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**TRADE LIBERALIZATION AND INDUSTRIAL PRODUCTIVITY: AN
ASSESSMENT OF DEVELOPING COUNTRY EXPERIENCES**

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Foreword

This paper by Deb Kusum Das explores the relationship between trade liberalization and industrial productivity in developing countries, drawing upon a large number of studies in Latin America, Africa and Asia. It is based on the author's Ph.D dissertation "Some Aspects of Productivity Growth and Trade in Indian Industry" which has been submitted to the University of Delhi. Beginning with a discussion of an appropriate measure of trade liberalization, the paper reviews the relationship between trade liberalization and industrial productivity at different levels of disaggregation.

By and large, there is evidence of a positive relationship between trade liberalization and productivity growth in the industrial sectors of the economies of Latin America, Africa and Asia. However, the author suggests need for caution in interpreting framework. More empirical work is being undertaken at ICRIER to explore the impact of trade liberalization on productivity in India. Studies such as the present one by Debkusum Das are very important in providing an international perspective on this very important subject.

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I Introduction*

The debate on the relationship between trade policy and economic performance attained new heights in the 1980s due to several factors, such as third world debt crises, reforms in the East European transition economies, the success of East Asian countries. Neoclassical growth models assume that technological change is exogenous, unaffected by a country's trade policy [Solow (1957), among others]. New growth theories assume that technological change is endogenous.¹ Several studies have attempted empirical tests of the effects of openness on economic growth [Dollar (1992), Wha-Lee (1993), Sachs and Warner (1995), Harrison (1996), Jin (2000) and Greenaway *et. al* (2002)]. The impact of openness on productivity growth has been explored in two recent studies [Edwards (1998) and Milner and Upadhyay (2000)]. Despite the voluminous empirical literature, the relationship between openness and economic growth remains highly contentious.²

It is important to examine the trade-productivity link at the disaggregated level, given that much of the controversy centers on the macro analysis of trade- growth linkages. Further literature on production and aggregation tell us that there are several important conceptual and empirical advantages to focus on TFP growth at the disaggregated level. The nature of the trade regime has implications for growth in industrial productivity. There are many arguments explaining why more open trade regimes lead to productivity improvements in the industrial sector. Perhaps the most basic is that returns to entrepreneurial effort increase as exposure to foreign competition rises [Corden (1974), Martin and Page (1983) and Tybout (1992)]. A second argument is that increasing returns to scale imply lower costs per unit as output increases [Pack (1988) and Tybout (1992)]. Finally, greater openness may accelerate adoption of technological innovations originating in industrial countries leading to more investment in product development. There has however been no clear confirmation of the hypothesis that countries with an outward orientation benefit from greater growth in productivity in the component sectors of manufacturing. When combined with the small static costs of protection, this finding leaves those with a predilection towards a neutral trade regime in a quandary. Further, a conducive macroeconomic environment is also a necessary ingredient to establish the linkage between openness and productivity growth.

The paper reviews the literature on the impact of trade liberalization on productivity growth for developing countries. In particular, we focus on countries from

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¹ The "new" theories of growth pioneered by Romer (1986), Lucas (1988) have provided persuasive intellectual support for the proposition that openness affects growth positively. Romer (1992), Grossman and Helpman (1992) and Barro and Sala-I-Martin (1995), among others have argued that countries that are more open to the rest of the world have a greater ability to absorb technological advances.

² Rodriguez and Rodrik (1999) undertake an extensive critical appraisal of the literature covering the studies by Dollar (1992), Sachs and Warner (1995), Edwards (1998) and Ben David (1993). The authors conclude that the evidence is not convincing. Also see Srinivasan and Bhagwati (1999).

three regions: Latin America, Africa and Asia. In this review, we encompass not only on the empirical evidence, but also on the theoretical arguments and econometric methodologies to assess the role of trade policy reforms in bringing about productivity improvements for the industrial sector. The plan of the paper is as follows. Section 2 explores the theoretical arguments dealing with the impact of trade liberalization on industrial productivity growth. The measures of openness and trade orientation are reviewed in section 3. The empirical evidence on the impact of trade liberalization on industrial productivity for developing countries in three regions (Latin America, Africa and Asia) is reviewed in section 4. An assessment of the evidence is provided in section 5 and the final section concludes the paper. The appendix tables A1, A2 and A3 give certain useful classification of the reviewed empirical studies.

2. Trade Liberalization and Industrial Productivity: Theoretical Arguments

The theoretical foundations of the long run linkages between trade and growth have always been fragile. According to the standard neo-classical growth model, government policies cannot affect the steady state, and the “engine of growth” is exogenous technological progress. Thus the differences in trade regimes are not linked with variations in long term growth. The emergence of the “new growth” theories in the late 1980s provided a rigorous analytical framework within which trade liberalization can be linked with economic growth. In particular, Grossman and Helpman (1992) argue that technological change can be influenced by a country’s openness to trade. Openness to trade provides access to imported inputs, which embody new technology and increases the size of the markets facing producers which in turn raises returns to innovation and affects a country’s specialization in research intensive production. Thus a country’s openness leads to improvements in domestic technology; helps the production process become more efficient and culminates in productivity improvements.

The proponents of a neutral trade regime predict gains in manufacturing productivity from outward looking trade policies. Outward trade orientation brings about familiarity with new technologies induces greater capacity utilization as well as scale benefits via production for export markets and brings about international competition. These in turn are expected to result in productivity improvements in the industrial sector. A number of theoretical arguments linking trade liberalization with higher rate of industrial productivity growth can be put down. These are (1) those that affect productivity growth via scale benefits arising from correcting the domestic-relative price ratio in favor of the comparatively advantaged sectors. (2) Those, which help improve productivity via the reduction in managerial slackness due to competition and (3) those that allow imports embodying superior technology to improve productivity.

A restricted trade regime leads to a resource mis-allocation by altering the domestic relative-price ratio in favor of the comparatively disadvantaged sector [Rodrik

(1995)].³ Trade liberalization aims at correcting the domestic relative price ratio so that resources flow to the exportable sector⁴. Further, the lowering of controls on exports allows firms and industries to target the export markets and overcome under utilization of capacities, if any, due to deficient demand at home. The net result of this is to allow the producers to reap the benefits of scale and thus make it possible to reduce costs. This is supposed to affect productivity growth positively. However analytical scrutiny has shown that scale economies can cut both ways [Krugman (1986); Rodrik (1992a); Roberts and Tybout (1991)]. When domestic firms have market power extra competition from foreign producers can force producers to expand or exit. But the net effect of trade liberalization on productivity depends upon the specifics of demand shift that accompany liberalization, ease of entry or exit and the nature of competition.

Productivity gains could be realized also via reductions in X-inefficiency. This is interpreted as some kind of managerial slack and the popular argument is that the return to entrepreneurial effort increases with exposure to foreign competition. According to Nishimizu and Robinson (1984), there is an implicit “Challenge-Response” mechanism induced by competition from trade reforms. This argument assumes that there is a satisficing and not optimizing behavior on part of the firms as regards the business objective. This is due to insufficient competitive pressure prevailing in a regime closed to foreign trade. Rodrik (1992a) has pointed out that it is possible to argue analytically that a protected market, by ensuring a larger market share for the domestic producers, will make it worth while to invest in productivity enhancing technology. Further, Corden (1974) points out that a theoretically sound statement of this case must presuppose a backward bending supply curve of managerial effort i.e. the income effect dominates the substitution effect in the profit-leisure trade-off for managers.⁵

Finally, the integration of the world economy is seen as having important influence on the pace and direction of technical change. The new literature on endogenous growth links trade openness with innovation and growth. Grossman and Helpman (1991), consider how trade and industrial policies affect the long-run rates of innovation and growth. Trade liberalization also enables cheaper and easier access to foreign technologies and global capital and makes possible greater international exchange of information. Lowering of trade restrictions makes possible the import of capital and intermediate goods which embody superior technology and this helps in reducing costs and also in turn increasing productivity growth in the sector which uses this product. Rodrik (1992a) has shown that domestic firms’ rate of technological ‘catch-up’ is positively related to the market share. The implication is that the sectors that gain in

³ Rodrik (1995) argues that relative price distortions such as trade taxes and investment subsidies affect relative profitabilities across industries and sectors. If learning in some sectors is adversely affected by interventions, others must be left in better shape. Consequently even if changes in sectors profitabilities could be presumed to have unambiguous consequences for innovative activity, the net change in economy wide innovation would still be unpredictable.

⁴ Mukhopadhyay (2000), however, argues that despite the lifting of trade restrictions, the relative price may not move in favor of the comparatively advantaged sector.

⁵ See Rodrik (1992b) where he argues that if this is the case, X-inefficiency would be increasing in sectors with increasing incomes.

productivity are exportable sectors and the import competing sectors have a non-positive impact as far as technological change is concerned.

It can be seen from the above that trade liberalization creates the imperative for increasing productivity. Chart 1 in the appendix highlights the various links through which trade liberalization leads to productivity growth. The first link helps to control for managerial slackness and in turn bring about competition. The second relates exports to the large markets and the scale arguments for lowering costs and /or increasing productivity. The final mechanism underlines the trade-technology links.

3. Measures of Openness and Trade Orientation in the Literature

Any assessment of the impact of trade policy reforms on economic performance requires an understanding of the notion of trade liberalization. The literature on trade policy reform includes several distinct concepts of “trade liberalization”⁶ It encompasses both openness and changes in trade orientation. Openness is an economy wide measure, whereas trade-orientation is an industry specific measure. The lack of an agreed upon definition of trade liberalization makes it difficult to provide a “right” measure of openness or trade orientation, yet the question of how trade liberalization should be measured has received little attention in the past.⁷ The evidence on trade and growth includes both cross-country comparisons of trade policies and GDP growth as well as inter-industry analysis of the impact of trade liberalization on productivity growth. For both these sets of exercises, the measures of trade barriers are usually of two kinds: incidence and outcome.⁸ Table 1 lists the various measures used in cross-country regressions trying to explain the relationship between openness and economic growth. Our focus in this paper however is on the measures of trade orientation highlighted in Table 2. The detailed discussion of these measures is undertaken in section 5.1

⁶ In general, trade liberalization has been equated with becoming more “outward oriented”. Pritchett (1996) argues that this term tends to be interpreted in three broad ways. Countries may be considered more outward oriented if their trade reforms imply a move towards neutrality, liberality or openness. A move towards neutrality involves equalizing incentives, on an average, between the exporting and import-competing sectors. A more liberal regime is one where the level of intervention has been reduced. Finally, an increase in openness is equated with an increase in the importance of trade in the economy (as a percent of GDP). Harrison (1996) suggests that a good measure of trade policy ought to capture differences between neutral, inward-oriented and export-promoting regimes.

⁷ Most empirical studies on the relationship between trade and economic performance have relied upon one or two indexes and have thus left themselves open to criticism by reform skeptics. Further, Pritchett (1996) observes that various trade policy indicators are uncorrelated, thereby implying that different dimensions of trade policy may have different effects on growth.

⁸ Baldwin (1989) suggests that the incidence based measures attempt to measure trade policies by direct observation of the policy instrument. The outcome-based measures of trade policy on the other hand, assess the deviation of the actual outcome from what the outcome would have been without the trade barriers.

