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Nominal and Effective Rates of Protection by Industry in Pakistan: A Tariff Based Analysis

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Abstract:

The study calculates nominal and effective rates of protection and their association with major characteristics of industries—labour intensity, export orientation and revealed comparative advantage. The results indicate that nominal as well as effective rate of protection has declined between two benchmark years—1990 and 2002, but vegetable oil, motor vehicles, and a sector producing intermediate good 'other manufacturing' remains highly protected. Overall results reveal that manufacturing import competing sectors enjoy higher protection through trade policy—tariff while negative effective rate of protection for majority of agriculture and services sectors show their disadvantage position in the economy. The results clearly indicate government priority for manufacturing sector over agriculture and services sectors. The results also reveal that effective rate of protection is negatively associated with industrial characteristics such as labour intensity, export orientation, and revealed comparative advantage indicating that a sector needs less protection if it has comparative advantage—labour intensive and produce exportable commodity. The results of the study also indicate that trade policy in Pakistan shifts trade in favours of trade in intermediate inputs in 2002 from trade in final goods in 1990. There is a need to restructure tariff structure to remove bias against agriculture and services sectors. Agriculture where majority of unskilled labour engaged ask immediate action from government to improve the condition of poor.

Keywords: Protection, Trade Policy

1. INTRODUCTION

Since independence, manufacturing industries of Pakistan were highly protected through tariff and non-tariff barriers that promoted

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dualism[1]. In 1981, Pakistan move towards free trade regime by reducing quantitative restrictions and tariff rationalization that work through domestic prices and change terms of trade. Trade policy not only determines level of export, import, and size of the economy but also determines structure of consumption and production.[2] Restrictive trade policies distort market signals of prices—imposition of tariff raises price by the amount of tariff. This distortion pulls factors of production towards protected sectors.[3] Consequently, it changes structure of production in favour of protected sectors at the cost of production in unprotected sectors. Therefore, protectionist policies favour import competing sectors at the cost of sectors having comparative advantage and producing exportable surplus. In brief, the effects of trade policies on domestic prices determine the structure of protection—nominal or effective—of any country, which ultimately determines structure of production, consumption and trade.

Nominal protection is protection provided to final product—tariff[4] on imports. Increase in nominal protection affects consumers by reducing their command over goods and services – as real income declines. It affects producer positively by increasing their profit margin and hurts them by increasing cost of production. Nominal protection ignores cost raising effects of tariff on their inputs. For effective trade policy framework, effective protection is more important. It takes into account both protection provided to inputs (tax on production) and protection to final output (subsidy to production). In this paper we focus

[1] Dualism is associated with trade policy. It is a sign of markets working poorly (or market failure case) for deviating from free trade. Import substitution policies promoted economic dualism.

[2] However, the growth impact of these policies depends on a number of other factors such as viability of export sectors, size of domestic market, and ability to transfer resources from one industry to the other.

[3] Thus protectionist policies are associated with various types of cost such as resource misallocation and higher cost of production, slower rate of productivity increase, loss of economies of scale, terms of trade losses. This may also result in reduction in competition and inability to take technological advantage as producers engaged in rent seeking activities. These are very important factors which can be focused in future research.

[4] In addition to tariff, any other quantitative restriction such as quota, licensing requirement, prohibitive measure, subsidies, or tax rebates, or imports by specific importers which protect domestic industry and affect prices to deviate from international prices, determine structure of nominal protection.

on both aspects of protection. Kemal (1987) recommends that for a policy point of view one should calculate ERPs for more than one year and mean value of these ERP can be used for policy point of view. This study is a first step in this direction. We measure nominal and effective protection provided through trade policies in two years 1990 and 2002 using similar methodology, data set, and aggregation scheme to have comparable values. The focus of this research is to determine the structure of protection and associate those with the other characteristic of industries to identify industries need immediate action.

First, the study investigates nature and structure of nominal and effective rates of protection, which measure distortions introduced in the economy through trade policies in 1990 and 2002 and compare them with the results of the earlier studies. Second, we associate structure of protection with other characteristics of industries such as export orientation, revealed comparative advantage, and factor intensity which is not frequently done in conventional trade policy analysis. The paper then briefly discusses change in investment, value added and trade over two benchmark years.

In the past, a number of studies[5] estimated effective rates of protection (ERPs) for manufacturing industry of Pakistan. However, these studies focus on manufacturing industries and ignore agriculture and services sectors. The output of agriculture and services sectors may not or marginally be affected directly through tariff on their output, but may be affected more through intermediate inputs. The importance of these sectors is in their connectivity with manufacturing industries- a sector with strong connectivity with rest of the world through trade. Agriculture crop sectors provide raw material to industries producing exportable commodities—'energy' and 'transport and telecommunication' are major input from services sectors to industries. Therefore, we have included agriculture and services sectors in the analysis to present a comprehensive picture of structure of protection for Pakistan's economy to demonstrate where action is needed.

We calculate nominal and effective rates of protection using consistent data set from social accounting matrix for two years, 1990 and

[5] Soligo and Stern (1963/4), Lewis and Guisinger (1968), Kemal (1987), Kemal, *et al.* (1994), Din, *et al.* (2007)

2002, for 30 sectors of the economy under three major groups – Agriculture (9), Industry (14), Services (7) and compare them to see the change in structure of protection provided through trade policy. The two questions are generally asked when exploring the structure of protection of any country: (1) 'how much protection is given'; and (2) 'how much income change as a result'. In the literature, the first question has been analyzed with reference to difference in domestic and world prices which takes into accounts both tariff rate on its competitive imports and tariff paid on its intermediate inputs (new concept) (Anderson, 1995). Answer to the second question is associated with answer to the first question i.e., percentage change in value added due to one unit change in tariff (old concept). In this paper, first we calculate protection focusing on the first question. The results explain the change in distortion structure introduced by government through tariff in an open economy in two benchmark years, 1990 and 2002.

The paper is structured in four sections: introductory section is followed by a brief discussion on data and methodology in sections II and III, respectively. Section IV first part briefly discusses the structure of protection provided through trade policy—tariff[6] in two benchmark years. Second part of section IV discusses key findings focusing on the change in structure of protection in terms of NRPs and ERPs and their association with sectoral characteristics and compare results with earlier studies. The final section concludes with a summary of key results and suggestions for future research. Appendix I, II and III are on details on industries, ranking of industries, and review of literature concerning theoretical aspects and empirical results, respectively.

2. DATA

We construct two consistent I/O matrices with the help of two social accounting matrices (SAM) –SAM -1990 [Siddiqui and Iqbal (1999)], SAM-2002 [Dorosh, *et al.* (2006)], and I/O table-1990 [Pakistan (1996)]. Motor vehicle is very important sector to be analyzed as it enjoys very high protection level in both period; 1990 and 2002. But data

[6] In this paper, we assume tariff is the only restriction on imports.

for motor vehicle[7] was neither available from SAM-2002 nor from I/O table for 1989-90. It is extracted from the aggregate data in SAM using information from statistical year book [Pakistan (1995), (2005)], Census of Manufacturing industries (CMI) [Pakistan (1990), (2001)], and CBR-year book (1992, 2003). Incorporating this information, we construct I/O table with same classification for thirty sectors including motor vehicles classified under three major heads, agriculture (9), industry (14) and services (7). Details about industries (agriculture, industry and services) are given in Table 1 in Appendix 1.

3. METHODOLOGY

In the literature[8], protection provided to an industry or commodity has been analyzed with reference to difference in domestic and world prices. In this paper, nominal protection is measured by difference in domestic and world prices due to tariff.[9] Nominal rate of protection (tm)[10] is defined as follows:

NRP (t_m) = Total tariff revenue/total imports

Let domestic price of a traded good be P_{mi} in the absence of tariff. Government imposes tariff on imports of good *i*. assuming there is no qualitative or quantitative restriction but tariff, price of imported item can be defined as follows:

$$P_{mi} = (1 + t_{mi}) * P_{wi} \qquad \ldots (1)$$

[7] Demand for cars increased significantly due to banks' consumer financing schemes despite high tariffs. Therefore, we incorporate this sector explicitly in the analysis.

[8] A brief review of theoretical aspects of ERP and empirical estimates for Pakistan and for some other countries in historical perspective are briefly discussed in Appendix III.

[9] Quantitative restrictions such as licensing requirement, prohibitive measure, subsidies, or tax rebates can also be included. The nominal protection provided to an industry can also be defined as a percentage change in domestic prices of final goods due to government policies.

[10] There are two ways of calculating NRPs (i) With total imports; and (ii) With imports (duty pay able). Here, we calculate NRPs, with total imports.

where, P_{wi} stands for world price of i^{th} traded good and t_{mi} is tariff rate on i^{th} commodity. Nominal protection is measured by t_{mi} – the difference between domestic price and world prices due to tariff.

$$t_{mi} = (P_{mi} - P_{wi}) / P_{wi} \qquad \ldots (2)$$

ERP takes into accounts both tariff rate on its competitive imports and tariff paid on its intermediate inputs. Effective rate of protection measures protection after taking into account both tariff on inputs and outputs. Ideally effective rate of protection should be calculated in general equilibrium frame work. However, they can be calculated with-out solving general equilibrium model. The conditions are those of non-substitution theorem[11]and small open economy. Under these conditions, structure of protection depends on input-output relationship, and structure of taxes (nominal protection rates). We calculate effective rate of protection assuming non-substitution, separable production function, small open economy, and protection to industries provided through tariffs only, perfect substitutability between domestically produced goods and imported goods.[12] Intermediate inputs are used in fixed coefficients (a_{ij}) (Leontief technology), the effective rate of protection of sector *i*, is measured as follows:

$$ERP_i = \frac{P_{wi}(1+t_i) - \sum_j P_{wi}(1+t_j) * a_{ij}}{P_{wi} - \sum_j P_{wj} * a_{ij}} - 1 \qquad \ldots (3)$$

Here, we assume non-traded inputs as traded inputs without tariff as discussed by Lewis and Guisinger (971). Another reason to include non-traded sector in the analysis is that they may not be protected being non traded sector but they are protected indirectly by using traded input.

