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Research Article

The Intensive and Extensive Margin of Aquatic Product Export in China

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Abstract: This study is aim to find out the contribution of intensive margin and extensive margin of Chinese aquatic products export. We construct a measure of the export margin and exploit export data of Chinese firms to analyze it, the result imply that intensive margin affect the export growth significantly, while the role of extensive margin is much important than intensive margin facing external shocks. We also find heterogeneity of markets and firms influence contribution of intensive margin and extensive margin differently: (i) intensive margin plays a positive and steady role in export growth which is imported by developing economies, while external shocks affect intensive margin negatively which is exported to developed economies; (ii) intensive margin and extensive margin of state-owned enterprises negatively impact exports in most years, while the contribution of intensive margin compared with extensive margin more pronounced on both private and foreign firms. However, the impact of external shock on intensive margin of foreign companies is more significantly.

Keywords: Aquatic product, extensive margin, intensive margins

INTRODUCTION

China has ranked at the first place in seafood export since 2002 and kept this primacy for more than 10 years. In 2012, the export of China's aquatic product was $18.21 billion, when the global exports reached 129.3 billion dollar, accounting for 14.1% of global exports. As one of the important products, export of aquatic products has a significant impact on China's exports. The export of aquatic accounted for 29.1% when China's export of agricultural products amounted to $62.5 billion in 2012. It should be noted that the export of seafood accounted for only 0.9% in 2012 when China's goods export reached $2048.78 billion. However, the surplus of aquatic product reached $10.77 billion that contributed 4.7% to the trade surplus when the goods trade surplus reached $230.58 billion. Although the scale of aquatic export trade is small in goods trade, it plays a significant role in promoting Chinese trade to develop.

As one of the important agricultural products, aquatic products play a pivotal role in the economy of China and even the World, the development of China's marine economy is inseparable from the development of aquatic products industry, while the export of aquatic products is an important way to the development of aquaculture. Although the share of China's exports is high in global market, however, it is not conducive to the sustainable development of China's seafood exports if products are vulnerable to anti-dumping, anti-subsidy and technical barriers for trade, owning to concentration of export market and the product of simple structure.

China has been the world's largest exporter of aquatic products since 2002, even the trade friction continued. Now scholars concern about the motivation of export's growth and the promoting factors for exports. Traditional international trade theory suggests that a country's participation in the export trade is decided by an absolute or comparative advantage the product has, the growth of a country's exports followed by the expanding of goods scale. The 'New-new Trade Theory' shows that higher firm productivity can overcome the fixed costs of export trade, entering and exiting export market of company constitutes extensive margin and expansion in the export amount dimensions constitute intensive margin, (Melitz, 2003) points out that the growth of a country's export achieved along with the expansion of intensive margin and extensive margin. To some extent product differentiation reflects the firm productivity situation, growth of exports can be viewed as the export of existing products and new products (Amiti and Freund, 2010). Fixed costs of different export markets are not the same, heterogeneous firms trade theory make the definition of export margin (intensive margin and extensive margin) based on the perspective of product and market dimensions and investigate dynamic changes of export growth.

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Existing literatures describe or verify the factors which affect aquatic export (Shyam *et al*., 2004), but rarely analyze the sources or paths of seafood export. This paper targets to analyze intensive and extensive margin of aquatic products export based on the respect of product-country pair and deeply understanding of aquatic products' path to grow, which is beneficial to grasp the substance of the growth of aquatic products in China. We also examine the effects of export margin in different destinations and the influence of heterogeneity of firms on the contribution of export margin in more detail.