Table 1. Measures of Openness in Different Studies

Measure of Openness	Definition	Study(ies)
Trade Interventions	Difference between actual and predicted trade intensity	Edwards (1992)
Deviation from Actual Trade		Balassa (1985)
Trade Shares, Exports/GDP and Imports/GDP	[i]Ratio of exports and imports to GDP [ii]Ratio of exports/GDP and [iii] Ratio of imports/GDP	Quah and Rauch (1990), Harrison (1996), Miller and Upadhyay(2000) and Jin (2000)
Changes in Trade Shares	Change in export and imports/GDP	Helliwal and Chang (1991)
Trade Restrictions I and II	Annual index of trade liberalization [i]derived using information on commercial policy and exchange rate and [ii]country sources on tariffs and NTB	Harrison (1996)
Leamer's Openness Index	Ranking of deviation of trade volumes from values predicted by implementation of HOV theory	Barro(1991) Edwards(1992) Sachs and Warner (1995) Edwards (1998)
Trade Liberalization Index	An Index with value 1 for the case of highly repressed external sector and 20 when foreign trade was fully liberalized	Lopez(1990), Thomas and Nash (1992)
Sachs and Warner Openness Index	A binary index takes the value 1 if the country is considered open in a particular year and 0 if it is closed	Edwards (1998)
WOLF Index	A Regression based Index of Import distortions	Edwards (1998)
WDR Index	Classifies countries in four categories according to their perceived degree of openness	Edwards (1998)
MTIP	Relative Price of tradeables to international prices	Bhalla and Lau (1992), Harrison (1996)
Tariff	Import weighted average tariff rate	Edwards(1998), Whalee (1993)
Collected Tariff Ratio	Ratio of total revenue to taxes on international trade to total trade	Edwards (1998)
QR	Average coverage of NTB	Edwards (1998)
BLACK	Deviation of the black market rate from the official exchange rate	Harrison(1996), Edwards (1998)
Black Market Exchange Rate Premium	Average of the black market exchange rate premium	Wha-lee (1993)
Real Exchange Distortions and Variability	[i]Actual price level divided by the predicted price level and [ii] coefficient of variation in the index of price level	Dollar(1992), Harrison (1992)
HERITAGE Index	Classifies countries according to five categories according to level of tariff and other distortions	Edwards (1998)

Notes: BLACK refers to black market premium; WDR refers to World development Report index of outward orientation; MTP refers to movement towards international prices; QRs stands for quantitative restrictions

Source: Author's compilation from the review of studies

The simplest measures of trade orientation are based on actual trade flows, such as imports /GDP, exports/GDP and exports and imports as share of GDP [Balassa(1985), Quah and Rauch(1990), Helliwal and Chung (1991), Edwards (1992), Milner and Upadhyay (2000) and Jin (2000)]. Most of these measures show a positive association with GDP growth. These measures are however an imperfect proxy for trade policy. Barro (1991) and Bhalla and Lau (1992) on the other hand use price-based measures of trade policy.⁹

Some authors have also attempted to utilize information on policy to classify countries according to the degree to which trade is distorted¹⁰. In particular, Sachs and Warner (1995), World Development Report Index (1987), Trade Liberalization Index [Thomas et al (1991)], Heritage Foundation Index (1996) undertake a subjective assessment of trade policy stance. Some analysts have tried to use the observed values of the variables associated with trade restrictions- tariff averages, QR averages, collected tariff ratios [Whalee (1993), Edwards (1998)]. In addition, some studies have argued that the black market premium for foreign exchange is a good proxy for the overall degree of external sector distortions [Whalee (1993) and Edwards (1998)]. One can determine the seriousness of policy interventions by measuring the degree to which trade patterns are distorted from those occurring in the absence of policy interventions. Edwards (1992, 1998) uses the Leamer's openness index as one of the several trade policy indicators¹¹. Such a measure has the advantage of determining the effects of intervention, thus avoiding many of the problems with the administrative measures. The principal merit of Dollar's (1992) contribution lies in the construction of two indices- "index of real exchange rate distortion" and an "Index of real exchange rate variability". Dollar's study demonstrates that each of these indices is negatively correlated with economic growth over the 1976-85 period in a sample of 95 developing countries.

The review of the wide range of openness measures shows that given the complex nature of trade policy, and given that trade is being affected by tariffs, quotas, licenses, and exchange controls, it is very difficult to construct a single, satisfactory indicator of trade liberalization.¹² Further, the fact that the various trade policy indicators are weakly correlated with each other suggests that different dimensions of trade policy may have different effects on growth¹³

⁹ Price comparison between goods sold in domestic and international markets can provide an ideal measure of the impact of trade policy, particularly in the absence of domestic policy distortions. Direct price comparison also incorporates the impact of various policies that affect domestic prices: tariffs, quotas, different exchange rates for imports and exports and subsidies.

¹⁰ See "outward orientation" index in the World Development Report (1987); Heritage Foundation Index in Johnson and Sheehy (1996) and Thomas et al (1991) Trade Liberalization Index. Edwards (1998) discusses the details of the construction of these alternative openness indexes.

¹¹ Leamer (1988) measures deviations of actual trade patterns from those predicted by the country's endowments using a Heckscher-Ohlin factor intensity model. This index however suffers from its reliance on a theory which had questionable empirical validity.

¹² Edwards (1998) suggests that for research on the relationship between trade policy and growth to be persuasive, its results have to be robust to the way in which openness is measured.

¹³ See Harrison (1996) and Pritchett (1996)

Table 2 lists the inter-industry cross-section studies along with the measures of trade orientation used to capture the impact of trade liberalization on industrial productivity growth. Trade liberalization brings about a change in trade orientation. Finding an appropriate measure of trade orientation is a major problem for empirical studies of this nature. Many studies have used indicators that relate to the actual trade volume (such as exports/output ratios, imports/output ratios and import penetration rates).¹⁴ The direct measures of trade policy (legal tariff rates, nominal rates of protection and coverage ratios) are useful because they allow one to capture the idea that open policy stance could increase productivity growth without being reflected in the trade volumes. It may important to point out that though tariff averages have frequently been used to measure the height of trade orientation, the rise in the relative importance of non-tariff barriers has made average tariff increasingly suspect as the overall measures of trade barriers. Further, though the coverage ratios are suggestive of the severity of non-tariff barriers, but not all non-tariff barriers can be measured and are equally restrictive.

Several studies have attempted to analyze impact of trade liberalization on productivity growth and level through sectoral effective rate of protection (ERP), which measures the extent to which sector is sheltered from foreign competition. A large number of studies, as evident from Table 2, have captured trade orientation through the ERP. However in developing countries, ERP might not so straightforwardly indicate the protection to value added.¹⁵ Finally, some studies have investigated the relationship between TFP change and the two demand components directly associated with trade policies- export promotion and import substitution. An assessment of these different measures is attempted in section 5.

¹⁴ Edwards(1998) notes that the main limitation of these types of indicators is that they are not necessarily related to the actual trade orientation, a country can distort trade heavily and still have a high trade dependency ratio.

¹⁵ Krueger (1986) points out why the ERP fails to reflect protection to value added in developing countries.

Table 2. Measures of Trade Orientation in Different Studies

Measure of Trade Orientation	Definition	Study(ies)
Export Promotion	Share of exports in total demand	Nishimizu and Robinson (1984) Pinheiro (1990), Bonelli (1992), Norouz(2001)
Import Substitution	Share of imports in total demand	Same as Above
Change in Protection	$(1+R_j^{79})/(1+R_j^{67})$; R is the effective protection rate, j is the industry	Tybout et al (1991)
Trade	Total protection rate for the industry	Gocekus (1995)
Nominal Rate of Protection (NRP)	Average Tariff Rate	Weiss (1992); Kim(1994) Whalee (1995) Tybout and Westbrook (1995) Kim(2000) Sharma(2000)
Effective Rate of Protection (ERP)	Price based or tariff based Corden or Balassa method	Weiss (1992); Okamoto (1994); Urata and Yokota (1994); Kajiwara (1994); Osada (1994); Kwak (1994); Kim (1994); Sjoholm (1999); Alam and Morrison (2000), Goldar and Kumari (2002).
Changes in NRP and ERP	Changes in average tariffs and effective rate of protection	Weiss and Kumaran (1995), Das(2001)
Export Growth	Rate of growth in exports	Nishimizu and Page (1991) Haddad (1993,96) Sharma (2000) Das(2001)
Export Intensity	Ratio of exports to output/production	Parades (1994) Okauda(1994) Kwak (1994) Tybout and Westbrook (1995)
Import Coverage Ratio NTB	Percentage of Imports covered by License or NTB	Weiss (1992) Tybout and Westbrook (1995) Whalee (1995) Kim (2000) Das(2001) Goldar and Kumari (2002)
Tariff Equivalent of QRs	Excess of domestic over international prices	Ocampo (1994)
Import Penetration	Ratio of imports to domestic availability. Domestic availability is defined as output plus imports minus exports	Nishimizu and Page (1991) Forouton (1991,96) Weiss (1992) Harrison (1994) Okuda (1994) Jenkins (1995) Tybout and Westbrook (1995)

Source: Author's compilation from the review of studies

4. Empirical Evidence from Industrial Sectors: Developing Countries in Three Regions

During the 1980s trade liberalization seemed to be contagious in the developing world and was undertaken extensively in three regions: Latin America, Asia and Africa. Yet each region seems to have followed a different approach. The evidence on the impact of trade liberalization on total factor productivity (TFP) has however been mixed. In some studies the impact is found to be positive, in others it is not so. The issue has been investigated at different levels: plants, firms or industrial sectors, with different measures of trade liberalization as well as with different model specifications. The examination of the evidence for the industrial sectors in the different countries of the three regions enables us to assess whether trade liberalization- productivity linkage is rooted in the macroeconomic environment specific to the region.

The available empirical evidence for the industrial sectors in the three regions is far from unambiguous. All the three African industrial sectors show strong positive association between trade policy reforms and productivity growth. Further most of the evidence for the Asian industrial sector point towards a significant role of trade liberalization. For Latin America the evidence is however is mixed.

4.1. Evidence for Latin American Countries

Most Latin American countries began to open up to the rest of the world in the late 1980s as a part of the structural adjustment programs that followed the debt crisis. The trade liberalization programs in Latin America sought to reverse protectionism that for decades has been at the heart of the region's development strategy. The pioneer in the reform process was Chile, which along with trade liberalization introduced reforms in areas of domestic, financial and labor markets.¹⁶ Bolivia introduced substantial changes in the trade regime far more quickly than better known Latin American cases such as Chile and Mexico. The major focus was on the elimination of QRs and adoption of low tariffs.¹⁷ Colombia adopted a mixed strategy of import substitution with explicit export promotion till the late 1980s.¹⁸ Compared to other countries, Peru was a latecomer to industrialization via import-substitution. Since 1990, trade policy reforms have been very

¹⁶ Chile unilaterally eliminated QRs and reduced import tariffs to a uniform level of 10 percent by the early 1990s. Further, despite several disequilibrium problems in the 1980s, there was no resort to QRs, and were addressed via large real devaluation, increases in nominal tariffs and maintenance of exchange controls. The planned time path of tariff reduction and final tariff levels however did not meet the requirement of stability and predictability of rules over time. See Rodrik (1990). The effects of trade reforms upon industry have been documented in Mellor (1994). First, besides the reduction of industry's share of GDP, there were also compositional changes within the manufacturing sector. Second there was reduction of industrial employment close to 10 percent.

¹⁷ See Jenkins (1996) for an account of the Bolivian trade liberalization measures.

