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Exchange Rate Transmission into Industry-Level Export Prices: A Tale of Two Policy Regimes in India

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In the 1990s, India initiated extensive policy reforms that included the adoption of a flexible exchange rate regime and an acceleration of trade liberalization. This paper analyzes the impact of the policy reforms on exchange rate pass-through into export prices using sectoral panel data (at the two-digit Standard International Trade Classification level) for the pre-reform (1980–90) and post-reform (1991–2001) periods. Several econometric tests revealed the existence of a structural break in pass-through into export prices around 1991. The panel results suggest that the number of industries exhibiting incomplete

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pass-through increased in the 1990s relative to the 1980s, reflecting a higher degree of pricing power by these firms as export prices react to exchange rate changes in more sectors, after having controlled for the effect of product shares, marginal cost variations, and a macroeconomic policy index. These changes in pass-through behavior may be partly attributable to the elimination of currency and trade controls, which increased competition among firms and fostered a concern with market share gains in the 1990s, over an attempt to make profits as a result of depreciation in the 1980s. [JEL F13, F14, F31, F41]
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Export expansion is crucial for the growth of any developing economy, as illustrated during the 1990s by the East Asian tigers. This is because, in the absence of a mature internal market for consumer goods, industrialization can achieve only a minimally efficient scale by focusing on exporting. In turn, the degree of exportability depends on the relative export competitiveness of the products a country produces. In this regard, policy liberalization can play an important role in changing the pricing behavior of exporters as opposed to a controlled regime. In the context of developing economies, which many times lack the product sophistication that allows countries to compete in quality, export price competitiveness becomes even more important to determine export performance. The various measures of policy liberalization introduced in East Asia created an economic environment that was highly supportive of export promotion and facilitated the industrialization and associated export boom of the 1990s. Another more recent case of success is that of China, which has also adopted a more outward-looking development strategy. India, the second-largest developing economy after China, has also, even if reluctantly, followed a more outward-looking path since the extensive reforms introduced during the 1990s.[1]

The simultaneous trade liberalization and change of exchange rate regime brought by the 1991 reforms make India an interesting country to study the sensitivity of industry-level export prices to exchange rate changes. Moreover, India may also serve as an example to other larger developing countries that are trying to internationalize their economies and implement liberalizing reforms. The policy liberalization that occurred in the 1990s involved developing markets with the intention of integrating India into the global economy so as to realize the benefits of competition. In this paper we view the

[1]For a detailed discussion of the 1990s trade policy reforms, see Ahluwalia (2002) and Panagariya (2004a and 2005). Also see Joshi (2003), particularly for a discussion of the management of India's balance of payments in the 1990s. For the different quantitative impact of trade and exchange rate policy changes, see Table A1 in the Appendix I. A summary is provided in the next section of this paper.

degree of transmission of exchange rate changes to export prices as an indicator of how competitive a country's exports are in the global economy. In explaining the variation in exchange rate pass-through, we assess the impact of policy reforms as a factor contributing to the creation of competitive markets, reflecting market share gains from international trade in the post-reform period and a higher degree of pricing power by exporting firms, ultimately creating higher growth and development in India, a large developing country.

There are numerous studies examining the extent of pass-through from exchange rates to prices of traded goods. Most of the existing studies have looked at the behavior of firms in larger countries, either U.S. importers, or Japanese and German exporters practicing pricing-to-market (Feenstra, 1989; Froot and Klemperer, 1989; Hooper and Mann, 1989; Knetter, 1989 and 1994; Kim, 1990; Koch and Rosensweig, 1992; Parsley, 1993; Athukorala and Menon, 1994; Gagnon and Knetter, 1995; Goldberg, 1995; Bleaney, 1997; Tange, 1997; and Yang, 1997 and 1998). Overall, these existing studies conclude that Japanese and German exporters tend to accommodate exchange rate changes, whereas U.S. exporters keep margins constant and pass through any exchange rate changes. A second generation of studies dealt with smaller countries: Korea (Athukorala, 1991; Yang and Hwang, 1994; and Lee, 1997), Australia (Menon, 1992 and 1996), Switzerland (Gross and Schmitt, 1996), and Ireland (Doyle, 2004).

The phenomenon of incomplete pass-through of exchange rates to trade prices has been largely seen in the context of high-income countries. With global integration and trade reforms, this can also be feasible in developing country markets. There is limited evidence on developing countries using disaggregated data, because most recent studies have been carried out at an aggregated level, but they do support the possibility of incomplete pass-through in developing countries. Recently, Frankel, Parsley, and Wei (2005) have examined the pass-through into import prices of eight selected narrowly defined brand commodities exported by 76 developing countries, reporting a downward trend in the exchange rate pass-through as in developed markets. Moreover, Barhoumi (2006) estimates the exchange rate pass-through into import prices for a panel of 24 developing countries using aggregate data and finds that the differences in pass-through are due to three macroeconomic determinants: exchange rate regimes, trade barriers, and inflation regimes.

The present paper helps fill the existing gap in the pass-through literature regarding disaggregated cross-sectional exchange rate pass-through effects in a large developing economy, namely India, at the same time extending the analysis in several directions. First, the paper provides a sectorally disaggregated analysis of pass-through to export prices using a panel of two-digit-level Standard International Trade Classification (SITC) products. In the context of India as a developing country, it is important to explore whether there is evidence for cross-sectional differences in exchange rate pass-through.[2] Second, this paper attempts to draw some conclusions on

the impact of the 1991 policy reforms by analyzing the pass-through behavior of Indian exporters in the 1990s relative to the 1980s after incorporating a macroeconomic policy index in our estimations.[3] This index controls for trade barriers, inflation regimes, and budget deficits and allows us to single out the impact of changes in the exchange rate regime.

The main findings can be summarized as follows. Compared with the 1980s, in the 1990s we find a larger number of sectors for which India's export prices, measured in rupee terms, respond to the rupee's movements against a trade-weighted basket of currencies, after having controlled for the effect of product shares, marginal cost variations, and the policy index. However, even in the 1990s, Indian exporters fully pass through the exchange rate changes in most sectors. In those few sectors where exporters appear to adjust their profit margins by changing rupee prices, the relative sensitivity of the foreign currency prices of Indian exports is translated into incomplete pass-through. Nevertheless, this result suggests that Indian exporters can, to some extent, manipulate the foreign price of their exports, reflecting a change in pricing behavior in the liberalized regime.

In this context, the 1990s policy reforms regarding exchange rate regime and faster trade liberalization have borne fruits. Although it might benefit Indian exporters to refrain from fully passing through the exchange rate shock to the foreign currency price of exports, their reaction has changed over time and is sector-specific. The pass-through effect in exports has been extended to a greater number of sectors in the liberalized 1990s, as opposed to the 1980s, when the pegged currency regime made the exchange rate relatively sticky and caused substantial currency overvaluation. In addition, relatively higher inflation in the 1980s could explain the exporters' rupee prices rising relatively quickly and thus leading to the changes in foreign currency export prices. Also, in the 1990s the free float and liberalization climate increased competition among Indian exporters, who relied less on depreciation to increase their profits and tried instead to gain market share.

