Threat of Anti-dumping Duty and Determinants of Anti-dumping Initiations in Case of Indian Manufacturing Industries

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Abstract

This paper deals with two issues. We first describe the phenomenon of dumping through a price-leadership model and thereby calculate the optimal level of an ad-valorem anti-dumping (AD) duty required to enforce a threat upon the exporting firm such that it exports above the 'normal value'. We find that a credible threat in terms of an AD duty restricts dumping and thereby leads to a win-win situation for both the (foreign) exporting and (domestic) import competing firms.

Secondly, the paper enquires about what factors led India to be a frontrunner in terms of anti-dumping initiations. We empirically inquire some of the possible factors that triggered anti-dumping initiations among five Indian manufacturing industries (Chemical and Allied industries, Rubber and Plastics industry, Textiles, Base Metals, and Machinery and Mechanical Appliances) over the period 1997-2011. Our results indicate that number of anti-dumping initiations is dependent on the value of imports, the presence of a dominant industry lobby and retaliatory behaviour, among others. We find that in determining the number of anti-dumping initiations conventional economic and foreign affairs policies take a backseat! The predictions of the empirical model are consistent with the stylized facts based upon data on Indian anti-dumping activities.

Keywords: Anti-dumping duty, Price Leadership, Count data, Poisson Regression Model, Negative Binomial Model

JEL Classification: C02, C23, D43, F13, F14, L40

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1. Introduction

In the recent past, widespread use of 'new protectionism' in the form of anti-dumping (AD) has opened up somewhat controversial debate in academia. Some of the debated issues raised are: Why there has been a paradigm shift of AD activities from 'traditional' to 'new' users? Whether anti-dumping as practiced today, is a form of good politics against bad economics? What factors influence filing intensity of an anti-dumping case by an industry?

The sudden spurt in AD activities across the world over the last 15-20 years has led to the dilemma of *whether actually anti-dumping is a form of protection from genuine harmful practices or is it a modified form of a protectionism measure*.[1] Over the period 1995-2012, the traditional and new users account for 32% and 48%, respectively of the total AD cases filed worldwide amongst the WTO member countries.[2]

The most plausible explanation for such a rapid spread of AD activities was that most of the newly industrialized countries across the world are now members of the WTO and have undertaken substantial trade liberalization. With the increased volume of trade among these nations and to protect their newly developed industries, AD has emerged as a major policy tool for protectionism. Furthermore, AD law justifies the protection given to the weak firms and thereby protects the sick industries. Hence, one might argue that AD Agreement has somewhat diverged away from its original intentions in light with the declining orthodox protectionist measures; for instance, see Finger (1993) for similar arguments.

In figure 1, we illustrate the number of AD initiations and the corresponding measures of major users over the period 1995-2012. The WTO data indicate India to be one of the top users of AD. In fact, India has filed 16% of all global anti-dumping cases, quite disproportionate to its share in global imports (2.75% in 2011-12).

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[1] Prior to 1980s there were less than 100 AD activities across the world. However, during the period 1995 and 2011 there were more than 235 cases on an average every year. See, Prusa (2005) for details. Recent available data from WTO reveal that anti-dumping initiations constitute of 89% of the total contingent protection cases.

[2] Traditional Users comprises of Australia, Canada, European Union and the United States. New Users consists of Argentina, Brazil, China, India, Mexico, among others.
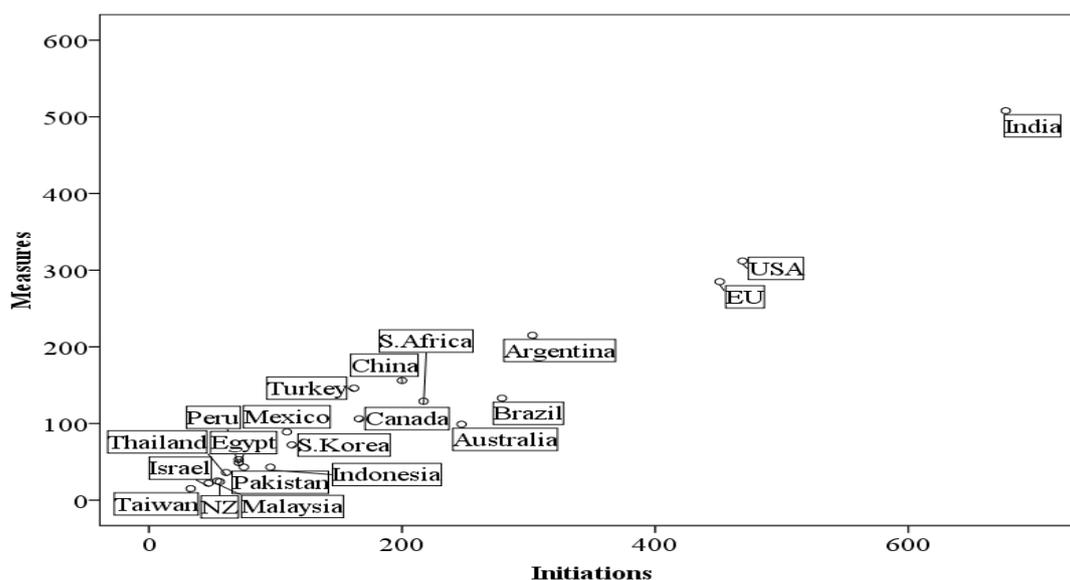
Fig. 1: Scatter Plot — Countrywise Anti-dumping Initiations and Measures
Data Source: WTO Reports on Anti-dumping Initations and Measures.

The upsurge in AD activities in India can be mainly attributed to the gradual shift in trade policy post 1990s, and also adopting the liberalizing multilateral trade policies. By 2001, India removed almost all quantitative restrictions. In addition, the basic custom duty for non-agricultural products was reduced from 150% in 1991-92 to 10% in 2007-08. Since, the last review of Indian trade policy in 2009 the simple Most Favoured Nation (MFN) average tariff rate declined from 79.2% in 1991-92 to 10.1% in 2009-10. This led to a reduction in protection for the Indian manufacturing industries; and subsequently a rise in AD.

