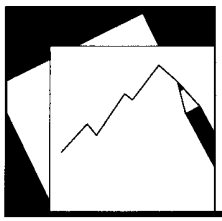
WP/07/268



IMF Working Paper

What Explains India's Real Appreciation?

Renu Kohli and Sudip Mohapatra

INTERNATIONAL MONETARY FUND

 WP/07/268

IMF Working Paper

Asia and Pacific Department

What Explains India's Real Appreciation?

Prepared by Renu Kohli and Sudip Mohaptra[1]

Authorized for distribution by Joshua Felman

November 2007

Abstract

We examine the evolution of nontradable and tradable prices in the Indian economy over 1980–2002 and find widening differentials: the real exchange rate has been appreciating. This might seem unsurprising, since India's rapid per capita income growth suggests Balassa-Samuelson factors at play. However, after 1990, the tradable-nontradable labor productivity gap, the driver of real appreciation according to Balassa-Samuelson, virtually disappeared. So what explains the real appreciation? Assessing the role of both demand and supply factors, we find that demand pressures arising from higher income growth accounted for much of the relative price increase during the post-reform period. Falling import prices also contributed significantly, along with an increase in government spending.

JEL Classification Numbers: E3, E6, F4

Keywords: Tradable, nontradable, inflation, real exchange, appreciation, exchange rate policy, productivity, macroeconomic policy

Authors' E-Mail Addresses: rkohli@imf.org; smohapatra@imf.org

[1] International Monetary Fund Resident Representative Office, New Delhi. We are grateful to Joshua Felman, Arvind Subramanian, Kalpana Kochhar, and Charles Kramer for helpful comments and suggestions in an earlier version of this paper.

Contents Page

Tables

Appendices

Appendix Tables

I. INTRODUCTION

The price of nontradable goods in India has been growing much more rapidly than the price of tradable goods. This development is significant because the ratio of nontradable to tradable goods prices is a critical relative price—it is a measure of the real exchange rate. An increase in the relative price of nontradable goods therefore, corresponds to a real exchange rate appreciation. Our earlier work identified major structural changes in India's economy that might be driving the real appreciation (Kohli and Mohapatra, 2006). Amongst other things, export growth has been robust since 1990 and the share of tradables in aggregate output has expanded to almost 30 percent in 2004–05 as against 19 percent in 1980. Productivity in the tradable sector has risen after 1990, while real per capita income growth has accelerated to 4.1 percent in 2000–05 from 3.8 percent and 3.7 percent respectively in the nineties and the eighties. In summary, India is catching up with other countries, an ineluctable process where faster productivity growth in the tradable sector may be leading to resource shifts away from the nontradable sector, a higher inflation rate for nontradables and a real appreciation of the exchange rate.

At first blush, this result seems unsurprising. After all, Balassa-Samuelson (1964) argued that real exchange rates typically appreciate as countries develop—and India has been developing rapidly. This hypothesis has been empirically documented in numerous cross-section studies. However, it does not fit the Indian case, or rather, does not fit it completely. For after 1990, precisely when the economy was opened up to foreign competition, we found that the tradable-nontradable productivity gap virtually disappeared. So then what explains India's real appreciation? This paper attempts to answer this question, which is critically important for the framing and conduct of macroeconomic policy.

The empirical literature research on the subject of real appreciation has grown rapidly in recent years, though much of it relates to industrialized countries (De Gregorio, Giovannini, and Wolff, 1993, 1994; Canzoneri, Cumby, and Diba, 1999, amongst others). As cross-country productivity levels among industrial countries have begun to converge, however, the emergence of sectoral inflation differentials in emerging and developing countries has inspired more empirical interest. A sizeable literature has emerged in the case of transition and accession countries in Central and Eastern Europe, where inflation divergence is an important issue for accession to the European Union.[2] Productivity growth-induced real exchange rate appreciation trends for some Asian and APEC economies have been analyzed by Chinn (2000) and Ito, Isard, and Symansky (1997), while Choudhri and Khan (2004) have focused on a panel of 16 developing countries. Nonetheless, the nonindustrialized country sample remains limited, with a lack of country-specific, longitudinal studies. In part, the gap is due to the lack of disaggregated information on prices and productivity, which is a major drawback to research on the subject.

[2] See Backe (2002) for a review.

This paper aims to fill this gap by analyzing the increase in the relative price of nontradables in India over 1980–2002. Using the integrated theoretical framework developed in Bergstrand (1991) and De Gregorio, Giovannini, and Wolff (1994), we examine the role of both demand and supply factors. Apart from Balassa-Samuelson type productivity shocks, demand side influences like a change in fiscal stance (Rogoff, 1992, Obstfeld and Rogoff, 1996), or a shift in consumer preferences toward services (nontradable goods) as incomes rise (Kravis and Lipsey, 1983), can also push up relative nontradable prices. Using Indian data, our findings reveal that both demand and supply factors are relevant in explaining relative price developments. After 1991, demand pressures originating from per capita income growth have been the key driving force behind relative nontradables inflation. Fiscal and import price trends have also played an important role. Finally we find a small Balassa-Samuelson effect, which we suspect to be underestimated due to data reasons.

The paper is organized as follows: Section II discusses the theoretical frameworks for explaining relative price developments, Section III takes a preliminary look at the data, and Section IV formally analyzes the role of different factors in relative price changes. Section V discusses the implications for nominal exchange rate and fiscal policies.

II. What Explains the Increase In Relative Price of Nontradables—Theory

Several theories explain the secular increase in the prices of nontradable goods as an economy develops. Supply-side models (Balassa, 1964; Samuelson, 1964) describe it as a part of cross-country convergence in productivity levels. Under the assumption of perfect integration of goods and capital markets, which sets tradable goods prices and interest rates, faster technological progress and productivity growth in the tradable sector leads to an increase in the relative price of nontradables, where productivity growth is slower. Productivity gains in the tradable sector are accompanied by rising wages, and the assumption of labor mobility between the two sectors equalizes nominal wages across the two sectors. The relative price of nontradable goods then rises because the wage increase is not accompanied by matching productivity growth in the nontradable sector. Differential productivity growth rates thus translate directly into sectoral inflation differentials, which, in turn, corresponds to a real exchange rate appreciation.

The Balassa-Samuelson effect is essentially a long-term phenomenon, based on productivity trends. In conjunction with this supply-side impact, transitory demand disturbances could add to the relative price increase. For example, shocks like a rise in government spending could induce a temporary increase in the relative price of nontradables (Obstfeld and Rogoff, 1996). The role of government spending has also been the focus of recent models of equilibrium exchange rate determination, which show government expenditure falling exclusively (Rogoff, 1992; De Gregorio, Giovannini, and Krueger, 1994) or disproportionately (relative to private spending, Froot and Rogoff, 1991) upon nontradable goods.

Demand pressures originating from income growth could also induce an increase in the prices of nontradable goods (Kravis and Lipsey, 1983; 1988; Bergstrand, 1991). Assuming nonhomothetic tastes, i.e. income elasticity of demand for services (goods) exceeds (is less than) unity, a rise in per capita income will induce an expenditure shift towards nontradables, as the latter are luxuries in consumption. This expenditure shift translates into a higher relative price of nontradables (particularly services) as resources shift towards the production of nontradable goods. A demand-induced relative price increase will thus be reflected in the rising share of nontradables in aggregate output. Similar demand influences could prevail due to shifts in technologies (Dornbusch, 1988).

Theoretical frameworks combining the supply and demand approaches can be found in several works. Bergstrand (1991) integrates the productivity growth and relative factor endowment (Bhagwati, 1984) models with the demand-oriented hypothesis, real income growth, for a cross-section of 21 countries. DeGregorio, Giovannini, and Wolff (1994) incorporate demand shocks alongside productivity-growth induced supply shocks by relaxing the assumptions of perfect capital mobility and purchasing power parity in the Balassa-Samuelson models. Another strand of literature extends the framework to include terms of trade shocks, identified as a major determinant of the relative price of nontradables (Edwards, 1989; De Gregorio, and Wolff, 1994).

Empirical evidence endorses both supply and demand side influences upon relative price movements. De Gregorio, Giovannini, and Wolff's (1994) study reveals income growth and higher productivity growth in the tradable sector as key sources of the increase in relative nontradables' prices for 14 OECD economies over 1970–1985. Canzoneri, Cumby, and Diba (1999) confirm that the relative price of nontraded goods reflects the relative labor productivities in their panel study of 13 OECD countries. These results are reinforced by Chinn and Johnston's (1996) panel estimates for 14 OECD countries that identify productivity measures, government spending and terms of trade as significant determinants of real exchange rate movements.

For emerging and developing countries, Chinn (2000) estimates a productivity-based model of relative prices and real exchange rates for nine East Asian economies and finds conflicting results. The hypothesis of productivity-driven real exchange rate appreciation is supported for Japan, Malaysia, and Philippines but not for fast growing countries like China and Thailand in the time-series samples; the panel estimates support the productivity effect with government spending and terms of trade emerging as insignificant factors. Ito, Isard, and Symansky (1997) find that rapid growth is associated with real exchange rate appreciation only for some APEC and ASEAN economies, viz. Japan, Korea, Taiwan, and to some extent, Hong Kong and Singapore, while countries like Indonesia, Malaysia and Thailand did not experience any real appreciation. They point out three factors that might explain the lack of exchange rate appreciation—high productivity growth in service sectors, divergences in domestic-foreign

tradable prices and economic reforms that promote export and growth through nominal depreciation.

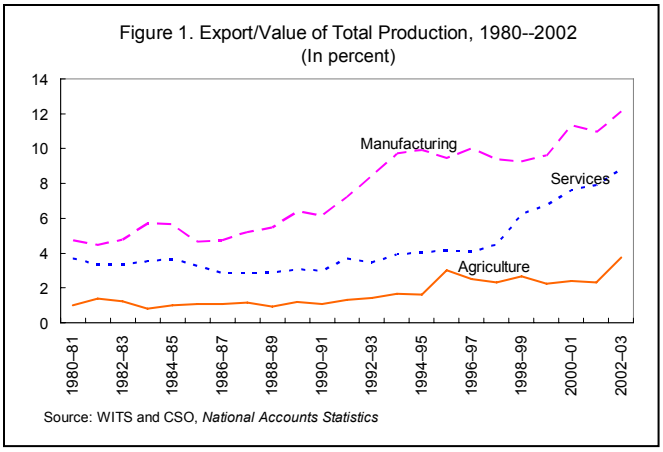
Only one study, Choudhri and Khan (2004), focuses solely upon developing countries. In a panel sample of 16 countries, they find the traded-nontraded sector productivity growth differential to be a significant determinant of the relative price of nontraded goods, which, in turn, exerts a significant influence upon the real exchange rate. Empirical research on sectoral inflation differentials and, more broadly, on factors driving real exchange rate appreciation in the transition and accession countries of the European Union has also grown rapidly in recent years;[3] many cross-section studies establish the Balassa-Samuelson phenomenon as a driving force of inflation divergence (De Grauwe and Skudelny, 2000; Halpern and Wyplosz, 2001; Jazbec, 2002, amongst others) and country studies confirm this feature.[4]

The next two sections of this paper scrutinize domestic relative price developments in India to see whether these conform to the trends reviewed above.

[3] Backe (2002) reviews the empirical literature for transition and accession countries of the European Union.
[4] Recent work by Altissimo et al (2005) also identifies the role of productivity shocks affecting the nontradable sector, and to a lesser extent, mark-ups' shocks in driving the euro area inflation differentials.

III. A First Look at The Evidence

This section takes a preliminary look at relative price trends and the relevant demand and supply indicators through descriptive statistics. As a first step, implicit price series were derived from the nominal and real output data (Box 1).[5] Next, the price series were classified by their tradability, following the method used by De Gregorio, Giovannini, and Wolff (1994), namely, if exports of a good or service activity exceeded 5 percent of production, the category was considered tradable.[6] Compared to the convention of classifying manufacturing as traded and services as nontraded, this method allows a more accurate tradable-nontradable characterization as some services might be traded while some agricultural and manufacturing goods might not. It thus reduces the bias in the measured relative price of nontradables, which could be potentially quite large for India, which is a significant exporter of services (Figure 1).



The trends in sectoral export shares in the total value of production (agriculture, manufacturing, and services) show that the share of tradables in the value of total manufacturing output started rising in the mid-eighties, accelerating in the next two decades. The disaggregate sectoral trends in Table 1 uncover further interesting features. Between 1980 and 2002, at least 7 of the 15 manufacturing subsectors more than trebled their export shares; primary drivers of export growth in manufacturing have been nonmetallic products, textiles, other manufacturing, chemicals, electrical and nonelectrical machinery, and basic metals.

In contrast to manufacturing, the share of tradable services in total value of its output changed little between 1980 and 1995, but more than doubled from 4.1 percent to 8.8 percent between 1995 and 2002. More than half of business services, which make up more than half of aggregate services' exported output, were tradable in 2002. Still, only three of the eleven categories classified as services under the *National Accounts Statistics* are classified as

[5] The use of implicit price deflators in the absence of services' price indices is the standard approach in the empirical literature. The implicit price indices for India represent farmgate prices of goods and services and are producer price inflation proxies. Potential circularity in our analysis arising from the use of WPI or CPI as deflators is limited, as this approach is used for only 23 percent of services' GDP or 12 percent of aggregate GDP.

[6] De Gregorio, Giovannini, and Wolff (1994) used a 10 percent share of exports in production as the threshold level for defining tradability of a sector. Export/production ratios for India are far lower though, with few manufacturing sub-sectors exporting more than 10 percent of their total value of output.

Box 1. Implicit Price Series

The implicit GDP deflators in the National Accounts Statistics (NAS) are derived as a ratio of Gross Value Added (GVA) at current prices to that of GVA at constant (base year) prices. The information on quantity of output produced and the prices for the current and base year are compiled by the Central Statistical Organization (CSO) through both direct and indirect methods. About 28 percent of the services statistics is compiled directly, while 24 percent is compiled indirectly.

Under the *direct method* data are gathered separately on output as a quantum index (QI) and prices as producer price index (PPI) to estimate GVA at current and constant prices. The implicit GDP deflator derived through this methodology is statistically a fair approximation to the producer price trend observed in the sector. Service activities like banking, insurance, public administration, railways and public sector activities in trading, transport, communication, education, medical and media are estimated directly.

