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Research on the Peer Effect of Firms' Export Behavior

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ABSTRACT
Because of the information asymmetry and risk uncertainty, export firms will learn to adjust export decisions from their peers. Based on the micro-matching data of China's customs export products and listed firms, this paper examines the peer effect of firms export activities by introducing equity shock as an exogenous variable. It is found that first, the values, scopes and number of destinations of exporters' products are positively influenced by their peer firms; second, exporters with lower product quality, growth capability and export intensity will follow those exporters with better export performances to change their behaviors. These asymmetric results prove that peer effect of firms' export behavior is in accordance with the law of logical imitation; third, CEOs with different demographic characteristics have great impact on the magnitude of export peer effect, showing that risk preferences and cognitive patterns of CEOs are significant for firms' export behavior.

Keywords: peer effect, export behavior, equity shock

INTRODUCTION

The uncertainty factors faced by firms in the export process have brought great risks to them in export decision-making. Under the information asymmetry conditions, firms can adjust the export behavior through self-learning. Facundo et al. (2012) found that exporters have a sequential nature. As the current export profits of the firms include the future potential export profit information, in order to reduce the risk of entry, firms adapt the behavior strategy to enter a number of export markets in turn according to the existing profit information and profit model. Eaton et al. (2012) pointed out that firms first invest resources in the export markets and search for buyers, and then determine the market popularity of the products to update the export profit expectations, and then continue to adjust the proportion of resources to maximize the export profits. Nguyen (2012) argues that firms will use known information on export markets to predict unknown market demand and decide whether to export, while the forecast results have uncertainties, leading to delays in the firms export and even export decision-making mistakes.

However, the export information obtained by the firm through "self-selection" (Bernard et al., 1995; Bernard et al., 1999; Melitz, 2003; Bernard et al., 1997; Girma et al., 2004) is quite limited. It has been pointed out that in the actual process, the interaction between firms has played a more important role in the export of firms. Clerides et al. (1998) stated that if an industry's export density is high, non-export firms within the industry are more likely to choose to export. Cadot et al. (2013) found that the survival probability of new export firms increases as the number of firms that export similar products in the market increases. Aitken et al. (1997) discovered that multinationals can significantly promote the export level of neighboring firms. Clerides et al. (1998) also found that the overall production costs of export firms were reduced in areas where export activities increased. Similar studies include Koenig et al. (2010) and Fernandes et al. (2014). This paper believes that the export behavior of firms may also be affected by the peer effect: firms will adjust exports by learning from firms which export similar products (i.e. peer firms) within the product group. Although the peer effect of firm's behavior has been one of the key issues in the corporate finance field (e.g. Mark et al., 2014; Raff et al., 2015; Popadak, 2015), there is still less literature on introducing this firm learning mechanism into the analysis of export behavior, and thus the peer effect of export behavior constitutes this paper's research key.

Based on the calculation of the exogenous equity shock of China's listed export firms, this paper analyzes with econometric models whether the export behavior has the peer effect and the direction and influencing factors of

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Contribution of this paper to the literature

- The firms and their peers have same direction of the export adjustment behavior in the number of export destination, scope of export products and export value.
- The export behaviors of firms, with low product quality, slow growth rate, and low export density, are influenced by that of firms with high export product quality, quick growth rate and high export density within the group.
- The peer effect of firms, with female CEOs, as well as CEOs who are relatively young, have a lower academic level and have a longer tenure, will be significantly enlarged, confirming the fact that the heterogeneous business managers whose risk preference and behavioral cognitive model have significant impact on the peer effect of the firms' export behavior.

the peer effect. This idea is feasible because: first, existing literature has proved that firm's export activities and stock returns are closely linked. Breinlich (2014) confirms that the unanticipated volatility of the tariff level resulting from the adoption of the North American Trade Freedom Agreement negotiations has a significant correlation with changes in the stock prices of the exporting firms in a short period of time. Manova (2008) proves, from the point of view of financing constraints, that the export behavior of firms are directly linked to the openness of the stock market. Fillat et al. (2015) also pointed out that multinational export firms have higher stock returns than non-transnational export firms. Second, there are literature on the mature method of calculating heterogeneous stock return (such as Mark et al., 2014). Such studies believe that the equity shock measured through heterogeneous stock return bears exogenous characteristics.

In addition, the previous studies of firm's export behavior are often faced with endogenous choice and export behavior identification issues: on the one hand, export firms in the same group have similar technical level, face similar market and policy environment, but these potential factors make direct use of group samples produce selection errors, leading to bias in estimating firm's export behavior; on the other hand, relevant literature did not completely distinguish reasons of firm export adjustment, that is, it is not clear that whether the export adjustment is due to the changes of firms export behavior in the same group or due to the overall adjustment of the group. For example, if a group's average increase in the number of export products makes a particular firm expand the scope of export products, this may due to the firm's observation of the changes in peer export behavior, or may be derived from the improvement of the group's average technical level, product quality and product structure, or may because of the changes in the common export market and business environment faced by the group, leading to the change of the overall export status of firms in the group. Due to the exogenous characteristics of equity shocks, this paper introduced heterogeneous stock returns in the study of export behavior to solve the above two types of problems.

Compared with previous studies, the main contributions of this paper are: first, using a new estimation method to identify whether the export behavior of firms bears the peer effect or not. By comparing the export data of China Customs with the micro-data of Chinese listed firms and introducing equity shocks as exogenous variables, this paper makes a more accurate identification of the peer effect in firms' export behavior; second, this paper investigates the asymmetric characteristics of export behavior and the peer effect from the perspective of heterogeneous firm characteristics; third, this paper also investigates the influence of the risk preference and cognitive difference of the firm manager on the export behavior peer effect from the perspective of the CEO background.

This paper demonstrates that the export behavior of firms is affected by the significant positive impact of peer firms in the same export product group, and the peer effect of export behavior is asymmetric. Meanwhile, the magnitude of the peer effect is also influenced by the CEO with different background characteristics, which confirms the relationship between the export behavior and the manager's risk preference and behavioral cognition pattern. The rest of this article is organized as follows: the second part is the research hypothesis; the third part is the research design; the fourth part is the basic regression analysis; the fifth part is the mechanism discussion; the sixth part is the main conclusion.

RESEARCH HYPOTHESIS

Firstly, the adjustment of firm's behavior is not carried out in isolation. Firms tend to try to get information from group peers, thereby reducing investment risk (Hausmann et al., 2003). Competition, imitation, learning and information sharing among firms play an important role in the choice of investment (Lieberman et al., 1988; Fracassi, 2008). Besides, the decision-making behavior of firms shows obvious strategic complementarity and group convergence (Glaeser et al., 2000; Manasa, 2011; Hoberg et al., 2016). For listed firms, the investment decisions of management are often dependent on the price fluctuation information released by peer firms in the stock market

(Foucault et al., 2014). When making export decisions, firms may also show a peer effect. Chaney (2011) pointed out that firms choosing to enter an export market is closely related to the network they embedded in. Doyle et al. (1976) found that some firms did not export because business managers did not think that there were enough firms in the same industry to enter the export market. Based on the above analysis, this paper proposes the first hypothesis:

Hypothesis 1: The export behavior of the firm will be significantly affected by the behavior of other export firms in the same export product group.

