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Article

The Impact of Terms of Trade on the Export Structure of Manufactured Products in Different Economic Developing Status

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Abstract: The Prebisch-Singer Hypothesis states that in structural time series analysis, the terms of trade between primary products and manufacturers have a negative deterministic trend. Many researchers argued that the deterioration in trade is the type of country in which the products are exported, regardless of whether the types of products exported by such countries are primary or manufactured products. This paper employs a development-differentiated model to analyze the correlation between various terms of trade and the export proportion of manufactured products on different economies of development status. In the long run, stable co-integration relations exist between terms of trade and the export proportion of manufactured products for development status. Furthermore, the increased proportion of manufactured products exports is the Granger casualty for the worse terms of trade for several economies of development status. The results demonstrated that changing the terms of trade is significantly influenced by structured changes in the export proportion of manufactured products for the development status of economies.

Keywords: Prebisch-Singer Hypothesis, Deterioration of Terms of Trade, Export Structure

1. Introduction

Prebisch (1950) and Singer (1950) had revealed that the Net Barter Terms of Trade (NBTT) between primary and manufactured products have a negative deterministic trend. This is the so-called Prebisch-Singer Hypothesis or Theory of Deterioration Terms of Trade (TDTT). This is due to the abundant labor force in developing economies with low wages and the fact that agricultural markets are similar to competitive markets in which productivity gains do not lead to high profits. Developed economies, which mainly produce manufactured products and face an imperfectly competitive international market, have reflected their technological progress and increased labor productivity in monopolized prices for their products. Increased labor productivity in developing economies has often led to a decline in prices and thus worsened the terms of trade. According to TDTT, many developing economies have begun to implement "import substitution" trade development strategies to avoid the continuous deterioration of the terms of trade by the export of primary products. The debate is also related to the treatment of transport costs and quality change (Sapsford and Chen, 1998).

The acceleration of the industrialization process in developing economies causes major changes in the structure of exporting commodities where the proportion of exports of manufactured products rises rapidly and replaces previously exporting products. At the same time, TDTT is altering from the past with the emphasis on the types of exports. Emmanuel (1969) believed the main reason for the TDTT was the type of economy in which the products were exported, regardless of whether the types of products exported by different economies were primary or manufactured products. Sarkar (1986) also examined the terms of trade behavior of the developing economies along with primary products and found an uneven distribution of gains from trade and economic progress. The interaction between developed and developing regions through multilateral development aided the distribution. Sarkar and Singer (1991) further developed the TDTT of export of manufactured products in 29 developing economies and regions between 1965–1985 and showed that the price index for exported manufactured products had fallen by an average of 0.65%. Ardeni and Wright (1992), however, found that the rate of decline was only about half what was predicted using the data available to Prebisch and Singer and the finding of secular deterioration was robust.

Zeng and Hu (2005) stated that the exporting proportion of the primary and manufacturing products both presented a negative correlation with the terms of trade in China. China's terms of trade were deteriorating even as the export industrial structure has been greatly upgraded and manufactured products have replaced primary agricultural and mineral products as the main export-generating products. Lutz (1999) nested the univariate and bivariate time-series models and strongly supported the Prebisch-Singer

hypothesis and rejected the recent finding that the terms of trade were characterized by infrequent negative shocks in favor of a long-term negative trend.

Cashin and Pattillo (2006) examined whether there was a relationship between the commodity terms of trade (the price of primary products relative to the price of manufactured products) and the NBTT of 42 Sub-Saharan African countries. For most countries, there was little evidence of a stable, long-run relationship between the two terms of trade series. Accordingly, the practice in the proxy for movements in any given country's terms of trade by using an aggregate index of relative commodity prices was inappropriate and was likely to mislead policy-makings and decisions. Witkowska (2016) selected EU member countries to demonstrate that the Prebisch-Singer hypothesis is used for the explanation of the diverging terms of trade development of industrialized countries with different export structures. A possible cause is a differing specialization in specific export sectors of these countries and the corresponding price developments of the exported products. Wacker *et al*. (2016) also highlighted the positive effect of foreign direct investment (FDI) and education levels on export upgrading and associated terms of trade in developing economies.