[11] If production is governed by constant returns to scale, there are no joint products and there is only one non produced factor—factor of production, then the non-substitution theorem tells us that the mix of production –value added – is determined by prices alone.

[12] However, in future, these assumptions can be dropped one by one to see the effects of non-tariff barriers (quota restrictions, value ceiling on imports, imports by specific importers, etc.) and substitutability.

We explore relationship of ERPs and NRPs along with other characteristics of industries such as labour intensity, export orientation and revealed comparative advantage through correlation coefficient matrix to show the strength of interdependence among them.

Labour intensity (L_{int}) of the *ith* sector is measured by the ratio of labour cost (L) to value added (Y).

$$L_{int} = {}^{L_i}/_{Y_i} \quad \ldots (4)$$

Exports' orientation (X_{orti}) of the i^{th} sector is determined by export (X) to output ratio (Q)

$$X_{orti} = X_i/Q_i \quad \ldots (5)$$

and revealed comparative advantage (RCA) of the i^{th} sector is defined by the following ratio

$$RCA_i = (X_i - M_i)/(X_i + M_i) \quad \ldots (6)$$

where, M stands for imports.

This analysis along with change in investment behaviour, structure of production and trade would reveal the effects of incentive structure between two bench mark years 1990-2002 and future policy action.

4. RESULTS

(i) Trade Policy

Pakistan's trade regime can be identified as a highly complex structure with many different tariff rates and high degree of dispersion. Figure 1 shows that there is a huge gap between minimum (0%) and maximum (435%) tariff rates in 1990. These values change to minimum (0%) and maximum (30%) excluding commodities with specific rates, in 2002. However, majority of imports face tariffs rates in a range 0—20% in both years except imports with specific rates. The imports with specific duty rates hold the largest share in total imports in both years

(see, Figure 1). Figure 1 indicates that distribution of imports in both periods is heavily concentrated towards specific duty rates, which cannot be defined by any of the tariff lines described above.

Figure 1: distribution of Import Tariff Rates and Imports Share (%)

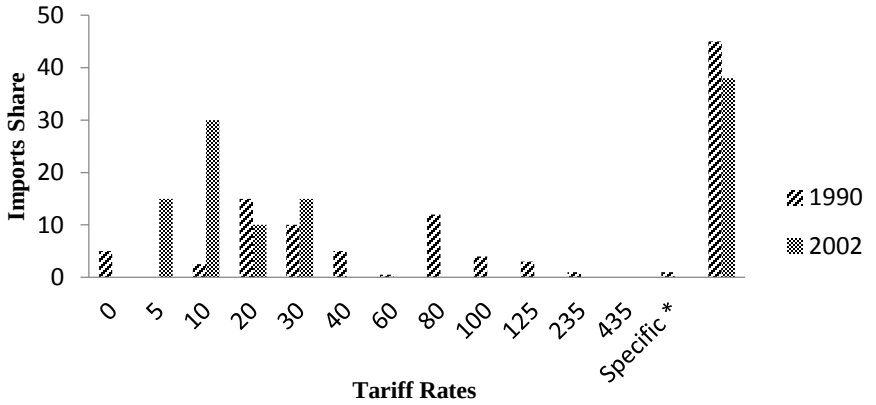


Table 1. Descriptive Statistics of Tariff Rates

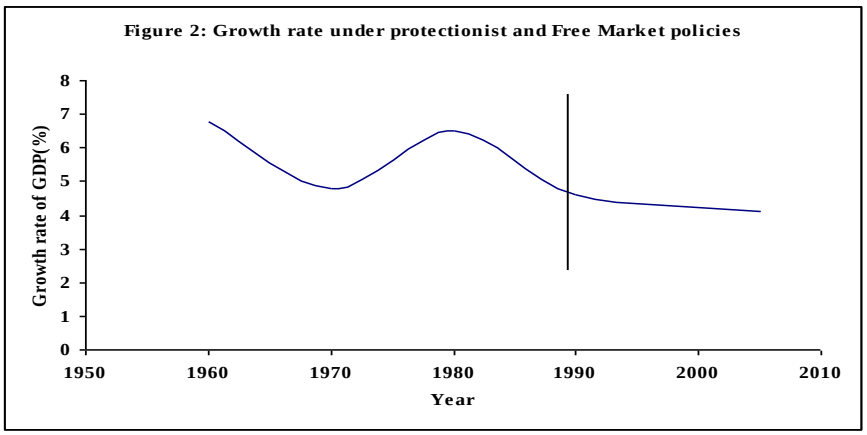
Descriptive Statistics	*1990*	*2002*
Mean	95.7	16.3
Standard Error	31.4	5.5
Coefficient of Variation	1.23	0.8
Range	435.0	25.0
Minimum	0.0	0.0
Maximum	435.0	30.0
Count(Tariff slabs)	14.0	4.0

Table 1 presents descriptive statistics for tariff rates for the two bench mark years – 1990 and 2002. It indicates that average tariff rate was very high in 1990; 95.7% which reduces to 16.3% in 2002. The coefficient of variation[13] indicates that the dispersion of tariff rates has reduced from 1.2 percent in 1990 to 0.8 per cent in 2002. This is also evident from number of duty slabs, which reduces from 14 to 4, indicating high level of distortions in 1990.

Another important feature which can be observed from empirical data is that Pakistan was growing at faster pace under umbrella of

[13] ($SD/\bar{X}$), where SD stands for standard deviation and $\bar{X}$ is mean value of tariff.

protectionist policies than the policies emphasizing on free market economy. Figure 2 shows high growth in 1960 but decline in the 1970s (a period after separation of East Pakistan). During 1970-1980 growth accelerated but decelerated after the peak point of the 1980s, when government started to implement trade liberalization policies by reducing quantitative restrictions and tariff rationalization in the following years (Figure 2). This raises an important question; why are we emphasizing on free market economy?[14]



Although effective protection is important for effective policy frame work, the importance of nominal protection cannot be ignored either. It is nominal protection which determines effective protection along with input-output relationship determined by coefficient a_{ij}. Effective protection is higher for the good where nominal protection is high on final goods along with low nominal protection on intermediate good. While ERP is low or turns into negative if tariff is low on final goods relative to tariff on input and high on intermediate input than on output, respectively. Therefore, ERPs and Tariff are correlated. Table 1

[14] It is mentioned by Chen that the developing world grew at the rate of 3.1% per annum during the 1960-1980 period (a period characterised by protected trade regime), between 1980-2000 (trade liberalization), as the IMF and WTO forced more and more developing countries to open their economies to international competitors, their growth rate slumped to 1.4% per annum.

explains ERP's dependence on tariff on input, tariff on output and free trade input share (see, Table 2).

Table 2. Tariff and Effective Rates of Protection

Tariff		Direction of change in ERP
If $t_j = t_i$	⇨	$ERP = t_i = t_j$
If $t_j > t_i$	⇨	$ERP > t_i > t_j$
If $t_j < t_i$	⇨	$ERP < t_i < t_j$
If $t_j < a_{ij} * t_i$	⇨	$ERP < 0$
If value of imported inputs exceeds the value of output (at free trade prices)	⇨	$a_{ij} > 1 \Rightarrow VA < 0$ [15]

(ii) Nominal Rate of Protection (NRPs)

Nominal Rate of protection computed using equation 1 are reported in Table 3. Economic-wide average tariff rate was 22.4% in 1990, which reduced to 4.7% in 2002. This indicates significant decline in nominal protection under import liberalization policies implemented in two bench mark years—1990 and 2002. A comparison of the protection across the industries reveals that on average, agriculture has much lower NRPs than those of manufacturing in both years. The highest incidence of tariff within the agriculture is on 'fishing' sector followed by 'forestry' and 'vegetables and fruits'. The range was very large for agriculture in 1990, 0 to 75%, which reduces to 0-27% in 2002. However, average nominal protection to agriculture sector increases from 6.9 percent in 1990 to 11.8 percent in 2002. Consequently, imports share of agriculture commodities register a decline—from 6.34 percent in 1990 to 3.07 percent in 2002. This is an indication of prohibitive tariffs. However, large variations of NRPs across agriculture sectors do not necessarily mean high degree of distortions in domestic relative prices as the share of imports of these agriculture groups of commodities is very small (Table 3).