¹⁸ Ocampo (1994) analyses the relationship between trade and industrial policies till 1967 and foreign exchange and trade policies since 1967. The trade liberalization initiated in the 1990s attempted to expose Colombia to international competition and streamlined government regulations in the export and foreign investment sectors. Dean et al (1994) lists the important features of the reforms in trade policy as elimination of import licensing and reduction in the levels and number of tariffs.

rapid and intense and have been followed by stabilization policies.¹⁹ Brazil followed the import substitution policies till mid1980s. The reform measures initiated in the mid-1980s aimed at intentional shift away from QRs to greater reliance on tariffs.²⁰ Mexico's industrial development was nurtured in an import substitution regime. The 1980s however witnessed the overhaul of the trade and industrial policies in response to the external debt crises and oil price shock.²¹

Table 3 documents the experiences of the Latin American countries. Three studies have attempted to explore the link between trade liberalization and industrial productivity in Mexico. Weiss (1992) examines the impact of the major trade liberalization that was introduced in Mexico in the mid1980s on efficiency in the manufacturing sector. Alternative indicators of efficiency are calculated and changes in these indicators are sought to be explained through regression analysis, in terms of various measures of trade liberalization. The conclusion is that trade liberalization has had a positive, but weak effect on performance. Iscan (1998) using a panel data for a sample of Mexican manufacturing industries examines several alternative mechanisms through which trade may contribute positively to productivity levels and growth rates. Special attention is also paid to the comprehensive trade liberalization policies implemented in Mexico after 1986. The results indicate that productivity growth is positively correlated with the share of imported intermediate inputs in sectoral output. Reductions in rates of protection are found to have significant positive effects on sectoral productivity levels. However, the effects of trade liberalization on long term productivity growth rates are found to be statistically insignificant. Tybout and Westbrook (1995) using plant level information attempt to examine if the trade reforms generate productivity gains in Mexico. The finding that improvements in scale efficiency are not associated with increased exposure to foreign competition runs counter to much of the analytical and simulation literature on trade with imperfect competition²².

¹⁹ Parades (1994) provides a detailed account of the trade and industrialization policies in Peru from 1960-90. The country pursued export led growth based on primary products until the late 1950s. The period 1959-75 saw a phase of import substitution policies. The balance of payments crisis and promotion of non-traditional exports marked the years 1976-78. The attempt at trade liberalization started during 1979-82. The period of 1980s however saw a return to protectionism.

²⁰ Fritsch and Franco (1994) describe the basic regulatory framework, which began to be reformed only in the 1990s. The main features were (i) a peculiar system of import protection relying mainly on QRs; (ii) an active export promotion policies, which neutralized the strong distortions of the import regime; and (iii) extensive domestic regulation with a clear pro-incumbent bias, reinforcing natural entry barriers, preventing exit by distressed firms and solidifying market positions.

²¹ Ros (1994) argues that the transition towards a liberalized trade regime has been strikingly smooth in terms of both the microeconomic processes of resource reallocation and the macroeconomic adjustments dependent on the overall industrial competitiveness. Two main economic factors account for this. First, Mexico's successful import substitution experience manifested in the fact that current trends in trade patterns and industrial structure are just an extrapolations of the past. Second, adjustment to the debt crisis and declining terms of trade forced macroeconomic policy to provide exchange rate protection which facilitated the adjustment of firms to a more open economy and subsumed dislocation costs of trade liberalization to more apparent costs of overall macroeconomic adjustment.

²² Three sources of productivity growth were addressed: (i) scale economies; (ii) output share reallocation and (iii) residual effects not accounted for by scale effects or share reallocations.

In the case of Brazil, the sources of productivity growth and the role of industrial organization features, and especially trade orientation therein, have been a debated issue. The studies by Pinheiro (1990) and Bonelli (1992) address these issues directly. Both authors undertook a cross-section version of the exercise performed in Nishimizu and Robinson (1986), in which industrial TFP growth rate is regressed on the growth rate that is attributable to exports and to import substitution. The main tenor of the result is that the key influence on TFP is that of growth and investment. The influence of trade regime and industrial organization variables tends to be much weaker than that of growth related variables.

Parades (1994) explores the trade-productivity link for Peru's manufacturing industries for the period 1976-87. The evidence of across the board fall in productivity suggests that growing macroeconomic chaos and pervasive policy induced market distortion play a much larger role than sector-specific factors. The results of the inter-industry regressions support the hypothesis that the poor performance was to a large extent explained by the inadequate macroeconomic environment that prevailed during this period. The study by Alam and Morrison (2001) presented new micro-level evidence regarding the connection between trade policy and industrial sector efficiency in Peru focusing on the impact of the liberalization program initiated in the 1990s. The result of the exercise based on cross- industry as well as pooled regression suggests Peruvian stabilization and reform package of 1990s led to increase technical efficiency.

Table 3. Trade Liberalization and Productivity: Studies for Latin American Countries

Country	Study	Model Specification	Data-Base	Methodology	Nature of Observed Impact	Major Limitation of the Study
Mexico	Weiss (1992)	TFP growth is a function of trade liberalization technology and Market structure	Cross section of 2 and 4 digit industries	Inter-industry cross-section regression	Trade liberalization has a positive but weak effect on TFP growth	Analysis of period1 is with 4 digit industries, other periods based on 2 digit industries
	Tybout and Westbrook (1995)	Average cost and Productivity growth decomposition	Panel of plants	Pearson and Spearman Correlation	Little association between changes in openness and changes in performance	Lacks a rigorous econometric formulation of the association between components of TFP growth decomposition and openness.
	Iskan (1998)	TFP growth is a function of trade variables and trade liberalization measures	Panel of 2 digit industries	A dynamic panel data regression	Reductions in rates of protection have a significant effect on productivity levels. The effects of trade liberalization on long term TFP growth are insignificant	Protection captured only by ERP and no attempt made to capture NTBs
Brazil	Pinheiro (1990)	TFP growth is a function of output growth allocated to exports and imports	Cross section of 3 digit industries	Inter-industry cross-section regression	Growth attributable to exports and imports have a positive influence on TFP growth	TFP growth regressed on only two variables – output growth allocated to exports and imports
	Bonelli (1992)	TFP growth is a Function of output growth allocated to exports and imports	Cross-section of 3 digit industries	Inter-industry cross-section regression	Exports have a positive influence on TFP growth while the evidence on imports is unclear	Same as above

Peru	Parades (1994)	TFP growth is a function of trade and market structure	Cross section of 3 digit industries	Inter-industry cross-section regression	Export orientation has a negative impact on TFP growth	Trade policy variables do not capture the tariff and non-tariff barriers
	Alam and Morrison (2000)	Mean Efficiency is a function of commercial policy and industrial structure	Panel of plants	Inter-plant cross-section and pooled regressions	The degree of protection and the level of TE are inversely related	Uses mean efficiency scores as opposed to plant level efficiency
Colombia	Ocampo (1994)	TFP growth is a function of trade policies and industrial concentration	Panel of 3 digit industries	Inter-industry panel regression	Negative impact of trade policy variables on TFP growth	Focus on six short periods of 4 years duration, but no attempt to study the long term impact
Bolivia	Jenkins (1995)	TFP Growth and trade liberalization indicators	Cross section of 4 digit industries	Pearsonian Chi-square test	Negative relationship of TFPG with import competition and import availability	No attempt to assess the impact of non-trade policies
Chile	Tybout et al (1991)	Tech Efficiency and Protection indices	Cross sections of plants	Spearman Rank correlation	Reductions in protection leads to improvements in TE	Variables not properly constructed

Source: Author's compilation from the review of studies

Ocampo(1994) analyses the relations between trade policy and industrial performance in Colombia since 1967. Using broad three-digit ISIC sectors, the study confirms the central role played by Verdoorn effects on TFP performance in Colombian manufacturing.²³ This may be interpreted in the sense that TFP is largely a dependent rather than an independent variable, with demand variables playing the dominant role in industrial growth. The effects of trade variables are weaker and have the opposite signs to those suggested by the proponents of domestic and external competition as a source of productivity enhancement. The study by Jenkins (1995) attempts to explore whether productivity increased in the aftermath of the trade liberalization of the 1980s. Using statistical tests on three-digit industries, the study addresses whether both import discipline and import availability effects of trade liberalization had any impact on Bolivian industry²⁴. The statistical exercise concludes that the Bolivian trade reforms have not led to improved productivity performance.

As much of Latin America did during the 1960s, Chile pursued a strategy of inward-oriented development.²⁵ The study by Tybout et al (1991) analyzes the changes in industrial sector performance that accompanied Chile's dramatic trade liberalization in the 1970s.²⁶ The micro evidence using plant level data for the census years 1967 and 1979 shows little overall productivity improvement. The study confirms that several macro shocks had hit the Chilean manufacturing sector between the census years, masking the effects of commercial policy in sector-wide analysis. The cross- industry analysis, however, shows that industries undergoing large reductions in protection experienced relatively large improvements in average efficiency levels and relatively large reductions in cross-plant efficiency dispersion.

To sum up, studies for Latin American countries show that the impact of trade liberalization on productivity growth is mixed. In the case of Mexico, Chile, Colombia and Bolivia the impact is either weak or negative. Brazil and Peru confirm the presence of a positive association between trade liberalization and productivity. It is interesting to note that the last two countries fall into the category of late reformers. It is however important to add that the trade and macroeconomic policies of the late reformers prior to reform differ rather considerably from those of the early reformers.²⁷

²³ Studies by Dudley (1983), Sandoval (1982), Roberts (1988), Echavarria (1990) all found a strong Verdoorns link. These studies together with Ocampo (1994) however covered the period prior to the 1990 .Hence may not be of much value in trying to judge the impact of the reforms.

²⁴ Chi-square tests were conducted to test for the effects of trade liberalization on productivity.

²⁵ See the studies by Corbo (1985), Galvez and Tybout (1985) and World Bank (1989) for an account of the Chilean reforms and adjustment programs.

²⁶ In a related study Tybout (1996) confirms that there is little evidence that foreign competition disciplines market power in Chile. The results based on both the plant and industry level analysis of price cost margins (PCM) casts doubts on the conjecture that variations in the market power of industries are associated with variations in the degree of exposure to international competition.

²⁷ See Tables 7.1 and 7.2 in Dean et al (1994)

4.2. Evidence for African Countries

In virtually all the African countries, non-tariff barriers covered all product lines. Restraints were either imposed directly on imports (quotas, bans or prior licensing arrangements) or indirectly through elaborate foreign exchange rationing schemes. The latter restrictions were reflected in the real exchange rate appreciation and resultant large as well as rising black market premium. Further, severe macroeconomic crises were experienced in most of the economies. Rising levels of real GDP, inflation and current account deficits pointed towards the need for stabilization efforts prior to trade liberalization. Malawi was one of the first countries in sub Saharan Africa to pursue the path of structural adjustment. Trade policy in Malawi however went through several phases in response to adverse events, largely external.²⁸ Cote d'Ivoire implemented trade reform in 1985 following a severe macroeconomic imbalance in the early 1980s²⁹. The emergence of external as well as internal disequilibrium in the 1980s led the government in Morocco to begin reforms built around stabilization and structural adjustment measures.³⁰

Table 4 lists four studies for the African region, which have attempted to explore the link between trade regimes and industrial performance. Harrison (1994) attempts to explore the relationship between market power, productivity and trade reforms. Using a panel of 246 firms for the period 1979-87, the study shows that assuming perfect competition and constant returns to scale leads to underestimating the gains in productivity from the trade reforms.³¹ Two of the approaches to measuring the impact of trade policies show a positive association between more open trade policies and higher productivity growth. The time-series approach, which compares the behavior before and after 1985, shows that productivity growth tripled after reforms. Using tariffs as a measure of trade policy shows that productivity growth was four times higher in the less protected sectors. If import penetration is used, the relationship turns out to be ambiguous. Haddad et al (1996) undertakes a quantitative assessment of the impact of trade liberalization on productivity growth using data on Moroccan industrial firms during the period 1984-89. Two important results emerge from the study. First, there is no indication

²⁸ The first half of the 1980s saw the trade regime turn inwards increasing import tariffs for revenue considerations with restrictions on access to foreign exchange and tightening of import licensing. Since the signing of the Enhanced Structural Adjustment Facility [ESAF] in 1988 the coverage of import controls decreased. The dismantling of the protectionist system was complete by 1990, with the emergence of a market-based allocation of foreign exchange. Mulaga and Weiss (1996) provide a detailed description of the trade policies in the 1980s. Also see, Gulhati (1989) and Harrigan (1991) for information on economic policy in Malawi.

