The China's Exchange Rate Policy to Export Competition

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Abstract

Purpose – The purpose of this paper was to analyze the Chinese government's announcement of the RMB's appreciation on July 1, 2010, and its aim was to ascertain whether the appreciation has affected Chinese export prices by empirically measuring the degree of the exchange rate pass-tough on those prices.

Research design, data, and methodology - Using 73 HS trade categories with cross-industry and time-series data, the panel estimation of a fixed-effects model has been applied to measure the degree and stability of any exchange rate pass-through effects. The estimation results show that the export prices of most trade categories were affected by the exchange rate changes. The pass-through effect was generally small, at about –0.485, and statistically significant in most export prices.

Results - The empirical results indicate that China would lose its advantage and competitiveness in export if the RMB were appreciated continuously and rapidly because its export goods would no longer operate under strong monopolistic competition.

Conclusions – The implications for China's exchange rate policy suggest that it would be better for the RMB to appreciate slowly and gradually rather than radically. It is clear that it would be allow the capital free flow in Chinese overall economic interest to reduce the continuous appreciation pressure on the currency and pave the way for improvements in export distribution competitiveness.

Keywords: Pass-Through, Export Pricing, Panel Estimation, Fixed-Effects Model.

JEL Classifications: E31, F3, F41, F42.

1. Introduction

The China-USA trade imbalance argument has captured widespread attention as China has contributed the largest share of America's trade deficit since 2000. In the past two decades, China's merchandise exports to the US have enlarged dramatically by more than 80 times in the last several decades with China's exports to the US rising from almost zero percent share of the US import in 1990 to 16.1% in 2013, in <Table 1>.

The issue which has come under most criticism is that of China's export share. This was the largest, rising up to 39%

of the US trade deficits in 2013, in <Table 2>.

That is why the US officials and the American trade unions have seriously criticized China's unfair trade practice. In the past couple years, the US applied pressure on China to open up its market and also exerted influence on the Chinese Government to appreciate the Renminbi (RMB) in order to improve the trade imbalances between China and the US. Market watchers expected China to announce this change and to appreciate the RMB during the last couple of years. In fact, it was only on 1st July 2010 that the Chinese People's Bank suddenly announced a two percent appreciation and also introduced a series of reforms in the foreign exchange system and market policy in order to allow more flexibility of the RMB. Since then, the RMB has steadily continued to appreciate and has now become the most important issue in China's monetary decisions that has captured the world's attention.

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<Table 1> Sino-US trade statistics (Millions USD)

	US merchandise Exports to China	Export to China shares of the US total exports%	US merchandise imports from China	Import from China shares of the US total imports %	US's trade balance with China	China shares of the US's total trade balance %
1990	3856	1.8	3862	1.1	-6	0.0
1991	3106	1.4	4771	1.3	-1665	1.2
1992	3497	1.4	6294	1.5	-2796	1.8
1993	5013	1.6	8511	1.9	-3489	2.9
1994	5755	1.6	11990	2.5	-6234	5.7
1995	4806	1.2	15237	3.1	-10431	10.3
1996	6278	1.5	18969	3.9	-12691	19.4
1997	7419	1.7	25728	4.8	-18309	21.7
1998	8763	1.9	31540	5.4	-22777	19.7
1999	9282	1.8	38787	5.8	-29505	19.6
2000	11754	2.0	45543	6.1	-33790	21.3
2001	11993	1.9	51513	6.5	-39520	23.2
2002	12862	1.9	62558	7.2	-49696	27.5
2003	14241	2.1	71169	7.8	-56927	24.8
2004	13111	1.9	81788	8.0	-68677	20.9
2005	16185	2.1	100018	8.2	-83833	19.2
2006	19182	2.6	102278	9.0	-83096	20.2
2007	22128	3.2	125193	10.8	-103065	22.0
2008	28368	3.9	152436	12.1	-124068	23.3
2009	34744	4.2	196682	13.4	-161938	24.9
2010	41837	4.6	243462	14.6	-201626	33.5
2011	55185	5.3	287774	15.5	-232588	28.4
2012	65236	5.6	321442	16.5	-256206	36.0
2013	71457	5.5	337789	16.1	-266332	39.3

Source: U.S. Census Bureau, 2013.