Secondly, if the peer effect of firm export does exist, its direction is likely to be asymmetric. According to the law of logic imitation (Tarde, 1903) in the organizational learning theory, in groups, individuals tend to imitate the decision-making behavior of the more successful, more experienced leaders. For example, Iacovone et al. (2014) found that once firms start exporting a new product, other firms will soon export the same products. Wagner et al. (2015) found that in Chile's business, if leaders continue to export new products for more than one year, the probability of followers exporting such products will increase by at least 40%. This paper argues that the direction of the export behavior of the firm is the same as that of a leader-follower asymmetric model. Based on the above analysis, this paper proposes the second hypothesis:

Hypothesis 2: The peer effect of firms' export behavior has leadership-following asymmetric characteristics.

Thirdly, the export behavior of firms are directly affected by the level of firm management (Lu et al., 2009; Bloom et al., 2017). Therefore, as the main implementation body of firm's decision-making, the heterogeneity of firm managers and the firm behavior are closely related. Clerides et al. (1998) pointed out that firm managers faced very complex factors in making export decisions. Banerjee (1992) believes that it is virtually impossible for a firm manager to actually construct a decision function in an uncertain business situation and a noisy decision-making environment, so that imitating others can sometimes become preferred. Some scholars have pointed out that firm managers will follow the Bayesian rule to correct the priori probability according to the behavior of peer firms (Romer, 1993; Trueman, 1994). At the same time, if the cost of the optimal decision is too much, the business managers will tend to make decisions based on the other firms' behavior that can be observed (Conlisk, 1980). What's more, the study of upper echelons (Hambrick et al., 1984) shows that the psychological characteristics of firm's executives have a significant impact on its behavior. Based on the above discussion, this paper gives the third hypothesis :

Hypothesis 3: The differences of the perceived and risk preference of firm managers will have an impact on the magnitude of the peer effect of the export behavior.

RESEARCH DESIGN

Model Setting

To study the peer effect of the firm export behavior, it is necessary to examine the influence of the average export level on the export behavior of individual firm within the group. To this end, this paper established Formula (1) according to the most basic learning model of the peer effect (Ammermueller et al., 2009).

$$y_{fit} = \alpha + \beta \bar{y}_{-fit} + \gamma' \bar{X}_{-fit-1} + \lambda' X_{fit-1} + \delta' \mu_{if} + \phi' v_{mt} + \varepsilon_{fit} \quad (1)$$

where y_{fit} indicates the export behavior variable of firm f in group i in year t; $\bar{y}_{-fit}$ is the average value of export behavior variables of the firms except firm f in group i during the same period; $\bar{X}_{-fit-1}$ indicates the one-phase lagged mean value of the control variable of the firms except firm f in group i, and X_{fit-1} is the one-phase-lagging mean value of the control variable of firm f in group i; μ_{if} represents the fixed effect of the group-firm dimension; v_{mt} indicates the fixed effect of the industry-time dimension divided by the CSRC (China Securities Regulatory Commission) primary classification criteria; ε_{fit} is the error term. Since $\bar{y}_{-fit}$ is an endogenous explanatory variable in this paper, there will be a bias in the estimation of Formula (1), so this paper addresses this problem by introducing equity shock as the exogenous variable. The equity shock is essentially the part, which is separated from the firm stock returns using the augmented market model, has nothing to do with the entire market and group fluctuations but only relates to the value fluctuation of the firm itself.

Therefore, Formula (1) is re-expressed as Formula (2) by the practice consistent with Manski (1993) and Leary et al. (2014), and the reduced-form model with the equity shock variable is given:

$$y = \alpha + \beta E(y|\mu_{if}, v_{mt}) + \gamma' E(X|\mu_{if}, v_{mt}) + \lambda' X + \delta' \mu_{if} + \phi' v_{mt} + \varepsilon \quad (2)$$

From Formula (2), the conditional mean regression of y relative to X, μ_{if} and v_{mt} can be obtained:

$$E(y|X, \mu_{if}, v_{mt}) = \alpha + \beta E(y|\mu_{if}, v_{mt}) + \gamma' E(X|\mu_{if}, v_{mt}) + \lambda' X + \delta' \mu_{if} + \phi' v_{mt} \quad (3)$$

Thus, the conditional expectation of the firm feature X relative to μ_{if} and v_{mt} is:

$$E(y|\mu_{if}, v_{mt}) = \alpha + \beta E(y|\mu_{if}, v_{mt}) + \lambda' E(X|\mu_{if}, v_{mt}) + \gamma' E(X|\mu_{if}, v_{mt}) + \delta'\mu_{if} + \phi' v_{mt} \quad (4)$$

Let $\beta \neq 1$, from Formula (4), we can get:

$$E(y|\mu_{if}, v_{mt}) = \frac{\alpha}{1-\beta} + \left(\frac{\gamma+\lambda}{1-\beta}\right) E(X|\mu_{if}, v_{mt}) + \left(\frac{\delta}{1-\beta}\right)' \mu_{if} + \left(\frac{\phi}{1-\beta}\right)' v_{mt} \quad (5)$$

And from Formula (3) and (5), Formula (6) can be obtained:

$$E(y|X, \mu_{if}, v_{mt}) = \frac{\alpha}{1-\beta} + \left(\frac{\beta\lambda+\gamma}{1-\beta}\right) E(X|\mu_{if}, v_{mt}) + \lambda' X + \left(\frac{\delta}{1-\beta}\right)' \mu_{if} + \left(\frac{\phi}{1-\beta}\right)' v_{mt} \quad (6)$$

Referring to Leary's et al. (2014), the average equity shock of peer firms is used as the exogenous peer-firm feature variable ($E(X|\mu_{if}, v_{mt})$). If the estimated value of coefficient ($\beta\lambda + \gamma/1-\beta$) in Formula (6) is not 0, then β and γ can not be zero at the same time. Therefore, the coefficient ($\beta\lambda + \gamma/1-\beta$) of equation (6) can be used to determine whether the firm export have the peer effect or not.

By bringing the equity shock into Formula (6), the peer effect reduced-form model of firm export behavior is obtained as expressed in Formula (7):

$$y_{fit} = \alpha^* + \beta^* \overline{peer\_shock}_{-fit-1} + \theta^* shock_{fit-1} + \varphi^* total\_return_{fit-1} + \gamma^* \bar{X}_{-fit-1} + \lambda^* X_{fit-1} + \delta^* \mu_{if} + \phi^* v_{mt} + \varepsilon_{fit} \quad (7)$$

In Formula (7), $\overline{peer\_shock}_{-fit-1}$ indicates the one-phase lagged average equity shock of the firms except firm f in group i whose estimated value is the focus of this paper. $shock_{fit-1}$ is the one-phase lagged equity shock of firm f in group i. $total\_return_{fit-1}$ is the one-phase lagged total stock return rate of firm f in group i. Other control variables are defined the same as those in Formula (1).

The use of group-firm dimension fixed effect in Formula (7) eliminates the impact of cross-group changes, so that the firm export behavior is explained only by changes in the group. Meanwhile, the fixed effect of the group-firm dimension also controls the influence of the change among different firms in the same group, and further eliminates the differences among firms due to the level of labor skills, the level of R&D investment, the ability to enter the foreign export market and other factors. The use of the fixed effect of the industry-year dimension according to the CSRC primary classification criteria controls all cross-industry and cross-year changing factors, eliminating the systemic differences due to industry divergence. For example, Manova et al. (2015) pointed out that China's textile industry has a comparative advantage, which may make the industry firms, whether export or not, have higher income relative to the electronic machinery manufacturing firms.

