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A Study on the Transmission of Imported Inflation through the Trade Channel—From the Perspective of Import Structure

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Abstract

This paper studies the effect of imported product structure change on inflation, and distinguishes between ordinary trade imports and processing trade imports. Results show that both high-technology products and low-technology products such as bulk commodities are of high proportion in China's import structure. The former is mainly for general trade, while the latter is mostly for processing imports, which weakens its impact on domestic price. With China's increasing dependence on international resources such as petroleum and minerals, the changes of international oil prices as well as other bulk commodities will be an important variable affecting China's inflation level.

Keywords

Imported Inflation, Import Trade Structure, Input-Output Table

1. Introduction

The outbreak of the international financial crisis in 2008 was a turning point for the world economy, which put an end to the mild inflation situation in major economies since the mid-1980s (the "Great Moderation" period). After the financial crisis, although developed countries have implemented quantitative easing monetary policy, they are constantly plagued by low inflation rate. Either in the "Great Moderation" period or the post-financial crisis era, the inflation of major economies has shown the characteristic of comovement. This synchronism reflects that the price level of each country is not independent; it is affected by the price level of other economies. Monetary policy targeting inflation rate strengthens the correlation of inflation between each other, while low labor cost

of developing countries reduces the price level of developed countries through global trade (Liu & Liu, 2022). In the era of globalization, changes in the price level are not only determined by domestic factors, but are also influenced by external factors.

With the increasing scale of foreign trade, the dependence of China's economy on international products is also increasing. The impact of product price changes in the international market on China's commodity prices has attracted more and more attention. Many scholars have noticed that international commodity prices have a significant impact on China's price level (Su & Zhang, 2011; Chen, 2011; Xiao et al., 2009). However, these studies haven't noticed the role played by the change in import structure.

Based on customs data since 2000, this paper examines the impact of changes in the import structure on inflation. The results show that low-tech goods are the main source of imported inflation in China. The contributions of this paper are as follows. Firstly, unlike previous studies which only focused on the impact of commodity prices on China's inflation, this paper focuses on the impact of import structure on China's imported inflation. Secondly, this paper is the first to distinguish between ordinary trade imports and processing trade imports.

2. Literature Review and Research Hypotheses

With the acceleration of urbanization and industrialization in emerging economies and the continuous increase in the demand for bulk commodities, researchers have found that there is relationship between domestic price increase and global price increase. For example, Mumtaz & Surico (2012) adopted a dynamic factor model and extracted global factors and country factors based on inflation data in industrialized countries; the global factor better depicts the inflation trend in various countries, while country factors only play a role in explaining inflation fluctuations. The research by Monacelli & Sala (2009) confirmed the above conclusion. They conducted factor model analysis on inflation data from the United States, Germany, France and the United Kingdom and found that global common factors can indeed explain common price fluctuations between countries. Similarly, Neely & Rapach (2011) used dynamic factor models and variance analysis to analyze inflation data in 64 countries. Their study found that global factors can explain about 35% of the variation in inflation across countries.

In an increasingly open macroeconomic environment, external shocks have become an important factor affecting China's inflation, which is inseparable from the international economic environment (Wang, 2013). Each round of inflation in China is linked to global price increases during the same period, and imported inflation has increasingly become an important factor that cannot be ignored in triggering domestic inflation. The principle of this connection is that rising prices of imported products may trigger cost-push inflation in the entire economy (Liang, 2007). This indicates that global price increases can be trans-

mitted to the domestic price system through the prices of imported products. Many scholars have confirmed the link between imported products and inflation through empirical analysis. For example, Calderón et al. (2007) found that trade links between countries help enhance business cycle synchrony, and this effect will be more obvious among developed countries. Inklaar et al. (2008) found that trade has a weak positive impact on the economic cycle based on data from 21 OECD countries from 1970 to 2003.

Based on the above analysis, this paper proposes the first hypothesis.

Hypothesis 1: The rising price of imported products will increase China's inflation level.

Bulk commodities are an important component of costs, so commodity price shocks can lead to synchronized changes in inflation across countries. For example, the oil price shocks from 1970 to 1985 led to a sharp rise in inflation in various countries, and the continuous rise in global commodity prices before the 2008 financial crisis was accompanied by an increase in inflation in various countries. Commodity price changes mainly affect the inflation level through three channels: first, as raw materials for industrial production, commodity price changes affect the production cost of enterprises, and then affect the prices of corresponding industrial products; Second, commodity prices, especially energy prices, affect the inflation expectations of the public sector; Third is when the rise in commodity prices lead to rise in price levels, workers would demand higher wages to compensate for the rising cost of living, leading to further rise in production cost, forming a vicious cycle of rising inflation (Blanchard & Gali, 2007).