In figure 2, we plot India's share in AD activities amongst cases initiated by other WTO member countries. In particular the period of 2000-03, witnessed a significant rise in the number of anti-dumping initiations in India. As a matter of fact, around 20% of total AD cases initiated worldwide were initiated by India alone. In fact during this period around 84% of India's AD initiations were converted into measures! However, during the entire period (1995-2012) around 75% of AD initiations were converted into measures making its success rate higher than any other country. On the other hand, India faces on an average around 4% of the total AD initiations over the period 1995-2012. This gives them a rank of 8th in terms total AD cases faced.[3]

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[3] Author's calculation based on WTO reports on anti-dumping initiations and measures.
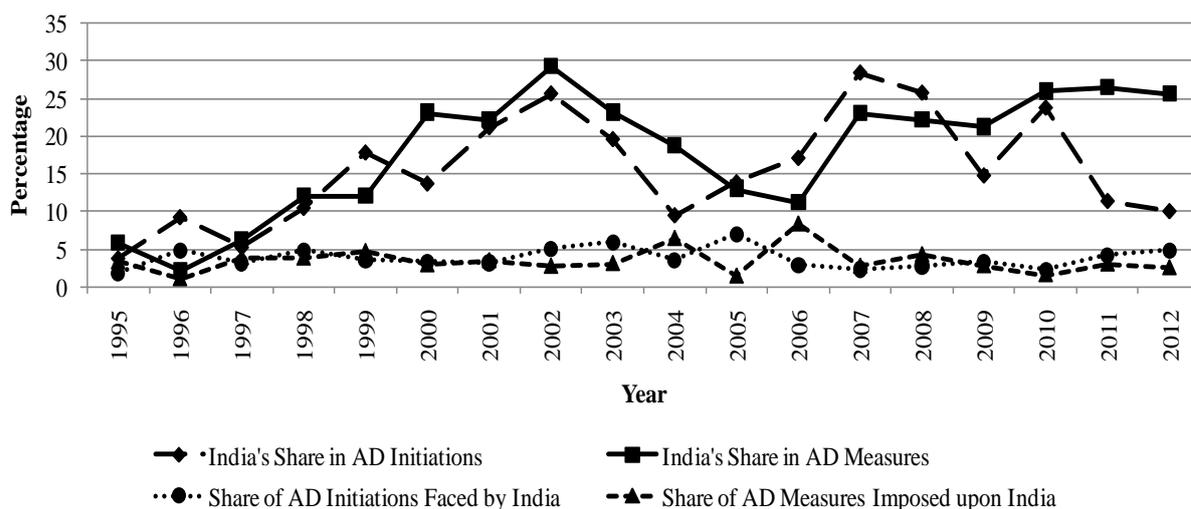
Fig. 2: Anti-dumping Cases *Against* and *By* India, 1995-2012
Data Source: WTO reports on Anti-dumping Initiations.

Rest of the paper comprises of two distinct segments. Section 2 builds upon a price-leadership model to find out how does optimal level of an *ad-valorem* anti-dumping duty restricts exports being made *below* the 'normal value'. Section 3 briefly reviews the empirical studies centring on our empirical exercise. In Section 4, we report the Indian experience and thereby put forward the rationale of selecting the said industries for our empirical exercise. Data set, construction of variables and empirical findings are presented in Section 5. The rationale for our empirical exercise arises from the fact that the typical policy of import substitution has faced enough criticism for protecting inefficient domestic industries from international competition. Now, owing to WTO membership many countries have abandoned orthodox trade practices and have ventured into free trade. However, we still find anti-dumping and few other trade policies have been used by the member countries vivaciously to safeguard their domestic industries. Thus, in the empirical part we intend to look whether anti-dumping initiations have any economic rationale at the industry level. Finally, Section 6 summarizes the paper.

2. Threat of Anti-Dumping Duty: A Theoretical Construct

We show within a *duopolistic* market structure that the threat of an optimal *ad-valorem* AD duty would alter the pricing strategy of the foreign player (firm) with respect to exporting *below* the 'normal value'. We consider a price-leadership model involving the domestic firm and a foreign firm, both producing homogeneous goods. The technologically superior foreign firm (Firm 1) is the *price leader* and can dump in the home country. The foreign firm

exports q_1 amount of output to the home country. On the other hand, in autarky Firm 2 (the domestic firm) produces q_2 amount of output and is assumed to be the *single* producer of the product in its home country. There is no information asymmetry among the market participants.

The linear market demand function is given by $Q = a - bp; \ a, b > 0.$[4]
The quadratic cost functions for firm 1 and 2 are considered to be:

$$c_1(q_1) = \lambda q_1^2 + \gamma q_1 + F_1; \lambda, \gamma > 0 \text{ and } c_2(q_2) = \rho q_2^2 + \sigma q_2 + F_2; \rho, \sigma > 0$$

with $c_1' < c_2'$. F_i ($i = 1, 2$) denotes the fixed costs for firm 1 and 2, respectively. $Q = q_1 + q_2$

With trade the domestic firm does not get to enjoy its monopoly power, as there are cheap exports from the foreign firm. As a result the domestic firm might lobby to the government authorities for protection. Among others, one policy choice by the domestic government is initiating an anti-dumping case.

Proposition: *A potential credible threat in terms of an optimal ad-valorem anti-dumping duty would ensure exports to be made above the 'normal value' and the domestic firm an opportunity of being involved in the price competition.*

In what follows, we consider the following three cases.

Case I: Dumping With No AD Protection

With trade, the domestic firm would accept the price 'p' set by the foreign firm, and choose its output level. 'p' being the export price which is below 'normal value'.

The profit maximizing problem for the domestic firm will be:

$$\max_{q_2} \pi_2 = pq_2 - \rho q_2^2 - \sigma q_2 - F_2$$

The follower (Firm 2) would choose an output level where price is equal to its marginal cost. With p as the (parametric) prevailing price in the domestic market, the foreign firm would be serving the *residual* demand.

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[4] In autarky, the domestic firm also faces the same market demand function. We assume that firm 2 does not face any capacity constraint.

The profit maximization problem of the foreign firm is:

$$\max_{q_1} \pi_1 = \left(\frac{a}{b+1} - \frac{q_1}{b+1} \right) q_1 - \lambda q_1^2 - \gamma q_1 - F_1$$

The trade equilibrium price-output combinations for the two firms are:

$$q_1^* = \frac{a - \gamma(b+1)}{2(\lambda(b+1)+1)}; \; q_2^* = \frac{a + (2a\lambda + \gamma)(b+1)}{2(\lambda(b+1)+1)(b+1)} = p^*$$

Had the domestic firm, accepted the prevailing export price, it would not have been able to sustain the losses, as it can nowhere reach the price level that the foreign firm can charge.[5] Amid these, we argue of *whether an AD duty can lead to a Pareto optimal outcome*.

Case II: Dumping With AD Protection

Here we consider an *ad-valorem* anti-dumping duty on equilibrium price below 'normal value' (p^*). Domestic firm would now accept the price $\tilde{p} = p^* + t\tilde{q}_1$ where $t > 0$ is the rate of AD duty. Such an AD duty will raise the export price to the level of 'normal value' and ensure the dumping margin to be zero.[6] Accordingly, the importing firm would choose its output level $(\tilde{q}_2)$.