LITERATURE REVIEW

Most of researches explain the motivation and substance of export growth based on the dimension of export margin, the contribution of intensive margin and extensive margin have generated considerable controversy in the existing literatures. Part of the literatures emphasizes the importance of extensive margin, (Evenett and Venables, 2002) studies export growth of 23 developing countries from 1970 to 1997 and finds that the expansion of extensive margin affects it profoundly. Hummels and Klenow (2005) extend the range of study to global trade, testing the difference of export margin among countries, the finding shows that extensive margins decide 60% of world's total exports. Another part of the literatures accentuate the role of the intensive margins. Previous studies confirm the importance of the intensive margins to export trade based on different countries. Amiti and Freund (2010) considers Chinese export growth from 1992 to 2005 mainly as a consequence of intensive margin, (Eaton *et al*., 2007) points out that although half of exporter is new entrant of export markets, export growth is still relying on intensive margin in Colombia. Some scholars combine these two types of research results in their paper (Bernard *et al*., 2009), they stress the two margin contribute to variation in American trade across trading partners, types of trade and both time dimensions and also believe the variation of trade across trading partners is mainly determined by extensive margin, while variation of trade across one year interval relies on intensive margin.

Scholars discuss the contribution of intensive margin and extensive margin of export growth from different perspectives, while the existing literatures do not analyze role of export margin in the field of marine products. Most researchers study the determinants of aquatic products, including exchange rate, anti-dumping measure, import competition, Safety Control Systems and so on (Asche, 2014; Bagumire *et al*., 2009; Curzi *et al*., 2014; Kinnucan and Myrland, 2006). Little has pay attention to the role of product structure and market structure, (Somasekharan and Parameswaran, 2013) employs Constant Market Share (CMS) approach to study the market size effect and market composition effect on the export growth of Indian seafood product. Sarada *et al*. (2006) further imply that the commodity concentration and geographic concentration of Indian seafood have a positive effect on export value.

Analysis of intensive margin and extensive margin of aquatic product export is contained in the framework of the research of agricultural export margin. Liapis (2009) decomposes agricultural exports of 69 countries between 1996 and 2006 into four parts which are new export products to new markets, new export products to the old markets, the old export products to new markets and old products to the old partners' markets, indicating that the rule of extensive margin is unobvious. Scoppola *et al*. (2014) further examines the factors affecting export margin and show that the EU PTAs affect agricultural extensive margins positively, especially through other than tariff impacts linked with the PTA. This study will deepen the decomposition of China's seafood export on the basis of existing research, examine the contribution of intensive margin and extensive margin, analyze the relationship between the export margin and different types of enterprises and export markets.

MATERIALS AND METHODS

Data sources: We use the export data of Chinese firms over the 2000-2010 period which is recently released by Chinese Customs office to measure the intensive margin and extensive margin of aquatic products and analyze the essence of China's aquatic product trade deeply. The aquatic products refer to the products in the eight-digit. Harmonized System (HS), including 03011000-03079990 (Fish, crustaceans, mollusks and other aquatic in vertebrates), 05080010-05080090 (Coral and similar materials), 05090000 (Natural sponges of animal origin), 12122010-12122090 (Seaweeds and other algae), 13023100 (Agar-agar), 15041000-15043000 (Fats and oil and their fractions, of fish or marine mammals), 16030000 (Extracts and juices of meat, fish or crustaceans, mollusks or other aquatic invertebrates), 16041110-16059090 (Prepared or preserved fish, caviar and caviar substitutes prepared from fish eggs), 23012010-23012090 (Flours, meals and pellets, of fish of crustaceans, mollusks or other aquatic invertebrates), 28012000 (Iodine), 29054300 (Mannitol), 39131000 (Alginic acid, its salts and esters) and 71011010-71012290 (Pearls, natural or cultured).

The HS code has been adjusted twice during 2000-2010, 2002 (1 year after China's accession to the WTO) and 2007. In order to ensure the consistency of statistical standards, avoid the influence of the adjustment on the relation of product structure and export, parts of the HS code have been adjusted. For example, the *Thunnus thynnus* Eels (HS code: 03019410) and *Thunnus maccoy* Eels (HS code:

03019510) have been separated from other fry (HS code: 03019919) in 2007-2010, we reconvert the product to 03019919 over the period; the Tilapia (HS code: 03019991) and other cavefish (HS code: 03019999) have been isolated from other cavefish (HS code: 03019990) in 2002-2010, we reconvert the product to 03019990 during the period.