Arezki *et al*. (2014) re-examined the Prebisch-Singer hypothesis by using the secular trend and the short-run volatility as the dynamics of relative primary product prices. A total of 25 series were employed and a majority of them confirmed the hypothesis that relative commodity prices followed a downward secular trend. Geronimi and Taranco (2018) revisited the Prebisch-Singer hypothesis of a secular decline in the terms of trade of primary products (TTPC) by adopting two approaches of time series to allow the identification of a succession of three different dynamic regimes in the TTPC over the 1900–2016 period. The third regime (1986–2005) was characterized by the lowest level of terms of trade of the whole period, and the return to the second regime after 2005 was associated with a level of significantly higher price (57.5% higher than the previous prices). Such an upward shift in primary products' prices was unprecedented in the 20th century and could be an opportunity for developing countries that were specialized in exporting primary products.

With the acceleration of industrialization, the structure of China's export commodities has changed dramatically. Using data of manufactured products from UNCTAD as an example (Figure 1), the proportion of export of manufactured products from China to the world declined from 21.63% in 1995 to 15.76% in 2003, rose to 18.34% in 2008, and presented a dramatic fall to 15.38% in 2009 followed by steadily rising to 17.43% in 2019. During the same period, the NBTT of China also presented a consistent time-series trend. However, it deserved to examine the existence of development status which is consistent with Prebisch and Singer's Hypothesis and the terms of trade.

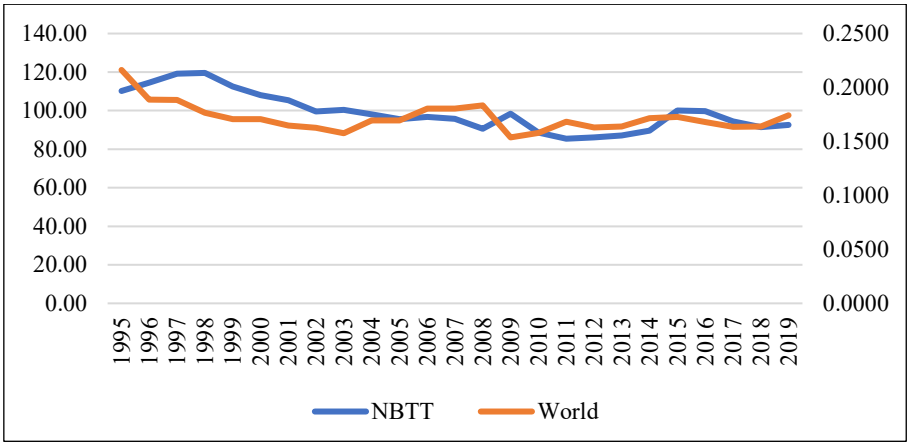

Fig. 1. Long-term time-series trend of China's NBTT and the proportion of exports of manufactured products from China to the world.

Using the time-series data from 1995 to 2019, we tested the impact of the structure of export on China's terms of trade on development-differentiated status. Four terms of trade (NBTT, export price index (P_X), import price index (P_M), income terms of trade (ITT)) are tested in four exported regions (the world ($MENU_{WD}$), developing economies ($MENU_{ING}$), transition economies ($MENU_{ION}$), and developed economies ($MENU_{ED}$)) to examine whether the upgrading of China's export structure in terms of the proportion of exports of manufactured products avoids the deterioration of Prebisch-Singer's terms of trade.

