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Working Paper

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Working Paper, No. 1996-20

Provided in Cooperation with:

Department of Economics, Rutgers University

Suggested Citation: Gang, Ira N.; Pandey, Mihir (1997) : Published and Realized Tariffs: the Weak Link, Working Paper, No. 1996-20, Rutgers University, Department of Economics, New Brunswick, NJ

This Version is available at:

<https://hdl.handle.net/10419/94279>

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Published and Realized Tariffs: the Weak Link

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Revised
September 26, 1996

JEL Codes: F13, D78, O21

Keywords: protection, trade, liberalization, political economy

Abstract:

This paper investigates the link between published tariff rates and realized tariff rates using Indian inter-industry manufacturing sector data over three Plan periods. Understanding this link is important as economies liberalize trade and must deal with the potential revenue shortfalls: if the published and realized rates exhibit independent idiosyncratic behavior, it is difficult to calculate the actual implications of changes in the published tariff rate.

Published and Realized Tariffs: the Weak Link

I. Introduction

This paper investigates the link between published tariff rates and realized tariff rates using Indian inter-industry manufacturing sector data over three Plan periods. Understanding this link is important as economies liberalize trade and must deal with the potential revenue shortfalls [Pritchett and Sethi (1994)]: if the published and realized rates exhibit independent idiosyncratic behavior, it is difficult to calculate the actual implications of changes in the published tariff rate.

The published rate and the realized rate are two ways of measuring the nominal rate of protection. The published tariff rate is the statutory or official tariff rate while the realized tariff rate is the collected customs duty divided by the value of imports. These measures capture different aspects of the protective structure. The published tariff informs us about the formal and potential protective structure adopted by the government. The realized tariff rate accounts for all the duty exemptions that the government permits; however, it allows for the possibility of understating protection due to prohibitive tariffs or the economy being on the downward sloping portion of a Laffer curve.

Greenaway (1988) argues for the usefulness of the realized tariff rate over the published rate. He argues that realized rates have the "merit of taking account of duty-free and preferential access imports...and, unlike the ex ante (i.e., published or nominal) tariff, they incorporate variable levies." Goldar and Saleem (1992) also noted differences between these alternative measures, pointing out that the realized rate is able to reflect the protection afforded when the explicit tariff structure is modified by the presence of factors such as

quantitative restrictions, import duty exemptions, price controls and illegal activities, for example smuggling, under-invoicing, and so on. On the other hand, if a sector shows no imports, then the collection is zero; though the lack of imports may be due to a very high level of protection itself. In this case, the realized rate of duty fails to capture the presence of protection altogether. Realized rates may also be biased because of a few outliers, as Goldar and Saleem (1992) point out.

We construct the realized tariff rate for each industry utilizing information available in the input-output tables for the Indian economy. It is useful to contrast measures of protection based on these with measures based on published tariff data and actual customs data. Rather than arguing for one measure over the other, in this paper we examine the link between these measures. In this we follow Pritchett and Sethi (1994) who in comparing published and realized tariff rates for Jamaica, Kenya and Pakistan found: i) a weak relationship between the two measures, ii) the variation of the realized rate increases with the level of the published rate, iii) the collected rate is generally less than the published rate, and iv) the relationship between the two is not linear.

In the next section we outline and present the data we employ. In Section III we report on our analysis. Section IV concludes.

II. Data

Nominal tariff rates are taken from Goldar and Saleem (1992) and Goldar, Narayana and Saleem (1992) and are available for 32 manufacturing sectors for the years 1980-81, 1983-84 and 1989-90. These are the simple averages of tariff rates derived from the Customs

Tariff Working Schedule, taking into account the basic and auxiliary rates of customs duty and the quantifiable exemptions.

