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ANALYSIS OF THE COMPETITIVE LEVERAGE OF PROTECTIVE TARIFFS

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Abstract

This paper offers a theoretical model to lend further support to previous studies used to call for the need to remove protective tariffs. When the United States imposed a 15% tariff against imported steel and some other products in 2002 (which was later removed after 2 years), the measure was seen as a clear means of protecting jobs in the steel and allied industries, which have been faced with stiff competition from foreign producers. However, whether or not the move really proves to be ultimately helpful to the US economy is quite a different matter that needs to be addressed and verified. When countries implement tariff protection for their domestic firms, the most common reason given is to ensure that workers' jobs are not jeopardized by "unfair" foreign competition. This excuse sounds reasonable, except that it is also economically flawed. While the short-run impact of such a measure might be appreciated, its long-term effect is less than favorable, and may, in fact, be damaging to not only the economy's competitiveness but also the economic state of being of the workers whom the measure sought to protect. This paper offers an analysis of these impacts and their policy applications.

Key words

Competitive leverage; Optimum tariff; Protectionism; Infant industries; Cost-Benefit ratios.

INTRODUCTION

During the turn of the millennium, the United States imposed a 15 percent tariff against imported steel and some other products as a means of protecting jobs in the steel and allied industries, which had been faced with stiff competition from foreign producers. However, whether or not the move really proved to be ultimately helpful to the U.S. economy is quite a different matter that needs to be addressed and verified. Protectionism arises as countries adopt various trade restriction measures to protect their domestic markets on behalf of domestic producers, against foreign competitors. The tariff is a tax on imported goods deemed to raise their prices to par with those of domestic producers. Besides being a revenue source for the

government, a tariff effectively gives a competitive edge to domestic (import-competing) producers of similar goods.

This paper explores the ultimate impact of a tariff regarding whether or not it actually "protects" workers' jobs and economic well-being. It examines whether or not the kind of competitive edge - *the competitive leverage* - that tariff protection gives to domestic producers is really effective. This is important in several respects. As a tariff effectively shields domestic firms against competition from international firms, it can allow them to operate with high-cost margins and yet remain in business. It also means that consumers pay higher than necessary prices for the product, while the economy suffers loss of the benefits of lost goods. The jobs in these firms are "protected" as a result of the measure. However, two questions, at least, arise as to how long these jobs could be "protected" through such an interventionist approach; and at what ultimate costs to the economy are these jobs protected.

That protectionism introduces distortions in the pattern of international production is not a new assertion. Weidenbaum and Munger (1983) had estimated ratios of costs to benefits (CB ratios) of protective tariffs in various industries and found that it costs the nation $4 of deadweight loss for every $1 of saved job in the automobile industry (Thompson, 1993). These losses were found to be even greater in other industries such as footwear (CB = 9/1), television (CB = 6/1), steel (CB = 5/1), apparel (CB = 7/1), and compact radios (CB = 10/1). Consumers and the general public are generally not aware of the costs imposed by protective tariffs.

In assessing the potential gains from an economic policy measure such as imposition of a trade tariff, greater attention need to be given to its overall and long-term impact effects rather than the short-term results. It is in this regard that this paper assesses how far a tariff succeeds. The next section gives a survey of tariff protection and a discussion of its effects on international trade and competitiveness. Section 3 presents an expository model of competitive leverage and examines the place of trade tariffs in enhancing or inhibiting the ability of a domestic firm to sustain its *dispositional stance to* competitive leverage in the global international trade environment. Section 4 offers some policy analysis and concluding remarks of the study.

WHY PROTECTIVE TARIFFS

There is always a degree of vulnerability to which a country's economy is subject as it opens its borders to international trade. This would indicate how far, and with what level of ease, its trading partners could effectively reach its markets. An index for measuring the degree of an economy's vulnerability to foreign competitors is the country's *import penetration* index (IP). *Import penetration* may be defined as the ratio of the total volume of imports to the total volume of goods and services transacted

within the economy during a given time period (say, one year). Using the Gross Domestic Product (GDP) as a proxy for the total volume of transacted goods and services over one year, a country's import penetration index may be depicted as:

$$IP = \frac{V_M}{Y}$$

where V_M = total volume of imports, Y = GDP.