I. Policy Reforms in India: Exogenous or Endogenous?

The policy reforms in the early 1990s in India offer a natural experiment regarding whether the pricing behavior of Indian exporters might have changed in the face of trade and exchange rate liberalization. India's policy reforms in the early 1990s were triggered by a balance of payments (BOP) crisis in 1991. The factors that gave rise to that crisis can be described broadly

[2]The exchange rate used is a trade-weighted average of nominal bilateral exchange rates against India's main trading partners that account for the bulk of transactions (nominal effective exchange rate). A total of 36 country bilateral weights of the Indian rupee have been used in the index (index base: 1985 = 100). For full details, see www.rbi.org.in.

[3]The choice of pre-reform time period is constrained by data availability. It also provides a comparable number of observations before and after the reforms. It can also be argued that the 1980s differ from previous decades because a mild form of reforms had started in India in the 1980s.

under two categories: exogenous and endogenous. The main exogenous event that contributed to the crisis was the 1990 Gulf War creating an oil-price shock, which put pressure on India's trade accounts and aggravated the state of the BOP. Also, the political instability around the same time compounded the crisis, adding to the already weak credibility of the government caused by persistent internal and external imbalances during the 1980s.

An important endogenous factor that contributed to the crisis was the import substitution policy that made good-quality imports prohibitively expensive and in practice replaced them with low-quality domestic inputs, thus making exports uncompetitive, because they were either too expensive or of too low quality. The history of India's protectionism goes back to the 1957 foreign exchange crisis (Panagariya, 2004b). In its aftermath, quantitative restrictions on imports, industrial licensing, and foreign exchange controls were progressively strengthened. This controlled regime gave rise to a macroeconomic scenario characterized by severe fiscal and external imbalances in the 1980s. Although the liberalization of imports was initiated during the mid-1980s, the slow pace of such liberalization failed to prevent the BOP crisis in the summer of 1991. To get over the BOP difficulty, the government of India accepted IMF credit in July 1991 to gain access to external liquidity, conditional on a set of policies attached to its bailout package. The policy reforms India had to implement in the 1990s were quite comprehensive, including fiscal deficit reduction, industrial and trade policy reforms, financial liberalization, privatization, and other structural reforms. However, in this paper the developments in exchange rate regime and trade policy are the most relevant and hence will be described in more detail.

In 1991, the government announced a significant devaluation of the rupee vis-à-vis the U.S. dollar of more than 30 percent. This initial devaluation led to the replacement of the peg in place since the 1970s with a managed float regime that has been in place since the early 1990s. Between 1981–82 and 2001–02, the rupee depreciated at an average annual rate of about 8 percent. Cerra and Saxena (2002) find that currency overvaluation as well as current account deficits and investor confidence played significant roles in the sharp exchange rate depreciation.

At the same time, trade was extensively liberalized, with reduction of tariffs and elimination of quantitative restrictions. The abolition of import licensing by 1993 for capital goods and intermediates and by 2001 for final consumer goods represented an important step in liberalization, because import licensing for substitutes of domestic production had at its peak covered about 80 percent of the tariff lines. These crucial elements of the new export promotion strategy have helped meet the fairly high import contents of many export products and allowed Indian exporters access to the global marketplace. There were other export restrictions like registration and packaging requirements, including export taxes and export promotion marketing boards that cannot discriminate by price between the export-oriented firms. Before 1991, 439 items of various product categories were subject to export controls, and export taxes and subsidies were creating

further distortions in specific sectors. The 1990s reforms have largely removed these legal constraints and allowed greater competition among exporting firms.

Coupled with the huge devaluation, the reforms taking place since 1991 have reduced the anti-export bias of Indian industry (Chopra and others, 1995). India's total trade as a percentage of GDP has gone up from 14.1 percent during 1980–89 to 26.7 percent in 2001–02 (see Appendix I). The highest tariff rate was brought down from 150 percent in 1991–92 to 30.8 percent in 2002–03, while the average import-weighted tariff was reduced from 72.5 percent in 1991–92 to 29 percent in 2002–03 (Ahluwalia, 2002). However, this average hides important sectoral differences, with imports such as textiles and footwear still subject to tariffs higher than 40 percent (Mattoo and Stern, 2003).

Given the variety of policy changes that have taken place during the early 1990s, the question is how best to disentangle the change in pass-through owing to the change in exchange rate regime or to other policy reforms. In this paper, we have constructed a policy index for India, following the Burnside and Dollar (2000) approach, that takes account of the policy reforms and isolates other factors besides exchange rate regime change. This index combines fiscal deficit, inflation, and trade openness (defined as trade-to-GDP ratio), thus accounting for changes in several macroeconomic policies during this time. The empirical model to be developed in the next section is estimated using this index as an additional control variable to obtain pass-through estimates that are net of these other policy changes.

II. Analytics of Exchange Rate Pass-Through

The study of exchange rate pass-through, defined as the elasticity of import prices to exchange rate changes, goes back to the 1970s (Goldberg and Knetter, 1997).[4] This phenomenon is made possible by imperfect competition and the associated markup pricing:[5] when the exchange rate changes, exporters change the price in their own currency to stabilize their export prices in the importer's currency.

In theoretical terms, the phenomenon can be explained through the standard markup model (see, for example, Knetter, 1989 and 1993; and Gagnon and Knetter, 1995). This model is based on the definition of the price of exports in domestic currency as the product of marginal cost and a markup coefficient. In a panel structure, these elements can be distinguished as, respectively, time varying and product specific. We introduce a simple modification to the standard markup model for the case of a representative

[4]For an earlier comprehensive survey, see Menon (1995).

[5]In this paper, the definition of imperfect competition relies on the existence of markups fostered by product differentiation, which being present mostly in the manufacturing sector gives each firm a degree of monopoly power that allows the firm to use markup pricing. Because product differentiation is lower in the agricultural sector, firms in this sector have fewer possibilities for markup pricing behavior.

profit-maximizing exporting firm that produces n goods for sale in foreign markets.[6] The firm's profits will equal the difference between its revenue and its cost:

$$\Pi = \sum_{i=1}^{n} P_i^x q_i\left(\frac{P_i^x}{e}\right) - C\left(\sum_{i=1}^{n} q_i\left(\frac{P_i^x}{e}\right), w\right), \tag{1}$$

where w is an index of input prices, including the imported raw materials, q is the quantity demanded of exports, which can be assumed as a function of the export price relative to the price level in the destination market, and e is the exchange rate defined as the price of foreign currency (for example, the U.S. dollar) in terms of domestic currency (for example, the rupee).

Assume that the firm's external demand changes as the exchange rate changes. To maintain competitiveness, the representative exporter may be constrained to keep the price of its products in its own currency stable despite exchange rate fluctuations. This means that the exporter would maximize its profit function by setting its export price as a markup over the production cost, where the exchange rate is assumed to determine the profit markup at a given price elasticity of external demand. Taking the first order derivative of equation (1) with respect to P^x, the following expression is obtained:

$$P_i^x = MC\left[\frac{\eta_i\left(\frac{P_i^x}{e}\right)}{\eta_i\left(\frac{P_i^x}{e}\right) - 1}\right], \quad i = 1, \ldots, n, \tag{2}$$

where η is the absolute value of the price elasticity of demand in the foreign market.