The profit maximization problem of the domestic firm can now be written as:

$$\max_{\tilde{q}_2} \tilde{\pi}_2 = \tilde{p}\tilde{q}_2 - \rho\tilde{q}_2^2 - \sigma\tilde{q}_2 - F_2$$

Since the foreign firm would operate in the domestic market based upon the *residual* demand, the profit maximization problem for the foreign firm would become:

$$\max_{\tilde{q}_1} \tilde{\pi}_1 = \left(\frac{a}{b+1} - \frac{(bt+t+1)}{b+1}\tilde{q}_1 \right) \tilde{q}_1 - \lambda\tilde{q}_1^2 - \gamma\tilde{q}_1 - F_1$$

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[5] In order to check for the validity of the statement, we conduct an analytical exercise using the same demand function but different cost specification $c_1(q_1) = \alpha q_1 + F_1; \alpha > 0$ and $c_2(q_2) = \frac{q_2^2}{2} + F_2$. We considered some hypothetical values for *a*, *b* and α. Our results do not change qualitatively. We find that in the post trade scenario the domestic firm suffers from sustained material injury owing to the competition faced from the foreign firm. It was found that imposition of an anti-dumping duty beyond the profit maximizing price level of the foreign firm would cause a decline in its profits.

[6] Dumping margin is defined as the difference between 'normal value' and the export price.

Trade equilibrium price-output combination with the duty prevailing in the home market for the two firms would be:

$$\tilde{q}_1^* = \frac{a - \gamma(b+1)}{2(\lambda(b+1) + (t(b+1)+1))};$$

$$\tilde{q}_2^* = a - b\frac{a + (b+1)(2a\lambda + \gamma)}{2(\lambda(b+1)+1)(b+1)} + (bt-1)\left\{\frac{a - \gamma(b+1)}{2(\lambda(b+1) + (t(b+1)+1))}\right\} \text{ and}$$

$$\tilde{p}^* = \frac{a + (b+1)(2a\lambda + \gamma)}{2(\lambda(b+1)+1)(b+1)} + t\frac{a - \gamma(b+1)}{2(\lambda(b+1) + (t(b+1)+1))}$$

which can be re-written after simplifications as

$$\tilde{q}_2^* = \frac{\tilde{p}^* - \sigma}{2\rho} \text{ and } \tilde{p}^* = p^* + t\tilde{q}_1^* \text{ when } q_2^* = \frac{p^* - \sigma}{2\rho} \text{ where both the cost parameters } \rho, \sigma > 0.$$

This happens as the residual demand function faced by the foreign firm reduces and thus a lesser exports market to cater. Hence, we find that *a credible anti-dumping duty increases domestic output, decreases foreign exports, and increases the market price*. In other words, we have while $\tilde{q}_1^* < q_1^*$ but $\tilde{q}_2^* > q_2^*$ and subsequently, $\tilde{p}^* > p^*$.

Case III: Exports Above Normal Value With Counterfeit AD Case

When exports are made above the 'normal value', the prevailing price in the home market would be $\hat{p} = p^* + \mu$ and $\mu > tq_1$. As the domestic firm does not get to realize initially whether the imports are above or below the 'normal value' of the exporter before filing an AD investigation, the AD case is likely to be a *counterfeit* one. Under such circumstances both the firms would bear an unnecessary cost of fighting out the AD case.

In order to capture such unnecessary costs, we modify the initial cost functions to the followings:

$$c_1(q_1) = \lambda q_1^2 + \gamma q_1 + \overline{F_1}; \lambda, \gamma > 0 \text{ and } c_2(q_2) = \rho q_2^2 + \sigma q_2 + \overline{F_2}; \rho, \sigma > 0$$

where, $\overline{F_i} = F_i + \theta_i, i = 1,2$ and θ_i includes the monetary and non-monetary cost of an counterfeit AD case.[7]

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[7] Examples of non-monetary cost are loss of goodwill, frequent visits to case hearings, time cost, among others. This is also known as 'harassment effect'; Prusa (2001).

The profit maximization problem for the domestic firm is: $\max\limits_{\hat{q}_2} \hat{\pi}_2 = \hat{p}\hat{q}_2 - \rho\hat{q}_2^2 - \sigma\hat{q}_2 - \overline{F}_2$

The foreign firm's profit maximization problem would be:

$$\max\limits_{\hat{q}_1} \hat{\pi}_1 = \left(\frac{a}{b+1} - \frac{\hat{q}_1}{b+1} - \mu\right)\hat{q}_1 - \lambda\hat{q}_1^2 - \gamma\hat{q}_1 - \overline{F}_1$$

Then the trade equilibrium price-output combination for the two firms would be:[8]

$$\hat{q}_1^* = \frac{a - (\mu + \gamma)(b+1)}{2(\lambda(b+1)+1)};$$

$$\hat{q}_2^* = a - b\left\{\frac{a + (b+1)(2a\lambda + \gamma)}{2(\lambda(b+1)+1)(b+1)} + \mu\right\} - \frac{a - (\mu + \gamma)(b+1)}{2(1 + \lambda(b+1))} \text{ and}$$

$$\hat{p}^* = \frac{a + (b+1)(2a\lambda + \gamma)}{2(\lambda(b+1)+1)(b+1)} + \mu$$

which can be re-written as

$$\hat{q}_2^* = \frac{\hat{p}^* - \sigma}{2\rho} \text{ and } \hat{p}^* = p^* + \mu. \text{ Thus, we have } \hat{q}_2^* > \tilde{q}_2^* > q_2^*.$$

Compared to Case I and II, *the foreign firm would not export above 'normal value', as the trade equilibrium output of the foreign firm falls*. Thus, in order to encourage exports *above* 'normal value' in the home market, the home country must have the ad-valorem AD duty to be:

$$t^* > \frac{\mu(1 + \lambda(b+1))}{(a - (b+1)(\mu + \gamma))}$$

t^* acts as a credible threat[9] for the foreign firm and restricts it only to export *above* the 'normal value'. Any value less than equal to t^* would ensure exports made *below* the 'normal value' is profitable. In the post-trade scenario the domestic firm enjoys a larger market share when the prevailing price in the home market (i.e., export price) is *above* the 'normal value'.

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[8] When exports are made *above* 'normal value' and there is no counterfeit AD case, the trade equilibrium price-output combinations for the foreign as well as the domestic firm will be similar to that of $\hat{q}_1^*$ and $\hat{q}_2^*$, respectively. However, the profit function for the two firms would not consider the monetary and non-monetary cost of a counterfeit AD case. In other words, profit of the two firms would be larger than what these respective firms earn (i.e. profit) in Case III.

[9] t^* ensures foreign firm's output in Case II to be *less* than that in Case III (i.e., $\tilde{q}_1^* < \hat{q}_1^*$).

On the contrary, when exports are made *below* the 'normal value', the domestic firm enjoys an increment in profit with an *ad valorem* AD duty levied. Given the non-monetary cost associated with a counterfeit AD case, the domestic firm would not like to engage itself in such a situation. Nonetheless, when the foreign firm exports *above* 'normal value', and there is no counterfeit AD case filed by the domestic firm, both firms(s) enjoy a higher profit share. *Thus, a credible threat of a strategically chosen optimal AD duty can potentially alter the pricing strategy of the exporting firm from 'below' to 'above' normal value and create a win-win situation for both the firms.* Thus, our proposition is proved.

Therefore, having shown that an AD duty can act as a strategic trade policy tool to restrict cheap exports, we now attempt to determine what factors prompt AD initiations among the major Indian manufacturing industries.

