

Brunner, Hans-Peter; Calì, Massimiliano

**Working Paper**

## Dynamics of Manufacturing Competitiveness in South Asia: Analysis through Export Data

ERD Working Paper Series, No. 77

**Provided in Cooperation with:**

Asian Development Bank (ADB), Manila

*Suggested Citation:* Brunner, Hans-Peter; Calì, Massimiliano (2005) : Dynamics of Manufacturing Competitiveness in South Asia: Analysis through Export Data, ERD Working Paper Series, No. 77, Asian Development Bank (ADB), Manila, <https://hdl.handle.net/11540/1905>

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# ERD Working Paper

ECONOMICS AND RESEARCH DEPARTMENT

## SERIES

No. 77

### Dynamics of Manufacturing Competitiveness in South Asia: Analysis through Export Data

Hans-Peter Brunner and  
Massimiliano Calì

December 2005

Asian Development Bank

ERD Working Paper No. 77

**DYNAMICS OF MANUFACTURING COMPETITIVENESS  
IN SOUTH ASIA:  
ANALYSIS THROUGH EXPORT DATA**

**HANS-PETER BRUNNER AND MASSIMILIANO CALÌ**

December 2005

*Hans-Peter Brunner is Senior Economist in the South Asia Department, Asian Development Bank; Massimiliano Calì is a Ph.D. student at the London School of Economics.*

Asian Development Bank  
6 ADB Avenue, Mandaluyong City  
1550 Metro Manila, Philippines  
[www.adb.org/economics](http://www.adb.org/economics)

©2005 by Asian Development Bank  
December 2005  
ISSN 1655-5252

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## **FOREWORD**

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## **ABSTRACT**

The outstanding export performance of South Asian countries (India in particular) over the 1990s has prompted some observers to see in it the roots of an export-led growth similar to that of its Southeast Asian neighbors. We employ export unit values (UVs) cum real competitiveness analysis to the manufacturing sector of four South Asian countries (with particular focus on India), in order to investigate the determinants of this apparent success. Shifts toward higher UVs relative to technology leaders serve as the most appropriate indication of underlying structural changes, and such change is manifested in technology closing-up processes among countries. According to our indices, the export competitiveness of South Asian countries (except Pakistan) seems to have slightly improved relative to its Southeast Asian comparators, but not relative to the Organisation for Economic Co-operation and Development. South Asian export growth has been mainly driven by relative quantity expansion through a reduction in relative costs rather than relative quality improvement. Such expansion has been concentrated in natural-resource-intensive, standard technology-intensive (in India), and labor-intensive sectors (in Bangladesh). On the other hand, the more technology-intensive sectors in India still suffer from a significant gap relative to Thailand that has not been closing up in the last decade. These findings suggest some notes of caution in interpreting the recent good export performance of South Asian economies.

## I. INTRODUCTION

Economic development is a process that happens at the micro level with macroeconomic geographic consequences. The process of micro-level institutional change manifests itself in productivity increases, higher export unit values, higher worker output and wage levels, and income and export share growth, all tied to geography (Brunner and Allen 2005). The new technology-driven character of the global economy must be properly thought through with an analysis of technological change and trade competitiveness, networks of interaction and communication, economic growth, and income disparities.