In other words, these sectors have apparent comparative advantage and nominal protection does not change the relative prices and

[15] Negative values of ERP indicate that an activity may not be beneficial despite tariff on final output. The industries producing exportable face problem because there may be tariff on their inputs but they are protected by tariff on their final output.

consequently do not change consumer's and producer's behaviour. Thus, nominal protection does not benefit to agriculture producing expo-

Table 3. Nominal Rate of Protection

Sector	*1990*	*2002*	*1990*	*2002*
	Imports Share		NRP	
Wheat	4.30	0.29	0.0	0.0
Rice	0.00	0.00	0.0	0.0
Cotton	0.00	0.00	0.0	0.0
Sugar cane	0.00	0.00	0.0	0.0
Other major crops	0.89	0.59	6.9	0.0
Fruit and Vegetable	0.61	1.29	36.7	27.0
Live Stock	0.31	0.68	3.8	2.1
Forestry	0.23	0.23	60.1	0.0
Fishing	0.00	0.00	75.2	0.0
Agriculture	**6.34**	**3.07**	**6.9**	**11.8**
Mining	7.84	9.11	2.8	0.1
Vegetable oil	3.81	2.29	30.6	44.2
Milled Grain	0.19	0.80	0.0	0.0
Sugar	1.01	0.27	21.7	0.0
other food	3.52	1.04	24.0	9.4
Lint Yarn	0.97	0.69	13.2	0.0
Textile	0.74	1.58	43.4	13.7
Leather	0.17	0.11	16.3	4.2
Wood	1.76	0.55	34.8	0.0
Chemicals	14.22	10.94	26.0	7.1
Petroleum	5.95	9.52	12.2	2.4
Motor Vehicles	2.24	1.93	86.4	28.8
Other manufacturing	45.15	52.96	28.1	2.6
Cement	0.05	0.00	27.9	0
Manufacturing	**87.60**	**91.79**	**25.7**	**4.7**
Energy	0.05	0.00	0.0	0.0
Construction	0.00	0.00	0.0	0.0
Commerce	2.60	0.21	0.0	0.0
Transport and Communication	0.00	0.00	0.0	0.0
Housing	0.00	0.00	0.0	0.0
Public services	0.00	4.93	0.0	0.0
Private services	5.64	0.00	0.0	0.0
Services	**8.29**	**5.14**	**0.0**	**0.0**
Total	100	100	22.4	4.7

rtable, In response to a decline in nominal protection to 'forestry' and 'fishing', imports of these two commodities did not increase rather import of fishing has declined. This indicates that protection through

tariff provided to these two commodities was redundant. [16] Pakistan has comparative advantage in these two commodities. While, decline in tariff from 36 percent to 27 percent and 3.8 to 2.1 percent on import of 'vegetable and fruit' and "Live Stock" between 1990 and 2002, boost their imports. Import share of these two commodities doubled between the years under consideration; from 0.61 percent to 1.29 percent and 00.31 to 0.68 percent. This indicates that these sectors face prohibitive tariff, which is detrimental for welfare of people especially in rural area. However, the share of these two commodities is very small in total imports. These are perishable commodities, Government has restricted imports through tariff to avoid losses. Tariff on final good has power to protect the producer but it hurts the consumer. Net impact determines suitability of a policy for the economy as a whole. Siddiqui (2008), taking into account both consumer and producers sides of the economy, analyzes the effect of liberalization of agriculture trade. The results show that reduction in tariff on horticulture improves condition of poor population especially in rural area. Government should reduce tariff on these two commodities to improve condition of the poor.

Majority of exports from Pakistan are agro-based – 'textile', 'milled grain' (rice) and 'leather'. First four agriculture sectors can broadly be classified as major input providers to these manufacturing sectors. For instance, 'Wheat', 'Rice', and 'Other major crops' provide inputs to 'milled grain', 'Other food', sugar cane to 'sugar' and 'cotton' to 'textile', livestock to 'leather'. Among these sectors, 'Textile' products are major export from Pakistan. Milled grain includes rice, the second largest export from Pakistan. Tariff on these commodities expected to hurt export oriented industries by raising the cost of production. In both years, these sectors are not protected by tariff. Hence, the cost of production did not increase. The sectors producing exportable remains competitive.

In agriculture, variation in tariff rates for manufacturing industries is also large. Industry consists of both import competing and export

[16] The benefit of protection also depends on the selection of market where producers wants to sell their product. For instance, producers of exportable commodities may enjoy higher protection if producing for domestic market in presence of tariff on import of these commodities and sell them in domestic market for higher return.

oriented sectors as 91% of imports and 87% of exports are industrial based. Table 3 indicates that some industrial sectors have large imports inflows despite high tariff. This observation indicates that government tends to raise tariff revenue albeit providing protection to domestic producers. But there is high risk that protection to industries tends to misallocate limited resources. Table 3 reveals that on average NRPs on industries has declined substantially between 1990 and 2002, i.e., from 25.7% to 4.7%. Consumer goods industries such as sugar, other food items, textile has very high NRPs in 1990s, which have declined substantially from the range of 22— 43 percent to 9.4—13.4 percent. But nominal protection to vegetable oil industry has increased from 30.6% to 44%. High protection given to final consumer goods means that high costs borne by consumers. In 1990, sector producing exportable surplus 'Textile' was highly protected as tariff was higher than average; 43.4 percent. In 2002, government reduced tariff on it to 13.7 percent. In response to a significant decline in nominal protection, imports share of textile marginally increased between two bench mark years. This indicates that tariff on textile is redundant and sector has comparative advantage.[17] Government put tariff on its imports for revenue generation purposes only. Despite the fact that imports of milled grain did not face any tariff, imports share remains less than one per cent—0.2 and 0.8 percent in 1990 and 2002, respectively. This indicates the sector's comparative advantage. The other two sectors producing consumer goods are 'sugar' and 'other food'. Their import shares in the total import have declined between 1990 and 2002, despite significant decline in tariff over the same period.

Among the import competing manufacturing sectors, motor vehicle is highly protected sector in both years but nominal protection has significantly declined in 2002 (one third of the level in 1990). Its import share remained around 2%. During this period, banks consumer financing schemes boost demand for domestically produced cars. Within the manufacturing sector, the largest import share is of 'other manufacturing' producing intermediate goods which includes electric machinery, non-electric machinery, transport equipment excluding motor vehicles,

[17] Export oriented industry 'Textile' receive very large subsidies from government in both periods, which neutralize the impact of tariff.

etc. Despite highly protected sectors with tariff rate (nominal protection) of 28%, imports inflow of other manufacturing goods is 45% of the total in 1990. Government significantly liberalizes this sector by reducing nominal protection to 2.6%. Consequently imports share has increased from 45% to 53%. In rest of the industrial sectors producing intermediate inputs such as chemical, petroleum which has strong backward linkages with rest of the economy and cement with construction industry, nominal rate of protection has declined substantially (see, Table 3). The effects of reduction in tariff vary by commodity. Import of petroleum increased which indicates that tariff is binding on its imports. Therefore, imports two commodities, i.e., 'chemicals' and 'cement', have declined over time. The demand for their import fell. The reason can be slowdown in economic activity or because of substitution of domestically produced goods. These sectors may have become competitive over time. The reasons of this decline need to be explored further.

Despite no tariff on import of services, the share of services sectors in total imports declined from 8.29 percent in 1990 to 5.14 percent in 2002. Effective rates of protection reveal the reasons behind this decline.

(iii) Effective Rates of Protection (ERPs)

ERPs reflect protection the industries receive from government through trade policies—tariff on both input and output. This section compares effective rates of protection across the sectors as well as over the two bench mark years—1990 and 2002.

We compute ERPs for 30 sectors of the economy assuming no barrier on imports exist in the economy but tariff.[18] A positive ERP indicates that value added is higher than it would be in the absence of the government intervention.[19] The opposite effects of tariff on output and inputs may result in negative effective rate of protection while NRP is

[18] The results may understate actual protection enjoyed by the industries in presence of non-tariff barriers on trade.

[19] In presence of any other protective measure(other than tariff), value added increase by tariff equivalent—over all difference between world and domestic prices.

still positive. Negative ERPs reveals sectors' disadvantage position under existing policies. The results are reported in Table 4.

The economy shows a decline in protection level between 1990 and 2002 (a period characterized by tariff rationalization), i.e., from 42.5% to 27.4% [Table 4]. ERPs by economic classification reveals discrimination against primary sectors (agriculture) and services sectors. On average ERPs for the agriculture and manufacturing industry has declined but services position has improved. The results also reveal that most of effective protection comes from high tariff on final output with low tariff on their imported input or using locally produced inputs.

In agriculture, ERPs have declined moderately, by 4 percentage points. Crop sectors have been negatively protected, though negative protection in absolute term has reduced in 2002. Negative effective protection rate for crops indicate inputs to these sectors are highly protected—chemical (fertilizer) (see, Table 4). Negative rates of protection have reduced (in absolute term) in 2002, the improvement in crop sectors comes from input channel, tariff on chemicals (fertilizer) has been reduced from 26 percent in 1990 to 7.1 percent in 2002. On the one hand, this change in tariff structure increases their prices and brings them closer to world prices. On the other hand, it increases cost of production of the exportable commodities of manufacturing sectors, where these commodities are major inputs. Commodities such as – 'forestry' and 'fishing' are highly protected in 1990, but protection on these two sectors has significantly reduced in 2002 due to tariff elimination on final good of 'fishery' and 'forestry' and turn into negative (see, Table 4). These are the sectors where ERP if greater than NRP, therefore enjoyed the higher benefits in 1990. 'Vegetables and Fruit' (perishable commodities) remains highly protected in both years [see, Table 3], though effective protection has marginally declined from 42.3 percent in 1990 to 40.5 percent in 2002 but remains higher than NPR. Thus, the producer of these commodities reaps high benefits than any other agriculture sector.

The sectors are arranged by level of protection in Appendix II-Table 1. A clear pattern of ranking of industries emerges. It reveals that ranking of majority of industries change as effective rates of protection change between two benchmark years, 1990 and 2002. Among agri-

culture sectors 'Fishing', and 'Fruit and Vegetable' producing perishable consumer goods that are exportable are the most protected sectors in 1990. In 2002, 'Fruit and Vegetables' and 'Livestock' are the most protected sectors. These are the sectors where nominal tariff was greater than zero. Tariff on majority of crop sectors imports is equal to zero, therefore they face negative protection because of tariff on their inputs such as fertilizers. Two staple food commodities –Wheat and Rice – used as intermediate goods for export oriented manufacturing industries and manufactured consumer goods sector take the lowest positions and have negative protection level. This again indicates disadvantageous position of agriculture sector (relative to industry) where majority of rural poor is engaged in earning their livelihood. Therefore, there is a need to formulate a policy to remove bias against agriculture and bring domestic price equal to world prices. Tariff on their inputs should be reduced. However, this will increase cost of production of exportable, where they are used as intermediate goods. Government should subsidize those sectors to neutralize the impact of increase in cost of producing exportable.

The results reported in Table 4 clearly show that industrial sectors have been enjoying the highest protection level in both bench mark years despite decline in average effective rate protection for manufacturing sectors —from 46.6 percent to 29.3 percent. The results show that 'vegetable oil' and 'motor vehicles' have been highly protected in both years—1990 and 2002. ERPs on motor vehicles is very high— 302.85 percent in 1990, which has declined to 100.8 percent in 2002. Because, NRP on 'motor vehicles' is very high—86.4 (28.8) per cent relative to nominal protection to its major input provider sector 'Transport equipment' included in other manufacturing sector 28.1 (2.6) percent in 1990 (2002).

