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# SECTORAL EXCHANGE RATE PASS-THROUGH: TESTING THE IMPACT OF POLICY REFORMS IN INDIA

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## Abstract

*This paper analyses the impact of India's policy reforms on exchange rate pass-through into import and export prices, using panel data (at one-digit SITC level) for pre- (1980–90) and post-reform (1991–2001) periods. While the pass-through into import prices has declined, the pass-through into export prices (in USD terms) has increased during the 1990s. The results suggest that, relative to rupee depreciation, Indian exporters increased their USD prices around 20% in the 1980s, but decreased them by around 70% in the 1990s. Moreover, the number of sectors exhibiting some degree of pass-through increased in the 1990s (six), relative to the 1980s (three). These changes may be 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 use depreciations to increase profits in the 1980s.*


## I Introduction

In the aftermath of a severe balance of payments (BOP) crisis in 1991, India implemented a comprehensive package of economic reforms.[1] A devaluation of the rupee vis-à-vis the USD of more than 30% in 1991 was followed by a managed float regime that replaced the peg in place before 1991. Between 1981–82 and 2001–02, the rupee depreciated at an average annual rate of about 8%. Trade has been extensively liberalised, with tariffs being reduced and quantitative restrictions being eliminated. Import licensing was fully abolished by 1993 for capital goods and intermediates, but only by 2001 for final consumer goods. The export taxes and export promotion marketing boards that prevented free competition among exporting firms have been largely removed. India's openness index, defined as the sum of exports and imports with respect to GDP, has gone up from 16% in 1985–86 to 37% in 2002–03 (Mattoo and Stern, 2003). The highest tariff rate was brought down from 150% in 1991–92 to 30.8% in 2002–03, while the average import-weighted tariff was reduced from 72.5% in

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[1] For a detailed discussion of the 1990s trade policy reforms, see Ahluwalia (2002) and Panagariya (2004).

1991–92 to 29% 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% (Mattoo and Stern, 2003).

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 market place. Coupled with the devaluation of the rupee, the reforms taking place since 1991 have reduced the anti-export bias of Indian industry and India has become an increasingly important player in world trade (Chopra *et al.*, 1995). The simultaneous trade liberalisation and change of exchange rate regime included in the 1991 reforms make India an interesting case study to investigate the extent of exchange rate pass-through (EPT) to traded goods prices. Moreover, India may also serve as an example to other developing countries that are trying to internationalise their economies and implement liberalising reforms.

There are numerous studies examining the pass-through mechanism. Most of the existing studies have looked at the behaviour of firms in larger countries, either US importers, or Japanese and German exporters (Feenstra, 1989; Froot and Klemperer, 1989; Hooper and Mann, 1989; Knetter, 1989, 1994; Kim, 1990; Koch and Rosensweig, 1992; Parsley, 1993; Athukorala and Menon, 1994; Gagnon and Knetter, 1995; Goldberg, 1995; Bleaney, 1997; Tange, 1997; Yang, 1997, 1998). A second generation of studies has dealt with smaller countries: South Korea (Athukorala, 1991; Yang and Hwang, 1994; Lee, 1997), Australia (Menon, 1992, 1996), Switzerland (Gross and Schmitt, 1996), Ireland (Doyle, 2004). However, in the context of emerging market economies such as India, there is little, if any, evidence examining the EPT effect.

This paper attempts to fill the existing gap regarding developing countries by examining the extent of transmission of rupee/USD exchange rate changes to India's import and export prices, at the same time extending the analysis in several directions. First, while most studies in the literature have dealt with either exports or imports, thus developing specific models of either EPT or pricing-to-market, this paper links exchange rate changes to both export and import prices. This is done by stressing how changes in import prices can feed through to export prices when the imported component of exports is substantial, as in many developing countries. Second, the paper provides a sectorally disaggregated analysis for both import and export prices. In the context of India as a developing country, it is worth exploring whether there is evidence for cross-sectional differences in EPT. Finally, this paper attempts to draw some conclusions on the impact of the 1991 policy reforms, including the change in exchange rate regime, by analysing the pass-through behaviour of Indian importers and exporters in the 1990s relative to the 1980s.

The main findings can be summarised as follows. Both import and export prices of India, measured in rupee terms, are very responsive to the rupee's movements in the 1990s. On the whole, exchange rate changes are mostly absorbed by Indian importers and exporters. Exporters appear to adjust their profit margins by changing rupee prices, as they prefer to avoid large fluctuations in the USD price of traded goods. The relative insensitivity of the

USD prices of Indian exports and imports is translated into incomplete pass-through for exports and complete pass-through for imports, and it suggests that India is still a price-taker in the global market place. This is because of the fact that the firms' behaviour depends on the elasticity of external demand, and on the share of imported content embodied in exports. The dependence on imported components precludes a structural break in the pass-through into import prices.

However, the 1990s policy reforms regarding exchange rate regime and faster trade liberalisation have produced fruits. Although it might be to the benefit of Indian exporters to refrain from fully passing through the exchange rate shock to the USD 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 liberalised 1990s, with currency changes being transmitted for six industry groups, relative to three industry groups in the 1980s. This behaviour partly reflects the 1980s pegged currency regime, which made the exchange rate relatively sticky, and caused substantial currency overvaluation. In addition, as a result of high inflation, the exporters' rupee prices were rising relatively quickly. Consequently, domestic inflation was more responsible than exchange rate changes for the changes in USD export prices. On the contrary, in the 1990s the free float and liberalisation climate increased competition among Indian exporters, who relied less on depreciation to increase their profits and tried instead to gain market share.

The remainder of the paper is organised as follows. Section II describes a simple model of EPT into export and import prices, from which an empirical specification is derived. Section III discusses the data and estimation results. A summary and discussion of implications of the findings are provided in Section IV.

## II The Modelling of EPT

The study of EPT, defined as the elasticity of import prices to exchange rate changes, goes back to the 1970s (Goldberg and Knetter, 1997). Several authors (Mann, 1986; Dornbusch, 1987; Feenstra, 1989; Froot and Klemperer, 1989; Hooper and Mann, 1989; Ohno, 1989; Yang, 1995) measured directly the EPT using equations where the price in the importer's currency was the dependent variable. If the exchange rate coefficient were significant, then there would be pass-through, albeit incomplete if the coefficient would be less than one. Following this approach, EPT can be described in the import price ($P^m$) equation for sector $i$ and year $t$ as follows:

$$d \ln P_{it}^m = \alpha_i + \beta_i \, d \ln e_t + \varepsilon_{it}, \tag{1}$$

where $d$ is the first difference operator, $e_t$ is the rupee/USD exchange rate and $\beta_i$ is the EPT coefficient of import prices and indicates the percentage of exchange rate change that is transmitted to the import price given in domestic currency.

