Evaluating US - China Trade Dynamics: Elasticities and New Key Players under Protectionist Policies

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Abstract: *This study explores the price elasticity of U. S. imports from China in the context of recent protectionist policies. By analyzing trade data from 2023, the research examines the effects of tariff increases on import quantities across various industries. The findings reveal that U. S. imports from China exhibit inelastic demand, influenced by exchange rate fluctuations and domestic competition. Additionally, the paper identifies potential substitute countries for U. S. imports and discusses implications for international trade dynamics. The study's significance highlights the broader implications of U. S. trade policies on international trade dynamics and identifies potential shifts in global supply chains.*

Keywords: price elasticity, U. S. - China trade, tariffs, international trade, protectionist policies

1. Introduction

The issue is important in international trade economics, where changes in exchange rates and trade policies are continuously occurring. Price elasticity reflects the responsiveness of the quantity demanded of a certain good to changes in the good's price. Several studies have examined the price elasticity of U. S. imports from China, given influences such as fluctuating currency, domestic competition, and upward inflation pressures.

A key finding in the literature is that Price elasticity measures how the quantity demanded of a good responds to changes in its price., which would suggest that there is a low responsiveness by the consumer to a change in price, as prices rise, the quantity demanded falls very slightly. Thorbecke and Smith also report that price elasticities for U. S. imports from China are often incorrectly signed, suggesting traditional models may be mis - specifying how consumers act in this context. This finding suggests that price shocks, particularly those linked to currency fluctuations, do not significantly impact import volumes.

Li and Zhao go further to show how the dynamics in the volatility of the exchange rate translate into price elasticities. They observe that the appreciation of the RMB has had a complicated impact on the prices of U. S. imports and, hence, the derived demand. Their findings suggest that U. S. producers may use various pricing responses to increase import competition from China, complicating elasticity estimates further. Auer supports this, indicating that import price shocks from China pass through to U. S. producer prices on average at 0.7, meaning that large price shocks to imports have a quantifiable effect on domestic inflation, as shown in Auer (2015).

Along with the concept of exchange rate pass - through is the notion, or the concept, of price elasticity, which plays a vital role in understanding how price elasticities change. The work of Auer suggests that, for example, a 1% RMB appreciation corresponds to an increase in U. S. producer prices of about 0.56%, in line with the growing interdependence of international trade and domestic pricing (Auer, 2011). The relationship thus explained also basically means that even though the demand for Chinese imports may be inelastic, the effect of currency fluctuations does hold significant implications for U. S. inflation and domestic market conditions.

The competitive landscape might also impact U. S. import price sensitivity. Thorbecke and Smith estimated the exchange rate elasticities for aggregate Chinese imports to be about 0.2, depicting the low responsiveness of imports to price level changes. This elasticity level would be very low, meaning U. S. consumers have a small number of alternatives to Chinese goods, implying that demands are relatively inelastic under varying price conditions.

Furthermore, inflationary pressure and domestic competition are broader economic contexts that make a critical difference in price elasticity. Auer and Fischer go on to reveal how low - wage import competition from China has contributed to lower inflationary pressures in the U. S., thus inferring that the general economic environment can affect consumer responsiveness to changes in prices. That is according to Auer & Fischer, 2010. This interaction between the prices of imports and domestic economic conditions makes estimates of price elasticity particularly complicated in the context of U. S. - China trade.

In sum, the price elasticity of demand for the imports of the United States from China is inelastic, depending on variables that determine the change in prices, such as changes in the exchange rate, pressure by domestic competition, and inflationary tendencies. Thus, the results discussed underline the importance of accommodating models that enable a clear understanding of the consumer behavior responses to the market, given such dynamics in international trade.

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Table 1: Value of US imports from China year 2023.