<Table 2 > Major sources of the USA's trade deficits (percentage shares, %)

Rank	1	2	3	4	5	6	7	8	9	10
2013	China	Canada	Japan	Mexico	Germany	Saudi Arabia	Ireland	Italy	S. Korea	Taiwan
%	39.33	11.02	10.73	9.51	6.32	6.25	3.38	3.05	1.96	1.63
2012	China	Japan	Mexico	Canada	Germany	Venezuela	Nigeria	Saudi Arabia	Malaysia	Italy
%	36.0	12.7	11.43	9.96	6.88	4.57	4.62	3.88	3.25	3.22
2011	China	Japan	Canada	Mexico	Germany	Malaysia	Nigeria	Venezuela	Italy	Ireland
%	28.4	10.8	8.9	7.8	5.8	2.9	3.1	3.4	2.5	2.5
2010	China	Canada	Japan	Germany	Mexico	Venezuela	Nigeria	Malaysia	Saudi Arabia	Ireland
%	33.5	12.7	13.7	8.4	8.3	4.6	3.8	3.9	3.4	3.2
2009	China	Japan	Canada	Germany	Mexico	Italy	Venezuela	Malaysia	Ireland	S. Korea
%	24.8	11.5	10.2	7.0	6.9	2.7	3.1	2.6	2.9	3
2008	China	Japan	Canada	Germany	Mexico	Ireland	Venezuela	France	S. Korea	Italy
%	23.2	12.3	10.2	7.3	7.6	3.4	2.6	2.2	2.4	2.7
2007	China	Japan	Canada	Germany	Mexico	Italy	Taiwan	Ireland	Malaysia	Mexico
%	22.0	14.9	10.6	7.6	7.9	3.0	2.9	3.3	2.9	2
2006	China	Japan	Canada	Germany	Mexico	Taiwan	Italy	S. Korea	Mexico	Malaysia
%	20.1	16.7	12.9	7.0	7.2	3.7	3.3	3.1	2.5	3.1
2005	China	Japan	Canada	Germany	S. Korea	Malaysia	Taiwan	Mexico	Italy	Venezuela
%	19.2	18.6	12.1	6.7	2.8	3.3	3.7	5.5	3.2	3.0

Source: U.S. Census Bureau, 2013.

In the past, traders did not need to consider the foreign exchange risk when they traded with the US due to the fact that under the fixed exchange rate system the RMB was fixed and linked to the US dollar. However, since 1st July 2010, traders have needed to reconsider the foreign exchange risks due to the uncertainty caused by the appreciation of the RMB. Exporters, in particular, would experience a direct effect on their pricing decisions, if they want to maintain their competitiveness and market share, due to exchange rate changes. Therefore, traders need to adjust their trade prices according to the foreign exchange rates changes (Barhoumi, 2005).

The purpose of this study is to empirically analyze the pass-through effect of the RMB appreciation on China's trade prices. We would like to estimate the degree of pass-through on different trade commodities to see how the appreciation of the RMB has affected China's export prices and to review China's export competition. A lower degree of RMB exchange rate pass-through on trade prices also has important implications for the China economy. It may have significant bearings on China's effort to correct the trade imbalance, particularly with the US. If trade prices are less responsive to changes in currency values, a larger appreciation of the RMB will be needed to narrow the trade imbalance.

2. Empirical Framework

Since the early 1970's, as most industrial countries adopted the flexible exchange rate system, the pass-through effect of exchange rate changes on trade prices has captured researchers' attention. Most studies have examined the pass-through degree and the stability of the trade prices during the fluctuation of exchange rates. This is because the pass-through effect of the exchange rate on import prices will have direct implications on local prices and inflation rates that impact production costs, output, employment and economic growth. Conversely, the pass-through effect on the export prices will have a direct effect on a country's external trade competition and market share that will cause changes in a country's balance of payments, foreign reserve, interest rate, currency value and economic policy, etc.

The empirical framework of this paper follows the studies of Gagnon and Knetter(1995), Knetter(1995), and Marazzi et al.(2005). First, considering a firm producing differential commodities for export to different markets, the firm's profit (π) is determined by

$$(1) \quad \pi = \sum_{i=1}^{n} px_i q_i - C\left[\sum_{i=1}^{n} q_i, pd_1, po_1\right]$$

Source: Gagnon & Knetter (1995).