3. The Extant Literature

We divide the entire spectrum of empirical literature broadly into two categories. First, we highlight what makes anti-dumping a popular form of protectionist policy and also its strategic attribute. Second, we discuss a few studies pertaining to determination of anti-dumping initiations. Alongside, we highlight few studies focusing on the impact of anti-dumping activities in India.

Finger (1993) demonstrates that anti-dumping as practised today comprises largely of *bad economics* and *power politics*. Users of anti-dumping laws have mechanized ways that often times convert initiations into measures. As a result, this law is used by meagre firms to initiate AD cases, bring imports under scrutiny and thereby protect them from competition. A series of accounting adjustments by the home country allows having a 'dumping margin' and also ensures significant 'material injury' to incumbent firm.[10] Almost in a similar line Prusa (2005) critically examines the rationale for the AD protectionism measure. The author finds that in the facet of international competition and declining orthodox protectionist measures the affected industries seek for protection in the form of AD measures. On the other hand, Bhattacharjea (2005) reports that Indian industries that obtain protection in the form of AD duty predominantly affect small, unorganized labour intensive firms which face the burden of

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[10] For instance, Bhattacharjea (2005) mentions that the anti-dumping authority of India (DGAAD) accepted increase in foreign firm's market share as an evidence of material injury, even though the Indian industry witnessed a rise in sales, profits and prices.

a higher input cost caused by the duty. The large firms exploit the AD mechanism to much of their interests. Therefore, arguably the misuse of the AD Agreement by both developed and developing nations has removed it from the economic rationale that created anti-dumping law (i.e., protection from *predatory* dumping).[11] Bekker (2006) opines that loopholes in the anti-dumping code can lead to strategic use of it against exporters, even when exports are not made *below* the 'normal value'. Such an act will lead to a *Pareto inferior* situation for the concerned parties.

Krupp (1994) found that anti-dumping initiations are *positively* influenced by factors (i.e., import penetration ratio, dumping margin) which increases the probability of an affirmative material injury to the industry and *negatively* influenced by factors which improves the overall health of the industry. Aggarwal (2007) includes various macroeconomic factors that might be responsible for anti-dumping filings across both developed and developing nations. For all developing, low and lower middle income countries declining tariff rates is a major determinant of AD filings; for the developed nations it is insignificant. Retaliation in terms of the number of AD cases initiated against the countries are found to have differing impacts; for instance, it is a significant determinant for low and lower middle income countries but not significant for developed countries. For the developing countries, along with retaliation liberal trading regime also determine AD filings.

Singh (2005) examines the findings of the Directorate General of Anti-dumping & Allied Duties report (2001-02) of anti-dumping cases in India.[12] The study finds that anti-dumping duty does reduce imports. There is a rise in unit values from both 'named' and 'non-named' countries.[13] However, there is a welfare loss associated with the user industries and also the domestic consumers. These make the welfare effect somewhat ambiguous. Ganguli (2006) finds that AD actions have smaller impacts on imports and unit values rise from both 'named' and 'non-named' countries. Baruah (2007) finds that the impact of an AD duty is related to the size of the industry. Thus, lobbying by the domestic firms is an important factor to determine imposition of an AD duty. On the other hand, Malhotra *et al*. (2008) finds that

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[11] In fact some authors have asked for a revision of the anti-dumping Agreement. See, Finger (1993), Singh (2005) and Bhattacharjea (2005), among others.

[12] The findings of the report were: Competitiveness of domestic industry had improved due to AD duty, AD investigation did not lead to higher unit values, AD duty did not cause any decline of exports of products under investigation.

[13] Named countries are those countries that are targeted in the AD petition.

anti-dumping measures have significantly restricted trade for the pharmaceutical industry in India.

4. Stylized Facts: The Indian Experience

This section stresses on two stylized facts, firstly the Indian anti-dumping experience with its major trading partners and the other being Indian industries that initiates the outmost number of AD cases. In Table 1, we report countries against which India initiated the utmost number of AD initiations. Expectedly, these countries were among the major trading partners to India. Out of 677 anti-dumping cases initiated by India, 68% of the cases are targeted against these select countries. Furthermore, 76% of these cases resulted in AD measures. This suggests that as India progressively opened up its economy, AD initiations were targeted against its major trading partners and convincingly they were converted into AD measures. For instance, China being the largest exporter to India faces the outmost number of initiations. The other interesting result we find is that for 31% of imports India initiates 68% of AD cases.

Table 1: Anti-dumping Cases By India Against Other Countries, 1995-2012

| Countries	No. of AD Initiations (Measures)	AD Measures to Initiations (%)	Share in AD Initiations by India (%)	Avg. Share of Imports by India (%)
China	154 (126)	81.81	22.74	6.77
EU	50 (38)	76	7.38	5.42
South Korea	50 (38)	76	7.38	2.66
Taiwan	49 (40)	81.63	7.23	0.97
Thailand	39 (27)	69.23	5.76	0.81
United States	35 (24)	68.57	5.16	6.23
Japan	32 (25)	78.12	4.72	3.45
Indonesia	27 (20)	74.07	3.98	2.25
Malaysia	24 (15)	62.5	3.54	2.45
Total	*460 (353)*	*76.73*	*67.94*	*31.01*

Data Source: WTO Reports on Anti-dumping Initiations and Measures; DGCI&S, India.
Note: Average share of imports is calculated for the period 1996-2012.

In figure 3, we construct the reciprocity ratio[14] for India to understand whether increased AD activities have resulted into a 'prisoners-dilemma' for the Indian AD cases. In other words, a *lower* reciprocity ratio would imply that a country has initiated much more cases relative to what has been initiated against it. The argument is that a country would initiate more AD

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[14] Reciprocity ratio is calculated by dividing the number of anti-dumping cases against the country with the number of cases the country itself initiates. See, Rotinger (2002).

case(s) if that particular country experiences that it has been made a target for filing AD cases by its trading partners. This generally makes nations worse-off.
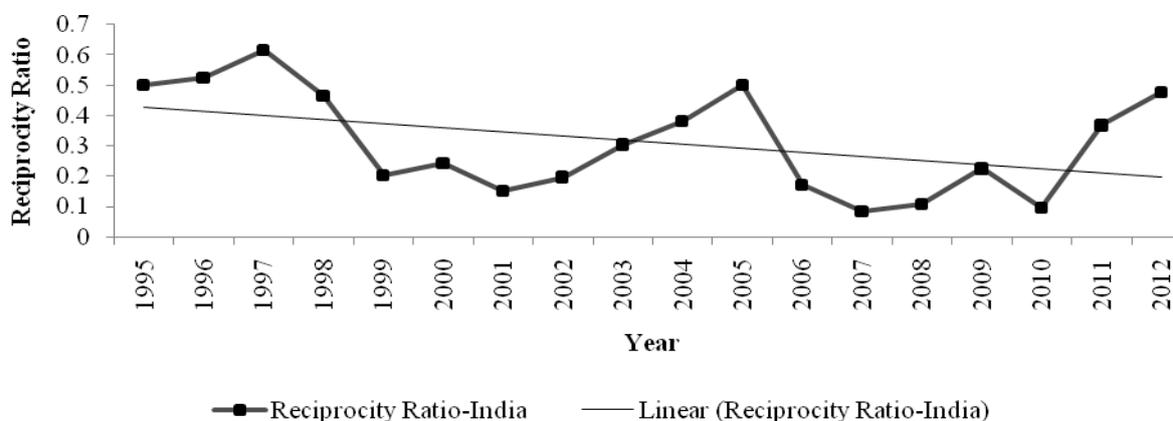
Fig. 3: Reciprocity Ratio of India, 1995-2012
Data Source: WTO Reports on Anti-dumping Initiations