Code	Description	Total Value	Value in thousands of USD	Rest of the World
85	Electrical Machinery, equipment and parts thereof, Sound Recorders and reproducers, television…	461, 389, 908.00	126, 293, 619	335, 096, 289.00
84	Nuclear reactors, boilers, Machinery and Mechanical Appliances; parts thereof,	460, 364, 084.00	86, 137, 526	374, 226, 558.00
87	Vehicles other than trains or tramway, rolling stock and parts and accessories thereof	381, 436, 364.00	16, 519, 566	364, 916, 798.00
27	Mineral Fuels, mineral oils and products of their distillation; bituminous substances; minerals…	266, 592, 032.00	239, 304	266, 352, 728.00
30	Pharmaceutical Products	182, 466, 922.00	6, 470, 434	175, 996, 488.00
99	Commodities not elsewhere specified	125, 058, 872.00	10, 053, 775	115, 005, 097.00
90	Optical, Photographic, Cinematographic, measuring, checking, precision, medical or surgical	116, 239, 155.00	11, 621, 013	104, 618, 142.00
71	Natural or cultural pearls, precision or semi- precious stones, precious metals, metals clad...	89, 549, 427.00	1, 759, 846	87, 789, 581.00
39	Plastics and articles thereof	72, 346, 644.00	20, 155, 172	52, 191, 472.00
94	Furniture; bedding mattresses, mattress supports, cushions and similar stuffed furnishings;	69, 156, 974.00	20, 319, 543	48, 837, 431.00
29	Organic Chemicals	66, 506, 883.00	8, 388, 423	58, 118, 460.00
73	Articles of iron or steel	55, 663, 036.00	11, 988, 477	43, 674, 559.00
61	Articles of apparel and clothing accessories, knitted or crocheted	45, 244, 512.00	9, 996, 063	35, 248, 449.00
95	Toys, games, sports requisites; parts and accessories thereof	44, 598, 914.00	33, 422, 260	11, 176, 654.00
62	Articles of apparel and clothing accessories, not knitted or crocheted	36, 346, 897.00	7, 807, 754	28, 539, 143.00
40	Rubber and articles thereof	34, 843, 081.00	2, 691, 576	32, 151, 505.00
72	Iron and steel	33, 156, 047.00	612, 964	32, 543, 083.00
22	Beverage, spirits and vinegar	30, 965, 720.00	671, 483	30, 294, 237.00
88	Aircraft, spacecraft, and parts thereof	29, 617, 124.00	383, 698	29, 233, 426.00
76	Aluminum and articles thereof	28, 296, 236.00	2, 743, 803	25, 552, 433.00
Total		2, 629, 838, 832.00	378, 276, 299	2, 251, 562, 533.00

Source: Intracen calculations based on US Census Bureau statistics.

US Imports from China: Today and Tomorrow

Firstly, this study examines U. S. imports from China in 2023. Total imported goods had a value of 3, 172, 533, 052.00, (3, 172 Bill. USD) according to (Intracen 2024). The research has collected detailed information on the top 20 industries imported by the US from China. These Top 20 industries account for 82.89% of the total US imports. The concentration index of the US imports from China then is $C_{20}^{82.}$ These Top 20 industries are the target of this research. The list appears in Table 1 indicating HD Code and values.

Secondly, all tariffs applied by the US on Chinese imports have been collected and are presented in Table 2. The tariff presented uses the Ad Valorem tariff system. The average tariff applied to imports from China was 1.5% taking into consideration all industries. From now on and with the new Trump Administration these tariffs could be increased (or at least this has been said as an electoral promise). D. Trump has promised at least an increase of tariffs of 20% for any country in the world and a 60 %Ad Valorem tariff for products from China.

Table 2: Ad Valorem tariff applied to each industry by the US to imports from China

Code	Tariff Applied in 2023
85	0.6 %
84	0.6 %
87	21 %
27	0.2 %
30	0.9 %
99	1.5 %
90	0.7 %
71	0.8 %
39	2.6 %
94	0.9 %
29	2 %
73	0.8 %
61	11.7 %
95	0.7 %
62	8.9 %
40	1.1 %
72	0.2 %
22	1.1 %
88	0.2 %
76	1.2 %

Source: Intracen calculations based on US Census Bureau statistics.

The first question raised here is up to what extent these tariffs will deter China from exporting to the US. Will they be enough? The answer depends on each industry, due to idiosyncrasies and peculiarities but considering this a simulation has been made. No actual data about the exact price elasticity of the demand for each good imported into the US but it is possible to attempt to bring light to this issue, making the assumption of inelastic imports from China in line with (Auer 2015) and (Thorbecke and Smith 2012).

