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Asymmetric Tariff Pass-Through to Trade Prices

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Abstract: This paper examines asymmetry in tariff pass-through, that is, how import prices react differently to the increase and decrease in most favored nation (MFN) rates. For this, we analyze Indonesia's imports because Indonesia not only reduced MFN rates for a significant number of products but also raised those rates for a large number of other products in 2010. The analysis results indicate asymmetric tariff pass-through: trade prices decrease when MFN rates decline but do not change when these rates rise. Furthermore, examining the effects of changes in MFN rates on product quality and quality-adjusted prices separately, we find that a decrease in trade prices when MFN rates decline is led by a reduction in (average) product quality. In addition, we find that controlling for the change in ad valorem equivalent rates, a change in tariffs from ad valorem form to specific form does not have any additional impact on import prices.

Keywords: Tariff pass-through; Trade prices
JEL classification: F15, F53

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Abstract: This paper examines asymmetry in tariff pass-through, that is, how import prices react differently to the increase and decrease in most favored nation (MFN) rates. For this, we analyze Indonesia's imports because Indonesia not only reduced MFN rates for a significant number of products but also raised those rates for a large number of other products in 2010. The analysis results indicate asymmetric tariff pass-through: trade prices decrease when MFN rates decline but do not change when these rates rise. Furthermore, examining the effects of changes in MFN rates on product quality and quality-adjusted prices separately, we find that a decrease in trade prices when MFN rates decline is led by a reduction in (average) product quality. In addition, we find that controlling for the change in ad valorem equivalent rates, a change in tariffs from ad valorem form to specific form does not have any additional impact on import prices.

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1. Introduction

Changes in tariff rates affect trade prices. Due to the proliferation of trade liberalization in the world in the 2000s, tariff rates have drastically changed, falling dramatically in some cases. Such a change affects trade prices through various channels such as changing exporters' markup or consumer prices. Thus, a reduction in tariff rates may either increase or decrease trade prices. Such an effect of tariff rates on trade prices has received attention as "tariff pass-through." The magnitude of tariff pass-through is important since it is one of the sources of the effect of tariff changes on national welfare. That is, the magnitude of a change in trade price plays a crucial role in determining the welfare impact of tariff changes.

Several studies have quantified the tariff pass-through. An early pioneering empirical work on the issue is by Feenstra (1989), who identified the symmetric

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pass-through between tariff rates and exchange rates in the long-run in U.S. imports from Japan. A similar analysis was conducted for India's trade liberalization in the 1990s by Mallick and Marques (2007). While these studies have focused on the effect of most favoured nation (MFN) rates, several studies have examined the effect of preferential tariff rates such as regional trade agreement (RTA) rates. Examples include the studies by Cadot et al. (2005), Olarreaga and Ozden (2005), Ozden and Sharma (2006), and Cirera (2014). Furthermore, while all the above studies have analyzed the issue at a product level, some studies have examined firm-level tariff pass-through. For example, Gorg et al. (2016) examined the tariff pass-through for Hungarian exports at the firm level but did not find significant tariff pass-through. On the other hand, Ludema and Yu (2016) found significant firm-level tariff pass-through in U.S. exports.[1]

This paper is the first to highlight another kind of asymmetry in tariff pass-through, that is, how differently the fall and rise in tariff rates affect trade prices. For this, we employ product-level import data for Indonesia. One unique feature of the trade policy in Indonesia is the absolute rise in MFN rates in 2010, as shown in Section 2. To protect domestic industry, the Indonesian government promulgated the Minister of Finance Decree on December 22, 2010, and raised MFN rates for more than 1,000 tariff-line products. With the global trend of the 2000s being trade liberalization, or the reduction in tariff rates, the above-mentioned studies have examined the effect of tariff reduction on trade prices. Indeed, Indonesia too reduced MFN rates for a number of products in 2010. Nevertheless, we also observe a rise in tariff rates for a significant number of products in Indonesia. Such a significant tariff rise has been rare in recent years and offers a good opportunity to examine how trade prices are affected by a fall or a rise in tariff rates. Another interesting feature is that such tariff increases for some products occur in terms of a shift from ad valorem to specific rates. Therefore, we can examine whether the introduction of specific rates has an additional impact on trade prices by controlling for the magnitude of ad valorem equivalent level of specific rates.

