THE CHINA PRICE: EVIDENCE
AND SOME IMPLICATIONS*

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Abstract

China's import penetration in Chilean markets is higher in unskilled-labor intensive sectors as predicted by traditional endowment-based theories of comparative advantage. However, there is also evidence of within-industry specialization. In particular, high-income countries receive higher prices for its products, and Chinese products are not only cheaper in comparison to the world average but also relative to countries with similar income per capita. These price differences cannot account for the depth and sectoral distribution of China's import penetration. The relative price of Chinese products have stayed relatively constant since the beginning of the 1990s, which means that factors other than price, like quality upgrading, productivity growth or the access of foreign direct investment are crucial to explain the Chinese import boom.

Resumen

En este trabajo se muestra evidencia que la penetración de importaciones provenientes de China en el mercado chileno ha sido mayor en sectores más intensivos en trabajo no calificado. Esto sería consistente con la teoría tradicional de comercio internacional, en la cual las ventajas comparativas están determinadas por la abundancia relativa de factores. Sin embargo, también encontramos evidencia de especialización al interior de los sectores manufactureros. En particular, nuestra evidencia indica que países de alto ingreso reciben mayores precios por sus productos y que los productos chinos no son sólo más baratos comparados al promedio mundial, sino también comparados a países de ingreso similar. Nuestros resultados sugieren que estos diferenciales de precios no pueden explicar la magnitud de la penetración de importaciones chinas ni su distribución sectorial. De hecho, el precio relativo de los productos importados desde China se ha mantenido relativamente constante desde principios de los años 90's. Ello implica que otros factores, tales como mejoramientos de calidad, crecimiento de la productividad o el acceso a inversión extranjera directa, son cruciales para explicar el fuerte crecimiento de las importaciones desde China.

Key words: *import penetration, China, imports price, extensive margin, intensive margin.*

JEL Classification: F1, F2, L11.

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1. **Introduction**

The huge increase in Chinese exports is a worldwide phenomenon. After several decades of autarky, Chinese exports have grown vigorously –especially since the 1990s– becoming one of the most important trading partners in the world. This phenomenon has generated a growing literature to analyze the potential impact of Chinese competition on third countries, especially in labor-intensive industries where China's exports are dominant. Although there are some descriptive and illustrative works discussing the expected impact of China (Devlin, et. al, 2006; Blásquez-Lidoy, et. al. 2006), only few papers have studied this phenomenon in detail. Some papers have focused on manufacturing industry in developed countries (Bernard et. al., 2006), others have studied the impact on other Asian countries' exports (Eichengreen, et. al., 2004), and other have analyzed the effects on Latin American exports in a third market (López Córdova, et. al. 2005 and 2006).

The literature on the characteristics of Chinese products is however less developed. We do not have a complete and broad view of the characteristics of China's exports, which is crucial to have a good understanding of the potential effects of Chinese exports on world markets. There is evidence that China's exports are higher in labor-intensive sectors –and we provide some evidence supporting such statement–, which is consistent with traditional endowment-based trade theory (see Leamer, 1995). There is however much less information regarding product heterogeneity within industries, like price differences. Recently, the trade literature has emphasized that factor endowment differences can lead not only to across-industry specialization but also to within-product specialization.[1] For example, using import data from the United States, Rodrik (2006) and Schott (2006) have shown that China's exports are relatively sophisticated compared to exports of countries with similar factor endowments, even for products defined in similar categories. Branstetter and Lardy (2006) argue that this evidence does not take into account that China imports high value-added parts and components, suggesting that after controlling for the structure of intermediate inputs, China's export structure reflect low costs of labor-intensive assembly. Our paper is an effort to analyze the characteristics of Chinese competition in developing countries, using data of Chilean imports between 1990 and 2003. In this sense, we not only analyze cross-industry differences in China's import penetration but also we focus on within-industry heterogeneity in order to distinguish the characteristics of Chinese products vis-à-vis the rest of the world in common product categories.

This paper is structured as follows. In section 2, we present the data and show the main facts regarding the increase in Chinese import penetration in Chilean markets since 1990. In section 3, we analyze the evidence on import prices. First, we test whether the data is consistent with within-product specialization –as shown by Schott (2004) for the United States–, that is, we search for cross-country price differences for similar products and we discuss possible

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[1]   Bernard, Jensen and Schott (2006) show how the factor endowments driven specialization is also useful for studying the consequences of low-wages import competition on the U.S. manufacturing plants.

explanations for these differences. Second, we compare Chinese imports to those of countries with similar income per capita, concluding that China's products are cheap not only relative to the rest of the world –as expected from income differences– but also compared to countries with similar level of development. We discuss and compare these results with those obtained by Schott (2006) and Rodrik (2006). In section 4, we extend our analysis by studying in detail the main sources of import penetration from China across different sectors. Following the methodology developed by Hummels and Klenow (2005), we decompose import penetration into two different margins: imports in common product categories from China and the rest of the world (intensive margin) and imports in different product categories (extensive margin). This distinction allows us to study the extent to which the important penetration of China's product in Chile is due to an increase in the set of products produced and exported from China or it is due to higher penetration in common product categories. Finally, we decompose the intensive margin into price and quantity margins to distinguish whether within-industry import differences are due to price differences and/or quantity differences. This decomposition is useful to analyze whether the rise in Chinese penetration is due to relative price changes, i.e., movements along the demand curve, or it is due to outward shifts in the demand for Chinese products relative to those from the rest of the world, in response to changes in the quality/willingness to pay of products or to changes in the number of unobserved varieties produced within highly-disaggregated product categories (see Hummels and Klenow, 2005, Alvarez and Claro, 2006a, and Hallak and Schott, 2006). In section 5, we summarize our findings and conclude.

2. Chinese Import Penetration: The Main Facts

This section shows some basic facts regarding import penetration across Chilean manufacturing industries during the 1990s. In particular, we are interested in identifying which sectors face higher competition from China. We compute import penetration as the share of imports from a specific source –say China– in total apparent consumption in each industry in Chile. We use information from UNIDO manufacturing dataset provided by Nicita and Olarreaga (2006), which has data on production (gross output), exports and imports from China and Rest of the World at 3-digit level industries (ISIC rev. 2). We follow Bernard et. al. (2006) by computing year and sector specific import penetration ratios for China (PChina) and Rest of the World (Pothers) according to:

$$(1) \qquad PChina_{jt} = \frac{M_{jt}^{Ch}}{(M_{jt} + Q_{jt} - X_{jt})},$$

where M_{jt}^{Ch} is the value of imports from China, M_{jt} is the value of import from all countries (including China), Q_{jt} is domestic production, and X_{jt} represents Chile exports.

$$(2) \qquad POthers_{jt} = \frac{M_{jt} - M_{jt}^{Ch}}{(M_{jt} + Q_{jt} - X_{jt})}$$