²⁹ The first stage of the reform implemented in 1985 saw the removal of QRs and reference prices, rationalization of tariff structure and introduction of temporary import surcharges. By 1988 all import duties were reduced to 30 percent. In the 1990s renewed attempt at trade liberalization was made, which involved export promotion and rationalization of the tariff structure. For details on the trade liberalization attempts in Cote d'Ivoire, see Harrison (1994) and Dean et al (1994).

³⁰ Since 1983, Morocco liberalized trade within the framework of structural adjustment aimed at reducing the anti-export bias and rationalizing the incentives to import substitution. It also included a flexible exchange rate policy to improve Morocco's external competitiveness. See Haddad (1993) for an account of the trade policy changes in Morocco.

³¹ Correcting for the potential bias in the Solow measure of productivity measures, Harrison estimates productivity using a methodology pioneered by Hall (1985) and Domowitz et al. (1988).

that greater competition from imports enhances productivity growth at the industry level. Second a positive correlation is found between TFP growth and exports only at the firm level.³² In a related study, Haddad (1993) estimates the effects of various trade and market structure variables on the level of TFP as well as on the deviation of firm TFP from the efficiency frontier. The results are not sensitive to the different measures of TFP and show that trade liberalization in Morocco resulted in improved productivity in manufacturing firms, so that they could exploit their comparative advantage and compete better with foreign firms.

³² Haddad (1993) using the same database also finds a positive relationship between exports and productivity at the firm level. Further, the TFP at the firm level is estimated using panel data and corrected for various biases.

Table 4. *Trade Liberalization and Productivity: Studies for African Countries*

Country	Study	Model Specification	Data Base	Methodology	Nature of Observed Impact	Major Limitation of the Study
Malawi	Mulaga and Weiss (1992)	TFP growth is a function of trade policy and market structure	Cross section of Firms	Inter-firm cross-section regression	The association between changes in ERP and productivity growth is sensitive to the TFP estimates used	No attempt to assess whether there is a lagged impact of trade liberalization
Cote d'Ivoire	Harrison (1994)	Production Function Framework [Halls methodology]	Panel of firms	Inter-firm panel regression	Negative relationship between import penetration and TFP growth	No attempt made to assess the relationship between NTB and TFP growth.
Morocco	Haddad (1993)	TFP growth is a function of trade policy and market structure	Panel of firms	Inter-firm panel regression [Fixed effects Model]	Import penetration and export share has a significant effect on firms productivity	No explicit measures of protection capturing tariff and non- tariff barriers
	Haddad et al (1996)	TFP growth is a function of trade policy and market structure	Panel of firms and Panel of 2 digit industries	Inter-firm panel regression [Fixed Effects Model and Pooled OLS]	Positive correlation between exports and TFP growth at the firm level	No attempt to assess if there is a lagged impact of trade liberalization on TFP growth

Source: Author's compilation from the review of the studies

Mulaga and Weiss (1996) examined two issues pertaining to the trade and productivity linkage debate. First, an assessment of the extent to which efficiency improved within the manufacturing sector in Malawi and second, whether a reduction in protection was associated with improvements in total factor productivity growth. Data derived from a survey of large manufacturing enterprises were used to estimate firm level effective rates of protection and TFP growth. The results from a cross sectional regression model show that the conclusions are highly sensitive to the way in which productivity growth is measured.³³

To sum up, the studies for African countries provide evidence of a positive link between trade liberalization and productivity. All the three studies are based on firm level data. For Cote d'Ivoire and Malawi, we however find that the results are sensitive to the way we measure productivity growth.

4.3. Evidence for Asian Countries

Most of the East Asian economies had already made a serious commitment to trade liberalization by the 1980s. Reforms in South Asia were relatively slow and still retained an anti-export bias.³⁴ Taiwan was the first developing country to shift in a major way to outward orientation in the late 1950s by unifying and devaluing the exchange rate and adopting measures which gave exporters more or less free trade status. Korea followed Taiwan with a five-year lag and by 1985 had removed most QRs and was well on way to tariff levels of developed countries. Sri-lanka is an exception in South Asia and replaced virtually all QRs with tariffs by 1977 and by mid 1980s there were no bans, import quotas and domestic content requirements³⁵. In Malaysia, Thailand and Indonesia, a situation of strong external payments created an impetus for trade reforms. In Philippines, the motivation for the reform came from the balance of payments disturbances. India started providing easier access to imports as early as the late 1970's. However, major trade liberalisation attempt only occurred in the early 1990s. Turkey responded in the 1980s to the debt crisis by undertaking a stabilization program wherein reform of trade and payments policies was a key component. The character and pace of trade reforms differed from country to country reflecting differences across the Asian countries in the level of development.

³³ The results from the conventional exercise show that the change in ERP is significant with the expected sign. However, when the TFP estimates are adjusted for change in capacity utilization, the TFP growth is unassociated with changes in protection. Mulaga and Weiss (1996) argues that with fall in protection more foreign exchange were made available and that most of what appeared as improvements in TFP was in fact higher capacity working as firms previously facing a shortage of foreign exchange was able to stock up on parts and materials.

³⁴ Bangladesh, Pakistan and Nepal maintained highly complex and extensive import licensing regimes. These were often in the form of positive, negative or restricted lists. Further, the tariff levels and dispersions across the South Asian countries were also very high. Some movements towards trade reforms were noticeable in the first half of the 1980s in all these countries. Nepal's trade and industrial policies became more open only after 1985-86. In earlier phases, its policies mimicked those of India's.

³⁵ Wignaraja (1994) examines the trade policies, macroeconomic stability and industrial strategies in the context of the outward orientation followed in Sri-Lanka since 1977.

Table 5 lists several studies for the Asian Region, which have attempted to assess the impact of trade liberalization on industrial productivity. Studies on Turkey examine the link between productivity/ efficiency and trade liberalization³⁶. Forouton (1991) observes that productivity in the private sector was higher than in the public sector. Within the private sector, the productivity performance is better in the case of the tradeable sectors, the reverse holds true for the public sector. Further growth in import penetration accounts for the improved productivity performance in the private sector. Gocekus (1995) attempts to explore the relationship between trade reforms and industrial efficiency using plant level data. The focus of the study is on the rubber industry, given its importance as an example of an import substitution industry. Empirical evidence shows that there is a decline in the number of plants below 60 percent level of technical efficiency in 1985. Investigation into the effects of trade and other plant specific factors shows that decline in protection has a positive effect on the technical efficiency level.³⁷

Using data on 2,892 domestic manufacturing establishments for the years 1980 and 1991 in Indonesia, Sjöholm (1999) shows that establishments participating in exports or imports have high levels of productivity. Further, the results indicate that higher the share of the establishment's output that is exported, the higher its productivity growth. The results concerning the effects of imports are mixed.³⁸ A cross-section regression for nine manufacturing sectors undertaken for the period 1987-90 by Osada (1994) using effective rate of protection as indicator of import liberalization confirms the positive role of ERP in accounting for TFP growth. The results suggest that ERP reduction was more influential on TFP growth.

Urata and Yokota (1994) analyze whether the trade reforms could be possible determinants of productivity growth in Thai manufacturing.³⁹ Drawing upon cross-

³⁶ Forouton (1996) examines the impact of trade liberalization on the market power of the firms. The study concludes that in Turkey greater exposure to international trade exerts a modest effect on the market power of firms both in the private and public sectors. The study also confirms that a positive shift in productivity occurred in Turkish industry following the trade reforms. This result is however sensitive to the methodology used. This is because the methodology is more appropriate for firm level than the industry level data used in the study.

³⁷ Several other studies have also evaluated the effects of trade policy on productivity growth in Turkey [Krueger and Tuncer(1982), Nishimizu and Robinson (1984)]. The study by Krueger and Tuncer (1982) has however not explored the impact of trade liberalization on productivity growth using an explicit quantitative methodology and hence has not been reviewed above. Nishimizu and Robison (1984) find that in some of the industries there is positive association with growth in exports and in some with import substitution. We have not reviewed this study as the study refers to the period: 1963-76 and Turkey's trade reforms occurred later. See Celasun (1994) for an assessment of Turkey's post 1980 trade and industrial policies and performance in a long term perspective.

³⁸ Grossman and Helpman (1991) suggest that international trade facilitates knowledge transfers, but they do not differentiate between the effects of imports and exports. The study however found that the coefficient of imports is not statistically significant. This may be partly due to the fact that the productivity effects of only intermediate imports were taken into account and thus the observation that transfers of knowledge being more important via exports will have to be interpreted with caution.

³⁹ Akrasanee and Wiboonchutikula (1994) show that for the period 1983-86, the TFP growth rate of all manufacturing was around 0.94 percent. A host of factors were listed as possible reasons for the observed very small increases in productivity such as rising prices of raw materials, decrease in demand for products and rise of labor union pressure. Comparing the productivity performance of the import-substitution and exporting industries, the authors conclude that productivity growth in the import-substitution industries declined. This was to a large extent a reflection of the phase of inward looking policies, which did not set a time limit beyond which protection was to be phased out.

section data of industries and using effective rate of protection as a measure of trade liberalization, an econometric assessment of trade-productivity linkage was attempted. The results show that by and large trade liberalization has a positive impact on TFP growth. In the mid-1980s Malaysia introduced liberal economic policies.⁴⁰

The study by Okamoto (1994) however found no clear evidence regarding the impact of import liberalization as measured by effective rates of protection on TFP growth. The role of foreign direct investment policies was found to be significant. Kajiwara (1994) observes that for Philippines, even though the TFP growth rates in the manufacturing sector during the 1970s and 80s were negative, there were improvements brought about by the trade liberalization. The cross-industry regression shows an inverse relationship between TFP improvements and ERP. The results indicate that the trade liberalization measures made domestic markets more competitive and improved the efficiency of the manufacturing sector. Taiwan is the only Asian country where the impact of trade reforms on productivity growth turns out to be negative. Okuda (1994) analyzes the impact of trade and foreign direct investment policies on TFP growth rates for the period 1979-91. Both export ratio and import penetration rates are of wrong sign but not significant. The author concludes that import penetration proceeded so fast that it led to fall in the sector's earnings. No convincing explanations was however available for the negative sign of the export ratio.

Studies on Korea report both negative and positive impacts of trade liberalization on productivity growth. It is important to note that though Korea followed an export oriented industrialization policy from the 1960s, the promotion of import liberalization was not addressed until it emerged confident in the export market. The government however maintained a strong leadership in the economic management. Wha-lee (1995) examined the impact of government intervention policies on productivity growth using a panel of 38 manufacturing sectors for the period 1963-88. The results indicate that neither tariff nor non-tariff barriers had any impact on manufacturing productivity.⁴¹ Similarly a study by Kim (1994) using cross-section regression for 1967-88, shows a negative impact of trade liberalization as captured by the changes in import/output ratio and nominal protection rate. Kwak (1994) undertakes an inter-industry regression comprising 26 manufacturing sectors using export/output ratio and effective rate of protection as indicators of trade liberalization. The results show that industries with low protection rates in the 1980s experienced a large increase in productivity. In the 1970s and for extended periods including the 1970s, the effective protection rate was not statistically significant. This result is in accord with the Korean attempt to raise efficiency of domestic industries via import liberalization in the 1980s. Kim (2000) examines the

⁴⁰ See Ghee and Woon (1994) for an account of the industrial restructuring in Malaysia. The paper analyzes the sources of structural change in Malaysia at both the macroeconomic and industry levels.