Using log-linear differentiation, Equation (2) can be written as

$$d\ln P_i^x = d\ln MC + \frac{d\ln \eta_i}{d\ln\left(\frac{P_i^x}{e}\right)}\left(\frac{d\ln P_i^x - d\ln e}{\eta_i - 1}\right). \tag{3}$$

Collecting terms for $d\ln P_i^x$ on the left-hand side yields the following testable equation:

$$d\ln P_{it}^x = \tau_i + (1 - \delta_i) d\ln MC_i + \delta_i d\ln e_t, \tag{4}$$

[6]The original model refers to the case of a representative profit-maximizing exporting firm that produces a good for sale in n foreign markets. This setup originates the pricing-to-market commonly referred to in the literature, as the firm's markup varies by market. However, the data used in this paper show India's exports of several goods to the rest of the world. Hence, we modify the original model to allow for markups to vary by product. This could be called pricing-to-product as in Goldberg and Knetter (1997), who found that pricing-to-market differed more across industries than across countries within the same industry. In this model, it is implicitly assumed that India faces an aggregate foreign price and foreign demand elasticity per product, or that the variation across products is so high that it dwarfs the variation across countries.

where

$$\delta_i = \frac{\partial \ln \eta_i}{\partial \ln\left(\frac{P_i^x}{e}\right)} \left[1 - \eta_i + \frac{\partial \ln \eta_i}{\partial \ln\left(\frac{P_i^x}{e}\right)}\right]^{-1}$$

is a function of both the level and the elasticity of η_i, and τ_i is a sector-specific intercept that captures the constant terms. The coefficient δ is a coefficient of pricing-to-market, which can be analyzed as a coefficient of pass-through by assuming that exchange rates have no effect on the exporter's cost of production. If $\delta = 0$, the export price in domestic currency is determined only by internal factors and there is full pass-through in foreign currency terms. If $\delta = 1$, the export price in domestic currency is determined solely by external factors and exporters fully absorb exchange rate changes; that is, there is no pass-through to foreign currency prices.[7]

It should be noted that, from the exporter's point of view, pass-through is measured only indirectly (see, for example, Krugman, 1987; Giovannini, 1988; Knetter, 1989, 1993, and 1995; Marston, 1990; Kasa, 1992; Goldberg, 1995; and Gagnon and Knetter, 1995). The dependent variable is the price in the exporter's currency and, assuming marginal costs are independent from the importing markets, it also represents the exporter's markup. In general, emerging markets have been more inflation-prone than high-income countries (see Montiel, 2003). Because higher inflation could be associated with a lower markup in the long run (see Banerjee and Russell, 2001) and higher inflation is likely to change the marginal production cost, it is important to control for this variable while examining the exchange rate pass-through effect.

The relationship between foreign currency export prices (P^{x^*}) and domestic currency export prices (P^x) can be written as $P^{x^*} = P^x/e$. Taking logs and differentiating,

$$\frac{d \ln P^{x^*}}{d \ln e} = \frac{d \ln P^x}{d \ln e} - 1. \tag{5}$$

The coefficient of pass-through to foreign currency is then equal to the coefficient of pass-through to domestic currency minus one. Therefore, as long as markups vary with exchange rates, pass-through will be incomplete.

The pass-through to export prices is a crucial estimate to gauge the pricing behavior of exporters in different products. The extent of exchange rate pass-through depends on the level of markups and product differentiation, which influence the degree of imperfect competition. In other

[7]It should be noted that constant elasticity of demand would imply $\delta = 0$. For intermediate values of δ to be possible, it is implicitly assumed that the demand schedule is less convex than a constant elasticity demand schedule. This condition applies to, for example, linear demand, but other functional forms would be possible. In any instance, as long as the demand function is assumed to be less convex than the constant elasticity demand function, the specification of a particular functional form would not have an impact on the empirical model.

words, product differentiation gives the firm a degree of monopoly, and it is this monopoly power that allows the firm to use the markup approach to price determination. The manufacturing sector could conform to an imperfectly competitive market, as opposed to the agricultural and small business sectors, which appear to have less market power and thus could be price takers. The importance of studying this imperfect competition behavior is justified by both theory and policy reasons. Exchange rates influence markups and thus export prices. When a local currency appreciates, exporters reduce their selling price to remain competitive, but when a local currency depreciates, exporters may take advantage of this depreciation by increasing their selling price marginally, still establishing the case of incomplete pass-through as is found in this paper.

III. Evidence for Sectoral Pass-Through Effects in India

The unit value indices[8] of exports for a number of sectoral groups are regressed against the rupee nominal effective exchange rate (NEER) so as to investigate the extent of exchange rate pass-through into the unit values of exports (see the Appendix I for more detail on data sources and definitions). Three control variables are added: (1) the sector's share in total exports;[9] (2) the sector's wholesale price index as an approximation for marginal costs; and (3) a policy index including budget surplus, inflation, and trade openness (Burnside and Dollar, 2000).[10]

On the basis of Equation (4), the empirical measurement of exchange rate pass-through has been commonly carried out in a panel data framework (see, for example, Knetter, 1994; Gagnon and Knetter, 1995; Feenstra, Gagnon, and Knetter, 1996; Madsen, 1998; and Goldberg, 1999). Using a panel of export prices in two-digit sectors in India during the 1980s and 1990s, we estimate the pass-through of exchange rate changes to changes in India's export prices in local currency. The differences in behavior across the different sectors are tested and measured assuming sector-specific slopes. Referring back to Equation (4), export prices depend on both marginal costs and exchange rates, as well as sector shares in exports and a policy index. Hence, following Equation (4), the empirical specification for India's exports of sector *i* in period

[8]It is well known that unit values are an imperfect proxy for the true prices of goods and are subject to aggregation bias. Although the results must be interpreted with caution, unit values can be regarded as a first approximation to goods prices.

[9]For a detailed explanation of the relationship between pass-through and market share, see Feenstra, Gagnon, and Knetter (1996). They study the market share of a number of exporters in a number of markets. In the present paper we look at the share of each product in India's total exports. Hence the perspectives differ.

[10]The Burnside and Dollar (2000) policy index is defined as Burnside and Dollar policy index = 1.28 + 6.85 budget surplus—1.4 inflation + 2.16 trade openness. In this paper we use the Burnside and Dollar index as defined above and as calculated with data for India in Mallick and Moore (2005). Budget surplus is defined as budget balance as percent of GDP and trade openness is defined as ratio of exports and imports to GDP.

t can be written as follows:

$$d\ln P_{it}^{x} = \tau + \alpha d\ln S_i + \beta d\ln MC_i + \delta_i d\ln e_t + \gamma Policy_t + \varepsilon_{it}, \qquad (6)$$

where $d\ln P_{it}^{x}$ is the change in the log of export prices in domestic currency (rupees), $d\ln e_t$ is the variation in the log of the NEER exchange rate (an increase indicates depreciation), $d\ln MC_i$ is the change in the log of sectoral producer price indices, $d\ln S_i$ is the change in the log of sectoral export shares, and $Policy_t$ refers to the macroeconomic policy index. From Equation (5),

$$\frac{d\ln P^{x^*}}{d\ln e} = \delta_i - 1$$

with P^{x^*} as the foreign currency export price. Similar empirical specifications have been used in the literature, being derived from an exporter's profit maximizing framework. Furthermore, the specification of equation (6) in first differences can also be justified statistically by means of unit root tests. In particular, we have carried out the Zivot and Andrews (1992) test, which allows for structural breaks, and found that there is a unit root in levels data. Hence the first differences specification is justified empirically, as well as theoretically.