In sectors where data on both output and prices are not available, the *indirect method* is used to estimate nominal output. Each of the service activities is extrapolated with respect to its relevant benchmark indicator. The GDP estimation for each item at current prices is extrapolated by an indicator of current prices while constant price items are extrapolated similarly by an indicator of constant prices. The relevant consumer price index (CPI) is used as deflator in the majority of the cases, the exceptions being trade (index of gross trading income), some transport items (implicit price indices of road, air and transport), ownership dwellings (index of house rent), recreation or entertainment (tax rate and collections), etc. The derived implicit GDP deflator using the indirect method is therefore a mix of producer and consumer prices.

Table 1. Tradable-Nontradable Classification by Export/Total Production Ratio

	1980	1990	1995	2000	2002	1980–2002	1990–2002	T/NT
Agriculture	1.0	1.1	3.0	2.4	3.8	1.7	2.2	NT
Mining	14.7	8.2	8.3	6.8	5.2	7.6	7.3	T
Manufacturing	6.2	6.7	10.0	12.1	13.5	8.5	10.1	
Food products	2.3	2.7	5.7	5.0	4.9	4.0	5.0	T
Beverages, Tobacco, etc.	18.9	12.9	14.9	9.9	5.5	14.6	12.2	T
Textiles	9.2	17.4	20.0	27.9	26.7	17.4	22.8	T
Wood, Furniture, etc.	2.0	0.5	1.1	1.4	2.5	1.1	1.3	NT
Paper and Printing ,etc.	0.2	0.2	1.5	2.3	3.3	0.8	1.3	NT
Leather and Fur Products	10.6	12.8	8.8	7.6	7.9	10.0	8.8	T
Chemicals, etc.	2.7	6.0	8.3	10.4	12.2	6.2	8.7	T
Rubber, Petroleum, etc.	0.8	3.5	5.5	8.7	10.4	5.2	5.9	T
Nonmetallic Products	20.8	38.7	58.0	73.2	79.9	45.7	58.9	T
Basic Metal Industries	0.8	1.3	4.1	6.4	9.7	2.9	4.6	T
Metal Products	6.9	4.9	7.5	13.1	14.2	7.3	9.2	T
Nonelectrical Machinery	4.6	5.0	6.3	10.6	12.3	6.3	7.8	T
Electrical Machinery	2.5	2.4	4.3	6.6	8.7	3.7	4.7	T
Transport Equipment	2.9	2.1	3.8	4.3	4.7	2.9	3.8	NT
Other Manufacturing	14.8	7.1	18.6	20.8	23.4	14.9	17.5	T
Services	3.7	3.0	4.1	7.6	8.8	4.4	5.2	
Travel and transportation	33.6	22.1	34.8	24.2	23.5	26.9	28.2	T
Insurance	8.8	6.7	8.5	9.1	6.6	7.9	8.1	T
Business (including software), Legal and Communication Services 1/	56.7	43.8	35.2	45.3	63.2	51.2	47.7	T

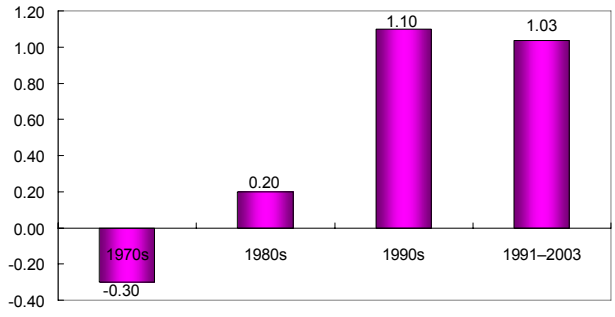
1/ Staff calculations from CSO National Accounts data, RBI Handbook of Statistics and WITS database. The three services have been clubbed together as the export data (miscellaneous exports) indicates export values in aggregate for these services. Export and GDP values in U.S. dollars used for computation of the ratios.

tradable, namely transportation, insurance and business, legal, and communication services. Meanwhile, the export shares of the agriculture sector in its total production remained stagnant between 1980 and 1990; between 1990 and 2000, however, its tradedness more than doubled. With an average export share of 1.7 percent in total production over the sample period, however, agriculture lies much below the threshold value and is classified as nontradable. It can be seen that were a more aggregate classification or a higher threshold, for example, 10 percent, used to define tradability, the only tradable sector would be manufacturing. A lower threshold of 5 percent and disaggregated export shares in output allow us to include emerging export industries that increased their export/total production ratios substantially in the nineties, for example, chemicals, metal products, nonelectrical machinery, rubber, and so on. Likewise, our choice affects insurance in the services sector; at an average export share of 8 percent in its total output over the sample period, it falls between a 5 percent or 10 percent benchmark and is classified as tradable.

A. Rising Relative Nontradable Prices

Utilizing this classification, implicit inflation rates were derived for the tradable and nontradable sectors of the economy. The mean divergence in the nontradable-tradable inflation rate, or the relative nontradables' inflation rate, is plotted in Figure 2 for every decade from 1970. The relative inflation

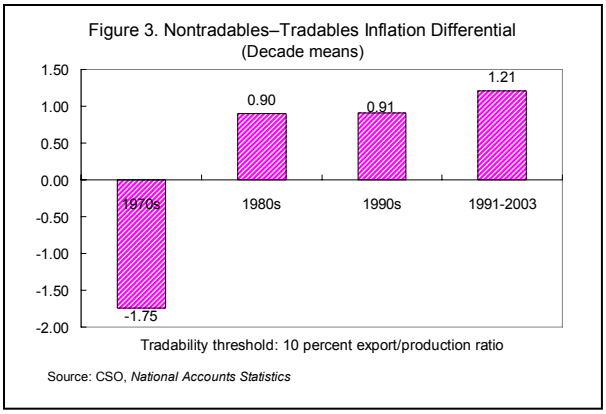
Figure 2. Nontradables-Tradables Inflation Differential
(Decade means)

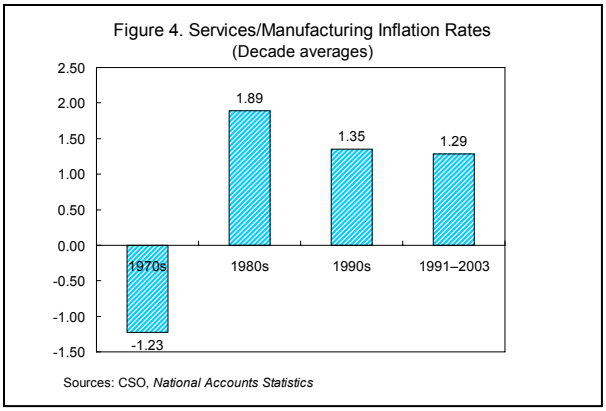


Source: WITS and CSO, *National Accounts Statistics*

differential turns positive in the 1980s and exceeds 1 percentage point from the 1990s till the end of the sample period, 2003–04.

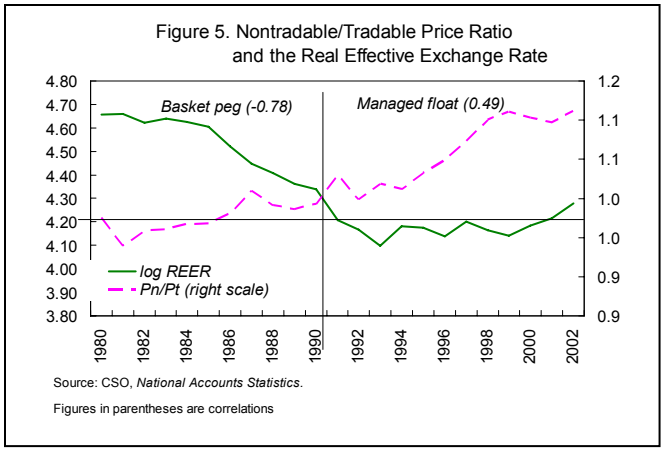
The inflation divergence is robust to a number of alternate tradable-nontradable classifications. To test whether the result is driven by an arbitrary threshold, we relaxed it to a 10 percent export share of each subsector in the total value of its production. The recomputed sectoral inflation rates confirm the robustness of the divergence trend (Figure 3); nontradable inflation rate exceeded the tradable inflation rate from the 1980s, crossing the 1 percent bar in the 1991–2003 period even as the decade averages are different. A further robustness check using the conventional definition of manufacturing as tradable, and services as the nontradable sector (Figure 4) again showed the divergence beginning in the 1980s, though the relative nontradable inflation rate is greater than one throughout the sample period.





B. Relative Nontradable Prices and Other Measures of the Real Exchange Rate

Since the relative price of nontradables is a measure of the real exchange rate and an increase in it corresponds to a real appreciation, how does its evolution compare with other real exchange rate measures? Figure 5 shows the nontradable-tradable price ratio and the 36 country, trade-weighted real effective exchange rate moving in opposite directions before 1991 (correlation -0.78) but not hereafter (correlation, 0.49). How can this difference be explained? Quite easily, it turns out. Consider a simple, two country formulation of the real effective exchange rate,



$$r = \frac{p}{e.p^*} \qquad (1)$$

where r is the real exchange rate, p is the domestic price level and p^*, the foreign price level. Now consider the case where tradable and non-tradable shares, α and $(1-\alpha)$ are the same in both countries. Then we can write

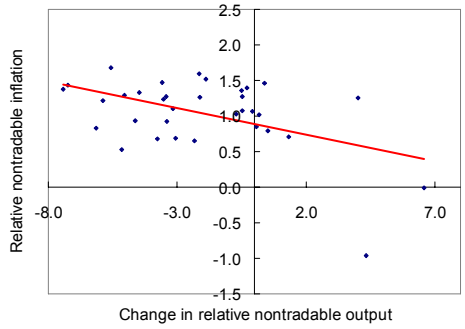
$$r = \frac{P_T^{\alpha} P_N^{1-\alpha}}{(E.P_T^*)^{\alpha}(E.P_N^*)^{1-\alpha}} = \left[\frac{P_T}{E.P_T^*}\right]^{\alpha}\left[\frac{P_N}{E.P_N^*}\right]^{1-\alpha} \quad (2)$$

where P_T and P_N are the prices of tradable and nontradable goods respectively. It is then clear from inspection that the real effective exchange rate can appreciate if a) there is a deviation from purchasing power parity in the traded sector, or b) the price of nontraded goods rises faster in the home country than abroad. Either or both of these conditions can hold, irrespective of the relative price of nontradables in the domestic country; in India's case, there is some indication that pre-1991, the first case was applying. From the mid-1980s, an active policy of nominal depreciation produced a real depreciation, correcting an earlier overvaluation. But the shift to a more flexible exchange rate regime led to a loose comovement between the two measures after 1991. A sensitivity check with another measure of the real exchange rate, constructed as the bilateral rupee/U.S. dollar rate times the foreign/domestic price ratio confirms a similar trend (corresponding correlation coefficients: -0.34 and 0.48). Thus real appreciation pressures originating from domestic relative price changes from the 1980s onwards are diametrically opposite to the real depreciation trends in the official exchange rate measures until 1991.

C. Relative Nontradable Prices and Nontradable-Tradable Sectors' Output Shares

How do relative price changes relate to changes in relative output shares? The Balassa-Samuelson hypothesis predicts that a rise in relative nontradable prices will be accompanied by falling shares of nontradables in aggregate output, as resources are reallocated towards the tradable sector. Preliminary examination shows that the annual rise in the relative price of nontradables is associated with a fall in the share of nontradable output, though the observations are clustered loosely along the regression line (Figure 6).

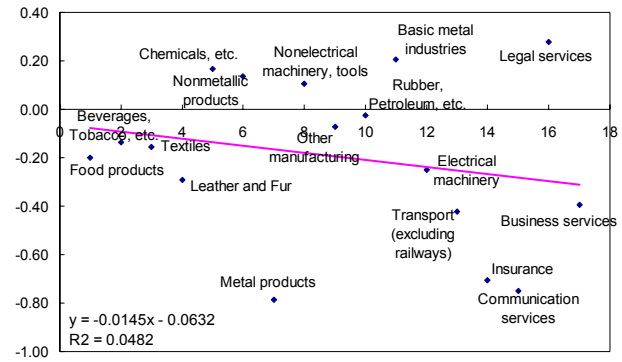
Figure 6. Scatter Plot of Relative Nontradable Inflation and Output Share, 1970–2002



Output reallocation towards tradables is equally dispersed across both manufacturing and services, with the average traded component of each sector increasing from 12.9 percent and 5.7 percent of total output (1980–89) to 15 percent and 7.8 percent respectively in 1990–2003. The output shares of fast-growing export sectors increased significantly during this period

(Appendix Tables 1–4). Illustratively, the share of communication and business services in total output increased from an average 0.98 percent and 0.27 percent respectively during 1980–89 to 2.0 percent and 0.87 percent during 1990–2003.[7] Correspondingly, combined average annual export growth for these services (along with legal services) jumped to 23 percent in the latter period from a 9 percent average in the first. Within manufacturing, sectors like chemicals, with export growth averaging an annual 17 percent throughout the sample period, expanded its share in output at an annual average growth rate of 7.2 percent. The subsector inflation rates mostly correlate negatively with respective changes in output (Appendix Tables 5–7)).

Figure 7. Correlations: Change in Ouput and Inflation Rates



Source: CSO, *National Accounts Statistics*

The expanding share of tradables in the economy, from an average 20.9 percent (1980–89) to 25.3 percent during 1990–2003 reflects trade, investment and price liberalization effects, all of which took place in these two time periods. Import liberalization began in the 1980s (Box 2) while price and entry restrictions in the services sector were gradually dismantled in the 1990s, increasing competition and investment (Box 3). Agriculture, classified as nontradable, shrank from an average 36 percent of output (1980–89) to 27 percent during (1990–2003) while nontradable services expanded from an average 38 percent of output to 42 percent; nontraded manufacturing declined marginally (3.6 percent to 3 percent of output). The expansion of nontradable services' output originated significantly from the financial sector (from 6.8 percent to 9.9 percent of output between the two sample periods), and to a lesser extent, from community, social and personal services, trade and hotels, and electricity, gas and water supply.