2. Time Trend of China's Terms of Trade

Cashin and Pattillo (2006) proposed a classical and general linear function to analyze the changing tendency of terms of trade using a time trend variable and a dependent variable as Equation (2).

$$\ln Y_t = \alpha + \beta T + \sum_{i=1}^{m} \beta_i \ln Y_{t-i} + \mu \quad (1)$$

where β_i is the coefficients and the absolute value of βi determines the stability of terms of trade. $|\beta_i| < 1$ means that the time-series data of the terms of trade are stable, and the results of the equation have good explanatory power. $|\beta_i| = 1$ means that there is a unit root problem with the time series data and variable differentials are to be made for stability. $|\beta_i| > 1$ means the variable cannot be regressed using the linear equation. We applied the equation of Cashin and Pattillo (2006) to measure the changing trend of China's export price of trade (P_X), the import price of trade (P_M), the net barter terms of trade (NBTT = P_X/P_M), and income terms of trade (ITT = NBTT × Q_X) in the same period based on the proportion of China's exported manufactured products from 1995 to 2019 (Fig. 2).

Fig. 2 shows that the trend variables of NBTT have generally been deteriorated over the past 25 years, while the rest of the terms of the trade index have increased. Specifically, the declined NBTT results from a high increase in P_M relative to P_X, and increased ITT is a result of a tremendous increase in the volume of exported products that offsets the relatively slight decline of NBTT. The volume index of exports (Q_X) increased from 8.32 in 1995 to 115.27 in 2019 with the index base of 2015 as 100.

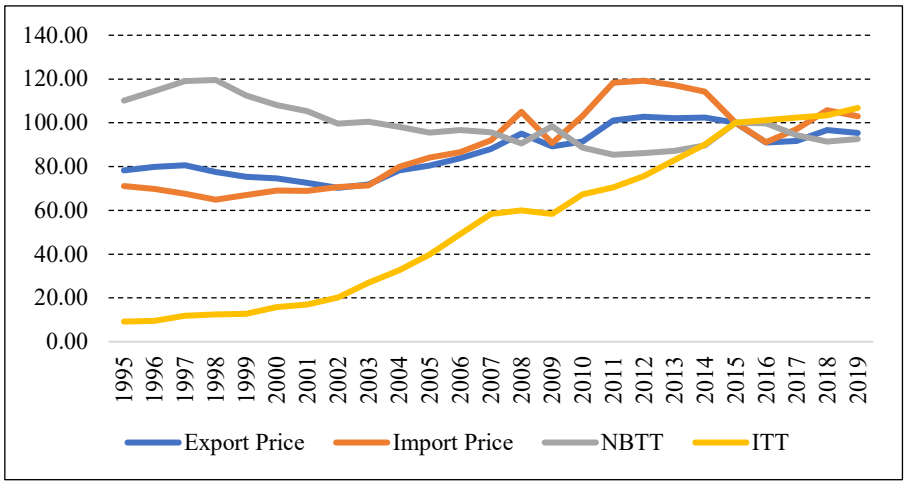

Fig. 2. China's terms of trade from 1995 to 2019.

The areas of exporting manufactured products from China are classified to the whole world, developing economies, transition economies, and developed economies (Fig. 3) to investigate the development-differentiated status in changes of the proportion of exported manufactured products. Fig. 3 demonstrates that the developing economies imported manufactured products from China at a high proportion. The tendency is consistent among the three economies through the period and coincides with Linder's theory of Preference Similarity in China (Li and Cao, 2005). The more similar the demand of economies, the more products are traded. International trade between two different economies has identical preferences as relying on specialization to create a comparative advantage in differentiated products.

For the transition economies, the proportion of exported manufactured products from China rose continuously from 1995 to 2019 with a peak in 2009. This is consistent with Funke and Ruhwedel (2005) who utilized the panel data for 14 East European economies and supported the hypothesis that a significant amount of export helped to explain relative GDP per capita. They concluded that the index of relative export across countries was significantly correlated with relative income per capita.