The most protected sector in 2002 is vegetable oil, which is categorized as final consumer good, protection level has increased between 1990 and 2002. This sector enjoys the maximum protection from government trade policies in 2002. This increase in protection is from two channels—(1) nominal protection to its final product has increased from 30.6 to 44.2 percent; and (2) nominal protection to its intermediate inputs from agriculture 'fruit and vegetable' has declined

from 36.7 percent to 27 percent.

The EPR on two basic food items—'Vegetable oil' and 'Other food' have increased over time that benefits to the producers but harmful for consumers—in particular expected to hurt more to poor segment of population, whose larger share of budget is spent on foods commodities.

Table 4. Effective Rates of Protection by Industry (%)

Sector	ERPs	
	1990	2002
Wheat	-21.11	-2.5
Rice	-15.14	-1.6
Cotton	-17.49	-2.6
Sugar cane	-10.89	-1.4
Other major crops	1.37	-0.5
Fruit and Vegetable	43.24	40.5
Live Stock	-2.94	1.3
Forestry	69.59	-0.2
Fishing	99.69	-1.1
Agriculture	**20.9**	**16.9**
Mining	-0.01	0.0
Vegetable Oil	210.96	468.5
Milled Grain	-51.09	-1.2
Sugar	42.37	-0.5
Other food	16.91	17.1
Lint Yarn	1.91	-1.9
Textile	102.95	45.9
Leather	23.57	33.3
Wood	57.82	-0.9
Chemicals	32.97	20.0
Refined Petroleum	2.59	36.7
Other manufacturing	60.35	129.9
Motor Vehicles	302.85	100.8
Cement	26.25	-65.0
Manufacturing	**46.6**	**29.3**
Energy	-16.60	-0.2
Construction	-32.80	-3.7
Commerce	-1.92	-0.3
Transport and Communication	-14.74	-0.5
Housing	-4.90	-0.1
Public services	-16.74	-0.8
Private services	-12.99	-0.3
Services	**-16.1**	**-0.8**
Total	42.5	27.4

Milled grain, a major food item and an export commodity, faces negative protection. The prices are lower than world prices, which benefit to consumer but deteriorating effect on producer. They produce less than the level they can produce. This is detrimental for growth prospects of the economy.

Sugar was heavily protected in 1990. Due to reduction in tariff on both its inputs and output, this sector is net looser as effective protection level from 42.4 in 1990 turn into negative protection—(-0.5).

The results show that export oriented industry 'textile' enjoys high protection, but imports share remains very small. Over time effective protection to textile has reduced because of decline in tariff on final good and increase in prices of cotton (major input). Producer can increase their profit by domestic sale. This indicates that benefit of protection depends on the market where producer wants to sell their product. The protection to 'lint yarn' has been reduced from 1.9 to (-1.9) between two years. It is operating less than its optimal level. It is associated with exportable. Government should pay attention to improve its condition.

In addition to 'Vegetable Oil', two other import competing sectors, 'Refined Petroleum' and 'other manufacturing' enjoy high protection in both years and over time the protection level has increased. That shows that import competing sectors still enjoy high protection despite decline in tariff on these commodities, which is detrimental for efficient use of factors of production.

These commodities have larger backward linkages and are categorized as intermediate goods. Prices of these commodities are higher than world prices and have cost push effect in production. Cement – another intermediate input – was highly protected in 1990. But reduction in tariff on its imports reduces protection from high positive to negative. The lower price of cement benefits to construction sector by reducing their cost of raw material. The construction will boost its production, where unskilled labour from poor households is engaged.

Leather – a sector producing exportable — enjoys high protection in both years. The ERP on Leather has increased from 23.6 to 33.3 percent between 1990 and 2002. Its import share is small. Like textile, this sector enjoys the benefit of higher prices being a competitive sector in

the world market. It can also increase the benefit by increasing their sale in domestic market.

The ranking of the industries in Table 1 Appendix I show that ranking of industries have changed over time. Among the manufacturing sectors, motor vehicle and vegetable oil takes top positions in both years. Overall results show, effective protection was higher for final consumer goods-vegetable oil and textile (basic need commodities). 'Motor Vehicle' and 'Other Manufacturing' commodities (classified as investment Good and intermediate goods respectively) also enjoy higher protection level in the 1990s. In 2002 all these four items again take first four positions from the top and enjoy higher protection—higher than the average level of protection of manufacturing industries and also higher than average economy-wide protection in both years. This has very strong implications for poverty and welfare of the people as well as for growth prospects.

Industries producing intermediate goods such as chemical retain their positions. In relative term it still enjoys benefit of protection higher than six sectors of the economy. Another intermediate good, petroleum reaped larger benefits in 2002. This sector became more profitable in 2002.

Among the consumer good producing sectors 'other food' become more profitable in 2002 relative to in 1990. The ranking of industries shows the profitability of sectors. If investment decisions are made on the basis of profit margin, this gives a clear picture for priority sectors for investment.

However, to some extent the results are dependent on the aggregation of commodities, i.e., aggregating commodities that have high NRPs with those that have low NRPs change the structure of protection. For instance 'other manufacturing sector' including motor vehicle shows NRP of 31% and 3.5% in 1990 and 2002 respectively. This aggregation (underestimates) the protection enjoyed by the motor vehicle. After disaggregating data of motor vehicles from other manufacturing sector reveal that motor vehicle sector remains among the top 3 positions in both years with NRPs/ERP 28.1/302.8 percent and 2.6/100.8 percent in 1990 and 2002, respectively.

Third group belongs to services sectors which are not directly

protected through tariffs. Negative ERPs reveal their disadvantageous position from input channel. Tables 2 and 3 reveal position of services sectors improves in 2002 as negative protection has significantly declined in absolute term from[-16.1 percent] in 1990 to [-0.8 percent] in 2002. The most negatively affected sector in both years is construction. Cement is major input to this sector, which is highly protected through tariff; 27.9 percent in 1990, which reduces to 0 in 2002. Consequently, effective protection changes from [-32.8] percent in 1990 to [-3.7] percent in 2002. The decline in absolute value of ERPs of services sector indicate that tariff on intermediate input to services sectors has been significantly reduced. The results indicate that reduction in cost of production favours services sector. While this is expected to increase the cost of production in all other sectors of the economy through input channel. For example, 'energy and transport and communication' which have strong backward linkages, increase in their price increase cost of production. Though bias against services sectors has declined in absolute terms between 1989-90 and 2002, there is a need to reduce tariff on their input to neutralize negative effective protection and bring domestic prices closer to world prices. The sectors will bear the larger impact the larger the share these input have in production. Due to reduction in bias against services sector, investment in services sectors doubles in 2002 from the level in 1990. Hence, services share in GDP has also increased. Investment in agriculture and manufacturing industries has declined over the same period.

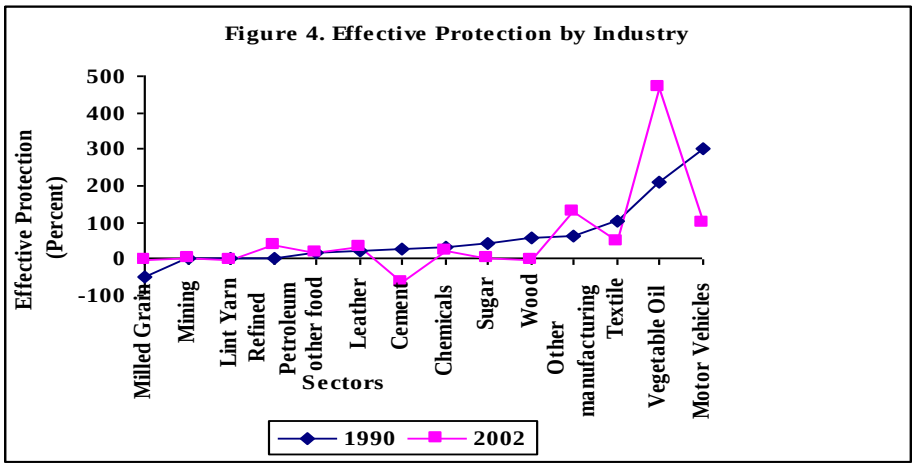
A clear picture of structure of effective protection by sectors for two bench mark years is presented in Figures 4 to 6. The gap between the two curves shows the change in protection level between two years. The larger the gap between two lines the higher will be the change in policies over the bench mark years.

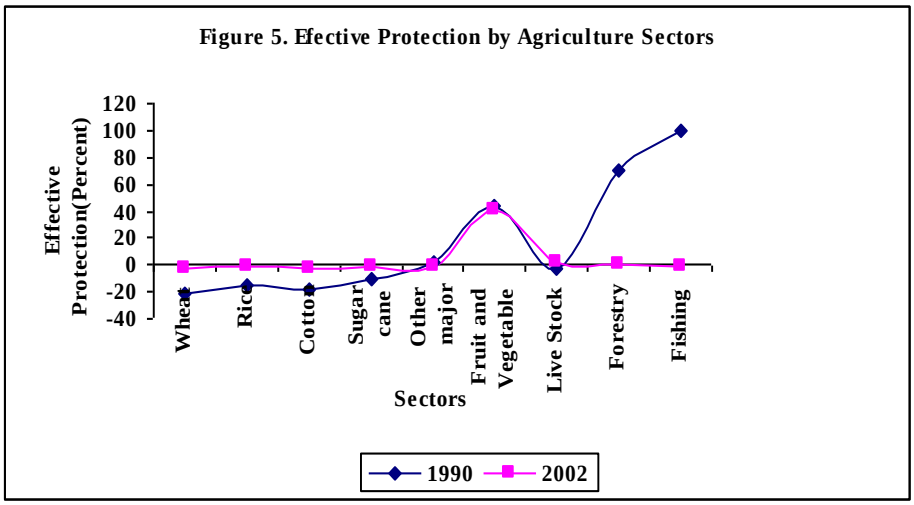
From Figure 4, we observe that among manufacturing industries, large variation is in ERPs on 'vegetable oil' and 'motor vehicle', which are highly protected in both years. Among agriculture sectors, 'forestry' and 'fishing' face larger change in their protection level. While 'Fruit and vegetables' face same protection level in both years (see, Figure 5).