Analysis methods: The existing of different methods to define export margin is the main reason for dispute on the contributions of intensive margin and extensive margin on export trade. There are three main methods to define respectively:

- Amurgo-Pacheco and Piérola (2007) defines intensive margin as old product being exported to the old market and extensive margin as the sum of new product being exported to old market, old product being exported to new market and new product being exported to new market.
- Melitz and Redding (2014) makes a definition of the intensive margin as exports of a given firm and the extensive margin as the number of exporting firms at firm level, while (Bernard *et al*., 2014) decompose the export flows at three dimensions of firm, product and market into intensive and extensive margin.
- Some scholars think intensive margin as the export growth of the destination where have been exported to and extensive margin as the export growth of newly established partnership (Helpman *et al*., 2008).

Most of literatures on intensive margin and extensive margin are based on 'product and market' perspective using HS six-digit code. It is difficult to refine the product category, leading to different results. We use HS 8 digital code to redefine the category, making the export margin more detail. To better illustrate the export margin of seafood export in China, we also use descriptive statistics of the export from the perspective of firms, it shows that Chinese seafood exports are mainly dependent on the intensive margin.

We follow the empirical strategy of Liapis (2009) to analyze the contribution of different product-market pair on export trade of the aquatic product. Total export will be decomposed into old products being exported to old destinations, old products being exported to new destinations, new products being exported to old destinations and new products being exported to new destinations, the former is intensive margin and extensive margin of the three later. We focus on the source of export growth, which means the contribution of intensive margin and extensive margin, the decomposition of export as follows.

where, i stands for product, I for the set of product, j stands for export market, J for the set of export market, t for year. OP refers to the set of product which were exported in t-1 and t period (continuing products), NP refers to the set of product which were exported in t period and were not exported in t-1 period (new products), DP refers to the set of product which were exported in t-1 period and were not exported in t (disappearing products), OD refers to the set of markets where products were exported to in the period (continuing markets), NP refers to the set of markets where products were exported to in t period and were not exported to in t-1 period (new markets), DP refers to the set of markets where products were exported to in t-1 period and were not exported to in t period (disappearing markets). It should be noted that the market of 'old products being exported to new destinations' and 'new products being exported to new destinations' are determined at the HS 6-digit level:

$$\begin{aligned}
&\sum_{i=1}^{I_t}\sum_{j=1}^{J_t} X_{t,i,j} - \sum_{i=1}^{I_{t-1}}\sum_{j=1}^{J_{t-1}} X_{t-1,i,j} \\
&= \underbrace{\sum_{i=1}^{I_t^{OP}}\sum_{j=1}^{J_t^{OD}} (X_{t,i,j} - X_{t-1,i,j})}_{\text{Intensive margin}} \\
&+ \underbrace{\sum_{i=1}^{I_t^{NP}}\sum_{j=1}^{J_t^{OD}} X_{t,i,j} - \sum_{i=1}^{I_{t-1}^{DP}}\sum_{j=1}^{J_{t-1}^{OD}} X_{t-1,i,j}}_{\text{Entensive margin}} \\
&+ \sum_{i=1}^{I_t^{OP}}\sum_{j=1}^{J_t^{ND}} X_{t,i,j} - \sum_{i=1}^{I_{t-1}^{OP}}\sum_{j=1}^{J_{t-1}^{DD}} X_{t-1,i,j} \\
&+ \sum_{i=1}^{I_t^{NP}}\sum_{j=1}^{J_t^{ND}} X_{t,i,j} - \sum_{i=1}^{I_{t-1}^{DP}}\sum_{j=1}^{J_{t-1}^{DD}} X_{t-1,i,j}
\end{aligned} \quad \text{Entensive margin} \quad (1)$$

Export of china's aquatic product: The results shows that China's aquatic products exports increased from 3.83 billion dollar in 2000 to 13.76 billion dollar in 2010, 2.59 times than the export of 2000 year, with an average annual exported 7.97 billion dollar (column 5). Meanwhile, the number of exporters increased from 11,092 to 13,948 during this period, annual export enterprise is about 13,047 (column 3). While, the export product range from 55 to 34 species during the period (column 2), one of the reasons is the species were reclassified. we can find that the number of export enterprises and product categories did not change obviously (Fig. 1), along with the rapid growth of exports, that is to say the Chinese aquatic products export mainly depend on the companies and products have been exported. Column 7 and 8 in Table 1 demonstrates average number at product-market pair per firm and average exports at products-market pair