⁴¹ Wha-lee (1995) offers three plausible theoretical explanations for the negative link between trade protection and productivity in Korean manufacturing. First, empirical evidence from the Korean manufacturing industries seems to point towards incorrect targeting and protecting the infant industries. Second, protection by depriving the local firms of the spillover benefits of "scientific, engineering and industrial know-how", stock of knowledge, drawn via commodity trade contact with advanced nations. This in turn hampers the advancement in productivity growth. Third, protection by targeting premature industries causes a fall in productivity growth by creating mismatch between the pace of the rate of invention and society's speed of learning by doing.

dynamic impact of trade liberalization on productivity, competition and scale efficiency. The link is established for two sets of productivity estimates.⁴² Using a standard TFP estimate, he finds that none of the openness measures are significantly related to productivity performance. By taking into account for both imperfect competition and non-constant returns to scale, trade liberalization is found to impact positively on productivity growth. The author concludes that despite the positive impact, the productivity increase was not significant because the extent of trade liberalization was not substantial enough in Korea. Furthermore adverse macro economic conditions at times masked the positive effects of trade reforms.

Evidence on the impact of trade liberalization on the productivity performance in South Asian manufacturing is limited.⁴³ Studies examining the productivity implications of trade liberalization in Sri Lanka report mixed evidence as far as improvements in productivity growth rates are concerned. Weiss and Jayanthakumaran(1995) use cross-section regression with 2 and 4 digit industrial data for two periods 1979-89 and 1985-89. Over the longer period no support is found for the trade liberalization and productivity growth link. For the shorter and later period regression however a weak link between trade reforms and performance is established. This association is stronger in more concentrated branches and can be interpreted as a result of short term resource allocation in response to tariff changes in the second half of the 1980s. Athukorala and Rajapiratna (2000) examine the impact of trade reforms by analyzing the differences in productivity performance both across industries and over time. The TFP growth and trade reforms relationship is sought to be taken into account by a dummy variable to represent the trade policy shift as the key explanatory variable, other openness related measures like export orientation and foreign ownership are also included. The coefficient of the dummy variable is statistically significant and the magnitude of the coefficient is remarkably robust to the inclusion or exclusion of other explanatory variables. Further, the authors examine four sub-periods using manufacturing survey data for the initial and terminal years for documenting TFPG by industry. Comparison of the estimates for the sub-periods suggests that the positive impact of policy shifts on productivity growth involved considerable time lags. This holds implications for the mixed result coming from the Weiss and Kumaran (1995) study and other studies on developing country experiences.

Some studies attempting to document productivity growth for Indian manufacturing sector have partially explored the trade-productivity linkage.⁴⁴ Studies on

⁴² Kim(2000) following Hall (1988), computes modified TFP estimates that take into account non constant returns to scale and imperfect competition. He also presents the standard TFP growth estimates based on Solow residuals.

⁴³ We have not come across any study trying to relate trade reform experience with the industrial sector performance for Bangladesh and Pakistan. For Bangladesh, Rahman (1994) presents evidence on the structure of trade policies initiated in the new economic policy (1983-84) and Krishna and Sahota (1991) computes TFP growth for a large number of manufacturing activities at firm and four digit industry level. There has however been no attempt at exploring the link.

⁴⁴ Goldar (1986a,b) used effective rate of protection and estimates of import substitution as indicators of trade policy, whereas Ahluwalia (1991) used a Chenery measure of import substitution to address the issue of determinants of productivity growth. Both the studies found a negative relationship between productivity growth and indicators of trade policy.

the impact of trade reforms for India have been both at the firm as well as industry level. Krishna and Mitra (1998) and Balakrishnan *et al.* (2000) incorporate the methodological refinements in the measurement of productivity growth. Both these studies rely on the CMIE database. The periods covered in the two studies overlap. Krishna and Mitra (1998) cover the period 1986-93 for the following industry groups: electrical machinery, non-electrical machinery, electronics and transport equipment and find strong evidence of an increase in competition and some evidence of an increase in productivity growth after reforms. In particular, there is evidence of significant reduction in markups in the years following the reforms in three industries. There is also evidence of increases in productivity growth in some industry groups. The study finds that for non-electrical and electronics industry groups, there is evidence of both competition and productivity growth. Balakrishnan *et al.* (2000), on the other hand show that there is no evidence of increase in productivity since the onset of reforms in 1991-92. Their study covers a much larger sample spanning the period 1989-98. This observed difference between the studies appears to be attributable to differences in the econometric methodology.⁴⁵

Recent studies [Das (2001) , Goldar and Kumari (2002) and Chand and Sen (2002)] have addressed the issue of the trade liberalization-manufacturing productivity growth linkage with appropriately defined measures of trade policy reforms⁴⁶. These studies use panel data with appropriately defined lag structures for testing the observed relationship. The first one covers the period of 1980s and early 1990s using 72 three-digit industries, the second study extends the period of 1980s up to the late 1990s for 17 two-digit industry groups and the third one covers the period of 1970s till 1988 for around 30 three-digit industry groups. Das (2001) study covers the period 1980-95 and around 72 three-digit industries. Using measures of trade liberalization such as ERP and NTB, the study attempts to capture the competitive impact of trade policy reforms on manufacturing productivity via lowering of tariff and non-tariff barriers. The results show that lowering of NTB's have a positive impact on the manufacturing as well as intermediate goods sectors industrial productivity. The study by Goldar and Kumari (2002) covering the period till 1997-98 shows that a reduction in effective rate of protection to industries appeared to have had a favorable effect on productivity growth in Indian industries. However the observed fall in productivity in the 1990s may be attributable partly to the gestation lags in investment projects. Sen and Chand (2002) show that a reduction in the price-wedge has a positive impact on productivity growth. Their study however covers the much of the period (1973-88) before the onset of major trade liberalization attempts.

⁴⁵ The random-effects model is estimated in Krishna and Mitra (1998). The results in Balakrishnan *et al.* (2000) are based on IV estimation of a fixed-effects model, the time dummy of the intercept indicates no improvement in productivity growth. An important limitation of both the studies is the reliance on dummy variables and the absence of an explicit trade policy indicator to assess the trade liberalization consequences.

⁴⁶ Trade liberalization indicators for India have either been unsatisfactory [Goldar (1986), Ahluwalia (1991)] or been captured through dummy variables [Krishna and Mitra (1998), Balakrishnan *et al.* (2000)]. The recent studies by Das (2001), Goldar and Kumari (2002) and Chand and Sen (1999) have however used various indicators of trade liberalization to quantify protection and have explored the link using them.

Sharma et al (2000) investigate whether liberalization improves productivity in Nepalese manufacturing using data on four-digit manufacturing sectors for the period 1972-73 to 1993-94. Econometric specification of the trade-productivity impact was modeled with export intensity, nominal rate of protection as explicit measures of trade policy changes, the impact of QRs was however captured using a dummy variable. Two alternative measures of productivity (using gross output and value-added specification of output) are used to check the sensitivity of the results. The association between trade liberalization indicators and TFPG was however not significant. In particular, neither the impact of the NRP nor the coefficient of the QR was significant thereby suggesting that the level of protection has no impact on productivity growth in Nepal

Table 5. *Trade Liberalization and Productivity: Studies for Asian Countries*

Country	Study	Model Specification	Data Base	Methodology	Nature of Observed Impact	Major Limitation of the Study
Turkey	Forouton (1991)	TFP growth is a function of change in trade regime	Panel of 3-digit public & private sector industries	Inter-industry panel regression & Demand decomposition	Growth in import penetration has significant effect on TFP growth only in private sector.	No attempt to assess whether there is any role of industrial structure
	Gocekus (1995)	TE is a Function of trade protection	Cross section of Plants	Inter-plant cross section regression	Trade exposure has a positive effect on TE	No attempt to assess the impact of industrial structure
Indonesia	Osada (1994)	TFP growth is a function of trade liberalization and FDI policies	Cross section of broad industry groups	Inter-industry cross section regression	Reduction in ERP has a significant effect on TFP growth	No attempt to assess the impact of industrial structure
	Sjoholm (1999)	Production function framework to capture the growth & level of TFP	Cross section of plants	Inter-plant cross section regression	Positive impact of exports and mixed evidence for imports on TFP growth	Lack of explicit indicators for trade orientation
Korea	Kim ,K.S (1994)	TFP growth is A function of trade & industrial structure	Cross section of broad industry groups	Inter-industry cross section regression	Reduction in NRP has a negative effect on TFP growth	No attempt to capture the impact of NTBs on TFP growth

Korea	Kwak (1994)	TFP growth is a function of trade policies and industrial structure	Cross section of broad industry groups	Inter- industry cross section Regression	Removal of import protection has a significant impact on TFP growth.	No attempt to assess whether there is a lagged impact on TFP growth.
	Whalee (1995)	TFP growth is a function of government interventions	Panel of broad Industry groups	Inter-industry panel regressions	Reduction of NTB has a significant impact on TFP growth	No attempt to capture the impact of industrial structure.
	Kim (2000)	Production Function Framework [Hall's method]	Panel of broad Industry groups	Inter-Industry panel regression [OLS]	Relationship between trade liberalization and TFP growth sensitive to TFP measure	No attempt to check the lagged impact of trade liberalization on TFP growth
Taiwan	Okuda (1994)	TFP change is a function of trade and investment liberalization.	Panel of broad industry groups.	Inter-Industry panel Regression [OLS]	Import penetration has a negative significant effect on TFP growth	No attempt to assess the role of industrial policies.
Thailand	Urata and Yokota (1994)	TFP growth is a function of trade policies and industrial structure	Cross-section of 4digit industries.	Inter-industry cross section regression.	Trade liberalization indicators have a positive effect on TFP growth.	No attempt to capture the effects of NTB
Phillipines	Kajiwara (1994)	TFP growth is a function of trade and FI policies.	Cross section of broad industry groups	Inter-industry cross section regression	ERP has a positive effect on TFP growth	No attempt to capture the effects of NTB
Malaysia	Okamoto (1994)	TFP is a function of trade protection	Cross section of broad industry groups	Inter-industry cross-section regression	No definitive conclusion regarding trade liberalization and TFP growth	No attempt to capture the effects of NTB

Nepal	Sharma et al (2000)	TFP growth is a function of trade policy and industrial structure	Panel of 4 digit industries	Inter-industry panel regression [OLS]	The association between trade liberalization and TFP growth not significant	No explicit indicator of NTB
Sri-Lanka	Weiss and Kumaran (1995)	TFP growth is a function of trade policy and market structure	Cross section of 3 and 4 digit industries	Inter-industry cross section regression	Weak short-run association between trade liberalization and TFP growth. No long-run relationship	No attempt to capture the effects of NTB
	Athukorala and Rajapatirana (2000)	TFP growth is a function of trade policy and market structure	Panel of 3 digit industries.	Inter-industry panel regression	Trade policy has a significant impact on TFP growth.	No explicit indicator of trade liberalization capturing tariff and non tariff barriers
India	Fujita (1994)	TFP growth is a function of trade liberalization	Cross section Of 3 digit Industries	Inter-industry cross section regression	Trade liberalization has a positive impact on TFP growth	Lack of trade policy indicators
	Krishna and Mitra (1998)	Production Function Framework [Hall's method]	Panel of firms	Inter-firm panel regression [Random Effects Model]	Trade liberalization has a positive impact on TFP growth	Lack of explicit trade policy indicators
	Balakrishnan et al (2000)	Production Function Framework [Hall's method]	Panel of firms	Inter-firm panel regression [Fixed Effects Model]	Trade liberalization has a negative impact on TFP growth.	Lack of explicit trade policy indicators
	Norouz (2001)	TFP growth is a function of export expansion	Cross-section of industries	Inter-industry variation in TFP growth	Trade regimes do not have any significant impact on TFP growth	Lack of any explicit trade policy indicators

	and import substitution				
Das (2001)	TFP growth is a function of trade, industrial and macro policies	Panel of 3 digit industries	Inter-industry panel Regression [Fixed Effects Model]	Trade liberalization has a positive impact on TFP growth	Time period of major trade reforms too small
Goldar and Kumari (2002)	TFP growth is a function of trade liberalization and investment	Panel of 2 digit Industries	Inter- industry panel regressions [Fixed Effects Model]	Trade liberalization has a positive impact on TFP growth	Lack of any industrial policy variables
Chand and Sen (2002)	Production function framework incorporating intermediate inputs	Panel of 3 digit industries	Inter-industry panel regressions [fixed effects]	Trade reforms has a positive impact on productivity growth.	Lack of any industrial as well as macro policy variables

Source: Author's compilation from the review of the studies

To sum up, we observe that in most Asian countries there is a positive impact of trade liberalization on productivity growth. Further, the evidence holds at all levels of disaggregation. Taiwan and Nepal are the only two countries where the impact of trade liberalization turns out to be negative. For Korea, Sri-Lanka and India, however, the evidence is mixed.