The degree of pass-through to export prices will be analyzed from India's point of view. In the export price equation (6), if H_0: $\delta = 0$ ($\delta = 1$) is accepted, there is complete (no) pass-through into India's export prices as the rupee price of *exports* does not change (changes one-to-one) with the exchange rate. If both H_0: $\delta = 0$ and H_0: $\delta = 1$ are rejected, then there is incomplete pass-through in export prices. If neither H_0: $\delta = 0$ nor H_0: $\delta = 1$ is rejected, no conclusion can be reached because the standard errors of the coefficients are simply too large.

Average Pass-Through Behavior and the Role of Changes in Policy Regime

We start by using panel estimation with common sector coefficients to find out the nature of the average pass-through relationship.[11] Table 1 shows the pre- and post-1991 regression results for the common pass-through coefficients into export prices for 34 two-digit sectors, including the coefficients of the three control variables—sector share in total exports, sectoral wholesale price index, and macroeconomic policy index. During the 1980s, the pass-through co-

[11]We would use a dynamic panel method such as the generalized method of moments (GMM) (Arellano-Bond) if we had a larger time-series dimension in our sample. Unfortunately, in our case the GMM results would not be reliable because in our sample N (number of cross-sections – sectors) is greater than T (number of time periods – years). It will be problematic when we divide the sample into two subperiods (1980s and 1990s) with a smaller sample size (just 11 years). Given this limitation, dynamic panel results would not be robust enough to draw inferences and base our conclusions and we use static Feasible Generalized Least Squares (FGLS) instead, which nevertheless allows us to control for heteroscedasticity and autocorrelation.

efficient is not significantly different from zero; this result suggests that on average there was full pass-through during the 1980s. In the 1990s, the pass-through coefficient is significantly different from either zero or one, suggesting incomplete pass-through. The two results hold true even with the control variables.[12]

The common (Table 1) and sectoral (Table 2) exchange rate coefficients remain significantly different from one, after having controlled for other policy changes, suggesting that India's export prices react less than proportionally to exchange rate changes. As a consequence, the foreign price of exports changes also less than proportionally to exchange rate changes. Moreover, the negative and significant policy index in the 1990s (as opposed to insignificance in the 1980s) means that a better macroeconomic policy environment by itself led to a decline in export prices and thus confirms the importance of reforms for the competitiveness of exporters.

Hence after having controlled for other policy changes, any change in pass-through estimates can be attributed with more credence to changes in exchange rate regimes. To further prove this point, we have also added the RESET test to Tables 1 and 2. The RESET test indicates that there are omitted variables in the models specified without the policy index in both periods, but that the model is well specified if the policy index is included in both periods. For this reason, we believe that the policy index accounts for the bulk of the policy changes, other than the change in exchange rate regime, influencing export prices.

Because these average coefficients present a clear contrast between the pre-reform and post-reform periods, they raise the question of whether the change in policy regime induced a structural break in pass-through. Table 1 shows the results of a Chow test for a structural break in the estimated export price equation.[13] The null of no structural break in 1991 is rejected jointly for slopes and intercepts, although not for slopes only, in half of the specifications. This result indicates that the 1991 reforms had an effect on changes in rupee prices by making the pass-through relationship shift downward, as represented in Figure 1. Given the structural break in 1991, as revealed from the Chow test, we further carry out the stability test using recursive estimation to obtain the cumulative sum of the squared residuals, which also

[12]Only in model (4) is the exchange rate coefficient not significant in the 1990s. However, given that the policy index, which includes inflation, may be correlated with the proxy for marginal cost, we run models (5) and (6) removing each of the insignificant variables (marginal cost in the 1990s and policy index in the 1980s) from model (4). The results of models (5) and (6) show the robustness of the exchange rate coefficient to the various specifications.

[13]We have run Chow tests for every year of the sample and find structural breaks for exports in the following years at the 5 percent level of significance: 1989, 1990, 1991, 1992, and 1993. However we have chosen to break the sample in 1991 because it is the median of the break period and because the devaluation of the rupee occurred in 1991. Using a Chow test, Mallick and Marques (2006) also find a structural break in India's rupee/U.S. dollar exchange rate pass-through into export prices at the one-digit level around 1991.

Table 1. Panel Regression Results for Export Prices (Common Sector Slopes) and Chow Test on Pass-Through (H0: No Structural Break in 1991)

	(1)	(2)	(3)	(4)	(5)	(6)
Exchange rate	0.086†††	0.047†††	0.040†††	0.295††	0.296††	0.053†††
[1980–90]	(0.193)	(0.196)	(0.194)	(0.325)	(0.324)	(0.192)
Exchange rate	0.276***†††	0.265***†††	0.179***†††	0.091†††	0.115**†††	0.114**†††
[1991–2001]	(0.046)	(0.046)	(0.054)	(0.060)	(0.058)	(0.058)
Sector share		0.058*	0.058*	0.068**	0.067**	0.065**
[1980–90]		(0.033)	(0.033)	(0.033)	(0.033)	(0.033)
Sector share		0.030*	0.033**	0.034**	0.032**	0.032**
[1991–2001]		(0.015)	(0.015)	(0.015)	(0.015)	(0.015)
Marginal cost			0.457**	0.461**	0.454**	0.485**
[1980–90]			(0.224)	(0.229)	(0.227)	(0.226)
Marginal cost			0.294***	0.138		
[1991–2001]			(0.095)	(0.107)		
Policy index				0.161	0.162	
[1980–90]				(0.173)	(0.173)	
Policy index				−0.134***	−0.156***	−0.156***
				(0.042)	(0.038)	(0.038)
Cons [1980–90]	0.088***	0.091***	0.058***	−0.105	−0.107	0.056***
	(0.012)	(0.012)	(0.020)	(0.175)	(0.175)	(0.020)
Cons [1991–2001]	0.016***	0.017***	0.001	0.190***	0.226***	0.227***
	(0.005)	(0.005)	(0.007)	(0.059)	(0.051)	(0.051)
No. of observations	735	714	714	714	714	714
No. of sectors	35	34	34	34	34	34
Log-likelihood	196.8549	196.5821	203.5673	208.3178	207.5965	207.0844
Wald chi-sq	227.07***	229.24***	248.38***	263.54***	263.05***	260.82***
RESET test (H0: no omitted variables)	2.16**	2.35***	1.87**	1.32	1.39	1.70**
Chow test on slopes	0.12	0.13	0.05	0.13	0.14	0.02
Chow test on slopes and intercepts	9.70***	9.37***	2.09	0.79	0.72	2.34*

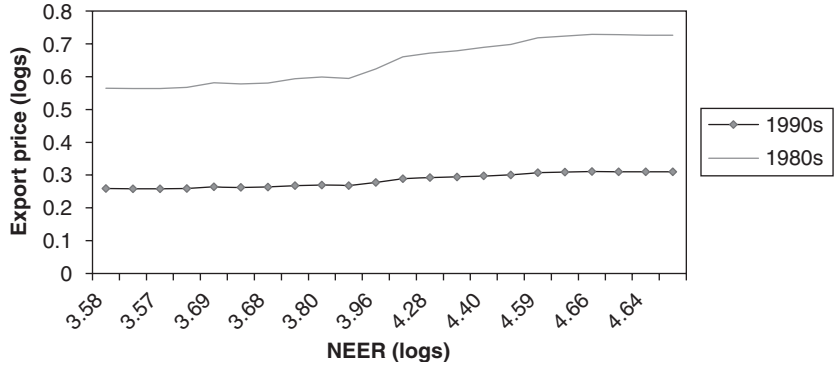
Source: Authors' regression results.