Table 1: Export of China's aquatic product

Year	Number of products	Number of firms		Value of products		Average number at product-market pair per firm	Average exports at products-market pair per firm (1000000$)
		N	Total (%)	Value 1000000$	Total (%)		
2000	1	1600	14.42	503.03	13.12	2.32	1.03
2000	2	1337	12.05	367.28	9.58	7.28	0.39
2000	3	935	8.43	282.08	7.36	8.74	0.47
2000	4	816	7.36	285.93	7.46	13.40	0.35
2000	5	782	7.05	280.34	7.31	16.93	0.29
2000	6-10	2411	21.74	731.59	19.09	29.56	0.05
2000	11-20	2181	19.66	840.68	21.93	65.29	0.03
2000	21-30	746	6.73	307.25	8.02	208.42	0.02
2000	>30	284	2.56	234.78	6.13	693.02	0.02
2001	1	1735	15.33	391.69	8.68	2.55	1.02
2001	2	1374	12.14	463.89	10.28	6.46	0.51
2001	3	1053	9.30	422.43	9.36	14.03	0.31
2001	4	819	7.23	392.87	8.71	15.03	0.37
2001	5	702	6.20	226.62	5.02	20.47	0.31
2001	6-10	2553	22.55	982.11	21.77	29.18	0.06
2001	11-20	2162	19.10	1076.06	23.85	82.70	0.03
2001	21-30	590	5.21	303.60	6.73	224.23	0.03
2001	>30	333	2.94	253.05	5.61	484.89	0.03
2002	1	1808	15.15	590.44	12.58	2.62	0.99
2002	2	1308	10.96	353.85	7.54	6.31	0.57
2002	3	1139	9.54	349.76	7.45	14.76	0.28
2002	4	914	7.66	459.28	9.78	14.85	0.35
2002	5	788	6.60	329.09	7.01	16.93	0.35
2002	6-10	2851	23.88	1130.09	24.07	32.48	0.05
2002	11-20	2343	19.63	1073.33	22.86	67.99	0.03
2002	21-30	637	5.34	294.52	6.27	216.79	0.03
2002	>30	149	1.25	114.52	2.44	519.41	0.06
2003	1	2005	16.38	680.82	12.40	2.84	0.96
2003	2	1591	13.00	501.10	9.12	8.09	0.43
2003	3	1210	9.89	668.38	12.17	14.51	0.31
2003	4	1090	8.91	489.48	8.91	23.17	0.22
2003	5	784	6.41	441.45	8.04	22.23	0.32
2003	6-10	2669	21.81	1242.83	22.63	31.15	0.07
2003	11-20	2267	18.52	1115.31	20.31	79.45	0.03
2003	21-30	520	4.25	317.13	5.77	258.15	0.04
2003	>30	103	0.84	35.06	0.64	564.88	0.09
2004	1	2399	18.27	1058.08	15.18	3.18	0.91
2004	2	1649	12.56	652.35	9.36	8.95	0.47
2004	3	1355	10.32	684.04	9.81	16.57	0.31
2004	4	994	7.57	682.87	9.79	21.65	0.32
2004	5	935	7.12	496.39	7.12	22.90	0.33
2004	6-10	3210	24.44	1805.77	25.90	39.39	0.06
2004	11-20	2097	15.97	1258.24	18.05	83.18	0.04
2004	21-30	419	3.19	250.17	3.59	266.77	0.06
2004	>30	74	0.56	84.13	1.21	717.03	0.13
2005	1	2530	18.26	867.69	10.97	2.92	1.07
2005	2	1678	12.11	712.99	9.02	9.01	0.52
2005	3	1590	11.47	897.45	11.35	17.55	0.28
2005	4	1285	9.27	936.87	11.85	21.47	0.29
2005	5	1106	7.98	771.22	9.75	34.93	0.20
2005	6-10	3336	24.07	2068.00	26.15	46.56	0.05
2005	11-20	2006	14.48	1297.91	16.41	99.31	0.04
2005	21-30	291	2.10	302.40	3.82	263.05	0.10
2005	>30	36	0.26	52.38	0.66	1044.00	0.21
2006	1	3080	20.76	1095.00	11.69	3.36	0.91
2006	2	2055	13.85	1088.84	11.62	11.45	0.40
2006	3	1623	10.94	1045.02	11.15	20.51	0.28
2006	4	1335	9.00	908.30	9.69	25.75	0.27
2006	5	1067	7.19	862.11	9.20	27.69	0.32
2006	6-10	3587	24.18	2718.79	29.01	65.30	0.04
2006	11-20	1741	11.73	1405.08	14.99	130.19	0.04
2006	21-30	277	1.87	167.71	1.79	223.65	0.15
2006	>30	72	0.49	79.62	0.85	444.63	0.29
2007	1	3483	23.29	1458.93	14.97	4.18	0.67
2007	2	2220	14.84	1120.13	11.49	11.69	0.38
2007	3	1917	12.82	1405.96	14.42	27.71	0.18
2007	4	1400	9.36	1176.22	12.07	33.79	0.21