At the same time, since the average annual equity shock of group i in year t can be decomposed into the peer-firm equity shock $\overline{peer\_shock}_{-fit}$ and the firm's own equity shock $shock_{fit}$, and by a simple operation we can see that the average annual equity shock volatility of group i in year t is zero, $shock_{fit}$ actually controls all year-group volatility factors, thereby mitigating the omission of variables associated with the firm equity shock within the group. In addition, other factors included in the equity shock that may impact firm export behavior and stock yield are controlled by the total stock yield rate $total\_return_{fit-1}$.

Data Processing and Measurement

The selection of customs sample time dimension

China's General Administration of Customs provides us with all Chinese trade transactions by importing and by exporting firm at the HS 8-digit level. With regard to the determination of the time span of customs data, the current time span available for export data is from 2000 to 2010. But from January 1st 2007, China's listed firms began to implement the new accounting standards, which changed the accounting information quality of listed firms and the relevance of accounting information (Bartov et al., 2005; Barth et al., 2008), thus indirectly affect the stock price information content and the proportion of private information of listed firms (Francis et al., 2004; Durney et al., 2003). This change may cause inconsistency of firm value information contained in the equity shock before and after 2006, thus affecting the estimation of the firm export behavior regulation. On the other hand, we found that the statistical caliber of the quantity of import and export products in customs trade data was not exactly the same before and after 2006. Since the use of equity shocks to estimate the peer effect of export behavior is sensitive to the changes in export behavior, for the sake of stability, and taking into account the need to use one-phase lagged explanatory variable of firms' export activities, this paper finally set the time span of export firm samples as from 2001 to 2006. In addition, as listed in **Table 1**, the recent representative literature on the time span selection of Chinese customs import and export data sample is basically the same as this paper.

Table 1. Selected Literature about the Choices of Customs Data Time Span in Recent Years

No.	Title	Journal	Time Dimension of customs data (year)
1	Trade liberalization and markups: Micro evidence from China	Journal of Comparative Economics, 000(2017) 1-28	2000-2006
2	Unexceptional exporter performance in China? The role of processing trade	Journal of Development Economics, 121(2016) 177-189	2000-2006
3	Trade liberalization, quality and export prices	Review of Economics and Statistics, 97(2015) 1033-1051	2001-2006
4	Learning to Export From Neighbors	Journal of International Economics, 94(2014) 67-84	2000-2006
5	Export prices across firms and destinations	Quarterly Journal of Economics, , 127(2012) 379-436	2003-2005

Explanations of the matching between customs data and listed firm data

This article matched the listed firm data and product export data. Because of the need to use a unified market rate of return in calculating the firm's equity shock, we select China's A-share market listed firms as samples. Firm data are from the CSMAR database and the Wind database. Due to the need for long-term stock return data to measure the equity shock, the time span of listed firms' data is from 1995 to 2006. Export product data are selected from the customs import and export statistics database, the time span is of 2000-2006. Since firms generally do not arrange stable product exports every month, we aggregate monthly export data into annual data. The specific matching process is as follows:

Firstly, since the firm equity shock and the firm characteristic control variables are one-phase lagging in the regression equation, the matching firm samples require at least two consecutive export data. For example, export firms in 2006 should export products at least in 2005. On this basis, we merge the two types of databases through the firm name. As part of the listed firms were renamed during the sample period, we match the renamed firms with the customs export data and merge those firms through the stock codes of firms.

Secondly, due to the necessity of the historical data on firms' stock returns to estimate equity shocks, we set the duration of listed firms for at least two years. For instance, listed firms that match 2006 customs data need to be listed in December 2003 or before, and so on for other years.

Thirdly, due to the particularity of the export behavior of trade intermediaries and processing trade firms, these two types of firms are not within the scope of this paper, so they are excluded by identifying the fields including "trade", "import and export", and only to retain the type of export firms of the general trade. At the same time, we have removed the financial and utility-listed firms in accordance with the usual practice and have eliminated the firms whose export products amounts are missing or less than 50.

Fourthly, we employ the product HS double-digit classification in the customs export database as a basis for sorting the groups. After the group division in accordance with this standard, there are still some groups in some years with only one firm, which do not meet the minimum requirement of at least two firms in one group, so such groups are excluded.

After the above mentioned screening, a non-balanced panel data with 5820 group-firm observations from 2001-2006 is obtained, which contains a total of 330 listed firms, 85 HS double-digit groups, with an average of 23 firms in each group, and the median size of the group is of 19 firms. As most firms have cross-group export behavior, some listed firms in the same year will appear in several different groups.

Estimation of the firm equity shock

We use the augmented market model (Mark and Roberts, 2014) to estimate the firm equity shock, as shown in Formula (8):

$$r_{fit} = \alpha_{fit} + \beta_{fit}^{m}(rm_t - rf_t) + \beta_{fit}^{ind}(\bar{r}_{-fit} - rf_t) + \zeta_{fit} \quad (8)$$

In Formula (8), r_{fit} represents the stock return of firm f in group i in month t; $rm_t - rf_t$ is the excess market return, and $\bar{r}_{-fit} - rf_t$ is the excess return in month t which is calculated with the average stock return of the firms' portfolios omitting firm f in group i. ζ_{fit} is the firm equity shock after eliminating the common fluctuation factors of the stock return in the group; rf is the monthly risk-free rate, rm is the stock return of A-share consolidated monthly market. The relevant data are derived from the CSMAR stock market transaction database.

In order to calculate the equity shock of firm f in year t with the coefficient estimate β_{fit}^{m} and β_{fit}^{ind}, we need at least 24 months (i.e. year $(t-2)$), up to 60 months (i.e. year $(t-5)$) historical data of the stock returns of listed firms, other years of calculation are in the same manner. In this way, we get the estimated coefficients $\hat{\alpha}_{fit}$, $\hat{\alpha}_{fit}$ and

Table 2. Reports descriptive statistical results of the firm equity shock

	Mean	Standard Deviation	Median
α_{fit}	0.130	0.053	0.126
β_{fit}^{m}	0.311	0.834	0.310
β_{fit}^{ind}	0.255	0.835	0.203
ζ_{fit}	-0.031	0.039	-0.032
$\hat{r}_{fit}$	0.026	0.039	0.022
r_{fit}	-0.005	0.079	-0.010
R^2	0.372	0.187	0.403
Obs.	53	11	60

Table 3. Control Variables Statistics Summary

	Mean	Standard Deviation	Median	Obs.
Firm-Specific Variables				
Log(Book)	21.356	0.782	21.262	5820
Log(K/L)	14.019	1.058	13.863	5820
TFP	1.476	0.233	1.463	5820
Current	1.330	0.773	1.208	5820
Peer Firm Average Variables				
Log(book)	21.644	0.351	21.610	5820
Log(K/L)	14.521	0.361	14.468	5820
TFP	1.476	0.077	1.470	5820
Current	1.330	0.235	1.284	5820

$\hat{\alpha}_{fit}$ of 5820 group-firm-level samples from 2001 to 2006. The equity shock of firm f in group i is shown in Formula (9):

$$\begin{aligned}\hat{\zeta}_{fit} &= r_{fit} - \left[\hat{\alpha}_{fit} + \hat{\beta}_{fit}^{m}(rm_t - rf_t) + \hat{\beta}_{fit}^{ind}(\bar{r}_{-fit} - rf_t)\right] \\ &\equiv \quad r_{fit} \quad - \hat{r}_{fit}\end{aligned} \tag{9}$$

Table 2 reports descriptive statistical results of the firm equity shock.