Many studies have confirmed the link between commodity prices and inflation. Furlong & Ingenito (1996) studied the relationship between commodity prices and inflation (oil price excluded), they found that from 1970 to early 1980s, when inflation and commodity price are high, the commodity price is the forerunner variable to inflation. But as inflation fell, the leading effect of commodity prices disappeared. Abbas & Lan (2020) examined the impact of different commodities on inflation under different conditions, the results show that energy prices have an important impact on inflation in all countries, and agricultural product prices have a relatively more significant impact on prices during periods of high inflation. In periods when inflation is high and volatile, commodity prices have a greater impact on prices; while in periods when inflation is low and steady, commodity prices have a weaker impact.

Chinese scholars have also conducted a lot of research on the relationship between commodity prices and inflation. Xiao et al. (2009) studied the impact of international commodity prices on China's CPI, the results show that international oil and food prices will have an impact on CPI in the short term, while international industrial raw material prices will have a significant impact on CPI in both the short and medium term. Chen (2011) pointed out that the large fluctuation of commodity prices amplifies its impact on inflation, and the price of

imported commodities are as significant as the output gap and money supply among the factors affecting CPI changes. Su and Zhang (2011) used variable parameter state space model to test the relationship between international commodity prices and China's inflation, and found that the former had a strong promotion effect on the latter, while the international trade balance surplus itself did not have inflation effect. Tan et al. (2012) further examined the impact of international commodity futures prices on the wholesale price of agricultural products in China, and found that the former has a direct and indirect guiding relationship with CPI as the medium, and this guiding relationship is more obvious in the long run.

Therefore, this paper puts forward the second hypothesis.

Hypothesis 2: The price of resource-based products has an important impact on China's inflation level.

The deepening of global industrial division is an important reason for the rise of global business cycle synchronicity. This international division of labor helps to form value chains through different countries and enhances the synchronism of their business cycles (Frankel & Rose, 1998). The formation of value chains also leads to closer trade linkages among countries. Closer trade links require governments to coordinate monetary and fiscal policies, and economies will face more consistent policy shocks (Shin & Wang, 2003). Trade links between economies have a significantly positive impact on the co-movement of inflation (Auer & Mehrotra, 2014). This also strengthens the impact of import prices on China's inflation level. On the other hand, the global industrial division encourages countries to concentrate on specific product categories, hence leading to changes in the structure of imported products. Auer et al. (2021) studied the effect of the input-output link on the transmission of inflation across countries, and found that this link had a significant effect on the simultaneous change of PPI across countries.

Hypothesis 3: Change in import structure enhances the positive effect of import prices on China's inflation level.

Hypothesis 4: Change in import structure enhances the positive effect of resource-based product prices on China's inflation level.

3. Analysis of China's Imported Product Structure

Firstly, the imported products are classified. Based on the method of Lall (2000), this paper classifies imported products into primary products, manufactured products and other goods that cannot be classified according to the factor input, technical activity indicators and industrial technical knowledge. Among them, primary products refer to crude oil, wood, cocoa and other unprocessed resource products. Manufactured products can be divided into resource-based manufactured products, low-technology manufactured products, medium-technology manufactured products and high-tech manufactured products according to the level of technology content. The specific classification is shown in **Table 1**.

Table 1. Technical classification of tradables.

Classification	Item of Tradables
1 Primary Goods	Fruit, Meat, Rice, Cocoa, Tea, Coffee, Wood, Coal, Crude Oil, Natural Gas
2 Manufactured Goods	
2.1 Resource-Based Manufactured Goods	
2.1.1 Agriculture/Forestry Manufactured Goods	Processed Meat/Fruit, Beverages, Wood Products, Vegetable Oils
2.1.2 Other Resource-Based Manufactured Goods	Mineral Refining Products, Petroleum/Rubber Products, Cement, Cut Gems, Glass
2.2 Low-Tech Manufactured Goods	
2.2.1 Textile/Clothing category	Textile Fabrics, Clothing, Hats, Shoes, Leather Products, Travel Accessories
2.2.2 Other Low-Tech Products	Pottery, Primary Metal Parts, Furniture, Jewelry, Toys, Plastic Products
2.3 Medium Tech Manufactured Goods	
2.3.1 Automotive Products	Passenger Cars and Parts, Commercial Vehicles, Motorcycles and Parts
2.3.2 Medium Tech Processing Industries	Synthetic Fibers, Chemicals and Paints, Fertilizers, Plastics, Steel, Pipes
2.3.3 Medium Tech Engineering Products	Engines, Industrial Machinery, Pumps, Switchgear, Boats, Clocks and Watches
2.4 High Tech Manufactured Goods	
2.4.1 Electronic and Electrical Products	Office/Data Processing Equipment, Communication Equipment, Television, Transistor, Turbine, Power Generator
2.4.2 Other High-Tech Products	Pharmaceuticals, Aviation Products, Optical/Measuring Instruments, Cameras
3. Others	Electricity, Movies, Prints, Gold, Art, Coins, Pets