[7] There is some suspicion of overstatement of services sector output. Acharya (2006) has suggested that the shift to a new series with 1999–2000 as base might be responsible for the services' output expansion after 1996–97, while Bosworth, Collins, and Virmani (2006) suspect underestimation of price trends in services resulting in overstatement of output. Rajaraman (2007) contends that service sector growth in the new series starting 1999–2000 removed the earlier downward bias in measurement of services due to improvements in measurement methodology; the estimation of output in services for which no formal data collection mechanism exists was more closely aligned to the growth indicator of the corresponding service in the new GDP series of 1999–2000.

Box 2. Import Liberalization

The average effective tariff rate in India has been falling since 1991 (Table) and nontariff barriers have been eased with licensing restrictions on raw materials, and intermediate and capital goods eliminated in 1991; a tariff line-wise import policy introduced in 1996. These liberalization measures are reflected in falling input costs and consequently lower prices in the tradable goods sector, in particular manufacturing.

Weighted Average Import Duty Rates in India

	All Commodities	Peak Customs Duty 1/	Number of Basic Duty Rates 2/
		(In percent)	
1991–92	72.5	150.0	22.0
1992–93	60.6	110.0	20.0
1993–94	46.8	85.0	16.0
1994–95	38.2	65.0	16.0
1995–96	25.9	50.0	12.0
1996–97	24.6	52.0*	9.0
1997–98	25.4	45.0*	8.0
1998–99	29.2	45.0*	7.0
1999–00	31.4	40.0	7.0
2000–01	35.7	38.5	5.0
2001–02	35.1	35.0	4.0
2002–03	29.0	30.0	4.0

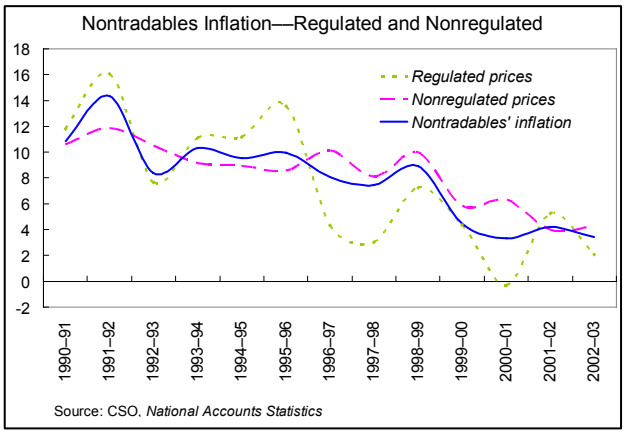
Source: Report of the Task Force on Employment Opportunities, Planning Commission, Government of India, July 2001. Estimates for 2002–03 from Ahluwalia, 2002.

1/ Includes the impact of surcharges in the years indicated by *. In 2000–01, duties for many agricultural products were raised above the general peak in anticipation of the removal of QRs. This explains why the average for all commodities exceeds the peak rate in 2001–02.
2/ Refers to *ad valorem* duty rates.

Box 3. Price Liberalization in the Services Sector

Deregulation of administered prices and liberalization or the adjustment of regulated prices to cost-recovery levels during the transition could impact relative prices, a process experienced by the European transition economies, where initial adjustments of relative prices (specifically in the tradables' sector) were associated with rapid price and trade liberalization in the early phase of transition (Backé, 2002b). This was followed by a moderation of inflation, a relatively faster increase in nontradables' prices and a trend appreciation of the real exchange rate.

Price deregulation in the nontradable (services) sector has been recent in India, confined so far to banking, insurance and communications and is yet to reach an advanced stage. Competition and interest rate deregulation were initiated in the banking sector from 1990 onwards and is complete save for the administered interest rate on savings' accounts. The insurance sector was deregulated in 1998–99, although insurance premia are set by the insurance regulatory body. Price liberalization in telecommunications followed the insurance sector in 1999–2000. Between 1998–99 and 1999–2000, the share of services with administered prices fell from 28.4 percent in to 13.9 percent.



The accompanying figure suggests that in the aggregate such deregulation has led to a decline in inflation for initially regulated industries, suggesting that it does not explaing the relative inflation rate for nontradables. However, the transition to market-based pricing is spread out over many years, making it difficult to identify the transition-related price dynamics. Also, as prices still have to be freed in many sectors, price liberalization may impact relative prices at some point in the future.

D. Relative Nontradable Prices and Labor Productivity Growth

Table 2 presents average labor productivity growth differentials between the tradable-nontradable and manufacturing-services sectors; Appendix Table 8, gives the disaggregated time series for each sector. These estimates need to be interpreted with caution for conceptual, measurement, and data reasons. First, since these are partial productivity measures, changes in input proportions can influence these measures (for example, a rise in average productivity of labor due to substitution of capital for labor). The second problem relates to measurement of productivity in services sector; data quality of output measures, including the price deflators necessary for obtaining real output from nominal magnitudes, are key issues here (Box 4).[8]

Table 2. Relative Labor Productivity Growth Differentials
Tradable-Nontradable and Manufacturing Services, 1982–2002

	Tradable (manufacturing only) - Nontradable (agriculture and services including tradable services)	Manufacturing Services (including tradable services)
1982–1986	4.23	2.77
1987–90	3.59	2.84
1992–95	2.71	1.92
1996–99	-1.12	-3.03
1982–90	3.9	2.8
1992–2002	1.7	0.2
2000–02	4.24	2.26

Source: NAS, CSO, and CEIC Database

Figures are period averages. Labor productivity estimates ae confined to 1982–2002 due to data availability constraints. Labor productivity for the tradable sector is proxied by the manufacturing sector while services and agriculture are clubbed together for computing labor productivity in the nontradable sector (See Box 2).

Third, since the only information on services is confined to numbers employed, productivity measurement is based upon output and input quantities alone.[9] Last, data aggregation constraints prevent strict correspondence between the tradable-nontradable distinction used for computing productivity estimates and prices respectively. Thus the inclusion of tradable services in the nontradable sector biases labor productivity growth estimates for that sector upwards.[10] All these factors render the labor productivity estimates considerably noisy.

---

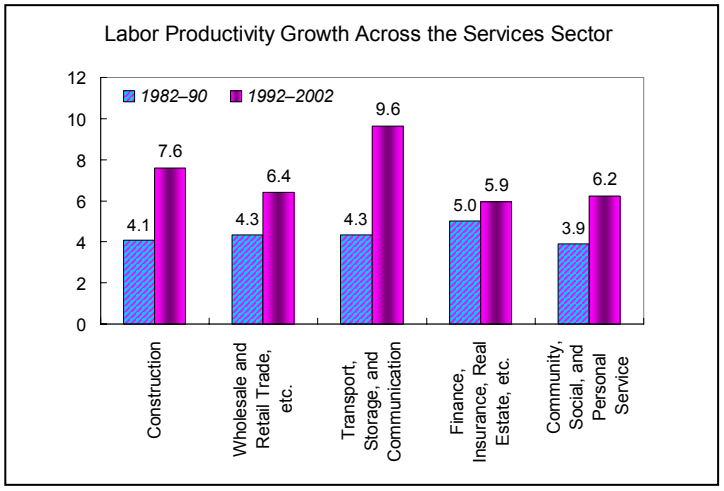
[8] Measurement issues in services' productivity have posed a challenge as changes in the nature of production, i.e., increased role of services, have outpaced changes in the statistical system that were traditionally geared towards collection of data on the goods sectors. Real output in most service sector industries is not very well measured and is also difficult to measure. Measurement problems in finance and insurance sectors are particularly severe where the concept of output is unclear, making measurement of its price change and productivity difficult (See Bosworth and Triplett, 2004, for a review of measurement issues in services' productivity).

[9] Labor productivity calculated as output per worker and is based upon total employment figures for agriculture, services and manufacturing sectors, drawn from the CEIC Database. These, however, are unadjusted for quality changes over time and to that extent pose a limitation.

[10] The tradable component of services cannot be extracted from the employment shares data, which is disaggregated across categories different from the subsectors used to classify tradability; nontraded manufacturing employment shares similarly cannot be separated from overall manufacturing employment estimates. Services and agriculture are therefore clubbed together to arrive at productivity estimates of the nontradable sector. Cross-sector biases arising from gaps in formal-informal sector employment estimates are also likely to affect productivity measurement; as the extent of informal employment is larger in services like construction, transport, personal services, etc. the size of the traded-nontraded productivity differential is likely to be smaller.

Box 4. Labor Productivity Growth in Services

Even though labor productivity growth has been well-distributed across all five services categories, the transport, storage and communications services category record the maximum improvement, 5.3 percent between 1980–89 and 1992–2002. With almost 30 percent of its output value being exported over the same time period (Table 1, main text), the sub-sector, travel and transportation, is classified as tradable for calculating relative price changes. Similarly, productivity gains in community, social and personal services, of which business services is a sub-set, are 2.3 percent. In the employment shares data, travel and transport is aggregated under transport, storage and communication services, insurance under finance, insurance, real estate services, while business services, which is predominantly tradable, is clubbed with community, social and personal services.



The empirical evidence on productivity growth trends in the post-reform period is inconclusive, though trends in recent years show significant increases in productivity (see RBI, 2004; Reddy, 2005 for recent summaries). There is some evidence to show relatively faster total factor productivity growth, particularly in the export-oriented industries. All these studies however, focus on the manufacturing sector, which, as our classification shows, is an incomplete representation of the tradable sector.

These caveats noted, we find that the tradable-nontradable sector productivity growth gap narrowed steadily after the mid-1980s until 2000. Column 2 of the table presents the gap computed by using the conventional tradable-nontradable distinction of manufacturing and services. Both definitions indicate that labor productivity growth in the services sector (including tradable services) narrowed the gap vis-à-vis manufacturing in the 1990s. The annual average labor productivity growth of the services sector increased from 4.2 percent to 7.2 percent between 1982–90 and 1992–2002 while that of manufacturing sector increased only marginally from 7.0 percent to 7.4 percent. Consequently, the tradable-nontradable labor productivity growth gap that averaged 3.9 percent in 1982–90, halved to 1.7 percent in 1992–2002. Excluding agriculture, the manufacturing-services productivity growth gap almost disappears in the latter half of the sample (Column 2).

Disaggregate analysis shows that labor productivity growth in the services sector was led by the services' category of transport, storage and communications, whose average productivity growth more than doubled from 4.3 percent (1982–90) to 9.6 percent in 1992–2002; this category also saw significant deregulation in the post-1991 period (Box 4).[11] It also includes two tradable services, namely transportation and communications, but the lack of further disaggregation in employment data prevents separation of the tradable and nontradable components.[12] This constrains pinpointing the exact location of the extraordinary labor productivity growth observed in the services, that is, it is not possible to determine whether it originated from the tradable or nontradable component of the sector. Available disaggregate estimates reveal that labor productivity rose in general across all services' sub-sectors, including purely nontradable ones like wholesale and retail trade, etc. For services like communications, insurance and banking, liberalization and deregulation of administered prices were a likely source of labor productivity growth as communications and information technology prices fell as a consequence.

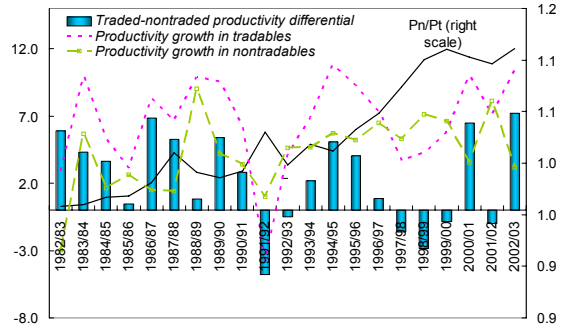
The virtual disappearance of the relative labor productivity growth differential from almost 3 percentage points in the 1980s to negligible between 1992–2002 is striking because the relative price of nontradables increased at a faster pace at the same time (Section III.C). Figure 8 depicts this paradox: accelerating productivity growth in nontradables closes the gap vis-à-vis tradable sector productivity growth, while the relative nontradable-tradable price ratio climbs at the same time. Adding to the puzzle is the negative (but weak) association observed between the relative productivity differential and relative nontradables inflation (Figure 9),

[11]This category also saw significant deregulation in the post-1991 period. The dynamics of price liberalization in services is discussed briefly in Box 2.

[12] The inclusion of tradable services in the nontradable sector thus biases labor productivity growth estimates of nontradables upwards.

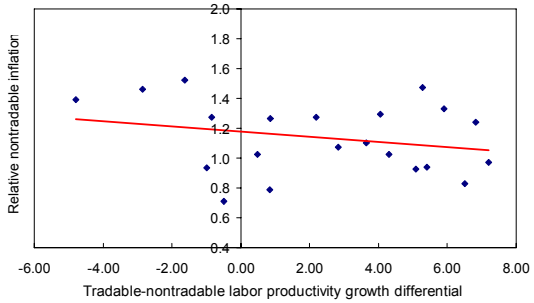
which, *prima facie*, neither supports a Balassa-Samuelson effect nor is consistent with the rising share of tradables in aggregate output.What then explains the increase in relative

Figure 8. Tradable-Nontradable Labor Productivity Growth Differential



Source: CEIC and CSO, *National Accounts Statistics*

Figure 9. Tradable-Nontradable Productivity Differential and Relative Nontradable Inflation



Source: CEIC and CSO, *National Accounts*

nontradable prices when the relative productivity differential actually narrowed in the 1990s? Did demand factors dominate during this period? We turn to this next.