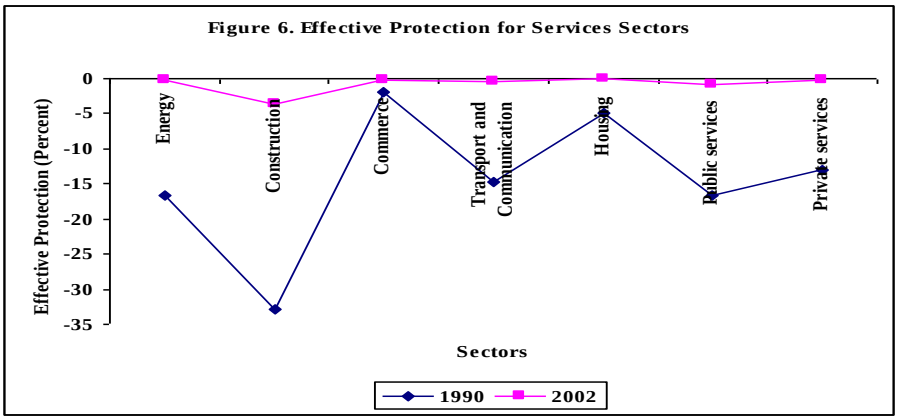
The large variation is found among the services sectors. ERP decline significantly. The prices in these sectors are moving towards the

world price level or free trade prices.

If ratio of an industry's protection over the economy average is used, agriculture reaps less premium than industry. Consumers of these commodities gain while their producers lose. Despite increase in NRPs on agriculture, effective protection has declined from 20.9% to 16.9% between 1990 and 2002. Average ERPs on agriculture commodities remains lower than in manufacturing [Table 4]. ERP for mining was negative in 1990s but increase marginally above zero—0.01 percent in 2002. The industries with negative ERPs imply that these industries are not only unprotected but also looser by the existing trade regime.







Absolute protection level and structure of protection affect resources allocation play a dominant role in forming structure of production, investment, and trade. Tables 2 and 3 indicate a large difference in incentives provided through NRPs and ERPs not only across the industries—agriculture, industry, and services but also within the industries. With such a structure of protection, investments tend to go away from unprotected sectors (agriculture and services) towards protected sector (industry). It hurts the poor segment of population as majority of them are engaged in agriculture activities (51 percent and 42 percent in 1990 and 2002, respectively)[20]. In this sense, trade liberalization is expected to be beneficial for the poor especially in rural areas and for women [see, Siddiqui, 2008, Siddiqui, 2009]. Results show that nominal as well as effective protection to industries has significantly declined between two bench mark years—1990 and 2002 (see, Table 5).

While status of services sectors improves as negative protection to services sectors has reduced from (-16.1) to (-0.8) percent in absolute term. Improved conditions of services sectors can be viewed from investment and production side. Investment in services sectors has doubled from Rs.4143 million to Rs.8340 million and its value added share has increased from 48.7 to 52.7 percent between 1990 and 2002, respectively. While agriculture and industrial sectors shares have declined (see, Table 5). Agriculture and Industrial shares have declined from 25.8 percent and 25.5 percent to 24.4 percent and 22.9 percent between 1990 and 2002.

[20] The number increases if one uses new definition of employed persons.

Structure of protection also affects structure of imports and exports. Between two benchmark years imports share of final goods in total imports has declined from 52 percent to 39 percent but imports share of industrial raw material for capital goods and consumer goods has increased from 48 to 61 percent. Like global trade, structure of protection shifts trade structure in favour of trade in intermediate goods that is an indication of industrialization in the country. Conversely, exports of manufactured goods (final goods) has increased from 56 percent to 75 percent and exports of primary goods and semi-manufactured goods has declined from 44 percent to 25 percent. Both the changes in structure of imports and exports reveal that structure of protection in Pakistan has promoted industrialization process in the country. However, in depth analysis of the issue requires general equilibrium frame work.

A comparison of the results of this study with the results of the earlier studies reveals the change in structure of protection over time. Though these studies differ in terms of computation method, data sets, aggregation schemes, and prices used. But the results, to some extent, can be compared in terms of direction of change and trend. Table 6 shows that ERP for Pakistan has declined from 271 to 66 percent between 1963-64 and 1980-81. Over the same period, average ERP for finished goods and capital goods have declined but ERP for intermediate goods has increased from 88 to 235 percent. The results of this study show that both, simple average and weighted average of ERPs for manufacturing industries has declined from 86.5 per cent to 69.1 per cent and 46.6 percent to 29.3 percent, respectively, over the next twelve years. Over the same period, ERP on finished goods has increased due to decline in ERP for intermediate goods from 31.9 percent to 21.5 percent. A comparison of ERPs for auto industry shows that ERP increased from 292 to 302.8 between 1963-64 and 1989-90 and has declined during the next twelve years to 100.8 percent. ERP for investment goods has also declined from 129.8 percent to 55.2 percent. The results are sensitive to extreme cases. If we exclude motor vehicles value from investment goods, average ERP reduces to 43.3 percent and to 32.45 percent in 1990 and 2002, respectively. Therefore, these results can be used as suggestive not definitive.

Table 5. Structure of Protection and Economy (per cent)

	Nominal Protection		*Effective Protection*		*Investment mln of Rs*		*Value Added*	
	1989-90	2001-02	1989-90	2001-02	1989-90	2001-02	1989-90	2001-02
Agriculture	6.9	11.8	20.9	16.9	8832	7383.	25.8	24.4
Industry	25.7	4.7	46.6	29.3	12184	15644	25.5	22.9
Services	0	0	-16.1	-0.8	4143	8340	48.7	52.7

	Import Shares by Economic Classification				Export Share by Economic Classification			
	Capital Goods	Raw material for Capital and Consumer Goods	Consumer Goods	Total	Primary Commodities	Semi Manufactured	Manufactured	Total
1989-90	33	48	19	100	20	24	56	100
2001-02	28	61	11	100	11	14	75	100

Table 6. Effective Rates of Protection for Manufacturing Sectors of Pakistan in Historical Perspective*

Average	*1963/4*	*1968/9*	*1980/1*	*1989/90***	*2001/02***
Finished Goods	883	179	26	50.7	70.0
Intermediate Goods	88	61	235	31.9	21.5
Capital Goods	155	58	69	129.8(43.3)@	55.2 (32.45)@
Motor Vehicles	292*			302.8	100.8
All Goods	271	125	66	86.5(46.6[a])	69.1(29.3[a])

Sources: Dorosh and Alberto (1990), Table 3 on pp 19. ** Estimates for Manufacturing Industries from this study. @ Values in the brackets are average excluding motor vehicles. a. Values in the brackets are weighted average.

A comparison of the results with the results of Diakantoni and Hubert (2012) for ten developed and developing countries shows that the range of degree of protection on industries of Pakistan is broader than in developing countries and also broader than that in developed countries. Table 7 shows 25.7 percent sectors in developing countries and 8.3 percent in developed countries benefit from tariff schedules in agriculture (where, ERP is higher than their nominal protection). In case of Pakistan, agriculture sectors enjoy the benefit of effective protection was 66.7 percent in 1990 which reduced to 33.3 percent in 2002. Relative loser are the sectors where ERP is less than the NRP and net loser are those sectors where ERP is less than zero.

In case of Pakistan, the table shows that share of agriculture sectors where ERP is less than NRP has remained constant over 1990-2002, 33.3 percent. But the share of agriculture sectors facing negative protection has increased to 33.3 percent between 1990 and 2002. Table 7 shows that tariff schedule not only remains biased against agriculture, but over time the situation has worsened. However, the results are sensitive to level of aggregation. The structure of protection for manufacturing sectors has also changed over time.[21] The results show that 66.7 percent of manufacturing industries producing final consumer goods enjoys the benefits of tariff schedule in 1990, which has declined to 55.6

[21] Though results at the disaggregated (4 digit or 2 digit level on the basis of SITC) level may reveal the structure change within the group.

percent in 2002. The share of manufacturing industries where ERPs are less than NRP was 22.2 percent in 1990 which was eliminated in 2002. However, the share of manufacturing industries where ERPs are less than zero has increased from 11.1 percent to 44.4 percent (net looser). Table shows that a larger proportion of industries (both agriculture and industries) producing intermediate goods face negative protection in Pakistan compared to both in developed and developing countries i.e., 45.5 and 63.6 percent in 1990 and 2002, respectively. While these number are 30.1 for developing countries and 12 percent for developed countries. The results are sensitive to aggregation scheme. We have estimated ERP at a very aggregate level. There is a need to compute ERP with same disaggregated schemes to get picture close to reality.

(iv) Correlation between NRP, ERP and Other Characteristics of Industries

This section explores the links between incentives for domestic producers with some characteristics of an industry such as labour intensity, export orientation and revealed comparative advantage (RCA), etc., by calculating correlation coefficients.

Table 8 shows that there is a strong association between nominal and effective protection at the national level—0.69 at the national level, the relationship between NRPs/ERPs with the export orientation, levels of labour intensity and RCA is negative as expected. Because, in a labour intensive country, labour intensive sector has comparative advantage and those sectors needs less protection. The country exports commodities where it has comparative advantage and employ more abundant factor—Labour in case of Pakistan. Similarly, if a country has comparative advantage in a commodity then tariff becomes redundant. This finding is consistent as Pakistan has comparative advantage in the sectors which are labour intensive.