To calculate realized rates, we use the input-output tables contained in the Appendices to the Sixth (1979-80), Seventh (1984-85) and Eighth (1991-92) Indian Five Year Plans [Government of India (1981, 1986, 1995)]. These are derived from the 115 sector input-output table of the Indian economy prepared by the Central Statistical Organisation; the number of sectors in the tables are 84, 50 and 60 respectively. We created 32 comparable manufacturing sectors for this study using value-added weights to join sectors where necessary. For the Seventh Plan, some sectors were not reported separately. For these we make the following compromises: for hydrogenated oil, we used food & beverages; for jute textiles, we use other textiles; for tractors & other agricultural machinery and machine tools, we use non-electrical machinery. The 1979-80 (Sixth Plan) and the 1991-92 (Eighth) input-output tables contain information on the structure of imports. Realized tariff rates were derived using the structure of import duties from the input-output tables and the total import revenue bill from the Economic Survey [Government of India (various years)]. Although the Seventh Plan document contains the input-output and the import coefficients matrix, it does not have the transactions matrix. The values for imports and value added were derived from the information pertaining to their structure combined with total value figures from the Economic Survey. For a discussion of the construction of these measures, and their strengths and weaknesses, see Gang and Pandey (1996a).

Table 1 presents the realized rates, the published rates and imports. Caution must be used in interpreting these measures. The published rates as calculated by Goldar and Saleem

(1992) are simple, not weighted averages. Weighted averages would be better, though they are extremely difficult to calculate across a broad range of the economy. Also, the rates as calculated by Goldar and Saleem are for years that do not exactly correspond to the input-output years. However, given the high correlation in published rates from year to year, we do not think this poses too much difficulty. With realized rates, as we discussed above, the calculations may show an increase for a host of reasons. For example, a prohibitive published tariff rate and a zero published tariff rate show the same realized tariff rate.

Realized tariff rates are generally lower than the nominal tariff rates. If tariffs were the only source of protection, this would mean that nominal protection to the industries is lower than what is intended by policy. Clearly there are other sources of protection. While nominal rates may reflect the level of official desired protection, realized rates are a result of official policy (tariff and other) as well as the responses of the importers. In particular, realized rates will include the effects of non-tariff trade barriers as well.

Since the early 1980's the spread between published and realized tariffs had increased. Moreover, on average the published rate increased while the realized rates decreased (these rates are as per the beginning of the plan periods). Elements of a Laffer curve relationship seem to be coming into play -- increases in the published rate may lead to decreases in imports and revenues. During the Sixth Plan the import weighted average tariff rate was 76%, the nominal rate was 47%; during the Seventh Plan the average published rate was 90%, the realized rate was 38%; while during the Eighth Plan the published rate was 107%, the realized rate was 5%. The fall in the realized rate was particularly large at the beginning of the Eighth Plan, 1991-92. At this time specific deposit regulations worked to squeeze

down the value of imports [Gangopadhyay (1994)].

In Table 2 we present the Spearman rank and Pearson correlation coefficients for the alternative tariff measures for the 32 Indian manufacturing sectors. The Spearman rank correlation coefficient between the nominal and realized tariff rates is low, pointing to the fact that the two are capturing very different phenomenon. For the Sixth Plan, the Spearman rank correlation coefficient between the published and realized rates is -.16, while the Pearson is .06; for the Seventh Plan .31 and .39, respectively; while for the Eighth Plan they are .18 and .34, respectively. While most of these numbers are significantly different from zero, they show a quite weak relationship between the realized and published tariff rate.

In Table 2 we also see the Spearman rank and Pearson correlation coefficients over time for each of our two nominal protection measures. Over the years, the realized rates show greater variations and change. The Spearman rank correlation coefficient between the Sixth and Seventh plan is .27, between the Sixth and Eighth plan is .52, and between the Seventh and Eighth Plan is .10. The respective Spearman rank correlation coefficients are .92, .68, and .74.

