

The Price and Welfare Effects of Tariff Reduction on Consumer Goods: Evidence from China

Ruobing Qin, Xue Bai, Hong Ma*

Abstract: Between 2017 and 2019, China rapidly lowered tariffs on various consumer goods by adjusting the most-favored-nation (MFN) and Temporary Tariffs in four major waves. This paper examines the price and welfare effects of this recent tariff reduction by using monthly data on tariffs, imports, and retail prices during this period. First, we evaluate the pass-through of tariffs into import prices and the corresponding effects on import quantities and values to quantify the impact on the cost of imported products. We then examine how tariff reduction impacts the import varieties. Lastly, we estimate the impact on the domestic retail price indices and evaluate the potential improvement in consumer welfare at the aggregate level. We find that these waves of tariff reductions on consumer goods in China have caused significant declines in tax-inclusive prices, increased import quantities, and effectively reduced the total costs for importers and consumers. Our estimates suggest that the cost reduction for importers amounted to 1.51% of total imports of consumer goods in 2018. In addition, this decrease in cost significantly increased the varieties of imported products, further decreased the import price index, and improved welfare. In particular, a 10% reduction in tariffs on consumer goods would result in a 16.2% decrease in the import price index. We also find a significant impact of tariff reduction on lowering domestic retail prices through the pro-competitive effect, and the effect was more prominent for sectors with higher import intensities. After adjusting with import intensities, we find that a 10% decrease in import tariffs would result in a decrease in domestic retail prices of approximately 3% at an import intensity of 10%.

Keywords: Consumer Goods, Tariff Reduction, Price Effects, Welfare Analysis

I. INTRODUCTION

Since joining the WTO in 2001, China had progressively lowered the average applied most-favored-nation (MFN) tariff rate from 15.3% in 2001 to 9.8% in

* Ruobing Qin, Assistant Professor, China Institute for WTO Studies, University of International Business and Economics, Email: qinruobing@126.com.

Xue Bai, Associate Professor, Department of Economics, Brock University, Email: xbai@brocku.ca.

Hong Ma, Professor, School of Economics and Management, Tsinghua University, Email: mahong@sem.tsinghua.edu.cn.

2007. Yet most of the products involved were capital goods and intermediate inputs. The import tariffs on consumer goods remained at a relatively high level. Compared with the 8.2% average MFN tariff imposed on capital goods and intermediate inputs, the average MFN tariff for imported consumer goods was as high as 15.4%.¹ For example, the average tariff rates for food and beverages, apparel and clothing ranged from 15% to 20%. The high levels of import tariffs on consumer goods had inhibited the consumption of imported goods, distorted consumer behavior, and caused welfare losses.

Over the past two decades, China's per capita income has grown tremendously. There is also increasing demand for imported consumer goods, which may be of higher quality and more varieties.² To further expand opening up and transform into a consumption-driven economy, China reduced import tariffs on consumer goods from 2017 to 2019. This new round of tariff cuts focused on consumer goods that are closely related to people's daily consumption, such as skin care products, apparel and clothing, footwear, pharmaceuticals, and household appliances. The product-country level trade-share-weighted tariff rate for all consumer goods fell from 6.8% in 2017 to 4.3% in 2019, a decrease of 37%.

Studies on the impacts of trade policy show that tariff liberalization affects domestic market through pass-through into prices and increased competition effects. Tariff pass-through operated on both extensive and intensive margins. At the intensive margin, tariff reductions directly reduced import prices and the total costs for importers and consumers and thus increased import quantities.³ At the extensive margin, tariff reductions have reduced the import prices of some varieties that were not imported previously due to prohibitively high prices and encouraged the import of new varieties. This is featured in the "new trade theory" as the gains from variety. In addition, increased imports due to tariff reductions had intensified foreign competition, forcing Chinese

1 The trade-share-weighted average MFN tariff rate on capital goods and intermediate inputs was less than 5% while that of the consumer goods was 15.5%.

2 Hong Ma and Ruobing Qin, Per capita Income, Income Distribution and Import Demand, *Economic Science*, No. 2, 2020, pp. 20–33.

3 Mary Amity, Stephen J. Redding and David E. Weinstein, The Impact of the 2018 Tariffs on Prices and Welfare, *Journal of Economic Perspectives*, Vol. 33, No. 4, 2019, pp. 187–210; Pablo D. Fajgelbaum et al., The Return to Protectionism, *The Quarterly Journal of Economics*, Vol. 135, No. 1, 2020, pp. 1–55.

manufacturers to reduce their prices and markups, thereby lowering domestic prices in the Chinese market. Using monthly data on import tariffs, imports, and retail price indices from 2017 to 2019, this study explores the price impact of the tariff reductions on consumer goods.

In this study, we have created a monthly panel dataset at the 8-digit HS product-country level by matching the import data from China Customs with import tariffs. Exploiting the information on twelve-month changes in import prices, quantities, and value, we first evaluate the impacts of this round of tariff reductions on import prices and quantities. Using the estimated trade elasticities, we then quantify the effects of the tariff reductions on the total costs for importers and domestic consumers. Then to verify and evaluate the gains from variety, we follow Feenstra (1994) to construct the import price index that incorporates entry and exit of varieties and examine the impact of tariff reductions on this index and its decomposition.⁴ Lastly, we supplement our main dataset with monthly consumer price indices for the domestic market and evaluate the tariff pass-through to the domestic prices, allowing heterogeneous effects across sectors with different import intensities.

We find that these waves of tariff reductions on consumer goods in China have significantly reduced tax-inclusive prices of imported consumer goods and increased import quantities. With complete pass-through, the benefits of consumer goods tariff reduction in China were mainly enjoyed by domestic consumers and importers. Our estimates suggest substantial reduction in the total costs for importers and consumers. In 2018, the total costs for importers fell by approximately \$1.513 billion, which was equivalent to approximately 1.51% of total imports of consumer goods from non-US countries. In addition, this decrease in import costs had greatly increased the varieties of imported products, further decreased the import price index, and improved welfare. In particular, a 10% decrease in consumer goods tariffs would result in a 16.2% drop in the import price index. We also find a significant impact of tariff reduction on lowering domestic retail prices through the pro-competitive effect, and the effect was more prominent for sectors with higher import intensity. After adjusting with import intensities, we find that a 10% drop in import

4 Robert C. Feenstra, New Product Varieties and the Measurement of International Prices, *The American Economic Review*, 1994, pp. 157–177.

tariffs will bring roughly a 3% decrease in domestic retail prices, with an import intensity of 10%. Our results are robust to confounding factors from endogeneity, the US-China trade war, and product and regional heterogeneity.

Our work is relevant to a number of areas in the literature. It is mostly related to the literature in international trade on the welfare analysis of trade policy.⁵ Existing literature mainly studies the impacts of trade policy on a country's welfare from the perspectives of manufacturers and consumers. Among them, a great number of studies focus on the effects of trade liberalization on firm productivity,⁶ profit margins,⁷ investment decisions,⁸ and trade behavior.⁹ These studies, both theoretical and empirical, explore the positive effects of reduced trade costs on enhancing firm productivity and industrial upgrading.

Consumer welfare analysis examines changes in consumer welfare levels resulting from adjustments in trade policy through changes in income and expenditure. The first strand of literature focused on the impact of trade policy adjustments on changes in individual income levels. Existing studies find that the impacts of trade liberalization on individual income distribution depends on skill levels of labor. Traditional trade theory (Stolper–Samuelson theorem) suggests that trade liberalization will increase the wages for relatively abundant low-skilled labor in developing countries, while decreasing the wages for high-skilled labor and skill premiums. However, empirical analysis indicates that this is not always the case. Existing research explains this paradox from the

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7 Jan De Loecker et al., Prices, Markups, and Trade Reform, *Econometrica*, Vol. 84, No. 2, 2016, pp. 445–510.

8 Paula Bustos, Trade Liberalization, Exports, and Technology Upgrading: Evidence on the Impact of MERCOSUR on Argentinian Firms, *American Economic Review*, Vol. 101, No. 1, 2011, pp. 304–340.

9 Lorenzo Caliendo and Fernando Parro, Estimates of the Trade and Welfare Effects of NAFTA, *The Review of Economic Studies*, Vol. 82, No. 1, 2015, pp. 1–44.

perspectives such as the labor market imperfections, product quality upgrades brought about by trade liberalization, and the complementarity between skills and factors of production.¹⁰ Meanwhile, researchers also found negative impact of trade openness on manufacturing employment and wage levels in developed countries. Due to increased import competition resulting from tariff reductions, employment and wages in domestic manufacturing sectors have declined, resulting in welfare losses for low-skilled workers.¹¹ Trade liberalization can also lead to unequal income distribution across regions. Regions facing more severe import competition experience more significant welfare losses among low-income families.¹² For developing countries, regions with higher degrees of trade openness can better enjoy increased income levels and welfare improvements resulting from trade liberalization and export expansion.¹³

The second strand of literature primarily studied the impact of trade policy adjustments on consumer goods market prices and living costs, focusing on welfare changes through the expenditure channel. First, tariffs directly affected the prices of imported products, leading to changes in costs for importers and consumers.¹⁴ The reductions of tariffs also led to decreases in the prices of imported products and promote an increase in both the quantity and variety of imports, which was also emphasized in the new trade theory's concept of gains

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from variety.¹⁵ Furthermore, the increase in the quantity and variety of imports intensified competition in the domestic market and reduced the price markups of domestic producers, thereby lowering the prices of domestic consumer goods, which was known as the pro-competitive effect.¹⁶ Specifically, Amiti et al. (2019) evaluated the impact of tariffs imposed by the United States in 2018 on domestic price levels and welfare using estimated tariff pass-through.¹⁷ They found that the pass-through rate of US tariffs to import prices was close to 1, meaning that a 10% increase in tariff levels led to a 10% increase in import prices. The imposition of tariffs resulted in higher import prices, which led to an approximately \$23.8 billion increase in total costs borne by the US importing sectors in 2018. Cavallo et al. (2021) and Fajgelbaum et al. (2020) had similar findings.¹⁸

Research on China has mainly focused on exploring the impact of tariff reductions on the productivity improvement of domestic firms and industrial upgrading since joining the WTO,¹⁹ as well as the effects on the income level and income distribution of Chinese residents.²⁰ There have been relatively fewer discussions on how trade policy affects consumers' welfare levels through the expenditure channel. Luo and Guo (2010) analyzed the impact of import price fluctuations on urban residents' consumption expenditure.²¹ Shi

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17 Mary Amiti, Stephen J Redding and David E Weinstein, The Impact of the 2018 Tariffs on Prices and Welfare, *Journal of Economic Perspectives*, Vol. 33, No. 4, 2019, pp. 187–210.