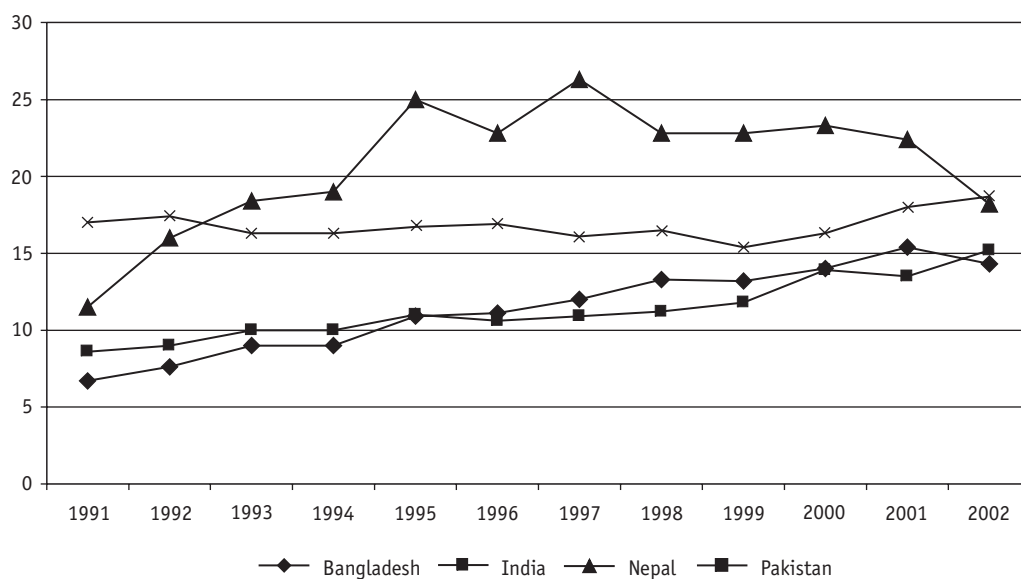
In line with these ideas we try to look at the economic development process by evaluating the underlying changes in a country's manufacturing production structure. We employ an analysis of export unit values (UVs) on a level of high aggregation relative to technology leaders as the most appropriate indication of underlying structural changes manifested in technology catching-up processes among countries. Inasmuch as UVs are an indication of product quality, when seen in a comparative perspective, they tend to reveal underlying structural changes in an economy (Aiginger 1998, Landesmann and Poeschl 1996, Timmer 2000). Changes in the export product mix toward relatively high-technology goods, and in the factor intensities using more capital and skilled labor are likely to show up in higher export unit value ratios (UVRs henceforth). Such pattern is likely to reflect changes in the whole economic structure of the country (see Timmer 2000 on these changes in Asia's growth in the 1980s). Seen in a dynamic perspective, UVRs can therefore be used as a valid indicator of underlying catching-up processes between countries.

We integrate the UV analysis with one of unit labor cost (ULC), the most popular indicator of production competitiveness. According to the literature (Landesmann and Poeschl 1996, Marsh and Tokarik 1996), a decreasing unit labor cost is a sign of improving competitiveness (labor productivity is increasing faster than labor cost). Hence a decreasing ULC ratio over time should strengthen the competitive position of the domestic country relative to the foreign one. The combination of an increasing UVR and a decreasing ULCR is the real competitiveness indicator (RC). A higher RC should then be positively correlated to the base country's relative competitiveness in its manufacturing sector, with an associated growth in its share of world exports (as manufacturing usually composes most of the merchandise exports of a country).

We apply the analysis to the case of South Asian manufactured exports, in order to investigate the determinants of its apparent success. As a matter of fact, in the past few years the rate of gross domestic product (GDP) growth in South Asia has been almost systematically above that of the world, with a rapid increase in exports. As shown in Figure 1, exports have been growing even faster than GDP over the 1990s in most South Asian countries.



FIGURE 1  
EXPORT AS PERCENT OF GDP



Source: *World Development Indicators* (World Bank, various years).

The aim of this work is to analyze the evolution of productivity, prices and unit values, and export competitiveness of South Asian manufacturing (India in particular) relative to a group of countries of the Organisation for Economic Co-operation and Development (OECD) over a period of 12 years (1991–2002). Due to unavailability of data, we were able to construct a complete dataset over that period only for India. For the other countries in the region the analysis is limited to shorter periods of time (with some gaps in between). Nevertheless we believe that even shorter time spans may be useful to have a clearer understanding of the dynamics of our variables of interest. Through this procedure we can match (and weigh in certain instances) national data with more precise international trade data. We carry out the analysis in a comparative fashion, benchmarking South Asia against some Southeast Asian countries.

In order to understand the trends in South Asia, it is particularly important to analyze the performance of India, which appears to have been outstanding in the last decade. Many observers have acknowledged the performance of the service sector (and the software industry in particular) in driving the growth of the Indian export sector. However, growth in the information and communication technology sector hardly accounts for decimal percentage points of the Indian labor force. Hence, while it is very good news for the country's international financial rating, this sector's growth is not likely to capture the deep-seated structural changes of the Indian production system, which represent the seeds for a country's economic prosperity. The present analysis will then focus on the industrial sector, and the manufacturing sector in particular, as the main indicator of evolution in the country's production structure.