Then, in order to analyze the technical structure of imported products, we add up the import value of products within the same technology category and calculates the proportion of each technology category in total import. Statistical results are shown in Figure 1, which shows that the structure of China's imported products has the following characteristics: firstly, the proportion of imports of primary products and resource-based products has gradually increased; secondly, the proportion of low-tech and medium-tech manufactured goods has been declining over year; thirdly, high-tech manufactured goods have always accounted for a large proportion of imported products.

Based on the classification of imported products, we further examine the proportion of general trade imports, and the results are shown in Figure 2. It can be seen from Figure 2 that general trade imports account for a large proportion of primary products and resource-based manufactured goods, a gradually increasing proportion of low-technology and medium-technology manufactured goods, and a low proportion of high-tech manufactured goods. China's imports of high-tech products are mainly for processing trade, and the proportion of general trade imports is low. Therefore, even if high-tech products account for a

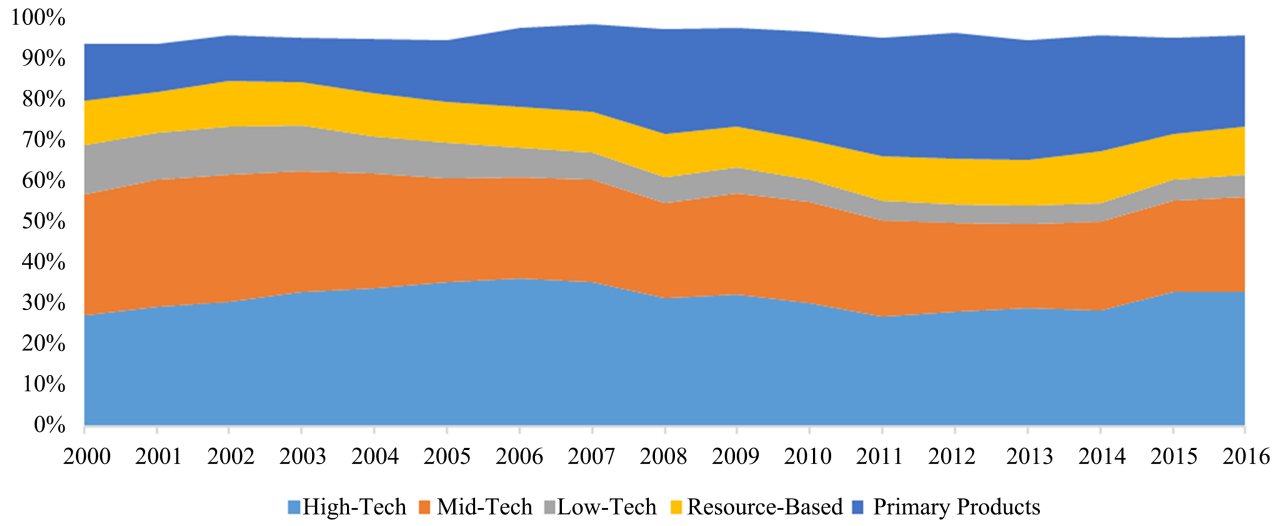

Figure 1. Proportion of imported products by technology category.