III. Analysis

Following Pritchett and Sethi (1994), we estimate a linear relationship between realized and published tariff rates, $(\text{realized rate}) = a + b(\text{published rate}) + \text{error}$, and a quadratic relationship, $(\text{realized rate}) = c + d(\text{published rate}) + e(\text{published rate squared}) + \text{error}$, where a , b , c , d , and e are estimated coefficients. We use the data on 32 industries presented in Table 1, and perform the estimates for the three plan periods, using SHAZAM

version 7.0 (1993). Our results are given in Table 3.

A one-to-one correspondence between published and realized rates would yield estimated coefficients $b = d = 1$ and $e = 0$. If there is a lot of "leakage" from published to realized rates, $b < 1$; while $b > 1$ indicates complementarity between the two rates. If e is not equal to zero, then the link between the rates is not linear; i.e., as the published rate increases the realized rate will : 1) increase then decrease, or 2) decrease then increase. In this case a turning point, the value of the published rate where the rate of change of the realized rate changes sign, can be calculated. Finally note, of course, that even when $b = 1$, the elasticity of the realized rate with respect to the published rate may not equal one, i.e., we can also examine how the elasticity of the realized rate with respect to the published rate changes over plan periods.

The explanatory power of the published rate varies substantially among the plans. In the Sixth Plan we find essentially no link between the published and realized rate. The adjusted R^2 is negative and no coefficients are significant. Our Seventh Plan data show a variety of interesting relationships. The adjusted R^2 is positive, and reasonable, if somewhat low. In the linear relationship $b > 1$, and the elasticity of the collected rate with respect to the published rate is 1.7. This elastic relationship is reinforced when we estimate the quadratic relationship. Here we also find a turning point value for the published rate of 123 percent. For the Seventh Plan relationships, we see there is a high cost to cutting the published rate: the collected rate will decrease even more than the cuts. If the quadratic specification is correct, however, for very high published tariffs (over 123), a cut in the published rates will raise the collected rate.

Our results for the Eighth Plan data are more tenuous. The linear relationship reflects the Seventh Plan results: though $b < 1$, the elasticity is quite high (4.0). However, while the quadratic relationship also yields a high elasticity estimate, the turning point we calculate here (85) is actually a minimum value: as the published rate increases, the realized rate first decreases and then increases. This result is robust to several outlier checks. Perhaps this reflects the suppression of imports by the extraordinary deposit scheme initiated in 1991-92. If the different industries possess different import elasticities, the revenue collection and imports would vary even when a uniform regulation is imposed.

IV. Conclusions

The major drawback of the nominal protection measures is that they take into account the effect of government policy only on output prices, though changes in the prices of intermediate products also affects the incentive structure. A tariff on the final product provides protection to the domestic producers by raising the product prices, whereas a tariff on intermediate inputs increases costs and decreases the extent of protection. The effective rate of protection takes into account price distortions of inputs as well as the final products, i.e. measures the joint incidence of output and input protection in domestic production. In this paper we have deliberately avoided discussing the protective structure of the economy (see Gang and Pandey, 1996a,b), and have concentrated on the apparently simple relationship between the realized rate and the published rate.

Each of the measures we use is based on a different premise, and therefore not strictly comparable. They differ in their properties and contain information on different aspects of

protection. The published tariff rate overstates protection because it does not take into account all the duty exemptions whereas the realized tariff rate understates protection because some tariffs may be prohibitive, or there may be other forms of trade restraints, or there may be a Laffer curve phenomenon.

For the Sixth Plan we fail to find a connection between the two rates. In the Seventh Plan, while it unclear whether the linear or quadratic form better describes the relationship, the realized rate is quite responsive to changes in the published rate. This is also reflected in the Eighth Plan. Pritchett and Sethi (1994) find a weak link between published and realized rates for India ($b = .24$). While we find a somewhat 'stronger' link, it shows great variability. In determining the consequences of tariff reform for India, we will have to look deeper than this simple relationship.