At the sectoral level the association between NRPs and ERPs decreases from agriculture to industry from 0.98 to 0.69. Although the association of NRP and ERP with labour intensity, export orientation and RCA is negative at the economy level, but results deviate at the sectoral level. A positive association between protection and revealed comparat-

ive advantage and the relationship between ERP and export orientation in agriculture are not consistent with expectation. However, value is very small. Because majority of exports from Pakistan are not of agricultural commodities but agro based industrial exportable commodities such as textile and rice (milled grain). Another counter intuitive result is positive association between NRP and labour intensity in industry. These are few areas which need further research.

5. CONCLUSION

The study investigates nature and structure of NRPs and ERPs using I-O table from SAM 1990 and 2002 based on the assumption that only tariff barriers to imports prevails in the economy. The result shows that both the nominal and the effective protection vary by type of industries. It benefits more to manufacturing industries than agriculture and services sector. However, equal protection to all sectors could not be implemented as resource constraint may not allow to expand all sectors at the same time. There is a need to prioritize sectors for investment purposes. ERP does this very efficiently.

The study reports a decrease in NRPs from 1990 to 2002 reflecting the effect of lower tariff in 2002. While decrease in ERPs reflect the effect of both change in interconnectivity with industries (change in technology)[22] and change in NPRs. Majority of industrial sectors are highly protected by existing government trade policies in both years. On average, nominal as well as effective rates of protection are higher for industry than for agriculture. Overall results show manufacturing sector enjoyed the highest protection followed by agriculture. Many manufacturing industries have very high NRP and ERPs, particularly motor vehicle industry, which is capital intensive and expected to affect more to rich. The industries that produce consumer goods come next, which are largely protected. Producers of these commodities gain, while consumer lose. This is expected to hurt the poor segment of population more as food has larger share in their budget.

[22] Here, we assume fixed technology.

Table 7. Sectors share by level of ERP Relative to NRP (%)*

	ERP>NRP			*ERP<NRP*			*ERP<0*			
	Developing	Developed	Total	Developing	Developed	Total	Developing	Developed	Total	All Sectors
Agriculture	25.7	8.3	34.0	32.4	8.3	40.7	19.4	5.9	25.3	100.0
Manufacturing	45.7	11.5	57.3	19.5	7.1	26.6	11.0	5.1	16.1	100.0
Raw material	6.6	0.0	6.6	38.3	13.1	51.4	30.1	12.0	42.1	100.0
Total	38.9	9.9	48.8	23.3	7.9	31.2	14.1	5.9	20.0	100.0
Pakistan	1990	2002		1990	2002		1990	2002		
Agriculture**	66.7	33.3	0	33.3	33.3	0	0	33.3	0	100
Manufacturing**	66.7	55.6		22.2	0		11.1	44.4	0	100
Intermediate***	18.2	27.3		36.4	9.1		45.5	63.6		100

* Percentage of sectors for developed and developing countries are calculated based on information in Diakantoni and Hubert (2012).

** these include final consumer goods only . *** Intermediate goods from both agriculture and manufacturing sectors.

Another indirect conclusion can be drawn from the results is that the large gap between ERPs of agriculture, industries, and services disfavour agriculture and services sectors. That may widen the rural-urban gap. Agriculture crop sectors (which provide intermediate inputs to export oriented industries) and services sectors suffer from negative protection in 1990 that significantly reduced in 2002. Agriculture non-crop sector are highly protected but protection to these sectors are redundant. ERPs for these sectors overestimate the actual protection. In 2002, government eliminated tariff on all non-crop sectors but 'Fruit and Vegetable' and 'Live Stock'. Except these two sectors, all agriculture sectors suffer from negative protection form input channel.

The reduction in ERPs is strong among manufacturing where intermediate inputs suffered from negative protection (milled grain) but effect has reduced between 1990 and 2002. Reduction in negative values indicates that price of agriculture commodities move toward world price. This indicates increase in cost of production in the sectors where they are intensively used. Decline in ERPs of industrial sectors indicate trade policies seem to be export led in 2002.

In brief, trade polices seem to reduce rent seeking activities (as measured by ERPs) indicating more open trade regime in Pakistan in 2002. ERP greatly reduced for 'motor vehicles' due to reduction in tariff on its imports. It is also reduced in labour intensive activity agriculture sectors and manufacturing 'textile and clothing' sector. The decrease in protection level for these sectors can largely be attributed to decrease in nominal protection on final goods, where nominal tariff was redundant. Government impose tariff for the sake revenue generation purposes.

NRPs have also reduced on intermediate goods 'Petroleum', 'Chemicals', and 'other manufacturing', 'Cement', etc. Drop in NRP on intermediate inputs implies drop in cost of production. The sectors which have stronger connectivity with these sectors benefit more. Reduction in tariff benefits these sectors. Review of structure of trade and production reveals that structure of protection in Pakistan has promoted trade in intermediate goods that is an indication of industrialization. This implies that Pakistan government has achieved the target to protect its industry through tariff. With the shift from trade in final goods to trade in intermediate good, the role of ERPs becomes more important to measure

protection to value added. The availability of two I/O tables allows us a deeper analysis of protection using trade policy and interconnectivity. The analysis reveals that the factors responsible for the change in protection level – change in structure of tariff.

Table 8. Correlation Matrix (%)

Economy	**NRP**	**ERP**
ERP	0.69	1.00
Export/Out Put	-0.09	-0.08
Labour/Value Added	-0.29	-0.24
RCA	-0.01	-0.18
Agriculture		
ERP	0.98	1.00
Export/Out Put	-0.01	0.06
Labour/Value Added	-0.38	-0.46
RCA	0.34	0.39
Industry		
ERP	0.69	1.00
Export/Out Put	-0.14	-0.14
Labour/Value Added	0.23	-0.03
RCA	-0.07	-0.17

Note: RCA= Revealed comparative Advantage

Correlation coefficient matrix reveals a link between effective protection and industry's characteristics. At economy level, high correlation exists between ERP and NRP, both are negatively associated with labour intensity, export orientation and RCA at the national level. However, at the sectoral level some results are not consistent with expectation. We leave this area to be explored in future by researchers.

The studies using I-O table under the assumption of separable production function renders unbiased results and can be used to predict direction of change in resource allocation, value added, and production, which can be used by policy makers to prioritize sectors for investment. The key contribution of this study is that the results of ERP for two years 1990 and 2002 are comparable. They are based on I-O table with same production and tariff aggregation schemes and are computed in same analytical framework. However, more studies are needed to compute EPR with same aggregation schemes with most recent data to set up an effective policy framework. But on the basis of this research we recommend that:

1. Bias against exportable should be reduced to reap more benefit instead of penalizing them. For instance 'Milled grain', contains 'Rice' which is second largest export from Pakistan. It is negatively affected by existing tariff structure. There is a need to formulate a policy which brings negative ERPs values equal to zero to eliminate bias. Tariff on their inputs should be reduced.
2. The sectors where larger proportion of low tariff imports are used as intermediate goods in production and also have higher returns that sector should be apriority sector for investment. See ranking of the industries by ERP in Appendix 2—Table 1.
3. It is recommended that tariff should be reduced on the sectors which have larger connectivity such as 'chemicals', 'other manufacturing' and 'petroleum' to foster industrialization process. It will benefit more sectors than any other sector.
4. Majority of agriculture sectors are negative protected, where unskilled wage labour is engaged. They bear the cost of negative protection in terms of low wages. There is need to remove this bias. Reduce tariff on the inputs such as chemical—fertilizer.

The spirit of ERP lies in the fact that how they affect not only trade and production but also other micro and macro aspects of an economy, i.e., consumption, welfare, poverty, etc. To quantify the effects on all dimensions of the economy including welfare and poverty simultaneously, CGE model should be used.

APPENDICES

Appendix 1.

Sectors: Federal Bureau of Statistics (FBS) has constructed Supply and Use Table for 1990 with 86 sectors. While Dorosh, *et al.* (2006) constructed SAM-2002 with 34 sectors of production. These sectors are classified under major head of agriculture, industry and services. Sectors are aggregated with same classification for two bench mark years, 1990 and 2002 to have comparable estimates. The detail of sector aggregation is given in Table 1.

Table 1. Classification of Sectors*

No	Sectors	SAM Activity Code		I/O-1991 Serial number	National Account Sectors
1	Wheat irrigated	A-WHTI	A1a-A1b	2	Major Crops
2	Rice	A-PADI+PADB	A2-A3	1	Major Crops
3	Cotton	A-COTT	A4	3	Major Crops
4	Sugar cane	A-CANE	A5	4	Major Crops
5	Other major crops	A-OCRP	A6	5-8, 12, 13	Major Crops
6	Fruits/vegetables	A-HORT	A7	9, 10, 11	Minor Crops
7	Poultry	A-CATT + Poultry	A8-A9	14	Livestock +Poultry
8	Forestry	A-FOR	A10	15	Forestry
9	Fishing	A-FISH	A11	16	Fishing
10	Mining	A-MINE	A12	17, 18, 19	Mining
11	Vegetable oils	A-VEGO	A13	21	Manufacturing
12	Grain Milled	A-WHTF + RiceI + RiceB	A14-A16	22, 23	Manufacturing
13	Sugar	A-SUG	A17	24	Manufacturing
14	Other food	A-OTHF	A18	25-27	Manufacturing
15	Lint, yarn	A-YARN	A19	28,29	Manufacturing
16	Textiles	A-TEXT	A20	30-36	Manufacturing
17	Leather	A-LEAT	A21	37, 38	Manufacturing
18	Wood	A-WOOD	A22	39-40	Manufacturing
19	Chemicals	A-CHEM	A23	41-43	Manufacturing
20	Cement, bricks	A-CEM	A24	48-49	Manufacturing
21	Petroleum refining	A-PETR	A25		Manufacturing
22	Other manufacturing**	A-MANF	A26	44-47, 50-60	Manufacturing
23	Energy	A-ENRG	A27	61,63 (62)	Electricity and Gas
24	Construction	A-CONS	A28	64	Construction
25	Commerce	A-TRAD	A29	73-74	Wholesale and Retail Trade
26	Transport	A-TRNS	A30	76-81	Transport and Communic.
27	Housing	A-HSNG	A31	87,88	Ownership of Dwell
28	Private services	A-PRISV	A32	82-86, 89, 92, 94, 96, 97	Services, Finance, Insurance and Banks
29	Public services	A-PUBS	A33	90	Public Administration and Defense

* For Further details see Pakistan (1996) and Dorosh, *et al.* (2004). **This sector is further disaggregated into two sectors: 'Motor Vehicles' and 'Other Manufacturing' for both years 1990 and 2002. See main text for further details.