Table 1: Continue

Year	Number of products	Number of firms		Value of products		Average number at product-market pair per firm	Average exports at products-market pair per firm (1000000$)
		N	Total (%)	Value 1000000$	Total (%)		
2007	5	1164	7.78	918.87	9.43	31.81	0.26
2007	6-10	3193	21.35	2356.89	24.18	64.32	0.05
2007	11-20	1385	9.26	1073.67	11.01	143.40	0.05
2007	21-30	196	1.31	237.11	2.43	371.44	0.13
2008	1	3221	25.05	1817.03	17.10	4.99	0.66
2008	2	2142	16.66	1484.48	13.97	14.71	0.34
2008	3	1400	10.89	1214.38	11.43	24.50	0.31
2008	4	1426	11.09	1587.15	14.94	41.91	0.18
2008	5	1059	8.24	1023.87	9.64	48.38	0.21
2008	6-10	2693	20.95	2409.60	22.68	80.05	0.05
2008	11-20	887	6.90	1017.45	9.58	150.90	0.08
2008	21-30	28	0.22	70.10	0.66	728.00	0.52
2009	1	2901	21.74	1275.12	11.88	4.64	0.80
2009	2	2105	15.77	1587.97	14.79	12.83	0.40
2009	3	1594	11.95	1251.67	11.66	27.15	0.25
2009	4	1318	9.88	1247.10	11.61	31.93	0.26
2009	5	1158	8.68	1035.48	9.64	49.43	0.19
2009	6-10	3065	22.97	2825.17	26.31	82.04	0.04
2009	11-20	1066	7.99	1199.56	11.17	164.97	0.06
2009	21-30	137	1.03	315.09	2.93	613.23	0.13
2010	1	3123	22.39	1627.18	11.83	4.54	0.97
2010	2	2120	15.20	1785.61	12.98	13.92	0.47
2010	3	1787	12.81	1763.87	12.82	26.95	0.29
2010	4	1407	10.09	1404.65	10.21	43.35	0.23
2010	5	1201	8.61	1387.81	10.09	53.69	0.21
2010	6-10	3057	21.92	3493.02	25.39	97.20	0.05
2010	11-20	1059	7.59	1738.71	12.64	196.95	0.07
2010	21-30	121	0.87	261.26	1.90	434.26	0.26
2010	>30	73	0.52	295.41	2.15	909.18	0.21

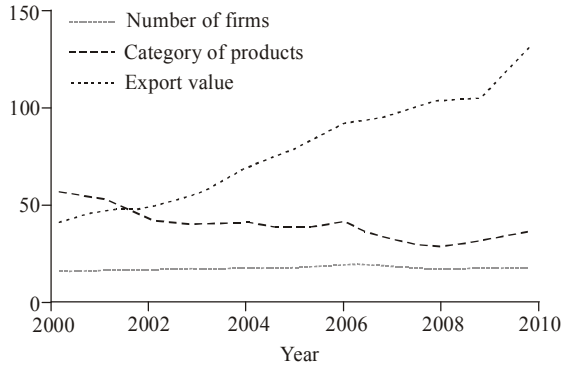

Fig. 1: Export of China's aquatic product; for the purpose of comparing the trend of number of firms, export value and category of products, we change the original data of those variables in different way: (1): The unit of number of firms is 1000; (2): The unit of export value is 100 million dollar; (3): The unit of category of products is 1

per firm, implying that the export is mainly relies on certain kinds of core products and the market is highly concentrated.