The paper is organized as follows: Section II introduces the unit value comparison methodology as a way to compare export quality across economies. The unit value comparison method is used to decompose a country's exports into the product of an intensive and an extensive export margin

(Hummels and Klenow 2005). In order to assess the relative competitive position of a country in Section IV, in Section III, we combine the export unit value analysis with a “real competitiveness” analysis. With the outlined methods, the empirical analysis is conducted in Section IV to examine the dynamics of trade specialization relative to OECD, and of real competitiveness for South Asian countries (Bangladesh, India, Nepal, and Pakistan). We also compare these dynamics to some Southeast Asian countries at a marginally higher level of economic development (Indonesia and Thailand). Section V concludes.

## II. UNIT VALUE ANALYSIS

The recognition that intra-industry product differences across countries may be important enough to spoil the test of traditional and new trade theories has spurred research on product quality and product innovation, especially in international trade. Several authors have focused on the analysis of export unit values<sup>1</sup> as the most precise indicator of export product quality (Hallack 2004, Schott 2004, Timmer 2000), using it to address various issues related to trade specialization (Hallack 2004, Schott 2004); export competitiveness (Aiginger 1998, Brunner and Allen 2005, Landesmann and Poeschl 1996, Timmer 2000); and product innovation (Aiginger 2001, Kaplinsky and Readman 2005). UV is a price–quantity ratio, taking a common measurement unit across sectors (usually kilos).

The popularity of UV as a quality indicator is related to some evident advantages: it is a market-based information, heavily dependent on consumers’ preferences; it is usually readily available from trade statistics; and it is comparable across sectors and across countries. As Hallack (2004, 31) puts it, “since unit values are likely to be the best, although indirect, available source of information on cross-country differences in quality levels covering a broad range of goods, further research focused on these indices seems necessary and promising.”

Yet, such use of UVs is subject to several drawbacks. First, UVs tend to incorporate also cross-country variation in exporters’ relative production efficiency, not only product quality (more so if a sector is less quality- and technology-intensive).<sup>2</sup> Second, they tend to be static, reflecting price differences as some point in time, without capturing the dynamics of innovative activity (Kaplinsky and Readman 2005). Thirdly, in cross-country comparisons, UV analyses may be biased toward less sophisticated products (such as natural resources-based products), for which values and quantities are readily available from trade statistics (Timmer 2002). How we use UV analysis in this paper allows us to tackle the second problem, by using longitudinal data for all the countries; and partially the third problem, by constructing a weighting scheme<sup>3</sup> that tries to compensate for the skewness in the loss of data toward the more sophisticated sectors.

<sup>1</sup> Some authors also refer to it as unit price.

<sup>2</sup> Hallack and Schott (2005) are the first authors to distinguish between this “pure” price and quality variation using a revealed preference analysis.

<sup>3</sup> See the methodological appendix on the way the weighting scheme has been constructed.

UVR is calculated as the ratio of product category<sup>4</sup>  $s$  unit values (derived by dividing yearly ex-factory output values by produced quantities of  $s$ ) in country  $i$  and country  $j$ :

$$UVR_{ij}^s = \frac{uv_i^s}{uv_j^s} \quad (1)$$

We can summarize the determinants of the product category  $s$  UV in country  $i$  in the following general way:

$$UV_i^s = f(K_i^s, (HL)_i^s, L_i^s, \sigma_i^s, \phi_i, D^s)$$

$$\text{with } f'(K_i^s) \geq 0, f'(HL)_i^s \geq 0, f'(L_i^s) \leq 0, f'(\sigma_i^s) \geq 0, f'(\phi_i) \geq 0, f'(D^s) \geq 0$$

where  $K_i^s$  is the (country-specific) level of capital used in the production of  $s$ ,  $(HL)_i^s$  is the (country-specific) high skilled labor employed,  $L_i^s$  is the (country-specific) proportion of low skilled labor employed,  $\sigma_i^s$  is the (country-specific) varieties' mix of which  $s$  is composed (a higher value of  $\sigma$  indicates a higher proportion of technology and/or skilled labor varieties within  $s$ ),  $\phi_i$  is a country parameter that is positively correlated to  $uv$  across product categories,<sup>5</sup> and  $D^s$  is the world demand for  $s$ .