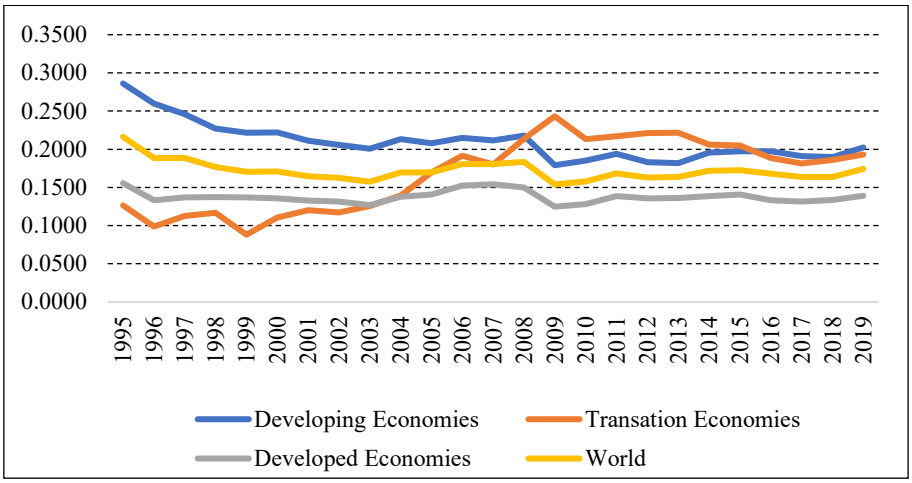

Fig. 3. The proportion of China's exported manufactured products from 1995 to 2019.

3. Development Status Investigation of Terms of Trade and Export Trade Structure

By using cointegration analysis, whether there is a long-term stable relationship between China's terms of trade and the structure of export to different economies of development status is investigated. The stability of each variable is tested for the non-smooth and the unit root inspection processes using the ADF method. Cointegration exists if all variables are in the same order and the linear combination of the variables is stable. Finally, Granger's causality test is used to analyze whether there is a causal relationship between the variables followed by the multiple regression models.

Table 1 presents the unit root test results for all variables of the terms of trade time- at the significant level of 5%. The first-order difference of all terms of trade is stable (they are all first- and single-order sequence I(1)) except IIT that is stable at the second-order difference level. The unit root test results for all proportion to the different economies ($MANU_{WD}$, $MANU_{ING}$, $MANU_{ION}$, and $MANU_{ED}$) are stable at the significant level of 5% except $MANU_{ION}$ that is stable at the first-order difference level. Co-integration exists only when two variables follow the same time-series process, or the time-series of dependent variables.

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Table 1. Unit root test results for all variables.

Variables	Test type (C, T, K)*	ADF-statistic	Test critical value (5% level)	Conclusion
NBTT	(C, 0, 2)	−2.1853	−3.0049	Not stable
P_X	(C, 0, 2)	−0.8108	−3.0049	Not stable
P_M	(C, 0, 2)	−1.1620	−3.0049	Not stable
ITT	(C, 0, 2)	−0.0625	−3.0049	Not stable
ΔNBTT	(C, 0, 1)	−3.7193	−3.0049	Stable
ΔP_X	(C, 0, 1)	−3.6637	−3.0049	Stable
ΔP_M	(C, 0, 1)	−3.6564	−3.0049	Stable
ΔITT	(C, 0, 1)	−2.7017	−3.0049	Not stable
ΔΔITT	(C, 0, 1)	−6.1464	−3.0049	Stable
$MANU_{WD}$	(C, 0, 0)	−4.7960	−2.9919	Stable
$MANU_{ING}$	(C, 0, 0)	−4.0713	−2.9919	Stable
$MANU_{ION}$	(C, 0, 0)	−1.0478	−2.9919	Not stable
$MANU_{ED}$	(C, 0, 1)	−3.1547	−2.9981	Stable
$\Delta MANU_{ION}$	(C, 0, 1)	−5.2022	−2.9981	Stable

* C denotes intercept; T denotes trend; K denotes lag length

Unit root test results from Table 1 demonstrates that NBTT, P_X, P_M, and $MANU_{ION}$ follow I(1) process while only ITT follows I(2) process. The variables meet the prerequisites for the existence of a cointegration relationship. Johansen's co-integration tests of trace statistic and the maximum Eigen statistic can be applied in this study and the results are illustrated in Table 2.