5. Assessment of the Evidence from Developing Country Studies

The empirical assessments of the trade liberalization-productivity growth link have been extensively documented for both developed [Nishimizu and Robinson(1991), US Trade Commission (1996) and Cameroon et al (1999)] and developing countries focusing on various dimensions of the supposed linkage. Three issues are important in the evaluation of the trade reforms-productivity literature. First, what is the “appropriate” measure of trade liberalization? Second, whether the impact of trade liberalization on TFP growth holds at all levels of disaggregation? Finally, What is the nature of the specification of the relationship between trade liberalization and TFP growth?

5.1. Choosing the “Appropriate” Measure of Trade Liberalization

The analysis of the impact of trade policy changes on manufacturing performance calls for the construction of a well-chosen set of measures providing comprehensive information on the direction of change in a country’s trade regime.⁴⁷ The manufacturing sectors of the developing countries are often subjected to severe trade restrictions in terms of high levels of tariff and extensive import restrictions via licenses and quotas. Thus to understand the complex nature of commercial policy we need to look at the multiplicity of instruments that quantify a country’s trade barriers.⁴⁸ Measures of nominal as well as effective rate of protection, import penetration rates and export intensity have by and large been widely used across the studies reviewed. Further, it has been observed that several aspects of trade distortions cannot be easily quantified and in addition, rampant official exemptions, discretionary administration and smuggling increases the difficulty of assessing changes in trade regime using data on official barriers. Appendix Table A1 provides the evidence on the various indicators of trade liberalization by the nature of the impact.

For many countries, the main measure of trade liberalization has been the nominal and effective rate of protection (NRP and ERP). The ERP series in the studies

⁴⁷ Empirical research into the effects of outward orientation on manufacturing performance has generally not untangled the various dimensions of trade policy stance. In particular, researchers have been unable to generate satisfactory indexes of trade policy orientation, although there is a proliferation of indices of trade restrictions. Rodrik (1995) argues that openness in the sense of lack of trade restrictions is often confused with certain macroeconomic aspects of the policy regime.

⁴⁸ The choice of the measure will differ, depending on the definition of liberalization chosen [Dean et al.(1994)]. Further, Pritchett (1996) concludes that various indicators of trade policy are pairwise uncorrelated and thus may be capturing different dimensions of growth.

for the Asian countries have been documented for fairly large number of sectors at specific time points [for large number of years for Mexico- Iscan (1998), India- Das (2001), Goldar and Kumari (2002)]. Assessing the usefulness of the measure of ERP in the context of trade policy-productivity appraisal must bear in mind its limitations. Foreign and domestic products are rarely strictly comparable in the limited range of products that are usually surveyed. Further, when firms enjoy market power at home and / or abroad, international price differentials reflect this power as well as commercial and exchange rate policy. One factor that stands out despite the measurement and conceptual limitations in respect of the ERP measure is the tractable methodology compared to most alternatives such as domestic resource cost or computable general equilibrium modeling.⁴⁹

A key component of the trade reform programmes has been the elimination, or at least severe reductions, of the coverage of NTBs across all the three regions covered in the review⁵⁰. However, our assessment of the various trade liberalization indicators reviewed points out that except for studies for Korea [Whalee (1995), Kim (2000)], Mexico [Weiss(1992), Tybout et al.(1995)] and India [Das (2001), Goldar and Kumari (2002)]none of the other studies have tried to capture the changes in NTBs as a direct measure of trade barriers. Evidence indicates that the effect of NTB is significant in explaining productivity growth for Korean industries, whereas in the case of Mexico, the variable is inconsequential in explaining inter-industry variations in productivity performance. For India, the evidence is mixed [Das (2001) reports a significant impact, whereas Goldar and Kumari (2002) show an insignificant relationship]. The absence of a measure of NTBs in exploring the competitive link in the trade-productivity literature is probably due to the difficulty in constructing a measure, which encompasses a large and diverse range of instruments⁵¹.

Micro studies have generally shown that the relationship between imports and productivity growth is often negative.⁵² Studies covering the industrial sectors of Morocco[Haddad (1993)], Mexico [Tybout et al (1995), Weiss (1992)], Taiwan [Okuda (1994)] and Turkey [Forouton (1991,96)] have used either growth or level of import penetration rate to assess the impact of increased exposure to foreign competition on productivity growth. There is evidence for all countries, except Taiwan, that an increase in import penetration leads to productivity improvements in the industrial sectors. However, this negative relation for Taiwan has to be judged against the overall policy of

⁴⁹ Even though the data requirements are less demanding, Bhagwati and Srinivasan (1973) assert that the fundamental failing with the effective protection analysis is that we are using a partial equilibrium measure to make inferences about the general equilibrium effects of protection.

⁵⁰ See Table 7.2 in Edwards (1995) which shows that between 1985-87 and 1991-92 in all most all groups of Latin American countries, the coverage of NTBs has been substantially reduced..

⁵¹ See Greenaway and Milner (1993), Table 2.1

⁵² Harrison (1996) puts forward the reasons for this. The pro-cyclical nature of productivity growth wherein productivity growth tends to be higher when output is growing and falling during recession or low growth period. Consequently, where greater import penetration is accompanied by a contraction of domestic industry, output growth also falls. In the case of India, we however find that for the years 1993-94, 94-95 and 95-96, annual growth rate of manufacturing was 6.1%, 9.8 and 13% and imports as a percentage of GDP was 9.7%, 10.5% and 12.6% respectively. [Refer Economic Survey]

the Taiwanese government, conditioned to a large extent by its friction with US on the trade related issues. Further, industries with higher import substitution tend to show higher productivity growth, which actually may be reflecting the differential between world and domestic prices.

Our survey of the empirical literature shows that only a few studies have attempted to explore the scale effects of trade liberalization on productivity growth. The export to output ratio has been used to capture the impact of trade policy reforms in the studies for Mexico, Morocco, Korea, Taiwan and India [Tybout et.al (1995), Haddad (1993), Kwak (1994), Okuda (1994) and Das (2001)]. For Morocco and Mexico, the evidence of a significant and positive relation between export share and productivity confirms that firms selling in international markets are forced to improve their productivity to stand up to the rigors of external competition. In case of Korea, Taiwan and India, the results are contrary to the expected one.⁵³

Other measures of openness such as average nominal tariffs has also been utilized in several studies [Weiss (Mexico); Tybout and Westbrook (Mexico); Harrison (Cote d'Ivoire); Wha-lee (Korea), Kim (Korea) and Sharma (Nepal)]. However the measure is subject to bias.⁵⁴ Measures such as tariff equivalent of QRs, real exchange rate contribution to export and import demand have also been used to capture aspects of trade policy reforms[Ocampo (Colombia)]. Further, import substitution and export expansion measures of the Chenery's growth-exercise have also been incorporated to account for trade liberalization impact [Nishimizu and Robinson (1984), Nishimizu and Page (1991), Norouz (2001)].

Our review of the trade liberalization indicators confirms that it is not easy to combine different aspects of trade policy into a single measure. Moreover, different measures capture alternative channels of the trade-productivity linkage. Growth and levels of effective rate of protection, import penetration rates and export intensity have been widely used in most of the studies. Some studies have also used measures such as average nominal tariffs, tariff equivalent of QRs, real exchange rates etc. We conclude that since in most developing countries, lowering of tariff and non-tariff barriers holds the key to successful trade liberalization, therefore an appropriate measure of trade orientation must encompass these aspects of trade policy changes.⁵⁵

⁵³ For Korea, it has to do with the fact that during this period the rise in capital intensity, promoted by the import substitution policies led to an increase in exports of capital-intensive and not labor intensive industries. In the case of Taiwan, government policies through out the 1980s were for curtailment of support for exports in industries whose productivity impact became ambiguous and this is perhaps reflected in the negative impact of exports on productivity growth.

⁵⁴ Dean et al. (1994) argues that, though the average nominal tariffs is useful for measuring the restrictiveness of trade, the weighting schemes are not free from bias.

⁵⁵ The study by Cameroon et al (1999) uses principal component analysis to extract a single, broad-based indicator from five empirical measures of the extent of openness in UK.

5.2. *Level of Disaggregation: Plants, Firms and Industries*

The evidence on the trade-productivity nexus for industrial sectors in different developing countries is mixed and is available at different levels of disaggregation. The range of disaggregation extends from plant level information at one end to broad industrial sectors at the other end. Appendix Table A2 provides the evidence by the level of disaggregation.

Studies based on plant level data are but few [Tybout and Westbrook (Mexico); Tybout et al. (Chile), Gocekus(Turkey), Sjöholm (Indonesia) and Alam and Morrison (Peru)] and have examined various dimensions of industrial performance such as scale/technical efficiency, productivity level and growth. The results of these limited studies, by and large tends to confirm that the impact of trade reforms on productivity and efficiency were largely positive. In Latin American countries, the impact was judged for scale as well as technical efficiency and was found to be weak. Studies for Chile and Mexico, show that gains due to scale economy were minor and were not correlated with reduction in protection. Both the studies were based on plant level information. The Chilean data covered two years, one pre-liberalization year (1967) and the other post-liberalization year (1979). For Peru, analysis based on the plant level data confirms an inverse relationship between the degree of protection and the level of technical efficiency. For Indonesia, we find that establishments participating in exports had high relative levels of productivity. In the case of Turkey, it was found that incumbent plants located near the international markets improved their technical efficiency to a larger extent than the other plants. The analysis of productivity growth at the plant level reveals that patterns of entry, exit, learning and growth in each industry are fundamental in shaping the sectoral performance and in many cases these forces are weakly associated with trade reforms.⁵⁶ Recent research however tells us that there is much to be learned from micro-econometric analysis of plant level data sets. These data sets constitute a rich source for uncovering the ways in which trade policy influences production, employment and technological performance of firms [Roberts and Tybout (1996), Bernd and Jenson (1995, 1998) and Aw, Chang and Roberts (1998)]

The evidence based on firm level data has been largely confined to industrial sectors of Africa and Asia. With regard to Africa, studies by Harrison (1994) for Cote d'Ivoire, Mulaga and Weiss (1992) for Malawi and Haddad (1993,1996) for Morocco all show a positive impact of trade liberalization on productivity growth.⁵⁷ In the context of trade liberalization, useful insights emerge from the behavior of firms in the manufacturing sectors of the countries. For Morocco, it was observed that entering firms were consistently located in the exporting sectors. Haddad (1993) observes that firms closest to the maximum levels of efficiency tended to have high share of exports. Further,

⁵⁶ See Roberts and Tybout (ed)(1996)

⁵⁷ The study on Malawi utilizes survey data for 1991-92 and covers four largest firms in operation from 1973 in each of the 10 branches of manufacturing. For Cote d' Ivore, the sample consists of a panel of 246 large and medium sized firms. In Morocco, all firms with more than ten employees or with sales revenue more than DH 100,000 were considered, for the time period 1984-89.

it was observed that exports were driving higher productivity growth and not the other way around. For Cote d'Ivoire, the author confirms that increased openness to trade lowered excess profits. In Malawi, there was a stronger effect of trade liberalization on the firms that had higher protection levels providing support to the fact that even in the short term trade reforms produced improvements in the efficiency of the firms. Although, the overall evidence based on the firm level data points towards a positive impact of trade reforms on industrial productivity performance, still a generalization may not be warranted given the number of firms as well as the kind of firms covered in the studies. In addition, there appears to be a bias towards large firms and against the informal sector.