In **Table 2**, the mean of R^2 is 0.372 which reflects that the residual value estimated by Formula (9) explains a large portion of the volatility of the firm's stock price, which also indicates that compared to the total return, the equity shock can better capture the adjustment of firms' export behavior.

Further, the monthly equity shock in Formula (9) is summed by year and is delayed by one period, and finally the average equity shock $\bar{\hat{\zeta}}_{-fi-t}$ of group i after removing firm f.

Variable Selection

Firm export variables. Similar to the study of Manova et al. (2015), we measure firm's export behavior from three perspectives: ① the logarithm of the number of export destinations (*Log_#Dest*); ② the logarithm of the scope of products exported by the firm(*Log_#Products*); ③ the logarithm of the firm's export value (denominated in US dollars) (*Log_Value*).

Control variables. We control the impact of other factors on export behavior through a series of firm's characteristic variables. Specifically include: ① total factor productivity (*TFP*), which is estimated by applying the method of Giannetti et al. (2015). Formula (10) is used to estimate the total factor productivity of listed firms:

$$y_{fit} = \alpha_{it} + \beta_{it} l_{fit} + \gamma_{it} k_{fit} + \delta_{it} m_{fit} + \varepsilon_{fit} \tag{10}$$

where y_{fit} indicates the prime operating revenue of firm f in group i in year t; l_{fit} is the number of workers of firm f in year t; k_{fit} is the total assets of firm f in year t; m_{fit} represents the cash paid for commodities or labor of firm f in year t. The above variables are logarithmic, and the industry is classified according to the CSRC primary classification criteria. The residual estimate of Formula (10) is the total factor productivity of listed firms. ② Capital labor ratio (*Log(K/L)*), calculated by the logarithm of the ratio of total book assets to total number of workers, reflecting the level of production technology that the total factor productivity failed to capture. ③ Firm scale (*Log(Book)*), calculated through the logarithm of the book value of the total assets, reflecting the factors associated with the export costs. ④ Current ratio (*Current*), used to reflect the export financing constraints faced by firms.

Meanwhile, we add the mean value of the characteristic variables of peer firms as the control variables into the Formula (7). **Table 3** reports the descriptive statistical results of the control variables.

Table 4. Regression Results of Peer Firm Average Equity Shock on firm-characteristic Variables

	Peer Firm Average Equity Shock	
	Contemporaneous control variable	**1-Period-advance control variable**
Firm-feature Variables		
Log(Book)	-0.007	-0.011
	(0.005)	(0.012)
Log(K/L)	-0.004	0.009
	(0.006)	(0.009)
TFP	0.012	-0.007
	(0.008)	(0.005)
Current	0.005**	-0.002
	(0.002)	(0.003)
Firm-feature Equity Shock	Yes	Yes
Firm-feature Stock Return	Yes	Yes
Peer Firm Average Characteristics	Yes	Yes
Group-firm Fixed Effects	Yes	Yes
Industry-year Fixed Effects	Yes	Yes
Obs.	5820	5820
R^2	0.934	0.934

Note: standard errors are reported in parentheses, *** p<0.01, ** p<0.05, * p<0.1

BASIC REGRESSION ANALYSIS

Initial Analysis

A prerequisite of introducing equity shock as an exogenous variable is that the equity shock of the peer firms does not contain information about the characteristics of the firms. Due to the size of firms, total factor productivity, financing constraints and other firm's characteristics are related to export behavior adjustment, if evidence shows that there is a significant correlation between $\overline{peer\_shock}_{-fit}$ and the characteristics of the firm, then the equity shock of peer firms is likely to include missing variables related to the firms' export determinants; otherwise, it is further illustrated that equity shock is exogenous relative to firms' export. To this end, we regress the peer firms' equity shock $\overline{peer\_shock}_{-fit}$ to current and one-period-advanced control variables of firm's export features. The regression results are reported in **Table 4**.

As can be seen from **Table 4**, both the current and one-phase-advanced firm characteristics of variables are basically insignificantly relevant to the equity shock of the peer firms. The only significantly correlated variable in the current is the firm current ratio, whose estimated coefficient is also very small. The results in **Table 4** show that the equity shock of the peer firms does not contain current or future unobserved factors of firms' export behavior. This estimate further alleviates the concerns of omitted variables in Formula (7).

Table 4 reflects another fact that the adjustment of export behavior may not be determined by the characteristics of the peer firms (i.e. γ in Formula (6)). In fact, the peer effect may be caused by the characteristics or the behavior of the peer firms. For the initial determination of whether the peer effect is mainly caused by changes in the behavior of the peer firms in the group (i.e. β in Formula (6)), we use the method adopted by Leary et al. (2014) for further analysis. First, calculate the mean value of the differences between export destination numbers of the peer firms in year t and year $t-1$. Second, to sort the mean of the one-phase-lagging equity shock of peer firms and the mean of the difference of export destination numbers among peer firms from small to large. After that, 20% of the minimum numbers, 50% -60% in the middle and the largest 90% -100% of the samples are selected and cross-paired in pairs into nine groups. Finally, the mean value of the difference between the number of export destinations in year t and the number of export destinations in year $t-1$ in each group is examined by t-test to see whether the numerical change is significantly different from zero. The results are shown in **Table 5**.

Table 5. T-Test of the means of changes in the number of export destinations in Groups

Peer Firm Average Equity Shock	Peer Firm Average Export Destinations Changes		
	Low 0-20%	Median 50%-60%	Top 90%-100%
Low 0-20%	0.389	0.851***	1.050**
	(0.398)	(0.283)	(0.415)
Median 50%-60%	-0.386	-0.914	0.007
	(0.327)	(0.684)	(0.574)
Top 90%-100%	-0.670*	0.793***	1.256***
	(0.359)	(0.265)	(0.377)

Note: standard errors are reported in parentheses, *** p<0.01, ** p<0.05, * p<0.1

From the results of **Table 5**, it can be seen that except the pairs of the second row, and the pair of the first column in the first row are not significantly different from zero, when the peer equity shock is fixed, the number of firm export destinations in the group increases with the number of export destinations of peer firms. From the column direction, it can be seen that in the second and the third column, when the change of numbers of peer firms export destinations is fixed, the number of export destinations in the same group does not change significantly with the increase in the equity shock of the peer firms. The above results show that the change of export behavior of the specific firm is sensitive to the change of the equity shock of the peer firms accompanied by the change of peer firms' export. When the equity shock does not include the change of the export of the peer firms, the change sensitivity of the export behavior of the specific firm is significantly reduced. **Table 5** initially reflects that the peer effect is mainly caused by export behavior changes in the group, rather than by the characteristics of the firm. In the appendix we also use the scope of products and firm's export value to repeat the initial estimation, but it is hard to draw a very clear conclusion, thus requiring a more accurate estimate analysis below.

Econometric Analysis Based on the Reduced-Form Model

Regression results

The reduced-form model (7) is used to test three types of export behavior peer effect, namely the number of export destinations, the export products scope and the export value. In the unreported results, the Hausman test showed that a fixed effect model should be used. The regression results in **Table 6** show that the equity shock of the peer firms is significantly positively related to the change in firm export behavior. That is, with the increase in the equity shock of the peer firms, the number of export destinations, the scope of export products and the amount of exports in the groups will increase significantly. Although the reduced-form model does not explain the economic meaning of the variable coefficient, the regression results have confirmed that the export behavior of the firm has the peer effect. The first hypothesis of this paper is verified.