Analyzing for instance the variability of  $UV_i^s$  due to factor proportions,  $UV_i^s$  varies across countries not only because of different varieties' composition across countries, but also because of the different factor intensity mix within the same variety. A shirt produced in People's Republic of China (PRC) is likely to be produced using relatively less skilled labor and less technology than an Italian shirt. This of course shows up in different export unit values: a shirt from Italy exported to the United States is four times as expensive as one from the PRC, although they are both considered as the same variety (Hallack and Schott 2005).

Such theoretical insights have received wide support in recent empirical literature. Schott (2004) finds that UVs are higher for varieties exported by capital- and skill-abundant countries than for varieties from labor-abundant ones. He also finds a strong positive association between UVs and the capital intensity of the production techniques used to produce them. More importantly, over time, skill- and capital-deepening countries increase their UVs relative to the more stagnant ones. Similarly Hallack (2004) finds that product quality (measured through UV) is an important determinant of the direction of trade. So, for instance high-income countries tend to trade more with each other because of their higher income elasticity for quality products and their specialization into these product categories.

Due to the complexity and the specificity of the effects at work, UVs (and UVRs of course) do not move in a unidirectional way as an economy evolves, reflecting the significant within- and cross-country sector heterogeneity. Therefore some degree of categories' aggregation is needed in order

<sup>4</sup> Following Hallack and Schott (2005), we define product category as an aggregation of different varieties, and sector (or industry) as an aggregation of product categories.

<sup>5</sup>  $\phi_i$  can be thought of as a summary of a country's characteristics that influence  $uv$  across sectors, such as institutional quality, image of a country at the international level, and so on.

to detect structural shifts of an economy in a meaningful way. In particular, we aggregate product categories' UVs (5- and 4-digit level) into one single UV for the entire economy, and into 20 originally constructed macro sectors.<sup>6</sup> In order to learn something more about the relative shift in export specialization, we perform the UVR sectoral aggregation into one economywide index (and into the 20 macro sectors) in two different ways.

The first method consists of calculating the UVR (relative to OECD) for the 4- and 5-digit categories in which India exports and then aggregate them up through a weighting scheme, which is based on the distribution of Indian exports (in values) over the period of analysis (the more important a category over the period, the higher the weight). More formally the macro aggregation into the single economywide value is obtained as:

$$UVR_{IO}^1 = \sum_{s \in X_I} \left[ \frac{uv_I^s}{uv_O^s} z_I^s \right] \quad (2)$$

where  $uv_I^s$  and  $uv_O^s$  are the unit values in product category  $s$  for India and OECD respectively,  $z_I$  is the Indian export based weighting scheme, and  $X_I$  is the set of product categories in which India exports.<sup>7</sup> In the same fashion we calculate the value for the macro sectors.<sup>8</sup> In this way we obtain an indicator of the extent to which the Indian economy's evolution is driven by relative quality in those product categories in which it exports (and produces). In other words it is a signal of whether Indian producers are competing in terms of quality relative to OECD producers in those categories.

The same UVR indexes are calculated also by aggregating the UVs separately for India and OECD, using the export categories of India and of OECD, respectively. The aggregations are performed using two different weighting schemes for India and OECD, which reflect the different composition of the export baskets both at the economy and at the sector level (see the methodological appendix for a formal description of the weighing scheme). For the economywide macro aggregation we have:

$$UVR_{IO}^2 = \frac{\sum_{s \in X_I} uv_I^s z_I^s}{\sum_{s \in X_O} uv_O^s z_O^s} \quad (3)$$

where  $X_O$  is the set of OECD export product categories and  $z_O$  is the weighting scheme used for OECD. Sector aggregations are obtained in the same way. This second method allows to informally assess the extent to which different specialization patterns may cause OECD and India UVs to diverge. It is a sort of indirect test for the importance of high-quality extensive margin for developed economies vis-à-vis India. If OECD were to specialize in a set of relatively high-value product categories as compared to India, then probably  $UVR_{IO}^1 > UVR_{IO}^2$ . Moreover, if those OECD categories were to display faster product quality growth than the Indian ones, then  $\hat{UVR}_{IO}^1 > \hat{UVR}_{IO}^2$ , namely, the first UVR should grow more rapidly (or, more correctly, should decline slower) than the second one.