Appendix 2.

Table 1: Rank Sector by Effective Rate Protection

Sector	*ERPs*				
	1990	Rank		2002	Rank
Fishing	99.7	1.0	Fruit and Vegetable	40.5	1
Forestry	69.6	2.0	Live Stock	1.3	2
Fruit and Vegetable	43.2	3.0	Forestry	-0.2	3
Other major crops	1.4	4.0	Other major crops	-0.5	4
Live Stock	-2.9	5.0	Fishing	-1.1	5
Sugar cane	-10.9	6.0	Sugar cane	-1.4	6
Rice	-15.1	7.0	Rice	-1.6	7
Cotton	-17.5	8.0	Wheat	-2.5	8
Wheat	-21.1	9.0	Cotton	-2.6	9
Agriculture	**20.9**		**Agriculture**	**16.9**	
Mining	-0.01		Mining	0.01	
Motor Vehicles	302.9	1	Vegetable Oil	468.5	1
Vegetable Oil	211.0	2	Other manufacturing	129.9	2
Textile	103.0	3	Motor Vehicles	100.8	3
Other manufacturing	60.4	4	Textile	45.9	4
Wood	57.8	5	Refined Petroleum	36.7	5
Sugar	42.4	6	Leather	33.3	6
Chemicals	33.0	7	Chemicals	20.0	7
Cement	26.3	8	other food	17.1	8
Leather	23.6	9	Sugar	-0.5	9
other food	16.9	10	Wood	-0.9	10
Refined Petroleum	2.6	11	Milled Grain	-1.2	11
Lint Yarn	1.9	12	Lint Yarn	-1.9	12
Milled Grain	-51.1	13	Cement	-65.0	13
Manufacturing	**46.6**		**Manufacturing**	**29.3**	
Commerce	-1.9	1	Housing	-0.1	**1**
Housing	-4.9	2	Energy	-0.2	2
Private services	-13.0	3	Commerce	-0.3	**3**
Transport and Communication	-14.7	4	Private services	-0.3	4
Energy	-16.6	5	Transport and Communication	-0.5	**5**
Public services	-16.7	6	Public services	-0.8	6
Construction	-32.8	7	Construction	-3.7	**7**
Services	**-16.1**		**Services**	**-0.8**	
Total	**42.5**		**Total**	**27.4**	

Appendix 3.

Effective Rate of Protection in Historical Perspectives.

During twentieth century, the concept of ERP was formally developed in a well-defined theoretical framework. Since then a large number of studies have been published on the subject. These studies can be categorized into two groups: theoretical and empirical, which have been discussed briefly in the next two subsections.

a. Theoretical Development

The concept of protection is not very old, it goes back to the work of Travis in 1952 and Barber and Meads, in 1955 who had discussed protection with respect to both tariff on inputs and tariff on outputs. But the concept under the theory of Effective Rate of Protection (ERP) is formally developed in sixties by Harry G. Johnson, Bela Balassa, Basevi, Stephen Guisinger, Stephen Lewis and Max Corden. They stress the need of an analytical framework to compute ERP index taking into account tariff on both input and output which can be used by policy makers for their development strategy.

Initially, theory of ERP is developed on the basis of following assumptions; Production function is separable—output function of primary factors and intermediate are separable —linear homogenous—Leonteif technology between inputs and outputs, elasticity of demand for imports and supply of exports are infinite (small country assumption), $P^D = P^W + T$[23], where P^D and P^W are domestic and world prices, respectively, and T is a measure of trade restriction, labour and capital are immobile internationally.

In the literature two definitions[24] of ERP are defined as:

1. The Corden-Anderson-Naya definition: Proportionate increase in value added per unit level of an activity (output) due to tariff over free trade value.
2. Corden-Leith: proportionate change (due to tariff) in price of value added.[25]

Though ERP based on above mentioned two definitions differs,

[23] Assuming there is no other restriction on imports except tariff.

[24] Bhagwati and Srinavasan (1983).

[25] If production function describing output Q as a function of primary factors and intermediate are separable and function combining primary factors is concave and homogenous of degree one. Then results for price and quantity are meaningful.

but under the assumption that production is separable and fixed coefficient technology, both definitions render same results (Corden, 1966). The proponent of General Equilibrium Theory agrees that if changes in coefficient a_j are ignored the two definition coincides (Khang, 1973; Ray, 1973; Jones 1971).[26] If production function is not separable, ERP index does not represent proportionate change in price of value added but still can be used to predict the direction of the change but not proportionate change in the quantity of value added. Assuming that intermediate inputs are used in fixed coefficients (a_{ij}) (Leontief technology), no substitution between intermediate inputs and primary factors the effective rate of protection of sector *i*, is measured as follows

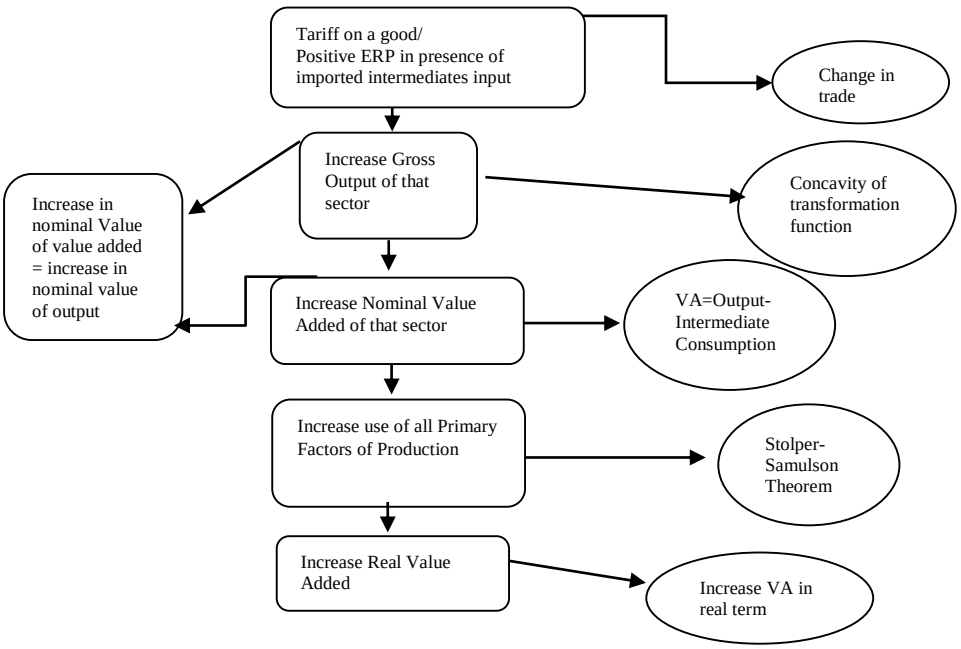
$$ERP_i = \frac{P_{wi}(1+t_i) - \sum_j P_{wi}(1+t_j) * a_{ij}}{P_{wi} - \sum_j P_{wj} * a_{ij}} - 1$$

The formula is derived based on classical open economy model. It measures relative difference between value added at domestic prices and value added at world prices per unit of free trade value added. The weights are calculated from Input output table—intermediate use of commodity in production—a_{ij}.

The theory of ERP describes effective protection in several alternatives ways. For example: "Corden (1966), Jones (1971), quantify effects of ERP on gross output, Khang (1973) measures the effect of Effective protection in terms of real value added, while Bruno (1973) discusses the effects of protection in terms of gross output, real value added and resource movements [Bhagwati and Srinavasan (1973)]. Bhagwati and Srinavasan also point out the impossibility theorem proposed by Ramaswami and Bhagwati the relationship between ERP and Value added may not be valid in case of more than two commodities, production function not separable. However, all the above mentioned effects are inter-related under the assumption fixed coefficient technology and separable production function (see, Figure 1).

[26] If production function is not separable, ERP index does not represent proportionate change in price of value added but can be used to predict the direction of the change but not proportionate change in the quantity of value added.

Figure 1: ERP/NRP and changes in Value Added and Output.



This work is not free of critiques. Jones (1971), Bruno (1973), Khang (1973) Bhagwati and Srinavasan (1973) challenge the utility of concept. The main difference in ERP developed by Balassa and by Corden lies in the treatment of value added of non-traded goods. Fixed technology assumption is also criticized. However, in the short run the assumption of fixed coefficient (Leontief Technology) is valid while in the long run it may not. The assumption of fixed technology is valid as far as we believe that there is no substitution between intermediate input and VA (Labour and capital).[27] Improvement in technology reduces ERP because of substitution and scale effect. In Bhagwati and Srinavasan (1983), it is documented that in Ramaswami and Srinavasan address impossibility theorem to the prediction of gross output and primary factor movement in the absence of assumption that production function is separable and in presence of more than two commodities. The treatment of non-competitive imports where tariff on these import is for revenue generation purposes is also a controversial issue. The difficulties

[27] Assuming capital is an imported good but not used as intermediate good. It is investment good and fixed in I-O table for that particular year.

in calculating ERP on the basis of group of commodities are also associated with computation of prices associated with group of commodities. The data on price are not available by commodity groups. Instead actual price difference we take nominal tariff as a measure of price differential. In addition, depreciation, tariff exempted imports, domestic sale and foreign sale (quality difference), separability assumption aggregation schemes are the issues which are largely debated in the literature. However, Bhagwati and Srinavasan (1973) pointed out that under the assumption that production function is separable, and fixed technology prevails, ERP theory work in a similar way as the theory of nominal tariff work (see, Figure 1). ERP is a weighted average of proportionate increase in prices of input and outputs. Weighted average of the change in the quantities of value added is predicted by ERP. Ethier (1977), points out that ERP is general equilibrium Phenomen, it should be calculated in general equilibrium frame work instead of partial Equilibrium.