Table 2 shows that there is at least one co-integrated relationship between NBTT and $MANU_{WD}$, NBTT and $MANU_{ING}$, P_X and $MANU_{ING}$, P_X and $MANU_{ION}$, P_M and $MANU_{ING}$ as well as P_M and $MANU_{ION}$. For ITT, however, no co-integration is found for all groups. The unit root test of non-equilibrium error shows that the obedience to I(0) process is stable for all groups, which further confirms the existence of the co-integration relationship in the sequence.

Table 2. Trace statistics of Johansen's co-integration tests (terms of trade variables *vs* groups).

	$MANU_{WD}$	$MANU_{ING}$	$MANU_{ION}$	$MANU_{ED}$	5% Critical Value
NBTT	18.3650*	23.2321*	11.7297	13.1019	15.4947
PX	11.9203	16.0878*	31.2007*	10.6157	15.4947
PM	13.0180	18.9806*	22.8090*	10.7917	15.4947
ITT	12.6513	14.9665	5.2769	14.2426	15.4947

* denote rejection of the hypothesis of no co-integration at the 5% level
** denote 5% Critical Value of 15.4947

The co-integration tests have demonstrated a long-term equilibrium relationship between several terms of trade and groups. Granger's causality tests verify the relationship between the causes and effects. Table 3 validates the relation of $MANU_{WD}$ and $MANU_{ING}$ to NBTT, $MANU_{ION}$ to PX, $MANU_{WD}$, $MANU_{ING}$ and $MANU_{ION}$ to PM as well as $MANU_{WD}$ and $MANU_{ING}$ to ITT in the first period. The relation also exists in the second period except $MANU_{WD}$ to ITT. In the third period, however, the Granger causality tests hold for only $MANU_{WD}$ and $MANUI_{NG}$ to NBTT, $MANU_{ING}$ and $MANU_{ION}$ to P_X as well as $MANU_{ING}$ to ITT. The results suggest that $MANU_{WD}$ and $MANU_{ING}$ affect NBTT, and $MANU_{ING}$ affects ITT, while the impact of structural changes to the rest of the exported groups on other terms of trade index is uncertain.

The model results for exported manufactured products to different economies are presented in Table 4 to Table 7. Table 4 demonstrates the impact of changes in $MANU_{WD}$ to NBTT, P_X, P_M, and ITT to the world, respectively. The dependent variables are all positively affected in the first period, which is consistent with the result of Cashin and Pattillo (2006) for stability except for IIT. The past paths are important for China's current terms of trade as the macro-economic controls inherited from the planned economic system possess a great ability to control the market so that the economic operation is not too volatile.

The positive impact of $MANU_{WD}$ to NBTT indicates the improvement of terms of trade by rapid rising of the proportion of exported manufactured products and replacing primary products as the main driving force for exports as rejecting the Prebisch-Singer Hypothesis or Theory of Deterioration Terms of Trade (TDTT) during this period. Specifically, a 1% increase in the proportion of exported manufactured products to the world ($MANU_{WD}$) resulted in 0.95% increases in the index of exports (P_X) and 0.0657% decreases in the index of imports (P_M), which causes a 1.75% improvement in China's net barter terms of trade (NBTT). Finally, a 1% increase in the proportion of exported manufactured products to the world ($MANU_{WD}$) resulted in a 0.14% increases in income terms of trade (ITT), which is a result of the increase in the volume of exported products coupled with the positive stimulus of that to NBTT.

Table 5 demonstrates the impact of changes in $MANU_{ING}$ to NBTT, P_X, P_M, and ITT to developing economies, respectively. The dependent variables are all positively affected by the terms of the first period, which are stable. (Cashin and Pattillo, 2006) The positive impact of $MANU_{ING}$ to NBTT indicates the improvement of terms of trade by rapid rising of the proportion of exported manufactured products and replacing primary product export as the main driving force of export as rejecting the Prebisch-Singer Hypothesis during this period. Specifically, a 1% increase in the proportion of exported manufactured products to developing economies ($MANU_{ING}$) resulted in a 0.1235% decrease in the index of exports (P_X) and a 0.98% decreases in the index of imports (P_M), which causes a 1.43% improvement in China's net barter terms of trade (NBTT). Finally, a 1% increase in the proportion of exported manufactured products to developing economies ($MANU_{ING}$) resulted in a 0.5364% decreases in income terms of trade (ITT).