Note: This table shows the pre- and post-1991 regression results for the common pass-through coefficients into export prices for 34 two-digit sectors, including the coefficients of the three control variables—sector share in total exports, sectoral wholesale price index, and macroeconomic policy index. Pass-through is incomplete and the policy changes have significantly contributed to a reduction of export price changes in the 1990s. ***,**,* indicate a coefficient significantly different from zero at 1, 5, and 10 percent, respectively. In sectoral pass-through coefficients, †††, ††, and † indicate a coefficient significantly different from one at 1, 5, and 10 percent, respectively. Standard errors are in parentheses. A likelihood-ratio Chi-squared test for panel heteroscedasticity and the Wooldridge (2002) panel autocorrelation test were conducted on exports. These tests are fully described at http://www.stata.com/support/faqs/stat/panel.html. The results show that our sample is heteroscedastic but does not show evidence of autocorrelation. The value of the heteroscedasticity test is 46.98 for exports (p-value 0.0000). The value of the autocorrelation test is 2.651 for exports (p-value 0.1421). All estimates were produced using cross-sectional time-series feasible generalized least squares with heteroscedastic panels and no autocorrelation.

indicate a break point in the early 1990s (Figure 2), thus confirming the Chow test results on the impact of 1991.

To further confirm the behavior suggested by the Chow and cumulative sum of Squares (CUSUM) tests, we have tested for endogenous structural

Figure 1. Structural Pass-Through Relationships Before and After the Reforms



Source: Authors' calculations using the regression coefficients.

Note: This figure shows that the 1991 reforms had an effect on changes in rupee prices by making the pass-through relationship shift downward. NEER = nominal effective exchange rate.

breaks. The appropriate method to uncover breaking trend and mean in a series, while testing for nonstationarity at the same time, is to apply the sequential estimation methodology due to Zivot and Andrews (1992), which was designed to test the unit root hypothesis against the alternative of one endogenously determined break in the mean and trend of a series.[14] The Zivot-Andrews (ZA) test suggests nonstationarity.[15] Moreover, after having considered the change in slope as well as in intercept, we found that the endogenous break is occurring in 1991 in the export price series, allowing us to divide our sample into two equal subsamples (see Figure 3).

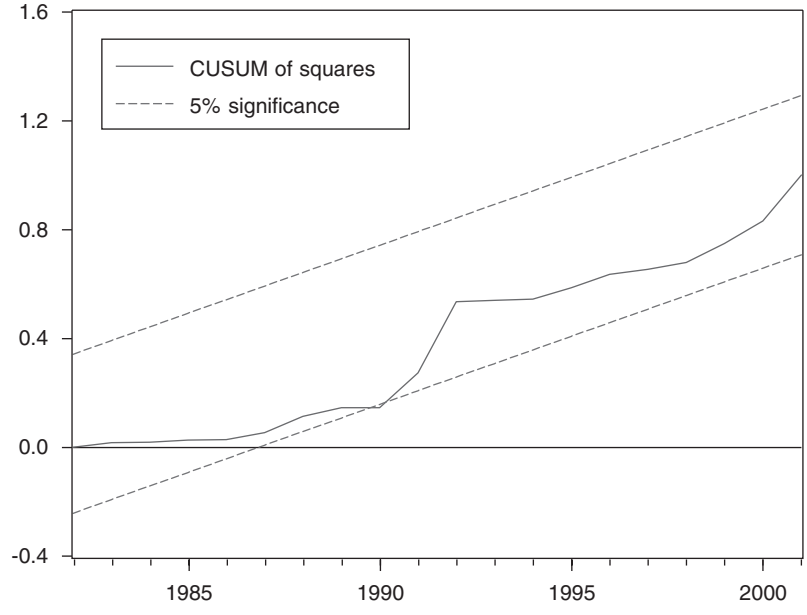
To further substantiate the structural break in 1991 reported with the ZA test, we present rolling estimates of the pass-through coefficient using a moving window as recommended by Pollock (2003).[16] The rolling regression estimator is based on only the most recent portion of the data as a way of accommodating parametric variability. As each new observation is acquired, another observation is removed so that at any instant the estimator comprises only n points. For obtaining our recursive estimates of the pass-through coefficient, we have carried out four-year rolling regressions (see Figure 4).

[14]In this context, it is worth mentioning that the alternative Bai and Perron (2003) procedure was designed to search for multiple breaks in "stationary" linear regression models and hence the method does not test for unit roots. Also this procedure is designed to capture breaks in the mean of a series and so it is inappropriate if there are breaks in the trend of a series.

[15]Allowing for the break in both intercept and trend, the Zivot-Andrews unit root t-statistic is -0.06981 at 1991:01. Critical values are -5.57 at the 1 percent level and -5.08 at the 5 percent level of significance.

[16]We chose rolling estimates (moving window) over recursive estimates with an expanding window because in the latter the sample size in each regression is different and thus presents the problem of not being comparable.

Figure 2. Cumulative Sum of Squared Recursive Residuals



Source: Authors' calculations using the recursive estimates.

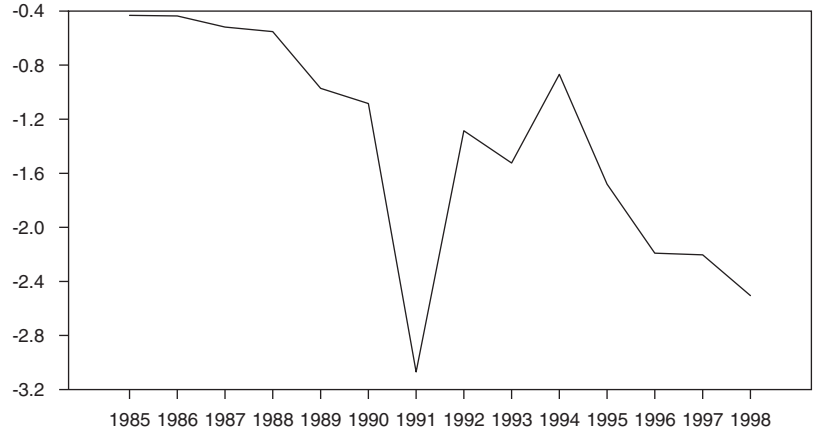
Note: This figure indicates a break point in the pass-through relationship in the early 1990s, thus confirming the Chow test results on the impact of 1991.

The rolling regressions do point to reduced volatility in the 1990s relative to the 1980s with high volatility in estimates. We conclude that, besides increasing export competitiveness, policy reforms also stabilized the economy, as reflected in smooth confidence intervals (CIs) of the pass-through coefficient from 1991 onward. The behavior of the CIs in the 1990s makes clear the overshooting of rupee export prices as a response to depreciation in the late 1980s. The figure does point to different pre-1990 and post-1990 behavior at the level of CIs, with a large reduction in standard errors in the 1990s compared with the 1980s.

