.20	23.20	55.20	16.00	12.00	44.00	28.00
1996-1997	19.58	13.60	57.60	60.00	39.20	12.80	56.00	59.20	16.80	13.60	39.20	49.60
1997-1998	26.02	21.60	56.80	59.20	43.20	20.80	86.40	59.20	23.20	21.60	39.20	36.80
1998-1999	26.21	21.60	57.60	64.00	50.40	20.00	61.60	52.00	24.80	20.00	48.00	42.40
1999-2000	32.43	25.60	60.80	65.60	55.20	24.80	65.60	61.60	28.00	26.40	43.20	53.60
2000-2001	33.50	26.40	72.80	77.60	52.00	25.60	66.40	68.00	29.60	25.60	53.60	60.00
2001-2002	26.57	19.20	74.40	79.20	56.00	16.80	64.80	71.20	23.20	18.40	47.20	61.60
2002-2003	26.25	20.80	57.60	60.80	44.80	20.00	49.60	55.20	24.00	20.80	36.80	32.00
2003-2004	23.25	18.40	50.40	55.20	37.60	16.80	54.40	53.60	20.80	17.60	31.20	33.60
2004-2005	22.44	16.00	55.20	58.40	37.60	15.20	56.80	60.80	19.20	16.80	37.60	28.80
2005-2006	20.75	14.40	52.00	61.60	41.60	12.00	48.80	60.80	18.40	16.00	33.60	27.20
2006-2007	25.13	19.20	52.80	53.60	40.00	19.20	45.60	60.00	23.20	20.80	34.40	32.00
2007-2008	28.17	24.00	49.60	53.60	45.60	22.40	45.60	56.00	26.40	25.60	36.80	29.60
2008-2009	17.03	11.20	42.40	42.40	33.60	10.40	59.20	37.60	14.40	11.20	30.40	22.40
Average	**24.35**	**18.68**	**57.13**	**60.75**	**43.81**	**17.41**	**52.33**	**57.79**	**21.74**	**18.82**	**39.72**	**38.12**

Notes: This table displays the reallocation measure by various firm characteristics; Reallocation = Positive + Negative - |Net|.

Table 4a: Net changes in annual export flows and periods of crises.

	(1) **1998 Asian Crisis**	(2) **2001 Recession**	(3) **2009 Great Recession**	(4) **Non-Crises Years**	(5) **All Years**
Employment Size					
100 to 249	0.0255**	0.0150	0.0101	0.0186***	0.0000545
	(0.012)	(0.010)	(0.009)	(0.003)	(0.003)
250+	0.113***	0.0393***	0.0143	0.0198***	0.00385
	(0.013)	(0.012)	(0.011)	(0.003)	(0.004)
Age					
5 to 9	-0.0961***	-0.119***	-0.0916***	-0.0914***	-0.416***
	(0.013)	(0.011)	(0.009)	(0.003)	(0.003)
10+	-0.139***	-0.153***	-0.133***	-0.114***	-0.422***
	(0.011)	(0.010)	(0.008)	(0.002)	(0.002)
Single-unit	0.0532***	0.0355***	0.0295***	-0.00480**	-0.0297***
	(0.010)	(0.009)	(0.008)	(0.002)	(0.003)
Retail/Wholesale	0.00730	-0.00128	0.00510	-0.0248***	-0.0214***
	(0.007)	(0.006)	(0.005)	(0.002)	(0.002)
Other	0.131***	-0.0484***	0.0194***	-0.0526***	-0.0313***
	(0.011)	(0.010)	(0.008)	(0.003)	(0.003)
_cons	-0.221***	0.159***	-0.0519***	0.198***	0.137***
	(0.015)	(0.014)	(0.011)	(0.005)	(0.005)
N	81,597	102,681	136,653	1,397,205	2,905,433
Adj. R^2	0.01	0.00	0.00	0.00	0.03

Notes: Dependent variable is net change in annual export flows at the firm-year level. Columns 4 and 5 include year fixed effects; multi-unit, manufacturing firms less than 5 years old and with less than 100 workers is the left-out category; standard errors in parentheses; * p<0.10, ** p<0.05, *** p<0.01.

Table 4b: Net changes in annual export flows and periods of crises.