Table 3. Results of Granger causality tests.

Null Hypothesis	Lags to include	F-Statistic	Prob.	Result
$MANU_{WD}$ does not Granger Cause NBTT		14.2074	0.0011	Reject
$MANU_{ING}$ does not Granger Cause NBTT	1	17.1148	0.0138	Reject
$MANU_{ION}$ does not Granger Cause NBTT		0.8114	0.3779	Not Reject

Table 3. *Cont.*

Null Hypothesis	Lags to include	F-Statistic	Prob.	Result
$MANU_{ED}$ does not Granger Cause NBTT		3.4491	0.0774	Not Reject
$MANU_{WD}$ does not Granger Cause P_X		1.5022	0.2339	Not Reject
$MANU_{ING}$ does not Granger Cause P_X		2.1964	0.1532	Not Reject
$MANU_{ION}$ does not Granger Cause P_X		5.5119	0.0288	Reject
$MANU_{ED}$ does not Granger Cause P_X		0.2576	0.6170	Not Reject
$MANU_{WD}$ does not Granger Cause P_M		5.1753	0.0335	Reject
$MANU_{ING}$ does not Granger Cause P_M		6.2319	0.0209	Reject
$MANU_{ION}$ does not Granger Cause P_M		4.8861	0.0383	Reject
$MANU_{ED}$ does not Granger Cause P_M		1.8252	0.1911	Not Reject
$MANU_{WD}$ does not Granger Cause ITT		5.0429	0.0356	Reject
$MANU_{ING}$ does not Granger Cause ITT		8.1229	0.0096	Reject
$MANU_{ION}$ does not Granger Cause ITT		3.7239	0.0673	Not Reject
$MANU_{ED}$ does not Granger Cause ITT		0.8448	0.3685	Not Reject
$MANU_{WD}$ does not Granger Cause NBTT	2	5.4676	0.0140	Reject
$MANU_{ING}$ does not Granger Cause NBTT		9.7599	0.0013	Reject
$MANU_{ION}$ does not Granger Cause NBTT		1.3236	0.2909	Not Reject
$MANU_{ED}$ does not Granger Cause NBTT		0.7064	0.5066	Not Reject
$MANU_{WD}$ does not Granger Cause P_X		2.5621	0.1049	Not Reject
$MANU_{ING}$ does not Granger Cause P_X		3.2793	0.0610	Not Reject
$MANU_{ION}$ does not Granger Cause P_X		17.5992	0.0000	Reject
$MANU_{ED}$ does not Granger Cause P_X		0.6378	0.5400	Not Reject
$MANU_{WD}$ does not Granger Cause P_M		3.8497	0.0406	Reject
$MANU_{ING}$ does not Granger Cause P_M		6.8995	0.0060	Reject
$MANU_{ION}$ does not Granger Cause P_M		10.4688	0.0010	Reject
$MANU_{ED}$ does not Granger Cause P_M		0.8489	0.4443	Not Reject
$MANU_{WD}$ does not Granger Cause ITT		2.6716	0.0964	Not Reject
$MANU_{ING}$ does not Granger Cause ITT		3.6565	0.0465	Reject
$MANU_{ION}$ does not Granger Cause ITT		1.4757	0.2550	Not Reject
$MANU_{ED}$ does not Granger Cause ITT		0.8689	0.4363	Not Reject
$MANU_{WD}$ does not Granger Cause NBTT	3	3.6249	0.0379	Reject
$MANU_{ING}$ does not Granger Cause NBTT		4.6436	0.0173	Reject
$MANU_{ION}$ does not Granger Cause NBTT		3.0728	0.0599	Not Reject
$MANU_{ED}$ does not Granger Cause NBTT		1.2905	0.3139	Not Reject
$MANU_{WD}$ does not Granger Cause P_X		1.4940	0.2565	Not Reject
$MANU_{ING}$ does not Granger Cause P_X		3.4181	0.0449	Reject
$MANU_{ION}$ does not Granger Cause P_X		9.2069	0.0011	Reject
$MANU_{ED}$ does not Granger Cause P_X		0.3061	0.8206	Not Reject
$MANU_{WD}$ does not Granger Cause P_M		2.4056	0.1079	Not Reject
$MANU_{ING}$ does not Granger Cause P_M		4.9050	0.0143	Not Reject
$MANU_{ION}$ does not Granger Cause P_M		7.3401	0.0030	Not Reject
$MANU_{ED}$ does not Granger Cause P_M		0.7231	0.5537	Not Reject
$MANU_{WD}$ does not Granger Cause ITT		2.5271	0.0967	Not Reject
$MANU_{ING}$ does not Granger Cause ITT		3.5036	0.0418	Reject
$MANU_{ION}$ does not Granger Cause ITT		1.7338	0.2030	Not Reject
$MANU_{ED}$ does not Granger Cause ITT		1.4885	0.2579	Not Reject