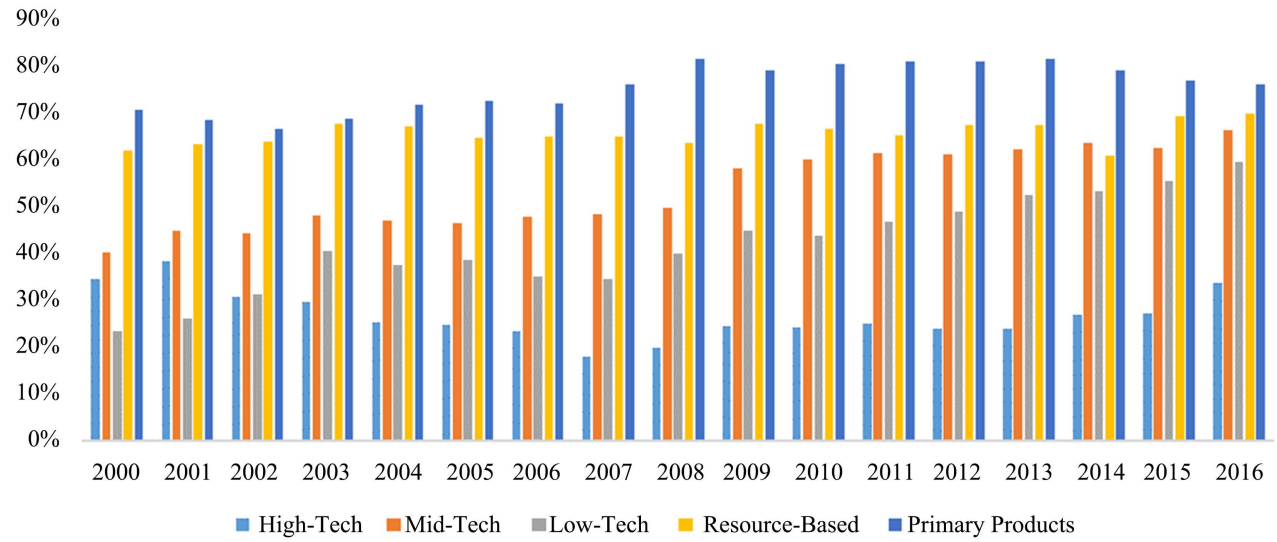

Figure 2. Proportion of general trade imports in each technology category.

large proportion of China's imports, their impact on China's domestic good prices may not be significant.

4. Impact of Import Prices of Different Sectors on Commodity Prices in China

This paper examines the impact of changes in import prices on domestic product prices by using input-output tables. Firstly, the input-output table is expressed in matrix form as follows:

$$\begin{bmatrix} x_1 \\ \vdots \\ x_n \end{bmatrix} = \begin{bmatrix} x_{11} & \cdots & x_{1n} \\ \vdots & \ddots & \vdots \\ x_{n1} & \cdots & x_{nn} \end{bmatrix}^{\mathrm{T}} \begin{bmatrix} 1 \\ \vdots \\ 1 \end{bmatrix} + \begin{bmatrix} x_{11}^{m} & \cdots & x_{1n}^{m} \\ \vdots & \ddots & \vdots \\ x_{n1}^{m} & \cdots & x_{nn}^{m} \end{bmatrix}^{\mathrm{T}} \begin{bmatrix} 1 \\ \vdots \\ 1 \end{bmatrix} + \begin{bmatrix} v_1 \\ \vdots \\ v_n \end{bmatrix}.$$

Let the price of $\begin{bmatrix} x_1 \\ \vdots \\ x_n \end{bmatrix}$ be $\begin{bmatrix} p_1 \\ \vdots \\ p_n \end{bmatrix}$, and the price of $\begin{bmatrix} x_1^m \\ \vdots \\ x_n^m \end{bmatrix}$ be $\begin{bmatrix} p_1^m \\ \vdots \\ p_n^m \end{bmatrix}$, and construct the input coefficient matrix $\begin{bmatrix} a_{11} & \cdots & a_{1n} \\ \vdots & \ddots & \vdots \\ a_{n1} & \cdots & a_{nn} \end{bmatrix}$ and $\begin{bmatrix} a_{11}^m & \cdots & a_{1n}^m \\ \vdots & \ddots & \vdots \\ a_{n1}^m & \cdots & a_{nn}^m \end{bmatrix}$, where $a_{ij} = x_{ij} / x_j$, $a_{ij}^m = x_{ij}^m / x_j$, then

$$\begin{bmatrix} p_1 \\ \vdots \\ p_n \end{bmatrix} = \begin{bmatrix} a_{11} & \cdots & a_{1n} \\ \vdots & \ddots & \vdots \\ a_{n1} & \cdots & a_{nn} \end{bmatrix}^{\mathrm{T}} \begin{bmatrix} p_1 \\ \vdots \\ p_n \end{bmatrix} + \begin{bmatrix} a_{11}^m & \cdots & a_{1n}^m \\ \vdots & \ddots & \vdots \\ a_{n1}^m & \cdots & a_{nn}^m \end{bmatrix}^{\mathrm{T}} \begin{bmatrix} p_1^m \\ \vdots \\ p_n^m \end{bmatrix} + \begin{bmatrix} v_1 \\ \vdots \\ v_n \end{bmatrix}.$$

This formula describes the components of the price of a final product in the input-output system. Taking the product price p_1 in the first row as an example, the matrix expression can be expanded as $p_1 = (a_{11}p_1 + a_{21}p_2 + \cdots + a_{n1}p_n) + (a_{11}^m p_1^m + \cdots + a_{n1}^m p_n^m) + v_1 i p_i^m p_1 a_{i1}^m$, and one unit change in p_i^m (price of the imported product i) leads to a_{i1}^m units change in the price of product 1. However, in the input-output system, product 1 is also the inputs to other products, so a change in the price of imported products will lead to reciprocal transmission of product prices among each other. In order to find the final sum of price changes, the above matrix formula needs to be further transformed by moving the domestic price p_i on the right side of the equation to the left side.

