Agglomeration and Temporary Export

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Abstract

I study a firm’s choice of export regime and explain the positive correlation between agglomeration and export entry into as well as exit from export market. Resting on the wisdom of Bekes and Murakozy (2012), I set up a two-period model with two export regimes: temporary trade and ordinary trade. Because agglomeration of firms introduces frequent random arrival of foreign demand, exporting through temporary trade regime becomes appealing in the agglomerated area. However, exporting through temporary trade regime also leads to frequent exit from export market, as opposed to ordinary trade. I also find supportive evidence using Chinese custom data that are consistent with three implications derived from the model.

Keywords: Agglomeration, Temporary Export, Ordinary Export

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Introduction

Export activity associates with substantial non-recoverable upfront costs, which implies that only a few firms with sufficiently high productivity or demand can profit from exporting. The essential part of the entry costs is often believed to be knowledge-intensive expenditures required to penetrate foreign markets, such as the establishment of distribution networks and the development of new products adapted to taste in foreign market (Roberts and Tybout, 1997). Agglomeration serves as an important mechanism to reduce such cost because of spillover effect in either demand or productivity. For example, a firm can overcome entry barrier by learning from others, either on productivity or on demand uncertainty of foreign markets. While some literature emphasizes the role of agglomeration on productivity spillover that encourages exporting (Greenaway and Kneller, 2008), the recent literature finds information spillover on demand side is equally important (Fernandes and Tang, 2014).

While existing literature well explains the mechanism through which agglomeration encourages export entry, it does not rationalize its effect on exit. If the positive feedback exists between agglomeration and productivity/demand spillover, firms are less likely to exit the export market once starting to export.\footnote{It does not well explain the significant negative relationship between export survival and number of exporters in the same area as in Table 8 of Fernandes and Tang (2014): “Learning to Export from Neighbors”, Journal of International Economics, 94(1), pp. 87-94.}

In the paper, agglomeration, measured by the number of firms in the same industry in the same area, does not account for export entry, but also positively correlates with firms’ exit from export market. The following table illustrates the relationship between proportion of short-period exporters and agglomeration, based on the Chinese firm and custom data. The table shows high proportion of short-period exporters exist in the agglomerated areas, as opposed to the non-agglomerated areas. It indicates the positive correlation between agglomeration and firms’ turnover in export market.

<table>
<thead>
<tr>
<th>agglomeration</th>
<th>proportion of temporary exporters</th>
<th>1-year exporters</th>
<th>1 or 2-year exporters</th>
</tr>
</thead>
<tbody>
<tr>
<td>low</td>
<td>25.6%</td>
<td>44.9%</td>
<td></td>
</tr>
<tr>
<td>high</td>
<td>30.2%</td>
<td>49.7%</td>
<td></td>
</tr>
</tbody>
</table>
Agglomeration of firms at certain area introduces the foreign buyers to search in local market for potential seller. Because of many alternatives in the local area, such buyer-seller relationship is vulnerable\footnote{Similar evidences are found in labor market where thick market positively correlates with high turnover}. Therefore, agglomeration of exporters does not lead to frequent entry into export market, but also result in frequent exit. In contrast with previous literature that emphasizes on the spillover either on information or productivity, the paper highlights a new mechanism of export regime choice along with agglomeration.

The goal of the paper is to study the positive correlation between agglomeration and firms’ entry into as well as exit from the export market. In order to do so, I build up a simple two-period model to explain the relationship between agglomeration and firm’s export regime choice. In particular, each firm chooses one out of the three export regimes: (1) non-export; (2) temporary export; and (3) ordinary export. I also derive three testable implications based on the model and find supportive evidence. The paper provides a new perspective to understand the relationship between export and agglomeration.

**Literature Review**

There are two strands of literature relevant to this paper.

The first strand of literature studies the agglomeration and export decision. Greenaway and Kneller(2008) examine the agglomeration effect on export. They find the productivity spillover is the main mechanism through which the agglomeration encourage export entry. Rather than emphasizing on the productivity gains from agglomeration, Fernandes and Tang(2014) find evidence to support that firms in the agglomerated areas are likely to enter into export market through learning about demand from others. However, the positive impact of agglomeration on productivity or demand only explains the entry but does not rationalize the frequent exit.

The second strand of literature investigates firms’ decision to export. The sunk cost of firm to enter into export market seems substantial (Das et al., 2007). Given the huge amount of small exporters in China, huge variation of entry cost is necessary to accommodate many small and large exporters enter at the same time. Recent literature ra-
tionalizes the prevalence of short period exporters through incorporate search (Besedes, 2007; EEJKT, 2014) and learning (Li, 2014). However, such literature only considers a single firm’s choice independent of environment and treats a firm’s exit decision as the result of receiving negative shock. Bekers and Murakozy (2013), instead, propose the short-period export as a firm’s endogenous choice of different export regimes. A firm may choose temporary export regime by paying lower entry cost but higher variable cost in export market as opposed to the ordinary trade regime. They find the temporary trade are more prevalent when a firm exports to a distant and small size country, using Hungarian data.