Table 4. Model results for exported manufactured products to the world.

	NBTT	P_X	P_M	ITT
C	−12.9735	−10.3657	10.4810	0.9676
	(−0.7489)	(−0.5561)	(0.3173)	(0.0667)
$MANU_{WD}$	175.6381	95.4033	−6.5711	14.1161
	(1.6648)	(1.0065)	(−0.0371)	(0.1670)
(−1)	0.8226	0.9403	0.9092	1.0136
	(8.5084)**	(11.5787)**	(10.2716)**	(44.7519)**

R^2	0.8194	0.8653	0.8431	0.9903
$\bar{R}^2$	0.8023	0.8525	0.8281	0.9894
D-W	2.2534	1.4445	1.7970	1.3246

* denote significant at 95% level; ** denote significant at 99% level

Table 5. Model results for exported manufactured products to developing economies.

	NBTT	**P_X**	**P_M**	**ITT**
C	2.5793	10.7620	36.0626	15.6021
	(0.2650)	(0.5818)	(1.1470)	(1.3438)
$MANU_{ING}$	143.9278	−12.3531	−98.0698	−53.6373
	(2.1368)*	(−0.2186)	(−0.8776)	(−1.0556)
(−1)	0.6679	0.9133	0.8364	0.9911
	(5.0859)**	(8.8669)**	(7.0388)**	(33.6171)**
R^2	0.8321	0.8591	0.8486	0.9908
$\bar{R}^2$	0.8161	0.8457	0.8342	0.9899
D-W	2.2610	1.6304	1.9570	1.4568

* denote significant at 95% level; ** denote significant at 99% level

Table 6 demonstrates the impact of changes in $MANU_{ION}$ to NBTT, P_X, P_M, and ITT to transition economies, respectively. The dependent variables are positively affected by the terms in the first period, which is stable. The negative impact of $MANU_{ION}$ to NBTT indicates the deterioration of terms of trade by rapid rising of the proportion of exported manufactured products and replacing primary product export and supporting the Prebisch-Singer Hypothesis during this period. Specifically, a 1% increase in the proportion of exported manufactured products to transition economies ($MANU_{ION}$) resulted in 0.73% increases in the index of exports (P_X) and a 1.44% increases in the index of imports (P_M), which causes a 0.26% deterioration in China's net barter terms of trade (NBTT). Finally, a 1% increase in the proportion of exported manufactured products to transition economies ($MANU_{ION}$) resulted in a 0.3893% increases in income terms of trade (ITT).

Table 6. Model results for exported manufactured products to transition economies.