After matrix transformation, we get

$$\begin{bmatrix} p_1 \\ \vdots \\ p_n \end{bmatrix} = (I - A)^{-1} A^m \begin{bmatrix} p_1^m \\ \vdots \\ p_n^m \end{bmatrix} + (I - A)^{-1} \begin{bmatrix} v_1 \\ \vdots \\ v_n \end{bmatrix},$$

where

$$A = \begin{bmatrix} a_{11} & \cdots & a_{1n} \\ \vdots & \ddots & \vdots \\ a_{n1} & \cdots & a_{nn} \end{bmatrix}^{\mathrm{T}}, \quad A^m = \begin{bmatrix} a_{11}^m & \cdots & a_{1n}^m \\ \vdots & \ddots & \vdots \\ a_{n1}^m & \cdots & a_{nn}^m \end{bmatrix}^{\mathrm{T}}.$$

Let $(I - A)^{-1} A^m = B = \begin{bmatrix} b_{11} & \cdots & b_{1n} \\ \vdots & \ddots & \vdots \\ b_{n1} & \cdots & b_{nn} \end{bmatrix}$, we get

$$\begin{bmatrix} p_1 \\ \vdots \\ p_n \end{bmatrix} = \begin{bmatrix} b_{11} & \cdots & b_{1n} \\ \vdots & \ddots & \vdots \\ b_{n1} & \cdots & b_{nn} \end{bmatrix} \begin{bmatrix} p_1^m \\ \vdots \\ p_n^m \end{bmatrix} + (I - A)^{-1} \begin{bmatrix} v_1 \\ \vdots \\ v_n \end{bmatrix},$$ then the impact of the price change of imported products j on the prices of domestic sectors products can be expressed as $\begin{bmatrix} \partial p_1 / \partial p_j^m \\ \vdots \\ \partial p_n / \partial p_j^m \end{bmatrix} = \begin{bmatrix} b_{1j} \\ \vdots \\ b_{nj} \end{bmatrix}$.

According to the above formula and considering the proportion of processing

trade[1], this paper analyzes the impact of price changes of imported products in 42 sectors on other sectors basing on the 2018 non-competitive input-output table. As can be seen from Table 2, firstly, changes in import prices of oil and gas extraction products have the largest overall impact on domestic prices, that's because oil and gas products are widely used in various sectors of the national

Table 2. Rank of cumulative impact of import price changes.

Serial No.	Coefficient	Serial No.	Coefficient	Serial No.	Coefficient
1	0.9784	15	0.0661	29	0.0032
2	0.4044	16	0.0610	30	0.0025
3	0.3693	17	0.0459	31	0.0004
4	0.3112	18	0.0458	32	0.0000
5	0.2235	19	0.0422	33	0.0000
6	0.1500	20	0.0393	34	0.0000
7	0.1351	21	0.0372	35	0.0000
8	0.1002	22	0.0242	36	0.0000
9	0.0881	23	0.0214	37	0.0000
10	0.0753	24	0.0194	38	0.0000
11	0.0733	25	0.0189	39	0.0000
12	0.0727	26	0.0148	40	0.0000
13	0.0707	27	0.010	41	0.0000
14	0.0669	28	0.0071	42	0.0000

Note: Serial No. 1 for oil and gas extraction products, 2 for chemical products, 3 for metal mining products, 4 for communication equipment, computers and other electronic equipment, 5 for metal smelting and rolling products, 6 for transportation, warehousing and postal services, 7 for agriculture, forestry, animal husbandry and fishery products and services, 8 for electrical machinery and equipment, 9 for accommodation and meals, 10 for general equipment, 11 for coal mining and processing products, 12 for instrumentation, 13 for rental and business services, 14 for transportation equipment, 15 for papermaking, printing and cultural, educational and sporting goods, 16 for petroleum, coking products and nuclear fuel processing products, 17 for other manufacturing products and scrap, 18 for professional setting, 19 for wood products and furniture, 20 for food and tobacco, 21 for textile, 22 for non-metallic minerals and other mineral processing products, 23 for culture, sports and entertainment, 24 for non-metallic mineral products, 25 for metal products, 26 for textiles, clothing, shoes, hats, leather, down and their products, 27 for finance, 28 for information transmission, software and information technology services, 29 for public administration, social security and social organizations, 30 for metal products, machinery and equipment repair services, 31 for production and supply of electricity and heat, 32 for comprehensive technical services, 33 for gas production and supply, 34 for water production and supply, 35 for architecture, 36 for wholesale and retail, 37 for real estate, 38 for research and experimental development, 39 for water, environment and public facilities management, 40 for residential services, repairs and other services, 41 for education, 42 for health and social work.