	(1) **1998 Asian Crisis**	(2) **2001 US Recession**	(3) **2009 Great Recession**	(4) **Non-Crises Years**	(5) **All Years**
Small (< 50 workers)	-0.0162*	-0.0117	-0.00501	-0.0214***	-0.00631***
	(0.009)	(0.008)	(0.007)	(0.002)	(0.002)
Young (< 5 years)	0.0509	0.168***	0.0770***	0.0638***	0.385***
	(0.037)	(0.031)	(0.028)	(0.008)	(0.008)
Small x Young	0.0814**	-0.0264	0.0492*	0.0493***	0.0388***
	(0.038)	(0.033)	(0.029)	(0.008)	(0.008)
Single-unit	0.0239**	0.0322***	0.0298***	0.000651	-0.0270***
	(0.009)	(0.008)	(0.007)	(0.002)	(0.003)
Retail	0.00387	0.00134	0.00836	-0.0211***	-0.0203***
	(0.008)	(0.006)	(0.005)	(0.002)	(0.002)
Other	0.137***	-0.0428***	0.0246***	-0.0483***	-0.0302***
	(0.011)	(0.010)	(0.007)	(0.003)	(0.003)
_cons	-0.302***	0.0276***	-0.173***	0.102***	-0.282***
	(0.007)	(0.007)	(0.006)	(0.004)	(0.004)
N	81,597	102,681	136,653	1,397,205	2,905,433
Adj. R^2	0.00	0.00	0.00	0.00	0.03

Notes: Dependent variable is net change in annual export flows at the firm-year level. Columns 4 and 5 include year fixed effects; multi-unit, manufacturing firms more than 5 years old and with greater than 50 workers is the left-out category; standard errors in parentheses; * p<0.10, ** p<0.05, *** p<0.01.

Table 4c: Probability of exiting the export market, by firm characteristics.

	(1) **1998 Asian Crisis**	(2) **2001 US Recession**	(3) **2009 Great Recession**	(4) **Non-Crises Years**	(5) **All Years**
Small (< 50 workers)	0.103***	0.0663***	0.0503***	0.0447***	0.0496***
	(0.003)	(0.003)	(0.003)	(0.001)	(0.001)
Young (< 5 years)	0.00862	0.00117	0.00468	-0.00733***	-0.00509***
	(0.011)	(0.008)	(0.009)	(0.002)	(0.002)
Small x Young	-0.0480***	-0.0477***	-0.0468***	-0.0386***	-0.0405***
	(0.011)	(0.008)	(0.010)	(0.002)	(0.002)
Single-unit	0.0386***	0.00980***	0.0470***	0.0333***	0.0330***
	(0.003)	(0.003)	(0.003)	(0.001)	(0.001)
Retail	0.0416***	0.0278***	0.0396***	0.0319***	0.0327***
	(0.003)	(0.002)	(0.002)	(0.001)	(0.001)
Other	0.0584***	0.0891***	0.101***	0.0917***	0.0906***
	(0.003)	(0.003)	(0.003)	(0.001)	(0.001)
_cons	0.159***	0.107***	0.0895***	0.0117***	0.108***
	(0.003)	(0.002)	(0.002)	(0.001)	(0.001)
N	148,400	174,490	199,173	2,383,370	2,905,433
Adj. R^2	0.02	0.01	0.01	0.02	0.02

Notes: Dependent variable take on value of 1 if firm dies or stops exporting either temporarily or permanently and 0 otherwise. Columns 4 and 5 include year fixed effects; multi-unit, manufacturing firms more than 5 years old and with greater than 50 workers is the left-out category; standard errors in parentheses; * p<0.10, ** p<0.05, *** p<0.01.

Table 5: Import margins (in percentage), 1992 – 2009.

		Increase				Decrease				
Year	**Positive Δ**	**Births**	**Starts**	**Restarts**	**Negative Δ**	**Deaths**	**Stops**	**Pauses**	**Net Δ**	**Reallocation**
1992-1993	14.7	5.2	8.6	0.5	13.7	8.3	2.9	7.4	1.0	27.4
1993-1994	23.1	2.7	4.3	1.3	8.5	11.9	2.7	8.1	14.6	17.0
1994-1995	25.9	2.8	4.0	0.8	6.6	12.8	4.2	9.8	19.3	13.2
1995-1996	15.3	3.6	9.1	2.4	12.2	11.7	2.9	6.4	3.1	24.4
1996-1997	18.1	3.4	12.3	2.5	10.5	19.7	2.4	11.3	7.6	21.0
1997-1998	16.0	3.9	4.8	1.6	12.0	10.3	3.0	6.9	4.0	24.0
1998-1999	19.1	3.0	4.2	1.3	10.9	12.1	2.7	9.0	8.2	21.8
1999-2000	21.0	2.4	3.6	1.4	10.6	11.5	2.4	8.6	10.4	21.2
2000-2001	12.5	3.2	6.2	2.3	19.1	5.6	2.2	4.1	-6.6	25.0
2001-2002	15.5	9.0	9.3	3.3	13.9	16.5	3.1	3.5	1.6	27.8
2002-2003	12.3	6.0	4.3	2.2	12.7	8.9	2.8	2.2	-0.4	24.6
2003-2004	20.9	3.4	2.7	1.7	6.6	15.6	3.6	4.5	14.3	13.2
2004-2005	14.7	4.7	4.4	2.8	10.6	10.3	2.5	2.2	4.1	21.2
2005-2006	15.7	4.6	7.5	3.9	8.8	26.2	3.7	2.8	6.9	17.6
2006-2007	13.4	4.6	10.8	2.8	14.3	14.2	2.2	1.5	-0.9	26.8
2007-2008	11.8	3.9	6.7	4.7	15.0	11.2	2.6	0.9	-3.2	23.6
2008-2009	7.7	5.9	6.4	4.2	29.0	4.5	1.6	0.3	-21.3	15.4
Average	**16.3**	**4.3**	**6.4**	**2.3**	**12.6**	**12.4**	**2.8**	**5.3**	**3.7**	**21.5**