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21 Zhi Luo and Xibao Guo, The Price Effect of Imported Goods on Urban Household Expenditure, *Economic Research Journal*, Vol. 45, No. 12, 2010, pp. 111–124.

and Zhang (2017) used tariff data from 1992 to 2011, regional disaggregated product price data, and micro household income and expenditure survey data to discuss the impact of China's trade liberalization on household welfare levels and their distribution.²² Wang and Qian (2020) examined the impact of trade liberalization on household consumer welfare based on the cost of living index and household survey data from urban areas in China from 1992 to 2009.²³ They found that tariff reductions resulting from trade liberalization significantly reduced domestic consumer prices, lowered residents' consumption expenditure costs, and reduced the consumption welfare gap between different income groups, promoted the fairness of consumption welfare distribution. Other studies have further explored the impact of infrastructure improvement, degree of marketization, and geographical location on the efficiency of tariff pass-through.²⁴ The studies above mainly focus on the initial stages of trade liberalization after China's accession to the WTO, and lack research on the price effects and welfare impacts of comprehensive tariff reductions on consumer goods, especially the detailed discussion and empirical testing on how tariff reductions on consumer goods affect domestic consumer expenditure costs by influencing the prices, quantity, and variety of imported products and determine domestic consumer goods market pricing mechanisms. This paper, based on the new stage of comprehensive opening-up policy of consumer goods, constructs monthly tariff data at the product-country level using 8-digit HS codes, and empirically tests the impact of consumer goods tariff reductions on residents' consumption expenditure costs and welfare levels from three dimensions: price pass-through, increase in import variety, and promotion of domestic market competition effect, which is of great practical significance.

The rest of this paper is organized as follows. In Section II, we discuss the policy context and provide data description. In Section III, we introduce

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24 Jun Han et al., Market Structure, Imperfect Tariff Pass-through, and Household Welfare in Urban China, *Journal of International Economics*, Vol. 100, 2016, pp. 220–232; Puyang Sun, Tiantian Zhang and Shujie Yao, Tariff Transmission, Domestic Transport Costs and Retail Prices, *Economic Research Journal*, Vol. 54, No. 3, 2019, pp. 135–149.

our baseline empirical strategy and discuss the results. Robustness checks and extended discussions are provided in Section IV. Lastly, we draw conclusion in Section V.

II. POLICY BACKGROUND AND DATA

In this section, we provide the timeline of tariff reduction events and describe the datasets used in this study.

A. Tariff Reduction Timeline

Since 2017, China had gradually reduced tariffs on consumer goods by adjusting the temporary tariffs, most-favored-nation (MFN) tariffs and preferential tariffs. We collect HS-8 product-country monthly level import tariff data of 2016–2019 from the Ministry of Finance website and limit our attention to consumer goods based on the Broad Economic Categories (BEC). In Table 1, we summarize the detailed timeline, scope, and scale of reductions of tariff rates on consumer goods from 2017 to 2019.²⁵

As shown in Panel A, the temporary and MFN tariff schedules have undergone four major adjustments, reflecting the rapid tariff decreases in consumer goods between 2017 and 2019. In the first wave, started on December 1, 2017, the average MFN tariffs decreased from 6.4% to 3.4% for 173 products at the 8-digit HS level, including food and beverages, clothing and footwear, pharmaceuticals, and other consumer goods. In 2017, the import value of these products reached \$21.7 billion, accounting for 22.5% of China's total import of consumer goods. The weighted average tariff rates decreased roughly by 23% to 55% among the four categories of consumer goods. Notably, tariffs on 26 medicine products worth \$13.8 billion decreased by more than 50%, from 4.4% to 2.0%. On May 1, 2018, in the second wave, the MFN tariff rates on 27 medicine products were further decreased by more than 99%, from 2.0% to 0.1%, lowering the import cost by 14.5% of the total import of consumer goods

²⁵ Note that the number of 8-digit HS products reported in Table 1 is slightly different from the number of products announced in the official statement. This is mostly because some of the targeted products were not imported between 2016 and 2019. There were also a few targeted products that appeared on the official announcement but did not have their applied tariff rates changed during the period.

worth \$13.9 billion. The third wave, the largest one, occurred on July 1, 2018, when average MFN tariff rates decreased by nearly 50%, from 10.5% to 5.6%, on 1,112 products worth \$18.1 billion. Most notably, tariffs for the apparel and footwear sector were significantly reduced, from 15.1% to 7.3%. Lastly, on November 1, 2018, the fourth wave further decreases tariffs on 27 products including food and beverages from 13.2% to 8.7%.

Table 1: Consumer Goods Tariff Reductions, 2017–2019

(1)	(2)	(3)	(4)	(5)	(6)	(7)
Tariff Wave	Products	#HS-8	2017 Imports		Tariff Rates (%)	
	Sector		Value	Share	Before	After
Panel A: Temporary and MFN Tariff Reductions						
Dec 1, 2017	Food & Beverages	24	1,236	1.3	13.9	10.7
	Clothing & Footwear	32	512	0.5	9.6	5.7
	Medicine	26	13,780	14.3	4.4	2.0
	Other Consumer Goods	91	6,165	6.4	9.2	4.9
	Total/Average	173	21,693	22.5	6.4	3.4
May 1, 2018	Medicine	27	13,960	14.5	2.0	0.1
	Total/Average	27	13,960	14.5	2.0	0.1
Jul 1, 2018	Food & Beverages	288	2,629	2.7	12.7	7.0
	Clothing & Footwear	340	4,828	5.0	15.1	7.3
	Other Consumer Goods	484	10650	11.1	8.0	4.4
	Total/Average	1,112	18,107	18.8	10.6	5.5
Nov 1, 2018	Food & Beverages	11	103	0.1	24.0	11.3
	Other Consumer Goods	16	288	0.3	9.3	7.8
	Total/Average	27	391	0.4	13.2	8.7
Panel B: Preferential Tariff Reductions						
Jan 1, 2017	All of above	1,271	10,210	10.6	7.0	5.6
Jan 1, 2018	All of above	1,362	10,401	10.8	8.1	5.1
Jan 1, 2019	All of above	1,274	8,696	9.0	5.2	3.3

Notes: This table displays the scope and scale of imports affected by tariff reductions. The import values in column (4) are in millions of US dollars. The denominator of the import share in column (5) is China's total import of consumer goods in 2017. The before (after) tariff rates are the trade-share-weighted averages of HS-8 product-country level tariffs in the month before (after) the tariff reduction event, using the annual import value in 2017 as the weight. Note that we exclude imports from the US in the benchmark analysis to avoid the confounding factors of US-China trade frictions. Thus, imports from the United States are excluded in the calculations of import shares and import tariff rates. As a robustness check, we include imports from the US in Section IV and find that this does not affect our findings.

Meanwhile, Panel B in Table 1 reports three waves of preferential tariff reductions that happened during the same period. An important distinction from Panel A is that preferential tariff reductions were country- or FTA-specific and largely expected by exporters and importers, as the reduction agreements and list of targeted products were usually announced in advance. For this reason, we exclude these product-country pairs from our benchmark analysis. The product range targeted for preferential tariff reductions slightly overlaps with those for MFN rate reductions. When a product-country pair was subject to both types of reductions, we use the lower tariff rate as the applied rate. We also plot the reductions in the trade-share-weighted average applied tariff rates in Figure 1.

These waves of tariff reduction share two important features. First, a wide range of products was targeted. More than 1,200 8-digit HS codes were eligible including consumer goods categories that were highly relevant to consumers' daily lives. Second, the extent of the tariff cuts was significant. For example, as shown in Figure 1, the average tariff rate for types of 369 clothing and footwear products (8-digit HS) reduced from 7.6% to 3.7%, a decrease of over 50%.