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Table 1: Tariff Rates and Imports

SECTOR	Sixth Plan			Seventh Plan			Eighth Plan		
	Published Tariff (%)	Realized Tariff (%)	Imports (Rs 10 ⁶)	Published Tariff (%)	Realized Tariff (%)	Imports (Rs 10 ⁶)	Published Tariff (%)	Realized Tariff (%)	Imports (Rs 10 ⁶)
SUGAR	99.0	0.0	0.0	110.0	138.0	1117.5	104.0	0.0	104.0
KHANDSARI BOORA	95.0	0.0	0.0	115.0	0.0	0.0	104.0	0.0	0.0
HYDROGENATED OIL	80.0	0.0	0.0	100.0	0.0	12052.7	138.0	0.0	161.0
OTHER F & B	112.3	9.9	6376.0	135.2	22.4	12052.7	148.9	5.7	6500.0
COTTON TEXTILES	115.0	0.0	0.0	135.0	141.8	5.0	129.0	0.0	700.0
WOOLEN & SILK TEXTILES	115.0	2.4	273.0	135.0	161.1	62.3	136.2	14.1	4200.0
JUTE TEXTILES	115.0	0.0	0.0	135.0	0.0	147.5	129.0	0.0	100.0
OTHER TEXTILES	115.5	0.0	106.0	136.8	243.5	147.5	143.7	0.0	2400.0
WOOD & WOOD PRODUCTS	86.5	0.0	15.0	111.9	100.3	49.2	115.7	0.0	532.0
PAPER/PAPER PRODUCTS	73.6	21.8	2005.0	89.9	28.5	3266.1	100.8	2.7	11227.0
LEATHER/L.PRODUCTS	115.0	0.0	2.0	129.9	0.0	39.4	139.6	0.0	676.0
RUBBER PRODUCTS	98.0	337.0	80.0	118.0	203.4	245.9	141.0	42.4	952.0
PLASTIC PRODUCTS	115.0	94.1	1027.0	135.0	0.0	0.0	152.0	183.4	1054.0
PETROLEUM PRODUCTS	78.0	20.9	10122.0	104.0	18.5	18346.9	108.0	2.4	48572.0
COAL TAR PRODUCTS	49.0	0.0	15.0	64.0	0.0	0.0	76.0	0.0	840.0
FERTILIZERS	41.7	12.9	6553.0	52.8	0.1	11155.8	37.5	0.0	18593.0
PESTICIDES	71.7	28.0	180.0	101.7	224.4	147.5	115.0	0.0	1401.0
SYNTHETIC FIBRE & RESIN	115.0	212.4	998.0	135.0	166.0	2754.5	132.0	0.0	45860.0
OTHER CHEMICALS	77.5	67.1	4339.0	102.9	92.5	11805.0	126.6	10.2	32242.0
CEMENT	49.0	0.0	804.0	78.0	36.9	324.7	131.0	73.1	40.0
OTH. NON. MET. MINERAL PRODUCTS	78.7	51.5	190.0	98.7	117.2	541.1	128.5	8.3	2481.0
IRON & STEEL	73.2	46.9	6733.0	125.1	59.0	12395.2	129.2	12.3	24500.0
NON FERROUS METALS	69.8	65.3	3595.0	103.2	70.9	4180.9	118.0	9.7	12980.0
TRACTORS & OTH. AGRI. MACH	45.0	90.8	313.0	62.5	0.0	22429.6	77.0	0.0	100.0
MACHINE TOOLS	40.0	44.6	620.0	60.0	0.0	22429.6	78.0	9.2	4936.0
OTH. NON. ELECT. MACHINERY	60.5	95.5	5671.0	80.7	67.0	22429.6	90.5	3.1	125162.0
COMMUNIC. ELECTRONIC EQUIP	95.8	110.2	826.0	123.1	67.3	2311.9	125.7	0.0	20941.0
ELECTRICAL MACHINERY	82.3	105.8	1250.0	105.3	102.5	4623.6	109.5	7.1	32392.0
RAIL EQUIPMENT	51.0	103.3	76.0	70.0	30.9	934.5	82.0	9.9	2501.0
MOTOR VEHICLES	95.0	207.7	259.0	115.0	264.9	393.6	104.0	7.7	6500.0
OTHER TRANSPORT EQUIPMENT	95.4	14.5	1715.0	107.4	40.1	2754.5	82.4	1.2	25962.0
OTHER MANUFACTURING	79.2	58.1	2790.0	105.4	133.5	4279.4	121.5	12.5	35599.0
AVERAGE (import weighted for rates)	76.2	46.8	1779.2	90.4	38.0	5419.5	106.7	5.2	14694.0