Notes: This table decomposes annual aggregate U.S. import flows. 'Year' refers to the change period under consideration and shown as *t-1- t*; 'Firms' refer to the number of firms in the sample as of the time period indicated under 'Year'; 'Net Δ' is the percentage change in annual exports between *t* and *t-1*; 'Positive Δ' is the percentage increase in annual exports between *t* and *t-1*; 'Negative Δ' is the percentage decrease in annual exports between *t* and *t-1*. 'Births', 'Starts', and 'Restarts' denotes the percentage share of increases in annual exports accounted for by each category respectively; 'Deaths', 'Pauses', and 'Stops' denotes the percentage share of decreases in annual exports accounted for by each category respectively.

Table 6: U.S. Importer – Foreign Supplier Pair Import Flows, 1992-2009.

		Increase			Decrease			
Year	**Positive Δ**	**Starts**	**Restarts**	**Negative Δ**	**Stops**	**Pauses**	**Net Δ**	**Reallocation**
1992-1993	38.2	45.8	0.0	37.2	33.7	6.5	1.0	74.4
1993-1994	46.9	38.9	2.6	31.2	38.0	6.6	15.7	62.4
1994-1995	48.0	32.7	2.5	28.3	38.6	5.5	19.7	56.6
1995-1996	39.3	39.9	3.3	36.9	35.7	4.6	2.4	73.8
1996-1997	43.4	39.2	4.4	36.0	39.1	5.3	7.4	72.0
1997-1998	40.5	36.2	3.8	36.0	31.2	6.0	4.5	72.0
1998-1999	44.7	39.4	3.3	35.2	35.5	5.3	9.5	70.4
1999-2000	44.0	39.1	4.0	34.0	35.2	4.7	10.0	68.0
2000-2001	34.0	43.0	5.2	43.9	33.7	4.1	-9.9	68.0
2001-2002	39.8	38.0	4.5	38.5	32.2	7.6	1.3	77.0
2002-2003	37.2	37.2	5.4	37.2	27.9	6.7	0.0	74.4
2003-2004	42.7	31.6	4.1	27.4	30.8	5.8	15.3	54.8
2004-2005	39.7	33.6	3.8	35.5	27.9	8.0	4.2	71.0
2005-2006	42.4	39.5	4.9	34.5	35.4	4.2	7.9	69.0
2006-2007	39.4	40.3	5.3	39.4	40.8	3.6	0.0	78.8
2007-2008	36.9	38.7	4.9	39.7	32.8	2.2	-2.8	73.8
2008-2009	31.7	35.7	5.2	53.9	28.2	0.0	-22.2	63.4
Average	**40.5**	**38.2**	**4.0**	**36.8**	**33.9**	**5.1**	**3.8**	**69.4**

Notes: This table decomposes annual aggregate U.S. import flows between a U.S. importer and foreign supplier pair. 'Year' refers to the change period under consideration and shown as *t-1- t*; 'Positive Δ' is the percentage increase in annual exports between *t* and *t-1*; 'Negative Δ' is the percentage decrease in annual exports between *t* and *t-1*. 'Starts' and 'Restarts' denotes the percentage share of increases in annual exports accounted for by each category respectively; 'Pauses' and 'Stops' denotes the percentage share of decreases in annual exports accounted for by each category respectively.