Meanwhile, compared to the equity shock, the impact of firm characteristics on the export behavior is relatively small or not significant. In addition to the influence of the total factor productivity of peer firms, other influencing factors of the peer firm are also small, which also illustrates the importance of the peer effect on the adjustment of the firm export behavior.

Table 6. Regression Results of Export Peer Effect Based on Reduced-Form Model

	Log_#Dest	Log_#Product	Log_Value
	(1)	(2)	(3)
Peer Firm Average Variables			
Equity Shock	0.270**	0.496**	0.825**
	(0.090)	(0.158)	(0.234)
Log(Book)	0.034**	0.057*	-0.000
	(0.013)	(0.022)	(0.034)
Log(K/L)	-0.051	-0.058	-0.070
	(0.032)	(0.042)	(0.072)
TFP	-0.303**	-0.679***	-0.958**
	(0.077)	(0.145)	(0.291)
Current	0.023	-0.019	0.063
	(0.090)	(0.094)	(0.148)
Firm-feature Variables			
Equity Shock	0.038	0.022	-0.012
	(0.056)	(0.085)	(0.135)
Stock Return	0.001	0.124	0.195
	(0.091)	(0.098)	(0.173)
Log(Book)	0.249*	0.344*	0.638**
	(0.117)	(0.151)	(0.190)
Log(K/L)	0.059	0.031	-0.006
	(0.038)	(0.050)	(0.081)
TFP	-0.112	-0.115	-0.136
	(0.085)	(0.110)	(0.180)
Current	0.075**	0.057*	0.060
	(0.029)	(0.025)	(0.031)
Group-firm Fixed Effects	Yes	Yes	Yes
Industry-year Fixed Effects	Yes	Yes	Yes
Obs.	5,820	5,820	5,820
R^2	0.065	0.074	0.060

Note: standard errors are reported in parentheses, *** p<0.01, ** p<0.05, * p<0.1

Robustness analysis

(1) Modify the control variable. To ensure the reliability of the results, we first make a series of modifications to the variables of the reduced-form model (7). The number of export destinations is used as the explanatory variables. The estimated results are listed in columns (1) to (7) of **Table 7**, respectively. In the unreported regression results, the scope of export products and the export value are similar to the estimated results of the number of export destinations. Because the quality of export products is an important determinant of the firms' export (Cage et al., 2015; Alvarez et al., 2007), In column (1), the impact of the quality of the export product on the peer effect is considered. We use the method adopted by Khandelwal et al. (2013) and Fan et al. (2015) to measure the quality of export products. First the export product quality in the product level is estimated, and the estimation equation is $\ln(x_{fdkt}) = \sigma \ln(p_{fdkt}) + \varphi_k + \theta_{dt} + \varepsilon_{fdkt}$, where x_{fdkt} represents the amount of product of k that firm f in year t export to the destination d; p_{fdkt} is the export unit price; φ_k is the fixed effect of product k (using HS six digit classification level), and θ_{dt} is the country-time fixed effect. The $\hat{\varepsilon}_{fdkt}$, which is the product quality, is obtained by OLS. Then, the product quality is added from the product level to the firm level and standardized, getting the quality of export products Q_{ft}. The formula is $Q_{ft} = \sum_{k=1} \left(\frac{v_{fdkt}}{v_{ft}} \times \frac{Q_{fdkt} - \min Q_{fdkt}}{\max Q_{fdkt} - \min Q_{fdkt}} \right)$, where v_{ft} is the total exports of firm f in year t; v_{fdkt} is the product value of product k by firm f in the year t to the destination d; Q_{fdkt} is the quality of product k by firm f in the year t to the destination d; $\min Q_{fdkt}$ and $\max Q_{fdkt}$ respectively represents the lowest quality and the highest export products of firm f. When we add the quality of the exported product to the equation, the estimated coefficient of the average equity shock of the peer firms does not change significantly.

In column (2) to (3), adopting the method mentioned by Fillat et al. (2015), firm's financial leverage (*Leverage,* represented by asset-liability ratio) and the *book-to-market ratio* are added in the equation respectively to control the impact of export firms' own resources and borrowed resources of different proportions on the export behavior. In column (4), the logarithmic of the firm's inventory turnover days (*Log_turnover*) is added to the equation to control the impact of the firm's product operating capability on export adjustments. The regression results from column (2) to (4) show that the estimated coefficients of the average equity shock of the peer firms are almost unaffected.

Table 7. Regression Results of Export Peer Effect on Number of Export Destinations Based on Reduced-Form Model with different control variables

	Log_#Dest						
	(1)	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**	**(7)**
Peer Firm Average Equity Shock	0.267**	0.281**	0.270**	0.266**	0.237**	0.269**	0.312**
	(0.090)	(0.085)	(0.090)	(0.093)	(0.072)	(0.093)	(0.117)
Quality	0.173***						
	(0.036)						
Leverage		-0.005**					
		(0.001)					
Book-to-Market Ratio			0.031				
			(0.030)				
Log_turnover				0.107			
				(0.092)			
$(Log\_\#Dest)_{t-1}$					0.250**		
					(0.068)		
Contemporaneous Control Variables	No	No	No	No	No	Yes	No
Quadratic and cubic Control Variables	No	No	No	No	No	No	Yes
Peer Firm Average Characteristics	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm-Specific Variables	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Group-firm Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry-year Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Obs.	5,820	5,820	5,820	5,820	5,820	5,820	5,820
R^2	0.067	0.069	0.065	0.067	0.119	0.088	0.106

Note: standard errors are reported in parentheses, *** p<0.01, ** p<0.05, * p<0.1

As the export of firms is continuous, in column (5), we add the logarithm of one-phase-lagged variable of export destination numbers to the equation, so the impact of the previous period export behavior on the current export can be controlled. Likewise, the corresponding estimates are not affected. In column (6), except the equity shock of the peer firms, we replace all the one-phase lagged variables in the equation with the current value in order to avoid the influence to the result of the common omitted variable existing in the one-phased lagged value of equity shock and the characteristic variables of the specific firm and the peer firms. In column (7), we add the square terms and cubic terms of the control variables (including the firm characteristic variables and the peer firm characteristic variables) in the equation, and reduce the possible influence of the nonlinear relationship of the variables on the results. The results show that these series of modifications still does not affect the estimation of the critical variable coefficients.

(2) Re-division of the peer Firms. In order to examine whether the re-division of the group will affect the results, we switch to the International Standard Industrial Classification Code (ISIC) as the group classification criteria. The customs HS six-digit code and ISIC Rev.2 three-digit code are matched to get a total of 4134 observed values in the dimension of group-firm from 2001 to 2006, including a total of 327 listed firms and 33 ISIC three-digit groups, where there are 32 firms in one group on average, and the median of the group scale is 30 firms.

Formula (7) is used to re-estimate the peer effect of the export firms, and the results in **Table 8** show that the number of export destinations, the scope of export products and the export value are still significantly positively affected by the export behavior of the peer firms, except a relative increase in the coefficient of the equity shock of the peer firms. This once again confirms that the export behavior of the firm has the peer effect.