The literature on exchange rate pass-through provides some rationale for such asymmetry in tariff pass-through. Numerous empirical studies have focused on exchange rate pass-through. In particular, Bussiere (2013), who examined asymmetry in the exchange rate pass-through for G7 countries, indicated two assumptions. One is that export prices are rigid downward, implying that exporters are more prone to increase their markup than to decrease it. Namely, "prices rise faster than they fall" (Peltzman,

[1] In addition, there are some studies that examine how trade price changes through trade policy changes are transmitted to household income (e.g., Nicita, 2009; Atkin and Donaldson, 2012; Ural Marchand, 2012).

2000). The other is that export quantities are rigid upwards. When exporting firms are already at full capacity, export prices are expected to react more during an exporter currency depreciation than during an appreciation. Under both assumptions, a positive shock to exporters affects export prices more than a negative shock. Applying this discussion to tariff pass-through, we may find that a tariff reduction affects trade prices more than a tariff increase.

Furthermore, we examine separately how a change in MFN rates affects product quality and quality-adjusted prices. Our empirical analysis indicates an asymmetric tariff pass-through and finds that an increase in MFN rates does not significantly affect trade prices but a decrease in rates lowers trade prices. The latter result is somewhat puzzling (although, theoretically, it can occur) because it implies that consumer prices decrease by more than the decline in MFN rates. One possible reason is that the decrease in variable trade costs such as MFN rates helps less-productive exporters and those exporting lower-quality products to start exporting, as theoretically demonstrated by Baldwin and Harrigan (2011). Thus, the product-level average trade prices decrease. Therefore, employing the method proposed by Khandelwal et al. (2013),[2] we examine tariff pass-through asymmetry for quality-adjusted trade prices and product quality separately. Through this, we find that the reduction in MFN rates raises quality-adjusted trade prices and decreases product quality. On the other hand, an increase in MFN rates affects neither quality-adjusted trade prices nor product quality.

The rest of this paper is organized as follows. Section 2 provides an overview of tariff rates in Indonesia. Section 3 specifies our empirical framework. Section 4 contains our empirical results, and Section 5 concludes the paper.

2. Tariff Rates in Indonesia

The data on MFN rates are taken mainly from the World Integrated Trade Solution (WITS) database. We use ad valorem equivalent rates for specific tariff products. The tariff-line code is defined at a 10-digit level in Indonesia and includes approximately 9,000 commodities. Table 1 reports the number and share of products in which MFN rates declined, did not change, or rose from 2009 to 2011. Although 75% of the tariff-line level products saw no change in MFN rates, those rates rose in approximately 1,300 products, which constitute 15% of all products. In particular, most

[2] There is growing literature on the trade price–quality nexus. These include studies by Khandelwal (2010), Amiti and Khandelwal (2013), Khandelwal et al. (2013), Bas and Strauss-Khan (2015), and Fan et al. (2015). These studies have investigated how trade policy changes affect trade product quality.

of these products saw a 5% point rise. The rest of the products (10%) saw declines in MFN rates, mostly by 5% points.

=== Table 1 ===

Table 2 shows how MFN rates rose, that is, the matrix between MFN rates in 2009 and 2011. It restricts products to those that saw a rise in MFN rates from 2009 to 2011. In one case, the change was from 0% (i.e., duty free) to 5%. The change from more than 40% rates in 2009 to higher rates in 2011 was mostly because of the switch from ad valorem to specific rates. The magnitude of increase is large for such products.