This expression indicates that a country's import penetration would rise or fall with the relative size of imports in GDP. Thus, it is not the absolute volume of imports *per se,* that a country should be concerned with. Rather, it is the size of imports relative to the GDP that should be watched in deciding whether or not a country has a high or low import penetration and therefore does or does not need protection for its domestic firms. A high *IP* level would mean that the country's import-competing firms are relatively uncompetitive, so that in a free-trade regime the economy would suffer unemployment and subsequent balance of payments adversity. This appears to provide justification for adoption of protective tariffs. Nevertheless, this is only a short-run justification. Besides, the above equation suggests that the best way to maintain low *IP* in the long-run is to raise the GDP, Y. However, other arguments that are advanced to support tariff protection include:

1. *Optimum tariff* -- this argues that a country suffering from an unfavourable balance of trade could improve its balance of trade by imposing a tariff in order to restrict the volume of imports. Such an outcome is supposed to allow sufficient time for the country to adjust its balance of trade situation. However, there is no means of determining any time limits for the duration of the "optimum tariff", nor could a country be expected to voluntarily assign terminal time periods for the duration. Therefore, the optimum tariff argument is frequently used to justify perpetual imposition of trade tariffs by countries.
2. The *Infant industry argument* for protectionism is advocated for measures to "protect" supposedly newly established (infant) industries which are not able to compete with well-established and mature foreign producers. It argues that these infant industries have not reached their maturity stages where they could reap scale economies and compete effectively. Again, how to determine the maturity period remains a problem in applying this position.
3. *Anti-dumping measure* -- the most often used argument for tariff protection –- is advocated as a legitimate response to what is labelled as the unfair trade competition practices of foreign producers. These producers are said to "dump" their products -- temporarily sell below cost -- in order to drive out the competition in the markets of their trading partners. Presumably, the

foreign firm would plan to reap profits later after eventually driving out the import-competing rivals.

These arguments seem tenable, except that they do not provide sufficient justification for the enormous tradeoff the economy absorbs by way of the deadweight loss in economic welfare. Evidence of this deadweight loss is be verified by applying *International Financial Statistics* data following the approach from a 1986 case study of the effects of protectionist legislation in the United States, over intermittent periods between 1891 and 1977.[1] Sixteen protected industries were studied from their various dates of implementation according to the *Market Price Effects (MPE)* and *Cost-Benefit Ratios (CBR)* of protective tariffs. The MPE measures the estimated increase in market price of the product over what the price would be without protection. The CBR is the estimate of what consumers must pay to save a job in that industry. We computed similar results by applying data on the same products, covering intermittent periods between 1980 and 2012. Table 1 provides a summary of the Hufbauer et al, (1986) findings, and Table 2 gives the results of the present study.

TABLE 1. SUMMARY OF HUFBAUER ET AL, (1986) FINDINGS

MPE and CBR Calculations on Protectionism, 1891-1977			
Industry	Date	MPE	CBR($)
Books	1891	+0.4	100,000
Glassware	1922	+0.19	200,000
Rubber Shoes	1930	+0.42	30,000
Ceramics	1930	+0.14	47,500
Ceramic Tiles	1930	+0.21	135,000
Orange Juice	1930	+0.44	240,000
Canned Tuna	1951	+0.13	76,000
Textiles	1957	+0.30	42,000
Steel	1969	+0.30	750,000
Autos	1981	+0.11	105,000
Maritime Goods	1789	+0.60	270,000
Sugar	1934	+0.30	60,000
Dairy	1953	+0.80	220,000
Peanuts	1953	+0.28	1,000/acre
Meat	1965	+0.14	160,000
Fish	1977	+0.10	21,000