Tariffs are applied considering the value of the merchandise once has reached the port of destination, (any port in the US). Its equation is as follows:

VMd = VMo + (T=I)
where
- VMd: the value of merchandise in destination (Any given port in the US)

- VMo: the value of the merchandise in origin (port of the country of the exporter)
- T+I: Transportation and Insurance Costs

About merchandise prices

Initially, the price - elasticity formula is based using the differential of quantities (Q1 and Q2), and the differential in prices (P1 and P2). The research will attempt to make a "tariff - elasticity" calculation that considers a price P1 as the value of the actual tariff (price= tariff applied) and P2 as the value of the expected tariff applied by the new administration, in the case of a value equivalent to 60 monetary units (60% ad valorem tariff) and other countries 20 monetary units (20% ad valorem tariff applied). Let's assume that a product has a value of zero (value = 0, zero), not considering either merchandise cost or transport or insurance, then its price would be limited to the payment of the tariff only.

About imported quantities

To obtain or estimate price or tariff elasticity for the US imports from China in each industry, we consider the imported value in the year 2023 as Quantity 1 (Q1) and we assume Quantity 2 as a reduction of 3 scenarios:

- **Scenario 1:** The application of the new tariff proposed (60%) eliminates all exports from China to the US in the industries analyzed here.
- **Scenario 2:** The application of the new tariff proposed (60%) eliminates only 50% of the exports from China. Notice that 50% of the Chinese exports could survive because of price reductions, profit reductions, variations in the exporter currency, specific elasticity, lack of alternatives in other suppliers, supply chain modifications, or any other reason.
- **Scenario 3. (The chosen one).** The application of the new tariff proposed (60%) eliminates 2/3ds of the Chinese imports in the US (66%). The new tariff policies present an effect with a direct impact on the elimination of 66% of the total products imported from China in each industry.

Consequently, the initial Quantity (Q1) will be the imported quantity of each sector into the US in 2023 and Quantity 2 (Q2) will be the expected quantity after the reduction of 2/3rds of the former quantity.

The data has been arranged as follows:

Table 3: Calculations of elasticities. Source Own elaboration

CODE	Price 1 (P1). Represented by the original Ad valorem tariff in the year 2023	Price (P2). Represented by the electoral promise of raising the Ad Valorem tariff to Chinese imports by 60%	Quantity 1 (Q1) The imported quantity in the US from China in the year 2023. (In Thousands USD)	Quantity 2. (Q2) The Expected Quantity (simulated) scenario 3. Reduction of 2/3ds of the supply from China.	Elasticity value obtained in Scenario 3. Effect of 66% on the imports from China.
85	0.6	60	126, 293, 619	83, 353, 789	- 0.52
84	0.6	60	86, 137, 526	56, 850, 767	- 0.96
87	2.1	60	16, 519, 566	10, 902, 914	- 0.53
27	0.2	60	239, 304	157, 941	- 0.55
30	0.9	60	6, 470, 434	4, 270, 486	- 0.52
99	1.5	60	10, 053, 775	6, 635, 492	- 0.53
90	0.7	60	11, 621, 013	7, 669, 869	- 0.52
71	0.8	60	1, 759, 846	1, 161, 498	- 0.52
39	2.6	60	20, 155, 172	13, 302, 414	- 0.55
94	0.9	60	20, 319, 543	13, 410, 898	- 0.52
29	2	60	8, 388, 423	5, 536, 359	- 0.12
73	0.8	60	11, 988, 477	7, 912, 395	- 0.52
61	11.7	60	9, 996, 063	6, 597, 402	- 0.75
95	0.7	60	33, 422, 260	22, 058, 692	0.52
62	8.9	60	7, 807, 754	5, 153, 118	- 0.68
40	1.1	60	2, 691, 576	1, 776, 440	- 0.52
72	0.2	60	612, 964	404, 556	- 0.51
22	1.1	60	671, 483	443, 179	- 0.53
88	0.2	60	383, 698	253, 241	- 0.49
76	1.2	60	2, 743, 803	1, 810, 910	- 0.52

As we can see in the last column of the former table the elasticity values are always <1, meaning that the imported goods would be hypothetically inelastic, in case the actual and very significant increase in the tariff reduces only 2/3rds the imports. It is easy to assume that such an inelastic behavior will not occur in general or at least not in all industries because an increase from a 1.5% Ad valorem tariff to a 60% represents 40 times (40) times higher than what it used to be.