In equation(1), px_i is the export price in terms of foreign currency values, q_i is the export quantities in foreign i market, C[.] is the total cost of production which is determined by different input factor costs, pd_1 is the domestic prices of factor costs, and po_1 is the domestic prices of inter-media imported factors when there is an appreciation in the export country, the price of inter-media imported factors would decline and lower the total costs of production.

On the other hand, the export pricing decision would consider each export market demand situation and the competitor prices, therefore, the export demand function in the foreign market is

$$(2) \quad q_i = Q_i\left[\frac{e_i px_i}{pc_i}, \lambda_i\right], \quad i = 1, \ldots, n \quad and \quad \frac{\partial q_i}{\partial \left[e_i px_i \middle/ pc_i\right]} < 0$$

Source: Gagnon & Knetter (1995).

In equation(2), e_i is the exchange rate of home currency against one unit of foreign currency, and pc_i is the foreign competitor price in terms of foreign currency. Basically all foreign competitor prices should include their local costs and competition factors. Where λ_i represent other factors. This export demand function not only reflects the foreign market demand but also reflects all the competition and market shares in the foreign export market. Based on the constraint of equation(2), taking the first-order differentiation and logarithmic of equation(1), it gives the following empirical equation

$$(3) \quad \ln(px_i) = \alpha_i + \beta_i \ln(MC_i) + (1 - \beta_i)\ln\left(\frac{pc_i}{e_i}\right), \quad s.t. \quad px_i \geq MC_i$$

Source: Gagnon & Knetter (1995).

In equation(3), α_i and β_i are the coefficients of the demand of the foreign export market. α_i reflects the markup profit on the export prices; usually the changes and the values of markup are dependent on the firm's market strategy while β_i reflects the marginal production costs of the export goods and is always responsive to the changes of markup and foreign competitor prices. Therefore, the change of export price is dependent on the change of the markup on marginal costs, competitor prices and exchange rates. Thus, an export firm would adjust its export prices in order to maximize its interest either in terms of profit or market shares. Simplifying equation(3) for empirical estimation gives

$$(4) \quad \ln(px_i) = \alpha_i + \beta_{1i} \ln(MC_i) + \beta_{2i} \ln(pc_i) + \beta_{3i} \ln(e_i) + \varepsilon_i$$

Source: Knetter (1995).

The exporter's marginal costs can be expressed as the domestic production cost, which is based on the local wage or price levels:

(5) $mc_{it} = c_0 + c_1 pd_{it} + \varepsilon_{it}$.

Source: Marazzi (2005).

Substitute equations(5) into equation(4), and the export prices can be written in a logarithm panel estimation specification as

(6) $px_{it} = c_0 + \beta_{0i} + \beta_{1it} pd_t + \beta_{2it} pf_{it} + \beta_{3it} e_{it} + \varepsilon_{it}$.

Source: Marazzi (2005).

From the estimation of equation, the coefficient measures the direct effect of exchange rate pass-through on the export prices in terms of local currency values as

(6') $\dfrac{\partial \ln px_i}{\partial \ln e_i} = \beta_{3i}$

Source: Marazzi (2005).

The interesting point is that when $\beta_{3i} > 0$, it means that when the local currency appreciates(exchange rate decline), it causes the export price(in terms of local currency) to be adjusted downward. Inversely, when $\beta_{3i} < 0$, it means that when the local currency depreciates(exchange rate rises), it causes an upward adjustment of the export price. Also, the estimated value of β_{3i} indicates the degree of competition of the particular goods in the foreign market. In general, when competition is high, all things being equal, the exporter would keep the export price unchanged or reduce its own markups in order to maintain its market share and its competitive edge in the foreign market, therefore minimizing

or lowering the degree of pass-through from home currency appreciation. When the pass-through is small, the exchange rate change is positively related to the export prices (i.e., $\beta_{3i} > 0$). However, when market competition is not so high, the exporter can upwardly adjust the export price when the home currency appreciates. Because the exporter does not have to worry about the loss of market share, he can maximize his markup and profit due to reduced competition in the foreign market; the exchange rate change will thus lead to a larger change in export price. When the pass-through degree is large, the change of export price will have a negative relationship with the exchange rate change (i.e., $\beta_{3i} < 0$).