RESULTS AND DISCUSSION

Baseline results: Splitting the growth of aquatic product export into intensive margin and extensive margin shows that the latter affects China's export significantly (see row 12 and 16): intensive margin generates about 95% of annual export growth (except for the year of 2001 to 2002, 2006 to 2007 and 2008 to 2009), on average, indicating that the export of continuing products and destinations drive most of the year to year fluctuations. While the contribution of intensive margin is above 100% in 2001 to 2002, several interpretations are available for the fact that China's entry into World Trade Organization (WTO). One is that the reduction of tariff is quite modest for the original export which decreasing the variable cost. An alternative interpretation is that the relative increase of sunk cost which adds to the difficulty of exporting of new products or exporting to a new market difficult.

As we can see, the contribution of intensive margin is negative in 2006 to 2007. The main reason is the impact of a managed floating exchange rate regime which established in 2005. The RMB exchange rate appreciated from 8.11 in 2006 to 7.74 in 2007, which fell below 8 for the first time. Héricourt and Poncet (2013) find that firms' decision to begin exporting (extensive margin) and the exported value (intensive margin) decrease for markets with a higher exchange rate volatility, while the moderating role of Total Factor Production (TFP) on continuing exporters is positive (Berman *et al*., 2012). The number of exporter mentioned above is stable, most of which continue to export in following years. TFP effects will be achieved by the expansion of new products and the contribution of new products is 637.9% ((13) + (14) in Table 2), so the influence of the exchange rate system is positive on extensive margin. While, the effect of extensive margin on export is much more important than the influence of intensive margin in 2008 to 2009, during which the

Table 2: The intensive margin and extensive margin of export of aquatic product

	2000-2001	2001-2002	2002-2003	2003-2004	2004-2005	2005-2006	2006-2007	2007-2008	2008-2009	2009-2010
1. Old products-old markets in current year	4476.81	4637.17	5413.95	6899.28	7833.99	9284.72	7277.85	10549.80	10571.40	12979.40
2. Old products-old markets in last year	3816.48	4441.65	4682.09	5475.90	6941.89	7864.12	9178.77	9699.65	10550.20	10261.50
3. Old products-new markets in current year	35.04	34.49	77.55	72.73	70.97	84.88	62.00	74.29	164.76	118.30
4. Disappearance of markets	14.98	69.55	11.40	14.92	29.72	42.28	190.81	47.46	73.69	66.27
5. New products-old markets in current year	0.09	21.85	0.00	0.02	0.00	0.08	0	0.02	0.48	659.27
6. Disappearance of products	0.82	0.02	1.06	0.07	0.01	0.28	0.16	0.00	0.01	409.12
7. New products-new markets	0.38	1.38	0.05	0.01	1.94	0.79	2407.94	0.00	0.53	0.56
8. Disappearance of product and market	0.66	1.11	0.34	0.66	0.43	0.23	0.73	0.67	0.15	0.27
9. Intensive margin	660.33	195.52	731.87	1423.38	892.10	1420.60	-1900.92	850.11	21.15	2717.89
10. Extensive margin	19.05	-12.97	64.81	57.10	42.76	42.96	2278.24	26.18	91.91	302.48
11. Contribution of intensive margin	97.20%	107.10%	91.86%	96.14%	95.43%	97.06%	-503.79%	97.01%	18.71%	89.99%
12. Contribution of old products to new markets	2.95%	-19.20%	8.30%	3.90%	4.41%	2.91%	-34.14%	3.06%	80.54%	1.72%
13. Contribution of new products to old markets	-0.11%	11.95%	-0.13%	0.00%	0.00%	-0.01%	-0.04%	0.00%	0.42%	8.28%
14. Contribution of new products to new markets	-0.04%	0.15%	-0.04%	-0.04%	0.16%	0.04%	637.97%	-0.08%	0.33%	0.01%
15. Contribution of extensive margin	2.80%	-7.10%	8.14%	3.86%	4.57%	2.94%	603.79%	2.99%	81.29%	10.01%