For the studies using industrial sector data (2,3 or 4 digit level), the evidence is mixed. Majority of the studies using four-digit industrial classification confirms the positive impact of trade reforms on productivity growth. Furthermore, inter-industry studies at the three-digit level of disaggregation [Parades (1994), Fujita (1994), Ocampo(1994), Forouton (1991,96) , Athukorala and Rajapatirana (2000), Das (2001) and Chand and Sen (2002)] all show that there is a positive effect of trade liberalization on manufacturing performance. Mexico is the only country where both the studies using two-digit industry data [Weiss (1992) and Iscan (1998)]⁵⁸ confirm a positive impact on manufacturing performance. The studies for Asian countries are mostly based on broad manufacturing sectors. Though the evidence on the impact of trade reforms in these countries turned out to be positive, the relationship was neither robust nor statistically significant.

Our review based on inter-industry studies do not confirm that the trade-productivity linkage is specific to the level of disaggregation, given that we observe mixed evidence at different levels of disaggregation.

5.3. Exploring the Link: Model Specification

While the forces of international trade are undoubtedly an important catalyst for improving industrial productivity, purely domestic factors including a stable macroeconomic environment have much to contribute. Therefore the model specification and the resultant empirical evidence based upon it assumes significance in throwing light upon the issue. In this subsection, we attempt to examine the underlying econometric models behind the observed impact of trade reforms on manufacturing productivity performance. Table A3 in the appendix provides an assessment of the evidence classified by the model specification.

Industrial policies have much to contribute to the observed productivity growth. Our review of the studies for the three regions indicate that for a number of countries the relationship between trade liberalization and productivity growth is explored by taking into account the possible influence of other determinants of productivity. In the case of Mexico [Weiss (1992)], Sri-Lanka [Weiss and Kumaran (1995)] and Morocco [Haddad

⁵⁸ For India, the studies based on 3-digit industrial classification [Das (2001), Chand and Sen (2002)] also confirm the positive impact of trade reforms on manufacturing productivity.

(1996)], we observe that the econometric model recognizes the influences of industrial structure on productivity growth in addition to the changes in trade policy. Further, many studies included a measure of industrial concentration as an explanatory variable to highlight the role of domestic competition in enhancing productivity improvements. The study by Wha-lee (1995) explores the impact of a set of government policy variables on the Korean industrial productivity growth. It is difficult to quantify the relative importance of various industrial policies and their influences. Yet the overwhelming impression derived from the reviewed studies is that, in terms of their influence on the industrial productivity, they have usually been at least as important as trade policies. For India, the study by Das (2001) attempted to incorporate the non-trade determinants of industrial productivity by looking at outcomes of industrial policy reforms [changes in price cost margins, R& D intensity and capital intensity].

Major changes in the areas of trade, industrial and macro policies need time before their impact can be discerned. Such possibilities point to the need for incorporating a suitable lag structure in the econometric model specification to assess the impact of the trade liberalization on productivity performance. The specification of correct lag structures is critical but has received little attention. Our reviews however show that for Mexico [Weiss (1992) and Iscan (1998)]and India [Das (2001)] an attempt was made in the studies by to incorporate a lagged impact of trade liberalization on productivity growth.⁵⁹ There is however no clear evidence on the time required for any positive effect of trade liberalization to be felt.⁶⁰

Countries such as Cote d'Ivoire, Morocco, Malawi, Colombia, Mexico, Turkey, Indonesia, Thailand and Philippines all pursued structural adjustment programs arising from macroeconomic uncertainty due to external shocks, debt crises etc. Further, the relative importance of microeconomic signals reflecting trade, industrial and other policies decline in a macro-economically turbulent period. In particular, higher inflation rates among other things have been seen to affect economic performance negatively. However the theoretical work on the subject has not addressed the issue of how inflation affects TFP growth.⁶¹ In a large number of cases, the failure to restructure the economies was not the result of trade reforms, but the co-pursuit of inconsistent macroeconomic policies.⁶² Our review of the studies from the three regions shows that the models specified to explore the impact of trade liberalization on productivity growth did not explore the role of macroeconomic policies.⁶³

⁵⁹ Both the studies confirmed that there is no support for continuity in the effect of trade liberalization. In particular, Iscan (1998) observed that the lagged export share variables were not significant, whereas Weiss (1992) found that lagged changes in import share were insignificant in explaining productivity growth. Das (2001) observed for India, that lagged changes in NTB were significant in explaining TFP growth.

⁶⁰ Papageorgiu et al (1990) argue that in many liberalizing economies positive effects have been experienced in a four-year period. In the case of Mexico, Weiss (1992) find that at the level of total manufacturing, the initial effects are modest, but show an improvement over the previous periods.

⁶¹ See Fischer (1993)

⁶² See Michaely et al (1986)

⁶³ In many of the studies the emphasis was on inter-firm or inter-industry analysis at a point of time, and hence the role of macroeconomic policy was not an issue. Some studies for India, have attempted to incorporate the effects of a stable macroeconomic environment with variables such as inflation uncertainty [Das (2001)] , real effective

One possible explanation for the lack of definitive result regarding the impact of trade liberalization on productivity may depend upon how productivity is measured. Most of the studies on the inter-industry analysis of the trade-productivity debate have relied upon the growth accounting framework to measure productivity growth. The measurement of productivity pioneered by Solow (1957) rests on two crucial assumptions: constant returns to scale and perfect competition in product markets. Yet the shifts in trade policy are likely to alter the competitive environments, particularly in developing countries where domestic markets are often dominated by several firms. Some studies [Tybout et al (1991) for Chile, Harrison (1994) for Cote d'Ivoire, Kim (2000) for Korea, Krishna and Mitra (1998)/Balakrishnan et al (2000) for India] have assessed these concerns for developing countries using a methodology [Hall (1988)]⁶⁴ that allows for imperfect competition and non constant returns to scale while trying to explore the impact of trade liberalization on productivity growth. The evidence from these studies does confirm that the methodology of measuring productivity growth does have a bearing on the impact on TFP growth of the trade policy reforms.⁶⁵

We conclude that empirical evidence needs to be interpreted with caution, as the results are sensitive to the specification of the relationship between trade liberalization and productivity growth.

Summing Up

Our review of the evidence from the three regions and the studies therein confirm that trade liberalization has indeed occurred extensively and some times dramatically in Latin America, Africa and Asia. Yet each region has a distinct approach and in the degree of trade liberalization actually achieved and this is reflected in the observed growth rates of industrial productivity. Our assessment of the three issues posed at the beginning of this section is as follows. First, given that most developing countries are subject to both tariff and non-tariff barriers, an appropriate measure of trade orientation should reflect the lowering of both these components of trade policy changes. Second, the level of disaggregation does not have any bearing on the observed trade liberalization-productivity linkage. Finally, many of the studies recognized the role of non-trade

exchange rates [Goldar and Kumari (2002)] to assess the impact of macro policies on manufacturing productivity growth..

⁶⁴ Hall (1988) challenged the key assumptions that underlie the growth accounting approach, namely perfect competition and constant returns to scale. Based on evidence from the US industry data, Hall attributed the cyclical variations in productivity residual to be caused by the presence of imperfect competition and increasing returns to scale.

⁶⁵ Kim (2000) shows that there is no discernable relationship between productivity and trade under the standard measure of assuming perfect competition and constant returns to scale. However accounting for the presence of mark-ups and non-constant returns gives rise to the claim that trade protection is negatively correlated with productivity growth. Harrison (1994) observed that productivity growth was four times higher in the less protected sectors, whereas using import penetration, the relationship is found to be ambiguous. Similarly Tybout et al. (1991) observes that relatively large reductions in protection are associated with relatively marked declines in the estimated returns to scale.

policies also, in particular the possible influences of industrial structure in explaining productivity growth.

6. Summary and Conclusions

In light of the ambiguous nature of the trade liberalization-productivity linkage, this paper has reviewed the empirical evidence on the impact of trade liberalization on industrial productivity for the developing countries. The review of the trade liberalization experiences of the three regions points out that though most countries have replaced quantitative restrictions with tariffs and rationalized the tariff structure, yet only Latin America effected large reductions in tariffs during the 1980s. In Latin America, Africa and Asia, trade liberalization has also included removal of direct disincentives for exporters. The liberalization of trade has been unidirectional and continual in most countries outside Africa.

The available empirical evidence on the impact of trade liberalization on productivity growth of the industrial sectors is far from unambiguous. Our review of studies for Latin American countries documents that the impact of trade liberalization on productivity growth is mixed. Mexico, Chile, Colombia and Bolivia show either a weak or negative impact of trade liberalization. Brazil and Peru confirm the presence of a positive association between trade liberalization and productivity. It is interesting to note that the last two countries fall into the category of late reformers. It is however important to add that the trade and macroeconomic policies of the late reformers prior to reform differs rather dramatically from those of the early reformers. The African countries provide evidence of a positive link between trade liberalization and productivity. For Cote d'Ivoire and Malawi, we however find that the results are sensitive to the way we measure productivity growth. The evidence for Asian countries points towards a significant role of trade liberalization [Turkey, Indonesia, Thailand, Malaysia, India and Philippines]. Taiwan and Nepal are the only two countries where the impact of trade liberalization turns out to be negative. For Korea and Sri-Lanka, we however find mixed evidence.

The evidence on the impact of trade liberalization on the productivity performance for Indian industries is limited. Studies by Krishna and Mitra (1998) and Balakrishnan et.al (2000) cover the period of 1980s as well as the 1990s, when India undertook significant reforms in trade and industrial policies. These studies based on firm level data produce contradictory results. This observed difference between the two studies appears to be attributable to the differences in the econometric methodology within the Hall (1988) framework. Three recent studies [Das (2001), Goldar and Kumari (2002), Chand and Sen (2002)] based on the quantification of trade liberalization indicator reports positive impact of trade policy changes on productivity growth. These studies cover time periods ranging from the early 1970s to the late 1990s.

Our review of the studies based on countries from the three regions points towards three important issues encompassing the trade-productivity literature. One, what is the correct measure of trade liberalization ? Two, does the impact holds at all levels of

disaggregation? Finally, what is the specification of the relationship between trade liberalization and productivity growth. Our assessment is the following. The review of the trade liberalization indicators confirms that it is not easy to combine different aspects of trade policy with a single measure. Further, in most developing countries, lowering of both tariff and non-tariff barrier holds the key to successful trade liberalization. Thus we ought to construct appropriate “measures” of trade orientation reflecting both the above aspects of trade policy changes. The inter-industry studies confirm that the trade-productivity is not specific to the level of disaggregation, as we observe both positive and negative impact at various levels of disaggregation. Finally, many of the studies recognized the role of non-trade policies, particularly the possible influences of industrial structure in explaining productivity growth.

We conclude that majority of the studies have shown a positive relationship between trade liberalization and productivity growth in the developing countries of Latin America, Asia and Africa. The evidence however needs to be interpreted with due caution as the empirical analysis is plagued by limitations.