=== Table 2 ===

Next, we examine the relation between MFN rates and RTA preferential rates. As of 2011, Indonesia had five RTAs. The first RTA concluded by Indonesia was the ASEAN free trade agreement (FTA), which became effective in 1993. It covers the "ASEAN six," that is, Brunei, Indonesia, Malaysia, Philippines, Singapore, and Thailand. Later, more countries joined this FTA (Vietnam in 1995, Laos and Myanmar in 1997, and Cambodia in 1999). The FTA deepened further in 2010 as ASEAN Trade in Goods Agreement (ATIGA).

Indonesia is also a member of three ASEAN-plus-one FTAs—the ASEAN–China FTA, the ASEAN–India FTA, and the ASEAN–Korea FTA—which came into force in 2005, 2010, and 2007, respectively.[3] The only bilateral RTA was concluded with Japan in 2007. The data on RTA preferential rates are taken from the WITS database.[4]

Table 3 reports the preference eligibility status for products with an increase in MFN rates from 2009 to 2011. Specifically, at a tariff-line level, we identify the lowest rates among all the available RTA rates. These are indicated by "Pref" in Table 3. Products that have lower Pref than MFN rates are called eligible products. The table indicates that almost all products faced with an increase in MFN rates (96%) were ineligible to any RTAs in 2009 but became eligible in 2011. More importantly, the lowest preferential rates did not change from 2009 to 2011 for such products. Namely, an increase in MFN rates resulted in a change in eligible status rather than a reduction/introduction of preferential rates. Although many empirical studies have

[3] The ASEAN–Australia–New Zealand FTA came into force in 2012 in Indonesia.

[4] Unfortunately, in the WITS database, Indonesia does not report tariff rates for the Japan–Indonesia economic partnership agreement, which is the FTA with the country that has the third largest export value to Indonesia. We obtain this data from the FTA between Japan and Indonesia.

focused on how RTA rates affect MFN rates, this observation may indicate that an increase in MFN rates in Indonesia is not associated with a change in RTA rates.[5]

=== Table 3 ===

3. Empirical Framework

We estimate the following simple reduced-form equation on a log difference of import prices using the ordinary least squares (OLS) method.

$$\Delta \ln P_{ip} = \beta_1 \Delta \ln\left(1 + MFN_p\right) + \beta_2 \Delta \ln\left(1 + Pref_p\right) + \beta_3 Specific_p + u_i + \epsilon_{ip} \quad (1)$$

$\Delta \ln P_{ip}$ indicates a log difference of import prices (unit values or imports divided by import quantity) from country i of tariff-line level product p from 2009 to 2011.[6] The data on import values and import quantity at a tariff-line level in Indonesia are obtained from the World Trade Atlas by Global Trade Information Services. $\Delta \ln\left(1 + MFN_p\right)$ indicates a log difference of Indonesia's MFN rates against product p from 2009 to 2011. Hayakawa et al. (2016) theoretically examined the price effect of tariffs under a flexible demand function. It is demonstrated that the price effect (i.e., β_1) is negative if the demand elasticity of markup is negative, that is, if the demand curve is not sufficiently convex, as assumed in typical trade models (e.g., Krugman, 1979).

To evaluate the price effects of MFN rates as applied rates, sample countries include only RTA non-member countries. Thus, we exclude ASEAN countries, China, India, Japan, and Korea. Nevertheless, RTA tariff rates may affect import prices from RTA non-member countries. For example, Chang and Winters (2002) developed a simple strategic pricing game model in segmented markets. They derived the import price equation from RTA non-member countries that includes not only MFN rates but also RTA rates as independent variables. Since RTA rates are tariffs faced by competitors for RTA non-member countries, the lower RTA rates will increase the extent of competition and pressurize RTA non-member countries to lower export prices. To

[5] The empirical studies in this literature show that reciprocal trade liberalization (e.g., RTA) leads to a reduction in MFN rates (Estevadeordal et al., 2008; Calvo-Pardo et al., 2011; Magee and Lee, 2001). On the other hand, some studies examining unilateral trade liberalization found the opposite result (e.g., Bohara et al., 2004; Limao, 2006; Karacaovali and Limao, 2008).