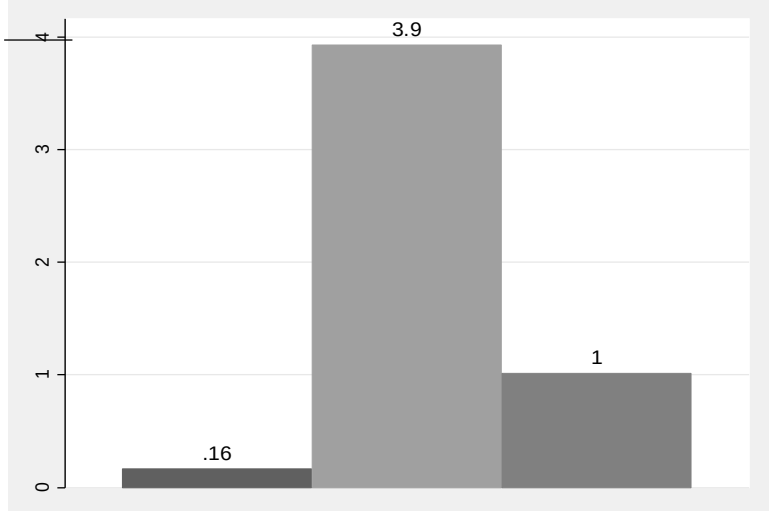
Table 7: Foreign Supplier Flows, 1992-2009.

Year	Positive Δ	Increase		Negative Δ	Decrease		Net Δ	Reallocation
		Starts	Restarts		Stops	Pauses		
1992-1993	31.6	30.6	0.0	30.6	21.8	2.4	1.0	61.2
1993-1994	39.5	24.4	1.2	23.8	25.0	3.8	15.7	47.6
1994-1995	41.8	20.4	1.0	22.1	26.6	2.4	19.7	44.2
1995-1996	31.5	24.4	1.3	29.2	20.8	1.8	2.3	58.4
1996-1997	34.9	22.6	2.2	27.6	23.3	2.1	7.3	55.2
1997-1998	33.5	21.7	1.7	29.0	17.2	2.6	4.5	58.0
1998-1999	36.5	23.8	1.4	27.1	18.2	2.0	9.4	54.2
1999-2000	35.9	21.5	1.6	25.9	18.0	2.4	10.0	51.8
2000-2001	27.2	28.5	2.1	37.1	16.4	1.5	-9.9	54.4
2001-2002	32.9	22.2	1.8	31.5	17.2	3.5	1.4	63.0
2002-2003	31.1	24.6	1.7	31.1	16.3	2.4	0.0	62.2
2003-2004	37.1	18.5	1.8	21.8	16.9	2.4	15.3	43.6
2004-2005	34.1	21.2	1.6	29.8	15.1	2.4	4.3	59.6
2005-2006	35.4	21.2	2.3	27.6	17.4	1.7	7.8	55.2
2006-2007	30.2	21.4	2.0	30.1	16.4	1.9	0.1	60.2
2007-2008	31.2	22.1	2.1	33.9	15.2	1.3	-2.7	62.4
2008-2009	26.0	22.5	2.0	48.3	14.0	0.0	-22.3	52.0
Average	**33.6**	**23.0**	**1.6**	**29.8**	**18.6**	**2.2**	**3.8**	**55.5**

Notes: This table decomposes annual aggregate foreign supplier flows into the U.S. 'Year' refers to the change period under consideration and shown as *t-1- t*; 'Positive Δ' is the percentage increase in annual exports between *t* and *t-1*; 'Negative Δ' is the percentage decrease in annual exports between *t* and *t-1*. 'Starts' and 'Restarts' denotes the percentage share of increases in annual exports accounted for by each category respectively; 'Pauses' and 'Stops' denotes the percentage share of decreases in annual exports accounted for by each category respectively.

Figure 1a: Percent share of annual increases in export flows accounted by births, starts, restarts, by firm ownership.