To my best knowledge, no literature explains agglomeration and both entry into as well as exit from export market. Chinese custom data provides an ideal sample to address the topic because (1) there are huge heterogeneity across domestic market in agglomeration and (2) many firms exhibit entry and exit in export market. In this paper, I marry the literature on export decision with agglomeration and highlight the temporary export as the endogenous choice as a result of agglomeration.

**Model**

The goal of the model is to lay out the mechanism in which the agglomeration induces firms’ frequent entry into and exit from export market. In order to make it simple, I set up a two-period model.

Each firm chooses one out of three alternatives: (1) non-export; (2) temporary export; and (3) ordinary export. In the two-period model, ordinary export refers to the export regime through which a firm actively accesses the foreign market with a large upfront cost to set up its own distribution network and customize its products. Most of the large upfront cost includes information cost to search the potential customer. In contrast, temporary export refers to the export regime through which a firm waits for random arrival of foreign demand with much less cost incurred. Since it is a two-period model, the distinction between fixed and entry cost becomes trivial. For simplicity, a firm is assumed to pay one-shot cost upon exporting.

\[3\] It is analogous to the two-part tariff pricing with different fixed and variable rate
Because China is well-known as the “world factory”, many foreign downstream firms come to local market to search for potential producers and outsource the production to them. The firm that conducts temporary trade does not incur cost as much as ordinary trade which actively reaches out foreign buyers. As the market becomes thick with more buyers and sellers, the relationship with foreign buyers through temporary trade is unstable and vulnerable to break up.

There are two periods in total, the timing is as follows:

(1) At the beginning of each period, foreign demand arrives randomly at rate $\lambda(n_j)$, which depends on the agglomeration in area $j$ that is measured as the number of firms in area $j$: $n_j$. A firm receiving the stochastic demand generates profit $\pi$, where $\pi \sim G(.)$. In particular, $G(.)$ is a Pareto distribution with shape and location parameter: $k$ and $\pi_0$.

(2) After observing the potential demand, the firm knows its product popularity and decides to choose among the three export regimes. If the firm chooses ordinary export, it pays upfront cost $c^{oe}$, which includes the cost such as setting up distribution networks and customizing their product. Under the ordinary export regime, the firm obtains the same profit in period 2. The setup highlights the stable relationship through ordinary trade. Alternatively, if the firm chooses temporary export, the firm incurs fixed cost $c^{te}$ and the export continues with probability $\delta$ at period 2. However, the firm may receive other foreign demand in period 2. $c^{te} < c^{oe}$. In addition, the firm can also choose to stay outside and get payoff 0. Once firm chooses to stay outside at period 1, the firm also receives 0 profit from foreign market in period 2.

In order to make the analysis simple, there are several things to be noted: First, there is no discount in the period 2. Second, each firm only has one partner in each period at each destination. Third, there is no firm level heterogeneity. Therefore, I omit the subscript $i$ from here on.

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4In trade literature, the productivity is usually assumed to follow the Pareto distribution. Under CES, the profit is isomorphic to productivity. Here I directly assume the distribution of revenue as the Pareto distribution.
According to the timing, a firm’s payoff through ordinary export is $W^{oe}$:

$$W^{oe} = \hat{\pi} - c^{oe} + \hat{\pi} = 2\hat{\pi} - c^{oe}$$

$\hat{\pi}$ denotes the realized profit at the beginning of period 1. Without discount factor, the firm achieves the same profit at period 2 through ordinary trade. $c^{oe}$ is the cost initiated at the period 1.

Alternatively, if the firm chooses temporary trade, the payoff is $\hat{\pi}_i$ at period 1. At the period 2, the firm has probability $\lambda(n_j)$ to come across with another random demand in the period 2. The probability of not receiving any order at period 2 is $(1 - \lambda(n_j))$. In addition, the export relationship continues with probability $\delta$, which is assumed to be constant. The payoff for temporary export $W^{te}$ becomes:

$$W^{te} = \hat{\pi} + \lambda(n_j)\delta[F(\hat{\pi})\hat{\pi} + (1 - F(\hat{\pi}))\mathbb{E}(\pi|\pi > \hat{\pi})] + (1 - \lambda(n_j))\delta\hat{\pi} + (1 - \delta)\lambda(n_j)\mathbb{E}(\hat{\pi}) - c^{te}$$

The first argument $\hat{\pi}$ denotes the realized profit in period 1 and the second argument $\lambda(n_j)\delta[F(\hat{\pi})\hat{\pi} + (1 - F(\hat{\pi}))\mathbb{E}(\pi|\pi > \hat{\pi})]$ represents the payoff when the export relationship at period 1 continues and the foreign demand hits the firm at period 2. If the foreign demand at period 2 is less profitable than it achieved in period 1, the firm still maintains the relationship at period 1: $F(\hat{\pi})\hat{\pi}$. However, if the foreign demand at period 2 is more profitable, the firm switches to the newly arrived foreign demand: $(1 - F(\hat{\pi}))\mathbb{E}(\pi|\pi > \hat{\pi})$.