3. Data And Estimation Method

In this paper, the sample data was obtained from China Customs. The monthly cross-section unit value indexes of export prices (pxi) of 76 selected SITC trade categories are used and the monthly sample period was from July 2010 to January 2014. The consumption indexes (CPIs) for different industries are proxy for the domestic production cost (pdi) and are basically obtained from the National Bureau of Statistics of China. Since the US is the largest export market for China's merchandise trade, the foreign competitor prices are proxy and are therefore obtained from the US Bureau of Labor Statistics which provides the import and export price indexes for different industries. The exchange rates of the RMB against the US dollar are the monthly

\<Table 3\> Estimated results of fixed-effect model

pxit	C	pdit	pfit	et	$\hat{\rho}$	$\overline{R}^2$	SEE	DW	N
Total	5.126**	0.077**	0.054**	-0.485**	0.823	0.983	0.035	1.786	3139
(1) Food & primary Pdt	6.933**	0.002	0.014	-1.087**	0.668	0.981	0.048	1.948	731
(2) Mineral Pdt (exclude oil)	9.665**	0.055	-0.270**	-1.703**	0.891	0.988	0.042	1.699	172
(3) Chemical & Allied Industries Pdt	4.616**	0.265	0.017	-0.581**	0.840	0.979	0.026	1.709	344
(4) Plastics & Articles, Rubber & Articles	-2.077	1.501**	0.048	-0.155	0.612	0.880	0.019	1.831	129
(5) Raw Hides & Skins, Leather, Furskins Pdt	4.026**	-0.108	0.360**	-0.260**	0.622	0.881	0.018	2.175	172
(6) Wood & Articles of Wood, Wood Charcoal & paper related Pdt	3.902**	-0.116	0.390**	-0.244**	0.613	0.903	0.033	1.857	172
(7) Textiles & Textile Articles	4.892**	-0.150*	0.129*	-0.087**	0.772	0.974	0.004	2.007	215
(8) Footwear, Headgear, Umbrellas, Gaiters & Parts of such Articles	2.047	-0.014	0.587**	-0.040	0.516	0.733	0.009	2.349	86
(9) Articles of Stone, Plaster, Cement, Ceramic & glassware	4.530**	-0.003	0.268**	-0.530**	0.659	0.889	0.027	2.019	215
(10) Base Metals & Articles of Base Metal	8.091**	-0.015	-0.096	-1.250**	0.893	0.981	0.039	1.446	301
(11) Machinery, Mechanical Appliances etc.	1.304**	0.008	0.759**	-0.121**	0.614	0.980	0.013	2.273	129
(12) Transportation, Vehicles, Aircraft, Vessel etc.	4.726**	0.001	0.094	-0.246**	0.553	0.911	0.009	2.262	172
(13) Optical, Photographic, Cinematographic, Measuring Inst. etc.	2.540**	0.390**	0.005	0.109*	0.775	0.879	0.003	2.124	86
(14) Manufacturing Pdt.	0.812	0.153	0.668**	-0.001	0.581	0.959	0.015	2.192	215

^p: the first order autocorrelation   *: 5% & 10 t-statistic

average values which are obtained from the China State Administration of Foreign Exchange (SAFE). The estimation results are based on the sample period from July 2010 to latest date with total more than 1200 observations. Given the continuous appreciation of the RMB within this period it is worth reviewing the degrees of exchange rate pass-through on China's export prices, and the impacts on China's export competition. The motivation for this study was the announcement of the RMB appreciation on 1st July 2010, and it intends to ascertain whether the appreciation has affected China's export prices. The purpose of this paper is to empirically measure the degree of exchange rate pass-through on China's trade prices. Using the 76 selected SITC trade categories with cross-industry and time-series data from July 2010 to January 2014, the panel estimation of the fixed-effect model is applied to measure the degree and stability of exchange rate pass-through on the export prices.

4. Empirical Results

<Table 3> reports the panel estimation results which are based on the fixed-effects model of equation(6) for 14 different industrial groups which contains 76 selected SITC trade categories, and the estimated period is from July 2010 to January 2014. From the estimated results, it can be seen that most of the trade categories show a statistically significant negative effect of the exchange rate pass-through. The panel-estimated pass-through effect for all categories is about –0.485, which means that a 1% appreciation in the RMB would induce only a 0.485% upward adjustment in the overall export price.