Table 8. Regression Results of Export Peer Effect Based on Reduced-Form Model with ISIC Group Classification Standard

	Log_#Dest	Log_#Product	Log_Value
	(1)	(2)	(3)
Peer Firm Average Variables			
Equity Shock	0.406***	0.802***	1.175***
	(0.086)	(0.103)	(0.245)
Log(Book)	0.130***	0.137**	0.121
	(0.030)	(0.048)	(0.114)
Log(K/L)	-0.080	-0.052	-0.078
	(0.057)	(0.098)	(0.174)
TFP	-0.432*	-0.744*	-1.084**
	(0.193)	(0.319)	(0.361)
Current	0.069	0.005	0.011
	(0.102)	(0.091)	(0.126)
Firm-Specific Variables			
Equity Shock	0.031	-0.071	-0.241
	(0.078)	(0.122)	(0.213)
Stock Return	0.040	0.288**	0.576***
	(0.071)	(0.079)	(0.137)
Log(Book)	0.175	0.215	0.362*
	(0.131)	(0.184)	(0.159)
Log(K/L)	0.008	0.023	0.148*
	(0.029)	(0.043)	(0.071)
TFP	-0.011	0.120	0.054
	(0.099)	(0.108)	(0.178)
Current	0.073**	0.064*	0.097**
	(0.024)	(0.029)	(0.036)
Group-firm Fixed Effects	Yes	Yes	Yes
Industry-year Fixed Effects	Yes	Yes	Yes
Obs.	4,134	4,134	4,134
R^2	0.068	0.080	0.067

Note: standard errors are reported in parentheses, *** p<0.01, ** p<0.05, * p<0.1

(3) Constructing indirect peer firms. To further exclude all the changing factors of stock return related to the potential omitted variables in the group, it is necessary to introduce average group stock return into the formula (7). To this end, this paper uses the characteristics of the firms that export a variety of cross-group products to construct an indirect peer firms. Specifically, the indirect peer firms corresponding to firms f in the group i need to meet two requirements: ① the indirect peer firms do not export any of the same HS two-digit code products as firm f; ② indirect peer firms have the same export products with the peer of firm f outside group i. **Figure 1** intuitively shows the calculation process of the equity shock of the indirect peer firms.

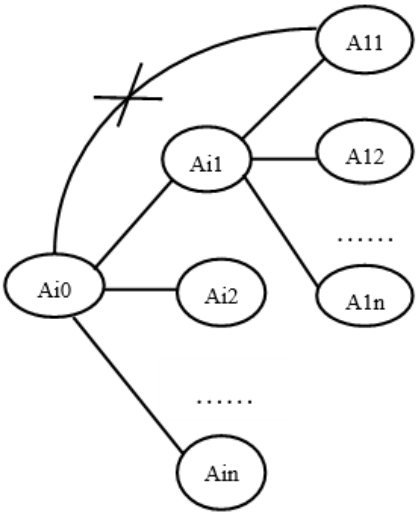

Figure 1. Method of choosing indirect peer firms and calculating equity shocks. Ai0, Ai1, Ai2, ... Ain represent exporters A0, A1, A2, ... An, which belong to group i. We take exporter Ai1 as an example to show how to calculate indirect peer firms average equity shock of Ai0: (1) A11, A12, ... A1n represent firms which export the same HS double-digit products with A1. However, A11, A12, ... A1n do not export the same HS double-digit with A0 (we use symbol "×" to represent it). (2) We calculate average equity shock of A11, A12, ... A1n to replace the equity shock of Ai1. (3) We repeat the procedures of (1) and (2) to calculate Ai2, Ai3, ... Ain, and average out the equity shock of them to get the equity shock of indirect Peer Firms of Ai0.

Indirect peer firms and the specific firm are not in the same export group. This not only alleviates the omitted variable problem, but also meets the exogenous requirements of the equity shock, and therefore the average stock return of the group can be included in the equation. If the basic regression results in **Table 6** are robust, it can be expected that the equity shock of indirect peer firms should also have a positive impact on the export behavior adjustment. After the calculation, this paper has obtained 409 group-firm dimension observations from 2001 to 2006 to meet the requirements. From the results in **Table 9**, we can see that the use of the equity shock from the indirect peer firms as an exogenous variable makes the conclusion still established. Specifically, the coefficient of the average equity shock of the peer firms is significantly positive within 10% of the significance level, and consistent with the coefficient of the basic regression results, which further shows that the export behavior adjustment has the peer effect.

Table 9. Regression Results of Export Peer Effect Based on Reduced-Form Model with Indirect Peer Firms

	Log_#Dest	Log_#Product	Log_Value
	(1)	(2)	(3)
Indirect Peer Firm Average Equity Shock	0.526*	1.344***	1.378***
	(0.224)	(0.238)	(0.289)
Group Average Stock Return	-2.346***	-4.970***	-3.950**
	(0.569)	(0.473)	(0.993)
Indirect Peer Firm Average Variables			
Log(Book)	-0.699***	-1.113***	-1.423***
	(0.113)	(0.105)	(0.246)
Log(K/L)	0.010	0.040	0.348
	(0.070)	(0.059)	(0.178)
TFP	1.471***	2.533***	3.100***
	(0.175)	(0.352)	(0.620)
Current	-0.054	0.045	0.080
	(0.037)	(0.096)	(0.136)
Firm-Specific Variables			
Equity Shock	0.002	0.475***	-0.344
	(0.093)	(0.047)	(0.229)
Stock Return	-0.206	-0.394*	0.922
	(0.107)	(0.174)	(1.661)
Log(Book)	-0.661*	-0.703**	-0.195
	(0.291)	(0.252)	(0.483)
Log(K/L)	0.469***	0.596**	1.338***
	(0.083)	(0.153)	(0.118)
TFP	0.458	1.233	-0.011
	(0.278)	(0.831)	(0.495)
Current	1.243**	1.566**	2.395***
	(0.313)	(0.509)	(0.145)
Group-firm Fixed Effects	Yes	Yes	Yes
Industry-year Fixed Effects	Yes	Yes	Yes
Obs.	409	409	409
R^2	45.6%	56.5%	45.7%

Note: standard errors are reported in parentheses, *** p<0.01, ** p<0.05, * p<0.1

Analysis of the Influence Extent of the Peer Effect

This paper has been able to confirm the existence of the peer effect in the firm export behavior. However, compared with the Formula (2), we can see that the equation (6) does not distinguish the cause of the peer effect which may be the change of the export behavior of the group (i.e. β), or the characteristics of the peer firms (i.e. γ). Therefore, it is difficult to explain the influence extent of the peer effect according to the coefficient value of the reduced-form model (7). To this end, we use the equity shock of the peer firms as an instrument variable and analyze the impact extent of the peer effect with Formula (1). The use of instrument variable method needs to meet two conditions: one is the exogeneity of the equity shock; the other a high degree of correlation between the equity shock and the firm export behavior. For the first condition, the previous discussion has given a positive answer. The second condition can be judged by using conventional statistical tests. We use the fixed-effect two-stage least squares (FE2SLS) to analyze the non-balanced panel data of the HS double-digit export group from 2001 to 2006.

As can be seen from the results in **Table 10**, in the first-stage regression, the problem of weak instrument variables can be ruled out based on the results of the F-statistic. The equity shock of the peer firms is significantly positive, and the coefficient and the coefficient of the reduced-form model are basically the same. In the second stage of regression, the coefficients of the number of export destinations, the scope of export products and the export value of the peer firms are significantly positive, indicating that the specific firms are positively affected by the export behavior of the peer firms. To be specific, a 1% increase of the number of export destinations, the scope of export products and the export value for the peer firms will increase the corresponding export activities of the firms in the group by 1.15%, 1.21% and 0.72% respectively, and the increase is also the largest proportion compared to the coefficient of the firm characteristic variables. The regression results of the instrument variable method further show that the impact of the peer effect on the firm export behavior should not be neglected except for the influence of its own factors.