The third argument denotes the case when there is no order arriving in period 2, the expected payoff is $(1 - \lambda(n_j))\delta\hat{\pi}$. The last argument denotes the case when the previous relationship discontinues but there are new orders arrived, the expected payoff is $(1 - \delta)\lambda(n_j)\mathbb{E}(\hat{\pi})$. The payoff becomes 0 if the relationship at period 1 terminates and the firm also does not receive any demand at period 2.

Assumption:

$$\frac{\partial \lambda(n_j)}{\partial n_j} > 0$$

$^5$Actually, $\lambda$ and $\delta$ are endogenously determined, I assume it as exogenous for simplicity
The assumption implies that firms’ agglomeration boosts arrivals of foreign demand. Let us consider two areas \( s, h \) \( n_s > n_h \). More foreign buyers are likely to go to area \( s \) because agglomeration of firms in the same industry provides more alternatives for buyers, who are more likely to switch export partner within area \( s \) rather than across the area (Monarch, 2014).

In general, agglomeration has two opposite effects on export relationship. On the one hand, agglomeration tends to terminate the export relationship, because agglomeration provides better alternatives. On the other hand, agglomeration tends to extend the export relationship because of better matching exists between buyer and sellers. Here I highlight the dominant role of former effect on frequent entry and exit induced by agglomeration.

**Proposition 1**: Under mild condition for \( c^{te} \) and \( c^{oe} \), there are two cutoffs for profit in any area \( j \) such that \( \hat{\pi}_j^{te} < \hat{\pi}_j^{oe} \). If the realized profit \( \hat{\pi} \in [\hat{\pi}_j^{oe}, +\infty) \), the firm chooses to export through ordinary trade; For \( \hat{\pi} \in [\hat{\pi}_j^{te}, \hat{\pi}_j^{oe}) \), the firm chooses temporary export. For \( \hat{\pi} \in (-\infty, \hat{\pi}_j^{te}] \), the firm does not export.

Proof: Since \( \pi \sim Pareto(k) \) with location \( \pi_0 \), \( F(\pi) = 1 - (\frac{\pi_0}{\pi})^k \), \( E(\pi) = \frac{k}{k-1} \pi_0 \). The conditional probability \( E(\pi|\pi > \hat{\pi}) = \frac{k}{k-1} \hat{\pi} \).

A firm chooses to ordinary export iff \( W^{oe} \geq \{W^{te}, 0\} \). Under mild condition, \( W^{te} > 0 \). It is equivalent to consider \( W^{oe} > W^{te} \). Suppose \( \hat{\pi}^{oe} \) is the solution to \( W^{oe} - W^{te} = 0 \).

\[
W^{oe} - W^{te} = [(1 - \delta) - \frac{\lambda \delta}{k-1} (1 - F(\hat{\pi}^{oe}))] \hat{\pi}^{oe} - \frac{\lambda (1 - \delta) k}{k-1} \pi_0 - (c^{oe} - c^{te}) = 0
\]  

(1)

For any \( \hat{\pi} > \hat{\pi}^{oe} \), \((1 - F(\hat{\pi}^{oe})) > (1 - F(\hat{\pi})) \), since \( \frac{\lambda \delta}{k-1} > 0 \),

\[
W^{oe}(\hat{\pi}) - W^{te}(\hat{\pi}) > 0
\]

There is a cutoff \( \hat{\pi}^{oe} \) above which the firm chooses ordinary export.

Let us turn to temporary export. We assume \( \hat{\pi}^{te} \) is the solution of \( W^{te} = 0 \). A firm
conducts temporary export iff $W^{te} > 0$, which implies:

$$(1 + \delta) \hat{\pi}^{te} + \frac{\lambda(n_j)\delta}{k-1} \hat{\pi}^{te} (1 - F(\hat{\pi}^{te})) + (1 - \delta) \lambda(n_j) \frac{k}{k-1} \pi_0 - c^{te} > 0 \quad (2)$$

From (2), we know the following

$$\frac{\partial W^{te}}{\partial \hat{\pi}^{te}} = 1 + \delta - \lambda(n_j)\delta(\frac{\pi_0}{\hat{\pi}^{te}})^k \quad (3)$$

Because $\pi_0$ is the location parameter such that $\hat{\pi}^{te} > \pi_0$, we get $(\frac{\pi_0}{\hat{\pi}^{te}})^k \in (0, 1)$ due to $k \geq 1$. Again $\delta \in (0, 1)$ and $\lambda(n_j) \in (0, 1), \lambda(n_j)\delta(\frac{\pi_0}{\hat{\pi}^{te}})^k \in (0, 1)$. $1 + \delta - \lambda(n_j)\delta(\frac{\pi_0}{\hat{\pi}^{te}})^k > 0$. 

$$\frac{\partial W^{te}}{\partial \hat{\pi}^{te}} > 0$$

Because $\hat{\pi}^{te}$ is the solution to $W^{te} = 0$, for any $\hat{\pi} > \hat{\pi}^{te}, W^{te} > 0$; alternatively $\hat{\pi} < \hat{\pi}^{te}, W^{te} < 0$.