Multi Unit



Single Unit

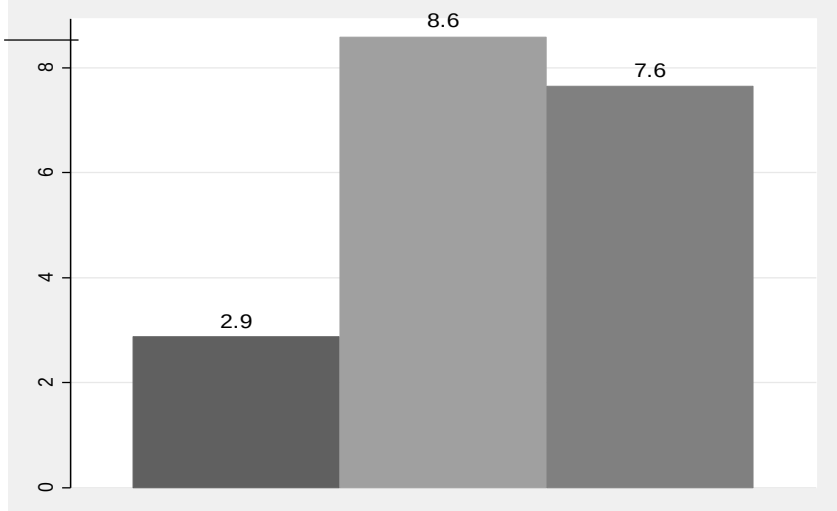
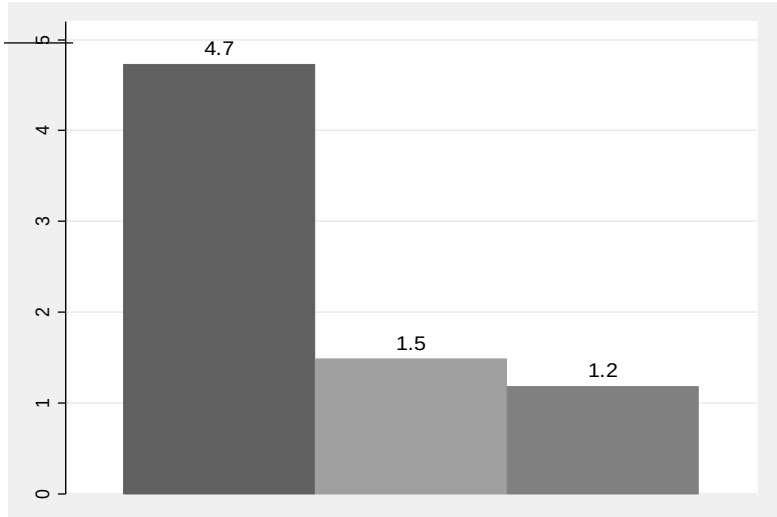


Figure 1b: Percent share of annual decreases in export flows accounted by deaths, stops, pauses, by firm ownership.

Multi Unit



Single Unit

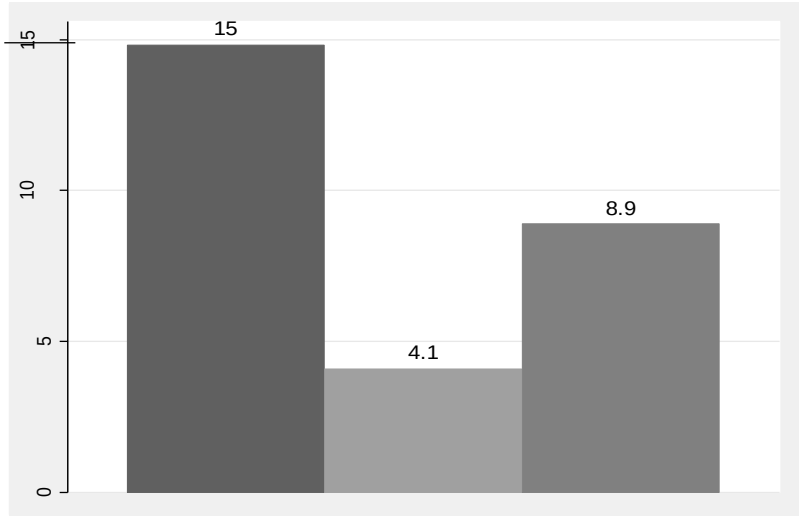


Figure 2a: Percent share of annual increases in export flows accounted by births, starts, restarts, by firm size.