B. Data Source

In this study, we build a monthly panel dataset by combining information from three data sources for the period between 2016 and 2019. The first dataset is the import records from China Customs at the 8-digit HS (Harmonized System, h)-origin country (i)-month (t) level.²⁶ Based on the Broad Economic Categories (BEC), we focus on consumer goods and calculate the twelve-month log changes in import prices ($\Delta \ln p_{iht}$), quantities ($\Delta \ln q_{iht}$), and value ($\Delta \ln m_{iht}$). The second dataset consists of HS-8 product-country monthly level import tariff data collected from the Ministry of Finance website. After matching tariff data to import data, we can also calculate the twelve-month log changes in consumer goods import tariff rates ($\Delta \ln(1 + \tau_{iht})$). Additionally, we supplement these two datasets with the monthly consumer price indices for China's domestic market. These indices take into account the prices of major consumer good categories

²⁶ Note that we exclude imports from the US in the benchmark analysis to avoid the confounding factors of US-China trade frictions. As a robustness check, we include imports from the US in Section IV and find that this does not affect our findings.

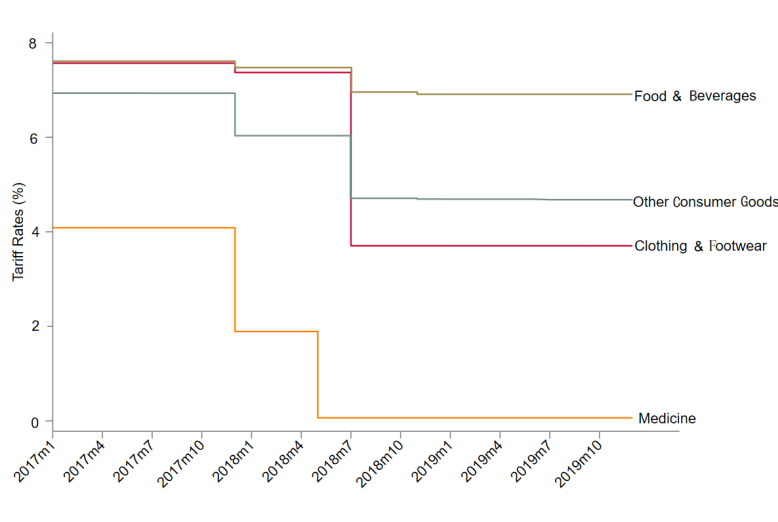


Figure 1: Timeline and Average Tariff Rates, 2017–2019

Notes: The above figure shows the changes in average applied tariff rates on imported consumer goods between 2017 and 2019, weighted using the 8-digit HS product-country level import values in 2017. Imports from the United States are excluded from this study to avoid confounding factors from the US-China trade frictions. FTA-specific preferential tariff reductions are excluded.

including food, beverages, tobacco and alcohol, clothing, and household appliances and other daily necessities. Specifically, we use two measurements of consumer price index. The first one is the official monthly CPI (Consumer Price Index) published by the National Bureau of Statistics of China (NBSC). It covers a basket of 14 major consumer good categories including food, cooking oil, pork, beef, lamb, fresh fruits, fresh vegetables, fish and other aquatic products, dairy products, tobacco, alcohol, clothing, footwear, and household appliances. We denote it as CPI_{ht}^{14} . The second is retail price data for 36 major cities provided by the Price Monitoring Center of the National Development and Reform Commission (PMC-NDRC). This index covers the prices of most daily necessities and durable consumer goods in greater detail. It can better reflect the retail price fluctuations at the product level. After matching with the HS codes, we use the retail prices of 42 consumer goods to calculate this price index CPI_{ht}^{42} . Table 2 provides summary statistics for these variables.

Table 2: Summary Statistics

		N	Mean	S.D.	Min.	Max.
<i>Country-HS8-month Level</i>						
$\Delta \ln p_{iht}$	Import Price	325,964	0.007	0.454	-1.306	1.099
$\Delta \ln q_{iht}$	Import Quantity	661,173	0.305	4.042	-18.194	18.194
$\Delta \ln m_{iht}$	Import Value	762,981	0.539	5.622	-19.743	18.521
$\Delta \ln(1+\tau_{iht})$	Import Tariff	762,981	-0.016	0.034	-0.451	0.215
<i>Product/Industry-month Level</i>						
$\Delta \ln CPI_{ht}^{I/4}$	Consumer Price Index	504	0.026	0.086	-0.327	0.743
$\Delta \ln CPI_{ht}^{I/2}$	Retail Price Index	1,478	0.024	0.074	-0.296	0.740

Note: Import and tariff variables are at country-HS8-month level from January 2016 to December 2019. Price indices for the domestic market are at the product and industry level. Twelve-month log changes are reported for all variables. We excluded observations with pre-tax price ratios greater than 3 or less than 1/3 between t and $t-1$ for import prices and import quantity. Imports from the US are excluded from the benchmark analysis to avoid the confounding factors from the US-China trade frictions. As discussed in Amiti et al. (2019), newly-added imported varieties which had zero quantities and values in the same period last year are excluded from the sample in the calculation of month-level twelve-month changes, which can lead to an underestimation of elasticity. Following Amiti et al. (2019), we use the inverse hyperbolic sine transformation to replace log changes when the import quantities and values variables were zero in t or $t-12$. Here we report the import quantities and values after the transformation.

III. EMPIRICAL STRATEGY AND RESULTS

In this section, we outline our empirical strategies and discuss our findings from three aspects. First, we evaluate the effect of the reduction of consumer goods tariffs on import prices and quantities and quantify its impact on the cost to importers. Then we examine the effect of tariff reductions on imported varieties. Lastly, we estimate the effect of reduced consumer good tariffs on domestic retail price indices and evaluate the potential improvement in consumer welfare.

A. Effects on Import Prices and Quantities

First, we follow Amiti et al. (2019) to evaluate the pass-through of tariffs into import prices and the corresponding impacts on import quantities and values.²⁷ Specifically, we regress the twelve-month log changes in the tariff-inclusive

²⁷ *Supra* n. 17.

import prices $\Delta \ln x_{iht}$ (or import quantities and import values) onto the change in one plus the applied tariff on imports at the country-product-time level $\Delta \ln(1 + \tau_{iht})$ based on the following model:

$$\Delta \ln x_{iht} = \mu_h + \theta_{it} + \beta \Delta \ln(1 + \tau_{iht}) + \varepsilon_{iht} \quad (1)$$

where i is the origin country of imports, h denotes the 8-digit HS level product, and t is the time of observation at the month level. Our main variable of interest is $\Delta \ln(1 + \tau_{iht})$. Its coefficient β measures the elasticity of the dependent variable (import price, quantity, or value) with respect to import tariffs. To alleviate omitted variable bias, we further control for product fixed effects μ_h and country-month fixed effect θ_{it} . These fixed effects can account for unobserved heterogeneity at the product level, such as import demand and country-time-level factors like exchange rates.

In Table 3, we present the regression results for equation (1). Column (1) reports the effects of tariff reduction on tariff-inclusive import prices. Here we see that the import prices have an elasticity of 1.073 with respect to tariff changes. This result suggests that tariff reductions significantly decrease import prices and a 10 percent decrease in the consumer goods tariff leads to a 10.73% decrease in the import price. This result is consistent with the findings of Amiti et al. (2019) and Fajgelbaum et al. (2020) using data from the United States. They found that the tariff increases were fully pass-through onto US customers and importers, with nearly all of the cost of the 2018 tariff increases falling on US consumers and importers. Analogously, the benefits of China's reduction in import tariffs on consumer goods were mainly enjoyed by domestic consumers and importers.

The results for import quantities and values are reported in columns (2)–(3). When we calculate twelve-month change on a monthly basis, newly-added imported varieties with zero imports in the same period last year are excluded from the sample. This can lead to an underestimation of elasticity. Thus we follow Amiti et al. (2019) and use the inverse hyperbolic sine transformation, $\ln[x + (x^2 + 1)^{0.5}]$ to replace log changes when the dependent variables are zero in t or $t - 12$. Estimates indicate that the elasticities of import quantities and values with respect to tariff are -1.629 and -2.246 , respectively. This implies that 10% decrease in import tariff will induce 16.29% increase in import quantities and 22.46% increase in import values. With complete pass-through, the estimated

coefficient in column (3), -2.246 , can also be seen as import demand elasticity. This estimated elasticity is within the range of estimates in the literature (Fieler et al., 2018; Fajgelbaum et al., 2020), i.e., between 2 and 4.

Table 3: Impacts of Tariff Reductions on Import Price, Quantity, and Value

Dependent Variable:	$\Delta \ln p_{iht}$	$\Delta \ln q_{iht}$	$\Delta \ln m_{iht}$
	(1)	(2)	(3)
$\Delta \ln(1+\tau_{iht})$	1.073*** (0.055)	-1.629*** (0.457)	-2.246*** (0.618)
Product Fixed Effect	Y	Y	Y
Country-time Fixed Effect	Y	Y	Y
Observations	325,258	660,372	762,202
R^2	0.032	0.065	0.060

Note: Standard errors in parentheses are clustered at the 8-digit HS product level. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. Observations are aggregated to the 8-digit HS product-country-month level. We exclude observations targeted in preferential tariff reductions during 2017 and 2019. Observations with a pre-tax price ratios greater than 3 or less than $1/3$ between t and $t-1$ are excluded in columns (1) and (2). Following Amiti et al. (2019), newly imported varieties are taken into account in columns (2) and (3) by using the inverse hyperbolic sine transformation to replace log changes when the import quantities and values were zero in t or $t-12$.