Under some mild condition of $c^{te}$ and $c^{oe}, \hat{\pi}^{te} < \hat{\pi}^{oe}$. Q.E.D

Proposition 1 shows the relationship between initial profit and export regime choice in a given area $j$. A firm receiving high initial profit that signals the high popularity of the goods chooses to export through ordinary trade regime, which lasts for two periods. Alternatively, a firm with relatively low profit chooses export through temporary trade regime, which lasts $1 + \delta + \lambda(n_j)(1 - \delta) < 2$ periods. Finally, a firm that receives low initial profit does not export. While proposition 1 illustrates the relationship between initial profit and export regime choice in a given area, proposition 2 illustrates the extent to which the cutoffs vary with the agglomeration.

**Proposition 2**: Consider two areas $\{s, h\}$ in which $n_s > n_h$. The 2 cutoffs satisfies: $\pi^{oe}_s > \pi^{oe}_h$ and $\pi^{te}_s < \pi^{te}_h$.

**Proof**: Since $\frac{\partial \lambda(n)}{\partial n} > 0$, $n_s > n_h$ implies $\lambda(n_s) > \lambda(n_h)$. Both $\hat{\pi}^{oe}_s$ and $\hat{\pi}^{oe}_h$ are the cutoffs between ordinary export and temporary export in the two areas. It is equivalent to show $\hat{\pi}^{oe}_s > \hat{\pi}^{oe}_h$, where $\hat{\pi}^{oe}_j$ is the solution to $W^{oe}_j - W^{te}_j = 0, j \in \{s, h\}$.

Suppose $\hat{\pi}^{oe}_s < \hat{\pi}^{oe}_h$, $(1 - F(\hat{\pi}^{oe}_s)) > (1 - F(\hat{\pi}^{oe}_h))$. From (1), $W^{oe}_s - W^{te}_s < W^{oe}_h - W^{te}_h$.
$W_{ht}^{te}$. It contradicts the assumption that $\hat{\pi}_{oe}^s$ is also the solution to $W_{st}^{oe} - W_{st}^{le} = 0$. Hence $\hat{\pi}_{oe}^s > \hat{\pi}_{oe}^h$.

Let us see the relationship between $\hat{\pi}_{st}^{te}$ and $\hat{\pi}_{ht}^{te}$. Considering (2), since $\lambda(n_s) > \lambda(n_h)$,

$$(1 - \delta)\frac{\lambda(n_s)}{k-1}\pi_0 > (1 - \delta)\frac{\lambda(n_h)}{k-1}\pi_0$$

from (3), we know $(1 + \delta)\hat{\pi} + \frac{\lambda(n_j)\delta}{k-1}\hat{\pi}(1 - F(\hat{\pi}))$ is increasing in $\hat{\pi}$.

Suppose $\hat{\pi}_{st}^{te} > \hat{\pi}_{ht}^{te}$ and $W_{ht}^{te}(\hat{\pi}_{ht}^{te}) = 0$, then $W_{st}^{te}(\hat{\pi}_{st}^{te}) > 0$, which contradicts $W_{ht}^{te}(\hat{\pi}_{ht}^{te}) = 0$. Hence $\hat{\pi}_{st}^{te} < \hat{\pi}_{ht}^{te}$. Q.E.D

Because $n_j$ measures the agglomeration, the proposition shows the cutoffs between ordinary export and temporary export increases with agglomeration while the cutoffs between temporary export and non-export decreases with agglomeration.

**Intuition:** The intuition is: a firm in the agglomerated areas has relatively high probability to hit arrival of foreign demand and its payoff to conduct temporary export becomes appealing, which imposes 2 effects. On the one hand, the fringe firms that would have exported through ordinary trade are likely to conduct temporary trade. On the other hand, the fringe firms that would not have exported are likely to export through temporary export regime. The graph below illustrates the essence of proposition 2.