1 – 99 Employees **100-149 Employees** **250+ Employees**

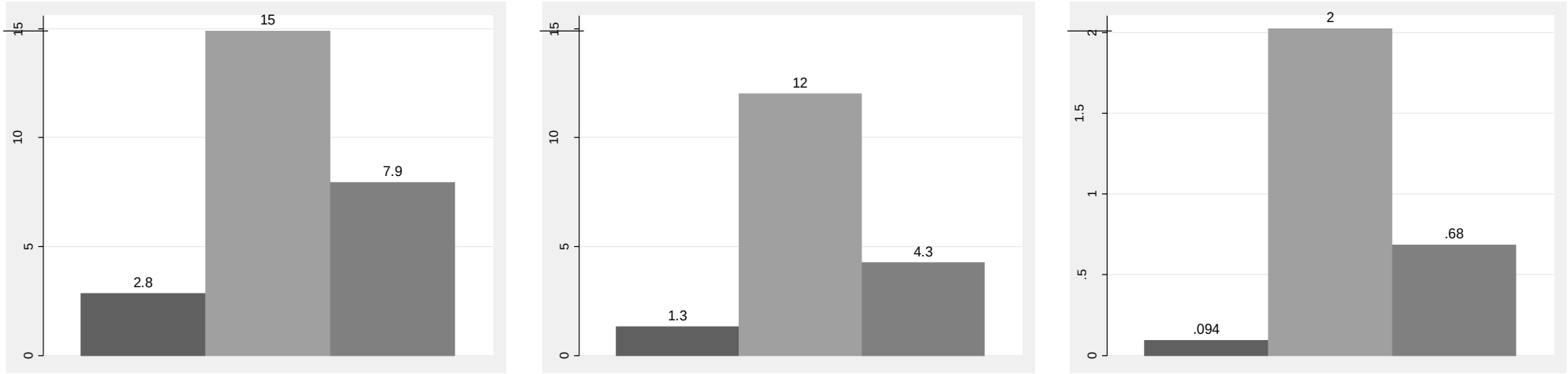


Figure 2b: Percent share of annual decreases in export flows accounted by deaths, stops, pauses, by firm size.

1 – 99 Employees **100-149 Employees** **250+ Employees**

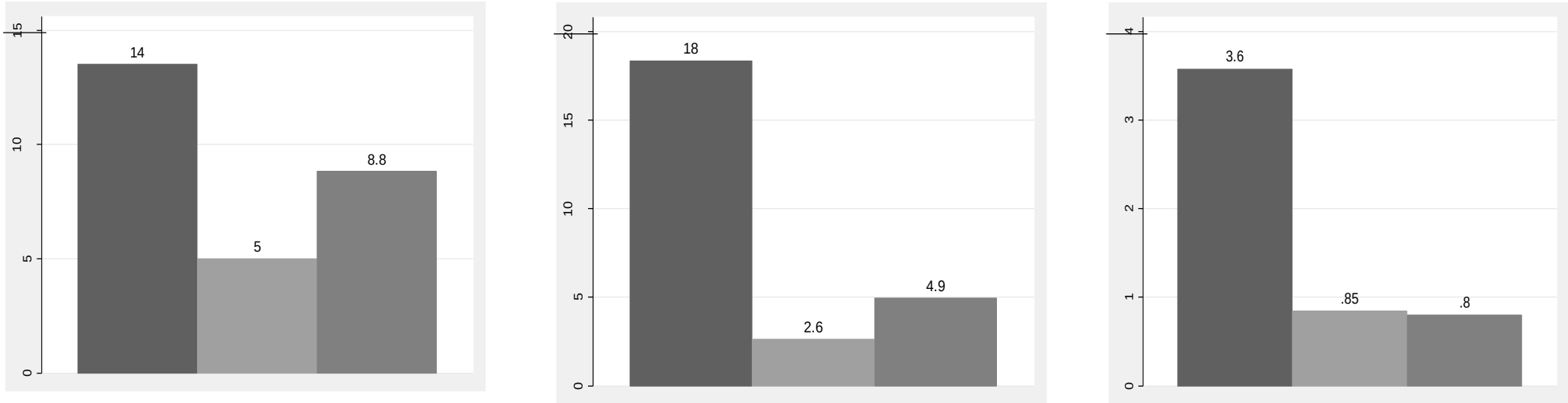


Figure 3a: Percent share of annual increases in export flows accounted by births, starts, restarts, by firm age.