This phenomenon of incomplete pass-through is made possible by imperfect competition and the associated mark-up pricing:[2] when the exchange rate changes, exporters change the price in their own currency to stabilise their export prices in the importer's currency. In theoretical terms, the phenomenon can be explained through a mark-up model (Knetter, 1989, 1993; 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 mark-up coefficient. In a panel structure, these elements can be distinguished as, respectively, time varying and product-specific. As an illustration, consider the model in Gagnon and Knetter (1995), modified for the case of a representative profit-maximising exporting firm that produces $n$ goods for sale in foreign markets.[3] The firm's profits will equal the difference between its revenue and its cost:

$$\Pi = \sum_{i=1}^{n} P_i^x q_i\left(\frac{P_i^x}{e}\right) - C\left(\sum_{i=1}^{n} q_i\left(\frac{P_i^x}{e}\right), w\right), \tag{2}$$

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, $e$ is the exchange rate defined as the price of foreign currency (e.g., USD) in terms of domestic currency (e.g., 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 USD price of its products stable despite exchange rate fluctuations. This means that the exporter would maximise its profit function by setting its export price as a mark-up over the production cost, where the exchange rate is assumed to determine the profit mark-up at a given price elasticity of external demand. Taking the first-order derivative of equation (2) with respect to $P^x$, the following expression is obtained:

$$P_i^x = MC\left[\frac{\eta_i\left(P_i^x/e\right)}{\eta_i(P_i^x/e) - 1}\right], \quad i = 1, \ldots, n, \tag{3}$$

[2] In this paper, the definition of imperfect competition relies on the existence of mark-ups fostered by product differentiation. The differentiation present mostly in the manufacturing sector gives each firm a degree of monopoly power that allows the firm to use mark-up pricing. As product differentiation is lower in the agricultural sector, firms in this sector have fewer possibilities for mark-up pricing behaviour.

[3] The original model refers to the case of a representative profit-maximising exporting firm that produces a good for sale in $n$ foreign markets. This set-up originates the pricing-to-market commonly referred to in the literature, as the firm's mark-up 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 mark-ups 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 $\eta$ is the absolute value of the price elasticity of demand in the foreign market. Using log-linear differentiation, equation (3) can be written as

$$d\ln P_i^x = d\ln MC + \frac{d\ln \eta_i}{d\ln(P_i^x/e)}\left(\frac{d\ln P_i^x - d\ln e}{\eta_i - 1}\right). \tag{4}$$

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

$$d\ln P_{it}^x = \tau_i + (1-\delta_i)d\ln MC_i + \delta_i d\ln e_t, \tag{5}$$

where

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

is a function of both the level and the elasticity of $\eta_i$ and $\tau_i$ is a sector-specific intercept that captures the constant terms. The coefficient $\delta$ is a coefficient of pricing-to-market, which can be analysed as a coefficient of pass-through by assuming that exchange rates have no effect on the exporter's cost of production. This assumption implies a separate analysis of imports and exports as carried out in this paper. 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.[4]

It should be noted that, from the exporter's point of view, pass-through is measured only indirectly (Krugman, 1987; Giovannini, 1988; Knetter, 1989, 1995; Marston, 1990; Kasa, 1992; Knetter, 1993; Gagnon and Knetter, 1995; Goldberg, 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 mark-up. The relationship between foreign currency export prices ($P^{x*}$) and domestic currency export prices ($P^x$) can be written as $P^{x*} = \frac{P^x}{e}$. Taking logs and differentiating:

$$\frac{d\ln P^{x*}}{d\ln e} = \frac{d\ln P^x}{d\ln e} - 1. \tag{6}$$

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 mark-ups vary with exchange rates, pass-through will be incomplete.

In addition to the extent of direct pass-through into import prices, the pass-through to export prices is a crucial estimate to gauge the pricing behaviour of exporters in different product groups. The extent of EPT depends on the level of

[4] It should be noted that constant elasticity of demand would imply $\delta = 0$. For intermediate values of $\delta$ 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.

mark-ups and product differentiation, which influence the degree of imperfect competition. In other words, product differentiation gives the firm a degree of monopoly, and it is this monopoly power that allows the firm to use the mark-up 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 behaviour, both from the perspective of the importer (pass-through) and of the exporter (pricing-to-market), is justified by both theory and policy reasons. Exchange rates influence mark-ups 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, as is found in this paper.

## III Testing Sectoral Pass-Through Effects in India

The unit value indices of imports and exports for a number of sectoral groups are regressed against the rupee/US dollar exchange rate so as to investigate the extent of EPT into the unit values of imports and exports (see Appendix A for more detail on data sources and definitions). As it is well known that unit values are an imperfect proxy for the true prices of goods and are subject to aggregation bias, the results must be interpreted with caution. However, in the absence of micro data for emerging markets, unit values can be regarded as a first approximation to allow the analysis of an important issue. The direction of India's trade is critical in terms of the choice of exchange rate. The use of the rupee/USD rate in this analysis does reflect the fact that USA is the leading trading partner of India, especially on the export side (see Table A1), and thus USD remains as the currency in which the exporters' prefer to price their goods.

On the basis of equation (1) for imports and equation (5) for exports, the empirical measurement of EPT has been commonly carried out in a panel data framework (Knetter, 1994; Gagnon and Knetter, 1995; Feenstra *et al*., 1996; Madsen, 1998; Goldberg and Knetter, 1999). The panel structure presents several advantages, namely the possibility of sectoral disaggregation of the data and the incorporation of time and cross-sectional effects. In this case, time effects measure changes in marginal costs and other supply factors, while cross-sectional effects control for variations specific to each importing market, such as exchange rate changes and other demand factors. The issue is usually whether exchange rate changes also make prices in the importing market vary or are reflected on the exporters' margins.

Existing studies (e.g., Mann, 1986; Knetter, 1989, 1993; Marston, 1990) conclude that Japanese and German exporters tend to accommodate exchange rate changes, whereas US exporters keep margins constant and pass-through any exchange rate changes. These studies however look at this effect for OECD countries, but there is little evidence in the context of emerging economies providing this link at a sectoral level, which could be due in part to lack of sectoral data. The fact that India has such disaggregated data allows this paper to look at the sectoral

pass-through effects in India's exports and imports. In Table A2 in Appendix A, the sectoral importance is provided, indicating the shares of the various sectors in India's exports and imports, respectively, for the 1980s and the 1990s.