It is observed that the Indian Reciprocity Ratio has a downward trend. This indicates that the Indian Industries are highly retaliatory in nature. The Average Reciprocity Ratio is 0.31 over the said years (1995-2012). In other words, for every 10 cases India faces, the Indian domestic industries initiate 31 anti-dumping cases. Furthermore, we find over the period 1995-2012, the reciprocity ratio against the traditional users and new users were 1.11 and 0.10, respectively.[15] This shows that Indian industries actively initiate cases against the new users.

We now explore and identify the major Indian industries which initiate the most number of cases. Out of 677 cases initiated by India 615 cases have been filed by industries of Chemical, Plastics & Rubber, Base Metals, Machinery & Mechanical Appliances and Textiles over the period 1995-2012.

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[15] Traditional users comprised of Australia, Canada, European Union and the United States. New users consisted of China, South Korea, Malaysia, Singapore, South Africa, Taiwan and Thailand. If we leave out China the reciprocity ratio improves to 0.15.

Table 2: Anti-dumping Cases By Major Indian Manufacturing Industries, 1995-2012

Industry	No. of Initiations (Measures)	Measures to Initiations (%)	Share to AD Initiations by India	Initiations Faced (%)	Retaliation Rate	Avg. Share of Imports by India (%)
CHEM	287 (230)	80.13	42.39	42 (25.30)	6.83	9.19
RPR	96 (81)	84.37	14.18	26 (15.66)	3.69	2.29
BM	86 (46)	53.48	12.70	51 (30.72)	1.68	6.01
MEE	81 (58)	71.60	11.96	12 (7.22)	6.75	15.73
TEXT	65 (61)	93.84	9.60	19 (11.44)	3.42	1.86
Total	*615 (476)*	*77.39*	*90.84*	*131 (78.91)*	*4.69*	*35.08*

Data Source: WTO Reports on Anti-dumping Initiations and Measures; DGCI&S, India.
Note: Average share of imports is calculated for the period 1996-2011.
CHEM: Chemical; RPR: Resins, Plastics and Rubber; BM: Base Metals; MEE: Mechanical and Electrical Equipment; TEXT: Textiles.

To streamline our empirical research we highlight two important findings. First, these select five industries initiate around 91% of total cases for average share of imports of around 35%. Second, these industries have a high rate of retaliation. For every 10 cases initiated against them these industries retaliate back with around 46 cases; see Table 2. These observations prompt our fundamental research question: *what determines the number of anti-dumping initiations for these select Indian manufacturing industries*.

5. Empirical Exercise

Having initiated our arguments in the preceding section(s) we explore in detail to find out the plausible determinants of anti-dumping initiations by the select major Indian industries over the period 1997-2011. Section 5.1 discusses the data, variable and the estimation method to conduct the empirical analysis. Section 5.2 reports and discusses the estimation result.

5.1 The Data, Variables & Methodology

We extract data on the number of AD initiations of the select Indian manufacturing industries and also faced by them from the 'Global Antidumping Database', World Bank at the ITC HS 2 digit classification level for the period 1997-2011.[16] Coupling it with, we collect time series data on import and export of these five industries from DGCI&S, India at the ITC HS 2

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[16] Our point of empirical investigation starts from the post Uruguay Round (1994); this is because, India mostly started initiating anti-dumping cases after the commencement of the Uruguay Round. Given the availability of data in the DGCI&S, India database and also as most of our independent variables are computed at one-period lag, we take our study period from 1997 to 2011.

digit classification level to examine the plausible factors that determine the AD initiations. Table 3 summarizes choice of dependent and independent variables and the construction of variables. Subsequently, we depict the expected sign along with references from available literature. Following it we discuss the rationale for the incorporation of the variables defined.

Table 3: Construction of Variables

Variable Name	Constructions	E. Sign	References
Dependent Variable			
Number of AD Initiations (ADI)	AD initiations by the ith industry at time period t		Krupp (1994) and Aggarwal (2007)
Independent Variables			
Anti-dumping Against (ADA)	AD initiations faced by the ith industry at time period $(t-1)$	(+)	Aggarwal (2007)
Number of Firms (NF)	Number of firms initiating the AD case	(+)	Baruah (2007)
Imports (IM)	Value of Imports of ith industry at time period $(t-1)$	(+)	Ganguli (2008), Baruah (2007), Aggarwal (2007) and Malhotra *et al*. (2008)
Unit Value (UV)	$\dfrac{\text{Value of Import}_{t-1}^{i}}{\text{Quantity of Import}_{t-1}^{i}}$	(−)	Singh (2005) and Ganguli (2008)
Import-Export Ratio (MXR)	$\dfrac{\text{Import}_{t-1}^{i}}{\text{Export}_{t-1}^{i}}$	(+)	NA
Intra-Industry Trade (IIT)	$\left(1-\dfrac{\left\|\text{Export - Import}\right\|_{t-1}^{i}}{(\text{Export + Import})_{t-1}^{i}}\right)\times 100$	(−)	NA

NA: Not available to the best of the author's knowledge.

It is expected that when an industry or country faces an anti-dumping initiation, it would possibly retaliate back with an AD case. Hence, we take ADA at one-period lag to determine AD initiations at the current level.[17] Quite possibly, AD initiations are also dependent upon the number of firms (NF) in any particular industry initiating the case with the respective government. It happens so that when large number of firms file for a petition, an AD case is

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[17] This indicator is limited to countries targeting Indian exports for the same product.

more likely to be taken up by the government. High levels of imports (IM), Import-Export Ratio (MXR) increase the industry's chances of filing an anti-dumping case. Therefore, IM, MXR at one-period lag are expected to be positively related with ADI. Theoretically, unit value (UV) is expected to have a negative relation with the number of anti-dumping initiations. This is because threat of AD enforcement would decrease with increase the unit value of imports (Recall our arguments from section 2). Intra-Industry Trade (IIT) is an indicative of industry health. Increase in IIT would indicate that the industry's is experiencing a balanced trade and thus a lower demand of anti-dumping initiations. Thus one period lag of IIT is expected to behave inversely with ADI.