Table 10. Regression Results of Export Peer Effect Based on Instrument Variable Model

	Log_#Dest	Log_#Product	Log_Value
	(1)	(2)	(3)
Peer Firm Average Variables			
Export Behaviors	1.150**	1.209***	0.721***
	(0.523)	(0.436)	(0.238)
Log(Book)	-0.103	-0.257*	-0.319**
	(0.081)	(0.137)	(0.157)
Log(K/L)	0.054	0.121	0.102
	(0.073)	(0.102)	(0.132)
TFP	0.038	-0.080	-0.556
	(0.271)	(0.390)	(0.529)
Current	0.019	0.054	0.008
	(0.065)	(0.096)	(0.145)
Firm-Specific Variables			
Equity Shock	0.047	0.007	0.010
	(0.067)	(0.097)	(0.148)
Stock Return	-0.027	0.104	0.101
	(0.089)	(0.128)	(0.197)
Log(Book)	0.174**	0.226**	0.584***
	(0.079)	(0.112)	(0.160)
Log(K/L)	0.117*	0.123	0.005
	(0.065)	(0.093)	(0.132)
TFP	0.001	0.094	0.067
	(0.106)	(0.155)	(0.217)
Current	0.086***	0.092*	0.070
	(0.032)	(0.047)	(0.070)
First-Stage Regression Results			
Peer Firm Average Equity Shock	0.235***	0.410***	1.144***
	(0.047)	(0.072)	(0.121)
Control Variables	Yes	Yes	Yes
Group-firm Fixed Effects	Yes	Yes	Yes
Industry-year Fixed Effects	Yes	Yes	Yes
Obs.	5,201	5,201	5,201
F-Stat.	24.67**	32.37**	88.86**

Note: standard errors are reported in parentheses, *** p<0.01, ** p<0.05, * p<0.1
** F-stat< 10% maximal IV size, *F-stat< 15% maximal IV size

ANALYSIS OF MECHANISM OF ACTION

On the basis of confirming the existence of the peer effect in the firm export behavior, this paper further analyzes the differences of the peer effect of the firm export behavior from the perspective of the heterogeneity of the characteristics of the firm and the manager.

An Analysis of the Peer Effect Based on Leader - Follower Firms

In order to test the existence of the leadership-following peer effect in export firms, we sort the firm samples in the year-group dimension from high to low in accordance with its current export product quality (*Quality*), growth capacity (*Growth*, represented by total revenue growth), and export intensity (*Intensity*, represented by exports as a percentage of total sales), and one-third of the top-ranked firms are defined as leaders, and the remaining two-thirds are defined as a followers. And then we determine whether the export behavior of the followers will be significantly affected by the leaders' export behavior in the same group.

We performed a two-stage least-squares regression of two-thirds of the follower sub-samples. We use the leaders' peer firm export variables (*Log_ #Leader-Peer*, which represents three export variables respectively in each regression models) to replace the followers' peer firm export variables, and we also use the equity shock of the leader peer firms to replace the followers' peer firm equity shock as an instrument variable. From the regression results in **Table 11.A**, it can be seen that, except the number of export product destinations of the low export-intensive firms is not significantly affected by the high export-intensive leaders, firms with lower product quality, slower growth rate and low export intensity will imitate the firms with higher export product quality, faster growth

Table 11. Regression Results of Export Peer Effect Based on Leaders-Followers Model

	Log_#Dest			Log_#Product			Log_#Value		
	Quality	**Growth**	**Intensity**	**Quality**	**Growth**	**Intensity**	**Quality**	**Growth**	**Intensity**
	(1)	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**	**(7)**	**(8)**	**(9)**
	A. Do Follower Firms Mimic Leader Firms?								
Log_#Leader-Peer	0.362	5.723*	0.566	0.488**	3.659***	1.287*	0.474**	2.009***	0.923***
	(-0.237)	(-3.186)	(-0.551)	(-0.244)	(-0.881)	(-0.659)	(-0.239)	(-0.292)	(-0.314)
First-Stage F-stat.	32.61**	16.38**	18.09**	31.16**	21.02**	12.76*	28.20**	93.81**	55.99**
Peer Firm Average Variables	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm-Specific Variables	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Group-firm Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry-year Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Obs.	2,923	5,050	5,073	2,923	5,050	5,073	2923	5050	5073
	B. Do Leader Firms Mimic Follower Firms?								
Log_#Follower-Peer	-0.11	0.235	0.548	-0.111	0.259	0.261	-0.144	0.322*	-0.072
	(-0.302)	(-0.181)	(-0.338)	(-0.193)	(-0.226)	(-0.203)	(-0.222)	(-0.193)	(-0.105)
First-Stage F-stat.	25.88**	13.23*	9.77*	59.07**	8.16	20.36**	56.68**	12.54*	22.57**
Peer Firm Average Variables	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Firm-Specific Variables	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Group-firm Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry-year Fixed Effects	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Obs.	2,988	880	1,091	2,988	880	1,091	2,988	880	1091

Note: standard errors are reported in parentheses, *** p<0.01, ** p<0.05, * p<0.1
** F-stat< 10% maximal IV size, *F-stat< 15% maximal IV size

rate, and high export intensity to adjust their export destination number, product scope and export value. These results show that firms with lower export performance will follow the firms with higher export performance to adjust their export behavior.

If the peer effect of firms' export behavior follows the asymmetric nature of the logical imitation law, then the leaders will be relatively less influenced by the followers' export behavior of the same group. To verify this judgment, we switched to one-third of the leaders firms samples, using the followers' peer firm export variables to replace those of the leaders, and using the followers' peer firm equity shock to replace that of the leaders as an instrument variable. The results in **Table 11.B** show that leaders with higher export product quality, growth rate and export intensity are not significantly affected by the corresponding low export performance firms. The only exception is that a 1% increase of the export value in firms with a relatively low growth rate caused the firms with high growth speed increase by 0.3% at 10% of the statistical level. However, a 1% increase of the export value of the firms with higher growth rate will lead to a 2% significant export value increase of firms with lower growth rate, so the results still illustrate significant asymmetry of the export behavior among peer firms. Thus, the results of **Table 11.B** partially confirm the asymmetric effect of the peer effect on the adjustment of firm export behavior, and the second hypothesis of this paper is confirmed.