<sup>6</sup> See the methodological appendix for a formal description of the aggregation procedure.

<sup>7</sup> Clearly in this way we take into account only those categories in which OECD countries also export.

<sup>8</sup> In this case though, the weighting scheme would be sector-specific and would then be different from the economywide weighting scheme used for the single index.

Using the UVR approach, Hummels and Klenow (2005) decompose a country's exports into the product of an intensive and an extensive export margin. The former measures a country's share of world exports in those market categories in which it exports. The latter measures the fraction of world exports that occur in those market categories in which the country exports. The intensive margin can further be decomposed into an export price index (XPI) and an export quantity index (XQI). We slightly modify their methodology, in order to analyze the export competitiveness of South Asian countries.<sup>9</sup> We focus on the construction of the XPI and XQI for the set of countries in the analysis, setting the indexes against an international benchmark (OECD countries' exports), rather than referring it to the world exports. The analysis is then structured as a two-country comparison, according to a two-country model.

Indicating with  $A$  the Asian country and with  $O$  the OECD countries, we can define the export price index for the exporter  $A$  (with respect to OECD exports) as:

$$XPI_{AO} = \left[ \frac{\sum_{S \in X_{AO}} uv_A^S Q_A^S}{\sum_{S \in X_{AO}} uv_O^S Q_A^S} \right]^{1/2} \left[ \frac{\sum_{S \in X_{AO}} uv_A^S Q_O^S}{\sum_{S \in X_{AO}} uv_O^S Q_O^S} \right]^{1/2} \quad (4)$$

where  $X_{AO}$  is the set of export sectors of the Asian country to OECD,  $Q_A^S$  and  $Q_O^S$  are the quantity exported to OECD countries in sector  $s$  by the Asian country and by OECD, respectively. The index as defined in equation (4) is a geometric-weighted average of two indices, one using country  $A$ 's own export quantities in each sector to weigh country  $A$ 's and country  $O$ 's UVs in the same sector, the other using OECD export quantities as a weight. The index so constructed is a Fisher index.<sup>10</sup> The export price index summarizes the extent to which the quality of the  $A$  country export basket is high or low relative to OECD in the same product categories. It differs from UVRs in the weighting scheme, which also allows taking into account the OECD export basket.<sup>11</sup>

In the same fashion we also define the export quantity index as:

$$XQI_{AO} = \left[ \frac{\sum_{S \in X_{AO}} uv_A^S Q_A^S}{\sum_{S \in X_{AO}} uv_A^S Q_O^S} \right]^{1/2} \left[ \frac{\sum_{S \in X_{AO}} uv_O^S Q_A^S}{\sum_{S \in X_{AO}} uv_O^S Q_O^S} \right]^{1/2} \quad (5)$$

Since they represent an indication of how a country is competing in the export sectors to a specific set of markets against a benchmark, the combination of the two does not give the country's gross share of world export, as in Hummels and Klenow (2005). However, it is worth calculating it as a summary measure of the relative quality and quantity combined effects. We define this as the Export Competitiveness Index:

$$XCI_{AO} = XPI_{AO} XQI_{AO} \quad (6)$$

<sup>9</sup> Hummels and Klenow (2005) are interested in evaluating the determinants of the higher level of exports by big countries. Through the decomposition described, they can assess whether these higher exports come from larger quantities of a common set of goods (intensive margin), larger set of goods (extensive margin), or higher-quality goods. Since the objectives of this work are different, we depart from their methodology.

<sup>10</sup> The Fisher index is a geometric-weighted average of a Laspeyres and a Paasche index.

<sup>11</sup> Sectors that are important in OECD export but not in Indian export would still get a relatively high weight.