The fundamental hypothesis that we test in this paper is: [18]

$$ADI_{it} = f(\underset{+}{ADA_{it-1}}, \underset{+}{NF_{it}}, \underset{+}{IM_{it-1}}, \underset{-}{UV_{it-1}}, \underset{+}{MXR_{it-1}}, \underset{-}{IIT_{it-1}})$$

5.1.1 Econometric Method

The dependent variable (ADI) in our case takes finite integer values (i.e., 0, 1, 2, 3, 4, ...) and is randomly distributed over time. Such type of non-categorical discrete data is known as '*count data*'. These variables have non-negligible probabilities of zero and have preponderance of zeros and small values. Such characteristics make the parameter estimates weak when estimating through ordinary least squares (OLS) technique. The *Poisson Regression Model* is the most common form of estimation method used to estimate such 'count data' models. In this paper, we report the estimation techniques that have been earlier used by Krupp (1994) and Aggarwal (2007), among others.

We summarize the Poisson Regression Model here. The basic Poisson specification being:

$$\Pr[y_{it}] = \frac{e^{-\lambda_{it}} (\lambda_{it})^{y_{it}}}{y_{it}!}; \ \lambda_{it} > 0, \ y_{it} = 0, 1, 2, 3, \ldots$$
$$\text{and } \lambda_{it} = X_{it}\beta$$

where, y_{it} is the number of AD initiations (ADI) for the ith industry ($i = 1(1)N$) at the tth period ($t = 1(1)T$). Let us denote the vector of explanatory variables by X_{it}. The coefficient β_i's are interpreted as the effect of one unit change in regressor(s) on the conditional mean. In other words, this means that the coefficient estimates represent the percentage change in ADI

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[18] Our empirical estimation excludes variables like Revealed Comparative Advantage, Trade Balance Ratio and Import Penetration Ratio owing to the problem of multicollinearity.

attributable to a one percentage point change in X_{it}. This model has couple of limitations. First, the model predicts the number of zeros to be *less* than what is actually observed in the sample (known as the problem of '*excess zeros*'). Second, the Poisson specification holds only for '*equidispersion*' of data.

Table 4: Frequency and Percentage of No. of Anti-dumping Initiations

ADI	0	1	2	3	4	5	6	8	9
Frequency	15	13	8	7	3	5	2	1	4
Percentage	20	17.33	10.67	9.33	4	6.67	2.67	1.33	5.33
ADI	10	11	12	13	14	15	16	18	19
Frequency	1	1	1	1	1	1	1	1	4
Percentage	1.33	1.33	1.33	1.33	1.33	1.33	1.33	1.33	5.33
ADI	20	23	24	25	27				
Frequency	1	1	1	1	1				
Percentage	1.33	1.33	1.33	1.33	1.33				

One can see from Table 4 that 20% of the total observations have *zero* values. Figure 4 also suggests that our dependent variable (ADI) is *positively skewed*.[19] The variance of the distribution is almost *ten* times that of the mean. See, the summary statistics reported in Table 5. Thus, our data also suffer from the problem of *overdispersion* (i.e., $E[y_{it} \mid X_{it}] \langle V[y_{it} \mid X_{it}]$).
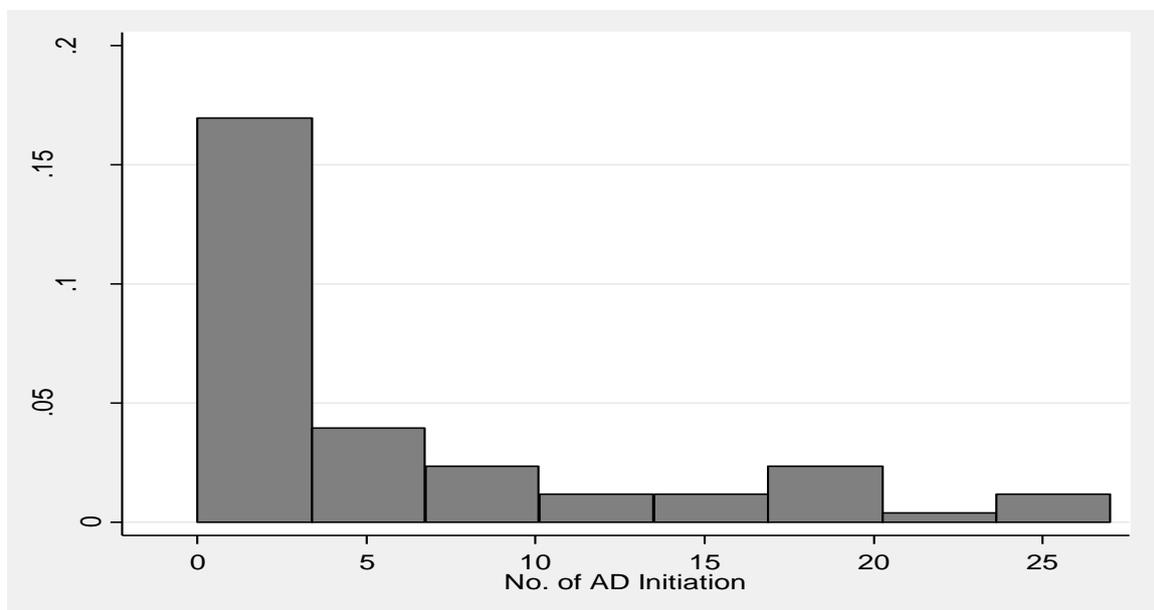
Fig. 4: Histogram of No. of AD Initiations

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[19] Our dependent variable is found to have *skewness* and *kurtosis* to be 1.34 and 3.66, respectively.

However, in the *random-effects* Poisson model the mean-variance ratio is *not* unity; rather the variance to mean ratio exceeds unity. It is therefore, the *overdispersion* of our data and (restrictive) limitations of the *fixed-effects* model that we initially estimate our empirical model through random-effects Poisson Regression Model. See, Hausman *et al*. (1984) for a detailed discussion. In fact, Hausman *et al*. (*ibid*.) depict that in such a case the Poisson Regression Model is not a statistically robust method of estimation and the *Negative Binomial Model* yields better parameter estimates.

Table 5: Summary Statistics

Variables	Mean	Median	S.D	Min.	Max.
ADI	5.96	3	7.27	0	27
ADA	8.16	2	20.87	0	145
NF	23.10	12	23.1	0	138
IM*	10074.35	4415.02	12894.86	625.8	56218.18
UV*	29.86	1.88	84.58	0.33	694.05
MXR	1.54	1.05	2.26	0.09	18.63
IIT	64.39	76.53	29.70	1.03	99.29

Therefore, we subsequently estimate our model with the Negative Binomial Model specification. In what follows, we briefly discuss the random-effects Poisson Model followed by the Negative Binomial Model.