Considering scenario 3 (conservative assumption), a reduction of the quantity of the exported value from China to the US will have to be assessed.

Table 4: Total imports in the US from China and the rest of the world in 2023

Code	Total Value imported	Value imported from China	Value imported from the Rest of the World (ROW)
85	461, 389, 908.00	126, 293, 619	335, 096, 289.00
84	460, 364, 084.00	86, 137, 526	374, 226, 558.00
87	381, 436, 364.00	16, 519, 566	364, 916, 798.00
27	266, 592, 032.00	239, 304	266, 352, 728.00
30	182, 466, 922.00	6, 470, 434	175, 996, 488.00
99	125, 058, 872.00	10, 053, 775	115, 005, 097.00
90	116, 239, 155.00	11, 621, 013	104, 618, 142.00
71	89, 549, 427.00	1, 759, 846	87, 789, 581.00
39	72, 346, 644.00	20, 155, 172	52, 191, 472.00
94	69, 156, 974.00	20, 319, 543	48, 837, 431.00
29	66, 506, 883.00	8, 388, 423	58, 118, 460.00
73	55, 663, 036.00	11, 988, 477	43, 674, 559.00
61	45, 244, 512.00	9, 996, 063	35, 248, 449.00
95	44, 598, 914.00	33, 422, 260	11, 176, 654.00
62	36, 346, 897.00	7, 807, 754	28, 539, 143.00
40	34, 843, 081.00	2, 691, 576	32, 151, 505.00
72	33, 156, 047.00	612, 964	32, 543, 083.00
22	30, 965, 720.00	671, 483	30, 294, 237.00
88	29, 617, 124.00	383, 698	29, 233, 426.00
76	28, 296, 236.00	2, 743, 803	25, 552, 433.00
Accum	2, 629, 838, 832.00	378, 276, 299	2, 251, 562, 533.00

Source: Intracen calculations based on US Census Bureau statistics.

Now that we know the impact of the reduction of imports from China to the US, then this research has collected data on the possible countries that could substitute the Asian giant. The Top 5 importing countries by the US in each category have been collected (aside from China). Countries already exporting to the US regularly present competitive production capabilities in each industry. Each country is weighted with a scale of 5 points to 1 possible. In case the country is in the highest position in the ranking of exporters to the US in that particular industry receives 5 points, the second one in the ranking will receive 4 points, the third one 3 points, the fourth one receive 2 points and the fifth one receives only 1 point. By doing this is possible to obtain a total of points for each country that relates to the potentiality as s supplier for the US.

Table 5: Calculation table of weights for China's Potential Substitutes. Source: own elaboration.

	HS CODES																				
	85	84	87	27	30	99	90	71	39	94	29	73	61	95	62	40	72	22	88	76	**Total**
Mexico	5	5	5	5		4	5	3	4	5		5		4	1	4	3	5		4	**67**
Viet Nam	4									4			5	5	5						**23**
Taiwan	3	3				1						3		3							**13**
Malaysia	2									1				2							**5**
Thailand	1																				**1**
Japan		4	3			2								1		2					**12**
Germany		2	1		4	3	4	1	2								1		3		**21**
Canada		1	4	5		5		5	5	3	1	4				3	5	1	5	5	**52**
Korea		2						2	3			2					2				**11**
Saudi Arabia				3																	**3**
Iraq				2																	**2**
Brazil				1				4								4			1		**10**
Ireland					5	2	3				5										**15**
Switzerland					3						3										**6**
India					2						2	1			3					2	**10**
Netherlands					1																**1**
Singapore						1					4										**5**
Costa Rica																					**0**
Italy										2							3	3			**8**
Cambodia													4								**4**
Bangladesh													3	4							**7**
Indonesia													2	2	1						**5**
Honduras													1								**1**
Thailand															5						**5**
France																		4	4		**8**
UK																		2	2		**4**
UAE																				3	**3**
Bahrain																				1	**1**

This represents countries that can take the place of China and increase their exports to the US. Of course, other considerations could be taken into consideration as effects of geographic distance and transportation costs, international agreements, quality of their products and brands, or currency exchange evolution.