(a): Intensive margin (9) = (1) - (2); (b): Extensive margin (10) = (3) - (4) + (5) - (6) + (7) - (-8); (c): Contribution of intensive margin (11) = (9) / ((9) + (10)); (d): Contribution of extensive margin (15) = (10) / ((9) + (10)) or (15) = (12) + (13) + (14); (5): We just give the results of contribution of intensive margin and extensive margin in following tables (Table 3 and 4) in order to make the findings more concise

Table 3: The effects of market and firm heterogeneity

	2000-2001 (%)	2001-2002 (%)	2002-2003 (%)	2003-2004 (%)	2004-2005 (%)
Developing economies:					
Contribution of intensive margin	51.36	74.27	67.47	86.56	93.23
Contribution of extensive margin	48.64	25.73	32.53	13.44	6.77
Developed economies:					
Contribution of intensive margin	97.67	132.71	95.04	98.24	95.65
Contribution of extensive margin	2.33	-32.71	4.96	1.76	4.35
State-owned firms:					
Contribution of intensive margin	92.52	-88.87	-113.51	95.10	-97.21
Contribution of extensive margin	7.48	-11.13	13.51	4.90	-2.79
Private firms:					
Contribution of intensive margin	89.76	87.47	77.94	94.95	93.36
Contribution of extensive margin	10.24	12.53	22.06	5.05	6.64
Foreign firms:					
Contribution of intensive margin	95.79	98.09	92.47	89.43	91.56
Contribution of extensive margin	4.21	1.91	7.53	10.57	8.44
	2005-2006 (%)	2006-2007 (%)	2007-2008 (%)	2008-2009 (%)	2009-2010 (%)
Developing economies:					
Contribution of intensive margin	86.21	79.85	92.88	76.26	89.34
Contribution of extensive margin	13.79	20.15	7.12	23.74	10.66
Developed economies:					
Contribution of intensive margin	99.04	-724.73	100.68	137.81	90.21
Contribution of extensive margin	0.96	824.73	-0.68	-37.81	9.79
State-owned firms:					
Contribution of intensive margin	99.44	-450.37	-94.85	-99.65	4.25
Contribution of extensive margin	0.56	350.37	-5.15	-0.35	95.75
Private firms:					
Contribution of intensive margin	94.89	-274.23	98.27	-145.85	95.78
Contribution of extensive margin	5.11	174.23	1.73	45.85	4.22
Foreign firms:					
Contribution of intensive margin	96.61	-1667.17	-98.62	-109.35	92.06
Contribution of extensive margin	3.39	1767.17	-1.38	9.35	7.94

Table 4: The results of robust test

	2002-2003	2003-2004	2004-2005	2005-2006	2006-2007	2007-2008	2008-2009	2009-2010
Robust test 1: Old product were exported at least 3 years during 2000-2004, otherwise product is defined as new product								
Contribution of intensive margin			102.76	102.52	-490.96	-189.21	-2182.84	-7.00
Contribution of extensive margin			-2.76	-2.52	590.96	289.21	2282.84	107.00
Robust test 2: Old product were exported at least 3 years during 2000-2003, otherwise product is defined as new product								
Contribution of intensive margin		97.30	95.14	83.35	-617.85	-268.87	-2417.37	-17.21
Contribution of extensive margin		2.70	4.86	16.65	717.85	368.87	2517.37	117.21
Robust test 3: Old product were exported at least 2 years during 2000-2003, otherwise product is defined as new product								
Contribution of intensive margin	95.94	97.31	95.28	83.55	-617.10	-268.58	-2413.82	-17.06
Contribution of extensive margin	4.06	2.69	4.72	16.45	717.10	368.58	2513.82	117.06

The data unit is percentage (%)

financial crisis exploded. We should notice that the influence of crisis happens in the next year, the changes in the export margin accounting for external shocks that change the demand pattern, especially for old products and old markets. The result also shows that the rule of old products export to new destinations plays a positive role on export growth (row 13), while the contribution of new products is negatively in most years (row 14 and 15), the reason for the finding is that the category of aquatic products is limited (Table 2).