[1]A large portion of China's foreign trade imports are for processing trade with both ends abroad. Its price changes will not affect the prices of domestic products, and the proportion of processing trade imports in different departments varies greatly. If the input-output table estimation does not take into account the factors of processing trade, the estimation results may have large deviations. Therefore, this article considers the proportion of processing trade imports in each industry when estimating the price impact coefficient.

economy, and China is highly dependent on the import of such products. Secondly, communication equipment, computers and other electronic equipment also have a great impact on domestic prices due to their impact on the cost of information and software services, meters, and other equipment. However, considering that a large part of China's imports is for processing trade, changes in the import prices of such products have little impact on domestic prices.

5. Impact of Structural Changes in Imports on China's Imported Inflation

The above analysis indicates that resource-based products have the greatest impact on domestic prices, while the impact of manufactured industrial products gradually weakens. As the domestic industrial system improves, the demand for production factors such as crude oil and ore increases, thereby increasing the demand for resource-based manufactured products. While medium-tech manufactured goods have gradually shifted from relying on imports to self-production, hence the proportion of imports has declined. For high-tech manufactured goods, although they always account for a high proportion of imported products, most of them are imported for processing trade; hence the impact of their price changes on domestic prices is limited. This section uses empirical analysis to verify whether changes in the structure of imported products have strengthened the impact of resource-based products on domestic prices.

5.1. Data Source and Index Selection

We selected annual data from 31 provinces from 2000 to 2016 as a research sample. The data comes from the Wind database, imported product data published by the General Administration of Customs, and the State Administration of Foreign Exchange. The dependent variable in this paper is the annual inflation level of each province indexed by *PPI* considering *PPI* is more stable than *CPI*. The *CPI* index includes food prices, and the prices of vegetables and pork in food are basically determined by domestic supply and demand. For example, the African swine fever epidemic in 2019 caused a sharp increase in pork prices in china, which in turn drove up the *CPI*, floods in Henan and other places in the summer of 2021 led to poor vegetable harvests and increased vegetable prices. At the same time, the *CPI* index also includes the price of service products which are mainly composed of non-tradable goods and are very little affected by the price of imported products. The *PPI* index mainly measures the ex-factory price of industrial products. Its price is more affected by the price of traded goods and can relatively better reflect the impact of the price of imported goods. Moreover, the *PPI* index can better reflect changes in corporate production costs. It should be noted that the annual *PPI* index is obtained by taking the average value of the monthly *PPI* index of each province.

The explanatory variables in this paper are the import price of primary products, the import price of manufactured industrial products and the proportion of

primary products in the general trade imports of each province. The import prices of primary products and industrial products are indexed by index of imported primary and industrial products prices each based on the SITC2 classification published by the General Administration of Customs. The data are also from the Wind database. The proportion of primary products in general trade imports in each province is obtained from the customs import data over the years. This paper distinguishes ordinary trade import from processing trade import, considering the import price of processing trade has nearly no effect on the price of domestic products. Processing trade occupies a large proportion in foreign trade of China, and the structure of general trade imports is very different from processing trade. In general trade, primary products and resource-based products occupies a large proportion, while in processing trade, the import proportion of manufactured products, especially high-tech products, is large. If we do not distinguish between processing trade and general trade, we are likely to misestimate the impact of changes in the structure of imported products on imported inflation through trade channels.

In order to control the impact of other factors on the annual inflation level of each province, this paper selects a series of control variables with reference to previous studies: money supply (M1 year-on-year growth rate), GDP growth rate and net capital inflow. Money supply is an important factor affecting the price change. In order to examine the impact of import prices on domestic prices, it is necessary to control the change of domestic money supply. The reason why M1 growth rate is selected instead of M2 is that M1 growth rate is more consistent with PPI, while there is a certain time lag between M2 growth rate and PPI index. The GDP growth rate reflects changes in aggregate demand, and is used to control the impact of domestic supply and demand on product prices. The reason to control capital inflows is that capital inflows will affect domestic liquidity, which is due to China's monetary authorities' consistent intervention of the foreign exchange market before the "8·11 exchange rate reform" in 2015. When net capital inflows bring appreciation pressure to RMB, the central bank will buy foreign exchange and release currency, which will lead to the expansion of the central bank's balance sheet and hence increase in money supply, which will in turn affect inflation. The names, symbols and results of descriptive statistics of the variables are shown in **Table 3**.