Using these two indicators, we first analyze import penetration across all 28 3-digit manufacturing industries. The evidence for China is presented in Figure 1. The relevance of Chinese imports is uneven across sectors. Sectors with high competition from China are apparel (322), other manufactured products (390), leather products (323), footwear (324) and Pottery (361), where import penetration in 2000 is above 15% and have also experienced important growth. By contrast, in sectors such as food (311), beverages (313) and wood products (331), import penetration from China is practically inexistent. For comparison, Figure 2 shows the evolution of import penetration from the rest of the world in the same period. Import penetration from the rest of the world is flatter, and in some capital-intensive sectors such as machinery (382), electric machinery (383), and transport equipment (385) it has been persistently large and constant over time. This evidence neither means that imports from the rest of the world have not grown in absolute terms or that the growth in import penetration has jeopardized domestic production. Table 1 reports the rate of growth of consumption, output, total imports and total exports for each sector. Imports from the rest of the world have indeed grown and, more importantly, total import penetration is not accompanied by a fall in domestic output but rather by relatively high growth in exports, meaning that at least as first approximation, China's import penetration has neither displaced foreign imports or domestic production.[2]

Given these differences in import penetration across sectors, we explore the relationship between input-intensity –measured as capital per worker and skill-intensity in 1990– and the change in import penetration between 1990 and 2000 (in percentage points) for each industry. According to factor endowments driven specialization we should expect a lower import penetration from China in more capital and skill intensive industries.[3] Some evidence on this regard is presented in Figures 3 and 4. There is a negative relationship between the change in Chinese import penetration and capital per worker and skill intensity across manufacturing industries. The slope for these relationships is estimated to be -0.04 and -0.025, respectively, and both coefficients are significant only at 10%.[4] In other words, the larger increase in imports from China is concentrated in industries with low intensity of physical and human capital, but this relationship is weak. There are several potential explanations for this. First, there might be significant heterogeneity in production techniques across producers in different countries within 3-digit industries (Bernard, et. al. 2006), meaning that the link between factor abundance and trade structure –defined at a very high level of aggregation– weakens. Second, a significant portion of the recent growth in international trade is due to exchange of intermediate products. The existence of intermediate inputs means that China's exports combines imported inputs with high value-added per worker with abundant domestic labor.[5] This is

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[2]   See Alvarez and Claro (2006b) for more evidence.

[3]   This is consistent with the idea that China is relatively more abundant in labor than Chile. See Schott (2005) for a comparison on relative endowments between China and other regions of the world.

[4]   We also explore the existence of some non-linearities in this relationship by including the square of both intensities, but the results were not significant.

[5]   See Claro (2006a).

FIGURE 1
IMPORT PENETRATION FROM CHINA
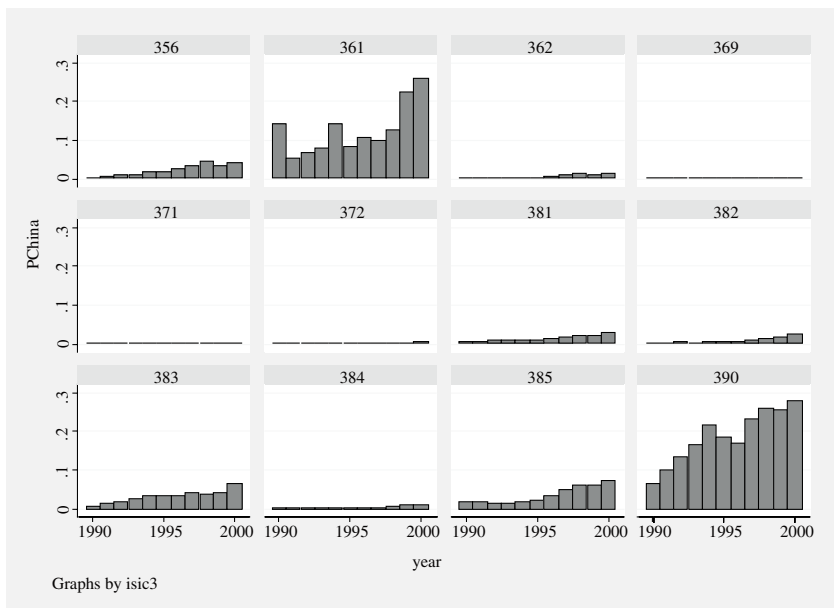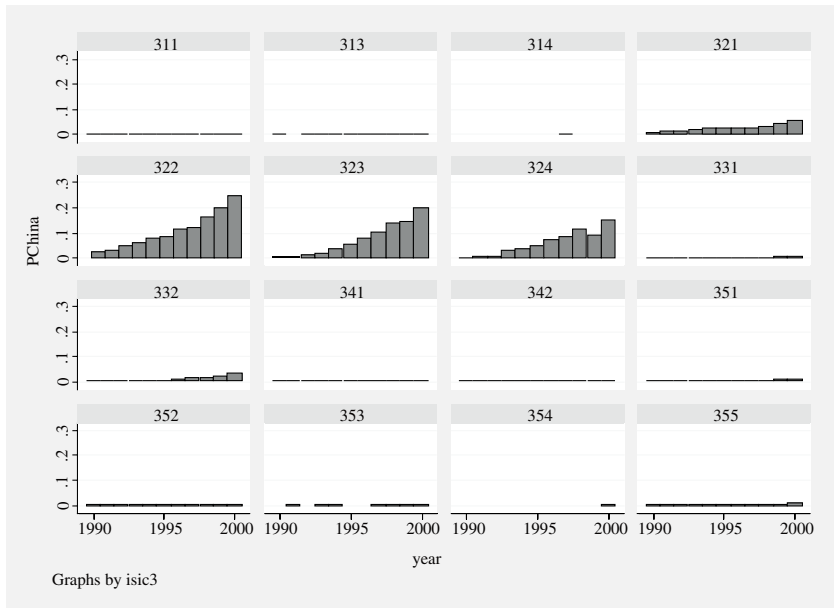