0 – 4 Years Old | **5 – 9 Years Old** | **10 Years + Old**

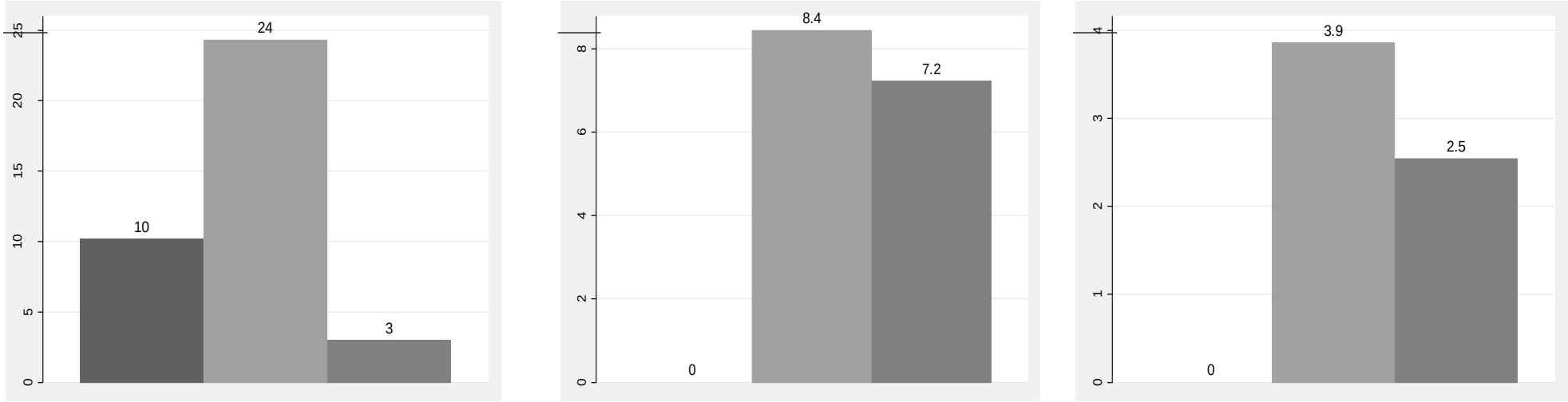


Figure 3b: Percent share of annual decreases in export flows accounted by deaths, stops, pauses, by firm age.

0 – 4 Years Old | **5 – 9 Years Old** | **10 Years + Old**

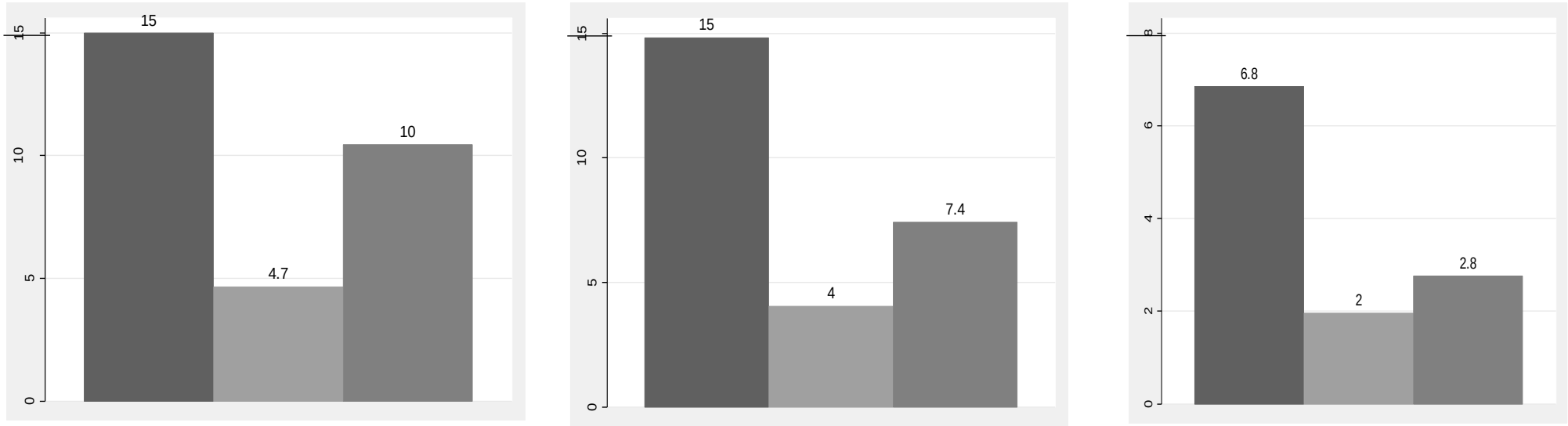


Figure 4a: Percent share of annual increases in export flows accounted by births, starts, restarts, by sector.