It is easy to understand that the neighboring countries of the US (Canada and Mexico) are the first ones to fill the gap of China due to their geographic proximity, the existence of a competitive industry, and the lack of tariffs due to the USMCA agreement.

Vietnam also benefits since it already receives a lot of FDI from China and has created a good network of very competitive companies that now will benefit from the increase of tariffs in China. European countries like Germany or Ireland with competitive companies and brands will also be present to bid regularly and to cannibalize the former Chinese presence. Other Asian nations such as Japan and Taiwan will be in a good position to increase their exports to the US.
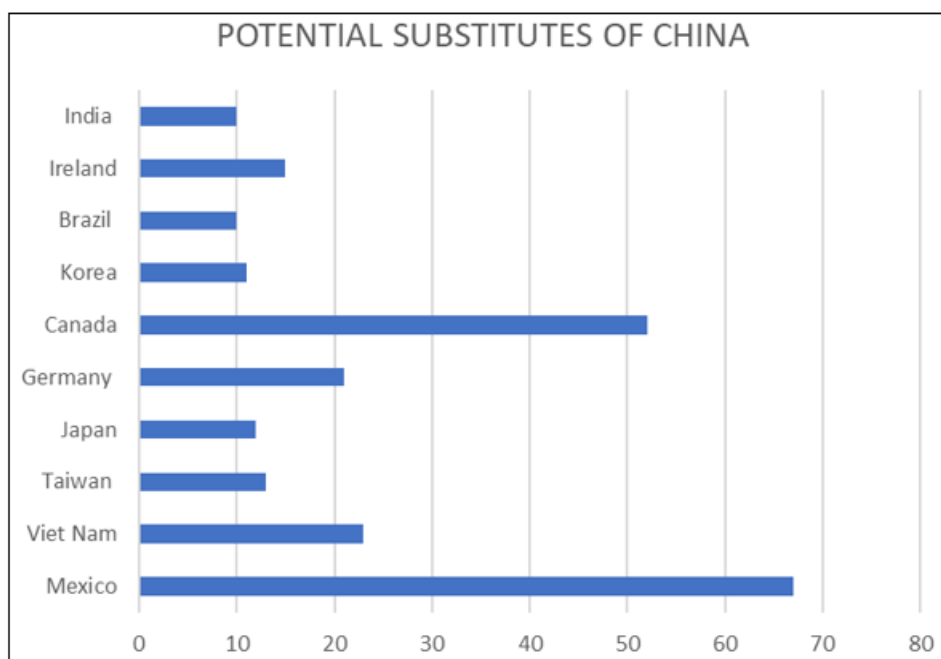

Figure 1: List of potential countries

For Chinese exporters that export significant parts of their production to the US and supply products price sensitive or elastic, this new US government decision about tariffs increase can be devastating. It would be a possible rescue strategy for them to relocate their production infrastructure to other neighboring countries like Vietnam, in case these strategies are not affected by Rules of Origin (ROO) limitations.

The recently born at the end of 2020 trading block Regional Comprehensive Economic Partnership (RCEP) in Asia represents the biggest trading bloc in the world and under its Rules of Origin policies, implementation will increase vertical trade among Asian countries and decrease horizontal trade to Europe, North or South America. A great counterweight in front of the new US protectionist policies.

Also, if Mexico or Canada (although Mexico presents more affinity) foster competitiveness in its industries they could absorb a big share of China's exports to the US. Both countries (mainly Mexico) might become the new preferential partner of the US, this will depend on how both countries' (US and Mexico) relationships evolve, and how other Donald Trump policies are implemented.

A mass deportation process will not help the relationships with Mexico, considering that a big part of them might be returned to Mexico. However, if new Mexican companies or investments (financed by Mexico or the US) can compensate part of the former Chinese exports to the US they could absorb as new employees part of the deported people through a bilateral agreement. Do not forget that in the year 2023, the US imported from China 3, 172 Bill. USD, that activity could create a few jobs!

2. Conclusion

This research underscores the inelastic nature of U. S. imports from China and the significant role of tariffs in shaping international trade dynamics. The identification of potential substitute countries further provides actionable insights for policymakers and industry stakeholders grappling with a shifting trade landscape

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