Using the estimates in Table 3, we can calculate the annual impact of tariff reductions on total cost for consumers and importers between 2017 and 2019. Specifically, the impact of tariff reductions on importers' total costs can be decomposed into two components: one is the reduction of deadweight loss (DWL) caused by tariff distortion; and the other is the decrease in tax burden on domestic importers and consumers. Based on the partial equilibrium model with a perfectly competitive market structure and linear import demand curve, the deadweight loss of tariff distortion can be expressed as a triangular area as shown in equation (2):

$$DWL = \frac{1}{2} p_i^* (d\tau)(dq) \quad (2)$$

where p_i^* is the pre-tax import price, $d\tau$ is the change in tariff rates, and dq is the change in import quantity. $p_i^*(d\tau)$ is observed in the data. We can also obtain an estimate of the change in import quantity due to tariff cuts (dq) using the estimated β in column (2) of Table 3 and the tariff change $\Delta \ln(1+\tau)$. As shown in column (1) in Table 4, we can compute the deadweight losses

for each year. The decrease in tariffs on consumer goods in 2017 reduced the deadweight loss by tariff distortions by approximately \$4 million. This value reached approximately \$70 million in 2018 and approximately \$44 million in 2019.

In addition, the tariff cuts have also significantly reduced the tariff burden on importers and consumers. In 2018, the tariff burden on consumer goods fell by approximately \$1.443 billion, and the total cost for importers fell by approximately \$1.513 billion, which was equivalent to approximately 1.51% of the total imports of consumer goods from non-US countries in 2018. It can be seen from the above partial equilibrium analysis that the tariff reduction of consumer goods has significantly reduced the prices of imported products and increased the import quantities, effectively reducing the total cost of importers and consumers.

Table 4: Total Cost to Importers and Consumers

	Deadweight Loss (–) (1)	Tariff Burden (–) (2)	Total Cost to Importers (–) (3) = (1) + (2)
2017	4	107	111
2018	70	1,443	1,513
2019	44	694	738

Note: The numbers reported are twelve-month changes. Values are in millions of US dollars. Imports from the United States are excluded.

B. Effects on Import Varieties

As new trade theory emphasizes, consumers can also benefit from trade liberalization because it allows them to access new varieties of products that might not be purchased due to prohibitive trade costs. As shown in the previous section, tariff reductions on consumer goods can significantly reduce the import prices and costs of certain varieties that did not enter the Chinese market in the past to a level that consumers are now willing to purchase. In this section, we assess the impact of tariff reductions on imported varieties. We first present some evidence of how the tariff reductions on consumer goods have influenced imported varieties in Figure 2. Define a variety as an HS-8 product-

country pair and set month zero to November 2017, the month prior to the first wave of MFN (temporary) tariff reductions. The number of varieties in each product category is normalized to one in month zero. As seen from the figure, the number of imported varieties among all categories of products remained relatively stable for the 15 months prior to the tariff reduction event. Shortly after the tariff reductions, all targeted product categories experienced a sharp increase in the number of varieties while the varieties of untargeted products remained relatively flat. Note that the number of imported varieties shows strong seasonality and drops every February due to the Chinese New Year.



Figure 2: Normalized Variety Counts

Notes: The above figure shows the monthly relative changes in the number of imported varieties. A variety is defined as an HS-8 product-country pair. Both imports from the US and targeted in preferential tariff reductions are excluded. The number of varieties in each product category is normalized to one in November 2017, which is the month prior to the first wave of MFN (temporary) tariff reduction for consumer goods. Import variety counts drop in every February due to the Chinese New Year.

To further assess the impact on imported varieties, we next follow Feenstra (1994) to construct the import price index that incorporates the entry and exit of varieties. Specifically, we construct the following index in equation (3).

$$\frac{P_{ht}}{P_{h,t-12}} = \frac{P_{ht}^*}{P_{h,t-12}^*} \left(\frac{\lambda_{ht}}{\lambda_{h,t-12}} \right)^{\frac{1}{\sigma-1}} \quad (3)$$

It can be decomposed into two components from the intensive and extensive margins.

The first, $\frac{P_{ht}^*}{P_{h,t-12}^*}$, is a “common-variety” component, which measures the price changes among the same set of product varieties available in both periods, $t-12$ and t . Hence it captures changes in the import price index from the intensive margin. It is defined as

$$\frac{P_{ht}^*}{P_{h,t-12}^*} = \prod_{i \in \Omega_{h,(t,t-12)}^*} \left(\frac{p_{iht}}{p_{ih,t-12}} \right)^{s_{iht}^{\Omega^*}} \quad (4)$$

where $\Omega_{h,(t,t-12)}^*$ represents the “common-variety” of two periods. It is defined as the set of import countries for product h (i.e., varieties) from both periods. This corresponds to the Sato–Vartia price index which accurately reflects the constant elasticity of substitution demand system. The weight in this index, $s_{iht}^{\Omega^*}$, is the logarithmic mean of the import cost shares from country i of product h in the relevant months t and $t-12$ among all imports in $\Omega_{h,(t,t-12)}^*$.²⁸

The second component, “variety-adjustment”, captures the effect of entry and exit of varieties (i.e., extensive margin) on the import price index. It is defined as $\left(\frac{\lambda_{ht}}{\lambda_{h,t-12}} \right)^{\frac{1}{\sigma-1}}$, where σ is the elasticity of substitution and λ_{ht} (or $\lambda_{h,t-12}$) denotes the fraction of imports in period t (or $t-12$) of the “common-varieties” $i \in \Omega_{h,(t,t-12)}^*$ relative to the total imports of product h . Specifically,

$$\lambda_{ht} = \frac{\sum_{i \in \Omega_{h,t-12}^*} p_{iht} m_{iht}}{\sum_{i \in \Omega_{h,t}^*} p_{iht} m_{iht}}, \quad \lambda_{h,t-12} = \frac{\sum_{i \in \Omega_{h,t-12}^*} p_{ih,t-12} m_{ih,t-12}}{\sum_{i \in \Omega_{h,t}^*} p_{ih,t-12} m_{ih,t-12}} \quad (5)$$

If the tariff cuts on consumer goods significantly reduce the import prices of some varieties that were not imported during $t-12$, but were imported in the current period, these newly imported varieties will lead to a decrease in λ_{ht} in equation (5), which will lead to a decrease in the price index. On the other hand, if some varieties are imported during $t-12$ and the price rises so much that it becomes prohibitively expensive and are not imported during

²⁸ That is, $s_{iht}^{\Omega^*} = \frac{(s_{iht} - s_{ih,t-12}) / (\ln s_{iht} - \ln s_{ih,t-12})}{\sum_{i \in \Omega_{h,(t,t-12)}^*} (s_{iht} - s_{ih,t-12}) / (\ln s_{iht} - \ln s_{ih,t-12})}$.

t , this will lead to a decrease in $\lambda_{h,t-12}$ and an increase in import price index. Eventually, when the number of imported varieties increases and the share of new varieties in the current total imports increases, $\frac{\lambda_{ht}}{\lambda_{h,t-12}}$ will be less than 1. This decline in the import price index measures the welfare enhancement effect from the newly imported product varieties. The magnitude of its impact also depends on the elasticity of substitution between products. Intuitively, if the elasticity of substitution is so high that the new and disappearing varieties are close substitutes for existing varieties, then $\frac{1}{\sigma-1}$ will approach zero and the “variety-adjustment” component will be close to 1 and the impact should not matter much. We assume that $\sigma = 2$, construct the import price index and its decomposition of each product at the 6-digit HS level from 2017 to 2019, and use them as the dependent variables in the following regression.²⁹

$$\ln\left(\frac{P_{ht}}{P_{h,t-12}}\right) = \mu_h + \theta_t + \beta \Delta \ln(1 + \tau_{iht}) + \varepsilon_{ht} \quad (6)$$

where t is the month, h denotes the product at the 6-digit HS level, and $\Delta \ln(1 + \tau_{iht})$ is the import-share-weighted average of the twelve-month log changes in the tariff rates.³⁰

The estimates are reported in Table 5. We see from column (3) that the import tariff cuts significantly reduced the import price index. The elasticity of the common-variety component of the import price index is 1.049, which is consistent with the above estimation results. Additionally, tariff reductions on consumer goods have also significantly increased the varieties of imported products and further decreased the import price index, with an elasticity of 0.567. The added varieties brought additional welfare improvements. Put together, a 10% decrease in tariffs on consumer goods will result in a 16.16% drop in the import price index.

29 Using the US data, Fajgelbaum et al. (2020) estimated the elasticity of substitution as 2.56. Based on our estimate in Table 3, the elasticity of substitution in China is 1.629. Thus we use $\sigma=2$ in our analysis; Pablo D. Fajgelbaum et al., *The Return to Protectionism*, *The Quarterly Journal of Economics*, Vol. 135, No. 1, 2020, pp. 1–55.

30 The product-level log change in import tariff is calculated as the weighted average of 8-digit HS product-country level tariff log change. Following Amiti et al. (2019), we use the import value share from the previous year as weights; Mary Amiti, Stephen J. Redding and David E. Weinstein, *The Impact of the 2018 Tariffs on Prices and Welfare*, *Journal of Economic Perspectives*, Vol. 33, No. 4, 2019, pp. 187–210.

Table 5: Import Price Index and Its Decomposition

Dependent Variable	Common-variety $\ln\left(\frac{P_{ht}^*}{P_{h,t-12}^*}\right)$	Variety-adjustment $\ln\left(\frac{\lambda_{ht}}{\lambda_{h,t-12}}\right)^{\frac{1}{\sigma-1}}$	Import Price Index $\ln\left(\frac{P_{ht}}{P_{h,t-12}}\right)$
	(1)	(2)	(3)
$\Delta\ln(1+\tau_{ht})$	1.049*** (0.106)	0.567* (0.305)	1.616*** (0.321)
Product Fixed Effect	Y	Y	Y
Time Fixed Effect	Y	Y	Y
Observations	35,056	35,056	35,056
R^2	0.097	0.069	0.072

Note: Observations are at the 6-digit HS product monthly level. Standard errors in parentheses are clustered at the 6-digit HS product level.

