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# How continuing exporters set the price? Theory and empirical evidence from China

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ABSTRACT

In this paper, we build a dynamic game model of quantity competition to explain the price difference between continuing exporters and exits. Continuing exports are forward looking and set a lower price at current stage to crowd out the competitors to maximize their overall expected profit. Using a large sample of matched panel data of Chinese firms, we find that after controlling the most important determinants of export price and the firm-year-specific effects, continuing exporters charge a price 39.2%–41.6% lower than the price level charged by future exits in China.



## 1. Introduction

Trade models with firm heterogeneity generate rich predictions for not only firm productivity but also export prices. Continuing exporters are expected to charge less than occasional exporters who sometimes exit from international market, since continuing exporters are more productive and have lower markup (Aw, Chung, & Roberts, 2000; Eaton, Eslava, Kugler, & Tybout, 2007; Melitz, 2003). For instance, Aw et al. (2000) show that average productivity is highest for continuing exporters followed by the group of entrants, exits, and non-exporters. In addition to productivity, market share and product quality are also key determinants driving export prices (Atkeson & Burstein, 2008; Bas and Strauss-Kahn, 2015; Fan, Li, & Yeaple, 2015; Manova & Zhang, 2012). For example, Fan et al. (2015) show that trade liberalization induces China's producers to upgrade the quality of the goods and raise their export price. But such effect is evident in industries where the scope for quality differentiation is large, which is consistent with their model. Bas and Strauss-Kahn (2015) also show that input trade liberalization in China raise the export price, but such effect is specific to firms sourcing inputs from developed economies and exporting output to high-income countries. This is consistent with the observation in Manova and Zhang (2012).[1] Such export price effect caused by market share and product quality during trade liberalization can only be effective for continuing exporters since exits from export market will not make use of the trade liberalization.

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[1] In addition, there are other studies to investigate the within-exporter price variation from other perspective. For instance, Johnson (2012) show that export prices are increasing in the difficulty of entering the destination market in the majority of sectors. Ge, Lai, and Zhu (2015) show that foreign-owned firms charge about 28% higher prices than Chinese exporters in export market, which is the multinational price premium.

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The mechanism above to explain the systematic price differentiation between continuing exporters and exits is from static setting and comparative static analysis by assuming that firms care about current profit. However, from dynamic point of view, continuing exports are forward looking and they may intentionally set a lower price in the export market at current stage to crowd out the competitors to maximize the overall expected profit in their total life period. Thus, in this paper, we build a simple dynamic model of quantity competition to show such price pattern, in which, other things being equal, when a firm observes its productivity level and foresees its exit from the export market next period, it will charge a higher price this period to maximize the current profit. On the contrast, once a firm which will continue to stay in a market, it has the incentive to reduce its current price to foreclose some competitors from this market in order to increase its profit in the future periods.

China offers an ideal setting to test our model's predictions. The Chinese Custom office collects the transaction level data of Chinese exporting firms. We can observe the price of each product produced by each firm exported to a particular market in a specific year. The comprehensive information enables us to make a comparison of the price difference between continuing exporters and exit exporters. Using a large sample of matched panel data of Chinese firms from firm-level production data and product-level trade data, we find that after controlling the most important determinants mentioned above of export price as well as the firm-year-specific effects, continuing exporters charge a price 39.3%–41.6% lower than the price level charged by future exits in China.

Besides the huge export price literature we discussed above, our paper is also closely related to the dynamic game literature. For example, Gallant, Han, and Khwaja (2012) document that in the pharmaceutical industry, the generical drug firms tend to enter some currently unprofitable markets to gain competitive advantage in the future drug markets. Amisano and Giorgetti (2013) emphasize the important role of a firm's early market entry behaviors on its profit in the following periods. Rodrigue and Tan (2015) also claim that when an export firm penetrates into a new export market, it tends to charge a lower price in the early periods to attract more consumers, build its reputation and increase its profit in the following periods. These papers underscore the impact of dynamic consideration on the firm-level behaviors. Different from these papers, in our model a firm's price and quantity choice affects not only its own current profit but also the profit of other firms. As such the benefits for continuing firms to reduce their price is to decrease the profit of their competitors and force them to exit the market. This will decrease the market competition in the future periods and hence increase the continuing firms' profit.

The rest of paper will proceed as follows, in Section 2 we introduce the dynamic model of quantity competition. Section 3 describes the data sets and variable constructions. The empirical results are reported in Section 4. The last section concludes.

## 2. The model

### 2.1. Basic set up

Following Atkeson and Burstein (2008), we assume the representative consumer's preference is given by

$$\begin{aligned} &E_0\sum_{t=0}^{\infty}\beta^t u(c_t, 1-l_t), \\ &u(c_t, 1-l_t) = \ln\left[c_t^u(1-l_t)^{1-u}\right] \end{aligned} \tag{1}$$

where $c_t$ denotes the consumption of final good, and $l_t$ denotes the working hours at time $t$. The final good is produced by a competitive firm using a continuum input $y_{jt}$ for $j\in[0,1]$ taking a Constant Elasticity of Substitution (CES) form:

$$c_t = \left[\int_0^1 y_{jt}^{1-\frac{1}{\eta}}\right]^{\frac{\eta}{\eta-1}}. \tag{2}$$

Therefore, the price index $P_{it}$ for the final consumption is given by $P_t = [\int_0^1 P_{jt}^{1-\eta}]^{\frac{1}{1-\eta}}$ and the inverse demand function of products in sector $j$ is given by $\frac{P_{jt}}{P_t} = (\frac{y_{jt}}{c_t})^{-\frac{1}{\eta}}$. $P_{jt}$ is the price of $y_{jt}$. In each input sector, there are only $K$ firms, as such the output in each input sector is given by: $y_{jt} = [\sum_{i=1}^{K}(q_{ijt})^{\frac{\rho-1}{\rho}}]^{\frac{\rho}{\rho-1}}$, where $q_{ijt}$ is sales of firm $i$ in sector $j$ at time $t$. The corresponding price index in sector $j$ can be written as $P_{jt} = [\sum_{k=1}^{K}(P_{ijt})^{1-\rho}]^{\frac{1}{1-\rho}}$ and the inverse demand function for product $i$ within sector $j$ is given by $\frac{P_{ijt}}{P_{jt}} = (\frac{q_{ijt}}{y_{jt}})^{-\frac{1}{\rho}}$. Thus, we have the demand function of product $i$, which is obtained by multiplying the demand function of products in sector $j$ and the demand function for product $i$ within sector $j$:

$$\frac{p_{ijt}}{P_t} = \left(\frac{q_{ijt}}{y_{jt}}\right)^{-\frac{1}{\rho}}\left(\frac{y_{jt}}{c_t}\right)^{-\frac{1}{\eta}}. \tag{3}$$

Upon above basic set up, we also have the following market structure assumptions:

(1) Goods are imperfect substitutes: $\rho<\infty$.
(2) Goods within a sector are more substitutable than goods across sectors: $1<\eta<\rho$.
(3) Firms play a dynamic game of quantity competition. In particular, each firm picks its quantity at each period to maximize its discounted profit. We further assume that firm $i$ cannot observe $q_{kjt}$ at period $t$ if firm $k$ does not exit, instead, it can