Graphs by isic3

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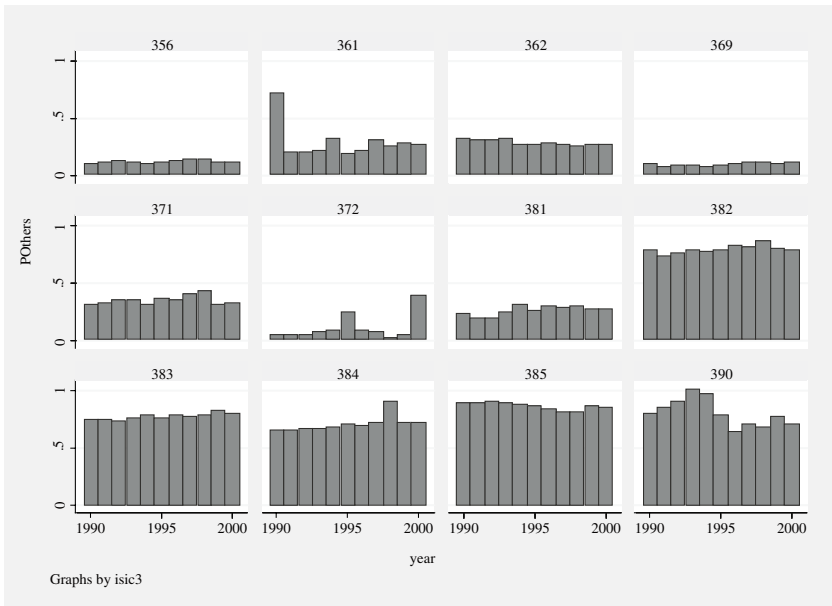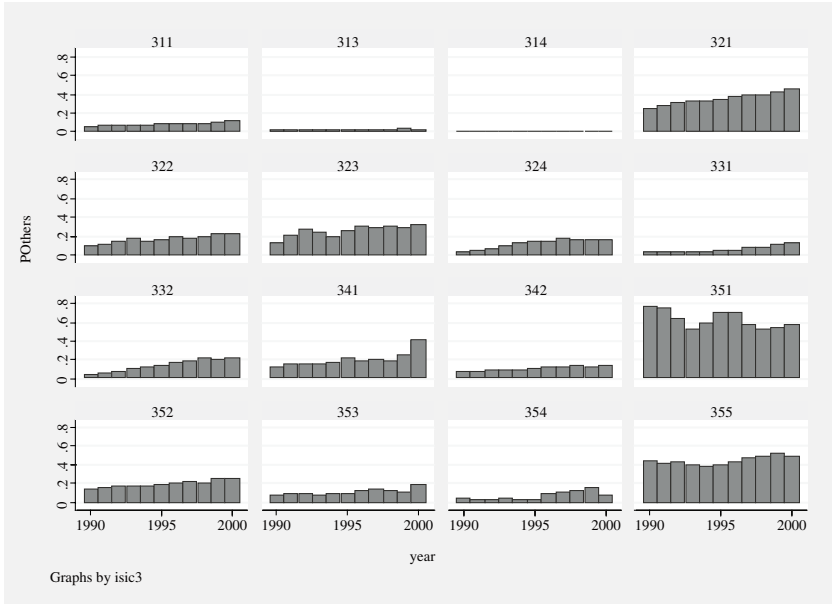
FIGURE 2
IMPORT PENETRATION FROM REST OF THE WORLD

TABLE 1
INDUSTRY ANNUAL GROWTH 1990-2000
(%)

Industry	Description	Apparent Consumption	Output	Exports	Imports	Import Penetration	
						China	Others
311	Food	11.1	9.0	4.8	28.7	–7.3	6.4
313	Beverages	11.7	17.4	74.5	28.1	7.0	5.8
314	Tobacco	9.4	9.6	474.0	16.4	*	3.1
321	Textiles	–0.1	–2.3	18.9	10.6	27.0	6.6
322	Apparel	11.5	2.6	0.5	73.5	27.1	8.5
323	Leather	2.5	0.0	89.9	37.3	50.6	9.1
324	Footwear	6.7	0.5	–7.9	167.0	63.9	19.1
331	Wood	4.5	8.2	19.5	43.2	37.5	13.5
332	Furniture	15.8	12.4	26.1	130.8	44.6	17.0
341	Paper	1.8	7.9	24.8	29.5	53.6	12.8
342	Printing	5.6	6.0	32.0	18.4	27.9	6.0
351	Chemicals	17.8	31.8	24.1	10.9	9.4	–2.9
352	Other chemicals	10.4	8.4	40.5	26.0	14.7	5.8
353	Petroleum Refineries	2.3	1.5	31.2	21.1	**	9.7
354	Products of Petroleum	2.7	2.3	–1.4	12.4	**	5.8
355	Rubber	9.8	10.2	20.6	12.1	46.2	0.9
356	Plastic	20.6	19.6	50.0	34.0	30.8	0.7
361	Pottery	58.7	17.1	–1.1	32.6	6.1	–9.3
362	Glass	14.3	17.5	67.3	11.6	21.0	–1.7
369	Other non–metallic mineral product	14.8	14.3	13.4	19.8	14.8	1.8
371	Iron and steel	4.1	4.0	5.2	4.7	20.1	0.3
372	Non–ferrous metals	–7.3	1.5	4.5	12.8	129.2	23.4
381	Metal products	4.7	4.4	31.7	8.1	18.8	1.2
382	Machinery, no elect.	5.7	6.3	63.5	6.3	23.1	0.1
383	Electric machinery	9.7	2.7	49.7	12.8	26.8	0.8
384	Transport equipment	11.1	11.1	34.0	13.1	25.1	0.8
385	Scientific equipment	9.8	10.5	38.6	10.1	15.3	–0.4
390	Other manufacturing	20.7	6.2	20.5	24.7	15.8	–1.3

Notes:

The annualized rate of growth of each variable is computed as: $100 \cdot \left[\left(\frac{X_{2000}}{X_{1990}} \right)^{1/10} - 1 \right]$, where X is

the variable measured in nominal dollars. For import penetration, the rate of growth (in percentage

points) is computed as $100 \cdot \left(\frac{Z_{2000} - Z_{1990}}{10} \right)$.

* No imports from China in 1990 and 2000
** No imports from China in 1990

perfectly consistent with endowment-based theory of comparative advantage, but it contaminates the relationship between factor abundance and final-goods trade flows.

FIGURE 3
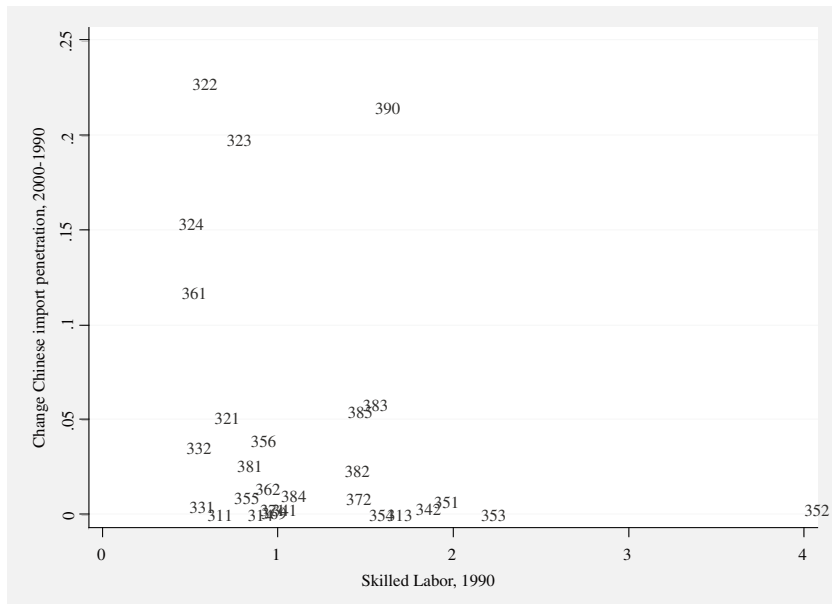IMPORT PENETRATION FROM CHINA AND CAPITAL INTENSITY
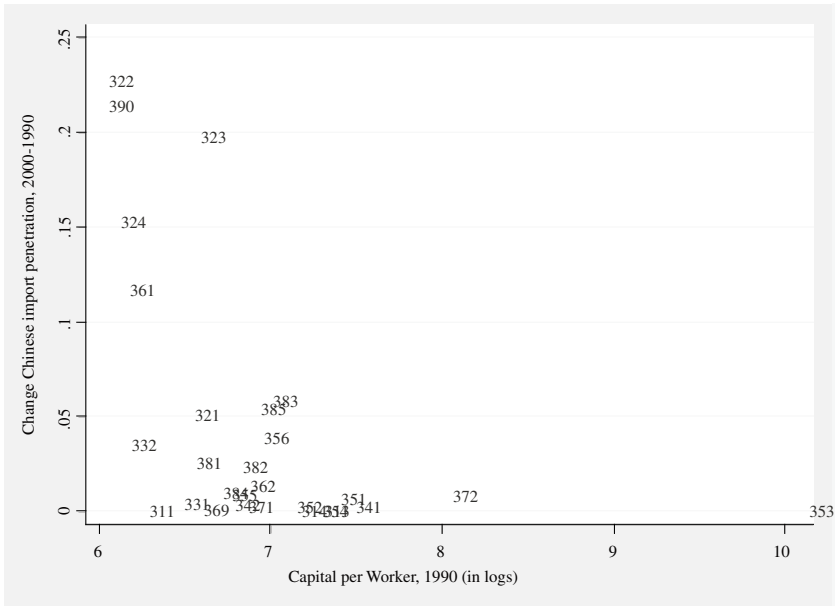
Notes: the change in Chinese import penetration is computed as $S_{2000} - S_{1990}$, which measures the simple change in import penetration in percentage points.