This paper uses panel techniques to estimate the pass-through of exchange rate changes to changes in India's import and export prices in local currency assuming a common slope across sectors, and a SUR estimation assuming sector-specific slopes. The SUR estimation is used because it incorporates the assumption that the sector errors are correlated, which may be expected. This assumption is however tested for. Referring back to equations (1) and (5), import and export prices depend on both marginal costs and exchange rates. However, because of data availability, the assumption that marginal costs are constant over time will be made, and marginal costs will be proxied by the intercept. Hence the empirical specifications for, respectively, India's imports and exports of sector $i$ in period $t$ can be written as follows:

$$d \ln P_{it}^{m} = \alpha_i + \beta_i d \ln e_t + \varepsilon_{it}, \tag{7}$$

$$d \ln P_{it}^{x} = \gamma_i + \delta_i d \ln e_t + \varepsilon'_{it}, \tag{8}$$

where $d \ln P_{it}^{m}$ and $d \ln P_{it}^{x}$ are, respectively, the change in the log of import and export prices in domestic currency (rupees), $d \ln e_t$ is the variation in the log of the rupee/USD exchange rate (defined as rupees per USD) and, from equation (5), $\gamma_i = \tau_i + (1 - \delta_i) d \ln MC_i$. From equation (6), $\frac{d \ln P^{x*}}{d \ln e} = \delta_i - 1$ with $P^{x*}$ the foreign currency export price.

The degree of pass-through to import and export prices will be analysed from India's point of view. In the import price equation (7), if $H_0$: $\beta = 0$ ($\beta = 1$) is accepted, there is no (full) pass-through into India's import prices as the rupee price of *imports* does not change (changes one-to-one) with the exchange rate. In the export price equation (8), 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 $H_0$: $\beta = 0$ ($\delta = 0$) and $H_0$: $\beta = 1$ ($\delta = 1$) are rejected, then there is incomplete pass-through in import (export) prices. If neither $H_0$: $\beta = 0$ ($\delta = 0$) nor $H_0$: $\beta = 1$ ($\delta = 1$) are rejected, no conclusion can be reached as the standard errors of the coefficients are simply too large.

*Did the 1990s reforms cause a structural break in pass-through?*

The answer is provided by a Chow test for a structural break in the export and import price equations to be estimated.[5] The null of no structural break cannot be rejected in the case of import prices (Table 1). However, a closer look reveals a lack of significance in the pre-1991 point estimate, meaning rigidity of the rupee import prices due in part to the existence of import restrictions, and a

[5] We have run Chow tests for every year of the sample and find structural breaks for exports in the following years at 5% level of significance: 1989, 1990, 1991, 1992, and 1993. However, we have chosen to break the sample in 1991 because it is both the median of the break period and because the devaluation of the rupee occurred in 1991.

Table 1
*Chow test ($H_0$: no structural break in 1991)*

| | Imprice | Exprice |
|---|---|---|
| Exchrate 80–90 | 0.994 | 1.210* |
| | (0.585) | (0.353) |
| Exchrate 91–01 | 0.368* | 0.346* |
| | (0.132) | (0.080) |
| Cons 80–90 | − 0.003 | − 0.020 |
| | (0.054) | (0.033) |
| Cons 91–01 | − 0.002 | 0.007 |
| | (0.017) | (0.010) |
| Adj $R^2$ | 0.109 | 0.300 |
| *F*-test | 6.76* | 21.23* |
| $N_{obs}$ | 189 | 189 |
| Chow test on slopes | 1.09 | 5.70* |
| Chow test on slopes and intercepts | 2.13 | 6.31* |

*Notes:*
*Significance at the 5% level.
Standard errors are in parentheses.

significant 30% response to changes in the rupee/USD exchange rate in the post-1991 period. Hence the behaviour of import prices will be analysed for both the 1980–90 and 1991–2001 periods.

While the Chow test on the imports regression could not reject the null of no structural break, the Chow test on the exports regression indicated the existence of a structural break. Thus export prices are also analysed for the 1980–90 and 1991–2001 periods. Note however that, while Indian exporters responded to exchange rate changes in both periods, the nature of that response differed. Before 1991, changes in rupee export prices amplified exchange rate changes, but after 1991 they were partially compensated. In addition, as restrictions on imports were removed, the post-1991 free market behaviour of exporters and importers became more similar than it had been during the protectionist pre-1991 period.

It should be noted that the $R^2$ is quite small. This is a characteristic found in the rest of the results presented here and it is probably because of the lack of control variables. Although these would be useful, the availability of data precludes their use. Moreover, $R^2$ in case of panel data models is generally smaller than the time-series models.

### *Pass-through in imports*

Tables 2 and 3 show the pre- and post-1991[6] pass-through coefficient in import prices for a range of static and dynamic panel techniques.[7] What follows is a

[6] The results for the full 1980–2001 period are available upon request from the authors.

[7] A likelihood-ratio $\chi^2$ test for panel heteroskedasticity and the Wooldridge (2002) panel autocorrelation test were conducted on exports and imports. These tests are fully described in http://www.stata.com/support/faqs/stat/panel.html. The results show that our sample is heteroskedastic but does not show evidence of autocorrelation. The value of the heteroskedasticity test is 46.98 for exports (*p*-value 0.0000) and 32.92 for imports (*p*-value 0.0001). The

Table 2
*Panel regression results for import prices (1980–90)*

| | Model 1 | Model 2 | Model 3 | Model 4 | Model 5 | Model 6 |
|---|---|---|---|---|---|---|
| Exchrate [1] | 0.994 | 0.994 | 1.054* | 0.994 | 1.464* | 1.105 |
| | (0.572) | (0.554) | (0.396) | (0.705) | (0.582) | (0.880) |
| Cons | − 0.003 | − 0.003 | − 0.006 | − 0.003 | 0.013 | − 0.013 |
| | (0.053) | (0.051) | (0.037) | (0.065) | (0.011) | (0.061) |
| Imprice( − 1) [2] | | | | | − 0.322* | 0.780 |
| | | | | | (0.122) | (0.558) |
| Long-run pass-through ([1]/1–[2]) | | | | | 1.107* | 5.023 |
| $N_{obs}$ | 90 | 90 | 90 | 90 | 72 | 63 |
| $R^2$ | 0.035 | 0.035 | | 0.035 | | 0.003 |
| Log-likelihood | | | 20.348 | | | |
| Wald $\chi^2$ | | 3.21 | 7.09* | 1.99 | 11.74* | |
| Breusch–Pagan ($H_0$: Var($u$[sector]) = 0) | | 2.41 | | | | |
| $F$-test | 3.01 | | | | | 1.80 |
| $F$-test ($u\_i = 0$) | 0.32 | | | | | |
| $F$-test (exchrate = 1) | 0.00 | 0.00 | 0.02 | 0.00 | | |
| Sargan test of over-identifying restrictions | | | | | 50.17 | |
| Arellano–Bond ($H_0$: AR(1) = 0) | | | | | − 3.75* | |
| Arellano–Bond ($H_0$: AR(2) = 0) | | | | | − 1.73 | |