C. Effects on Domestic Retail Prices

Tariff reductions on consumer goods may also increase competition in the domestic market, reduce markups by domestic firms, and further decrease the domestic prices for targeted products. In this section, we explore the impact of tariff cuts on domestic retail prices.

First, in Figure 3, we plot and compare the twelve-month proportional changes in the consumer goods price indices of all consumer goods and of those targeted in tariff reductions. Specifically, we calculate the import-share-weighted average of the monthly industry-level twelve-month CPI changes from 2016 to 2019, using import-shares of each product category (or industry) in 2017 as weights. The dashed line represents all consumer goods and the solid line plots the six targeted product categories that accounted for more than 10% of imports in 2017: household appliances, apparel, footwear, fish and other aquatic products, alcohol beverages, and food. For comparison, we normalized the price indices in November, 2017 to zero, and compared the trends between the two groups of consumer goods before and after the tariff reductions. We can see from Figure 3 that there is no significant difference between the trends of the two price indices before month zero. Shortly after the tariff reductions event, the two price indices started to diverge and the price index of consumer goods targeted by the tariff reductions shows a significant decline.

To verify and further explore the above observation, we use monthly consumer goods price index data at the product category (or industry) level and estimate the elasticity of the domestic retail price indices with respect to tariff reductions in the following regression:

$$\Delta \ln CPI_{ht} = \alpha_c + \theta_t + \beta \Delta \ln(1 + \tau_{ht}) + \varepsilon_{ht} \quad (7)$$

where h denotes product category (or industry), t denotes time, $\Delta \ln CPI_{ht}$ is the twelve-month log changes of the price indices, and $\Delta \ln(1 + \tau_{ht})$ is the import-share-weighted average of twelve-month log changes in the tariff rates.³¹ We further classify these products into five industry groups (c) and include industry

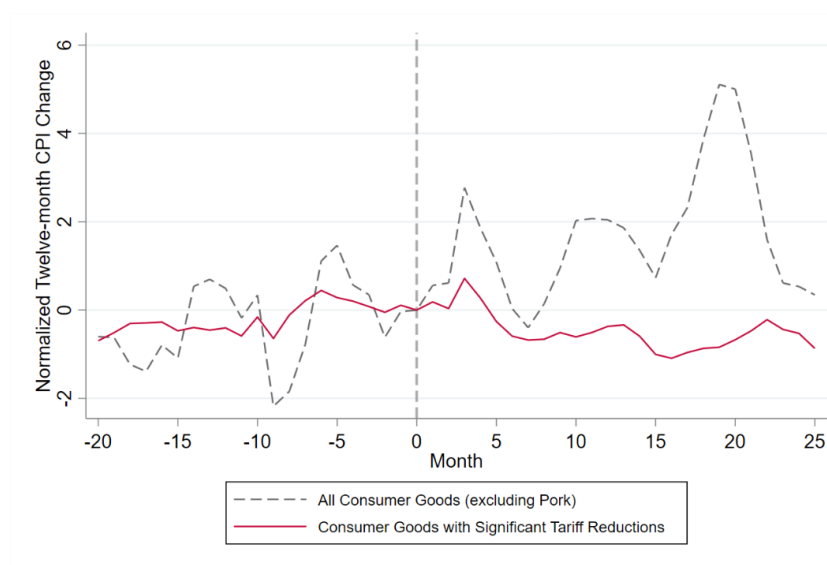


Figure 3: CPI, 2016–2019

Notes: Twelve-month proportional changes in the consumer goods price indices are plotted. The dashed line indicates the CPI of all consumer goods (excluding pork) and the solid line indicates that of the consumer goods that experienced tariff reductions. Specifically, we use the import shares of each product category (or industry) in 2017 as weights to calculate the consumer price indices. The targeted product group (i.e., the solid line) accounted for more than 10% of imports in 2017, including household appliances, apparel, footwear, fish and other aquatic products, alcohol beverages, and food. We normalize the CPI change to zero in November, 2017, the month prior to the first wave of MFN (temporary) tariff reductions.

31 The product categorization in the domestic retail price data is more aggregate than the HS system. The CPI published by the NBSC has 14 major consumer good categories and the retail price data from the PMC-NDRC covers 42 product categories. The product-level import tariff is calculated as the weighted average of 8-digit HS product-country level tariffs. We use the import value share in previous year as weights.

fixed effects in the regressions.³²

As shown in Table 6, we first use the official monthly CPI published by the NBSC to construct $\Delta \ln CPI_{ht}^{I^4}$ and present the estimates in columns (1)–(2). After controlling for industry and time-fixed effects, the coefficient on import tariffs is significantly positive. As seen in column (1), the reduction in import tariffs has effectively reduced the prices of similar products in the domestic market. This impact could also differ for products in the domestic market and with different import intensities. We expect that tariff reductions will have a greater impact on domestic prices of products with a greater import share. Thus, we adjust tariff measures by interacting with the import intensity. Specifically, we measure the import intensity of each product in 2017 and define the shares of import products in consumer spending. As shown in column (2), if imported

Table 6: Impacts of Tariff Reductions on Domestic Retail Prices

Dependent Variable	$\Delta \ln CPI_{ht}^{I^4}$	$\Delta \ln CPI_{ht}^{I^4}$	$\Delta \ln CPI_{ht}^{I^4_2}$	$\Delta \ln CPI_{ht}^{I^4_2}$	$\Delta \ln CPI_{ht}^{I^4_2}$	$\Delta \ln CPI_{ht}^{I^4_2}$
	(1)	(2)	(3)	(4)	(5)	(6)
$\Delta \ln(1 + \tau_{ht})$	0.480** (0.138)		0.294** (0.072)			
Import intensity _{ht} $\times \Delta \ln(1 + \tau_{ht})$		3.833** (0.866)		2.964*** (0.257)	2.885*** (0.396)	2.819** (0.653)
Industry Fixed Effect	Y	Y	Y	Y	Y	N
Time Fixed Effect	Y	Y	Y	Y	Y	N
Industry-time Fixed Effect	N	N	N	N	N	Y
Observations	504	504	1,478	1,478	752	1,442
R^2	0.118	0.117	0.059	0.061	0.099	0.129

Notes: Standard errors in parentheses are clustered at the industry level. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. Observations are aggregated to the CPI product-category-month level. Columns (1)–(2) use the official monthly CPI published by the NBSC. Columns (3)–(6) use the more detailed domestic retail price indices for 42 finer product categories provided by PMC-NDRC. Column 5 drops observations from the grain, oil and food sector, where retail prices usually fluctuate sharply among months. Column 6 further controls for industry-time fixed effect.

32 Products in the retail price data are grouped into five industries: grain, oil, and food; household appliances and daily necessities; tobacco and alcohol; apparel and clothing; and non-alcoholic beverages.

goods account for 10% of the consumer spending on a particular product, then a 10% drop in consumer goods tariffs will result in a 3.833% ($=10\% \times 10\% \times 3.833$) decrease in domestic retail prices. This result is slightly higher than the tariff pass-through effect estimates in some existing literature. There are two possible reasons. First, the official CPI data has fewer product categories and relatively larger measurement errors. Second, the increase in the amount and variety of imports due to the decline in tariffs has intensified competition among similar products produced domestically, leading to a greater decline in domestic prices.

As robustness checks, we use more detailed domestic retail price indices for 42 finer product categories provided by PMC-NDRC and re-examine equation 7 in columns (3)–(6). Columns (3) and (4) correspond to columns (1) and (2) respectively. As shown in column (3), the elasticity estimate of domestic prices to tariff changes is 0.294, which is consistent with the estimates range of 0.2–0.3 in the literature.³³ After adjusting import intensities, estimate

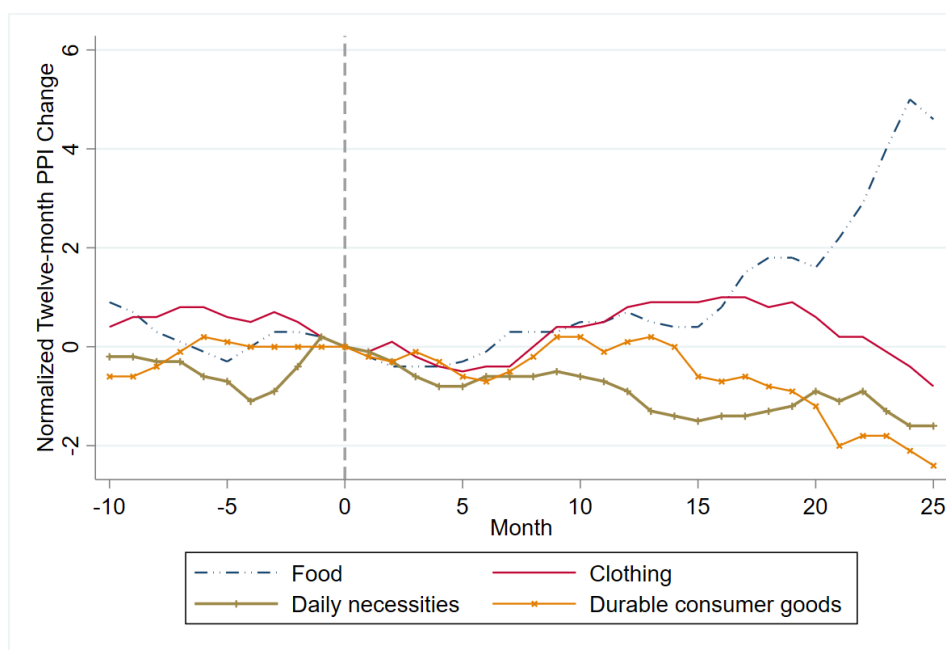


Figure 4: PPI, 2017–2019

³³ Bingzhan Shi and Xia Zhang, The Consumer Welfare Distribution Effects of China's Trade Liberalization, *China Economic Quarterly*, Vol. 16, No. 4, 2017, pp. 1421–1448; Puyang Sun, Tiantian Zhang and Shujie Yao, Tariff Transmission, Domestic Transport Costs and Retail Prices, *Economic Research Journal*, Vol. 54, No. 3, 2019, pp. 135–149.