![Figure 1: Proposition 2](image_url)

$\hat{\pi}^{te}$ and $\hat{\pi}^{oe}$ go the opposite way with agglomeration $n_j$. Not only does the number of exporters increase with agglomeration, but also the proportion of firms conducting
temporary trade increases with agglomeration. The simple model explains the positively correlation between export duration (summarize both entry and exit) and agglomeration. Noteworthy, the mechanism highlighted here is different from the previous literature that treats the exit as the result of receiving negative shock. Instead, I model the short term export as the firm’s choice. Based on the 2 propositions, 3 testable implications are derived.

**Implication 1:** The export duration is positively correlated with the initial profit of fringe firms.

The implication is derived from the proposition 1. While the high initial profit encourages firm to export through ordinary trade, the relatively low initial profit induces firm to export through temporary trade, which implies the shorter export duration compared with the ordinary trade.

**Implication 2:** The lower bound of cutoff profit of fringe firms conducting temporary trade decrease with agglomeration. However, the upper bound of cutoff profit of fringe firms conducting ordinary export increases with agglomeration.

The implication is directly derived from the proposition 2.

**Implication 3:** Agglomeration has large positive effect to extend duration for firms with low initial sales, compared with firms that have high initial sales.

The implication comes from both propositions. For firms with low initial profit (temporary exporter), the export duration $1 + \delta + \lambda(n_j)(1 - \delta)$ increases with $n_j$. As for the firms with high initial profit, two countervailing effects exist. One the one hand, agglomeration increases the duration of firms conducting temporary export. On the other hand, the export duration for ordinary exporter shrinks from 2 to $1 + \delta + \lambda(n_j)(1 - \delta) < 2$ for fringe exporters between ordinary trade and temporary trade, which makes the agglomeration effect on export duration not as significant as for firms with low sales.

In the next section, I will examine the above 3 testable implications.
Empirical Evidence

Data

The first dataset is the Annual Survey of Chinese Manufacturing Firm Data. It spans from 1999 to 2007 and covers all the State-owned firms and private firms with total sales above 5 million RMB (roughly equal to $600,000). The firms’ time-variant financial information such as the sales, total variable cost, capital stock, total wage, etc. are included. Besides, the time-invariant information such as the location, ownership structure, etc. are also documented. It allows me to identify the firm’s location and calculate the number of peer exporters in the same location.

The second dataset is the Chinese Custom Data collected at the monthly level. It documents every import and export transaction for all firms in China from 2000 to 2006. This dataset includes product categories, unit price, destination of export and import quantities, type of transaction and firm information such as telephone and address. It allows me to identify the firms’ annual export sales by destination. Since the export profit is hard to get, I use initial sales as the proxy for export profit.

Because the coding IDs are different from each other in the two datasets, they are matched through the firm name, address, telephone etc. The final matched number is around 95,710 firms. Each observation is defined as a firm-destination pair. To be more specific, each firm $i$ in industry $r$ located at region $c$ exports to destination $j$ at time $t$ is an observation. There are 1,054,059 observations in total. The following tests are based on all the observations.

The unobservable export regime may dampen the empirical validity of the highlighted mechanism. For example, it is hard to tell the two cases for a two-year exporter: (1) it discontinues the export relationship at period 1 at destination $j$ and start with a new demand at period 2 at destination $j'$. (2) it continues the export relationship at period 1 at the same destination. Unless the export regime to the same destination $j$ discontinues at a certain period can we tell the termination of export relationship, for example, $\{E_{it} = 1, E_{it+1} = 0, E_{it+2} = 1\}$. Roughly 1 % of total firms that are observed to

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6The destination in the custom data is recorded at country level, upon which I can aggregate export volume by destination country

7$E_{it}$ denotes export status of firm $i$ at year $t$. 1 denotes export, 0 otherwise
have multiple entries regardless of export destination. In order to alleviate the problem, I look at export regime by each destination $j$: $E_{ijt}$. There is no intermittent exporters observed to have multiple entries on a particular destination in the sense that a firm does not re-enter into destination $j$ once it exit. However, observations on each destination alleviate the problem rather than fully circumvent the problem. The following statics are all based on firm-destination pair.\footnote{Two issues matter for the observations: There are only 7 years in total, in which not long enough panel to observe the re-entry pattern. The second issue is about the observational time unit, which is define as a year to avoid seasonal demand.}

The following table shows the number of observations and their export duration. The red number denotes the number of observation suffer the truncation issue. The blue number denotes the proportion of firms that only have 1-year export by each year. For example, 29.4% of all firms entering in 2001 export only 1 year. This number increases and reach up to 45.8% in year 2005. Because the choice of trade regime is unobservable, the export duration is used as the proxy, in the spirit of Bekers and Murakozy (2013), for export regime. In particular, firms exporting for 1 or 2 years are more likely to be those that are conducting temporary export.