*Notes:*
*Significance at the 5% level.
Standard errors are in parentheses. Model 1, fixed-effects (within); Model 2, random-effects GLS; Model 3, cross-sectional time-series FGLS (heteroskedastic panels, no autocorrelation); Model 4, PCSEs OLS (correlated panels, no autocorrelation); Model 5, Arellano–Bond dynamic panel; Model 6, Anderson–Hsiao first-differenced IV dynamic panel.

summary for the static models (Models 1–4) and for the dynamic models (Models 5 and 6).

Before 1991, the short-run pass-through coefficient is not significantly different from zero in four of the six models, neither it is significantly different from one. The standard errors in this period are quite substantial and this is probably because of misreporting and under- or over-invoicing in an attempt to evade import restrictions, leading to measurement error. On the contrary, after 1991 the short-run pass-through coefficient amounts to 0.36% on average and is significantly different from zero across the four static models. In addition, the hypothesis of full pass-through of exchange rate changes into import prices in rupees can now be rejected and a robust adjustment share of 36% in rupees and 64% in USD is found.

value of the autocorrelation test is 2.651 for exports ($p$-value 0.1421) and 3.634 for imports ($p$-value 0.0931). After having corrected for the heteroskedastic nature of the sample, both random and fixed effects models are presented. An $F$-test cannot reject that the fixed effects are zero. For the whole sample period, the Breusch–Pagan test rejects that the variance of the random effects is zero, but this hypothesis cannot be rejected for the sub-periods exports. Both models are reported and in any case the pass-through coefficient is the same.

Table 3
*Panel regression results for import prices (1991–2001)*

| | Model 1 | Model 2 | Model 3 | Model 4 | Model 5 | Model 6 |
|---|---|---|---|---|---|---|
| Exchrate [1] | 0.368* | 0.368* | 0.336* | 0.346* | 0.275 | 0.202 |
| | (0.141) | (0.138) | (0.105) | (0.068) | (0.229) | (0.498) |
| Cons | − 0.003 | − 0.003 | 0.003 | 0.014 | − 0.006 | 0.010 |
| | (0.036) | (0.035) | (0.027) | (0.017) | (0.010) | (0.050) |
| Imprice( − 1) [2] | | | | | − 0.353* | 0.101 |
| | | | | | (0.110) | (0.264) |
| Long-run pass-through ([1]/1–[2]) | | | | | 0.203 | 0.225 |
| $N_{obs}$ | 99 | 99 | 99 | 99 | 81 | 72 |
| $R^2$ | 0.068 | 0.068 | | 0.149 | | 0.053 |
| Log-likelihood | | | 11.048 | | | |
| Wald $\chi^2$ | | 7.12* | 10.27* | 26.27* | 10.62* | |
| Breusch–Pagan ($H_0$:Var($u$[sector]) = 0) | | 1.81 | | | | |
| $F$-test | 6.78* | | | | | 0.17 |
| $F$-test ($u\_i = 0$) | 0.42 | | | | | |
| $F$-test (exchrate = 1) | 19.94* | 20.95* | 40.15* | 93.78* | | |
| Sargan test of over-identifying restrictions | | | | | 48.34 | |
| Arellano–Bond ($H_0$: AR(1) = 0) | | | | | − 5.52* | |
| Arellano–Bond ($H_0$: AR(2) = 0) | | | | | − 2.23* | |

*Notes:*
*Significance at the 5% level.
Standard errors are in parentheses. Model 1, fixed-effects (within); Model 2, random-effects GLS; Model 3, cross-sectional time-series FGLS (heteroskedastic panels, no autocorrelation); Model 4, PCSEs OLS (correlated panels, no autocorrelation); Model 5, Arellano–Bond dynamic panel; Model 6, Anderson–Hsiao first-differenced IV dynamic panel.

It is commonly argued that incomplete pass-through may be a short-run phenomenon because of price rigidities, but it would vanish in the long-run when all prices can be fully adjusted. The dynamic models 5 and 6 do not show conclusive evidence of stickiness in import prices. The lagged dependent variable is significant (and negative) in the Arellano–Bond but not in the Anderson–Hsiao specification. Nevertheless, these models allow the computation of the long-run pass-through coefficient as shown in Tables 2 and 3. The average long-run pass-through is a very high 3.065% in the 1980s and a low 0.214% in the 1990s, which does not differ much from the short-run estimate. Given that the data are annual, the results could mean that the dynamics are completed during the first year. It is not straightforward to reject that either the rupee price of imports does not react to exchange rate changes (no pass-through) or that it fully reacts to it (full pass-through). Further, pass-through into import prices has declined in the 1990s relative to the 1980s (Tables 2 and 3). Frankel *et al.* (2005) have reported a similar downward trend by examining the pass-through into import prices of eight selected commodities in 76 countries.