E. Relative Nontradable Prices and Demand Indicators

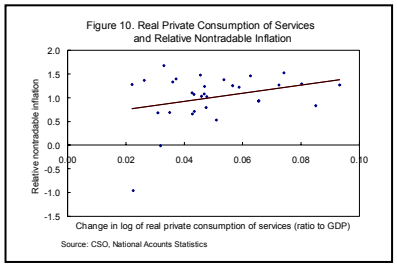
Table 3. Evolution of Demand Indicators, 1970–2003
(Decade averages, percent)

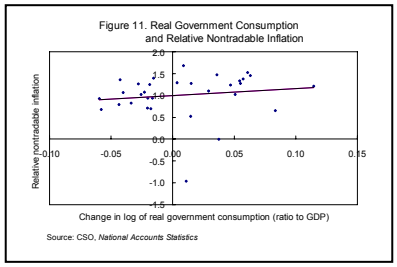
	Real government consumption expenditure growth	Real per capita income growth	Growth in private consumption of services
	1	2	3
1970s	4.90	0.61	4.02
1980s	6.92	3.66	4.81
1990s	6.32	3.63	6.18
2000--04	1.22	4.11	8.53
1992--2002	5.60	3.95	7.00

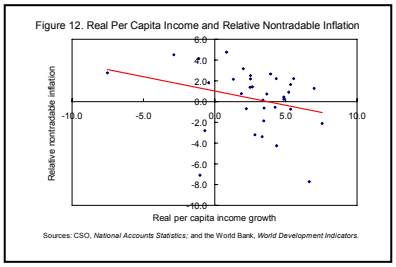
Source: Authors' calculations with data from NAS, CSO, and Handbook of Statistics, RBI. Column 3, row 4 average for 2000–03

Table 3 uncovers a major demand shift, public as well as private, in the eighties. Real fiscal expenditure growth averaged 6.9 percent of GDP in this decade, an increase of more than 2 percent over the 1970s. At the same time, real per capita income growth jumped to an average 3.7 percent from a minuscule 0.61 percent the previous decade. The post-reform decade of 1992–2002 shows private demand accelerating further to almost 4 percent and averaging 4.1 percent in the current decade. Real fiscal consumption growth slowed to an average 5.6 percent (1992–2002) and further to 1.2 percent in the current decade. Column 3 shows that growth in private consumption of services, a closer indicator of the nonhomothetic preferences hypothesis, spurted to 7.0 percent between 1992–2002 and a further 8.5 percent between 2000–04. This trend suggests that private consumption growth has been biased towards nontradable goods (defined using the 5 percent export share in total value of production classification) after 1990, a familiar enough trend associated with rising per capita incomes. Bivariate regressions of each of the demand indicators upon the relative

nontradables inflation rate (Figures 10–12) reveals that growth in real private consumption of services and government consumption expenditure are positively associated with the change in relative nontradable prices. But the negative association with real per capita income growth contradicts theoretical priors.[13]







Preliminary evidence thus suggests the following:

- Since the 1980s, there has been a divergence between nontradable and tradable prices.

- Relative to the prices of tradables, nontradable price changes accelerated after 1991, exceeding one percentage point per year, on an average, during the 1991–2003 period.

- The relative nontradable price (with an increase implying a real appreciation) is broadly consistent with the 36-country trade weighted real effective exchange rate during the flexible exchange rate regime of the 1990s and 2000s. In the 1980s, however, the two measures actually move in opposite directions. This suggests that the post-1991 reforms corrected an overvaluation, which kept the domestic price of tradables unsustainably higher relative to the foreign price.

- The share of the tradable sector, defined as those exporting at least 5 percent of their total value of production, rose from an average 20.9 percent between 1980–89 to 25.3 percent between 1990–2003. This is contrary to the commonly held perception that the share of nontradables in output is rising in India; our disaggregate analysis of changes in respective output shares shows that it is actually the opposite. The confusion arises from equating services with nontradability; close to 9 percent of services' output was traded in 2002 and the share of traded services in total production, driven by communication and business services, rose to 7.8 percent in 1990–2003 from an average of 5.7 percent in 1980–89.

- On average, tradable-nontradable labor productivity growth differentials widened in the 1980–89 period, but narrowed significantly between 1992–2002. Relative nontradable

[13] 1979 and 1991 are years of oil shock and macroeconomic crisis when per capita income is negatively impacted. Likewise, labor productivity growth is adversely affected during exchange rate depreciation episodes (1991, 1997, 1998, and 2001) through increases in the price of imported inputs.

prices, on the other hand, rose throughout the sample period. The narrowing of the tradable-nontradable productivity growth gap in 1992–2002 along with acceleration in relative price of nontradables at the same time is inconsistent with the Balassa-Samuelson hypothesis.

- The increase in the relative price of nontradables is positively associated with change in the share of tradables in total output, suggesting classic Balassa-Samuelson effects via widening productivity growth differentials between the tradable-nontradable sectors. However, the labor productivity growth gap narrowed in the 1990s, possibly reflecting the effects of liberalization upon deregulated services.

- A scrutiny of demand indicators shows big increases in both private and public demand. While the latter slows down in the 1992–2002 period, the former accelerates. Initial trends reveal increased demand for services (nontradable) after 1990, which would reflect in an increased output of nontradable goods. However, the share of tradable goods in total output increased during this period. These trends point towards a role for import liberalization, (Box 3), which increased competitiveness via lower import (input) prices, and exchange rate correction of an overvaluation that possibly made some individual sectors more tradable.

Initial evidence thus suggests that both supply and demand factors might play a role in the observed increase in the relative prices of nontradables since the 1980s. The evidence that productivity growth gap between tradable-nontradable sectors actually narrowed in the 1990s but relative nontradable prices rose throughout the two decades suggests a real appreciation via Balassa-Samuelson effect in the 1980s and through demand channels in the 1990s. The next section examines these aspects econometrically.

IV. DETERMINANTS OF THE RELATIVE PRICE OF NONTRADABLES: FORMAL EVIDENCE

Based upon the theoretical discussion of Section II, the relative price of nontradables is posited as a function of both supply and demand factors. The estimated equation takes the form of Equation 1, where the dependent variable, P_{nt}/P_t, is the relative price level of nontraded goods.

$$P_{nt}/P_t = \alpha + \beta_0(g_t) + \beta_1(a_t - a_{nt}) + \beta_2(y_t) + \varepsilon_t \quad (1)$$

The explanatory variables are, g_t, the log of government consumption expenditure as share of GDP (both in real terms); $a_t - an_t$, the labor productivity growth differential between the traded and nontraded sectors and y_t, real per capita income growth. ε_t is the error term. As in DeGregorio and Wolff (1994), Chinn and Johnston (1996) and Chinn (2000), equation 2 augments the standard productivity model to incorporate terms of trade fluctuations, allowing additional supply influences upon the relative price of nontradables.

$$P_{nt}/P_t = \alpha + \beta_0(g_t) + \beta_1(a_t - a_{nt}) + \beta_2(y_t) + \beta_3\left(P_x/P_m\right) + \varepsilon_t \quad (2)$$

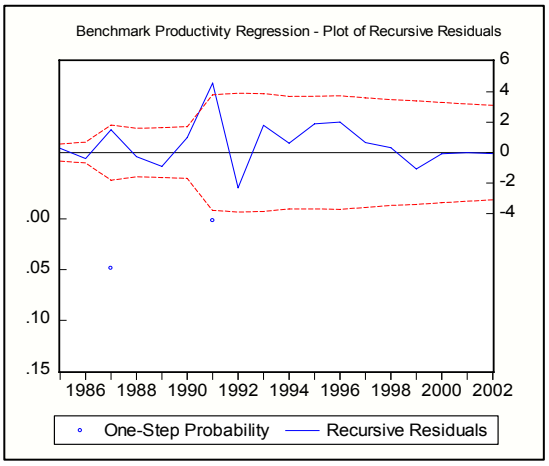
where P_x/P_m is the ratio of export prices to import prices. The expected values of respective coefficients on these variables, β_0, β_1, β_2 and β_3, are greater than zero. The sample length, 1980–2002, is guided solely by data availability on sectoral employment shares. A full description of the data sources and variables is provided in the Appendix II. All variables are in logs and the equation is estimated in first differences.[14] Appendix tables 9 and 10 present the regressions with different versions of equations 1 and 2 through both ordinary least squares and instrument variables methods to control for possible endogeneity and collinearity of the independent variables.[15]

Regression 1 (Appendix Table 9) is the regular productivity model with real government expenditure and per capita income growth capturing the demand influence upon the change in the relative price of nontradables. Though all variables enter with the correct sign in the benchmark estimations, only fiscal growth exerts a significant impact in both OLS and IV versions.

[14] All variables were tested for unit roots and found to be level nonstationary and I(1).

[15] The correlation coefficient between changes in log real per capita income and log import prices is 0.37. Productivity growth is also positively correlated with real per capita income growth, but at 0.10, the correlation coefficient is weak.

A scan of recursive residuals of the regression reveals 1991 to be an influential outlier; the recursive residuals stray outside the two standard error bounds, rejecting the hypothesis of parameter constancy (*p-value* less than 0.05) for the year (Figure 13)).



Regression 2, which controls for the 1991 outlier, shows overall improvement in the goodness-of-fit measures. β_1, the coefficient upon relative labor productivity $(a_t - a_{nt})$ is now significant; in terms of magnitude, a 7–8 percent increase in labor productivity growth differential results in a one percent increase in the relative nontradable inflation rate. Both regressions indicate that *ceteris paribus*, a one percentage point rise in fiscal growth, g_t, is matched by a little over a one quarter percent rise in the relative nontradable inflation rate. Thus a 4 percent fiscal expansion in real terms leads to a one percentage point rise in the relative rate of inflation in nontradable goods. The coefficient on per capita income growth, β_2, is insignificant in both versions of the standard productivity model. This indicates that relative productivity growth is not proxying for demand effects arising from a preference for nontradable goods as incomes rise.

Regressions 3–5 (Appendix Table 9) allow for additional supply shocks to determine relative price changes by including relative price shifts of tradables. Terms of trade, $\left(\Delta P_x / \Delta P_m\right)$, enters with a positive sign in Regression 3 but is insignificant in both estimations. All other variables remain unchanged in size and significance, pointing to the robustness of the benchmark specification.

In Regression 4, export and import price fluctuations are entered as separate variables to examine the effects of changes in tradable goods' prices. The coefficient upon change in export prices is wrongly signed and statistically insignificant. The import prices' coefficient however, is insignificantly different from unity: a price increase in imported goods corresponds to a decline in the relative price of nontradables, implying that the income effect dominates. The coefficient upon y_t, real per capita income growth, turns significant when the benchmark productivity model is augmented with tradable price changes, suggesting an omitted variable bias in the earlier specification. The point estimates lie in the 0.15–0.20 range, implying the magnitude of influence of income growth to be slightly less than the estimated impact of fiscal growth (0.26–0.29). A five percent increase in real per capita income results in a percentage point increase in the nontradables inflation rate via demand pressures.

Regression 5 is the final augmented productivity model where we drop the insignificant export price variable, retaining only supply-side impact of import price changes. The coefficient on annual change in import prices implies a pass-through between 0.04–0.05, suggesting that a very small portion of a positive (negative) external shock is absorbed into the economy through changes in domestic nominal prices. Both fiscal growth and relative labor productivity are robust across all specifications and estimation methods.

The estimated magnitude of the Balassa-Samuelson impact, 0.08–0.15, for India is smaller than the panel regression estimates obtained for the OECD[16] and East Asian economies.[17] Estimates for the transition and accession countries of the European Union are also generally higher,[18] though these vary widely across individual countries.[19] The relatively small magnitude of the Balassa-Samuelson impact for India could be due to several reasons. First, problems in the measurement and quality of data on labor productivity may be affecting the results (Box 4). In particular, the Balassa-Samuelson hypothesis also refers to total factor productivity whereas the lack of data on sectoral capital stock limits our relevant measure to labor productivity. Two, the assumption of open capital markets is strained for much of the sample period; capital account restrictions were relaxed only after 1991 and the process has been slow, qualified and still incomplete. Similarly, rigidities in inter-sectoral resource allocation question the assumption of labor mobility in the model.[20]

The significant role of demand factors uncovered in the exercise, in fact, supports the imperfect capital mobility case.[21] The demand influence originating from a shift in preferences towards nontradables lies in the range of 0.15–0.20 which, in conjunction with an average magnitude of 0.25 for fiscal growth, reveals a pronounced role of demand factors in the determination of

---

[16] These range between 0.10–0.76 with the labor productivity measure (See Chinn and Johnston, 1996, for a summary of empirical estimates). DeGregorio, Giovannini, and Wolff (1994) estimates range between 0.10–0.26, with the total factor productivity measure. Rogoff (1992) estimates a manufacturing labor productivity shock of -0.6 to -0.7 for the yen/dollar real exchange rate.

[17] Chinn's (2000) estimates for a panel of East Asian economies lie between 0.21–0.63.

[18] Jazbec (2002) panel estimates range from 0.86–1.33 for a panel of 19 EU transition economies over 1990–1998.

[19] Backe (2002) reviews the important empirical literature, pointing out that the annual Balassa-Samuelson effects estimated across these studies varies from a low 0.8 percent for the Czech Republic to 3.5 percent for Slovenia, 5.6 percent for Hungary, and 9.4 percent for Poland.

[20] Recent empirical work on the impact of trade liberalization on poverty in India, finds no evidence of labor reallocation after 1991, confirming a sluggish labor market response (Topalova, 2004). Consistent with low structural reallocation, employment labor shares remained constant with returns to factors (wages and industry premia) responding to the adjustment.

[21] DeGregorio, Giovannini, and Wolff (1994) argue that demand side factors will affect relative prices only if the assumptions of perfect competition in goods and factor markets, purchasing power parity for traded goods and perfect capital mobility are relaxed.

domestic relative prices. The supply side influences, represented by relative labor productivity growth and change in import prices, are relatively smaller, though in the light of reasons cited above, it would be reasonable to assume a stronger effect were more accurate productivity growth measures available.