Sources and Notes: Published rates are simple averages of statutory tariffs in the industry, as presented by Goldar and Saleem (1992). Realized rates and imports are calculated from the input-output tables contained in the technical appendices to the Sixth, Seventh and Eighth Plans. They are for 1979-80, 1984-85 and 1991-92, respectively. For the Seventh Plan, some sectors were not reported separately. For these we make the following compromises: for hydrogenated oil, we used food & beverages; for jute textiles, we use other textiles; for tractors & other agricultural machinery and machine tools, we use non-electrical machinery. For details on this construction, see Gang and Pandey (1996a,b).

Table 2(a): Spearman Rank Correlation Matrix -- Tariff Rates over Time

PUB6	1.00000					
REAL6	-0.15689	1.00000				
PUB7	0.92412	-0.11254	1.00000			
REAL7	0.32881	0.26796	0.31378	1.00000		
PUB8	0.68182	-0.08834	0.73534	0.23314	1.00000	
REAL8	-0.21884	0.51613	-0.10191	0.10301	0.17632	1.00000
	PUB6	REAL6	PUB7	REAL7	PUB8	REAL8

Table 2(b): Pearson Correlation Matrix -- Tariff Rates over Time

PUB6	1.00000					
REAL6	0.06234	1.00000				
PUB7	0.95340	0.07325	1.00000			
REAL7	0.36095	0.42287	0.39010	1.00000		
PUB8	0.71652	0.09617	0.81410	0.30695	1.00000	
REAL8	0.12239	0.19066	0.14162	-0.12541	0.34130	1.00000
	PUB6	REAL6	PUB7	REAL7	PUB8	REAL8

Source and notes: Our calculations using the data in Table 1. PUB is published tariff rate, REAL is realized tariff rate. 6, 7 and 8 refer to the Sixth, Seventh and Eighth Plans.

Table 3: Regression Results
(dependent variable: collected tariff rate; t-ratios in parentheses)

	Sixth Plan		Seventh Plan		Eighth Plan	
	(A)	(B)	(A)	(B)	(A)	(B)
Constant	39.911 (0.802)	-60.969 (-0.385)	-52.776 (-0.509)	-281.870 (-1.383)	-38.503 (-1.452)	85.064 (1.269)
Published Tariff	0.195 (0.342)	2.936 (0.713)	1.248** (2.320)	6.224 (1.455)	0.451*** (1.989)	-2.150 (-1.624)
Published Tariff Squared	-	-0.017 (-0.672)	-	-0.025 (-1.172)	-	0.013** (1.991)
Number of Cases	32	32	32	32	32	32
Adjusted R ²	-0.029	-0.049	0.124	0.135	0.087	0.169
Elasticity of Collected Rate with respect to Published Rate	0.291 (0.342)	0.143 (0.161)	1.667** (2.320)	2.668** (2.397)	3.969*** (1.989)	6.537* (2.842)
Turning Point (value of published rate at which realized rate is a minimum or maximum)	-	86.660* (4.553)	-	123.430* (5.226)	-	84.888* (6.869)

Source: Our calculations using the data in Table 1.

Notes: * significant at .01 level; ** significant at .05 level; *** significant at .10 level.