When we distinguish sectoral slopes through SUR estimation (Tables 4 and 5), we find pass-through in both periods only in the Crude materials sector, and

Table 4
*SUR regression results for import prices (1980–90)*

| | Bevt | Chem | Crud | Food | Fuel | Mach | Manu | Misc | Oils |
|---|---|---|---|---|---|---|---|---|---|
| Exchrate | 0.064 | 1.505 | 1.037* | 2.748* | 0.497 | −0.193 | 0.072 | 0.063 | 2.372* |
| | (0.802) | (1.348) | (0.376) | (0.603) | (1.037) | (0.654) | (0.502) | (1.216) | (1.033) |
| Cons | 0.139 | −0.077 | −0.007 | −0.192* | −0.003 | 0.084 | 0.113 | 0.127 | −0.156 |
| | (0.103) | (0.173) | (0.048) | (0.078) | (0.133) | (0.084) | (0.065) | (0.156) | (0.133) |
| RMSE | 0.206 | 0.346 | 0.097 | 0.155 | 0.266 | 0.168 | 0.129 | 0.312 | 0.265 |
| $R^2$ | 0.001 | 0.122 | 0.458 | 0.697 | 0.025 | 0.010 | 0.002 | 0.000 | 0.369 |
| $F$-test | 0.006 | 1.246 | 7.616* | 20.736* | 0.230 | 0.087 | 0.021 | 0.003 | 5.266* |
| $N_{obs}$ | 11 | 11 | 11 | 11 | 11 | 11 | 11 | 11 | 11 |
| $F$-test ($H_0$: slope equals 1) | 1.36 | 0.14 | 0.01 | 8.39* | 0.24 | 3.32 | 3.42 | 0.59 | 1.76 |
| $F$-test ($H_0$: equal sector slopes) | | | | | 23.02* | | | | |
| Breusch–Pagan ($H_0$: independence of residuals) | | | | | 35.248 | | | | |

*Notes:*
*Significance at the 5% level.
Standard errors are in parentheses.

Table 5
*SUR regression results on import prices (1991–2001)*

| | Bevt | Chem | Crud | Food | Fuel | Mach | Manu | Misc | Oils |
|---|---|---|---|---|---|---|---|---|---|
| Exchrate | 0.695 | 0.358 | 1.232* | 1.022 | − 0.288 | 0.326 | 0.671 | 0.851 | 1.763 |
| | (0.565) | (0.476) | (0.539) | (1.026) | (0.819) | (1.012) | (0.420) | (1.067) | (1.355) |
| Cons | − 0.007 | 0.042 | − 0.057 | 0.015 | 0.106 | 0.005 | 0.009 | − 0.119 | − 0.021 |
| | (0.072) | (0.061) | (0.069) | (0.131) | (0.104) | (0.129) | (0.065) | (0.136) | (0.172) |
| RMSE | 0.171 | 0.144 | 0.163 | 0.310 | 0.247 | 0.306 | 0.153 | 0.322 | 0.409 |
| $R^2$ | 0.144 | 0.059 | 0.368 | 0.099 | 0.014 | 0.011 | 0.163 | 0.066 | 0.158 |
| $F$-test | 1.51 | 0.56 | 5.23* | 0.99 | 0.12 | 0.10 | 1.75 | 0.64 | 1.69 |
| $N_{obs}$ | 11 | 11 | 11 | 11 | 11 | 11 | 11 | 11 | 11 |
| $F$-test ($H_0$: slope equals 1) | 0.29 | 1.82 | 0.19 | 0.00 | 2.47 | 0.44 | 0.42 | 0.02 | 0.32 |
| $F$-test ($H_0$: equal sector slopes) | | | | | 3.95* | | | | |
| Breusch–Pagan ($H_0$: independence of residuals) | | | | | 40.462 | | | | |

*Notes:*
*Significance at the 5% level.
Standard errors are in parentheses.

we cannot reject that it is complete, showing India's dependence on imported sources of energy. In addition, pass-through in the Food and Oils sectors in the 1980s was well above exchange rate changes. Although in the Oils sector we cannot reject that rupee prices were absorbing all the change, with the USD price unchanged, the results show that India's suppliers of Food were in fact increasing their prices by twice as much as the depreciation in exchange rate. Both these sectors produce consumer goods, which were subject to heavy tariffs and import licensing schemes, and India's suppliers might have tried to compensate restrictions with higher prices. Moreover, the equality of slope coefficients is rejected, implying that pass-through is indeed sectoral in both periods. Although the full pass-through exists only in three import sectors in the 1980s (Table 4), the lack of pass-through except the crude materials sector in the 1990s (Table 5) appears to be in line with the declining pass-through coefficient at the aggregate level as shown in Table 3. Within this sectoral panel regression, however, the same slope for all sectors is also rejected.

*Pass-through in exports*

The results for export prices when a common slope coefficient is assumed confirm the difference between the 1980s and the 1990s.[8] During the 1980s the coefficients average 1.2% across different models (Table 6), which means a 0.2% increase in dollar-denominated export prices despite currency depreciation. This reflects the anti-export bias symbolised by the high degree of regulation discriminating exporters, who had to buy imported inputs at high domestic prices and sell their output at world prices during the 1980s. Competition among firms was restricted and the general preference was to take advantage of depreciation to increase profits rather than gaining market share. In contrast, in the 1990s, the average coefficient of 0.29% across models (Table 7) suggests that for 1% rupee depreciation, the export price in US dollars has declined by 0.71% – a case of incomplete pass-through. After elimination of the regulatory export arrangements, competition among exporters in a free market has increased and to gain market share through a substantial decrease in USD prices became the priority.

Similar to imports, the dynamic models 5 and 6 do not show conclusive evidence of persistence in export prices. The lagged dependent variable is significant in the Arellano–Bond but not in the Anderson–Hsiao specification in the 1980s, and in the 1990s it is never significant. The average long-run change in the rupee export price is 0.96% in the 1980s (Table 6) and 0.18% in the 1990s (Table 7). These values show that the mean long-run pass-through behaviour differs substantially before and after 1991. In the 1980s, it cannot be rejected that the long-run coefficient is equal to one, but it is clearly different from zero. Hence, the rupee price of exports reacts to the exchange rate, but the hypothesis

[8] The results for the full 1980–2001 period are available upon request from the authors.

Table 6
*Panel regression results for export prices (1980–90)*

| | Model 1 | Model 2 | Model 3 | Model 4 | Model 5 | Model 6 |
|---|---|---|---|---|---|---|
| Exchrate [1] | 1.210* | 1.210* | 0.895* | 1.210* | 1.541* | 1.280* |
| | (0.338) | (0.329) | (0.193) | (0.391) | (0.373) | (0.362) |
| Cons | − 0.020 | − 0.020 | 0.013 | − 0.020 | 0.004 | − 0.005 |
| | (0.031) | (0.030) | (0.018) | (0.036) | (0.006) | (0.024) |
| Exprice( − 1) [2] | | | | | − 0.382* | − 0.594 |
| | | | | | (0.120) | (0.332) |
| Long-run pass-through ([1]/1–[2]) | | | | | 1.115* | 0.803* |
| $N_{obs}$ | 90 | 90 | 90 | 90 | 72 | 63 |
| $R^2$ | 0.133 | 0.133 | | 0.133 | | 0.190 |
| Log-likelihood | | | 85.643 | | | |
| Wald $\chi^2$ | | 13.53* | 21.40* | 9.58* | 21.97* | |
| Breusch–Pagan ($H_0$: Var($u$[sector]) = 0) | | 1.72 | | | | |
| $F$-test | 12.83* | | | | | 6.29* |
| $F$-test ($u\_i = 0$) | 0.43 | | | | | |
| $F$-test (exchrate = 1) | 0.39 | 0.42 | 0.29 | 0.29 | | |
| Sargan test of over-identifying restrictions | | | | | 54.3 | |
| Arellano-Bond ($H_0$: AR(1) = 0) | | | | | − 4.04* | |
| Arellano–Bond ($H_0$: AR(2) = 0) | | | | | 0.33 | |