Manufacturing **Retail/Wholesale** **Others**

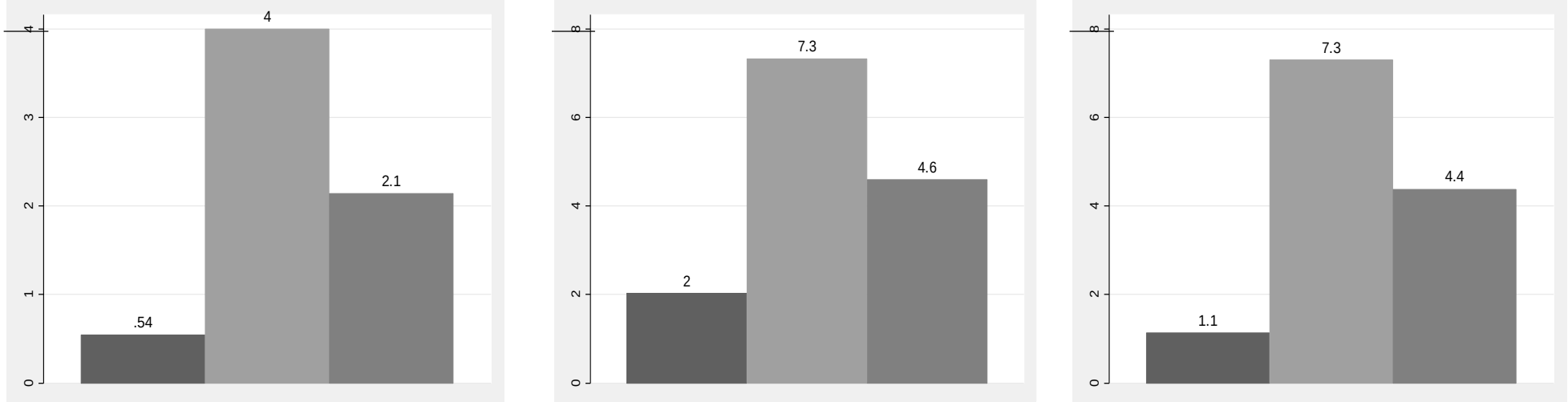
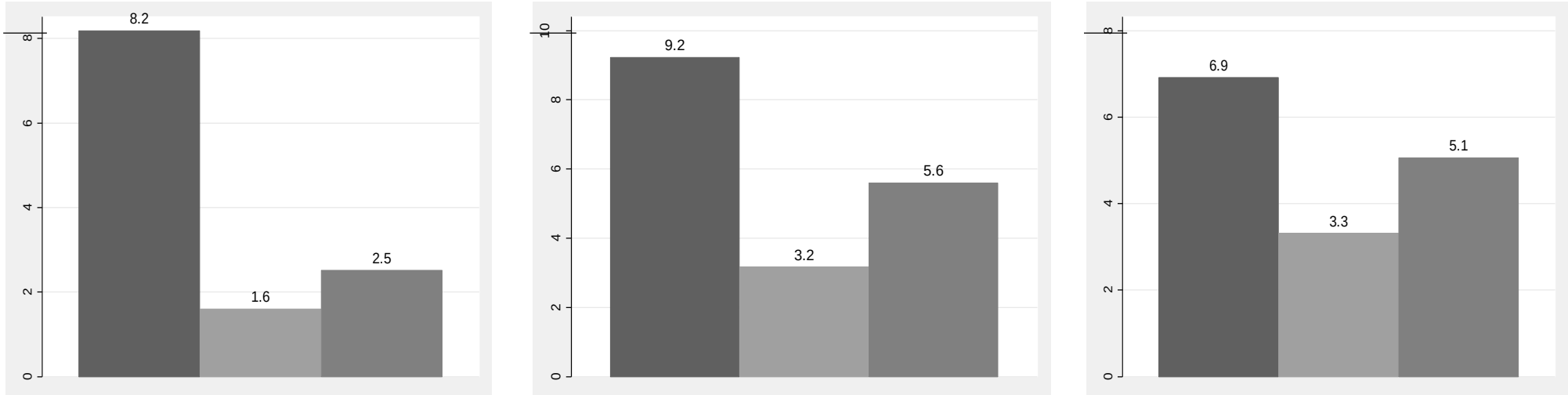


Figure 4b: Percent share of annual decreases in export flows accounted by deaths, stops, pauses, by sector.

Manufacturing **Retail/Wholesale** **Others**



Appendix

Table A1: Characteristics of single year exporters, 1993-2008.

Employment Size	
100 to 249	-0.0384***
	(0.001)
250+	-0.0512***
	(0.001)
Age	
5 to 9	-0.103***
	(0.001)
10+	-0.103***
	(0.001)
Canada or Mexico	0.0408***
	(0.000)
Related Party Trade	-0.0173***
	(0.001)
Retail/Wholesale	0.00641***
	(0.000)
Other	0.0875***
	(0.001)
_cons	0.0680***
	(0.007)
N	2,805,915
Adj. R^2	0.12

Notes: Dependent variable takes on the value 1 if firm is single year exporter and 0 otherwise; includes two digit HS product and year fixed effects; firms born prior to 1992 with trades in 1992 and those born prior to 2009 who last year of trade is in 2009 are excluded since we cannot determine the first and last years of trade for these firms; standard errors in parentheses; * p<0.10, ** p<0.05, *** p<0.01.