An upward trend of the index indicates an improvement in country *A*'s export competitiveness against a benchmark. Hence it is correlated to the gross export share, in that as it increases, the country share of world exports is also likely to increase.<sup>12</sup>

### III. REAL COMPETITIVENESS ANALYSIS

In order to assess the relative competitive position of a country, we combine the export analysis with a "real competitiveness" analysis. As argued by Landesmann and Poschl (1996), the evolution of an economy's real competitiveness can be measured using four main variables: (i) evolution of the real exchange rate, (ii) relative changes in wage rates, (iii) relative labor productivity growth, and (iv) relative changes in the per unit of standardized quality of a weighted sum of products (that is, a UVR aggregation). Marsh and Tokarick (1996) highlight the formal connection between the variables and propose an empirical indicator. We build on their work and construct country-based data series for the manufacturing sector on the four components of a real competitiveness index, defined as:

$$RC_{AO} = \frac{(V_A / L_A)E_{\$R}}{V_O / L_O} \frac{W_O / L_O}{(W_A / L_A)E_{\$R}} UVR_{AO} \quad (7)$$

where  $RC_{AO}$  is the real competitiveness index of the domestic country (Asian country) versus OECD countries,  $V_j$  is manufacturing output value of country  $j$ ,  $L_j$  is labor employed in manufacturing, is  $W_j$  manufacturing total wages in country  $j$ , and  $E_{\$R}$  is the dollar exchange rate to the domestic currency<sup>13</sup> (with  $j = A, O$ ). It is then easy to see in equation (8) the three components of the index: the output per worker ratio (the first term), the wage per worker ratio (the second term), and the unit value ratio (the last term). The exchange rate terms in equation (8) can be canceled out, leaving only the indirect effects of the exchange rate on competitiveness, operating via the other variables. The RC index can be further grouped in the following way:

$$RC_{AO} = \frac{UVR_{AO}}{ULCR_{AO}} \quad (8)$$

with  $ULCR_{AO}$  being the unit labor cost ratio between the Asian and the OECD countries.

According to the majority of the literature, a decreasing unit labor cost is a sign of improving competitiveness (labor productivity is increasing faster than labor cost). Hence a decreasing ULCR over time should strengthen the competitive position of the domestic country relative to the foreign one.<sup>14</sup> A higher RC should then be positively correlated to the base country's relative competitiveness of its manufacturing sector, with an associated growth in its share of world exports (as manufacturing usually composes most of the merchandise exports of a country). To the extent that competitiveness and exports drive income and GDP growth, then an increasing RC should also show up in GDP growth over time.

<sup>12</sup> In fact, the  $XCI_{AO}$  is correlated to the relative market share of the country versus OECD. But since the latter represents most of world trade, the index is also correlated to the country's world export share.

<sup>13</sup> In this case we define it as number of dollars needed for one rupee.

<sup>14</sup> However, see Felipe (2005) for a different interpretation of unit labor cost, based on its distributional dimension, rather than on its supply side interpretation.