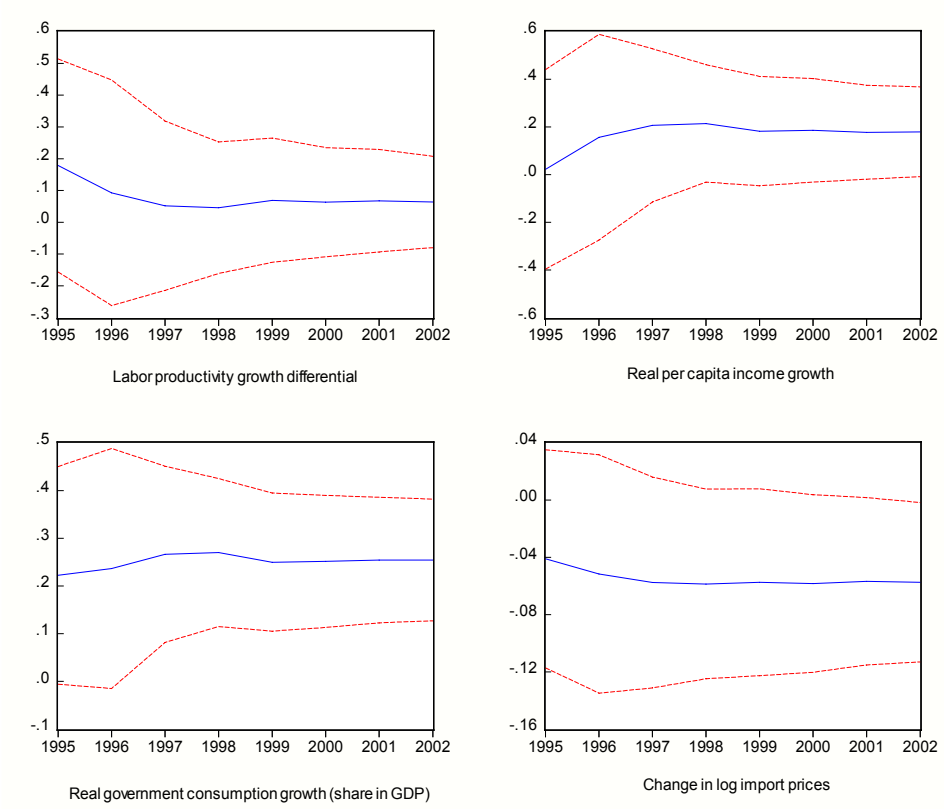
A. Stability: Accounting for Post-1991 Reforms/Liberalization Effects

The equations fitted above assume that no relevant factors other than public and private demand, productivity growth differentials and tradable prices were changing over the period considered. But this assumption is violated in the latter half of the sample, which is characterized by changing production and price structures due to economic reforms instituted after the 1991 crisis. For instance, administered prices were deregulated for some services (nontradables), while entry rules were liberalized for others, exposing them to greater competition. These reforms possibly impacted relative prices, in which case the non-inclusion of this factor in the estimated equation could possibly overestimate the importance of demand and supply factors.

Appendix Table 10 therefore, introduces a post-reform binary variable to capture structural changes during the transition process and re-runs the augmented productivity specification (Regressions 3–5 in Table 9). The coefficient on the reforms dummy is generally insignificant across all the three regressions (Regressions 1–3, Appendix Table 10) except in the estimation with terms of trade shocks (Regression 1), indicating that the relative price of IV nontradables increased at a higher rate of 1.06 percent in the post-reform period. This result, however, is not robust, suggesting that post-1991 changes associated with import liberalization and growth in per capita incomes have impacted domestic relative prices most significantly.

The parameters on both productivity and government consumption expenditure growth do not change in size and statistical significance when controlling for the change in economic environment, reflecting their stability and robustness. The coefficient upon real per capita income growth, however, is inconsistent when controlling for the post-reform period. To push the stability investigation further, the full specification was re-estimated through recursive least squares, where the equation is estimated repeatedly, using ever larger subsets of the sample data. Figures 14 trace the evolution of coefficient estimates for all feasible recursive estimations of $(a_t - a_{nt})$, g_t, y_t, and Δp_m (change in log import prices), along with the two standard error bands. The recursive coefficient estimates indicate no evidence of parameter instability for any of the explanatory variables. However, income growth effects tend to strengthen after 1995, indicating possibility of slope change in this parameter.

Figures 14. Recursive Coefficient Estimates
(Dotted lines are +/- 2 SE bands)



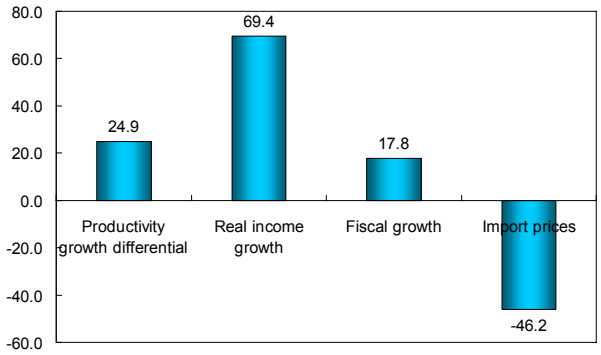
The income variable was therefore interacted with the reforms dummy to identify the slope change (Regression 5, Appendix Table 10). Controlling for the slope change in income growth, the coefficient on the reforms dummy turns negative and significant (*p-value* 0.15), suggesting that relative nontradable prices grew at a lower rate of 1.76 percent in the post reform period, but private demand grew at a faster rate. The coefficient size of 0.5 on the product variable indicates a substantially higher demand influence in the nineties compared to the mean point estimate of 0.17 for the overall sample period. The result also implies that demand growth after 1990 was biased toward nontraded goods. However, as observed from the rising share of tradables in total output during the period, the expenditure shift towards nontradables did not lead to an expansion of the relative share of nontradables in total output.

B. The Relative Contribution of Demand and Supply Factors

To further disentangle the relative contribution of demand and supply factors, the coefficient estimates from Regression 5 (Appendix Table 9) are used to decompose the mean relative price change over 1982–2002. Figure 15 displays the approximate contributions of each independent variable to the mean of the dependent variable. The decomposition exercise is useful as it reveals that demand factors, income and fiscal growth, account for more than three-fourths of

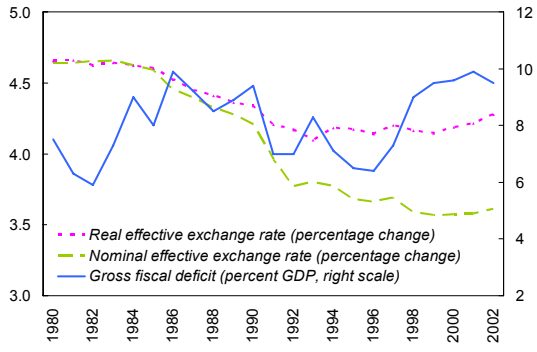
the average relative price increase over the sample period. Real per capita income growth alone represents almost 70 percent of the mean of the dependent variable. In contrast, relative faster labor productivity growth in tradable sector accounts for 25 percent of the mean. Of particular importance is the contribution of lowered import prices. Accounting for 46.2 percent of the average increase in relative prices during the sample period, their role in widening inflation differentials is not inconsiderable. Noting that import policy reforms were pursued almost throughout the sample period, this result underscores the role of convergence in tradable prices and its contribution to the divergence in sectoral inflation rates.

Figure 15. Percentage Contribution of Demand and Supply Factors to Relative Nontradables Inflation, 1981–2002



The prominent role of demand factors in driving the relative price of nontradables over two decades illuminates the evolution of exchange rate and fiscal policies during this period (Figure 16). Between 1980 and 1998, the nominal effective exchange rate depreciated by an average 5 percent annually, including an "active" devaluation phase (1986–90) of an annual average of 9.7 percent,[22] which slowed to 2.8 percent between 1993–98. Fiscal policy, on the other hand, was expansionary throughout this period. Corresponding to the two depreciation episodes, the consolidated fiscal deficit to GDP ratio averaged 9.2 percent and 7.4 percent respectively while in real terms, the share of government expenditure in GDP rose six fold between 1980 and 2002.

Figure 16. Exchange Rate and Fiscal Policy, 1980–2002



Source: RBI, Handbook of Statistics

The extent of real appreciation implied by the change in the relative price of nontradables during these nominal depreciation episodes is 1.14 percent (1986–90) and 1.74 percent

(1993–98) annually. Our results demonstrate that along with productivity and income growth, this fiscal expansion added considerably to the relative price increase throughout the eighties

[22] Joshi and Little (1994) point out that the rupee was devalued to keep the real exchange rate constant between 1983–85, followed by an active nominal devaluation policy between 1986–90 to produce a real depreciation that helped export growth (Joshi and Little, 1994, p. 277).

and the early nineties. As fiscal support was absent in correcting relative price distortions, nominal exchange rate policy was actively deployed to recover competitiveness and offset the impact of fiscal expansion during this period. Structural reforms to restore fiscal balance were initiated only after the macroeconomic crisis in 1991; after a brief phase of correction from 1992 to 1996, fiscal reforms were again delayed until 2004–05.[23] The scrutiny of past policy evolution thus illustrates how the choice of the exchange rate regime is determined to adjust the real exchange rate when fiscal imbalances are persistent and fiscal reforms are postponed.

C. Sensitivity Analysis

Apart from robustness to different estimation methods and stability checks, the above regressions were also subjected to sensitivity analysis of the explanatory variables to substitution with other proxy measures.

- Productivity growth in the tradable and nontradable sectors were entered as separate variables to test whether productivity gains in nontradable services' categories played a role in inflation divergence (Box 4). The result confirms that productivity growth in the tradable sector is the source of supply side influence (Appendix Table 11). The IV estimates between 0.23–0.26 indicate a strong impact of labor productivity growth in the tradable sector upon domestic relative price movements, with a 4 percent increase in labor productivity corresponding to a 1 percent rise in the rate of inflation in nontradables. The coefficient on nontradables' productivity growth is correctly signed but insignificant across all estimations. Both fiscal and income growth variables are robust to this substitution.

- Real government consumption was entered as two separate variables—compensation to employees and purchases—to test the proposition that government expenditure falls more heavily on nontradable goods. The significant coefficient on real government purchases supports this hypothesis (Appendix Table 12). While the import price variable retains its size and significance, the productivity variable is robust to this substitution in the regular productivity model alone; the coefficient on real per capita income growth turns totally insignificant in this version of the model. The results suggests that the aggregate consumption measure, g_t, is a better indicator of fiscal growth.

- Real per capita income growth was substituted by the growth in the real share of services in private final consumption expenditure (ratio to GDP), using a closer measure of the "preferences" hypothesis (Appendix Table 13). Though this definition of "preferences" is upheld in the basic specification, where the significant coefficient is estimated between

[23] Commitment to fiscal reforms has become binding with the rule-based Fiscal Responsibility and Budget Management Act, 2003. Under this, fiscal deficit is to be brought down to 3 percent of GDP and revenue deficit to be completely eliminated by March 2009.

0.40–0.48, the hypothesis is rejected in the augmented specification with import price changes. All other variables are robust to this definition.

V. Policy Implications and Conclusion

This paper examines the evolution of prices in the nontradable and tradable sectors of the Indian economy over 1980–2002 and finds widening inflation differentials between the two sectors. Our results show that both demand and supply factors have contributed to this real appreciation. Before 1990, a relatively faster labor productivity growth in the tradable sector (the Balassa-Samuelson effect) has been a key driver of the relative price increase. After 1990, this effect has disappeared, as relative productivity differentials have narrowed. But the real exchange rate has continued to increase because real per capita income growth and fiscal expansion have created demand pressures, pushing up the relative price of nontraded goods. These demand influences did not, however, result in a resource shift away from the tradable sector. By increasing competitiveness and rendering some sectors more tradable through correction of overvaluation, reforms like import liberalization and change in exchange rate regime played an important part in this process.

The research draws particular attention to the importance of relative price shifts within the tradable sector, that is, reduction in import prices, in changing domestic relative prices. As goods and services markets get integrated, structural factors such as convergence in domestic-foreign price levels due to progress in trade reforms will contribute significantly to inflation divergence. So the real appreciation may well continue. In the light of the beneficial impact of import liberalization[24] and a considerable share of imported inputs in domestic production,[25] the necessity of continuing trade reforms deserves emphasis with the use of other policies to achieve inflation convergence.

This conclusion is reinforced when the picture is extended beyond our study period. Emerging trends in the economy strongly point towards an acceleration of forces impacting relative price movements. These are, *inter alia*, a strong GDP growth rate averaging 8.1 percent over 2003–06, an average export growth of 24.1 percent during the same period, real per capita income growth of 7.0 percent in 2003–2004 and 8 percent in 2005 along with sizeable productivity gains in export-oriented industries.[26] A steadily rising inflow of portfolio capital,

[24] At the firm level, trade liberalization has been particularly beneficial to total factor productivity growth in industries close to the technological frontier (Aghion, et al, 2003; Siddharthan and Lal, 2004), firms located in regions or sectors with a more flexible labor environment and those that were privately managed (Topalova, 2004).

[25] The share of intermediate goods' imports in GDP averaged 7.2 percent in the 1980s and 10.4 percent over 1992–2002.

[26] Pointing out that productivity and per capita income growth induced pressures have grown considerably since 2000, the RBI Governor said in 2005 that "…many (productivity) studies draw upon the data up to the year

(continued)

which averaged 8.8 billion dollars over 2003–06, adds force to these trends. Though our results do not include the impact of capital inflows, we recognize that the tendency for real appreciation induced by relative price changes is reinforced by capital inflows which impact the real exchange rate via the nominal rate and through the foreign direct investment channel. Last of all, an economy undergoing structural changes, as India is, will experience relative price shifts due to factors like liberalization, adjustment of regulated prices and competition mentioned earlier in the paper.

What do these trends signify for future macroeconomic policy? To the extent that a real exchange rate appreciation (increase in the relative prices of nontradable goods) is productivity driven, it is an equilibrium phenomenon and reflects a natural evolution of the economy. This trend appreciation will also be reinforced by the associated increases in incomes, particularly if demand is biased towards services as living standards rise to converge towards those in more advanced economies.[27] As these evolutionary processes cannot be restrained and must be absorbed, they bring to the fore the necessity of freeing the exchange rate regime to absorb these effects through a nominal appreciation. In this context, a welcome development in recent times is a more flexible exchange rate regime From 1998 to 2003, nominal devaluation against the U.S. dollar has been only 0.03 percent; both the nominal and real exchange rate have appreciated since then, signifying some absorption of appreciation pressures.

Real appreciation arising from persistent fiscal deficits, however, is not an equilibrium phenomenon. Our results suggest a 0.25 percent cut in the real government expenditure to GDP ratio could result in a one percent real depreciation through a decline in the inflation rate in the nontradable goods sector. In addition, fiscal consolidation that reorients spending towards education and infrastructure would boost the productivity of the nontradable sector, further reducing the relative gap vis-à-vis the tradable sector. Thus continuing fiscal reforms could significantly facilitate absorption of equilibrium shifts induced by productivity and income growth.

Finally, our research also contributes by providing a tradable-nontradable characterization of the economy, which to the best of our knowledge, has not been attempted so far. With the growing openness of the economy in every sphere, this distinction provides a useful framework of analysis for future research on this and related issues. The research also raises a number of data issues, for it identifies gaps in data on sectoral employment shares, emphasizing the need

---

2000 while, by all indications, significant gains in productivity have occurred in the more recent years, particularly in manufacturing." (Reddy, 2005, p. 7). Also see Dholakia and Kapur (2001) and Unel (2003).