Source: Adapted from Thompson (1993)

The data in Table 1 reveals the magnitude of the inefficiency and resource misallocation imposed on the economy through protectionism. It indicates, for

[1]The study by Hufbauer, Berliner, and Elliot (1986) covered the effects of protective tariffs, trade quotas, and other nontariff barriers over a given time span. See Thompson (1993) for discussion of the broad methodology of the study.

example, that since 1997 from which date a tariff was imposed to protect the fish industry, the average retail price of fish has been 10 percent higher than necessary (*MPE = +0.10*), while it had cost fish consumers $21,000 *(CBR = $21,000)* to sustain each job in the industry. The most costly industries are dairy products (MPE=80%, CBR=$220,000), maritime goods (MPE=60%, CBR=$270,000), orange juice (MPE=44%, CBR =$240,000), steel (MPE=30%, CBR=750,000), and books (MPE= 40%, CBR=$100,000), among others. Table 2 reveals that this trend has only worsened over time until date.

TABLE 2. RESULTS

MPE and CBR Calculations on Protectionism, 1980-2012			
Industry	Date	MPE	CBR($)
Books	1980	+0.51	108,000
Glassware	1982	+0.22	219,000
Rubber Shoes	1985	+0.79	71,000
Ceramics	1987	+0.28	62,900
Ceramic Tiles	1988	+0.48	221,300
Orange Juice	1990	+0.59	323,000
Canned Tuna	1993	+0.32	101,000
Textiles	1994	+0.69	68,000
Steel	1998	+0.46	932,000
Autos	2000	+0.23	118,000
Maritime Goods	2003	+0.81	436,000
Sugar	2005	+0.37	84,000
Dairy	2008	+0.93	344,000
Peanuts	2010	+0.36	1,720/acre
Meat	2011	+0.39	202,000
Fish	2012	+0.24	76,000

Source: Computed from *International Financial Statistics* data, 1980-2012.

Yet, protective tariffs remain, and new ones are imposed on imports of various products. The main reason for this is far from the desire for enhanced economic performance of the country. It does have everything to do with the *rent seeking* agendas of agents in the US industrial economy. This is because protection yields significant gains to the domestic industries covered. As the US Congress is the body that enacts all trade legislation, and as Congressional representatives are elected from relatively small districts often having one single large firm and employer, voters in any district would normally elect a representative that would advocate and vote for measures designed to "protect the industry and jobs" of their district. Therefore, firms located in such districts tend to spend resources to have elected those representatives who would support their causes. Thus, industries tend to hire lobbyists in Washington who pressure Congressional members continuously to implement protectionism. This is rent seeking activity; rent seeking is the factor behind the persistence of protective tariffs despite its proven massive net losses imposed on the country's economy. It is important to provide thorough examination

of this problem to further highlight the urgency with which it needs to be addressed. To this end, the concept of competitive leverage is applied to explore the theoretical underpinnings of how protective tariffs disrupt economic efficiency and sustain deadweight losses upon the economy.

THE COMPETITIVE LEVERAGE MODEL

A protective tariff simply gives a domestic producer the competitive edge in terms of providing it with a cost-price *shelter domain* over which to compete with international rivals. The cost-price shelter provides the firm with a *competitive leverage* - the ability to absorb a negative price shock and yet remain in business (allowing it to capture greater market share). A firm's competitive leverage is measured as the ratio of its *shelter domain* to the market price - indicating the degree of leverage a firm has to maneuver within its global competitive environment. Denoting firm i's competitive leverage as ξ_i, we can write:

$$\xi_i = (p^*-c_i^*)/p^*, \quad (1)$$

where:

$\xi_i=0$, *under breakeven conditions for the firm;*

$\xi_i<0$, *under conditions of a loss making firm; and*

$1>\xi_i>0$, *under the normal circumstances of a profit-making firm;*

p^* = *market (equilibrium) price of output;*

c_i^* = *unit (average) cost of output.*

Denoting firm i's marginal cost of output as m_i, the firm's competitive leverage can be expressed as a function of production cost and efficiency parameters as

$$\xi_i = 1 - (m_i/p)(1- \delta_i q_i) \quad (1a)$$

where: m_i = firm's marginal cost, and $\delta_i = \partial c_i/\partial q_i$ = firm's cost-efficiency parameter.[2]

Then, the relationship between a firm's competitive leverage and market price it can charge for its products is

$$\partial p_i/\partial \xi_i = p_i^2/m_i(1- \delta_i q_i) < 0. \quad (1b)$$

This relationship will enable us explore further into how this leverage, or lack of it, could impact the operational disposition of a typical firm under the overriding profit-maximizing objective of such a firm. How would tariff protection affect the immediate (short-run) objective of the firm, as well as the overall long-term policy of sustaining operational productivity at the level that would ensure a non-negative

[2]Given total cost: $C_i = c_i.q_i$, *the firm's marginal cost is* $\partial C_i/\partial q_i = c_i^* + q_i \partial c_i/\partial q_i$; from which $c_i = \partial C_i/\partial q_i - q_i \partial c_i/\partial q$.

steady-state growth rate of desired (or projected) profit level? To pursue these questions, we apply a simplified model of the usual production and supply under optimization constraints.

The scenario is that the output of each firm depends on the (market) output of all the other firms competing in the market - including foreign firms. Assuming n firms, with inverse market demand function: $p = p(Q)$, where p is market price, and Q is market output defined as $Q = \Sigma_1^n q_i$, where q_i is firm i's market output, $i = 1, 2,...n;$ and assuming all firms face similar cost conditions,[3] $c = c(q_i)$, with the overriding objectives to maximizes their respective profits:

$$Max\ \pi_i = q_i p(Q) - c(q_i) \qquad (2)$$
$$(q_i)$$

The first-order requirements for operational maxima are:[4]

$$q_1 \frac{dp}{dQ}(1 + q_{21} + q_{31} + \ldots + q_{n1}) + p - \frac{\partial c}{\partial q_i} = 0$$

$$q_2 \frac{dp}{dQ}(q_{21} + 1 + q_{23} + \ldots + q_{2n}) + p - \frac{\partial c}{\partial q_i} = 0 \qquad (3)$$

$$q_3 \frac{dp}{dQ}(q_{31} + q_{32} + 1 + \ldots + q_{3n}) + p - \frac{\partial c}{\partial q_i} = 0$$

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$$q_n \frac{dp}{dQ}(q_{n1} + q_{n2} + q_{n3} + 1 + \ldots + q_{nn}) + p - \frac{\partial c}{\partial q_i} = 0$$

where

[3]Although all domestic firms face similar cost conditions, the foreign competitors may face different cost structures given the resource market conditions of their respective countries. However, with $c=c(q_i)$, the nature of the individual marginal cost of each firm: $c'(q_i)$, accounts for and captures any peculiar circumstances under which such a firm operates.

[4]The firm's operating target parameters include its output level, resource (including labor) employment levels, marketing (supply and sales), plant size, etc. The firm produces and markets its operational output target with the overall objective of achieving and sustaining these other target maxima. To what extent the existence of a protective tariff distorts these targets is a key question we seek to verify in the present inquiry.

$$q_{ij} = \frac{\partial q_i}{\partial q_j}.$$

The term q_{ij} defines firm i's *competitive stance. It* measures the domestic firm's disposition to respond to a foreign rival, such that:

1) $q_{ij} \circledcirc 0$, implies a protective tariff market in which domestic firms have little or no incentive to react to foreign competition.
2) $q_{ij} > 0$, implies competitive free-trade market situation in which domestic firms are apt to match any foreign competitors with appropriate responses.