Two-Digit Sectoral Pass-Through Behavior

We found in the previous subsection that Indian exporters responded to changes in the rupee NEER in the 1990s, but not in the 1980s. Before 1991, foreign prices changed one-to-one with the exchange rate, but after 1991 exchange rate changes were partially compensated by small increases in the rupee price, so that foreign prices changed less than the exchange rate. All tests conducted point to the existence of a structural break in the pass-through relationship in 1991. Our objective in this subsection is to investigate whether the incomplete pass-through observed in panel estimation with

Figure 3. Zivot-Andrews Unit Root Test with Structural Break for Export Price



Source: Estimated using RATS econometric software.

Note: This figure shows that, after having considered the change in slope as well as in intercept, an endogenous break is occurring in 1991 in the export price series.

common sector coefficients (Table 1) still holds when using sector-specific coefficients (Table 2). We find that it does hold for six sectors in the post-1991 period, representing about 20 percent of the sectors considered.

Table 2 shows that for two sectors in the 1980s (clothes and transport equipment) and six sectors in the 1990s (clothes, fruit, iron ore, metallic manufactures, minerals, and tobacco), the exchange rate coefficient is still significantly different from zero after including the three control variables. In this case, the change in the rupee export price goes beyond other factors in the macroeconomic environment and can be attributed with more certainty to exchange rate changes. Hence, even after accounting for other policy changes, we conclude that rupee export prices react to exchange rates in a larger number of sectors in the 1990s compared with the 1980s.

The results reported in Table 2 show that the sectoral slope coefficients do not significantly differ in the overall time-series or cross-section dimensions. However, for two sectors—cotton articles and transport equipment—there are significant differences between the 1980s and the 1990s. In the case of cotton articles, the rupee price did not change one-to-one with the exchange rate in the 1980s, but that hypothesis cannot be rejected for the 1990s. In the case of transport equipment, the rupee price decreased during the 1980s, but did not decline during the 1990s. At the same time, sector shares and producer costs are significant and positive in both the 1980s and the 1990s. However, the policy index was not significant during the 1980s and turned out to be statistically significant and negative after the reforms, implying that the reforms have had mostly a stabilizing effect on the export sector by reducing macroeconomic volatility, which was transmitted into lower export prices.

In the 1980s, the pass-through coefficients of two sectors—clothes and transport equipment—are significantly different from zero, suggesting incomplete pass-through during the period. Moreover the hypothesis of no pass-through (unit coefficient) for clothing is not rejected, whereas it has been rejected for transport equipment. In the other sectors, statistical insignificance of the pass-through coefficients suggests full pass-through to foreign currency

Table 2. Panel Regression Results for Sectoral Export Prices

	1980–90	1991–01	Chi-sq (1)		1980–90	1991–01	Chi-sq (1)
Carpets	0.478	−0.091†††	0.74	Clothes	0.782*	0.184*†††	1.51
	(0.642)	(0.167)			(0.472)	(0.115)	
Cereal	−0.543	0.077†††	0.26	Fruit	0.665	−0.461*†††	1.12
	(1.164)	(0.322)			(1.027)	(0.282)	
Coal	0.894	−0.234†††	0.97	Ironore	0.139	0.352**†††	0.13
	(1.105)	(0.304)			(0.581)	(0.149)	
Coffee	0.092	−0.222†††	0.06	Manmet	−0.096†	0.298*†††	0.39
	(1.241)	(0.343)			(0.612)	(0.158)	
Cotton	−3.064††	0.819	3.52*	Minerals	1.026	−0.743**†††	1.84
	(1.994)	(0.560)			(1.257)	(0.347)	
Elmach	−0.564	−0.241†††	0.04	Tobacco	−0.122†	0.335**†††	0.47
	(1.546)	(0.428)			(0.643)	(0.166)	
Fish	0.405	0.088†††	0.36	Transeq	−1.425*†††	0.271†††	4.47**
	(0.513)	(0.132)			(0.775)	(0.207)	
Footwear	0.818	0.308†††	0.45	Sector share	0.067**	0.036**	
	(0.736)	(0.194)			(0.033)	(0.016)	
Ironsteel	0.626	−0.155†††	0.89	Marginal cost	0.462**	0.184*	
	(0.801)	(0.214)			(0.219)	(0.107)	
Leather	0.970	−0.143†††	2.44	Policy index	0.189	−0.125***	
	(0.689)	(0.182)			(0.165)	(0.040)	
Livemat	0.405	0.237†††	0.03	Constant	−0.133	0.175***	
	(0.906)	(0.246)			(0.166)	(0.056)	
Meat	0.429	0.095†††	0.29	Chi-sq (2)	22.40	37.28	
	(0.601)	(0.158)					
Metals	2.519	−0.461††	1.22	Chi-sq (3)	60.15		
	(2.593)	(0.724)					
Mixmanuf	−0.265	−0.333††	0.00	No. of observations	714		
	(2.080)	(0.579)					
Nonelmach	1.695	0.162†††	1.55	No. of sectors	34		
	(1.186)	(0.326)					
Nonfermet	0.925	−0.108††	0.27	Log-likelihood	237.2575		
	(1.932)	(0.538)					
Nonmetmin	1.022	0.099†††	1.21	Wald chi-sq	356.04***		
	(0.812)	(0.218)					
Oils	−0.010	0.011†††	0.00	RESET test	1.15		
	(0.917)	(0.250)					
Othfib	−0.050	−0.018†††	0.00				
	(1.267)	(0.349)					
Othtex	0.167	−1.031†††	0.24				
	(2.349)	(0.655)					
Spices	−0.323	0.362†††	0.51				
	(0.926)	(0.252)					
Sugar	0.512	0.165††	0.04				
	(1.652)	(0.461)					
Tea	0.315	−0.168†††	0.40				
	(0.742)	(0.200)					
Textart	−0.147	0.101†††	0.09				
	(0.799)	(0.214)					

Table 2 *(concluded)*

	1980–90	1991–01	Chi-sq (1)	1980–90	1991–01	Chi-sq (1)
Veg	0.712	0.015†††	0.90			
	(0.709)	(0.190)				
Yarn	−0.452††	0.167†††	0.94			
	(0.619)	(0.160)				
Wovcot	1.089	−0.041†††	0.95			
	(1.117)	(0.306)				

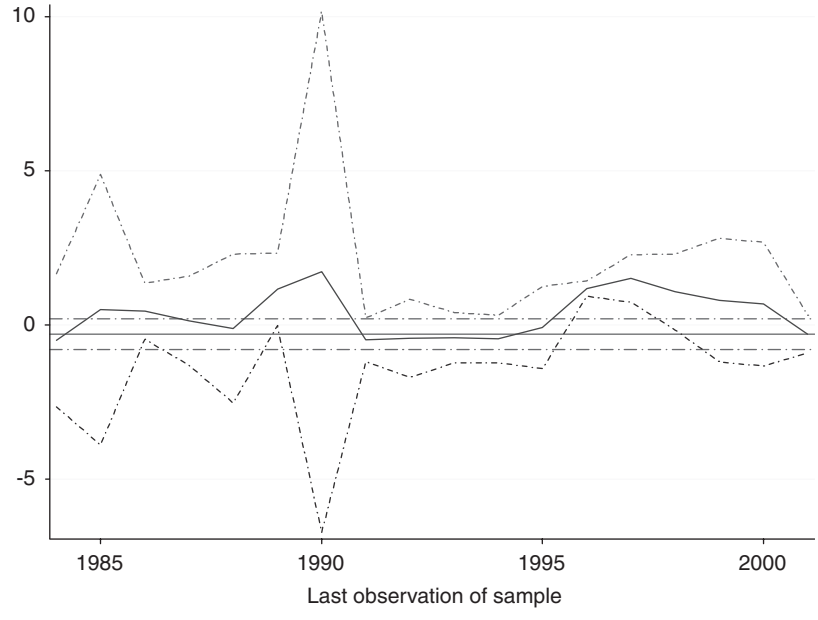
Source: Authors' regression results.