The common form of specification used in a random-effects model is $\tilde{\lambda}_{it} = \lambda_{it}\alpha_i$, where α_i captures the industry specific *random* effect(s). This makes the Poisson parameter ($\tilde{\lambda}_{it}$) random and not being a deterministic function of X_{it}. The *probability mass function* (*p.m.f*) of the Poisson distribution now becomes:

$$\Pr[y_{it}] = \frac{e^{-\tilde{\lambda}_{it}}(\tilde{\lambda}_{it})^{y_{it}}}{y_{it}!}$$

The joint density for $y_{i1}, y_{i2},...., y_{it}$ and α_i takes the form

$$f(y_{it} \mid X_{it}, \alpha_i, \beta) = \prod_{t=1}^{T}\frac{\left(e^{X'_{it}\beta}\right)^{y_{it}}}{y_{it}!} e^{-e^{\alpha_i}\sum_t X'_{it}\beta} e^{\alpha_i \sum_t y_{it}} g(\alpha_i)$$

where, $g(\alpha_i)$ is the probability density function of α_i. These α_i's are unobservable and assumed to be randomly distributed independently across the regressors. Furthermore, $g(\alpha_i)$ is assumed to follow gamma distribution with parameters $(\theta, \theta) \ni E(\alpha_i) = 1$ and $Var(\alpha_i) = \frac{1}{\theta}$.

17

Thus, we obtain the basic random-effects Poisson Model as follows:

$$\Pr(y_{i1}, y_{i2},......, y_{iT} \mid X_{i1}, X_{i2},......., X_{iT}) = \int_0^\infty \prod_t \frac{(e^{X_{it}'\beta})^{y_{it}}}{y_{it}!} e^{-\alpha_i \sum_t X_{it}'\beta} \alpha_i^{\sum_t y_{it}} g(\alpha_i) d\alpha_i$$

For this model we have, $E(y_{it}) = \lambda_{it}$ and $V(y_{it}) = \frac{\lambda_{it}(\lambda_{it} + \theta)}{\theta}$.

The Negative Binomial Model not only permits the variance to mean ratio to grow with mean, it also allows at the same time to capture the industry specific fixed effects α_i's to be correlated with the regressors. To start with we assume that the Poisson parameter λ_{it} to follow a gamma distribution with parameters (γ, δ) with $\gamma = e^{X_{it}\beta}$ and δ being common across cross-section and time periods. [20] Then the Negative Binomial Model can be obtained from

$$\Pr[y_{it}] = \int_0^\infty \frac{e^{-\lambda_{it}}(\lambda_{it})^{y_{it}}}{y_{it}} f(\lambda_{it}) d\lambda_{it}$$

5.2 Estimation Results

In this section we report the estimation results of two random-effects models — Poisson and the Negative Binomial Model.[21] Initially we estimate the random-effects Poisson model to determine what variables affect the number of anti-dumping initiations for the select Indian manufacturing industries. Given the limitations of the random-effects Poisson specification, we re-estimate our empirical model with Negative Binomial specification in order to obtain statistically robust parameter estimates. In order to test whether our industry specific effects are correlated with the regressors or not, we conduct the Hausman (1978) test. See, Table 6.

Table 6: Hausman Test Results (Negative Binomial Model)

Variables	Fixed-Effects	Random-Effects	Difference	Standard Error
ADA	0.00632	0.00477	0.001554	0.0023699
NF	0.01826	0.02103	−0.002777	0.0016187
IM	0.00001	0.00002	−0.00000728	0.00000539
UV	0.00277	0.00214	0.0006289	0.000084
MXR	−0.09813	−0.09789	−0.002355	0.02925

Hausman Test Statistic 4.01
Prob $> \chi_5^2 = 0.548$

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[20] In order to consider for heterogeneity across cross section units, the Poisson parameter is allowed to follow a Gamma distribution. The joint probability distribution of the Poisson and the Gamma distributions give the Negative Binomial distribution.

[21] The Jarque-Bera test statistic is found to be 24.05. Therefore, the *Chi-square* test at 2 *df* rejects the null hypothesis of normal distribution.

The Hausman test statistic when compared with tabulated χ_5^2 at 5% significance level *rejects* the null hypothesis of fixed effects and thus we report the parameter estimates of the random effects Negative Binomial Model. The empirical findings of the random-effects Poisson Model and Negative Binomial Model are reported in Table 7. Our reported results are obtained after eliminating any possible multicollinearity problem in our estimations. The statistically best fit (reflected by the log-likelihood and the likelihood ratio index) results are reported here.

Table 7: Regression Results

Variables	Random-Effects Poisson		Random-Effects Negative Binomial	
	Marginal Effects	$\lvert t \rvert$	Marginal Effects	$\lvert t \rvert$
ADA	0.00682	3.48^a	0.00477	1.50^c
NF	0.01506	9.82^a	0.02103	9.28^a
IM	0.00002	4.38^a	0.00002	2.50^a
UV	0.00258	4.99^a	0.00214	2.42^a
MXR	—	—	−0.09789	1.75^b
IIT	0.01313	3.36^a	—	—
Constant	0.03388	0.11	−0.52603	2.06^b
	Log-Likelihood −259.23*		Log-Likelihood −188.97*	
	Likelihood ratio Index 159.29**		Likelihood Ratio Index 42.04**	

Note: *a*: significant at 1% level. *b*: significant at 5% level. *c*: significant at 10% level.

$*$ compared with $\chi^2_{(1)} = 6.63$ at 1%. $**$ compared with $\chi^2_{(5)} = 15.08$ at 1%.

Table 8a: Correlation Matrix: Random-Effects Poisson Model

	ADA	NF	IM	UV	IIT
ADA	1				
NF	0.154	1			
IM	−0.071	−0.058	1		
UV	−0.100	−0.143	−0.017	1	
IIT	0.083	0.192	−0.041	0.085	1

Table 8b: Correlation Matrix: Random-Effects Negative Binomial Model

	ADA	NF	IM	UV	MXR
ADA	1				
NF	0.154	1			
IM	−0.071	−0.058	1		
UV	−0.100	−0.143	−0.017	1	
MXR	0.166	0.102	0.526	−0.018	1

The empirical observations are summarized below.

i. Retaliatory behaviour (ADA) of the select Indian manufacturing industries (when these industries are themselves charged with an AD case(s)) that are initiating an AD case against the dumping industries of the foreign countries has been found to be *positively* significant in both the model specifications. It has a stronger coefficient value in the Poisson Model specification than its Negative Binomial counterpart. Not only its impact weakens, the statistical significance changes from 1% (in case of Poisson estimation) to 10% significance level (in Negative Binomial Model).

ii. Lobbying by these affected manufacturing industries invoke the number of anti-dumping initiations. Compared with the Poisson model estimation the coefficient value of number of firms (NF) improves when estimated with the Negative Binomial model specification. The statistical significance remains the same at 1% level. This finding can be argued as the government has a nepotistic attitude towards these industries. Finger (1993) demonstrates that anti-dumping as practised today comprises largely of *bad economics* and *power politics*; see, Bekker (2006) for similar arguments. One can argue that an Indian anti-dumping case protects its competitive industries.