in column (4) indicates that a 10% drop in import tariffs will bring roughly a 3% decrease in domestic retail prices, with an import intensity of 10%. Since food prices such as fresh meat and fruits fluctuate greatly and are more susceptible to supply and demand shocks, we exclude food from the sample in column (5), and the results are robust. Lastly, we include industry-time fixed effects in column (6) to further control for time-varying industry-level factors such as supply costs and demand fluctuations. The estimate is similar to those in previous columns and is statistically significant.

Figure 4 depicts the twelve-month proportional changes in the Producer Price Index (PPI). The PPI data is collected from the National Bureau of Statistics. As before, we normalize the PPI change to zero in November, 2017, the month prior to the first wave of MFN (temporary) tariff reductions.

It is worth noting that the elasticity estimated in Table 6 reflects price changes of both imported and domestically produced consumer goods. As shown in Table 6, the degree of tariff pass-through onto the domestic retail price index is significantly higher than the average import intensity of consumer goods (10%). This indicates that the prices of domestically produced consumer goods also decreased significantly due to the increased competition from tariff reductions.³⁴ In other words, domestic producers lower their markups and/or prices because of increased competition from cheaper imported varieties and an increased number of imported varieties. This will further lower the domestic consumer prices and improve overall level of welfare. To further verify this, we collect and plot the manufacturer price index (PPI) of consumer goods from 2017 to 2019. As shown in Figure 4, the PPI of product categories that have been greatly impacted by tariff reduction have dropped significantly after 2018.

Using the elasticity estimates in Table 6, we can also obtain an estimate of the impact of tariff reductions on domestic prices of different products. As shown in Table 7, the degree of pass-through increases with import intensity: the higher the import share in total consumption, the greater the pass-through of the tariff to domestic consumer prices. Beverages, cigarettes and alcohol, and apparel have relatively lower import intensity and lower pass-through

34 Alessandro Nicita, *The Price Effect of Tariff Liberalization: Measuring the Impact on Household Welfare*, *Journal of Development Economics*, Vol. 89, No. 1, 2009, pp. 19–27; Pinelopi Goldberg et al., *Trade Liberalization and New Imported Inputs*, *American Economic Review*, Vol. 99, No. 2, 2009, pp. 494–500.

(0.1–0.2), compared to foods, appliances and personal care products. That is, a 10% reduction in tariffs will lead to a 1%–2% drop in domestic retail prices. Meanwhile, the pass-through is 0.39 in food industry, and 0.37 in appliances and personal care products.

Table 7: Impacts of Tariff Reductions on Domestic Retail Prices: By Sectors

Sector	Import Intensity	Tariff Pass-through	$\Delta \ln(1+\tau_{it})$	Price Effect (%)
Grain, Oil & Food	0.14	0.39	−0.84	−0.33
Household Appliances & Daily Necessities	0.13	0.37	−3.33	−1.22
Tobacco & Alcohol	0.07	0.20	−1.77	−0.35
Apparel & Clothing	0.05	0.14	−4.40	−0.62
Non-alcoholic Beverages	0.04	0.11	−8.51	−0.96

Note: Import intensity is estimated using 2017 import data from the customs and the total retail sales of enterprises in each sector from the National Bureau of Statistics.

Using the above estimated pass-through and the observed tariff reduction $\Delta \ln(1+\tau_{it})$, we can calculate the resulting price fluctuations in 2018 as shown in Table 7 column (4). Consistent with Figure 3, products that have experienced significant tariff reductions have seen great decline in domestic retail prices. In the short run, the overall consumer welfare increase is exactly the same level as the price decrease in consumer goods, assuming no income effect from adjustments in income level.

VI. ROBUSTNESS CHECKS

In this section, we conduct a series of robustness checks and show that our findings are robust to potential confounding factors such as anticipation of tariff reduction and the US-China trade war. We also examine the potential heterogeneous impacts of the policy.

A. Endogeneity

One may be concerned about tariff reduction anticipation that can complicate the elasticity estimates. To test the endogeneity of tariff reduction policy, we adopt an event study framework to test for preexisting trends. Specifically,

we compare trends in targeted varieties that were directly affected by tariff reduction to the ones that were not targeted using the following specification:

$$\Delta \ln x_{iht} = \eta_h + \mu_{it} + \sum_{s=-6}^6 \beta_s \left[I_{ihts} \times \left(-\ln \left(\frac{1 + \tau_{ihts}}{1 + \tau_{iht0}} \right) \right) \right] + \varepsilon_{iht} \quad (8)$$

s is the number of months between t and the event date — one month before the implementation of tariff reduction policy. The dependent variable $\Delta \ln x_{iht}$ measures the twelve-month log changes in tariff-inclusive import prices, import quantities, and import values. The variable I_{ihts} indicates whether the imported products are directly affected by tariff reductions. If the 8-digit HS product h imported s months after (before if s is negative) the event from country i belongs to the targeted variety group, then $I_{ihts}=1$, otherwise it is 0. τ_{iht0} and τ_{ihts} denote the tariff levels one month before the tariff reduction and in the month of import, respectively. Because the tariffs decreased after the event, we interact the event indicator variable I_{ihts} with the *negative* log change in tariffs for intuitive representation of the estimates of β_s in Figure 5. In addition, we include product (η_h) and country-time (μ_{it}) fixed effects in our specification to control for omitted variables and other factors that vary at the product and country-time levels such as import demand shifters and exchange rates.

As different products were subject to different waves of tariff reductions, we follow Fajgelbaum et al. (2020) to assign the event dates ($s = 0$) to targeted varieties.³⁵ Specifically, untargeted varieties in the same 4-digit HS code group as targeted varieties are treated as the control group and assigned the same event date as that of the targeted varieties within the group. The earliest event date was assigned if there were multiple waves of tariff reductions in this product code.

In equation (8), β_s measures the elasticities of import outcomes identified from i) the differences between the targeted and untargeted varieties; and ii) the differences before and after the tariff reduction. We plot $\{\beta_s\}_{s=-6}^6$ in Figure 5 to capture the relative trends of the targeted varieties before and after the tariff reduction event. The top two plots show the impact of tariff reduction on import prices exclusive and inclusive of tariffs, and the bottom plots show the effect on import quantity and values. As seen in all figures, we find little

35 Pablo D. Fajgelbaum et al., The Return to Protectionism, *The Quarterly Journal of Economics*, Vol. 135, No. 1, 2020, pp. 1–55.

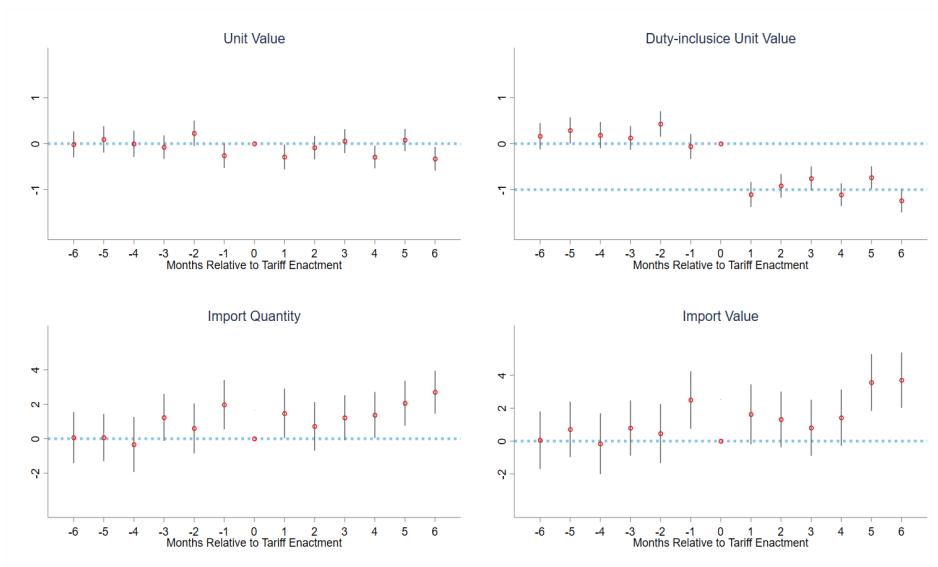


Figure 5: Event Study, 2017–2019

evidence of pre-trends, with the estimates of β_s close to zero in the six months before tariff reductions considering all import outcomes. Specifically, we see that (before-duty) unit values do not change and are around zero in the upper-left plot. Meanwhile, the value of the tax-inclusive unit in the upper-right plot decreases significantly after the tariff reduction event and the elasticity is close to 1. This suggests a complete pass-through of the tariff cuts. Similar patterns are observed in the plots for import quantities and values that the targeted and untargeted varieties were not on statistically different trends prior to the tariff reduction and the targeted group showed a significant increase afterward. It is worth noting that the import values jumped slightly during the -1 period (i.e., one month before the tariff reduction). This is likely due to a temporary stockpiling after China announced an increase in import tariffs on goods from the United States, which coincided with the tariff reduction timeline on the majority of targeted varieties in July 2018. In the next section, we show that the parallel trend assumption is satisfied and the finding is robust with the targeted varieties impacted in July 2018 excluded.