\begin{table}[h]
\centering
\begin{tabular}{|c|c|c|c|c|c|c|}
\hline
\hline
1 & 11032 & 8614 & 10709 & 17314 & 50973 & 49509 \\
2 & 4602 & 4714 & 6930 & 9012 & 37613 & 58644 \\
3 & 3383 & 3966 & 4503 & 8211 & 60041 & \\
4 & 3014 & 2839 & 4713 & 15400 & & \\
5 & 2130 & 2892 & 9091 & & & \\
6 & 2303 & 6188 & & & & \\
7 & 5148 & & & & & \\
\hline
\end{tabular}
\end{table}

Truncation issues are noteworthy: (1) firms that export at Year 2000 suffer the left truncation issue due to unknown year of their export entry. (2) firms that export up to Year 2006 suffer the right truncation issue due to unknown exit. Only firms entering after 2000 and exit before 2006 can be identified as the complete observations. In general, around 38% total observations suffers the truncation issue.
Even though the observational issues exist, the data on Chinese firms are still an ideal sample to test those implications. First, there are rich variations in number of firms across different areas. Second, the export destinations and sales are well-documented up to firm level. The destination information help alleviate the observation issue because the observed export duration to a certain destination is more likely to represent the duration of a certain export relationship. However, there are some flip sides that we need to address. First, only the Chinese exporter information is available in the exporter-importer relationship. Second, the temporary export regime is hard to observe, which can only be inferred from the export duration. Third, the initial profit is approximated by export sales. The firm level characteristics are also included in the test in order to control the cost.

Followed by the previous table, table 2 documents the relationship between the proportion of temporary exporters by year and agglomeration. The agglomerated areas is defined as the areas that have much more number of firms than other areas, as shown in column (5) and (6).

<table>
<thead>
<tr>
<th>Table 2: The proportion of temporary exporter and agglomeration</th>
</tr>
</thead>
<tbody>
<tr>
<td>proportion of temporary exporter (&lt;=1 year)</td>
</tr>
<tr>
<td>(1)</td>
</tr>
<tr>
<td>agglomeration</td>
</tr>
<tr>
<td>low</td>
</tr>
<tr>
<td>2001</td>
</tr>
<tr>
<td>2002</td>
</tr>
<tr>
<td>2003</td>
</tr>
<tr>
<td>2004</td>
</tr>
<tr>
<td>2005</td>
</tr>
</tbody>
</table>

Compared with the column (1) and (2), the proportion of temporary exporters are consistently higher in high-agglomerated areas. This pattern is invariant to the definition of temporary exporters. Actually, the agglomerated areas are exclusively the big cities. The average number of firms in agglomerated areas are almost 6 times the number of firms in non-agglomerated areas. Besides, 2 sources of variations in Table 2 are highlighted. The overtime variation comes from the comparison of each column in (1), (3) and (5)(Alternatively, column(2), (4) and (6)). The cross-section source of variation comes
from the comparison of each row between column (1) and (2) (Alternatively, column (3) and (4)).

**Testable Implications**

In the section, three testable implications discussed above are examined using the sample that is constructed based on all entrants $i$ in year $t$ at city $c$ in industry $r$ that export to destination $j$. Because the initial export profit is unobservable, the initial export sales $S_{ircjt}$ is used as the proxy for profit. The agglomeration is defined as the log number of firms in the same industry $r$ located at city $c$ at year $t$: $\ln N_{rcit}$. The export duration for each entrant is also calculated.

**Implication 1**: The export duration is positively correlated with the initial profit (foreign sales) of fringe firms.

The regression specification is:

$$l_{ircjt} = \alpha \ln S_{ircjt} + X_{it}' \beta + D_{rcjt} + \epsilon_{ircjt}$$

$l_{ircjt}$ denotes the export duration and $\ln S_{ircjt}$ denotes the log of initial sales. $X_{it}'$ denotes the firm $i$’s characteristics, including capital size, labor and productivity, which are intended to control the cost. $D_{rcjt}$ contains the set of dummies: $D_{rcjt} = D_r + D_c + D_j + D_t$, where $D_r, D_c, D_j$ and $D_t$ control the industry, city, destination and year fixed effects, separately. I control the truncation observations using the dummy variable. The following regressions are based on samples of the entry year.

The implication 1 indicates $\alpha > 0$. The following table shows:

Unsurprisingly, $\alpha > 0$ lends support to the implication 1. High initial sales are likely to result in long export duration. The estimates do not change by various controls.

**Implication 2**: The lower bound of cutoff profit of fringe firms conducting temporary trade decrease with agglomeration. However, the upper bound of cutoff profit of fringe firms conducting ordinary export increases with agglomeration.