[27] Illustratively, strong demand pressures originating from rapid income growth could affect competitiveness if it leads to wage pressures in the tradable sector. In a competitive environment, a strong and persistent demand bias towards nontradable goods (many services) could induce productivity growth and consequent wage increases in the nontradable sector. Indeed, as the labor productivity growth rates across different services in Box 3 show, nontraded sectors like construction services have recorded sizeable productivity growth after 1990.

for sufficiently disaggregated information to enable fruitful analysis and informed policy making.

Appendix I. Correlations of Relative Nontradable Price with Other Measures of the Real Exchange Rate

	Log Real Effective Exchange Rate	Nominal Exchange Rate* Foreign-Domestic Inflation Differential
Entire Sample (1980–2002)	-0.76	-0.45
Pre-reform(1980–90)	-0.78	-0.34
Post-reform (1991–2002)	0.40	0.59
Flexible Exchange Rate Regime (1993–2002)	0.49	0.48

Appendix II. Data

Variable Name	Definition/Construction of Variable	Source
P_{nt}/P_t	Sectoral gross value added deflator, classified as described in the text	CSO, National Accounts Statistics
g_t	Government Final Consumption Expenditure/GDP at Constant prices	CSO, National Accounts Statistics
y_t	Per capita Income	World Development Indicators (WDI)
$a_t - a_{nt}$	Relative Labor Productivity growth in Manufacturing and services (plus agricultural sector)	CSO, National Accounts Statistics and CEIC data base
P_x/P_m	Unit value of Exports and Unit value of Imports	International Financial Statistics

Appendix Table 1. Tradable Manufacturing—Within Sector Output Shares (Percent Total Output)

	Food Products	Beverages, Tobacco, etc.	Textile Group	Leather, Fur Products	Chemicals, etc.	Nonmetallic Products	Metal Products	Nonelectrical Machinery	Other Manufacturing	Rubber, Petroleum, etc.	Basic Metal Industries	Electrical Machinery	Total Traded Manufacturing
1980–81	1.23	0.72	2.60	0.24	1.29	0.61	0.82	0.87	0.61	0.49	1.48	0.65	11.59
1981–82	1.37	0.74	2.41	0.25	1.42	0.63	0.83	0.88	0.79	0.51	1.51	0.63	11.97
1982–83	1.50	0.73	2.36	0.25	1.44	0.70	0.91	0.91	0.85	0.63	1.37	0.77	12.42
1983–84	1.58	0.79	2.36	0.25	1.60	0.72	0.91	0.94	0.67	0.64	1.36	0.77	12.59
1984–85	1.51	0.74	2.35	0.26	1.62	0.79	0.89	1.07	0.76	0.73	1.35	0.91	12.99
1985–86	1.51	0.64	2.41	0.23	1.63	0.79	0.83	1.04	0.90	0.68	1.40	0.79	12.84
1986–87	1.48	0.67	2.46	0.22	1.61	0.76	0.85	0.95	1.13	0.89	1.25	0.85	13.12
1987–88	1.49	0.58	2.30	0.24	1.72	0.80	1.00	1.00	1.23	0.97	1.27	1.06	13.65
1988–89	1.69	0.68	2.10	0.22	1.73	0.81	0.96	0.90	1.07	1.00	1.52	1.02	13.70
1989–90	1.74	0.61	2.28	0.22	1.92	0.87	0.90	0.98	1.15	1.03	1.35	1.15	14.19
1990–91	1.53	0.62	2.34	0.23	2.04	0.91	0.84	0.96	1.03	1.11	1.55	1.20	14.36
1991–92	1.50	0.64	2.26	0.22	2.07	0.95	0.78	0.93	0.87	1.08	1.61	1.03	13.95
1992–93	1.41	0.66	2.22	0.28	2.29	0.81	0.71	0.95	0.92	1.07	1.47	1.06	13.83
1993–94	1.58	0.61	2.58	0.31	2.34	0.76	0.73	0.88	0.95	1.12	1.46	1.00	14.33
1994–95	1.74	0.60	2.55	0.24	2.26	0.78	0.74	0.90	0.94	1.09	1.66	1.36	14.87
1995–96	1.66	0.58	2.29	0.24	2.62	0.91	0.75	1.12	1.04	1.15	1.82	1.27	15.45
1996–97	1.51	0.65	2.57	0.23	2.68	1.06	0.76	1.09	1.02	1.35	1.84	1.21	15.97
199—98	1.63	0.69	2.58	0.24	2.51	0.92	0.73	0.94	1.13	1.15	1.73	1.36	15.62
1998–99	1.53	0.72	2.26	0.25	2.77	0.83	0.78	0.96	1.10	1.09	1.68	1.40	15.35
1999–00	1.44	0.77	2.27	0.24	2.69	1.05	0.75	0.94	1.02	0.98	1.67	1.26	15.07
2000–01	1.52	0.77	2.27	0.26	2.77	1.00	0.83	0.97	1.06	1.06	1.64	1.30	15.43
2001–02	1.42	0.82	2.16	0.26	2.75	0.96	0.71	0.93	1.07	1.11	1.62	1.24	15.04
2002–03	1.51	1.01	2.17	0.24	2.74	0.97	0.72	0.91	1.06	1.13	1.70	1.21	15.37
2003–04	1.39	1.01	1.98	0.21	2.74	0.92	0.69	0.97	1.03	1.09	1.71	1.30	15.03
Means:													
1980–89	1.51	0.69	2.36	0.24	1.60	0.75	0.89	0.95	0.92	0.76	1.39	0.86	12.90
1990–2003	1.53	0.72	2.32	0.25	2.52	0.92	0.75	0.96	1.02	1.11	1.65	1.23	14.98

Appendix Table 2. Nontraded Services— Output Shares (Percent Total Output)

	Electricity, Gas and Water Supply	Construction	Trade, Hotels, and Restaurants	Railway Transport and Storage	Banking, Real Estate Dwellings, and Business Services	Community, Social, and Personal Services	Total Nontraded Services
1980–81	1.66	5.97	11.96	1.56	5.59	11.44	36.51
1981–82	1.71	5.93	11.99	1.61	5.69	11.06	36.28
1982–83	1.78	5.37	12.30	1.60	6.12	11.52	36.91
1983–84	1.77	5.26	12.04	1.47	6.15	11.10	36.02
1984–85	1.90	5.24	12.10	1.44	6.49	11.13	36.40
1985–86	1.96	5.28	12.47	1.55	6.79	11.73	37.83
1986–87	2.08	5.18	12.65	1.62	7.25	12.04	38.72
1987–88	2.16	5.28	12.71	1.62	7.71	12.43	39.74
1988–89	2.17	5.11	12.29	1.45	7.84	11.97	38.66
1989–90	2.27	5.15	12.46	1.43	8.10	12.21	39.35
1990–91	2.31	5.46	12.40	1.42	8.45	12.04	39.78
1991–92	2.51	5.48	12.29	1.51	9.22	12.15	40.65
1992–93	2.57	5.41	12.43	1.40	9.45	12.13	40.81
1993–94	2.40	5.13	12.55	1.30	10.08	11.83	40.88
1994–95	2.45	5.05	12.96	1.24	10.10	11.39	40.74
1995–96	2.44	5.00	13.84	1.25	10.02	11.47	41.57
1996–97	2.38	4.73	13.80	1.21	9.91	11.29	40.94
1997–98	2.45	4.97	14.16	1.17	10.28	12.02	42.60
1998–99	2.46	4.95	14.29	1.12	10.25	12.45	43.06
1999–00	2.43	5.03	14.41	1.14	10.60	13.14	44.33
2000–01	2.44	5.16	14.41	1.14	10.21	13.29	44.22
2001–02	2.40	5.08	14.86	1.16	9.91	13.23	44.23
2002–03	2.38	5.25	15.47	1.17	10.10	13.22	45.21
2003–04	2.27	5.17	15.49	1.14	9.83	12.89	44.53
Means:							
1980–89	1.95	5.38	12.30	1.53	6.77	11.66	37.64
1990–2003	2.42	5.13	13.81	1.24	9.89	12.32	42.40

Appendix Table 3. Tradable Services—Within-sector Output Shares (Percent Total Output)

	Transport (excl. railways)	Insurance	Communication Services	Legal Services	Business Services	Total Traded Services
1980–81	3.61	0.50	0.94	0.14	0.17	5.36
1981–82	3.52	0.53	0.96	0.15	0.17	5.33
1982–83	3.53	0.56	0.98	0.16	0.19	5.42
1983–84	3.47	0.59	0.97	0.18	0.27	5.48
1984–85	3.62	0.54	1.01	0.19	0.29	5.65
1985–86	3.67	0.59	0.99	0.19	0.32	5.76
1986–87	3.70	0.62	1.01	0.19	0.36	5.88
1987–88	3.87	0.57	1.03	0.20	0.32	5.98
1988–89	3.73	0.52	0.98	0.19	0.31	5.73
1989–90	3.78	0.79	0.98	0.19	0.32	6.04
1990–91	3.71	0.58	0.99	0.19	0.37	5.83
1991–92	3.85	0.77	1.05	0.20	0.38	6.24
1992–93	3.87	0.63	1.12	0.20	0.39	6.22
1993–94	3.97	0.68	1.19	0.20	0.41	6.46
1994–95	4.08	0.44	1.30	0.20	0.46	6.49
1995–96	4.17	0.55	1.43	0.21	0.53	6.89
1996–97	4.18	0.50	1.48	0.20	0.59	6.95
1997–98	4.21	0.72	1.71	0.19	0.72	7.55
1998–99	4.15	0.73	1.92	0.18	0.85	7.83
1999–00	4.16	0.64	2.20	0.19	1.07	8.27
2000–01	4.27	0.62	2.68	0.20	1.40	9.17
2001–02	4.20	0.68	3.02	0.19	1.53	9.62
2002–03	4.29	0.88	3.62	0.20	1.68	10.68
2003–04	4.39	0.86	4.24	0.19	1.82	11.51
Means:						
1980–89	3.65	0.58	0.98	0.18	0.27	5.66
1990–2003	4.11	0.66	2.00	0.20	0.87	7.84

Appendix Table 4. Nontraded Agriculture and Manufacturing— Output Shares (Percent Total Output)

	Mining and Quarrying	Agriculture and Allied Sector	Wood, Furniture, etc.	Paper and Printing, etc.	Transport Equipments	Total Repairing Services	Total Nontraded Manufacturing
1980–81	2.07	38.97	1.71	0.57	0.76	0.79	3.83
1981–82	2.22	38.67	1.65	0.56	0.80	0.80	3.82
1982–83	2.41	37.39	1.45	0.53	0.87	0.83	3.68
1983–84	2.30	38.07	1.46	0.57	0.89	0.87	3.79
1984–85	2.24	37.21	1.19	0.64	0.94	0.84	3.60
1985–86	2.26	35.73	1.25	0.61	0.81	0.95	3.62
1986–87	2.46	34.03	1.15	0.69	0.91	0.97	3.72
1987–88	2.45	32.34	1.12	0.66	0.84	1.06	3.68
1988–89	2.55	33.80	0.87	0.65	0.82	1.05	3.39
1989–90	2.57	32.29	0.85	0.72	0.85	0.88	3.29
1990–91	2.70	31.85	0.78	0.73	0.89	0.77	3.17
1991–92	2.75	30.85	0.73	0.76	0.87	0.70	3.05
1992–93	2.66	31.14	0.67	0.61	0.78	0.71	2.78
1993–94	2.54	30.56	0.65	0.67	0.81	0.71	2.84
1994–95	2.59	29.95	0.60	0.68	0.90	0.73	2.91
1995–96	2.56	27.70	0.68	0.68	1.25	0.77	3.39
1996–97	2.38	28.12	0.69	0.66	1.14	0.77	3.25
1997–98	2.49	26.15	0.62	0.60	1.05	0.87	3.15
1998–99	2.40	26.06	0.57	0.61	0.87	0.78	2.83
1999–00	2.34	24.59	0.47	0.58	1.02	0.89	2.97
2000–01	2.30	23.61	0.46	0.51	0.97	0.88	2.82
2001–02	2.23	23.77	0.39	0.50	0.98	0.85	2.72
2002–03	2.34	21.27	0.31	0.51	1.08	0.86	2.76
2003–04	2.29	21.47	0.30	0.55	1.16	0.89	2.90
Means:							
1980–89	2.35	35.85	1.27	0.62	0.85	0.90	3.64
1990–2003	2.47	26.94	0.57	0.62	0.98	0.80	2.97

Appendix Table 5. Implicit Inflation Rates – Tradable Manufacturing Subsectors

	Food Products	Beverages, Tobacco, etc.	Textile Group	Leather, Fur Products	Chemicals, etc.	Nonmetallic Products	Metal Products	Nonelectrical Machinery	Other Manufaturing	Rubber, Petroleum, etc.	Basic Metal industries	Electrical Machinery
1980–81	13.2	-10.1	5.3	-2.3	21.4	22.8	33.6	10.6	23.6	30.9	5.3	6.9
1981–82	-1.2	3.3	2.2	-3.4	13.5	11.8	9.2	11.8	2.0	19.2	18.4	5.9
1982–83	-7.2	0.4	4.5	-1.5	-1.6	20.0	5.3	6.0	0.1	4.0	13.1	4.2
1983–84	23.9	12.6	7.6	6.2	4.6	8.1	11.9	7.0	3.1	5.1	7.7	4.0
1984–85	3.7	3.2	9.9	7.7	3.7	6.4	11.3	4.1	4.9	3.0	5.7	5.8
1985–86	5.5	16.2	1.5	18.7	6.4	4.8	9.8	10.7	5.1	10.2	13.6	8.5
1986–87	8.4	17.9	0.4	4.6	5.8	-0.6	1.3	5.8	3.8	1.9	1.2	4.9
1987–88	6.1	3.6	13.2	4.6	7.3	2.1	-12.5	4.9	2.3	7.1	12.3	2.1
1988–89	2.3	5.2	7.6	13.7	6.1	3.5	24.3	8.3	2.2	0.4	16.3	13.7
1989–90	12.8	14.9	13.9	12.3	3.1	9.6	28.6	12.0	6.0	0.9	12.6	8.1
1990–91	14.8	16.6	7.6	18.8	5.6	11.1	23.0	9.8	4.2	10.3	5.7	6.7
1991–92	13.3	9.8	9.8	4.1	13.9	16.2	16.5	15.8	9.9	9.9	6.1	15.4
1992–93	7.0	10.4	9.9	-2.4	14.1	7.9	7.4	16.9	12.7	12.1	10.1	6.2
1993–94	7.9	4.4	7.5	7.4	7.9	9.6	-5.0	-4.0	2.3	5.7	7.8	9.9
1994–95	11.3	18.3	14.5	9.7	16.6	10.9	9.4	8.6	11.8	6.2	8.4	4.2
1995–96	3.7	8.3	14.0	8.7	8.7	14.0	5.4	6.8	8.7	8.0	11.0	4.5
1996–97	5.7	5.3	-1.5	1.7	3.4	2.4	6.1	9.0	2.4	7.5	4.7	-0.4
1997–98	9.3	11.6	-0.7	6.3	4.6	-1.9	14.0	3.2	2.8	6.2	3.8	-3.2
1998–99	17.5	10.8	4.0	3.4	6.3	2.5	-11.6	2.9	4.6	1.2	1.6	-1.3
1999–00	1.3	4.4	-0.8	16.1	6.4	-2.2	12.8	1.7	2.9	6.1	1.7	-1.4
2000–01	-1.9	3.3	1.9	-3.2	5.9	5.1	-10.5	4.2	3.8	23.6	3.9	7.5
2001–02	0.4	7.8	-0.4	-5.7	2.8	7.5	31.9	6.9	2.0	3.9	0.3	3.2
2002–03	4.5	5.4	7.2	-7.8	2.9	-0.4	-16.3	3.2	2.1	5.9	3.1	-1.1
2003–04	9.2	0.6	5.9	13.0	1.9	3.4	7.0	3.6	6.2	5.9	15.6	0.2
Means:												
1980–89	6.7	6.6	6.1	7.0	8.9	12.3	8.1	5.3	6.7	8.3	10.6	6.4
1990–2003	8.4	5.6	5.0	7.2	6.2	6.4	6.3	5.5	7.4	8.0	6.0	3.6