[6] The data on import values and import quantity at a tariff-line level in Indonesia are obtained from the World Trade Atlas (WTA) by Global Trade Information Services (GTIS). Unlike the usual trade databases such as UN Comtrade, it provides tariff line-level data on trade. The GTIS was established in 1993. According to its website, the data are taken from the official source of each reporting country, e.g., customs agency or national statistics agency.

control for such an effect of RTA rates, we introduce a log difference of "Pref" in Table 3, namely, the lowest of all available RTA rates.

Furthermore, we introduce a dummy variable ($Specific_p$), which takes the value 1 if tariffs in product p change from ad valorem type in 2009 to specific type in 2011 and 0 otherwise. As shown in Table 2, such products experience a great extent of tariff rise in terms of the ad valorem equivalent level. With this dummy variable, we investigate whether such a change in tariff form has an additional impact on import prices. Although the log-difference form of our specification eliminates the effects of any time-invariant elements, we further control for country pair-specific time-variant elements, such as exchange rates, by introducing exporter fixed effects (u_i). The disturbance is ϵ_{ip}.

As mentioned in the introductory section, we estimate this equation for quality-adjusted prices and quality. To differentiate the quality component of import prices from the rest, we employ the modified version of the method proposed by Khandelwal et al. (2013). Specifically, we estimate the following for imports from RTA non-member countries in 2009 and 2011 using the OLS method.

$$\ln Q_{ipt} + \sigma_p \ln\left((1 + MFN_{pt}) \times P_{ipt}\right) = \alpha_p + \alpha_{it} + \epsilon_{ipt} \qquad (2)$$

Q_{ipt} denotes an import quantity of product p from country i in year t. α indicates fixed effects. σ_p indicates the elasticity of substitution in product p in Indonesia, which is available at an HS three-digit level in the study by Broda et al. (2006). Since MFN rates change over time in our sample, we use import prices multiplied by MFN rates rather than simply import prices. The log quality ($\ln \hat{\lambda}_{ipt}$) is measured by

$$\ln \hat{\lambda}_{ipt} = \hat{\epsilon}_{ipt}/(\sigma_p - 1).$$

$\hat{\epsilon}_{ipt}$ is a residual. The log of quality-adjusted prices (*QaPrice*) is obtained as

$$\ln P_{ipt} - \ln \hat{\lambda}_{ipt}.$$

Table 4 shows the basic statistics for our variables.

=== Table 4 ===

4. Empirical Results

Our estimation results for equation (1) are shown in column (I) of Table 5. It indicates the insignificant coefficient for MFN rates and also shows that the change in MFN rates does not significantly impact import prices. This result implies that the change in MFN rates is absorbed by importers. The coefficient for preferential rates is also found to be insignificant, indicating that the change in RTA rates does not affect import prices from RTA non-member countries. The dummy variable for the change to

non-ad valorem rates is estimated to be significantly negative, indicating that the change in MFN rates from ad valorem form to specific form lowers import prices.

=== Table 5 ===

Next, we examine asymmetry or non-linearity of tariff pass-through. In column (II) in Table 5, we introduce a square term of a log difference of MFN rates. Furthermore, its cube term is added in column (III). When introducing only the square term, we find that its coefficient is significantly negative while the level term has an insignificant coefficient. This result indicates a positive effect on import prices of a decrease in MFN rates and a negative effect of an increase in MFN rates. No coefficients for MFN rates-related variables are significant when introducing both square and cube terms of a log difference of MFN rates. Although the results for RTA rates are unchanged, the coefficients for a change to specific tariffs turns out to be positive, indicating the significant rise in import prices.