However, under tariff protection, we substitute $q_{ij} = 0$ into the above equation systems and obtain the reaction functions:

$$\begin{aligned} q_1 &= f(q_2, q_3, ..q_n) \\ q_2 &= f(q_1, q_3, ..q_n) \\ q_3 &= f(q_1, q_2, ..q_n) \\ &. \\ &. \\ q_n &= f(q_1, q_2, q_3 ..q_{n-1}) \end{aligned} \qquad (4)$$

Thus, the reaction function of a typical domestic producer is independent of its expected and supposedly *dispositional stance* to foreign competition. This is a clear uncompetitive stance and would be potentially quite costly to the country's economy.

To determine the firm's competitive disposition toward tariff protection, we extend the standard model by assuming a linear market demand curve for the economy and that each firm sets out to maximize its own profit as indicated by equation (2): $p=p(Q)$, $dp/dQ<0$, $d^2p/dQ^2=0$. Further, we assume technology of linear cost functions; that is: $c=c(q_i)$, $\partial c/\partial q_i>0$, $\partial^2 c/\partial q_i^2=0$.

We cast the scenario in a standard oligopoly setting whereby an individual firm's *dispositional stance* affects (determines) how it reacts to foreign rival entry or lack of entry in the face of protective tariff. It is under this setting that each domestic firm realizes the inherent interdependence between itself, domestic rivals, and foreign rivals in the market; in that the performance (profits) of any one firm depends on the actions of the others - firms are likely to negatively affect each other's profits by their own share participation in the competition. But then, in a protective tariff environment, this recognition is effectively negated, as a domestic firm's *dispositional*

stance is *nullified*. The solution of this problem under the *null stance* environment allows us to verify how a typical domestic firm is able to sustain *competitive leverage* while operating inefficiently:

$$Max\ \pi_i = \Sigma_1^n \pi_i$$
$$= \Sigma_1^n [q_i p(Q) - c_i(q_i)]$$
$$= Qp(Q) - \Sigma_1^n c_i(q_i)$$

The first order condition for firm *i* would be:

$$q_i \frac{dp}{dQ}(q_{1i} + q_{2i} + q_{3i} + \ldots + q_{ni}) + p - \frac{\partial c}{\partial q_i} = 0$$

from which

$$q_i^* = \frac{(\partial c / \partial q_i) - p}{(dp/dQ)[1 + \sum_2^n q_{ij}]},$$

and substituting the firm's competitive leverage (equation (1a)), we have

$$q_i^* = \frac{-m_i \delta_i q_i}{(dp/dQ)[1 + \sum_2^n q_{ij}]} \tag{5}$$

and further, substituting $\Sigma_2^n q_{ij} = 0$ under *protective tariff* conditions, we have

$$q_i^* = \frac{-m_i \delta_i q_i}{(dp/dQ)} \tag{6}$$

Equations (5) and (6) show a typical firm's operational output as a function of the total output levels of its market rivals (both domestic and foreign), as well as the firm's belief about the reactions of those rivals to its own actions, and competitive leverage. It is this disposition that drives competitive innovation into Research and Development (R&D) initiatives, investment expansion, upgrading, reengineering, and efficiency enhancement programs in firms and industries. The results also indicate the effects of cost-efficiency and competitiveness (such as role of technology), demand conditions, and elasticity of demand parameter as important factors that determine the domestic firm's competitive output.

Differentiating equation (6) with respect to q_j to obtain the firm's disposition to react to international rivals:

$$\frac{\partial q_i}{\partial q_j} = q_{ij} = -\left(\frac{\partial m_i}{\partial q_i} q_i \delta_i + m_i \delta_i \frac{\partial q_i}{\partial q_j} + m_i q_i \frac{\partial \delta_i}{\partial q_i}\right) \frac{1}{dP/dQ} \tag{7}$$

Simplifying and substituting $q_{ij} = \partial q_i / \partial q_j$, we obtain

$$q_{ij} = -q_i (dP/dQ + m_i \delta_i)[\delta_i \frac{\partial m_i}{\partial q_i} + m_i \frac{\partial \delta_i}{\partial q_i}] \tag{8}$$

Under tariff protection, the typical firm has little or no incentive for pursuing cost efficiency, thus:

$$\partial m_i / \partial q_j = \partial \delta_i / \partial q_j = 0,$$

and substituting into (8) we have

$$q_{ij} = -q_i (dP/dQ + m_i \delta_i) \tag{9}$$

Given that $dP/dQ < 0$, equation (9) shows that the competitive stance of a firm would depend on the firm's attitude about δ_i, namely, the magnitude of its cost-efficiency parameter.