Appendix Table 6. Implicit Inflation Rates—Tradable Services Subsectors

	Transport (excludes railways)	Insurance	Communication Services	Legal Services	Business Services
1980–81	-0.2	21.8	-2.2	11.7	12.3
1981–82	11.6	6.0	7.0	12.3	3.7
1982–83	12.0	2.6	15.8	13.7	3.5
1983–84	10.4	10.7	10.7	13.4	6.3
1984–85	10.2	17.4	2.3	8.0	8.3
1985–86	8.2	-0.3	7.4	7.4	6.9
1986–87	9.7	14.2	16.0	8.7	6.1
1987–88	9.0	8.7	33.4	9.3	7.7
1988–89	13.7	17.0	21.6	9.4	7.8
1989–90	10.2	-1.2	6.2	7.5	6.5
1990–91	12.6	26.9	11.8	11.4	10.8
1991–92	11.4	4.0	12.9	14.2	12.3
1992–93	14.1	22.0	13.3	11.3	10.1
1993–94	9.6	9.4	12.4	7.5	6.9
1994–95	7.5	34.6	8.2	10.0	9.9
1995–96	5.4	1.1	1.2	9.2	9.3
1996–97	12.3	11.5	8.0	9.0	9.2
1997–98	11.5	-13.6	-1.3	6.2	6.5
1998–99	12.7	2.8	-0.4	11.5	11.6
1999–00	5.4	14.3	-14.5	4.5	4.5
2000–01	7.2	9.6	-9.3	4.6	5.3
2001–02	5.6	28.6	-3.7	4.6	5.1
2002–03	4.7	6.3	-14.7	3.8	3.9
2003–04	5.1	-7.5	-2.0	3.7	3.7
Means:					
1980–89	9.5	9.7	11.8	10.1	6.9
1990–2003	8.9	10.7	1.6	8.0	7.8

Appendix Table 7. Implicit Inflation Rates—Nontradable Subsectors

	Mining and Quarrying	Agriculture, Allied Sector	Wood, Furniture, etc.	Paper and Printing, etc.	Transport Equipment	Total Repairing Services	Electricity, Gas, and Water Supply	Construction	Trade, Hotels, and Restaurant	Railways, Transport, and Storage	Banking, Insurance Real Estate, Dwellings, Business Services	Community, Social and Personal Services
1980–81	11.1	11.4	23.3	-40.4	13.8	-0.2	9.1	15.0	17.0	0.9	8.0	12.5
1981–82	64.2	6.8	14.2	7.8	13.3	9.6	1.7	8.3	15.2	29.2	9.9	11.3
1982–83	11.1	7.8	5.2	6.4	3.6	3.9	10.6	21.9	5.0	26.3	4.2	8.8
1983–84	8.7	9.0	10.8	8.5	-0.5	1.9	15.4	9.1	9.4	15.2	4.1	11.0
1984–85	9.5	6.1	4.7	11.8	5.2	5.3	7.9	13.4	11.4	1.4	5.3	10.0
1985–86	1.1	6.7	3.5	3.9	15.2	11.8	11.5	10.5	7.6	11.9	4.8	3.3
1986–87	2.7	8.3	-0.1	4.0	4.6	5.0	2.8	12.4	5.1	9.4	2.2	8.4
1987–88	0.6	12.8	4.0	3.5	6.1	4.3	4.7	12.1	6.7	10.7	4.9	9.2
1988–89	13.0	6.5	13.4	6.4	13.7	13.1	5.3	8.9	10.5	10.4	4.9	9.1
1989–90	4.4	8.9	0.7	15.3	10.4	9.4	6.8	8.4	8.7	11.6	6.8	6.9
1990–91	3.4	12.1	1.0	6.7	10.2	7.9	11.7	8.7	11.1	9.9	6.7	10.8
1991–92	4.7	18.1	1.6	17.6	11.6	13.9	10.1	10.1	13.3	5.6	12.4	13.7
1992–93	12.1	6.0	96.7	19.1	7.7	9.2	18.4	10.3	10.0	17.8	2.8	9.7
1993–94	14.7	11.6	19.8	5.4	2.6	4.1	13.4	9.8	9.7	15.6	8.2	7.5
1994–95	3.2	9.7	10.9	6.1	7.4	5.8	14.6	8.9	8.4	14.1	7.1	10.0
1995–96	5.2	9.7	7.2	23.6	7.9	6.1	9.0	11.0	7.2	4.1	12.9	10.1
1996–97	9.2	9.1	2.7	-0.1	6.2	2.7	2.6	11.8	9.0	1.1	1.9	9.4
1997–98	9.9	9.4	25.3	-3.3	3.8	0.4	9.2	12.4	5.3	7.3	2.6	7.1
1998–99	3.8	7.7	30.0	3.2	2.8	0.9	15.5	11.3	5.5	-3.6	7.3	12.1
1999–00	12.0	4.1	-2.5	14.1	3.0	1.4	-7.9	6.0	3.9	2.1	10.3	3.8
2000–01	7.4	1.5	-7.2	10.8	5.9	6.3	-2.5	3.5	6.1	0.7	4.0	3.9
2001–02	3.0	2.5	-3.1	4.5	2.4	2.5	0.2	3.8	2.0	10.5	7.1	4.3
2002–03	18.9	6.9	2.7	0.7	0.5	-0.1	8.3	3.8	2.0	7.7	5.2	3.8
2003–04	-4.2	3.3	0.2	-0.4	-0.1	0.0	4.6	4.2	4.1	-3.9	3.1	3.8
Means:												
1980–89	12.6	8.4	8.0	2.7	8.6	6.4	7.6	12.0	9.7	12.7	5.5	9.1
1990–2003	7.4	8.0	13.2	7.7	5.1	4.4	7.7	8.3	7.0	6.3	6.5	7.9

Appendix Table 8. Labor Productivity Growth in Agriculture, Mining, Manufacturing, and Services, 1982–2002

						Services				
	Agriculture	Mining and Quarrying	Manufacturing	Electricity, Gas, and Water	Services	Construction	Wholesale and Retail Trade, etc.	Transport, Storage, and Communication	Finance, Insurance, Real Estate, etc.	Community, Social, and Personal Services
1982/83	-0.83	5.27	2.52	1.04	-1.15	-9.14	5.70	-1.15	-3.43	0.95
1983/84	10.81	-0.88	11.87	5.11	3.57	5.58	3.43	2.84	5.21	1.70
1984/85	1.71	-2.96	6.70	7.94	3.14	0.91	2.27	5.82	1.84	2.27
1985/86	-2.47	6.50	2.59	4.93	6.36	2.78	8.20	6.01	5.90	8.06
1986/87	-4.68	18.36	6.81	10.00	4.71	2.97	5.00	4.84	8.35	4.48
1987/88	-0.84	1.85	7.48	0.28	4.67	3.98	1.62	5.64	4.47	5.65
1988/89	13.68	14.67	9.12	8.74	5.71	11.35	3.35	5.31	9.43	3.58
1989/90	1.13	6.00	10.16	8.03	7.06	8.19	6.55	5.23	9.70	6.54
1990/91	2.52	7.26	6.10	6.48	4.06	10.05	2.95	4.42	3.65	1.88
1991/92	-4.07	4.15	-5.06	9.12	3.35	1.40	0.02	4.97	9.58	1.59
1992/93	6.29	1.25	4.64	5.59	4.24	3.65	7.23	4.91	2.47	3.50
1993/94	7.77	-0.62	8.19	-1.74	5.58	1.40	3.86	6.15	11.22	2.19
1994/95	4.64	8.90	11.12	9.75	6.32	5.51	8.79	8.99	4.15	2.84
1995/96	-2.63	7.76	9.41	5.37	9.55	6.66	12.28	11.40	7.48	7.20
1996/97	10.67	3.29	7.85	4.38	5.33	4.08	7.22	8.12	4.90	4.30
1997/98	-1.68	14.32	2.27	8.09	9.70	10.80	6.75	8.42	10.80	11.47
1998/99	9.88	4.34	4.27	6.25	7.52	6.66	7.34	7.95	5.92	9.60
1999/00	-1.95	4.15	6.04	6.94	10.02	10.73	5.70	11.27	10.46	12.24
2000/01	-1.29	7.86	10.32	4.33	5.39	7.69	2.14	13.28	3.65	4.57
2001/02	13.98	5.23	7.40	6.02	7.79	9.39	11.30	10.39	6.47	5.86
2002/03	-11.17	10.92	10.31	3.18	8.07	17.02	-1.98	15.10	-2.28	4.92
Means:										
1982–90	2.30	6.20	7.00	5.80	4.20	4.10	4.30	4.30	5.00	3.90
1992–2002	3.10	6.10	7.40	5.30	7.20	7.60	6.40	9.60	5.90	6.20

Table 9. Basic and Augmented Productivity Model Estimates, 1981–2002

Without reform

	Basic Productivity Model				Augmented Productivity Model					
	(1)		(2)		(3)		(4)		(5)	
Dependent Variable $\Delta P_{nt} / \Delta P_t$	OLS	IV	OLS	IV	OLS	IV	OLS	IV	OLS	IV
Productivity Growth Differential	0.050 (0.58)	-0.01 (0.10)	0.13* (2.17)	0.13* (2.28)	0.13* (1.83)	0.15* (2.07)	0.12* (1.72)	0.13* (1.82)	0.10* (1.58)	0.08* (1.82)
Productivity Growth in Tradables										
Productivity Growth in Nontradables										
Real Government consumption (share of GDP)	0.26*** (4.73)	0.25*** (3.66)	0.28*** (4.80)	0.29*** (5.08)	0.28*** (4.09)	0.29*** (4.54)	0.28*** (4.79)	0.29*** (4.86)	0.26*** (5.44)	0.26*** (6.39)
Real Per Capita Income (share of GDP)	0.07 (0.71)	0.19 (1.51)	0.04 (0.40)	0.02 (0.21)	0.04 (0.42)	0.00 (0.03)	0.20* (2.08)	0.20* (1.87)	0.15 (1.53)	(0.15* (1.76)
Terms of Trade					0.01 (0.20)	-0.00 (0.13)				
Price of Exports							-0.05 (1.38)	-0.06 (1.30)		
Price of Imports							-0.04* (1.74)	-0.04 (1.60)	-0.05** (3.13)	-0.05** (3.34)
1991 Dummy			4.80*** (17.13)	5.43*** (4.59)	4.73*** (8.93)	5.66** (3.50)	6.49*** (8.28)	7.81*** (3.86)	5.46*** (18.18)	5.61*** (4.89)
Adj. R2	0.09	0.02	0.48	0.47	0.46	0.43	0.56	0.53	0.53	0.55
DW	2.38	2.61	1.82	1.71	1.81	1.63	1.98	1.77	1.91	1.90
S.E.	1.58	1.64	1.19	1.22	1.22	1.27	1.10	1.17	1.13	1.12
Obs.	21.00	21.00	21.00	21.00	21.00	21.00	21.00	21.00	21.00	21.00

Source: Description of variables and data source in Data Appendix

Notes: OLS and IV specifications with heteroskedasticity consistent errors. ***, ** and * indicate 1 percent, 5 percent, and 10 percent significance levels respectively.

Table 10. Augmented Productivity Model Estimates, 1981–2002

With Reform

	(1)		(2)		(3)		(4)	
Dependent Variable $\Delta P_{nt} / \Delta P_t$	OLS	IV	OLS	IV	OLS	IV	OLS	IV
Productivity Growth Differential	0.14*	0.17	0.12*	0.11*	0.11*	0.08*	0.14*	0.10*
	(2.17)	(1.58)	(2.0)	(1.86)	(2.04)	(1.78)	(2.29)	(1.90)
Productivity Growth in Tradables								
Productivity Growth in Nontradables								
Real Government Consumption	0.28***	0.28***	0.28***	0.28***	0.26***	0.26***	0.27***	0.27***
(share of GDP)	(4.26)	(4.52)	(4.58)	(4.73)	(5.49)	(5.83)	(4.72)	(4.41)
Real Per Capita income (share	-0.04	-0.14	0.18*	0.18	0.10	0.16*	0.02	0.09
of GDP)	(0.51)	(1.23)	(1.85)	(1.62)	(1.36)	(2.39)	(0.29)	(1.03)
Real Per Capita Income*							0.30	0.50*
Reforms Dummy							(1.31)	(2.07)
	0.00	0.00						
Terms of Trade	(0.13)	(0.03)						
			-0.04	-0.04				
Price of Exports			(1.11)	(1.04)				
			-0.04*	-0.04*	-0.04**	-0.05**	-0.03*	-0.05*
Price of Imports			(1.79)	(1.88)	(2.64)	(3.30)	(1.58)	(2.33)
	4.17***	3.72***	6.30***	6.26**	5.09***	5.34***	6.31***	7.64***
1991 Dummy	(4.63)	(4.70)	(4.17)	(4.19)	(6.18)	(6.11)	(5.36)	(6.49)
Reforms dummy	0.54	1.06*	0.11	0.10	0.28	0.05	-0.71	-1.78*
	(1.08)	(1.77)	(0.20)	(0.17)	(0.55)	(0.09)	(0.80)	(1.88)
Adj. R2	0.46	0.40	0.53	0.53	0.52	0.53	0.51	0.51
DW	1.96	1.90	1.98	1.93	1.96	1.95	2.18	2.42
S.E.	1.22	1.31	1.14	1.17	1.15	1.17	1.16	1.19
Obs.	21.00	21.00	21.00	21.00	21.00	21.00	21.00	21.00

Source: Description of Variables and data source in Data Appendix

Notes: OLS and IV specifications with heteroskedasticity consistent errors. ***, ** and * indicate 1 percent, 5 percent, and 10 percent significance levels respectively.