To directly examine the relation found in column (II), we interact dummy variables for the MFN decrease and increase with a log difference of MFN rates in column (IV). The result shows clear asymmetric tariff pass-through. While the coefficient for the interaction term with *Decrease* dummy is significantly positive, that with *Increase* dummy has an insignificant coefficient. These results indicate that the change in MFN rates affects trade prices when they fall but does not when they rise. However, the positive coefficient for the interaction term with *Decrease* dummy is not consistent with our expectation based on the fact that the demand function is not sufficiently convex. This result implies that consumer prices decrease by more than the decrease in MFN rates. Another noteworthy result is that the coefficient for the change to specific tariffs is insignificant. As found in Table 2, products faced with such changes experience a greater impact of MFN rate increases. Therefore, once we control the level of ad valorem equivalent rates, we do not see significant additional effects on import prices.

As mentioned in the introductory section, one possible reason for the positive coefficient for the interaction term with *Decrease* dummy is a change in product quality because of the change in MFN rates. Therefore, we separately estimate our model for quality-adjusted prices and quality, both of which are obtained from the estimation of equation (2). The results for the quality-adjusted prices are shown in columns (I) and (II) of Table 7. Column (I) shows that as is consistent with the case of a not-sufficiently convex demand function, the coefficient for MFN rates is significantly negative.

However, as found in column (II), such a significant relation between MFN rates and quality-adjusted prices exists only when MFN rates decrease. Specifically, it shows that a 10% decrease in MFN rates increases quality-adjusted import prices by 10%, but any increase in MFN rates does not change those prices. In other words, all parts of an MFN rate change is absorbed by exporters when MFN rates decrease and by importers when MFN rates increase. In both cases, consumer (quality-adjusted) prices do not change.

=== Table 6 ===

Columns (III) and (IV) show the estimation results for product quality. Consistent with our expectations based on the study of Baldwin and Harrigan (2011), column (III) shows that the coefficient for MFN rates is estimated to be significantly positive, indicating that the decrease in MFN rates lowers the average quality of import products. However, as in the case of quality-adjusted prices, such a relation exists only when MFN rates decrease. As shown in column (IV), the coefficients for the interaction terms with the MFN rate decrease and increase are significantly positive and insignificant, respectively. Namely, (average) import product quality decreases when MFN rates fall and does not change when MFN rates rise. The results for RTA rates and for change to specific tariffs are unchanged compared with those in column (IV) of Table 5.

5. Concluding Remarks

This paper examined asymmetry in tariff pass-through, that is, how import prices react differently to an increase and decrease in MFN rates. For this analysis, we considered a unique feature of trade policy in Indonesia in terms of the change in MFN rates in 2010. We found an asymmetric tariff pass-through; trade prices decreased when MFN rates fell but did not change when they rose. The decrease in trade prices was because the fall in MFN rates enabled low productive exporters to export and thus lowered the average product quality. Such an increase in low-quality varieties may yield benefits to consumers through love-of-variety effect. On the other hand, we found that a change in MFN rates did not significantly affect (quality-adjusted) consumer prices. Namely, a significant part of MFN rate change was absorbed by exporters when MFN rates fell and by importers when MFN rates rose. Therefore, the main benefit from MFN change for consumers may not be a change in consumer prices but an increase in varieties. In addition, we found that once we controlled for the level of ad valorem

equivalent rates, the change in tariffs from ad valorem form to specific form did not have additional effects on import prices.

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Table 1. Change in MFN Rates from 2009 to 2011 (Number of Tariff-line Level Products)

		Number	Share
Decline	Total	888	0.102
	△MFN < -5	66	0.008
	△MFN = -5	808	0.093
	0 > △MFN > -5	14	0.002
No Change		6,560	0.752
Rise	Total	1,280	0.147
	0 < △MFN < 5	2	0.000
	△MFN = 5	1,234	0.141
	△MFN > 5	44	0.005
Total		8,728	

Source: Ministry of Finance, Republic of Indonesia; WITS

Table 2. MFN Rates in 2009 and 2011 in Tariff-line Level Products with an Increase in MFN Rates