There is however a third explanation for the weak relationship depicted in Figures 3 and 4. If there is heterogeneity across products from different countries within commonly defined industries, the raise in Chinese import penetration may be explained by differences in products' characteristics, namely, price differences, quality differences and/or differences in the number of unobserved varieties within each product. These features are not captured by traditional trade models, and the rest of the paper is devoted to further explore the validity of these explanations.

3. EVIDENCE OF WITHIN-PRODUCT SPECIALIZATION

In two recent papers, Schott (2003, 2004) has shown that traditional classifications in international trade hide significant differences in the way countries specialize. Traditionally, consistent with factor-endowment-based theory of comparative advantage, we expect China to specialize in labor-intensive industries. Nevertheless, there is also evidence that specialization not only occurs across industries, but also within industries and even in narrowly-defined products. Using

FIGURE 4

IMPORT PENETRATION AND SKILL INTENSITY

Notes: the change in Chinese import penetration is computed as $S_{2000} - S_{1990}$, which measures the simple change in import penetration in percentage points.

disaggregated information for product defined to 10-digit of the Harmonized System, Schott (2004) shows that product prices differ significantly according to income and factor endowments. Rich countries (relatively more abundant in physical and human capital) specialize in high-price products, which use intensively their more abundant factors.

We test this hypothesis for the Chilean case. In particular, we first show evidence of systematic relationship between import prices and exporter's income and we then show that China's imports are cheaper compared to countries with similar income per capita. We use highly-disaggregated 8-digit Harmonized System (HS) import data from 44 countries during the period 1990-2003 from the Central Bank of Chile. The set of countries chosen include the 44 main trade partners of Chile in 2003. We compute the price for each product as unit value, i.e., imports in dollars over imported quantity.[6]

Firstly we estimate several versions of the following equation:[7]

(1) $$LogP_{ict} = \alpha_{it} + \delta \cdot LogI_{ct} + \varepsilon_{ict}$$

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[6]   Note that the unit of measurement of quantities differs across industries, say 3-digit ISIC level, but it is the same within each 8-digit product.

[7]   We also include year-fixed effects for controlling for shocks that are common across products.

where P_{ict} is unit value (in dollars) of imports from country c in 8-digit product i in year and I_{ct} is per capita GDP of exporter country c. Product-year fixed effects are denoted by α_{it}. The parameter of interest δ is expected to be positive, which is consistent with the idea that richer countries are specialized in high-price goods. The results shown in Table 2 confirm the hypothesis of within-product specialization. We estimate the equation for all 8-digit products (column 1), only for manufacturing products (column 2), and for manufacturing products imported exclusively from low and high income countries (column 3).[8] In all specifications the parameter of interest is positive and significant. A value of 0.35 means that a 10 percent increase in per capita income is associated with a 3.5 percent increase in product prices. We also estimate equation (1) for each 80 4-digit ISIC manufacturing industries to check whether the estimated coefficient varies across industries. The results are fairly consistent with the idea that richer countries receive higher prices for their exports across all sectors. In 65 out of 80 industries (81.3% of the manufacturing industries) the estimated parameter is positive and significant (at 5%), and for one industry only (3845) the parameter is negative but not significant. The results are shown in Figure 5 where we plot the parameter value and the confidence interval. The simple mean estimated parameter was 0.29, which is very similar to the 0.35 in Table 2.[9]

TABLE 2
IMPORTS PRICES AND INCOME PER CAPITA

	(1)	(2)	(3)
Income per capita (in logs)	0.345	0.347	0.349
	(8.36)**	(8.24)**	(8.16)**
Constant	–0.166	–0.181	0.180
	(0.40)	(0.43)	(0.38)
Observations	465185	449542	407072
R-squared	0.76	0.76	0.74

Robust t statistics in parentheses; * significant at 5%; ** significant at 1%.
(1) includes all products, (2) includes only manufacturing products, (3) includes only manufacturing products and those supplied only by low income economies. Low income countries are those with income per capita lower than the 30% of countries in the sample, and high income countries are those with income per capita higher that the 70% of countries in the sample. Income per capita is from World Development Indicators.

Accordingly, we expect China's imports to be relatively cheap. We estimate a different version of equation (1) in order to analyze whether Chinese imports

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[8]   Low income countries are those with income per capita lower than the 30% of countries in the sample, and high income countries are those with income per capita higher that the 70% of countries in the sample. Income per capita is obtained from World Development Indicators.

[9]   Detailed results for each industry are shown in Appendix 1.

FIGURE 5

INCOME PER CAPITA PARAMETER ACROSS INDUSTRIES
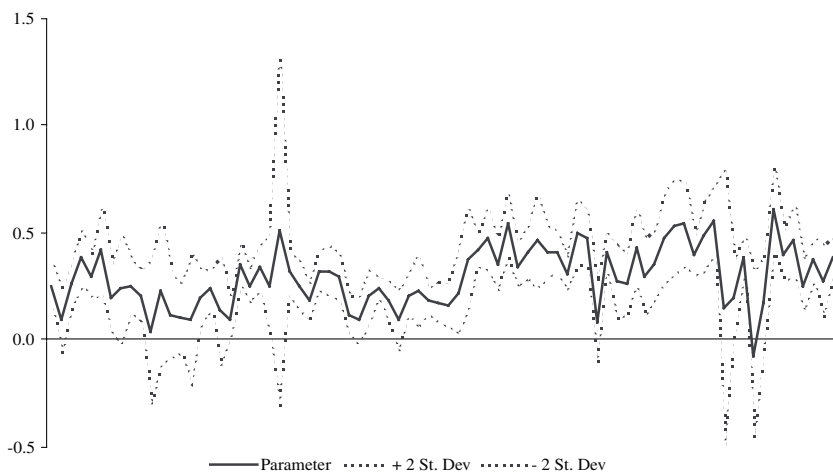
are low priced compared to products from other countries after controlling for income per capita. The specification used is:

(2) $$LogP_{ict} = \alpha_{it} + \beta \cdot CHN + \delta \cdot \log I_{ct} + \varepsilon_{ict}$$

In equation (2), CHN is a dummy variable for products imported from China. We are particularly interested in testing if β is negative or positive. In the case that β is negative we conclude that China's products are cheaper than those of countries with similar per capita income. The results are shown in Table 3. In all specifications we found that imports from China receive a price that is –on average– 30 percent lower that of countries at similar development stage. The evidence that Chinese products are relatively cheap, even compared to countries with similar income is consistent with that from Schott (2006), who shows that Chinese products on average sell for a discount relative to products of countries with similar GDP per capita in the United States during the 1990s.[10]

Rodrik (2006) has shown that the Chinese export basket corresponds to that of a middle-income country like Brazil. The basket is computed as the weighted average of the average per capita income of exporters in each 6-digit HS category. He computes the average income level of all exporters of each product, and he weights those income levels according to the share of each product in China's exports, concluding that China's export structure is similar to that of middle-income countries. High exports of product categories that are exported by high-income countries does not imply anything regarding cross-country price

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[10]   He also provides evidence that the number of product categories exported from China to the United States is significantly higher than those of countries at similar stages of development. This explains why he argues that China's exports are relatively sophisticated.

differences but they rather point out to the idea that the comparative advantage of China does not necessarily match that predicted by factor-abundance theories. To some extent, this is the hypothesis of the paper: the penetration of China in world markets and its cross-sector distribution seems to convey much more information than what endowment-based trade theories would predict.

For example, the bottom part of Table 3 reports the results of regressions allowing for β varying across sectors with different factor intensities. Chinese prices are lower than those of countries with similar income per capita in unskilled-labor intensive sectors, while prices of Chinese products are more expensive in skilled-labor intensive sectors. There are several potential explanations for this phenomenon, like quality upgrading or productivity differences associated with the uneven access of foreign-invested enterprises to China's markets that are consistent with Rodrik's evidence.[11]

It is interesting to note that these results would suggest a sort of convergence in export prices as long as countries converge in terms of income per capita. In the case of China, given its expected convergence to higher income, these price differentials should be reduced in the future. In such a case, the future competition from China would be concentrated in "high" price goods. However, the wide income gap between China and more developed countries suggests that this could happen several decades later.

In sum, we have found evidence that there is within-product specialization, meaning that there are significant price differences across similar products from different sources. In particular, price differences are highly correlated with income per capita of exporter's country, and products imported from China are low priced compared to those of countries of similar income per capita. To what extent is China's aggregate and sector-specific import penetration explained by these price differences? We explore this issue in next section by decomposing China's import penetration into different import margins.

4. Decomposing China's Import Growth

The expansion of imports from a determined country may be due to two main margins. The country may expand exporting the same varieties than other trading partners, which is denominated as intensive margin, and/or incorporating new product categories (extensive margin). To analyze the role of new products, a simple count of product categories defined at the 8-digit HS level, is not very adequate because it does note take into account the amount imported and the price of every variety. Hummels and Klenow (2004) developed a procedure to decompose trade values in these two main components. In addition, they show how the intensive margin may be decomposed in a quantity and in price index.

Define "overall" share of a country j's imports (in this case China) relative to the rest of the world as:

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[11]   See Claro (2006b) for evidence of cross-industry productivity difference within China and their relation with sectoral differences in FDI inflows.

TABLE 3
IMPORTS PRICES, INCOME PER CAPITA AND CHINA

Panel a: Fixed China Coefficient

	(1)	(2)	(3)
Income per capita (in logs)	0.316	0.316	0.316
	(7.59)**	(7.51)**	(7.48)**
China	−0.307	−0.320	−0.334
	(2.73)**	(2.84)**	(2.97)**
Constant	0.126	0.177	0.153
	(0.29)	(0.47)	(0.41)
Observations	465185	449542	407072
R-squared	0.76	0.76	0.74

Robust t statistics in parentheses; * significant at 5%; ** significant at 1%
(1) includes all products, (2) includes only manufacturing products, (3) includes only manufacturing products and those supplied only by low income economies. Low income countries are those with income per capita lower than the 30% of countries in the sample, and high income countries are those with income per capita higher that the 70% of countries in the sample. Income per capita is from World Development Indicators.

Panel b: Varying China Coefficient

	(1)	(2)	(1)	(2)	(1)	(2)
Income per capita (in logs)	0.316	0.316	0.316	0.316	0.316	0.316
	(7.51)**	(7.48)**	(7.51)**	(7.47)**	(7.51)**	(7.48)**
China	−0.332	−0.452	−0.406	−0.436	0.114	0.036
	(0.93)	(1.28)	(3.69)**	(3.98)**	(0.34)	(0.11)
China*KL	0.002	0.018			−0.083	−0.075
	(0.03)	(0.34)			(1.77)	(1.62)
China*HL			0.075	0.088	0.102	0.113
			(2.88)**	(3.41)**	(5.48)**	(5.99)**
Constant	0.126	0.152	0.123	0.150	0.124	0.151
	(0.28)	(0.41)	(0.27)	(0.40)	(0.28)	(0.40)
Observations	449542	407072	449542	407072	449542	407072
R-squared	0.76	0.74	0.76	0.74	0.76	0.74

Robust t statistics in parentheses; * significant at 5%; ** significant at 1%
KL is log of capital per worker, and HL is skilled total wage bill over unskilled total wage bill. Both are measured at 3-digit industry level for 1990. (1) includes only manufacturing products and (2) includes only manufacturing products and those supplied only by low income economies. Low income countries are those with income per capita lower than the 30% of countries in the sample, and high income countries are those with income per capita higher that the 70% of countries in the sample. Income per capita is from World Development Indicators.

$$(3) \qquad\qquad\qquad s_{jt} = \frac{M_{jt}}{M_{rt}}$$

where M_{jt} are total imports (in dollars) from country j, and M_{rt} are total imports from rest of the world. Taking into account the different number of varieties imported from the two sources, denoted by N_j and N_r, the overall share may be written as:

$$(4) \qquad s_{jt} = \frac{M_{jt}}{M_{rt}} = \frac{\displaystyle\sum_{i=1}^{N_j} M_{ijt}}{\displaystyle\sum_{i=1}^{N_r} M_{irt}} = \frac{\displaystyle\sum_{i=1}^{N_j} M_{ijt}}{\displaystyle\sum_{i=1}^{N_j} M_{irt}} \cdot \frac{\displaystyle\sum_{i=1}^{N_j} M_{irt}}{\displaystyle\sum_{i=1}^{N_r} M_{irt}} = IM_{jt} \cdot EM_{jt}$$