Table 11. Productivity Growth in Tradables as the Driving Force of Relative Nontradable Inflation

Dependent Variable $\Delta P_{nt} / \Delta P_t$	Basic Productivity Model			
	Without reforms		With reforms	
	OLS	IV	OLS	IV
Productivity Growth in Tradables	0.17* (2.02)	0.26** (3.34)	0.14 (1.30)	0.23** (3.06)
Productivity Growth in Nontradables	-0.04 (0.48)	0.09 (0.66)	-0.13 (0.92)	-0.21 (1.02)
Real Government Consumption (share of GDP)	0.29*** (5.04)	0.32*** (6.24)	0.28*** (4.02)	0.28*** (4.54)
Real Per Capita Income (share of GDP)	-0.13 (0.50)	-0.47* (2.01)	-0.05 (0.17)	-0.24 (1.09)
1991 Dummy	4.69*** (16.70)	4.69*** (4.32)	4.22*** (5.07)	4.64* (2.42)
Reforms Dummy			0.53 (0.69)	1.25 (1.62)
Adj. R2	0.47	0.40	0.45	0.32
DW	1.76	1.48	1.95	1.75
S.E.	1.21	1.31	1.22	1.41
Obs.	21.00	21.00	21.00	21.00

Source: Description of variables and data source in Data Appendix

Notes: OLS and IV specifications with heteroskedasticity consistent errors. ***, ** and * indicate 1 percent, 5 percent, and 10 percent significance levels respectively.

Table 12. Government Consumption Falls More Heavily Upon Nontradables

Dependent Variable $\Delta P_{nt}/\Delta P_t$	Basic Productivity Model				Augmented Productivity Model			
	Without reforms		With reforms		Without reforms		With reforms	
	OLS	IV	OLS	IV	OLS	IV	OLS	IV
Productivity Growth Differential	0.17*	0.22*	0.17	0.21*	0.13	0.11	0.14	0.02
	(1.87)	(2.01)	(2.01)	(2.43)	(1.44)	(1.11)	(1.59)	(0.19)
Real Government Compensation to Employees (share of GDP)	-0.01	-0.02	-0.01	-0.02	-0.01	-0.01	-0.01	-0.01
	(0.18)	(0.22)	(0.19)	(0.22)	(0.15)	(0.09)	(0.15)	(0.13)
Real Govt. Purchases (share of GDP)	0.14*	0.17*	0.13*	0.16*	0.11*	0.11	0.11*	0.10
	(2.04)	(2.02)	(2.00)	(1.82)	(1.84)	(1.87)	(1.77)	(1.66)
Real Per Capita Income (share of GDP)	-0.04	-0.11	-0.10	-0.11	0.09	0.09	0.05	0.33
	(0.41)	(0.96)	(1.44)	(1.11)	(0.71)	(0.70)	(0.39)	(1.58)
Price of Imports					-0.05	-0.05*	-0.05	-0.09**
					(1.70)	(1.82)	(1.48)	(2.28)
1991 Dummy	5.27***	7.81**	4.71***	7.05*	5.82***	5.74***	5.52***	6.72***
	(8.96)	(2.61)	(4.55)	(2.61)	(11.40)	(10.88)	(5.16)	(5.70)
Reforms Dummy			0.49	0.18			0.23	-0.66
			(0.81)	(0.26)			(0.38)	(1.06)
Adj. R2	0.24	0.10	0.21	0.11	0.27	0.30	0.23	0.19
DW	2.28	1.88	2.25	1.94	2.32	2.27	2.29	2.45
S.E.	1.45	1.61	1.47	1.60	1.41	1.42	1.46	1.53
Obs.	21.00	21.00	21.00	21.00	21.00	21.00	21.00	21.00

Source: Description of variables and data source in Data Appendix

Notes: OLS and IV specifications with heteroskedasticity consistent errors. ***, ** and * indicate 1 percent, 5 percent, and 10 percent significance levels respectively.

Table 13. The Real Share of Services in Private Final Consumption Expenditure as the 'Preferences' Variable

(Ratio to GDP)

Dependent Variable $\Delta P_{nt} / \Delta P_t$	Basic Productivity Model				Augmented Productivity Model			
	Without reforms		With reforms		Without reforms		With reforms	
	OLS	IV	OLS	IV	OLS	IV	OLS	IV
Productivity Growth Differential	0.15**	0.17*	0.13**	0.17**	0.16**	0.19***	0.14**	0.18**
	(3.13)	(2.09)	(2.88)	(2.20)	(3.24)	(3.17)	(2.97)	(2.54)
Real Share of Services in Private Final Consumption Expenditure (ratio to GDP)	0.05	0.40*	-0.00	0.48*	0.03	0.19	-0.06	0.17
	(0.50)	(1.72)	(0.04)	(1.88)	(0.34)	(1.31)	(0.59)	(0.57)
Real Government Consumption (share of GDP)	0.28***	0.25**	0.28***	0.23**	0.27***	0.26***	0.27***	0.26***
	(4.43)	(3.00)	(4.93)	(2.80)	(4.32)	(4.00)	(5.58)	(4.14)
Price of Imports					-0.02	-0.03*	-0.03*	-0.03*
					(0.87)	(1.75)	(2.08)	(1.93)
1991 Dummy	4.68***	6.46*	4.33***	6.29*	5.06***	7.18**	4.78***	6.80**
	(10.20)	(2.24)	(6.49)	(2.00)	(7.61)	(2.56)	(6.47)	(3.51)
Reforms dummy			0.42	0.05			0.62	0.11
			(0.81)	(0.09)			(1.10)	(0.14)
Adj. R2	0.48	0.10	0.48	0.08	0.47	0.28	0.51	0.30
DW	1.80	1.90	1.98	1.91	1.68	1.83	1.86	1.84
S.E.	1.19	1.61	1.19	1.76	1.20	1.40	1.17	1.39
Obs.	21.00	21.00	21.00	21.00	21.00	21.00	21.00	21.00

Source: Description of variables and data source in Data Appendix

Notes: OLS and IV specifications with heteroskedasticity consistent errors. ***, ** and * indicate 1 percent, 5 percent, and 10 percent significance levels respectively.

REFERENCES

Acharya, S., 2006, "If Growth Were Slower…?" *Business Standard*, December.

Aghion, P., R. Burgess, S. Redding and F. Zilibotti, 2003, "The Unequal Effects of Liberalization: Theory and Evidence from India," Mimeo.

Ahluwalia, M. S., 2002, "Economic Reforms in India since 1991: Has Gradualism Worked?," *The Journal of Economic Perspectives*, Vol. 16, No. 3 (Nashville, Tennessee: American Economic Association).

Altissimo, F. P. Benigno and D. R. Palenzuela, 2005, "Long run Determinants of Inflation in a Monetary Union," *NBER Working Paper* 11473 (Cambridge, Massachusetts: National Bureau of Economic Research).

Backé, P., 2002, "Disinflation in Central and Eastern European E.U. Accession Countries," Background paper for the Conference of the National Bank of Poland on Economic Policy Directions in the OECD Countries and Emerging Markets: Analyzing the Experiences, Warsaw, March 21–22.

Balassa, B, 1964, "The Purchasing Power Parity Doctrine: A Reappraisal," *Journal of Political Economy*, Vol. 72, pp. 584–96.

Bergstrand, J. H. 1991, "Structural Determinants of Real Exchange Rates and National Price Levels: Some Empirical Evidence," *American Economic Review*, Vol. 81 (1), March, pp.325–33.

Bhagwati, J., 1984, "Why are Services Cheaper in the Poor Countries?" *Economic Journal*, June, pp. 279–86.

Bosworth, B., S. Collins, and A. Virmani, 2006, "Sources of Growth in the Indian Economy," Paper prepared for Indian Policy Forum, New Delhi, July 31–August 1, 2006.

Bosworth, B. and J. Triplett, 2004, *Productivity in the U.S. Services Sector: New Sources of Economic Growth*, Brookings Institution, 2004.

Canzoneri, M. B., R. E. Cumby, and B. Diba, 1999, "Relative Labor Productivity and the Real Exchange Rate in the Long Run: Evidence for a Panel of OECD Countries," *Journal of International Economics*, Vol. 47, pp. 245–66.

Choudhri, E. U. and M. Khan, 2004, "Real Exchange Rates in Developing Countries: are Balassa-Samuelson Effects Present?" IMF Working Paper 04/188 (Washington: International Monetary Fund).

Chinn, M. and L. Johnston, 1996, Real Exchange Rate Levels, Productivity and Demand Shocks: Evidence from a Panel of 14 countries," *NBER Working Paper* 5709(Cambridge, Massachusetts: National Bureau of Economic Research).

Chinn, M., 2000, "The Usual Suspects? Productivity and Demand Shocks and Asia-Pacific Real Exchange Rates", *Review of International Economics*, 8 (1), pp. 20–43.

De Grauwe, P. and F. Skudelny, 2000, "Inflation and Productivity Differentials in EMU" University of Leuven, Discussion Paper No. 00/15, June 2000.

De Gregorio, J. A. Giovannini, and H. C. Wolff, 1993, "International Evidence on Tradables and Nontradable Inflation, *NBER Working Paper*, 4438 (Cambridge, Massachusetts: National Bureau of Economic Research).

_____, 1994, "The Behavior of Nontradable-Goods Prices in Europe: Evidence and Interpretation, *Review of International Economics*, 2(3) pp. 284–305.

_____ and H.C. Wolff, 1994, "Terms of Trade, Productivity and the Real Exchange Rate", *NBER Working Paper* 4807(Cambridge, Massachusetts: National Bureau of Economic Research).

Dholakia, R.H. and D. Kapur. "Economic Reforms and Trade Performance: Private Corporate Sector in India", *Economic and Political Weekly*, Vol. 36, No. 49, 2001.

Dornbusch, R., 1988, 'Purchasing Power Parity', in Eatwell, J.,. Migare, M. and Newman, P. (eds.), *The New Palgrave Dictionary of Economics*, pp. 1075–85 (London: Macmillan).

Edwards, D., 1989, Real Exchange Rates, Devaluation and Adjustment: Exchange Rate Policy in Developing Countries(Cambridge, Massachusetts, MIT Press).

Froot, K. and K. Rogoff, 1991, 'Government Spending and the Real Exchange Rate: The Empirical Evidence" (Mimeo, Harvard University).

Halpern L. and C. Wyplosz, 2001, "Economic Transformation and Real Exchange Rates in the 2000s: The Balassa-Samuelson Connection" Paper commissioned by United Nations Economic Commission for Europe and published as Chapter 6 in Economic Survey of Europe, 2001, No. 1, UN/ECE, Geneva, September.

Jazbec, B., 2002, "Real Exchange Rates in Transition Economies" William Davidson, *Working Paper* No. 482, (July).

Joshi, V. and I. M. D. Little, 1994, *India: Macroeconomics and Political Economy:*

1961–91, (Washington: World Bank).

Kato Atsushi, 2005, "Product Market Competition And Productivity in Indian Manufacturing Industry," Working Paper Series No. E/263, Institute of Economic Growth, 2005.

Ito, T., P. Isard, and S. Symansky, 1997, "Economic Growth and the Real exchange Rate: An Overview of the Balassa-Samuelson Hypothesis in Asia" NBER *Working Paper*, 5979 (Cambridge, Massachusetts: National Bureau of Economic Research).

Kohli and Mohapatra, 2006 "Inflation and the Services Sector in India" *India: Selected Issues*, IMF Country Report No. 06/56, February.

Kravis, I. B and R. Lipsey, 1983, *Toward an Explanation of National Price Levels,* Princeton Studies in International Finance No. 52, (Princeton, NJ: International Finance Center, Princeton University).

Kravis, I. B. and R. Lipsey, 1988, "National Price Levels and the Prices of Tradables and Nontradables" American Economic Review, May 1988 (Papers and Proceedings), 78, pp. 474–8.

Obstfeld, M. and K. Rogoff, 1996, *Foundations of International Macroeconomics*. (Cambridge, MA: MIT Press).

Rajaraman, I., 2007, "Service Sector Growth" *Economic Times*, January 9, 2007.

Reddy, Y. V., 2005, 'Importance of Productivity in India', Inaugural Address by Dr. Y.V. Reddy, Governor, Reserve Bank of India, at the Annual Conference of Indian Economic Association, December 27, 2005, Andhra University, Visakhapatnam.

Reserve Bank of India, "Report on Currency and Finance, 2002–03," 2004.

Rogoff, Kenneth., 1992, "Traded Goods Consumption Smoothing and the Random Walk Behavior of the Real Exchange Rate," *Bank of Japan Monetary and Economic Studies*, 10: 1–29.

Samuelson, P. A., 1964, "Theoretical Notes on Trade Problems, *Review of Economics and Statistics*, Vol. 46, pp. 145–54.

Siddharthan, N. S., and K. Lal, 2004, "Liberalization, MNE and Productivity of Indian Enterprises," *Economic and Political Weekly*, Vol. 39, No. 5, pp. 448–52.

Topalova, P., 2004a, "Trade Liberalization and Firm Productivity: The Case of India," IMF Working Paper 04/28 (Washington: International Monetary Fund).

Unel, Bulent, "Productivity Trends in India's Manufacturing Sectors in the last Two Decades," IMF Working Paper 03/22 (Washington: International Monetary Fund).