*Notes:*
*Significance at the 5% level.
Standard errors are in parentheses. Model 1, fixed-effects (within); Model 2, random-effects GLS; Model 3, cross-sectional time-series FGLS (heteroskedastic panels, no autocorrelation); Model 4, PCSEs OLS (correlated panels, no autocorrelation); Model 5, Arellano–Bond dynamic panel; Model 6, Anderson–Hsiao first-differenced IV dynamic panel.

Table 7
*Panel regression results for export prices (1991–2001)*

| | Model 1 | Model 2 | Model 3 | Model 4 | Model 5 | Model 6 |
|---|---|---|---|---|---|---|
| Exchrate [1] | 0.346* | 0.346* | 0.370* | 0.346* | 0.290* | 0.062 |
| | (0.087) | (0.084) | (0.073) | (0.068) | (0.130) | (0.302) |
| Cons | 0.014 | 0.014 | 0.006 | 0.014 | −0.014 | −0.005 |
| | (0.022) | (0.021) | (0.019) | (0.017) | (0.006) | (0.031) |
| Exprice(−1) [2] | | | | | −0.182 | 0.424 |
| | | | | | (0.098) | (0.310) |
| Long-run pass-through ([1]/1–[2]) | | | | | 0.245* | 0.108 |
| $N_{obs}$ | 90 | 90 | 90 | 90 | 81 | 63 |
| $R^2$ | 0.149 | 0.149 | | 0.149 | | 0.007 |
| Log-likelihood | | | 53.921 | | | |
| Wald $\chi^2$ | | 16.91* | 25.59* | 26.27* | 7.40* | |
| Breusch–Pagan ($H_0$:Var($u$[sector]) = 0) | | 3.42 | | | | |
| $F$-test | 15.76* | | | | | 0.99 |
| $F$-test ($u\_i = 0$) | 0.17 | | | | | |
| $F$-test (exchrate = 1) | 56.27* | 61.64* | 73.99* | 93.78* | | |
| Sargan test of over-Identifying restrictions | | | | | 64.21* | |
| Arellano–Bond ($H_0$: AR(1) = 0) | | | | | −3.34* | |
| Arellano–Bond ($H_0$: AR(2) = 0) | | | | | −2.58* | |

*Notes:*
*Significance at the 5% level.
Standard errors are in parentheses. Model 1, fixed-effects (within); Model 2, random-effects GLS; Model 3, cross-sectional time-series FGLS (heteroskedastic panels, no autocorrelation); Model 4, PCSEs OLS (correlated panels, no autocorrelation); Model 5, Arellano–Bond dynamic panel; Model 6, Anderson–Hsiao first-differenced IV dynamic panel.

that the changes in rupee prices fully compensate for the changes in exchange rate, and the USD price remains the same, cannot be ruled out. In the 1990s, the change in rupee price is different from zero in the Arellano–Bond, but not in the Anderson–Hsiao. However, in both cases the change in the rupee price of exports is less than the change in the exchange rate, even after 1 year. As a consequence, in the 1990s Indian exporters do not fully compensate for exchange rate changes and even after 1 year the USD price is still changing with the exchange rate.

The results also show that the sectoral slope coefficients are not equal (Tables 8 and 9). In the 1980s, the pass-through coefficients of three sectors – Chem, Fuel, Oils – are not significant (Table 8), suggesting full pass-through during the period. However the hypothesis of no pass-through cannot be rejected because of the high standard errors of the coefficients. In the other four sectors – Bevt, Crud, Food, Mach – the sectoral coefficients being significantly different from zero and the *F*-test showing the acceptance of the unit coefficient suggest no pass-through effect in USD terms during this period. The main reason for the low or inexistent pass-through during the 1980s could be the existence of currency controls and trade barriers that distort market forces. This possibility of no pass-through in these four sectors suggests that these sectors are the ones in which India can be considered to be a price-taker in the international market. Two other sectors – Manu and Misc with slope coefficients not being equal to one – exhibit a shared adjustment between rupee and USD prices in the order of, respectively, 44.1% and 55.9% in Manu and 51.6% and 48.4% in Misc.

In the 1990s, the coefficients of six sectors – Food, Fuel, Mach, Manu, Misc, Oils – are not significant (Table 9), implying that pass-through may be more common during the second sub-period relative to the 1980s. Overall, India seems to be more of a price-maker in the 1990s, although in Bevt, Chem, and Crud India appears to be still a price-taker.

From an economic point of view, the acceptance of the null hypothesis of $\delta$ being both equal to zero and one suggests that the exporting firms can either pass through the exchange rate changes fully or can keep the dollar price constant. This scenario is evident in five sectors in the liberalised 1990s as opposed to three sectors in the 1980s, which can be linked to the extent of export orientation of the sectors. The share of manufactured goods in total exports has gone up to 76% in 2001–02 from 68% in 1987–88, while the share of primary products has come down to 16% of total exports from 26% during the same period. Because manufactured goods are subject to a higher degree of differentiation, while 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 mark-ups. Therefore, in an environment where the exchange rate is depreciating more often than appreciating, the exporters have a choice between allowing exchange rate variations to improve competitiveness or to keep the foreign currency price unchanged to increase export profitability.