ERP calculated on the basis of I-O table has an advantage over EPR calculated in partial equilibrium frame work. They are unbiased outcome of net economic impact of nominal tariff on productive sectors (Diakantoni and Hubert, 2012). It is also a good indicator of transfer of income from one sector to other sector of the economy. The fixed coefficient assumption valid in short run. In the long run, substitution and scale effects reduce effectiveness of ERPs but do not eliminate. Antonia and Hubert (2012) have pointed out that I-O table is constructed for a point in time for a normal year. It is an outcome of resources and technology which do not change within a given year as they are end result of all substitutions effects due to changes in price and tariff structure. Thus majority of studies have used I-O table because of its simplicity and accuracy. They are synthetic and unbiased outcome of net economic impact of nominal tariff on the productive sectors.[28] These estimates are widely used by policy makers in investment planning. Therefore, we us I-O table in this study.

[28] However with the development computer soft wares to solve CGE, it is commonly practice to use CGE model to measure all micro and micro effects of Tariff on inputs and outputs, which takes into account both scale effect and substitution effect.

Antimiani (2004) documents two methods introduced by Corden and Anderson –DERP and OERP. Corden compute *Distributive Effective Rates of Protection* to find a uniform tariff on all goods produced by distorted sectors that is equivalent to that of initial tariff structure. While Anderson define OERP as the uniform tariff which has impact on profit similar to the impact of initial tariff structure. Anderson found that both methods provide same results. However, the methods are sensitive to underlying assumptions Antimiani (2004) drops small country assumption and found difference in the results.

With the development of computer software, CGE model are commonly used for trade policy analysis. In general equilibrium model, price of value added serve as effective protection which predict change in real value added in different sectors of the economy. From perspective of national accounts, value added is traded so it is ERP, not tariff, which measure trade distortions. High ERP indicate anti export bias as the cost of the value added of a sector is greater than the international cost producing same quantity of VA.

Review of Empirical Studies

Despite all the difficulties mentioned in theoretical review, a large number of researchers as well as PhD student from all over the world conducted research focusing on this area because of its simplicity in computation and it provision of solutions to complex economic problems. In this section, we review some of these empirical studies with a focus on results related to ERPs.

Diakantoni and Hubert (2012) compute ERP and correlation between ERP/NRP and intermediate inputs for 10 countries (both developed and developing) for two years 1995 and 2005. They believe that in presence of the recent bilateral and multilateral agreement, tariff schedule in one country also effect tariff schedule in other country. They use Global I-O table of 64 sectors. The results show that NRP and ERP have declined between 1995 and 2005 in all countries in all sectors of the economy-agriculture, manufacturing, raw material. The negative protection over the period of ten years has increased in both developed and developing countries. Present study show that in Pakistan share of sectors facing negative protection has also increased between 1990 and 2005 (see, Table 6 in main Text of the paper). The results show

technological progress and change in domestic and external demand are main drivers of change in ERP, tariff schedule and change in structure of production in all countries. Agriculture benefited more from higher decline in applied tariff on inputs than that of on output. Reverse is true for manufacturing sectors, which reap the benefits. In the long run change in technology effects substitution and scale work in opposite direction and reduce effectiveness of ERP. Positive ERP leads to anti export bias. The results show that ERP is also a good indicator of transfer of income from one sector to the other sector of the economy. In agriculture, ERP< NP for majority of developing countries and relatively higher decline in ERP is in developing countries i.e.' Asia. Correlation coefficients between ERP/NRP and intermediate inputs[29], reveals that high nominal protection negatively affects ERP for agriculture and raw material (primary sectors) and positively to manufacturing sectors. In addition to change in tariff schedule (main director), technological progress and changes in domestic and external demands are expected to change the structure of protection. The study concludes that ERP are more important than NRP as they take into account connectivity with both: domestic sectors and foreign sectors. The results also show that for a given tariff schedule, higher the share of intermediate inputs, the lower will be the absolute protection[30] and rate of value added.[31]Net impact depends on the relative strength of the two forces.

KDA (1967), compute ERP for sectors producing physical goods for Korea. The results show that the range of protection rate is broad, highest NRP is on cigarette and tobacco, while 14 sectors are with tariff > = 100 % and 135 sectors are with tariff between 25 and 100. The study finds EPR a better tool to measure interaction between tariff structure and rest of the economy compared to nominal tariff.

Balassa and Daniel (1968) have explored the relationship between comparative advantage and rate of effective protection. The results show that after adjusting for excess profit and monopoly power of labour union, the ranking of industry based by ERP indicate their comparative

[29] The share of intermediate inputs (strength of backward linkages)
[30] => lower the value of numerator = $t_i(1-\sum a_{ij})$.
[31] Denominator $(1-\sum a_{ij})$.

advantage. Study concludes that ERPs have priority to determine the industrial desirability/profitability over cost of foreign exchange.

Topalova and Amit (2011) measure the effects of change in tariff on productivity using firm level panel data for India. The results show that tariff reduction significantly increases productivity of import competing industries. The effect of reduction in tariff on inputs is larger than that of reduction in output tariff —six times higher in presence of uniform policies for all sectors. The results also indicate that improvement in productivity is resulted from input channel—improve quality and exposure to modern technology through imported input.

Antimiani (2004) compute ERP for four regions USA, EU, Mercosur and North Africa based on two definitions: DERP and OERP proposed by Corden (1971) and Anderson (1998), respectively. He conducts three simulations with same classification for sectors, factors and actors using GTAP model. The comparison of values obtained based on DERP and OERP shows that ERP differs with the change of the methodology, and assumption. They are not correlated with each other. Ranking of the industries also change. Contrary to the results obtained by Anderson (1998) who found high correlation between the two for agriculture sector of US Economy. However the difference in results of the studies may originate from underlying assumption and difference in analytical frame work. Anderson use small country assumption and compute ERP in partial equilibrium frame work. While Antimiani (2004) drops small country assumption and use GTAP frame work.

Effective Rates of Protection for Pakistan in Historical Perspective

This part represents review of the studies contributed to the literature on ERP for Pakistan.

Soligo and Stern (1965), as far as we know, was the first study conducted in the area of effective protection for Pakistan. They calculated ERP for the year 1963-64 for 48 manufacturing industries using I-O table along with other sources of data. The results show that ERP was very high in sixties. They conclude that ERPs are high due to failure of the domestic industry to use wastes and scrap. ERP are low due to higher relative cost of non-traded inputs such as electricity and transportation are responsible. While Dorosh (1990) states that these estimates overstate the actual level of protection for the industries where tariff were

redundant and under state where other import restrictions are also binding constrains such as quota, licensing requirement etc. However these reasons may vary by sectors, which were need to be explored further.

Lewis and Guisinger (1968) compute ERP for 3 groups of commodities; consumer, capital, and intermediate using I-O Table. They incorporate not only tariff but also taxes, subsidies, quota, redundant tariff, and multiple exchange rates. They pointed out that NP can be used as a guide for ERP. In presence of non-traded goods, low protection to inputs and low value added ratio, NRP understate the actual protection to high tariff industry. Industries with high NRP can have low ERP due to high NRP on inputs. ERP are sensitive to adjustment to non-tradable input which reduce EPR for all industries. Protection to low tariff industries changes the ranking of the industries when direct price comparison is used due to quota restrictions (on intermediate and capital goods). However, after all adjustment, domestic price remains higher than international prices. They pointed out discrimination in Pakistan against agriculture. Agriculture pay/receive 57/36 percent more/less when sell/buy a good to/from an industry. The main conclusion is that government should maintain prices to make correct investment decisions.

Following Lewis and Guisinger, two studies, Kemal (1987) using secondary data for 10 industries in Punjab from –census of manufacturing industries (CMI) and Kemal, *et al.* (1994) using primary survey data collected by PIDE, were conducted during the last quarter of twentieth century at the Pakistan Institute of Development Economics. Here we briefly discuss the results of Kemal, *et al.* (1994). They calculated ERPs using a micro level primary data for 961 firms for 70 industries for the year 1992-93 from all provinces of Pakistan. They employ three methods to compute ERPs using actual prices.[32] The results show 11 industries have negative protection and 39 industries enjoy high protection. At the provincial level, Balochistan enjoys the highest protection and Sindh the least. The results show that import competing industries are more efficient. But the results change with the change of

[32] For detail see Kemal, *et al.* (1994).

aggregation scheme, i.e., exclusion of cigarette from the analysis show that export oriented industries are most efficient [Dorosh (1990)].

Din et al (2007) compute ERP for 39 manufacturing industries using data from I-O table for 2001 for Pakistan and Corden's analytical frame work. The results show that 18 industries enjoy protection above average level –27.8 percent. They recommend to reduce ERP to the range of 5 to 10 percent in 3-5 years through price reform accompanied by policies to boost investment, competitive exchange rate and improve technology.

From the above mentioned theoretical and empirical review, we summarize a number of dimensions, which still need to be explored to formulate an optimal policy for Pakistan.

1. A more disaggregated analysis as aggregation change the results significantly if commodities are aggregated in such a way that contains extreme values.
2. To determine Pakistan's position in comparative advantage ranking, there is a need to analyze protection across the countries (with same/different trade policies).
3. Contribution of change in nominal protection, change in technology, and change in structure of production to total change in ERP.

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