- *Case 1:* Under no tariff protection, the firm's survival depends on its ability to maintain a high δ_i, with the result that $q_{ij} > 0$; indicating high efficiency of operation.
- *Case 2*: Under tariff protection, however, the firm has no incentive to pursue a high δ_i, with the result that $\delta_i < -\infty$, so that $q_{ij} < 0$. This indicates the firm's inefficient operational disposition under tariff protection.

POLICY ANALYSIS AND CONCLUSION

The current understanding within international trade policy circles seem to be pointing in the direction of unfettered efforts to impose and maintain protective tariffs as a way of protecting jobs. Despite consistent opposition by economists backed by several industry-specific case studies, the forces in favor of tariffs seem to always prevail. In searching for ways to provide further support to the view that protective tariffs tend to hurt the economy more than it helps it, this study has offered a model that addresses the problem from the standpoint of how it impacts the economy's competitive leverage. The model is applied to demonstrate how a

firm's competitive stance is ordinarily compromised by the existence of tariff protection.

Implied in the standard neoclassical case for free trade is that trade restriction inhibits the availability of goods to consumers and limits the potential for consumers to access greater diversity of products. Also implied is that uninhibited trade provides a country with these potentials as well as the potential for greater efficiency in production. Consumers are generally unaware of the extent to which protective tariffs raise prices of products and cut their real incomes. Nor are they generally aware of the extent to which tariffs impose operational inefficiencies in firms and businesses. These economic costs are spread across the entire economy; the deadweight losses impose significant welfare losses; the nation's state of competitiveness is impaired.

Even if there is sufficient public awareness of the costs imposed by tariff protection, there are bound to be strong sentiments in favor of their maintenance. Business, industry, and labor union power are apt to work against any policy moves for removal of protective tariffs in their various units. Thompson (1993) points to the difficulty of organizing and lobbying against protection granted to a local industry that employs friends and relatives, especially if those friends and relatives stand to lose their jobs and/or forced to retrain or relocate. Although it may sound unjust at first glance, this is essentially the sort of restructuring that are periodically required for industrial organizations in any free-enterprise economy that must maintain a degree of efficiency and competitiveness.

Inefficient firms need not be propped up by artificial "tariff walls" that only promote their degrees of inefficiency. Any short-term job losses that occur as a result of dismantling protective tariffs would be regained and even exceeded through enhanced efficiency and competitiveness that result from the removal of deadweight losses. Workers are also consumers; and as such, lower consumer prices of products and greater variety of goods confer much larger benefits to them as much as they confer to the general consumer public, so that overall social welfare is raised.

There is a need for a determined policy for phasing out protective tariffs completely. Tariff protection is inconsistent with the free-market regime of industrial policy. Protectionism not only introduces distortions in the pattern of resource allocation and distribution, it also penalizes consumers to the extent that the resulting deadweight losses outweigh any short-term employment gains that may have resulted. This conclusion has been supported empirically by studies such as Hufbaur et al, (1986) or Weidenbaum and Munger (1983). It is time that international trade policy makers should decide and choose whether to be guided by the desire for long-term positive economic gains or short-term politically expedient trade measures whose outcomes are less than favorable to the economy.

Note

5. We make this assumption only to simplify the analysis; although assuming that firms operate a (usual) technology of rising marginal cost may not significantly alter our purported results beyond complicating the solution of the model.

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