The first component in equation (4) –the intensive margin (IM)– compares imports from j and the rest of the world in a common set of goods. The second component –the extensive margin (EM)– compares imports from j and the rest of the world in goods that are only imported from the country j. Hummels and Klenow (2004) show how the intensive margin may be further decomposed in a quantity and price index. To do that, we need to compute only the price index given by:[12]

$$(5) \qquad\qquad\qquad P_{jt} = \prod_{i \in N_j} \left(\frac{P_{jit}}{P_{wit}} \right)^{w_{jit}}$$

where w_{jit} is a weight computed as the logarithmic mean of two shares: (i) the share of product i in country j´s exports, and (ii) the share of product i in rest of the world's exports. The evolution of these margins is illustrated in Figure 6. The key features are the following ones:
a) There is significant increase in imports from China. The overall share increases from less that 1 percent in 1990 to more than 8 percent in 2003.
b) The extensive margin is the main component of China's import penetration. Around 40% of imports from the rest of the world are subject to direct competition from Chinese products, i.e., present in the same 8-digit product category (extensive margin) and the penetration of Chinese products in those common categories (intensive margin) is relatively low.
c) The evolution of these two margins, however, tends to be different. The intensive margin grew steadily over the period, and the extensive margin grew only up to the end of the 1990s, when it stagnates. By 2003, the extensive margin reaches the level of 1997.
d) Finally, the increase in the intensive margin is almost exclusively attributed to the growth in imported quantities, with relative prices staying relatively constant.
    To analyze more formally the contribution of each margin to the evolution of the overall share we run a simple OLS regression of each margin against time.

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[12]   The implicit quantity index (Q_{jt}) is given by $IM_{jt} = P_{jt} \cdot Q_{jt}$

FIGURE 6
AGGREGATE MARGINS

Panel a: Overall Share

China's Imports - Overall Share: 1990-2003
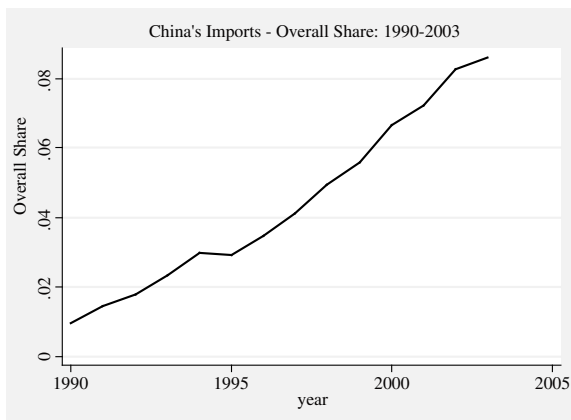
Panel b: Extensive and Intensive margins

China's Imports - Extensive and Intensive Margin: 1990-2003

Extensive Margin   Intensive Margin

Panel c: Price and Quantity Index

China's Imports - Price and Quantity Index : 1990-2003

Price Index   Quantity Index

The dependent variables are natural logs of each margin, so we can interpret the results are annualized rate of growth of each margin. The results are reported in Table 4. The main source of growth in Chinese imports is the intensive margin, which explains around 80% of the annual rate of growth of the overall share (0.126 over 0.158). The parameter for time in the equation for the price index is low and not significant, revealing that the price ratio did not change significantly between 1990 and 2003. Although Chinese products are cheaper, they have always been, and this difference does not contribute to explain the raise in import penetration. An increase in imported quantities –presumably driven by factors other than relative prices– explains almost all the variation in the intensive margin (0.121 over 0.126).[13] We therefore conclude that the most significant part of the increase in import penetration form China is explained by a high growth in quantities imported of products in common categories with the rest of the World.

TABLE 4
EVOLUTION OF MARGINS

	Ln(s)	Ln(EM)	Ln(IM)	Ln(PI)	Ln(QI)
Time	0.158	0.033	0.126	0.005	0.121
	(19.37)**	(4.83)**	(13.24)**	(1.53)	(10.77)**
Constant	–319.238	–65.831	–253.407	–10.655	–242.752
	(19.58)**	(4.90)**	(13.37)**	(1.62)	(10.85)**
Observations	14	14	14	14	14
R-squared	0.97	0.66	0.94	0.16	0.91

Absolute value of t statistics in parentheses. * significant at 5%; ** significant at 1%.

The evidence that the increase in China's quantity penetration has been achieved without a significant fall in relative product prices suggests a sort of puzzle for the conventional wisdom. There are at least two possible explanations for this phenomenon. One possibility is that there is heterogeneity across products even within highly-disaggregated product categories, i.e., 8-digit HS level, meaning that countries produce a different number of varieties of each product. If consumers have preferences for varieties, imports are higher from countries that produce more varieties. Alternatively, there might be differences in quality or willingness to pay for products of different sources, shifting relative demand for products within the same 8-digit category. In other words, it is possible that China offers a low number of varieties of each product or

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[13]   Given that OLS is a linear operator, the sum of the time parameters for the intensive and extensive margin is equal to the time parameter in column (1). Also, the sum of the parameters for the quantity and price index equals the parameter for intensive margin.

that the quality of its products is relatively low compared to products for the rest of the world.[14]

The secondary –if existent– role of price differences in explaining China's import penetration at the aggregate level may not necessarily hold across all sectors. We get a more disaggregated perspective of the causes of China's import penetration by analyzing the behavior of different margin at the sector level. Figure 7 show the evolution of import margins for some relevant sectors. Compare for example, the evolution of import margins for textiles and apparel. In the case of textiles, the main component of Chinese imports is the extensive margin. It is also clear that both margins have been growing over time. By contrast, the main component in the huge increase of Chinese apparel imports is the intensive margin. For this industry, the contribution of the extensive is fairly constant. In the case of leather and footwear products we observe that the growth in the overall share is mainly driven by the intensive margin. Also, the growth in the intensive margin is almost exclusively due to a strong increase in imported quantities. Interestingly, we observe differences in these two industries: there is a slight increase in the relative price of Chinese leather products, while there is no important change in the relative price in the footwear industry. It is interesting to compare the evolution of these margins with that experienced by the industry of fabricated metal products. Yet there is lower increase in the Chinese overall share, this is mainly explained by an increase in the extensive margin. However, after 1995 there is a relatively large increase in the quantity index that is accompanied by a reduction in the price index. This is something different to what we observe in the other sectors, where the increase in quantities is not accompanied by a decline in import prices.

Table 5 reports the results of running an OLS regression for different margins (in natural logs) against time for 12 manufacturing industries.[15] In the upper part of the Table 5 we show the results of our estimations. The bottom part reports the contribution of each margin on the overall share is presented. Similar to results in Table 3, most of the variation is attributable to growth in the intensive margin (and especially to quantity index). But there is some heterogeneity across sectors. In some of the industries –Pottery, Glass, and Fabricated Metal Products– the extensive margin has been an important driver of import growth. Moreover, we find that in some sectors –mainly plastic products, machinery and transport equipment– the increase in imported quantities has been accompanied by also high reduction in import prices. In sum, this simple methodology of import decomposition reveals some interesting features of the Chinese competition. Overall, the evidence shows that imports from China has grown mainly due to an increase in products already imported from the rest of the world (intensive margin), and that the increase in the intensive margin follows from increases in the quantities imported from China without a clear decline in the relative price of Chinese products relative to the rest of the world.