5.2. Model Setting and Parameters Estimation

The benchmark model is as follows:

$$\begin{aligned} PPI_{it} = {} & \alpha + \beta_1 idxpr_t + \beta_2 idxm_t + \gamma_1 ratio_{it} + \gamma_2 ratio_{it} \times idxpr_t \\ & + \gamma_3 ratio_{it} \times idxm_t + \beta X_{it} + \varphi_i + \eta_t + \varepsilon_{it} \end{aligned} \quad (1)$$

where *PPI* is the annual inflation level, *idxpr* is the import price of primary products, *idxm* is the import price of manufactured products, and *ratio* is the proportion of primary products in the general trade imports of each province. X represents the control variables, including money supply, GDP growth rate and

Table 3. Variable names, symbols, and descriptive statistics.

Variable names	Symbols	*N*	Mean	Median	Standard Deviation	Minimum	Maximum
Annual Level of Inflation	*PPI*	521	1.71	0.80	5.90	17.59	29.40
Import Prices of Primary Products	*idxpr*	372	5.75	4.64	21.87	29.18	43.44
Import Prices of Manufactured Goods	*idxm*	372	1.01	0.25	4.38	7.50	8.51
Primary Products over General Trade Imports	*ratio*	526	0.48	0.47	0.23	0.0047	0.96
Money Supply	*M*1	527	15.15	14.18	6.11	4.80	26.72
GDP Growth Rate	*GDP*	527	11.19	11.26	2.69	2.50	23.80
Net Capital Inflows	*flow*	527	1382.38	1223.31	1201.24	4394.13	272.50

net capital inflow. β_1 and β_2 measure the impact of import prices of primary products and industrial products on PPI index of each province; γ_2 and γ_3 are to measure whether the change of trade structure enhances or weakens the impact of primary and industrial prices on provincial PPI index. γ_2 is the coefficient of the interaction term between the proportion of primary imports in general trade imports and the import price index of primary products. γ_3 is the coefficient of the interaction term between the proportion of primary goods in general trade imports and the import price index of industrial products. Theoretically, the sign of γ_3 should be different from that of γ_2, because when the share of imports of primary products increases, the share of imports of other products will decrease accordingly, and the impact of their price changes will be weakened. In order to further confirm whether the change in the structure of imported products has strengthened or weakened the impact of the price of imported tradables on China's *PPI* index in general, this paper establishes the following model:

$$PPI_{it} = \alpha + \beta_1 idx_t + \gamma_1 ratio_{it} + \gamma_2 ratio_{it} * idx_t + \beta X_{it} + \varphi_i + \eta_t + \varepsilon_{it} \quad (2)$$

where idx_t is the overall price index of all imported products under HS2 classification, and other variables are defined as above.

5.3. Regression Results and Analysis

The regression results of the impact of resource-based products on domestic prices are shown in Table 4. Columns (1)-(3) show the regression results without controlling variables, with control variables and individual fixed effects and time fixed effects respectively. The coefficients of *idxpr* are positive and significant at the level of 1% in all regressions, which indicates that the increase of import price of primary products will lead to the increase of annual inflation level in each province. Coefficients of *idxm* are all negative and significant at the level of 10% or more, this is perhaps because domestic industrial products and imported industrial products could substitute each other, rise in the price of imported industrial products will stimulate domestic enterprises to expand their production capacity to increase supply. The interaction terms of *idxpr*, *idxm* and *ratio* are added in columns (4)-(6).

Table 4. Regression results of the impact of resource-based products on domestic prices.

Dependent Variable: *PPI*	(1)	(2)	(3)	(4)	(5)	(6)
idxpr	0.272***	0.269***	0.201***	0.111*	0.205***	0.053
	(9.48)	(8.43)	(4.42)	(1.77)	(4.17)	(1.16)
idxm	0.210**	0.224**	0.163*	0.265**	0.631***	0.057
	(2.77)	(2.49)	(1.87)	(2.5)	(4.33)	(0.36)
ratio				2.22	2.715	2.062
				(0.70)	(0.85)	(0.68)
ratio idxpr*				0.194***		0.315***
				(3.36)		(4.99)
ratio idxm*					0.757**	0.650*
					(2.59)	(1.81)
*M*1		0.031	0.567***	0.684***	0.632***	0.726***
		(1.61)	(5.77)	(5.74)	(5.07)	(5.94)
flow		0.0003*	0.005***	0.006***	0.005***	0.006***
		(1.97)	(6.44)	(6.27)	(5.47)	(6.43)
GDP		0.169**	0.018	0.024	0.008	0.033
		(2.60)	(0.15)	(0.26)	(0.08)	(0.36)
Constants	0.026	1.868***	11.630***	14.968***	14.454***	15.541***
	(0.16)	(3.45)	(4.72)	(4.49)		(4.57)
Individual fixed effects	No	Yes	Yes	Yes	Yes	Yes
Time fixed effects	No	No	Yes	Yes	Yes	Yes
Observations	372	372	372	372	372	372
R^2	0.712	0.744	0.760	0.786	0.778	0.788

Note: ***, ** and * indicate significance at 1%, 5% and 10% levels respectively. Numbers in parentheses are standard errors.