	NBTT	**P_X**	**P_M**	**ITT**
C	26.7004	16.6741	13.6144	−1.0220
	(0.9252)	(2.3231)*	(1.8655)	(−0.3409)
$MANU_{ION}$	−26.0210	73.0871	144.6084	38.9264
	(−0.5564)	(2.6490)*	(2.1452)*	(1.6324)
(−1)	0.7685	0.6724	0.5849	0.9707
	(3.5480)**	(5.6279)**	(4.4351)**	(29.5391)**
R^2	0.7986	0.8942	0.8713	0.9914
$\bar{R}^2$	0.7794	0.8841	0.8590	0.9906
D-W	1.7842	1.9524	2.0833	1.6024

* denote significant at 95% level; ** denote significant at 99% level

Table 7 demonstrates the impact of changes in $MANU_{ED}$ to NBTT, P_X, P_M, and ITT to developed economies, respectively. The dependent variables are all positively affected in the terms in the first period, which are stable except for IIT. The negative impact of $MANU_{ED}$ to NBTT indicates the deterioration of terms of trade by rapid rising of the proportion of exported manufactured products and replacing primary products as supporting the Prebisch-Singer Hypothesis during this period. Specifically, a 1% increase in the proportion of exported manufactured products to developed economies ($MANU_{ED}$) resulted in a 2.56% increases in the index of exports (P_X) and a 2.76% increases in the index of imports (P_M), which causes a 0.1129% deterioration in China's net barter terms of trade (NBTT). Finally, a 1% increase in the proportion of exported manufactured products to developed economies ($MANU_{ED}$) resulted in a 0.14% increases in income terms of trade (ITT).

Table 7. Model results for exported manufactured products to developed economies.

	NBTT	P_X	P_M	ITT
C	13.2042	−27.8527	−27.9763	−23.5464
	(0.5922)	(−1.7004)	(−0.9377)	(−1.8181)
$MANU_{ED}$	−11.2940	255.9297	276.0966	197.2909
	(−0.0818)	(2.3122)*	(1.2899)	(2.0916)*
(−1)	0.8754	0.9252	0.9042	1.0119
	(8.9644)**	(12.6348)**	(10.9461)**	(50.9508)**
R^2	0.7957	0.8874	0.8546	0.9920
$\bar{R}^2$	0.7762	0.8767	0.8407	0.9912
D-W	1.7858	1.4540	1.6499	1.5210

* denote significant at 95% level; ** denote significant at 99% level

4. Discussions and Conclusions

The structure of China's export has changed dramatically, which deserves the examining of the Prebisch and Singer Hypothesis on the deterioration of terms of trade. By using data of manufactured product export from UNCTAD, the proportions of exported manufactured products from China to different economies are used to investigate the relative impacts to the alternative terms of trade. The results show that Prebisch and Singer Hypothesis is supported for the proportion of exports of manufactured products from China to transition economies and developed economies. In the long term, a 1% increase in China's exports of manufactured products deteriorated the terms of trade for exports to transition economies by 0.26% and to developed economies by 0.11%. The terms of trade to developing economies and the world were improved by 1.44% and 1.76%, respectively.

For developing economies, the theory of Deterioration Terms of Trade (TDTT) is validated that the NBTT deteriorated the proportion of exported manufactured products from developing economies to developed economies (Emmanuel, 1969; Sarkar and Singer, 1991). There is a long-term and stable relationship between China's terms of trade and the proportion of exported manufactured products. Although they are non-stable, there is a long-term stable relationship in the linear combination. The exported manufactured products from China to developing economies had accounted for 60% from 1995 to 2019, which agrees with the other results. The increase in the proportion of China's export of manufactured products is the main cause of the change in the terms of trade, which has a derivative effect on the trade income and in turn, affects national income.

In the long run, a deteriorating trend is a relevant phenomenon for primary products since the trade between developing and developed economies usually occurs for non-oil primary products from developing economies for manufactured products from developed economies. Although the trade between developing and developed economies has become the horizontal exchange of manufactured products for manufactured products, the change in the trade structure leads to the expansion of manufactured product export as developing economies continue improving the trade structure.

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