[14] Álvarez and Claro (2006a) address this issue in detail.

[15] As we want to know the contribution of the margins on import growth, we do not use all the 28 industries. We only consider only those where the Chinese penetration has increased over time. Moreover, there are some industries – for example Tobacco where imports from China are negligible or inexistent for some year. After cleaning our sample, we maintain 12 industries where this estimation procedure makes sense.
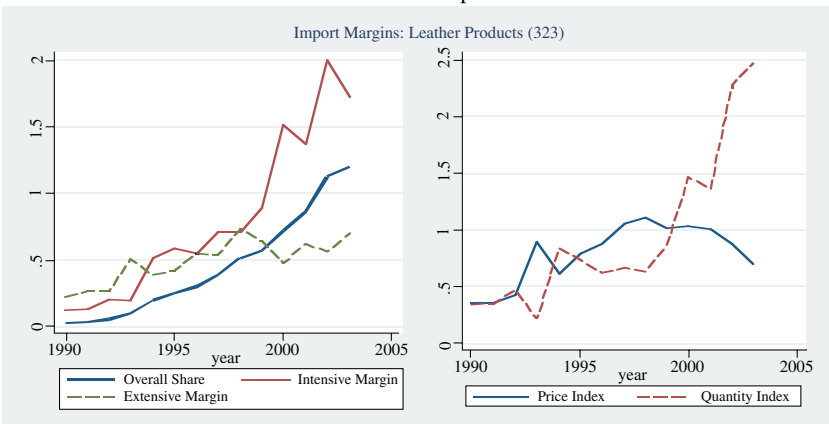
FIGURE 7
SECTOR-SPECIFIC MARGINS
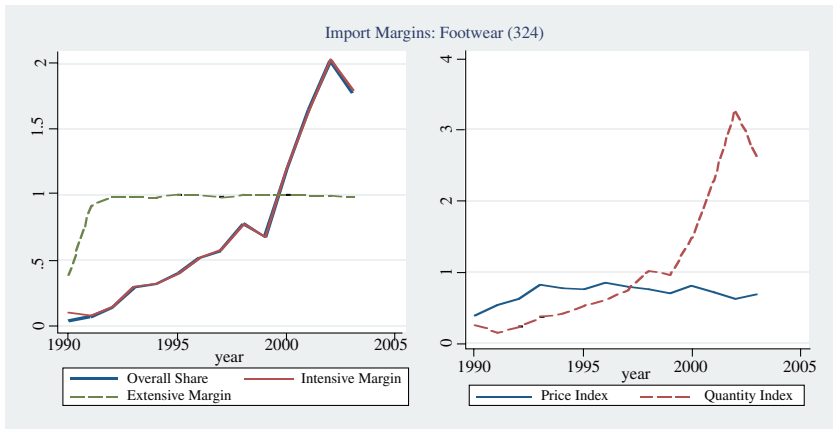
Panel a: Textiles
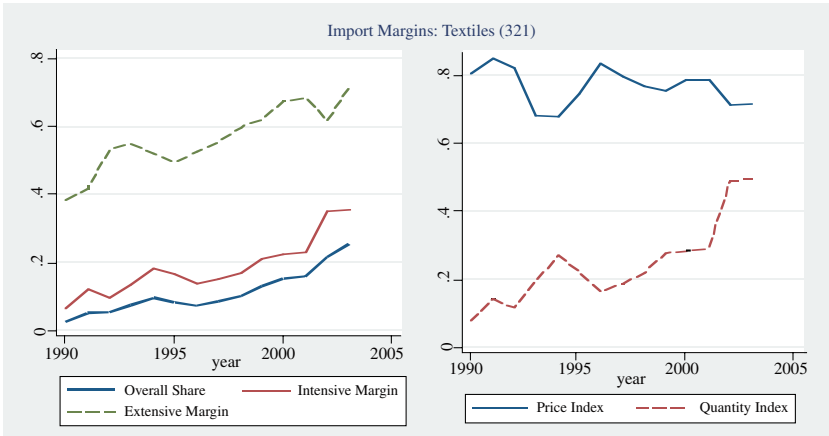
Panel b: Apparel
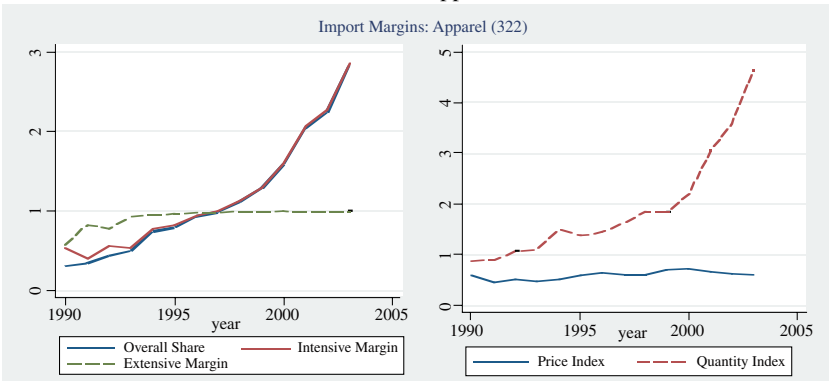
Panel c: Leather products