Analysis of the Peer Effect Based on CEO 's Characteristics

Furthermore, from the perspective of the background characteristics of firm's CEO, we examine how heterogeneous business managers can act on firm export behavior through the peer effect. Learning from Boden et al. (2000), Hambrick et al. (1984), Bantel et al. (1989), Fraser et al. (2006), this paper analyzes the impact of managers' characteristics on the peer effect of export behavior from the angles of CEO's gender, age, educational background, and service time. Taking the number of export destinations as an example, the above CEO characteristic variables

Table 12. Influences of CEOs' characteristics on the Peer Effect of Export Destinations

	Log_#Dest			
	Gender	**Age**	**Education**	**Tenure**
	(1)	**(2)**	**(3)**	**(4)**
Log_#Dest	1.082**	1.202**	1.006**	1.133**
	(0.508)	(0.539)	(0.512)	(0.522)
Log_#Dest×CEO Characteristics	0.117**	0.090***	0.279***	0.053**
	(0.053)	(0.029)	(0.058)	(0.023)
First-Stage F-stat.	12.70**	12.03**	12.17**	12.33**
Peer Firm Average Variables	Yes	Yes	Yes	Yes
Firm-Specific Variables	Yes	Yes	Yes	Yes
Group-firm Fixed Effects	Yes	Yes	Yes	Yes
Industry-year Fixed Effects	Yes	Yes	Yes	Yes
Obs.	5,201	5,201	5,201	5,201

Note: standard errors are reported in parentheses, *** p<0.01, ** p<0.05, * p<0.1 ** F-stat< 10% maximal IV size, *F-stat< 15% maximal IV size

are included as interaction terms with the number of export destinations of the peer firms. Specifically: ① if the CEO is female, set to 1, otherwise 0; ② if the CEO's age is less than the average age of CEOs in all year-firm, set to 1, otherwise 0; ③ if the CEO's education is below the master degree, set to 1, otherwise 0; ④ If the CEO's service time is longer than the average time of all years-firm CEO service time, set to 1, otherwise 0. In this paper, the two-stage least squares method of fixed effect is used, and the endogenous variables are the peer firm export variables and the interaction variables of the peer firm export variables and the CEO characteristics. The instrument variables are the equity shock of the peer firm and the interaction terms of the peer firm equity shock and the CEO characteristics. The relevant data is manually compiled according to Wind database.

From the results of **Table 12**, we can see that the coefficient of the number of firm's export destinations and its associated interaction terms with CEO characteristics are significantly positive. In column (1), if the CEO is female, the peer effect of the number of export destinations is amplified. One possible explanation is that female CEOs are more conservative and their risk aversion tends to be higher than male CEOs, and imitating the export behavior of the peer firms is a safer adjustment strategy. In column (2), if the CEO is younger, the peer effect of the number of export destinations is greater, reflecting the fact that the young CEOs in the implementation of export decisions show discretionary choosing and flexible learning behavior, while older CEOs are more inclined to follow industry standards. The results of column (3) show that for the CEO with relatively low level of education, the peer effect of the number of firm's export destination is greater. This suggests that low-educated CEOs may be more likely to mimic the decision-making behavior of highly educated CEOs with professional judgment, thereby reducing decision costs. The regression results of column (4) show that the longer the CEO takes office, the more obvious the peer effect in the number of export destinations. This may be due to the reason that the CEO will constantly revise the priori probability of their export decision making in accordance with the export behavior of the peer firms; with the accumulation of CEO's experience, the firms' export activities appear convergence in the group. The above results show that the demographic characteristics of firm's CEO differentiation directly affect the peer effect. In the appendix, we also use the export product scope and export value to do tests. In addition to the CEO age factor which does not significantly affect the peer effect, we also found an amplification effect of similar manager heterogeneity characteristics to the export behavior of the same group. Thus, the third hypothesis of this paper is validated.

CONCLUSIONS

Based on the theory of trade heterogeneity of firms, the study of export learning behavior often neglects the important influence of the peer effect on the export behavior of firms. In this paper, a new estimation method is used to analyze the peer effect of firm export behavior. Details are as follows:

First, the firms and their peers have same direction of the export adjustment behavior in the number of export destination, scope of export products and export value. A 1% increase of the number of export destinations, the scope of export products and the export value for the peer firms will increase the corresponding export activities of the firms in the group by 1.15%, 1.21% and 0.72% respectively. At the same time, the export peer effect is mainly caused by the export behavior changes within the group rather than by the characteristics of the firm.

Second, the export behaviors of firms, with low product quality, slow growth rate, and low export density, are influenced by that of firms with high export product quality, quick growth rate and high export density within the group. This conclusion shows that the peer effect of export behavior follows the logic of imitation law.

Third, from the perspective of the CEO's characteristics, this paper confirms that the peer effect of firms, with female CEOs, as well as CEOs who are relatively young, have a lower academic level and have a longer tenure, will be significantly enlarged, confirming the fact that the heterogeneous business managers whose risk preference and behavioral cognitive model have significant impact on the peer effect of the firms' export behavior.

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APPENDIX

Supplementary Results

Table A-1. T-Test of Scopes of Product Changes Based on Peer Firm Average Equity Shock and Peer Firm Average Scope of Product Changes

Peer Firm Average Equity Shock	Peer Firm Average Scope of Product Changes		
	Low 0-20%	**Median 50%-60%**	**Top 90%-100%**
Low 0-20%	3.039	6.429*	-4.158
	(3.932)	(3.846)	(3.873)
Median 50%-60%	-20.053**	-1.961	8.143
	(9.602)	(3.139)	(8.626)
Top 90%-100%	-7.874	7.219***	11.412***
	(7.749)	(2.370)	(3.859)

Note: standard errors are reported in parentheses, *** p<0.01, ** p<0.05, * p<0.1

Table A-2. T-Test of Export Value Changes Based on Peer Firm Average Equity Shock and Peer Firm Average Export Value Changes (ten thousand dollars)

Peer Firm Average Equity Shock	Peer Firm Average Export Value Changes		
	Low 0-20%	**Median 50%-60%**	**Top 90%-100%**
Low 0-20%	30.89	38.53*	40.11
	(217226)	(209956)	(439955)
Median 50%-60%	-79.26	-0.78	289.68***
	(519342)	(450793)	(1112702)
Top 90%-100%	23.14	58.72***	408.78
	(2564412)	(207860)	(2519088)

Note: standard errors are reported in parentheses, *** p<0.01, ** p<0.05, * p<0.1

Table A-3. Influences of CEOs on the Peer Effect of Ranges of Product

	Log_#Product			
	Gender (1)	**Age (2)**	**Education (3)**	**Tenure (4)**
Log_#Product	1.139*** (0.427)	1.242*** (0.444)	1.065** (0.426)	1.189*** (0.434)
Log_#Product×CEO Characteristics	0.104*** (0.040)	0.056** (0.022)	0.240*** (0.045)	0.047*** (0.018)
First-Stage F-stat.	16.40**	16.14**	16.14**	16.19**
Peer Firm Average Variables	Yes	Yes	Yes	Yes
Firm-Specific Variables	Yes	Yes	Yes	Yes
Group-firm Fixed Effects	Yes	Yes	Yes	Yes
Industry-year Fixed Effects	Yes	Yes	Yes	Yes
Obs.	5,201	5,201	5,201	5,201

Note: standard errors are reported in parentheses, *** p<0.01, ** p<0.05, * p<0.1 ** F-stat< 10% maximal IV size, *F-stat< 15% maximal IV size

Table A-4. Influences of CEOs on the Peer Effect of Export Value

	Log_Value			
	Gender (1)	**Age (2)**	**Education (3)**	**Tenure (4)**
Log_Value	0.677*** (0.235)	0.734*** (0.240)	0.691*** (0.238)	0.716*** (0.238)
Log_#Value×CEO Characteristics	0.054*** (0.015)	0.012 (0.009)	0.065*** (0.016)	0.015** (0.007)
First-Stage F-stat.	45.18**	44.23**	44.13**	44.42**
Peer Firm Average Variables	Yes	Yes	Yes	Yes
Firm-Specific Variables	Yes	Yes	Yes	Yes
Group-firm Fixed Effects	Yes	Yes	Yes	Yes
Industry-year Fixed Effects	Yes	Yes	Yes	Yes
Obs.	5,201	5,201	5,201	5,201

Note: standard errors are reported in parentheses, *** p<0.01, ** p<0.05, * p<0.1 ** F-stat< 10% maximal IV size, *F-stat< 15% maximal IV size