The results of the disaggregate industrial-level group estimation show that a relatively larger degree of exchange rate pass-through on the export price is exhibited in the (1) food and primary products, (2) mineral products, and (10) base metals and articles of base metal and steel categories and a relatively smaller degree in the following categories: (7) textiles and related products, (8) footwear, headgear, umbrellas, gaiters and the parts of such articles, (9) manufactured products, (13) optical, photographic, cinematographic and measuring instruments products, and (11) machinery and mechanical appliances. These are basically consistent with China's large percentage share of tradition labor-intensive export goods which are with lower values added and lower monopolistic competitiveness.

<Table 3> raises three interesting issues that need to be explained. First, there is a negative pass-through effect in most of the trade categories considered. In other words, the export prices of these goods experienced an upward adjustment following the RMB appreciation. Second, this effect in all of the trade categories was systematically small, which indicates that these goods face a relatively high degree of competition in foreign markets. Alternatively, it

may indicate that China's export goods do not enjoy a strong degree of monopolistic competition. The relatively small pass-through effects indicate that exporters generally choose to cut their own markups to maintain their existing market share and export competitiveness. Third, export prices appear to be mainly driven by foreign competitors' prices rather than by local price levels. This may reflect the growth in China's total exports during the period of RMB appreciation. This growth may have served to reduce markups and squeeze the profit margins of the country's exporters.

In general, our panel estimation of the exchange rate pass-through effect shows that the appreciation of the RMB has had a significant effect on the pricing behavior of Chinese exports. At the same time, however, it is also evident that the level of competition in international markets is very high and that Chinese exports do not enjoy strong monopolistic power in these markets. Therefore, the relatively small pass-through of the RMB appreciation has resulted in exporters adopting a lower pricing strategy and has, consequently, squeezed their markups.

5. Conclusion

5.1. Summary of Results of Research and Indications

The motivation for this study was the Chinese government's announcement of the RMB's appreciation on July 1st, 2010, and its aim was to ascertain whether that appreciation has affected China's export prices by empirically measuring the degree of the exchange rate pass-through on those prices. Using 73 HS trade categories with cross-industry and time-series data from July 2010 to January 2014, the panel estimation of a fixed-effects model has been applied to measure the degree and stability of any exchange rate pass-through effects. The estimation results show that the export prices of most of the trade categories were affected by the exchange rate changes. The pass-through effect was generally small, at about -0.485, and statistically significant in most of the export prices. Relatively smaller, although still significant, pass-through effects were found in the trade categories of (7)textiles and related products, (8)footwear and related products, and (14)manufactured consumer products. Furthermore, the estimation results of the three yearly dummy variables also provide evidence to show that the pass-through effects were more significant in the recent period of 2013, which indicates that China's export pricing strategy has recently increased awareness of exchange rate risks among exporters.

In general, the empirical results of this study indicate that, because there has been a relatively small degree of pass-through on export prices in the short run, the RMB

requires a larger range of appreciation to improve the trade imbalance between the U.S. and China. In the long run, China would lose its export advantage and competitiveness if the RMB were to continuously and rapidly appreciate, because its export goods would no longer operate under strong monopolistic competition. At the same time, the expansion of China's export trade is squeezing the markups of the country's exporters. These exporters therefore need to re-think their export pricing strategy and determine whether they want to keep their market share and remain competitive, but sacrifice their markups and profit levels. The findings of this study also have implications for China's exchange rate policy. They suggest that it would be better for the RMB to appreciate slowly and gradually rather than radically. It is also clear that it would be in China's overall economic interest to allow freer flows of capital to reduce the pressure on the continuous appreciation on the currency and pave the way for improvements in export competitiveness and profit margins.

5.2. Limitations and Further Recommendations

The review of the literature on pass-through, "a price response equal to one half the exchange rate change" was at that time of research "near the middle of the distribution of the estimated responses for the shipments to the U.S." (Goldberg & Knetter, 1997).

We find that several papers report estimates of a linear pass though equation similar to what we have used in this paper, usually considering various levels of dis-aggregation. Despite these conclusions, however, low estimates of pass through are often viewed with skepticism:

1. Low through estimates could reflect composition changes or other measurement problems, rather than low pass through at the individual levels.

2. There is relatively little work on the issue of whether pass through effects are nonlinear.

3. Some of the evidence on exposure of firm value and

profits to exchange rate changes is consistent with low and even falling pass-through.

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