Panel d: Footwear
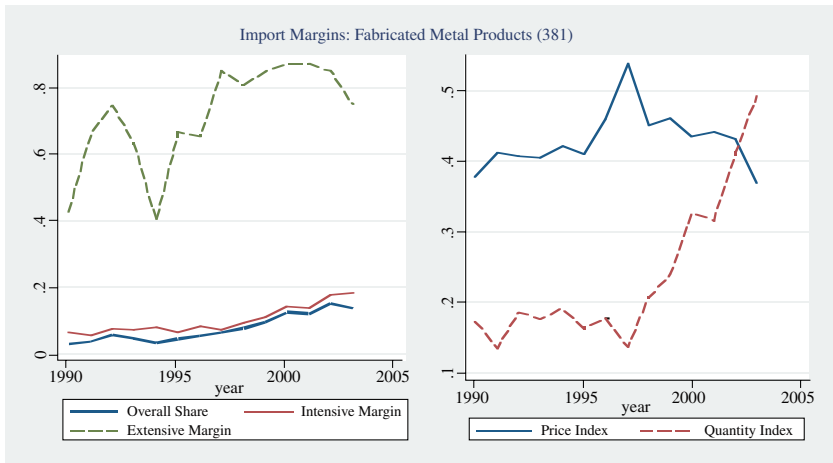

Panel e: Fabricated Metal Products

TABLE 5
EVOLUTION OF MARGINS FOR DIFFERENT INDUSTRIES

	Overall Share	Extensive Margin	Intensive Margin	Price Index	Quantity Index
	A. Regression Results				
Textiles	0.141	0.039	0.102	−0.005	0.107
	(9.97)**	(7.34)**	(7.88)**	(1.05)	(6.59)**
Apparel	0.167	0.027	0.140	0.024	0.117
	(30.15)**	(3.57)**	(17.69)**	(3.50)**	(13.11)**
Leather products	0.294	0.076	0.219	0.068	0.151
	(14.68)**	(5.33)**	(13.61)**	(3.48)**	(6.94)**
Footwear	0.274	0.030	0.244	0.021	0.223
	(12.03)**	(1.94)	(15.38)**	(1.63)	(15.48)**
Furniture	0.208	0.046	0.162	−0.016	0.178
	(23.32)**	(4.48)**	(12.97)**	(0.59)	(8.08)**
Plastic products	0.200	0.033	0.167	−0.065	0.232
	(10.74)**	(5.67)**	(11.94)**	(4.48)**	(16.20)**
Pottery	0.122	0.052	0.069	0.016	0.053
	(7.68)**	(3.45)**	(3.95)**	(0.74)	(1.75)
Glass	0.237	0.073	0.164	−0.010	0.174
	(13.19)**	(8.83)**	(14.89)**	(0.58)	(7.81)**
Fabricated metal prod.	0.126	0.040	0.086	0.005	0.081
	(9.34)**	(3.14)**	(8.40)**	(0.79)	(5.29)**
Machinery	0.210	0.043	0.167	−0.021	0.188
	(12.90)**	(8.88)**	(9.43)**	(2.14)	(9.06)**
Elect. Machinery	0.179	0.033	0.146	0.034	0.112
	(10.20)**	(5.70)**	(9.15)**	(2.52)*	(7.41)**
Transport Equipment	0.153	0.043	0.110	−0.026	0.136
	(9.51)**	(9.77)**	(7.37)**	(3.55)**	(10.74)**
	B. Contribution to Overall Growth				
Textiles	–	27.7	72.3	–3.5	75.9
Apparel	–	16.2	83.8	14.4	70.1
Leather products	–	25.9	74.5	23.1	51.4
Footwear	–	10.9	89.1	7.7	81.4
Furniture	–	22.1	77.9	–7.7	85.6
Plastic products	–	16.5	83.5	–32.5	116.0
Pottery	–	42.6	56.6	13.1	43.4
Glass	–	30.8	69.2	–4.2	73.4
Fabricated metal prod.	–	31.7	68.3	4.0	64.3
Machinery	–	20.5	79.5	–10.0	89.5
Elect. Machinery	–	18.4	81.6	19.0	62.6
Transport Equipment	–	28.1	71.9	–17.0	88.9

Absolute value of t statistics in parentheses. * significant at 5%; ** significant at 1%

4. Conclusions

The impact of Chinese competition is commonly thought to be transmitted through prices. In particular, as traditional endowment-based trade theory predicts, the main impact of China's competition is expected to be associated with a fall in the relative price of labor-intensive products and high penetration in labor-intensive sectors. Although there is some evidence supporting this view, we find that a large part of the action takes place within sectors. In particular, China's products are cheap not only compared to products from the rest of the world in the same industries, but they are also cheaper than those from countries with similar income per capita in unskilled-labor intensive industries. Although we do not study the reasons for this heterogeneity, we conclude that it is crucial to understand the evolution of China's import penetration.

But there is more. Although Chinese products are cheap, they have always been. There is not significant declining trend in the relative price of Chinese products. Overall, the increase in import penetration from China is probably explained by factors that have shifted the world demand for Chinese products, like quality upgrading or an increase in the number of varieties produced in China. Of course, we observe some heterogeneity across industries, which suggests that productivity improvements and/or quality upgrading is not evenly distributed across sectors. Therefore, there is important heterogeneity in the competition effects emanating from the irruption of China as a significant source of imported goods, not only across sectors but also within sectors. And this is relevant to understand the impact of China's export to developing countries, not only because competition from China is not restricted to labor-intensive industries but also because the effect on domestic producers and consumers depend on the specific characteristics of Chinese products. This paper raises much more questions than it provides answers. Although within-product price differences are significant, the evidence suggests that they cannot account for China's export miracle, meaning that other sources of heterogeneity need further study.

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APPENDIX 1
ESTIMATED PARAMETERS BY 4-DIGIT INDUSTRIES

ISIC-4	Parameter	St. dev.	t-test	ISIC-4	Parameter	St. dev.	t-test
3111	0.25	0.05	5.00	3524	0.16	0.05	3.28
3112	0.09	0.07	1.24	3530	0.22	0.10	2.30
3113	0.26	0.05	4.91	3540	0.37	0.12	3.08
3114	0.38	0.07	5.77	3551	0.42	0.04	11.03
3115	0.29	0.05	5.67	3559	0.47	0.07	6.47
3116	0.42	0.10	4.04	3560	0.35	0.06	5.99
3117	0.19	0.08	2.29	3610	0.54	0.08	7.18
3118	0.24	0.13	1.89	3620	0.34	0.05	6.92
3119	0.25	0.06	4.07	3691	0.40	0.06	6.57
3121	0.20	0.06	3.32	3692	0.46	0.11	4.20
3121	0.04	0.17	0.22	3699	0.41	0.06	6.80
3132	0.23	0.17	1.36	3710	0.41	0.05	8.25
3133	0.12	0.10	1.15	3720	0.31	0.04	8.09
3134	0.10	0.08	1.26	3811	0.50	0.08	6.49
3140	0.09	0.15	0.59	3812	0.48	0.07	7.35
3211	0.20	0.07	3.04	3813	0.09	0.09	0.92
3212	0.23	0.05	4.91	3819	0.41	0.04	9.11
3213	0.14	0.13	1.11	3821	0.27	0.08	3.22
3214	0.09	0.04	2.10	3822	0.26	0.07	3.61
3215	0.35	0.05	6.98	3823	0.43	0.09	4.70
3215	0.25	0.04	6.45	3824	0.30	0.09	3.37
3220	0.34	0.05	6.13	3825	0.35	0.08	4.28
3231	0.25	0.11	2.31	3829	0.48	0.10	4.58
3232	0.51	0.41	1.25	3831	0.53	0.11	4.79
3233	0.32	0.05	5.83	3832	0.54	0.10	5.50
3234	0.25	0.06	4.39	3833	0.40	0.05	8.35
3311	0.18	0.04	4.04	3839	0.49	0.08	5.96
3312	0.32	0.05	6.90	3841	0.56	0.08	6.96
3319	0.32	0.06	5.52	3842	0.15	0.32	0.47
3320	0.30	0.06	5.37	3843	0.20	0.09	2.20
3411	0.11	0.05	2.50	3844	0.39	0.05	8.44
3412	0.09	0.05	1.73	3845	-0.07	0.19	-0.38
3419	0.20	0.06	3.20	3849	0.17	0.11	1.58
3420	0.24	0.03	9.60	3851	0.61	0.10	6.01
3511	0.18	0.05	3.69	3852	0.40	0.06	6.66
3512	0.09	0.07	1.30	3853	0.46	0.09	5.29
3513	0.21	0.05	4.64	3901	0.25	0.06	4.40
3521	0.23	0.09	2.61	3902	0.37	0.05	6.87
3522	0.18	0.03	5.95	3904	0.27	0.08	3.36
3523	0.17	0.05	3.64	3909	0.39	0.04	8.64

Source: Authors' elaboration