Note: This table shows that the incomplete pass-through observed in panel estimation with common sector coefficients still holds when using sector-specific coefficients for six sectors in the post-1991 period, representing about 20 percent of the sectors considered. Product categories are defined in Table A2. ***,**,* indicate a coefficient significantly different from zero at the 1, 5, and 10 percent levels, respectively. In sectoral pass-through coefficients, †††, ††, † indicate a coefficient significantly different from one at the 1, 5, and 10 percent levels, respectively. Standard errors are in parentheses. All estimates were produced using cross-sectional time-series FGLS with heteroscedastic panels and no autocorrelation. A likelihood-ratio Chi-squared test for panel heteroscedasticity and the Wooldridge (2002) panel autocorrelation test were conducted on exports. These tests are fully described at http://www.stata.com/support/faqs/stat/panel.html. The results show that our sample is heteroscedastic but does not show evidence of autocorrelation. The value of the heteroscedasticity test is 46.98 for exports (p-value 0.0000). The value of the autocorrelation test is 2.651 for exports (p-value 0.1421). Chi-sq (1): Chi-sq test where H0: equal sector slopes between the two decades. Chi-sq (2): Chi-sq test where H0: equal sector slopes within each sub-period. Chi-sq (3): Chi-sq test where H0: equal sector slopes in the whole period.

prices during this period. In addition, in five cases, the hypothesis of no pass-through (unit coefficient) is rejected. The main reason for the high or full pass-through during the 1980s could be the existence of currency controls and trade barriers that distort market forces and shelter the domestic producers from foreign competition to the extent that they do not tend to change their rupee prices in reaction to external factors, such as exchange rate changes.

A positive pass-through coefficient in Table 2 implies that as the NEER depreciates, the rupee price increases. If this increase is less than proportional to the depreciation, the price in foreign currency declines. Otherwise, the price in foreign currency increases despite the depreciation, which justifies a pricing behavior that an exporting sector with less concern for market share could enjoy. A negative pass-through coefficient indicates that even with exchange rate depreciation, the rupee price declines, meaning a double source of decrease in foreign currency price. In general, in the 1990s there is an increase in the number of sectors whose rupee price changes by less than 1 percent, implying a fall in foreign currency price. In fact, in the 1990s the pass-through coefficient is less than 1 percent in all sectors except cotton articles, whereas in the 1980s this happened for only five sectors in Table 2. In the 1990s, the coefficients of six sectors—clothes, fruit, iron ore, metal manufactures, minerals, and tobacco—are significantly different from zero

Figure 4. Rolling Regression Estimates for Export Price: Coefficient on NEER (95 percent Confidence Interval) vs. Full-Sample Estimate



Source: Estimated using STATA econometric software.

Note: This figure shows reduced volatility in the pass-through coefficient in the 1990s relative to the 1980s. NEER = nominal effective exchange rate.

(up from two sectors in the 1980s), implying that incomplete pass-through is more common during the second subperiod relative to the 1980s. In all these sectors, the coefficients also significantly differ from one, implying that there is incomplete pass-through.

Looking at the share of adjustment borne by Indian exporters in these six sectors in the 1990s, only in fruit and minerals is the depreciation reinforced by a drop in the rupee price. In the other four sectors, the adjustment is shared, with most of it falling on the foreign currency price. The share of adjustment falling on the rupee price is around 20 to 35 percent for these four sectors. In general, the sectors where the rupee price reacts to a greater extent present a higher degree of monopoly power, which may result from a more concentrated market structure or a higher world market share. On the contrary, the sectors where the rupee price increases by a lesser extent are traditional export sectors in which India has been highly specialized and where gaining market share is extremely important.

Hence, from an economic point of view, the post-reform changes in pricing behavior can also be linked to the extent of export orientation of the sectors. The share of manufactured goods in total exports has gone up to 76 percent in 2001–02 from 68 percent in 1987–88, while the share of primary products has come down to 16 percent of total exports from 26 percent

during the same period. Because manufactured goods are subject to a higher degree of differentiation, whereas agricultural goods are more homogeneous, the structural shift to manufactures has established a pattern of imperfect competition and increased the potential for the existence of markups. Therefore, when the exchange rate is depreciating more often than appreciating, the exporters have a choice between allowing exchange rate variations to improve competitiveness or keeping the foreign currency price unchanged to increase export profitability. The finding that pass-through is incomplete for virtually all sectors in the 1990s, against only four in the 1980s, confirms that the reforms have influenced the way Indian producers react to exchange rate changes by increasing the extent of competition they face. They tend to react more actively to changes in the economic environment, but at the same time they react more strategically, taking care of maintaining price competitiveness abroad.

Despite currency depreciation, low or declining exchange rate pass-through has also been evidenced in individual low-income developing countries at the aggregate level (see Mwase, 2006, for Tanzania; Belaisch, 2003, for Brazil; Bhundia, 2002, for South Africa; and Ca' Zorzi, Hahn, and Sánchez, 2007, for 12 emerging markets). Overall macroeconomic stability appears to be one of the factors for the apparent decline in pass-through of changes in exchange rate in these economies. Thus the results presented in our empirical study after having controlled for the policy environment are robust enough in attributing the difference in pass-through between the pre- and post-reform periods to the change in exchange rate regime.

IV. Conclusions

This paper examines the responsiveness of Indian export prices to exchange rate changes, particularly the degree of export price pass-through after the acceleration of trade openness and the introduction of a market-determined exchange rate regime in the early 1990s. Based on the panel data of two-digit SITC sectors over the period from 1980 to 2001, the pass-through of changes in the NEER of the rupee into export prices is often found to be incomplete or imperfect in the 1990s. The results also indicate that there is incomplete pass-through into the foreign currency price of exports for more sectors in the 1990s than in the 1980s, suggesting that the pricing behavior of the Indian exporters varies across industries, with the variations being linked to industry-specific features, as well as exchange rate and trade policies.

Similar to most newly industrialized countries, India is generally held to be a price taker in international markets. This assumption would mean zero pass-through of exchange rate changes to foreign currency prices. The panel results in this paper show that the small country assumption does not fully fit India and suggest an incomplete pass-through instead, in line with the findings for high-income countries in the literature. Using industry-level data, several econometric tests validate the prior hypothesis of a structural break in

1991, reflecting the policy shift regarding the exchange rate and trade regimes that also gave rise to a downward shift in the pass-through relationship. The consequence was a rise in the number of sectors showing an incomplete pass-through in the 1990s.