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9The city is defined as the geographic area $c$ because the county level is geographically too small to have enough non-zero observations.
Table 3: Export Length and Initial Sales

<table>
<thead>
<tr>
<th></th>
<th>(1)</th>
<th>(2)</th>
<th>(3)</th>
</tr>
</thead>
<tbody>
<tr>
<td>$\alpha$</td>
<td>0.08*</td>
<td>0.07**</td>
<td>0.02**</td>
</tr>
<tr>
<td></td>
<td>(0.0007)</td>
<td>(0.0007)</td>
<td>(0.0004)</td>
</tr>
<tr>
<td>Truncation</td>
<td>no</td>
<td>yes</td>
<td>yes</td>
</tr>
<tr>
<td>$X_i$</td>
<td>no</td>
<td>yes</td>
<td>yes</td>
</tr>
<tr>
<td>$D_{rcjt}$</td>
<td>no</td>
<td>no</td>
<td>yes</td>
</tr>
<tr>
<td># of obs.</td>
<td>533031</td>
<td>533031</td>
<td>533031</td>
</tr>
<tr>
<td>$R^2$</td>
<td>0.06</td>
<td>0.08</td>
<td>0.08</td>
</tr>
</tbody>
</table>

Notes: t values are in parenthesis. * and ** denotes 5% and 1% significance level.

The regression specification is:

$$\ln S_{ircjt} = \alpha_1 \ln N_{rc} + X_i'\beta + D_{rcjt} + \epsilon_{ircjt}$$

$\ln N_{rc}$ measures the agglomeration. According to implication 2, we expect $\alpha_1 > 0$ for ordinary export firms and $\alpha_1 < 0$ for firms in temporary export. However, the export regime of firm is unobservable. Instead, I use the export duration as the ad hoc measure. The long duration are more likely to be the choices of ordinary export. In particular, we treat the ordinary exporter as the firms exporting more than two years or three years. The ordinary exporter complements the definition of temporary exporters, which are defined as the firm only export to one year or two years.

Table 4: Agglomeration and Initial sales: Ordinary Exporters

<table>
<thead>
<tr>
<th></th>
<th>ordinary exporters</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>$&gt;= 2$ year</td>
</tr>
<tr>
<td>$\alpha_1$</td>
<td>0.015*</td>
</tr>
<tr>
<td></td>
<td>(2.52)</td>
</tr>
<tr>
<td>$X_i$</td>
<td>yes</td>
</tr>
<tr>
<td>$D_{rcjt}$</td>
<td>yes</td>
</tr>
<tr>
<td># of obs.</td>
<td>234757</td>
</tr>
<tr>
<td>$R^2$</td>
<td>0.14</td>
</tr>
</tbody>
</table>

Notes: t values are in parenthesis. * and ** denotes 5% and 1% significance level.

The estimates are consistent with the prediction: $\alpha_1 > 0$. The average initial sales of fringe exporter conducting ordinary trade increases with the agglomeration. In contrary to the ordinary exporters, the following table exhibits the estimates on temporary
exporters. Unlike the proportion of ordinary exporter that decreases with agglomeration, the proportion of temporary exporter increases with agglomeration. The increased proportion of temporary exporter comprises of two parts: (1) the firms that would have exported through ordinary trade become temporary exporters. (2) the firms that would have not exported become temporary exporters. As the implication for ordinary exporter is already examined, the following table displays the relationship between the agglomeration and initial sales for temporary exporter, in particular for those with low initial sales.

<table>
<thead>
<tr>
<th>Table 5: Agglomeration and Initial Sales: Temporary Exporters</th>
</tr>
</thead>
<tbody>
<tr>
<td>(1) bottom 25% fringe temporary exporter</td>
</tr>
<tr>
<td>$S_{rcjt}$</td>
</tr>
<tr>
<td>&lt;= 1 year</td>
</tr>
<tr>
<td>ln $N_{rcjt}$</td>
</tr>
<tr>
<td>(-30.59)</td>
</tr>
<tr>
<td>$X_i$</td>
</tr>
<tr>
<td>$D_{rcjt}$</td>
</tr>
<tr>
<td># of obs.</td>
</tr>
<tr>
<td>$R^2$</td>
</tr>
</tbody>
</table>

Notes: t values are in parenthesis. * and ** denotes 5% and 1% significance level.

The first 2 columns are based on sample of the bottom 25% of temporary exporter, in terms of initial sales, while the column (3) and (4) are based on the sample of bottom 50% of temporary exporters. The last 2 columns are based on sample of all temporary exporters. The estimates tell us agglomeration indeed decrease the initial sales of bottom fringe temporary exporters. Besides, the overall effect of agglomeration on average of initial sales is slightly negative or insignificant because of the two countervailing forces: increases in $\hat{π}_{oe}$ and decreases in $\hat{π}_{te}$.

The estimates above provide another source of evidence to the prediction: $α_1 < 0$ for fringe temporary exporter and $α_1 > 0$ for ordinary exporter. The sign of coefficients is robust under different specifications.