Appendix

Table A1. *Trade Liberalization and Productivity: Studies Classified by the Nature of the Impact*

Country	Trade Liberalization Indicator(s)	Study
<i>Studies showing Positive Impact of Trade Liberalization on Productivity Growth</i>		
Chile	Change in Protection	Tybout et. al (1991)
Turkey	Total Protection Rate	Gocekus (1995)
Indonesia	Export/Output and Import/Output ratios	Sjoholm (1999)
Peru	ERP	Alam & Morrison (2000)
Morocco	Import Penetration and Export Share	Haddad (1993;1996)
Thailand	Level & Change in ERP	Urata & Yokota (1994)
Brazil	Export expansion and Import substitution	Pinheiro(1990)
Brazil	Current & lagged Export expan and Import sub	Bonelli (1992)
Turkey	Growth in Import penetration	Forouton (1993;1996)
Sri-Lanka	Liberalization Dummy	Athukorala et al (2000)
India	Share of Public enterprise in Value added	Fujita (1994)
Indonesia	Level & Change in ERP	Osada (1994)
Korea	Export/Output ratio and ERP	Kwak (1994)
Philippines	ERP	Kajiwara(1994)
India	Changes in ERP, NTB and Export growth	Das (2001)
India	ERP and NTB	Goldar and Kumari (2002)
India	Price -wedge measure of Protection	Chand and Sen (2002)
<i>Studies showing No Impact of Trade Liberalization on Productivity Growth</i>		
Mexico	Tariff, NTB, ERP, Import penetration & Exports	Tybout & Westbrook (1995)
India	Dummy variables	Balakrishnan et al (2000)
Bolivia	Import availability and Import Penetration	Jenkins (1995)
Peru	Ratio of Exports to Total sales	Parades (1994)
Korea	Export & Import Ratios, NPR	Kim(1994)
Taiwan	Import Penetration, Export/Output ratio	Okuda (1994)
Korea	NTB,	Whalee(1995)
India	Export expansion and Import substitution	Norouz (2001)
<i>Studies showing Weak/Statistically Insignificant relationship</i>		
India	Dummy variables	Krishna & Mitra (1998)
Mexico	ERP, NRP, Import Penetration, Tariffs, & ORP	Weiss (1992)
Sri-Lanka	ERP and NRP	Weiss & Kumaran (1995)
Mexico	ERP, Share of imported Inputs, Export share	Iscan (1998)
Malaysia	ERP	Okamoto (1994)
Colombia	Tariff Equivalent [QRs], Exch rate & Import sub	Ocampo (1994)
Nepal	NRP, dummy variable to capture QRs	Sharma et al (2000)
<i>Results sensitive to Methodology of TFP measurement</i>		
Cote d'Ivoire	Tariffs, Import Penetration	Harrison (1994)
Malawi	ERP	Mulaga & Weiss (1996)
Korea	Coverage Ratio, NRP and Tariffs	Kim(2000)

Source: Author's review of the studies

Table A2. Trade Liberalization and Productivity: Evidence by the Level of Disaggregation

Country	Finding (s)	Study
<i>Evidence from Plant Level Studies</i>		
Chile	Reductions in protection led to improvements in TE	Tybout et. al (1991)
Mexico	Little evidence of association between trade liberalization and TFPG	Tybout & Westbrook (1995)
Turkey	Improvements in TE largely due to trade liberalization	Gocekus (1995)
Indonesia	Positive effect of exports but effect of imports is mixed	Sjoholm (1999)
Peru	Degree of protection inversely related with TE	Alam & Morrison (2000)
<i>Evidence from Firm Level Studies</i>		
Cote d'Ivoire	Std TFP under estimates the gains from trade reforms	Harrison (1994)
Morocco	Trade Liberalization improves TFPG	Haddad (1993;1996)
Malawi	Conclusion highly sensitive to TFPG measurement	Mulaga & Weiss (1996)
India	Weak evidence of TFPG following trade reforms	Krishna & Mitra (1998)
India	No evidence of TFPG since the onset of trade reform	Balakrishnan et al (2000)
<i>Evidence from analysis of 4-digit Industrial Sectors</i>		
Mexico	TL has a positive but weak effect on performance	Weiss (1992)
Bolivia	No evidence that trade liberalization led to TFP improvements	Jenkins (1995)
Thailand	Positive impact from trade liberalization	Urata & Yokota (1994)
Sri-Lanka	No long-run link but short term weak relationship	Weiss & Kumaran (1995)
Nepal	Minor impact on productivity growth	Sharma et al (2000)
<i>Evidence from analysis of 3-digit Industrial Sectors</i>		
Brazil	Export & Import substitution has positive impact	Pinheiro(1990)
Brazil	Positive impact of trade orientation on TFPG	Bonelli (1992)
Peru	Negative relationship between export & TFPG	Parades (1994)
Colombia	Weak impact of trade liberalization on TFPG	Ocampo(1994)
Turkey	Positive impact of trade liberalization mainly in private sector	Forouton (1991; 1996)
Sri-Lanka	No long-run link but short term weak relationship	Weiss & Kumaran (1995)
Sri-Lanka	Policy reforms have a significant effect on TFPG	Athukorala et al (2000)
India	TFPG improved after trade liberalization	Fujita (1994)
India	Positive impact on TFP growth from lowering of NTB	Das (2001)
India	Trade Reforms have a positive impact on TFP growth	Chand and Sen (2002)
<i>Evidence from analysis of 2-digit Industrial Sectors</i>		
Mexico	Trade liberalization has a positive but weak effect on performance	Weiss (1992)
Mexico	Trade liberalization & TFPG long term link statistically insignificant	Iscan (1998)
India	Trade Regimes have no impact on TFP growth	Norouz (2001)
India	Import Liberalization has a positive impact on TFP growth	Goldar and Kumari (2002)
<i>Evidence from analysis of Broad Industrial Sectors</i>		
Indonesia	TFP benefited from reduction in protection	Osada (1994)

Korea	Negative relationship with trade liberalization	Kim(1994)
Korea	Import liberalization has beneficial impact on TFPG	Kwak (1994)
Taiwan	Negative impact from trade reforms	Okuda (1994)
Philippines	Improvements in TFPG based on trade liberalization	Kajiwara(1994)
Malaysia	No clear cut impact of import liberalization	Okamoto (1994)
Korea	Less government intervention leads to higher TFPG	Whalee(1995)
Korea	Trade liberalization leads to improved productivity growth	Kim(2000)

Note: TL represents trade liberalization, TFPG stands for total factor productivity growth and TE for technical efficiency levels.

Source: Author's review of the studies

Table A3. *Trade Liberalization and Productivity: Studies Classified by the Nature of Model Specification*

Country	Measures	Impact on TFP growth	Study
<i>Studies incorporating measures of Industrial Policy/Structure as non-trade determinants of TFP growth</i>			
Morocco	Herfindahl Index	Not significant	Haddad (1996)
Morocco	Herfindahl index, PD index and Firm age	All are significant	Haddad (1993)
Malawi	KL ratio and PCM	KL ratio is significant	Mulaga & Weiss (1995)
Indonesia	Hefindahl index	Not significant	Sjoholm (1999)
Indonesia	FDI	Not significant	Osada (1994)
Korea	Tax and Credit incentive	Not significant	Wha-Lee(1995)
Korea	KO ratio and CR index	Both significant	Kwak (1994)
Thailand	CR ratio and R&D ratio	Only R& D ratio was significant	Urata & Yokota (1994)
Turkey	External to Internal Funds	Not significant	Gocekus (1995)
Mexico	KO ratio, KL ratio, Scale, Tech, CR ratio, Foreign firm share and Advertising share	Kl ratio, Index of Technology and Index of scale significant in some periods.	Weiss (1992)
Colombia	CR ratio	Significant	Ocampo(1994)
Peru	CR ratio	Not significant	Parades (1994)
Peru	Hefindahl index	Significant	Alam & Morrison (2000)
Brazil	Firm size, CR ratio and Establishment age	Only CR ratio is significant	Pinheiro (1990)
Sri-Lanka	KL ratio, CR ratio	KL ratio is significant	Athukorala & Rajapatirana (2000)
Sri-Lanka	Public sector share, CR ratio, Scale and Tech	Only Public sector share and CR ratio significant	Weiss & Kumaran (1995)
India	PCM, KL ratio, R& D intensity	None of these significant	Das (2001)
Nepal	KL ratio	Not significant	Sharma et al (2000)
<i>Studies incorporating measures of macroeconomic policy as non-trade determinants of TFP growth</i>			
India	Inflation Uncertainty	Not significant	Das (2001)
India	Investment to capital stock and Real Effective Exchange rate	Both significant	Goldar & Kumari (2002)
Brazil	Investment to capital stock	Not significant	Pinheiro (1990)
Colombia	Real M Exchange rate	Not significant	Ocampo (1994)
<i>Studies incorporating lag structures to assess the impact of trade liberalization on TFP growth</i>			
Mexico	Lagged changes in Import share	Significant	Weiss (1992)

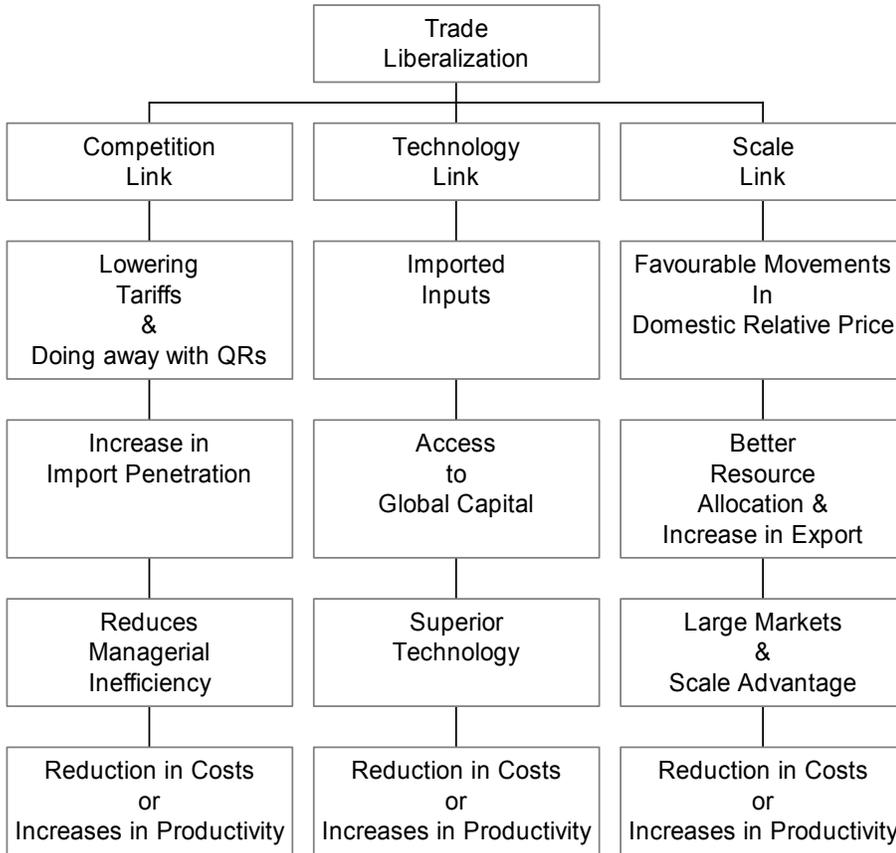
Mexico	Lagged changes in Export share	Not significant	Iscan (1998)
India	Lagged changes in ERP, NTB and Export growth	Lagged NTB significant	Das (2001)

Note: CR refers to concentration ratio; KL refers to capital-labor ratio; KO refers to capital -output ratio; PCM refers to price cost margins; PD refers to product diversification index; Scale refers to index of scale; Tech refers to index of technology; FDI refers for foreign direct investment; ERP refers to effective rate of protection; NTB refers to non-tariff barrier and Real M refers to real Import.

Source: Author's review of the studies

Chart 1

Trade Liberalization and Productivity Growth: Theoretical Links



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