B. US-China Trade War and Other Confounding Factors

In this section, we conduct robustness checks on potential confounding factors,

especially the US-China trade war. As discussed, the US-China trade war in 2018–2019 could bias our empirical results. Since March 2018, the US-China trade war was fueled by the US announcement of additional tariffs levied on Chinese imports and the following reciprocal countermeasures from China. The bilateral tariffs between China and the United States have continued to rise. This has caused certain impacts on the trade market and decreased the trade volume between the two countries. US exports to China fell by 20% in the latter half of 2018. Although consumer goods were less affected, we have excluded imports from the US in our previous analysis in order to avoid their confounding effects.

To further examine the impact of US-China trade war on imports of consumer goods, we now include products originating in the US into the sample and re-examine equations 1 and 6, taking into account the increased tariffs on imports from the US. The results are presented in Table 8. Compared with the benchmark regressions in Table 3, the sample size increased by about 4.5%–6% in columns 1–3. The estimates are similar to those found in Table 3. We find that the import price elasticity with respect to tariff changes is still close to 1, after taking into account the increased tariff on US imports. On the other hand, the elasticity of import quantity and value slightly increased to -3.096 and -3.773 , indicating suppressed import demand from the US due to the elevated tariff.

Additionally, the trade war can also create market sentiment disturbances. Some importers may have stockpiled out of panic about the market uncertainty, leading us to observe different trends between targeted and untargeted varieties prior to the tariff reduction in Figure 5. To alleviate the concern, we removed the products impacted in the round of tariff reduction in July 2018 and re-examined equation 8 and plotted Figure 6. We can see that the parallel trend assumption is basically satisfied for import value once we excluded the targeted products in July 2018, which alleviate the confounding pattern in Figure 5 due to market overreaction. Furthermore, we find consistent result as shown in Figure 5: the import prices of the targeted varieties decreased significantly after the tariff reduction and the pass-through was completed. Similarly, the import values and quantities also increased notably for the targeted varieties after the tariff reduction and the elasticity was between 2–3.

Table 8: Robustness Check: Including Imports from US

Dependent Variable	$\Delta \ln p_{iht}$	$\Delta \ln q_{iht}$	$\Delta \ln m_{iht}$	$\ln\left(\frac{P_{ht}^*}{P_{h,t-12}^*}\right)$	$\ln\left(\frac{\lambda_{ht}}{\lambda_{h,t-12}}\right)^{\frac{1}{\sigma-1}}$	$\ln\left(\frac{P_{ht}}{P_{h,t-12}}\right)$
	(1)	(2)	(3)	(4)	(5)	(6)
$\ln(1+\tau_{iht})$	1.121*** (0.048)	3.096*** (0.417)	3.773*** (0.545)			
$\ln(1+\tau_{ht})$				1.049*** (0.085)	0.449* (0.267)	1.498*** (0.272)
Product Fixed Effect	Y	Y	Y	Y	Y	Y
Country-time Fixed Effect	Y	Y	Y	N	N	N
Time Fixed Effect	N	N	N	Y	Y	Y
Observations	344,936	690,098	799,639	35,818	35,818	35,818
R^2	0.035	0.065	0.061	0.101	0.070	0.075

Notes: * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. Observations are aggregated to the 8-digit HS product-country-month level in columns (1)–(3). Observations with pre-tax price ratios greater than 3 or less than 1/3 between t and $t-1$ are excluded in columns (1)–(2). Newly imported varieties are taken into account in columns (2)–(3). Standard errors in parentheses are clustered at the 8-digit HS product level. Observations are aggregated to the 6-digit HS product-month level in columns (4)–(6). Standard errors in parentheses are clustered at the 6-digit HS product level.

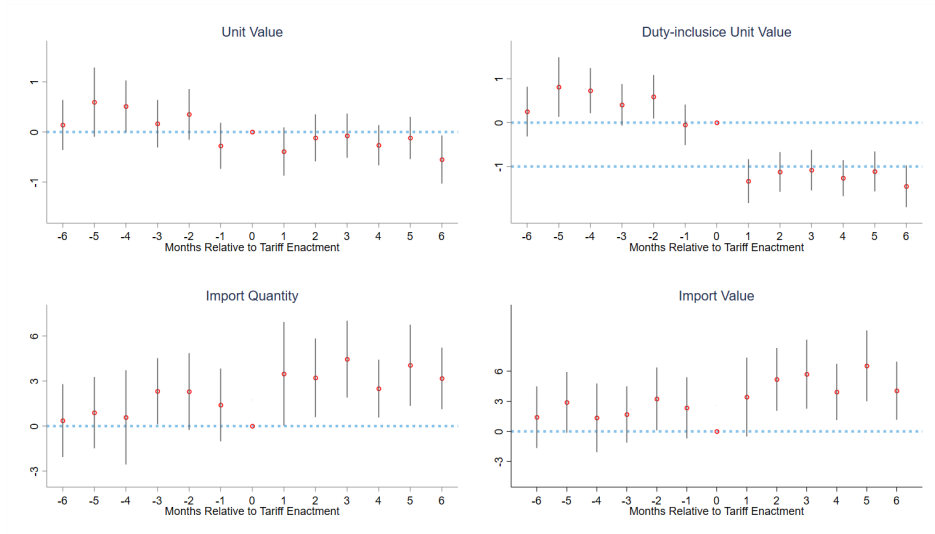


Figure 6: Robustness Check: Event Study Excluding July 2018

Next, we conducted additional robustness checks on our findings concerning the potential confounding import demand shocks from China's newly established free trade zones (FTZ) during the sample period. These establishments may have promoted local imports and resulted in bias in our estimates. To alleviate the concern, we excluded the provinces with newly established free trade zones from the benchmark sample between 2017 and 2019 and re-examined equation (1). The results in Table 9 indicate no significant difference in the elasticity estimates from the benchmark regression.

Table 9: Robustness Check: Excluding Free Trade Zones

Dependent Variable	$\Delta \ln p_{iht}$	$\Delta \ln q_{iht}$	$\Delta \ln m_{iht}$
	(1)	(2)	(3)
$\ln(1+\tau_{iht})$	1.134*** (0.055)	-1.792*** (0.498)	-2.564*** (0.671)
Product Fixed Effect	Y	Y	Y
Country-time Fixed Effect	Y	Y	Y
Observations	309,461	628,713	725,592
R^2	0.033	0.061	0.059

Notes: Standard errors in parentheses are clustered at the 8-digit HS product level. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. Observations are aggregated to the 8-digit HS product-country-month level. Observations with pre-tax price ratios greater than 3 or less than 1/3 between t and $t-1$ are excluded in columns (1)–(2). Newly imported varieties are taken into account in columns (2)–(3).

C. Heterogeneous Impacts of Tariff Reductions

Previously, we find that the tariff cuts since 2017 had significantly reduced the import prices of consumer goods and increased import quantities and varieties. In this section, we further examine the potential heterogeneity in the impacts of the policy.

1. Product Quality

First, we ask whether heterogeneous in product quality can lead to differences in the tariff pass-through. As is known in the literature, countries differ in their income elasticities of demand and their production technologies. High-income countries are usually more technologically advanced in producing high-

quality products.³⁶ The fraction of consumers who buy a higher-quality product also rises with income.³⁷ Thus when product prices fall, consumers' budget constraints will be less binding and their actual disposable income will rise. As a result, demand for imported products will increase as the tariff decreases and more so for high-quality consumer goods originated from high-income countries.

Table 10: Robustness Check: Product Quality Heterogeneity

Dependent Variable	$\Delta \ln p_{iht}$	$\Delta \ln q_{iht}$	$\Delta \ln m_{iht}$	$\Delta \ln p_{iht}$	$\Delta \ln q_{iht}$	$\Delta \ln m_{iht}$
	(1)	(2)	(3)	(4)	(5)	(6)
$\ln(1+\tau_{iht})$	1.188*** (0.081)	0.027 (0.630)	0.141 (0.788)	1.079*** (0.063)	-0.671 (0.518)	-0.439 (0.673)
$\ln(1+\tau_{iht}) \times \text{OECD Country}$	-0.163* (0.089)	2.637*** (0.757)	3.752*** (0.911)			
$\ln(1+\tau_{iht}) \times \text{High Priced Product}$				-0.012 (0.071)	1.561*** (0.405)	2.902*** (0.549)
Product Fixed Effect	Y	Y	Y	Y	Y	Y
Country-time Fixed Effect	Y	Y	Y	Y	Y	Y
Observations	325,258	660,372	762,202	325,258	655,276	753,942
R^2	0.032	0.065	0.060	0.032	0.062	0.056

Notes: Standard errors in parentheses are clustered at the 8-digit HS product level. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. Observations are aggregated to the 8-digit HS product-country-month level. Observations with pre-tax price ratios greater than 3 or less than 1/3 between t and $t-1$ are excluded from columns (1)–(2) and (4)–(5). Newly imported varieties are taken into account in columns (2)–(3) and (5)–(6).