**Implication 3:** Agglomeration has larger positive effect to extend duration for firms with low initial sales compared with firms that have high initial sales.
The regression on the specification is:

\[ l_{irct} = \theta_1 \ln N_{cr} + \theta_2 \ln S_{irct} + \theta_3 \ln S_{irct} \ast \ln N_{cr} + X_i' \beta + D_{rct} + \epsilon_{irct} \]

Where \( X_i \), \( \ln N_{cr} \) and \( \ln S_{irct} \) share the same definition as before. The same set of dummies are also controlled: \( D_{rct} \). \( \theta_1 \), \( \theta_2 \) and \( \theta_3 \) are of interests. Since the partial effect of agglomeration on the export duration is:

\[ \frac{\partial l_{irct}}{\partial N_{cr}} = \theta_1 + \theta_3 S_{irct} \]

according to the implication, it is expected that \( \theta_1 > 0 \) and \( \theta_3 < 0 \). Of course \( \theta_2 > 0 \). The estimates are in the following table:

| Table 6: Export Duration, Initial Sales and Agglomeration |
|---------------------------------|-----------------|-----------------|-----------------|-----------------|
| \( l_{irct} \)                  | (1)             | (2)             | (3)             | (4)             |
| \( \theta_1 \)                  | 0.049**         | 0.050**         | 0.033**         | 0.039**         |
|                                 | (16.94)         | (16.38)         | (5.39)          | (4.81)          |
| \( \theta_2 \)                  | 0.033**         | 0.035**         | 0.051**         | 0.061**         |
|                                 | (30.24)         | (31.44)         | (22.24)         | (21.30)         |
| \( \theta_3 \)                  | -0.003**        | -0.004**        | -0.002**        | -0.003**        |
|                                 | (-15.53)        | (-16.20)        | (-4.82)         | (-3.95)         |
| \( X_i \)                       | No              | Yes             | Yes             | Yes             |
| others                          |                 |                 |                 |                 |
| truncation                      |                 |                 |                 |                 |
| \( D_{rct} \)                   |                 |                 |                 |                 |
| truncation                      |                 |                 |                 |                 |
| \# of obs.                      | 533031          | 533031          | 222512          | 173003          |
| \( R^2 \)                       | 0.74            | 0.77            | 0.29            | 0.20            |

Notes: t values are in parenthesis. * and ** denotes 5% and 1% significance level.

The first 2 columns are based on all observations. Column (1) shows the estimates of minimum set of control variables, where the dummies \( D_{rct} \) and \( X_i \) are not controlled. The results are similar with the column (2) with all variables controlled. Since many firms export up to year 2006 suffers the truncation issue as discussed before, the column (3) only adopts the observation that do not suffer the truncation issue. Because the truncation issue, the observed export duration only reaches up to 2 years if we look at firm start to export in year 2005. In order to alleviate the contamination by the truncation issue, the column (4) includes the sample between 2001-2004. All estimates exhibits are
consistent with the predictions with similar magnitude.

The mean of export duration $l_{ircjt}$ of all observations is around 1.9, therefore the magnitude is not trivial given the mean value of log initial sales $\ln S_{ircjt}$ is around 12 and mean of agglomerations is around 4. Given $\theta_1 = 0.05$ and $\theta_3 = -0.004$, the partial effect of agglomeration on the export duration.

$$\frac{\partial l_{ircjt}}{\partial N_{rcj}} = \theta_1 + \theta_3 \ln S_{ircjt}$$

When $\ln S_{ircjt}$ is below the mean, which is around 12, the partial effect is positive. However, as $\ln S_{ircjt}$ goes above the mean, the effect becomes negative. On one hand, the number of peers firms have positive effect on firms’ export duration when they receive low initial sales, because those firms benefits from frequent demand arrivals due to agglomeration. It helps extend the observed export duration. On the other hand, it discourages the export duration for firms with high initial sales, because agglomeration makes those firms more likely to choose temporary export.

The above evidence lends support to the 3 model implications.

**Conclusion**

Agglomeration of exporters does not cause frequent entry into export market, but also result in frequent exit. In contrast with previous literature that emphasizes on the spillover either on information or productivity, the paper highlights a new mechanism of export regime choice associated with agglomeration. While previous literature does not explain exit well, the proposed mechanism in the paper jointly explain both entry and exit under a single framework. In order to do so, I build up a simple 2-period model in which a firm choose temporary export or ordinary export regime as a function of agglomeration. I also derive 3 testable implications based on the model and find supportive evidences.

However, there are several caveats. First, the estimates rely on the aggregate of sales up to the first year. The aggregation is subject to partial year effect. Second, the unobservable export regime prevent us directly test the model. Instead, only some implications are found.
Different market structures may induce firms’ entry into export market by choosing different export regimes. The mechanism provides another perspective in understanding the relationship between agglomeration and entry into as well as exit from the export market. Even though China’s export boom lasts for a couple of years, most exporters earn small fraction of value added because of less asset-specific investment. The agglomeration might be one of the reason that leads to less asset-specific investment. This topic leaves to future research.
References