Table 8
*SUR regression results for export prices (1980–90)*

| | Bevt | Chem | Crud | Food | Fuel | Mach | Manu | Misc | Oils |
|---|---|---|---|---|---|---|---|---|---|
| Exchrate | 1.419* | 0.230 | 1.291* | 0.683* | 0.888 | 1.347* | 0.441* | 0.516* | 0.541 |
| | (0.221) | (0.494) | (0.499) | (0.200) | (1.279) | (0.359) | (0.220) | (0.210) | (0.512) |
| Cons | − 0.041 | 0.048 | − 0.016 | 0.025 | − 0.062 | − 0.042 | 0.078* | 0.083* | 0.011 |
| | (0.028) | (0.063) | (0.064) | (0.026) | (0.165) | (0.046) | (0.028) | (0.027) | (0.066) |
| RMSE | 0.057 | 0.127 | 0.128 | 0.051 | 0.329 | 0.092 | 0.056 | 0.054 | 0.132 |
| $R^2$ | 0.821 | 0.024 | 0.426 | 0.564 | 0.051 | 0.610 | 0.310 | 0.402 | 0.110 |
| *F*-test | 41.171* | 0.218 | 6.686* | 11.661* | 0.482 | 14.067* | 4.044* | 6.054* | 1.117 |
| $N_{obs}$ | 11 | 11 | 11 | 11 | 11 | 11 | 11 | 11 | 11 |
| *F*-test ($H_0$: slope equals 1) | 3.58 | 2.43 | 0.34 | 2.51 | 0.01 | 0.93 | 6.47* | 5.34* | 0.80 |
| *F*-test ($H_0$: equal sector slopes) | | | | | 5.62* | | | | |
| Breusch–Pagan($H_0$: independence of residuals) | | | | | 54.591* | | | | |

*Notes:*
*Significance at the 5% level.
Standard errors are in parentheses.

Table 9
*SUR regression results for export prices (1991–2001)*

| | Bevt | Chem | Crud | Food | Fuel | Mach | Manu | Misc | Oils |
|---|---|---|---|---|---|---|---|---|---|
| Exchrate | 1.212* | 0.946* | 1.032* | 0.301 | 1.015 | 0.938 | 0.378 | 0.430 | −0.024 |
| | (0.375) | (0.361) | (0.397) | (0.420) | (0.814) | (0.534) | (0.504) | (0.725) | (0.460) |
| Cons | −0.040 | −0.014 | −0.009 | 0.042 | 0.032 | −0.007 | 0.017 | 0.037 | 0.066 |
| | (0.048) | (0.046) | (0.051) | (0.053) | (0.104) | (0.068) | (0.064) | (0.092) | (0.059) |
| RMSE | 0.113 | 0.109 | 0.120 | 0.127 | 0.246 | 0.161 | 0.152 | 0.219 | 0.139 |
| $R^2$ | 0.537 | 0.433 | 0.429 | 0.054 | 0.147 | 0.255 | 0.059 | 0.038 | 0.0003 |
| $F$-test | 10.425* | 6.876* | 6.755* | 0.515 | 1.556 | 3.082 | 0.563 | 0.352 | 0.003 |
| $N_{obs}$ | 11 | 11 | 11 | 11 | 11 | 11 | 11 | 11 | 11 |
| $F$-test ($H_0$: slope equals 1) | 0.32 | 0.02 | 0.01 | 2.77 | 0.00 | 0.01 | 1.52 | 0.62 | 4.95* |
| $F$-test ($H_0$: equal sector slopes) | | | | | 3.07* | | | | |
| Breusch–Pagan ($H_0$: independence of residuals) | | | | | 48.382 | | | | |

*Notes:*
*Significance at the 5% level.
Standard errors are in parentheses.

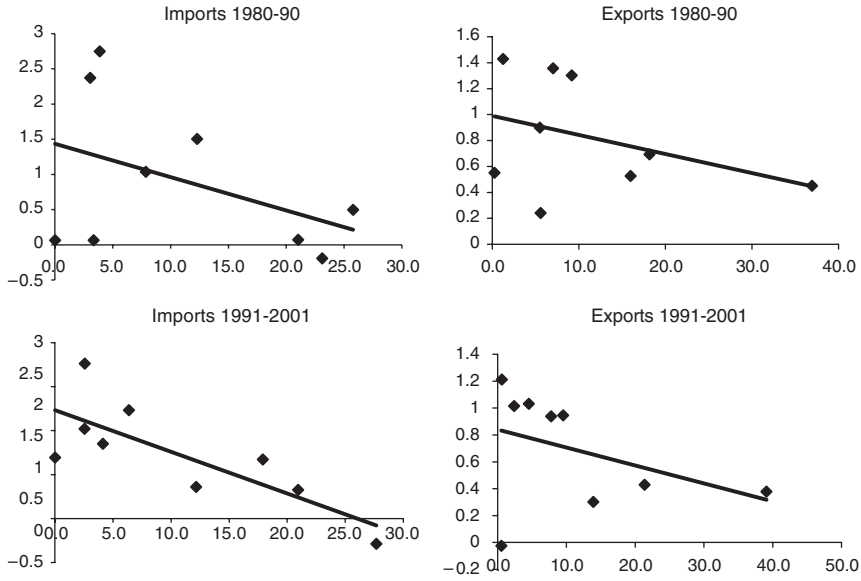


Figure 1. Estimated sectoral pass-through coefficients against sector shares in foreign trade.

*Sectoral pass-through and foreign trade shares*

Figure 1 plots the coefficients of Tables 4, 5, 8, and 9 against the shares of each sector in India's foreign trade provided in Table A2. It is evident from these plots that there is a negative relationship between the extent of EPT into rupee prices and share in foreign trade. On the export side, rupee prices react less to exchange rate changes in sectors like Food, Manu, and Misc, which have a higher share of exports, than in sectors like Bevt, Fuel, and Oils, which have a lower share of exports. On the import side, pass-through is lower in Fuel, Chem, Manu, and Mach, which have a higher share of imports, and higher in Food and Oils, which have a lower share of imports.

## IV Conclusions

This paper provides a comparative analysis of how Indian import and export prices have reacted to exchange rate changes, particularly the degree of export price pass-through after the acceleration of trade openness and the introduction of a flexible exchange rate regime. Based on panel data analysis of one-digit SITC sectors over the period from 1980 to 2001, the full pass-through of changes in the bilateral rupee/US dollar exchange rate into import prices is not rejected, while for export prices the pass-through is often found to be incomplete or imperfect. For the whole sample period (1980–2001), around 80% of the impact of currency depreciation is borne by domestic firms, but foreign firms bear 20% of the impact. Put differently, there is a 0.2% dollar price reduction and a 0.8% rupee price increase for 1% currency depreciation and this result holds for both

exports and imports. The results also indicate that there is pass-through into the dollar price of exports for more industry groups in the 1990s than in the 1980s, suggesting that the pricing behaviour of the Indian exporters varies across industries, with the variations being linked to industry-specific features, as well as exchange rate and trade policies.