	MFN Rates in 2009							
	0	5	7.5	10	15	40	90	150
MFN Rates in 2011								
4	1							
5	1,224							
8	2							
10		3	1					
13			1					
15				6				
40					8			
134							2	
135						2		
179								2
208								2
220								9
241								2
293								2
363							1	4
396								2
414								2
623							2	2

Source: Ministry of Finance, Republic of Indonesia; WITS

Table 3. Preferential Status in Products with an Increase in MFN Rates

			Year = 2011	
			MFN = Pref	MFN > Pref
Year = 2009				
MFN = Pref	△Pref = 0	Number	34	1,227
		Share	0.027	0.959
MFN > Pref	Total	Number		19
		Share		0.015
	△Pref = 0	Number		6
		Share		0.005
	△Pref < 0	Number		13
		Share		0.010

Source: Ministry of Finance, Republic of Indonesia; WITS

Notes: "Pref" indicates lowest rates among all of the available preferential rates. ΔPref shows the change of such rates from 2009 to 2011.

Table 4. Basic Statistics

	Obs	Mean	Std. Dev.	Min	Max
△ln Price	28,080	0.202	1.005	-10.691	10.616
△ln MFN	28,080	-0.004	0.025	-0.192	0.616
Square of △ln MFN	28,080	0.001	0.007	0	0.380
Cube of △ln MFN	28,080	0.000	0.004	-0.007	0.234
△ln Pref	28,080	-0.005	0.019	-0.192	0.616
△ln MFN * D.Decrease	28,080	-0.007	0.017	-0.192	0
△ln MFN * D.Increase	28,080	0.003	0.018	0	0.616
Specific	28,080	0.000	0.022	0	1
△ln QaPrice	28,080	0.294	1.312	-15	20.195
△ln Quality	28,080	-0.093	1.795	-20	18

Table 5. Baseline Results

	(I)	(II)	(III)	(IV)
△ln MFN	0.201	0.306	0.323	
	[0.285]	[0.289]	[0.296]	
Square of △ln MFN		-6.087***	-4.718	
		[1.920]	[4.176]	
Cube of △ln MFN			-2.825	
			[7.049]	
△ln MFN * D.Decrease				0.671*
				[0.348]
△ln MFN * D.Increase				-0.461
				[0.515]
△ln Pref	0.447	0.554	0.583	0.408
	[0.380]	[0.384]	[0.397]	[0.376]
Specific	-0.667**	1.044*	1.089*	-0.3
	[0.325]	[0.614]	[0.644]	[0.384]
Number of observations	28,080	28,080	28,080	28,080
Adjusted R-squared	0.001	0.0012	0.0011	0.001

Notes: ***, **, and * represent significance at the 1%, 5%, and 10% statistical levels, respectively. Parentheses contain the heteroscedasticity-consistent standard error. In all specifications, exporter fixed effects are included. We estimate using the OLS method.

Table 6. Decomposition to Quality-adjusted Price and Quality

	△ln QaPrice		△ln Quality	
	(I)	(II)	(III)	(IV)
△ln MFN	-0.818**		1.019**	
	[0.331]		[0.470]	
△ln MFN * D.Decrease		-1.034**		1.705***
		[0.457]		[0.612]
△ln MFN * D.Increase		-0.514		0.053
		[0.542]		[0.818]
△ln Pref	-0.681	-0.663	1.128	1.071
	[0.541]	[0.543]	[0.693]	[0.692]
Specific	0.349	0.18	-1.016	-0.48
	[0.558]	[0.595]	[0.788]	[0.841]
Number of observations	28,080	28,080	28,080	28,080
Adjusted R-squared	0.0675	0.0675	0.0286	0.0286

Notes: ***, **, and * represent significance at the 1%, 5%, and 10% statistical levels, respectively. Parentheses contain the heteroscedasticity-consistent standard error. In all specifications, exporter fixed effects are included. We estimate using the OLS method.