In column (4), coefficient of the interaction term *ratio* idxpr* is significantly positive, and is of the same sign as the coefficient of *idxpr*, which shows that as the proportion of primary product in general trade imports increases, the impact of changes in primary product import prices on the PPI could be strengthened. In Column (5), the coefficient of *idxm* is significantly negative, while the coefficient of the interaction term *ratio* idxm* is significantly positive, which offsets the impact of changes in *idxm* on *PPI*. From this perspective, the increase in the proportion of primary product imports has indeed weakened the impact of import prices of industrial product on *PPI*. In Column (6), the coefficients of *idxpr* and *idxm* are no longer significant, and the coefficient of *idxm* turns from negative to positive, but the coefficient of *ratio* idxpr* is still significantly positive, indicating that the increase in the proportion of primary imports enhances the impact of the change in the import price of primary products on *PPI* index. The signs of *idxm* and the interactive term *ratio* idxm* are different, which shows to a certain extent that changes in the structure of imported products have

Table 5. Regression results of the impact of changes in the structure of imported products on domestic prices.

Explained variable: *PPI*	(1)	(2)	(3)	(4)
idx	0.547***	0.461***	0.456***	0.274*
	(11.41)	(4.37)	(3.96)	(1.72)
ratio				0.971***
				(0.34)
ratio idx*				0.534***
				(4.21)
*M*1			0.190	0.091
			(0.97)	(0.36)
flow			0.001	0.001
			(0.84)	(0.51)
GDP			0.064	0.017
			(0.52)	(0.16)
Constants	0.107***	0.227	4.664	1.221
	(0.67)	(0.85)	(1.00)	(0.26)
Individual fixed effects	No	Yes	Yes	Yes
Time fixed effects	No	Yes	Yes	Yes
Observations	521	521	521	520
R^2	0.6426	0.707	0.707	0.736

Note: ***, ** and * indicate significance at 1%, 5% and 10% levels respectively. Numbers in parentheses are standard errors.

weakened the impact of industrial product import prices on *PPI*. In general, the empirical results show that the increase in the proportion of primary products in China's general trade imports strengthens the impact of primary product import price on domestic *PPI* index, while it also weakens the impact of industrial product import price.

The regression results of the impact of changes in the structure of imported products on domestic prices are shown in Table 5. In columns (1)-(4), the coefficients of variable *idx* are all positive and significant at least at the level of 10%, which indicates that the change in the structure of imports has significantly increased the inflation level of each province. In Column (4), the coefficient of the interaction term *ratio* idx* is positive and significant at the level of 1%, which indicates that the increase in the proportion of primary product imports will generally strengthen the impact of imported product prices on the domestic *PPI*.

6. Conclusion

By analyzing the customs import data, we find that since 2000, the proportion that primary products such as crude oil and ore occupies in China's imports has

been increasing, while the proportion of mid-tech industrial products has gradually decreased. This trend may be due to the improvement of China's industrial system, and more median- and low-tech industrial products have been produced in China, resulting in a decline in the proportion of low-tech industrial products import. High-tech products such as chips, communications equipment, precision instruments have always maintained a high proportion in the import. However, by dividing the trade types of imported goods, it is found that most of the high-tech imports are processing trade imports, which reflects the important position of Foxconn and other OEM enterprises in China's foreign trade. The outward nature of processing trade determines that the change of import price of high-tech products will not affect the price of domestic products, which limits the impact of import price of high-tech products on China's commodity price.

Through empirical tests, we find that as the proportion of primary products in the import structure increases, the impact of primary product prices on China's domestic price strengthens through time. On the whole, however, the structural change has strengthened the impact of import prices on domestic prices. Therefore, it is reasonable to believe that if China's dependence on foreign resources continues to increase, the impact of changes in the prices of primary products on domestic prices will also continue to increase.

Since 2020, international energy prices have continued to rise, pushing global inflation to a historically high level for a long time. At present, China's demand is weak, and monetary policy remains moderately tight, so the rise in inflation is limited, but this does not mean that the external inflationary pressure has disappeared. As domestic demand recovers and demand for international goods increases, rising commodity prices will be transmitted to domestic market at an accelerated pace, increasing domestic inflationary pressure. In the coming period, we must pay close attention to the prices of oil, natural gas, grain and other products, and be wary of the threat of their rising prices to domestic price stability and macroeconomic control during the economic recovery period.

Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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