India is generally held to be a small country in the sense that it is 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. A structural break in 1991 makes the extent of pass-through differ in the two sub-periods. In the 1980s, the rupee price amplified exchange rate changes by 20% and this excess was transmitted to the dollar export prices, while in the 1990s the rupee price compensated exchange rate changes by increasing only 29% and allowing the dollar export prices to decline by 71%. Hence, for a 1% depreciation of the rupee, the dollar prices of exports increased by 0.2% in the 1980s, but declined by 0.71% in the 1990s. This means that the exporters were taking more advantage of the exchange rate changes in the pegged currency regime of the 1980s by inflating the export prices in foreign currency terms. The main reason for the low pass-through in the 1980s appears to be the existence of currency controls and trade barriers that place a barrier on market forces. The Chow test for a structural break in 1991 does reflect the policy shift regarding the exchange rate regime that reflected upon a higher pass-through in the 1990s.

From a sectoral standpoint, in the liberalised 1990s, Indian exporters do pass through most of the exchange rate changes to dollar prices in six industry groups, as opposed to three in the 1980s. This implies that India is more of a price-maker after the liberalisation, as exporters in the food sector, machinery, transport equipment and manufactured goods in general have gained sufficient pricing power to make the dollar price of their exports change when the exchange rate changes. However, in the beverages & tobacco, chemical products, and crude materials sectors, India is still a price-taker in the international market, as the exporters do not have the pricing power to change the dollar price of their exports. 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 behaviour are the degree of durability of the goods or the sectoral degree of non-tariff barriers such as import licences. More flexible exchange rate regimes may neutralise the impact of any terms of trade shocks, emanating from these non-tariff barriers, on the current account (see Broda, 2004).

In policy terms, the liberalisation that took place in the 1990s has empowered India's exporters to exhibit a pricing behaviour that is less that of a price-taker and more that of a price-maker. It should be noted however that the policy

impact seems to have been sectoral, possibly located in the more modern sectors, giving these an edge over the more traditional exports. The more flexible exchange rate regime and rapid trade liberalisation have benefited exporters, making the extent of pass-through more dependent on endogenous factors. At the same time, the importing sector, unlike the exporting sector, remained more dependent on external factors – exogenous international market conditions – than on internal factors – exchange rate and trade policies. The impact of policy choices on modern and traditional sectors, as well as on the exporters and importers, may be a lesson to other developing countries currently internationalising their economies.

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## Appendix A: Data sources and definitions

The unit value indices of imports and exports for a number of sectoral groups, and the rupee exchange rate against US dollar, were compiled from the Handbook of Statistics on the Indian Economy 2002–03, Reserve Bank of India, over the period 1980–81 to 2001–02. Data on exports, which include re-exports, relate to free on board (f.o.b.) values and imports relate to cost, insurance and freight (c.i.f.) values. The data frequency is annual (see Tables A1 and A2). The codes and definition of the one-digit SITC (Rev. 2) sectors are as follows:

BEVT – Beverages & Tobacco (SITC 1)
CHEM – Chemicals & Related Products (SITC 5)
CRUD – Crude Materials, Inedible, Except Fuels (SITC 2)
FOOD – Food & Live Animals (SITC 0)
FUEL – Mineral Fuels, Lubricants & Related Materials (SITC 3)
MACH – Machinery & Transport Equipment (SITC 7)
MANU – Manufactured Goods Classified Chiefly By Material (SITC 6)
MISC – Miscellaneous Manufactured Articles (SITC 8)
OILS – Animal & Vegetable Oils, Fats & Waxes (SITC 4)

A full description of the SITC codes can be found at http://www.census.gov/foreign-trade/reference/codes/sitc/sitc.txt.

Table A1
*Direction of India's exports and imports (% 5-year average)*

| | 1987–88 to 1991–92 | | 1992–93 to 1996–97 | | 1997–98 to 2001–02 | |
|---|---|---|---|---|---|---|
| | Exports | Imports | Exports | Imports | Exports | Imports |
| USA | 16.7 | 11.1 | 18.6 | 10.2 | 20.8 | 7.3 |
| UK | 6.2 | 7.6 | 6.3 | 5.7 | 5.4 | 5.7 |
| Germany | 6.9 | 8.4 | 6.5 | 7.8 | 4.8 | 4.4 |
| Belgium | 3.9 | 6.9 | 3.6 | 5.9 | 3.5 | 6.3 |
| Italy | 3.0 | 2.2 | 3.0 | 2.6 | 3.0 | 1.8 |
| Japan | 9.8 | 8.2 | 7.1 | 6.4 | 4.4 | 4.7 |
| Russia | 12.4 | 5.4 | 3.0 | 1.7 | 2.2 | 1.2 |
| Australia | 1.1 | 2.8 | 1.2 | 3.2 | 1.1 | 2.7 |
| Bangladesh | 1.6 | 0.1 | 2.5 | 0.1 | 2.3 | 0.1 |
| Hong Kong | 3.4 | 0.6 | 5.5 | 0.9 | 5.9 | 1.3 |
| Singapore | 1.9 | 2.7 | 3.0 | 2.9 | 2.0 | 2.9 |
| Saudi Arabia | 1.6 | 5.7 | 1.8 | 6.3 | 2.0 | 3.6 |
| UAE | 2.7 | 4.3 | 4.6 | 4.7 | 5.5 | 3.1 |
| Africa | 2.1 | 3.1 | 3.8 | 3.2 | 4.7 | 5.3 |

*Source:*
Calculated with data from the Reserve Bank of India.

Table A2
*Dynamics of sectoral trade shares (%)*

| | Exports | | Imports | |
|---|---|---|---|---|
| | 1980–90 | 1991–2001 | 1980–90 | 1991–2001 |
| Food | 18.1 | 13.9 | 3.9 | 2.5 |
| Bevt | 1.3 | 0.6 | 0.02 | 0.03 |
| Crud | 9.2 | 4.5 | 7.9 | 6.4 |
| Fuel | 5.5 | 2.4 | 25.8 | 27.7 |
| Oils | 0.3 | 0.5 | 3.0 | 2.6 |
| Chem | 5.6 | 9.5 | 12.3 | 12.2 |
| Manu | 37.0 | 39.1 | 21.0 | 17.9 |
| Mach | 7.0 | 7.8 | 23.1 | 20.9 |
| Misc | 16.0 | 21.4 | 3.4 | 4.1 |

*Source:*
Calculated with data from Reserve Bank of India.
*Notes:*
Export and import value indices for the nine sectors are calculated by multiplying the respective quantity index with unit value index, and with base year values in local currency, the sectoral value indices are converted to local currency units and the percentages are then derived.

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