Specifically, in the liberalized 1990s, Indian exporters passed through some, but not all, exchange rate changes to foreign currency prices in all but one industry (cotton products), as opposed to four in the 1980s. This implies that after the liberalization, Indian exporters have gained sufficient pricing power to change their rupee price so that they can to some extent manipulate the change in the foreign currency price of their exports when the exchange rate changes. However, it is also the case that Indian exporters still did not change their rupee price at all in 94 percent of the sectors in the 1980s and in 82 percent of the sectors in the 1990s.

It could be the case that, because product differentiation is more a characteristic of the manufacturing sectors than of the agricultural and resource-based sectors, imperfect competition is more common in the former than in the latter. As a consequence, as manufactures gain export share over agriculture and natural resources, exporting firms have more leverage to adjust their profit margins when facing exchange rate changes. Other sectoral characteristics that may generate a different behavior are the degree of durability of the goods or the sectoral degree of non tariff barriers such as import licenses. More flexible exchange rate regimes may neutralize the impact of any terms of trade shocks, emanating from these non tariff barriers, on the current account (see Broda, 2004). The sectors exhibiting incomplete pass-through also differ in the degree of monopoly power, which may result from the degree of concentration in the industry, the share in the world market, or the degree of export orientation.

In policy terms, the liberalization that took place in the 1990s has empowered India's exporters to exhibit a pricing behavior that is less that of a price taker and more that of a price maker. Overall, the price competitiveness of exports seems to have improved, with export prices becoming less volatile. It should be noted however that the policy impact seems to have been sectoral, located in the sectors that represent a higher share of exports. The impact of policy choices on different types of sectors may be a lesson to other developing countries currently globalizing their economies and aiming to achieve export-led growth.

APPENDIX I

Data Sources and Definitions

The unit value indices of imports and exports for a number of sectoral groups, the rupee NEER (nominal effective exchange rate), and the wholesale price indices (the sectoral producer price index corresponds to different components of the wholesale price index), were compiled from the *Handbook of Statistics on the Indian Economy*, Reserve Bank of India, over the period 1980–81 to 2001–02. Financial year (annual average) data are used in this paper. Export value indices for the two-digit products are calculated by multiplying the quantity index with unit value index, and with base year values in local currency for the respective product, the sectoral value indices are converted to local currency units and the product shares are then derived.

The NEER is calculated as a weighted geometric average of the bilateral nominal exchange rates of the Indian rupee in terms of foreign currencies. Here it measures the appreciation/depreciation of the rupee against the weighted basket of 36 currencies whose countries are the main trading partners or competitors of India. The formula is

$$NEER = \prod_{i=1}^{36} (e_{i,INR})^{w_i},$$

where e_i is the exchange rate of the rupee against the currency of the trading partner i, that is, rupee per currency i (in index form); and w_i is the 36-country bilateral trade weights attached to currency/country i in the index.

Data on exports, which include reexports, relate to free on board (f.o.b.) values and import data relate to cost, insurance, and freight (c.i.f.) values. All the data are annual. The codes and definitions of the two-digit Standard International Trade Classification (SITC) (Rev. 2) sectors are shown in Table A2. A full description of the SITC codes can be found at http://www.census.gov/foreign-trade/reference/codes/sitc/sitc.txt.

Table A1. Impact of Trade Liberalization in India
(In percent)

	1974–79	1980–89	1990–95	1996–2001
Trade (percent of GDP)	13.3	14.1	19.2	26.7
Import duty (percent of total imports)	29.9	45.8	38.3	24.8
Export duty (percent of total exports)	2.7	0.8	0.2	0.2
Exchange rate depreciation (percent)	−0.5	−6.8	−10.4	−5.7
Import prices (percent change)		6.9	7.7	5.9
Import volume (percent change)		7.5	15.1	6.2
Export prices (percent change)		11.1	10.1	4.3
Export volume (percent change)		5.4	14.3	7.9

Sources: Data from World Bank, World Development Indicators; and Datastream.

Note: Trade as a percent of GDP for the last column includes data up to 2003. The missing numbers in the first column (1974–79) are due to nonavailability of data. The GDP at factor cost is nominal.

Table A2. SITC Two-Digit Codes and Definition (Revision 2) Sectors

Code	Description	SITC Revision 2 Code
Meat	Food & Food Articles: Meat & Meat Preparations	01
Fish	Food & Food Articles: Fish & Fish Preparations	03
Cereal	Food & Food Articles: Cereals & Cereal Preparations	04
Veg	Food & Food Articles: Vegetables	054 + 056
Fruit	Food & Food Articles: Fruits & Nuts	057
Sugar	Food & Food Articles: Sugar	06
Coffee	Food & Food Articles: Coffee	071
Tea	Food & Food Articles: Tea	074
Spices	Food & Food Articles: Spices	075
Oils	Food & Food Articles: Oilseed Cake	0813
Tobacco	Beverages & Tobacco: Tobacco & Tobacco Manufactures	12
Cotton	Crude Materials, Inedible, Except Fuels: Raw Cotton	263
Oth Fib	Crude Materials, Inedible, Except Fuels: Textile Fibers & Waste Excluding Cotton	26−263
Minerals	Crude Materials, Inedible, Except Fuels: Minerals (Excluding Coal, Petroleum, Crude Fertilizers, Sulphur, & Precious Stones)	27−272
Ironore	Crude Materials, Inedible, Except Fuel: Iron Ore & Concentrates	281
Metals	Crude Materials, Inedible, Except Fuel: Ores & Concentrates of Base Metals N.E.S.	287
Livemat	Crude Materials, Inedible, Except Fuels: Crude Animals & Vegetables Material N.E.S.	29
Coal	Mineral Fuels, Lubricants, etc.: Coal	32
Leather	Manufactured Goods Classified Chiefly by Material: Leather & Leather Manufactures Excluding Footwear	61
Yarn	Manufactured Goods Classified Chiefly by Material: Textile Yarn	651
Wovcot	Manufactured Goods Classified Chiefly by Material: Cotton Fabrics Woven	652
Othtex	Manufactured Goods Classified Chiefly by Material: Textile Fibers Other Than Cotton	653 + 654 + 655 + 656 + 657
Textart	Manufactured Goods Classified Chiefly by Material: Made-Up Articles of Textile Materials	658
Carpets	Manufactured Goods Classified Chiefly by Material: Floor Coverings	659
Nonmetmin	Manufactured Goods Classified Chiefly by Material: NonMetallic Mineral Manufactures N.E.S.	66
Ironsteel	Manufactured Goods Classified Chiefly by Material: Iron & Steel	67
Nonfermet	Manufactured Goods Classified Chiefly by Material: Nonferrous Metals	68
Manmet	Manufactured Goods Classified Chiefly by Material: Manufactures of Metals	69
Nonelmach	Machinery & Transport Equipment: Nonelectrical Machinery	711 + 712 + 713 + 714
Elmach	Machinery & Transport Equipment: Electrical Machinery	77

Table A2 *(concluded)*

Code	Description	SITC Revision 2 Code
Transeq	Machinery & Transport Equipment: Transport Equipment	79
Clothes	Miscellaneous Manufactured Articles: Articles of Apparel & Clothing Accessories	84
Footwear	Miscellaneous Manufactured Articles: Footwear	85
Mixmanuf	Miscellaneous Manufactured Articles: Miscellaneous Manufactured Articles N.E.S.	89

Source: http://www.census.gov/foreign-trade/reference/codes/sitc/sitc.txt.
Note: SITC = Standard International Trade Classification; N.E.S. = National Export System.

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