Results of subsample: To give a more detailed picture of export margin with countries and firms, Table 3 breaks countries into two subgroups:

- Developed economies, including United States, the United Kingdom, Germany, France, Japan, Korea, Hong Kong and so on
- Developing economies, the rest of world[1]

We also divide firms into three groups: stated-owned firms, which include collectively-owned enterprise and stated-owned firms; private companies; foreign enterprises are comprised of solely foreign-owned enterprises, Sino-foreign joint venture and Chinese-foreign cooperative enterprise. We now examine the effects of export margin in different destination and the influence of heterogeneity of firm on export margin in more detail.

Starting with the counts, Table 3 confirms that the contribution of intensive margin and extensive margin will be affected differently relying on the degree of economic development. It further shows that intensive margin plays a positive and steady role in export growth, which is imported by developing economies (row 3 and 4). The contribution of the margin is about 79.7%, while the external shocks have little influence on it. One of the possible reasons is that the import scale of those countries is not large enough and another reason is the effect of financial crisis is limited. However, as for the contribution of intensive margin and extensive margin for export to developed economies is consistent with the view discussed above (row 6 and 7), the establishment of managed exchange rate system and financial crisis affected intensive margin negatively, those countries were impacted by the crisis seriously.

Table 3 also presents the results from re-calculation of Eq. (1) for the group of 'state-owned firms', 'private firms' and 'foreign firms' separately. Since the year of 2002, intensive margin and extensive margin of state-owned enterprises negatively impact exports in most years (row 9 and 10), mainly because of weaker competitiveness of themselves. China's entry into WTO accelerating the competition that has taken the market share of State-owned firms. For private companies, compared with extensive margin of export growth, the intensive margin has a more pronounced influence on private companies (row 12 and 13), exporting though existed path may reduce trade cost and earn greater revenues. The export growth of foreign enterprises depends on the intensive margin, just as the export pattern of private companies. However, the impact of external shock on intensive margin is more significant (row 15 and 16), intensive margin effect is negative between 2006 and 2009, mainly due to the fact that foreign firms is more sensitive to changes of international market environment (Table 3).

Robustness of calculation: An alternative measure of old products, inspired by Amurgo-Pacheco and Piérola (2007), is the product that were exported at least 3 years before 2004, otherwise the product is defined as new product. We also define old products as all products that were exported at least 3 years before 2003 and 2 years before 2003, We can check the robustness of our calculation by different notion of old products and new products (Table 4). The effect of intensive margin is positive before 2007 of all robust tests (row 3 to 4, 6 to 7 and 9 to 10, respectively), while the role of extensive margin becomes negative after 2006 of the tests. The results reveal the fact that the contribution of intensive margin and extensive margin is reversed once the external economic circumstances changed, consistent with the basic result that intensive margin seems to be turning against the sustainable development of aquatic product's export.

CONCLUSION

The 'New-new trade theory' is central to the theory of international trade, especially intensive margin and extensive margin of trade. In this study we construct a measure of the export margin of aquatic product of China. The calculation is presented in section above. The result presents evidence that intensive margin affects the export growth significantly, while the role of extensive margin is much more important than intensive margin facing external shocks. Considering the effect of heterogeneity on contribution of two margins, we find that:

- Intensive margin plays a positive and steady role in export growth which is imported by developing economies, while external shock affects intensive margin negatively which is exported to developed economies.
- Intensive margin and extensive margin of state-owned enterprises negatively impact exports in most years, while the contribution of intensive margin compared with extensive margin are more pronounced on both private and foreign firms. However, the impact of external shock on intensive margin of foreign companies is more significant.

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End Note:

[1]: The division of developed and developing economy is based on the standards of World Bank, http://data. worldbank. org/about/country-and-lending-groups#High_income.