In Table 10, we verify this conjecture and present the estimates of equation (1) after controlling for sourcing countries' income and product quality proxied

36 Ana Cecilia Fieler, Nonhomotheticity and Bilateral Trade: Evidence and a Quantitative Explanation, *Econometrica*, Vol. 79, No. 4, 2011, pp. 1069–1101; Justin Caron, Thibault Fally and James R. Markusen, International Trade Puzzles: A Solution Linking Production and Preferences, *The Quarterly Journal of Economics*, Vol. 129, No. 3, 2014, pp. 1501–1552.

37 Pablo Fajgelbaum, Gene M. Grossman and Elhanan Helpman, Income Distribution, Product Quality, and International Trade, *Journal of Political Economy*, Vol. 119, No. 4, 2011, pp. 721–765.

by unit value. First, in columns (1)–(3), we interact the variable of interest $\Delta(1+\tau_{iht})$ with a dummy variable indicating whether the imported product is from OECD countries. As shown in column (2), the coefficient on the interaction term is -2.637 and statistically significant. Estimates show that tariff reduction increases demand more for imports from high-income countries. This finding further verifies the importance of tariff reduction in consumer welfare improvement and provides evidence of consumption upgrading in China.

Additionally, in columns (4)–(6) of Table 10, we use duty-exclusive import price to proxy for product quality, as verified in the literature that within fine product categories in a given market, products with higher quality are sold with higher prices.³⁸ Specifically, we classify imported consumer goods based on whether their tax-exclusive unit value is above the median value within the same 8-digit HS code category. Products with above-median unit values are considered to have higher quality. As shown in column (5), import quantities increased with tariff cuts, especially for high-priced products.

2. Elasticity of Substitution

In this section, we further explore the heterogeneity in tariff pass-through due to differences in the elasticity of substitution among products. As shown in the literature, differentiated goods are less substitutable and have smaller import demand elasticities on average than homogeneous and more substitutable goods.³⁹ As a result, tariff reduction should lead to larger growth in import demand for homogeneous and highly substitutable products. Following Soderbery (2015), we categorize 8-digit products into the high elasticity group if the estimated elasticity of substitution is greater than 3 and reexamine equation 1.⁴⁰ The results are shown in Table 11: columns (1)–(3) and (4)–(6) for high- and low-elasticity products respectively.

38 David Hummels and Peter J. Klenow, The Variety and Quality of A Nation's Exports, *American Economic Review*, Vol. 95, No. 3, 2005, pp. 704–723.

39 Anson Soderbery, Trade Elasticities, Heterogeneity, and Optimal Tariffs, *Journal of International Economics*, Vol. 114, 2018, pp. 44–62.

40 Anson Soderbery, Estimating Import Supply and Demand Elasticities: Analysis and Implications, *Journal of International Economics*, Vol. 96, No. 1, 2015, pp. 1–17.

Table 11: Robustness Check: Elasticity of Substitution

Dependent Variable	High Elasticity			Low Elasticity		
	$\Delta \ln p_{iht}$	$\Delta \ln q_{iht}$	$\Delta \ln m_{iht}$	$\Delta \ln p_{iht}$	$\Delta \ln q_{iht}$	$\Delta \ln m_{iht}$
	(1)	(2)	(3)	(4)	(5)	(6)
$\Delta(1+\tau_{iht})$	0.854*** (0.113)	3.136*** (0.869)	3.582*** (1.121)	1.136*** (0.062)	-1.174** (0.544)	1.948*** (0.739)
Product Fixed Effect	Y	Y	Y	Y	Y	Y
Country-time Fixed Effect	Y	Y	Y	Y	Y	Y
Observations	89,739	180,102	202,925	234,927	479,461	558,467
R^2	0.055	0.090	0.084	0.036	0.066	0.061

Notes: Standard errors in parentheses are clustered at the 8-digit HS product level. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. Observations are aggregated to the 8-digit HS product-country-month level. Observations with pre-tax price ratios greater than 3 or less than 1/3 between t and $t-1$ are excluded in columns (1)–(2) and (4)–(5). Newly imported varieties are taken into account in columns (2)–(3) and (5)–(6).

As shown in columns (2) and (5), the import demand elasticity with respect to tariff is higher for products with high elasticity of substitution than that for less substitutable goods. The estimates indicate that when the tariff decreases by 1%, the import quantities rise by 3.136% and 1.174% for high- and low-elasticity products, respectively. We also find that the tariff pass-through is relatively lower for products with high elasticity of substitution, as shown in columns (1) and (4). This is because the tariff pass-through is negatively correlated with import demand elasticity — the higher the import demand elasticity, the more tariffs will be borne by the foreign exporters.

3. Regional Heterogeneity

Lastly, we will examine whether the impact of tariff reductions on domestic retail prices varies across different regions in China. To supplement the existing dataset, we collected the consumer price index of 31 provinces, autonomous regions, and municipalities from 2017 to 2019, and constructed its twelve-month change $\Delta \ln CPI_{dht}$, for province d product h in month t . After matching with customs data, we can construct the tariff change at province-product-month level $\Delta \ln(1+\tau_{dht})$ and re-examine equation (7). As shown in Table 12 column (1), the results are consistent with the benchmark regression in Table

6. The tariff cuts significantly reduced the domestic prices of consumer goods with an elasticity of 0.211. To further explore the regional heterogeneity responses in domestic retail price, we interact a low-income dummy variable with the change in tariff. Specifically, low-income areas are locations with per capita disposable income in the bottom 30 percentile of the income distribution in 2017. As seen in column (2), the domestic retail prices are more responsive to consumer goods tariff changes in lower-income regions comparing to other regions. A 10% reduction in tariffs will lead to a roughly 1.7% decrease in consumer price index in middle- and high-income provinces and a 3.4% decrease in low-income provinces. This result further verifies a higher degree of pass-through in low-income provinces and the existence of competition effects.

Table 12: Robustness Check: Tariff Pass-through and Export Quality Upgrading by Region

Dependent Variable	Region			
	Consumer Price Index		Export Quality	
	$\Delta \ln CPI_{dht}$	$\Delta \ln CPI_{dht}$	$\Delta \ln Q_{dht}$	$\Delta \ln Q_{dht}$
	(1)	(2)	(3)	(4)
$\Delta(1+\tau_{dht})$	0.211** (0.038)	0.166** (0.036)	-0.194 (0.128)	-0.305** (0.134)
$\Delta(1+\tau_{dht}) \times \text{Low Income Region}$		0.170* (0.048)		1.086** (0.470)
Product Fixed Effect	Y	Y	Y	Y
Province-time Fixed Effect	Y	Y	Y	Y
Observations	7,080	7,080	81,996	81,996
R^2	0.144	0.144	0.045	0.045

Notes: Standard errors in parentheses are clustered at the industry level in columns (1)–(2), and at the 4-digit HS product level in columns (3)–(4). * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. Observations in columns (1)–(2) are aggregated to the CPI product-province-month level. Observations in columns (3)–(4) are aggregated to the 4-digit HS product-province-month level.

This can be explained by heterogeneous strategic choices of domestic producers when facing elevated competition from imported goods. On one hand, low-income provinces have relatively less-developed economy and production technology, compared with middle- and high-income regions. Manufacturers in these less-developed regions are also less competitive and are

more likely to lower their prices in the face of fiercer competition from import market. Therefore, the domestic consumer price index declines even more in these regions. On the other hand, domestic manufacturers in middle- and high-income provinces are more likely to upgrade their product quality and become more competitive.⁴¹ Thus we explore potential heterogeneous quality upgrading responses to tariff changes in columns (3) and (4).

Due to data limitations, we cannot measure the quality of goods sold in the domestic market. Following Khandelwal et al. (2013), we use monthly export data at the 8-digit HS level from 2017 to 2019 to proxy the twelve-month change in the quality of domestically produced products h at the 4-digit HS level in each province d in month t , denoted by $\Delta \ln Q_{dht}$.⁴² We can see from column (4) that the increased competition from the tariff cuts encouraged quality upgrading in middle- and high-income provinces but curbed the product quality upgrading in low-income provinces.

V. CONCLUSION

In this paper, we empirically examine the price and welfare effects of comprehensive tariff reductions on consumer goods. We find significant declines in tax-inclusive import prices, increased import quantities, and sizable reduction in total costs for importers and consumers. We also find complete pass-through, which indicates that almost all of the cost-saving effects resulting from tariff reductions are enjoyed by domestic importers and consumers. Additionally, this reduction in costs has significantly increased the varieties of imported products, further decreased the import price index, and improved consumer welfare. This study empirically verified the positive impact of tariff reductions on consumer goods under the new stage of comprehensive opening-up policy.

In the long run, changes in residents' welfare depend not only on changes in price levels but also on changes in income levels. Evaluating the impact of

41 Miaojie Yu, Processing Trade, Tariff Reductions and Firm Productivity: Evidence from Chinese Firms, *Economic Journal*, Vol. 125, 2015, pp. 943–988.

42 Amit K. Khandelwal, Peter K. Schott and Shangjin Wei, Trade Liberalization and Embedded Institutional Reform: Evidence from Chinese Exporters, *American Economic Review*, Vol. 103, No. 6, 2013, pp. 2169–2195.

consumer goods tariff reductions on the overall welfare level and its distribution among consumers in a general equilibrium framework is an exciting agenda for future research.