iii. One-period lagged imports (IM) positively determine the number of anti-dumping initiations at current period for the select industries. The coefficient value is exactly the same in both the model estimations, although its impact is weak.

iv. Unit Value (UV) *positively* determines the number of anti-dumping initiations which goes *against* our hypothesis. Under both of our estimated models we find UV to be statistically significant at 1% level. This might occur as filing an anti-dumping case does not depend upon the per unit price of imports. However, we have argued earlier in Section 4 that around 77% of the AD initiations by these select Indian manufacturing industries are converted into measures. Couple of reasons can be put together for such an occurrence. Firstly, 'new' users tend to use various accounting techniques to prove that one is 'materially injured' and thereby could convert anti-dumping initiations into measures; Finger (1993). Secondly, home government is affected by lobbying power (pressure groups) of the industry. Thus, even if imports are not *below* the 'normal value', initiations are made and thereby suffice the malicious accounting strategy of the industries.

v. Import-Export ratio (MXR) is found to be *negatively* related with the number of anti-dumping initiations for the selected sample of industries.[22] This result is *against* the popular notion on 'protectionism'. Moreover, we find the average change in imports to be greater than the average change in exports for these five industries. We find that the *mode* of MXR is 2.03, which suggests that in most of the observations a unit of exports yields around 2 units of imports. It can be seen from Table 7 that an increase in the MXR by 0.01 decreases the filing incidence by 0.09%. In other words, burgeoning trade deficit adversely affect anti-dumping initiations for these five manufacturing industries. Since petition filing for AD initiations are very much a part of firm level activity and depends a great deal on the lobbying power, conventional (macro)economic and foreign affairs policies take a backseat! Aggarwal (2007) also argued that domestic macro-economic pressure in developing countries do not determine number of anti-dumping initiations.

vi. In the case of Intra-Industry Trade (IIT), it is found to be positively related with the number of anti-dumping initiations. Thus, our null hypothesis gets *rejected*. In our estimated Poisson model we find that as trade gets balanced there is a rise in the number of anti-dumping initiations for these industries.

vii. The constant term while being statistically insignificant in the Poisson model turns out to be negatively significant (at 5% level) in the Negative Binomial model. This is also evident from the observation that the log-likelihood value and the likelihood ratio index significantly higher in Poisson model than its negative Binomial counterpart.

6. Summing Up

In our theoretical deliberations, we focused upon elaborating the point that *ex-ante* threat of an optimal *ad-valorem* anti-dumping duty can possibly force exports by the foreign firm to be above the 'normal value' and thereby cater to *fair* trade. In this regard, we dealt with a price-leadership model where the foreign firm is assumed to be technologically superior to the domestic firm. We compared and analyzed various possible trade-offs pertaining to selling *below* or *above* the 'normal value' by the foreign firm and corresponding actions by the

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[22] We estimated the random-effects negative binomial model separately with MXR and import penetration ratio (IMPNR) in place of IM. The results are statistically much worse. In the presence of IM, we found IMPNR to be statistically insignificant. The correlation coefficient between IM and MXR is found to be 0.52.

domestic firm. As a typical case, we found that imposition of an anti-dumping duty beyond the profit maximizing price of the foreign firm would decrease its profit.

Empirical investigation into the determinants of the number of anti-dumping initiations for these select Indian manufacturing industries reveals that anti-dumping initiations do *not* necessarily depend on the typical trade related variables. Rather it depends on the possible retaliatory behaviour and to a great deal on the number of firms filing petition to the government for initiating an anti-dumping case. One may be tempted to argue that the government functionary is affected by lobbying power (pressure groups) of the industry. Thus, even if imports are *not* below the 'normal value', AD initiations are made. It seems imperative from the policy point of view to ensure that an anti-dumping duty exerts credible threat to the (foreign) dumping firms. A strategic import tariff would be to push up the import price *above* the 'normal value' leaving some ground for the domestic players to be able to engage in a price war with the foreign firm(s).

The two major limitations of this work are the empirical study being restricted at the 2-digit industry classification. Since, AD cases are case specific such form of an aggregation gives just a preliminary inquiry. The other being the theoretical argument is not backed by an empirical model.

References

Aggarwal, A., *The Anti-dumping Agreement and Developing Countries: An Introduction.* Oxford University Press, (2007).

Bagchi, S., S. Bhattacharyya and K. Narayanan, "Does Anti-dumping Enforcement Generate Threat?" *Foreign Trade Review*, 49(1), (Forthcoming).

Baruah, N., "An Analysis of Factors Influencing the Anti-dumping Behaviour in India". *The World Economy*, 30(7), (2007): 1170-91.

Bekker, D., "The Strategic Use of Anti-dumping in International Trade". *South Africa Journal of Economics*, 74(3), (2006): 501-21.

Bhattacharjea, A., "Pricing and Anti-dumping Revisited". *Economic and Political Weekly*, 40(5), (2005): 482-84.

Bown, Chad P., "Global Antidumping Database". World Bank (2012)

Cameron, C. A. and P. K. Trivedi, *Microeconometrics*: *Methods and Applications*. Cambridge University Press, (2009).

Corden, M. W., *Trade Policy and Economic Welfare.* Oxford University Press, (1974).

Czako, J., J. Human and J. Miranda, *A Handbook on Anti-Dumping Investigations*. Cambridge University Press, (2003).

Drope, M. J. and W. L. Hansen, "Anti-dumping's Happy Birthday?" *The World Economy*, 29(4), (2006): 459-72.

Finger, J. M., *Anti-dumping*: *How it Works and Who Gets Hurt*. The University of Michigan Press, (1993).

Ganguli, B., "The Trade Effects of Indian Anti-dumping Actions". *Review of International Economics*, 16(5), (2006): 930-41.

Hausman, J., "Specification Test in Econometrics", *Econometrica*, 46(6), (1978): 1251-72.

Hausman, J., B. H. Hall, and Z. Griliches, "Econometric Models For Count Data With An Application to The Patents-R&D Relationship", *Econometrica*, 52(4), (1984): 909-37.

Krupp, C., "Antidumping Cases in the US Chemical Industry: A Panel Data Approach". *Journal of Industrial Economics*, 42(3), (1994): 309-11.

Malhotra, N. and S. Malhotra, "Liberalization and Protection: Antidumping Duties in the Indian Pharmaceutical Industry". *Journal of Economic Policy Reform*, 11(2), (2008): 115-22.

Prusa, J. T., "On the Spread and Impact of Anti-dumping". *The Canadian Journal of Economics*, 34(3), (2001): 591-611.

Prusa, J. T., "Anti-dumping: A Growing Problem in International Trade". *The World Economy*, 28(5), (2005): 683-700.

Singh, S. K., "An Analysis of Anti-Dumping Cases in India". *Economic and Political Weekly*, 40(11), (2005): 1069-74.

Viner, J., "The Prevalence of Dumping in International Trade: I". *Journal of Political Economy,* 30(5), (1922): 655-80.