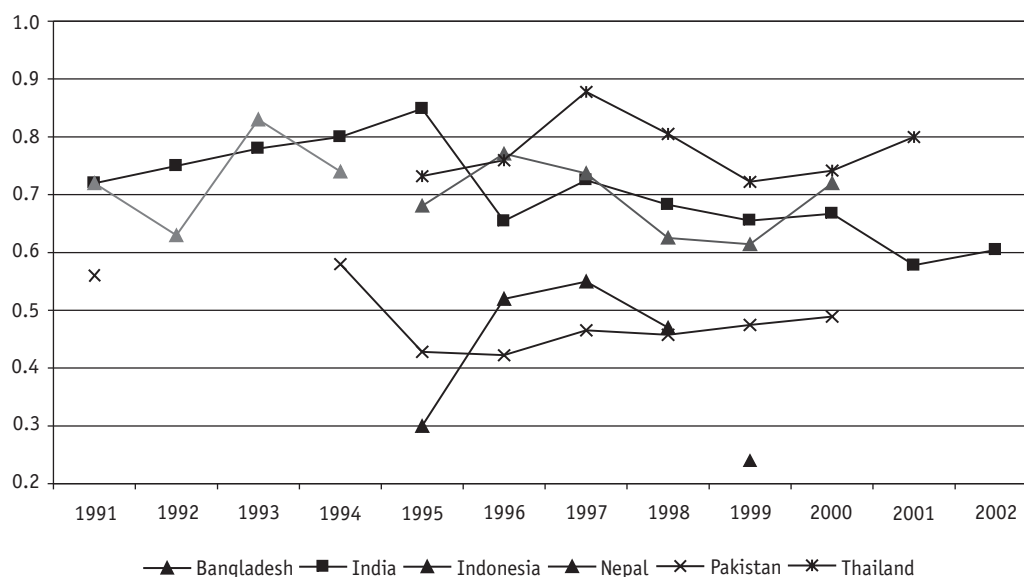
## IV. EMPIRICAL ANALYSIS

### A. Trade Data

The analysis is conducted using data from the International Trade Commission's database on Trade Analysis System (PC-TAS) to examine the dynamics of trade specialization relative to OECD, and of real competitiveness for South Asian countries (Bangladesh, India, Nepal, and Pakistan).<sup>15</sup> We also compare these dynamics to some Southeast Asian countries at a marginally higher level of economic development (Indonesia and Thailand). This comparison should allow us also to set the South Asian data against a challenging (although reachable) continental benchmark.

All the analysis is performed taking the main 23 OECD countries<sup>16</sup> as both the destination market and the terms of reference. We define a country's exports as its exports to OECD countries. Therefore in the analysis, when we refer to exports, we always mean exports to OECD countries.<sup>17</sup> This choice is motivated by the fact that OECD makes up most of the world imports and that it represents the most sophisticated markets. Moreover this choice allows us to make comparisons between more narrowly (and homogeneously) defined exports.

FIGURE 2  
EXPORT UNIT VALUE RATIO (RELATIVE TO OECD)



Source: Authors' calculation based on PC-TAS data.

<sup>15</sup> We could consider these countries as a good approximation of South Asia as a whole, as they make up over 90% of the region's GDP.

<sup>16</sup> We exclude the last OECD entrants: for instance Hungary, Republic of Korea, Mexico, and Poland.

<sup>17</sup> This applies also to OECD exports. We define those as the exports of OECD countries to Sweden, Switzerland, and US, which together compose the bulk of intra-OECD product categories exports.



First, we calculate UVRs for the South Asian economies for all the 5-digit ISIC sectors.<sup>18</sup> The aggregation of these UVRs into a single economywide index (using the method in equation 2) provides some interesting insights on the evolution of a country industry's structural change (Figure 2).<sup>19</sup>

Because of a statistical break in 1995,<sup>20</sup> we need to split the analysis into pre-1995 and post-1995 periods. In the former, the upward Indian trend seems apparent, while Nepal and Pakistan show no clear trend (the fall of Pakistan's 1995 value may actually be the product of a statistical artifact). The post-1995 period shows some stable pattern for all South Asian countries, with a steady decline for India (despite a marginal inversion of the trend in 2002) and Bangladesh (although in this case the inference is made with an incomplete series), coupled by a slight upward trend for Pakistan (Nepal is lacking enough data for a meaningful interpretation), which is entirely driven by the textile sector. Comparing these trends with those of Indonesia and Thailand, we notice how after a trough during the 1997 crisis, the two countries restore quite quickly their relative quality position with an upward trend after 1999. This appears to be a sign of production dynamism and innovativeness that is still somehow lacking in South Asian economies.

Second, using the method in equation (4) and equation (5), the computation of the export price index (XPI) and export quantity index (XQI) complements the UVR analysis of economywide structural changes. Table 1 shows a mixed picture of the quality index in South Asia. Pakistan displays a flat trend over the 1990s. After a moderate increase in the first half of the 1990s, India's XPI decreases steadily in the 1997–2002 period; and so does the index for Bangladesh, although the downward trend happens in the early 1990s in this case. Therefore the XPI analysis confirms the UVR one, highlighting even more markedly the decline in relative quality of South Asian exports (with Pakistan being somewhat an exception). The comparison with Indonesia and Thailand shows this time a similar trend to that of India for Indonesia in the second half of the decade, and a quick restoration of its precrisis relative quality for Thailand. This again appears to be a more quality-oriented economy than the South Asian ones.

The XQI analysis is enlightening for India, which displays a consistent upward trend (leaving aside the statistical-induced troughs of 1994 and 1995) throughout most of the period (Table 1). This quantity-led growth may explain a great deal of Indian export growth of the post-reform period. Such growth seems to have been accompanied by a moderate quality improvement right after the reforms, which ended in the second half of the 1990s, when increases in exports have mainly come by larger quantities at lower (relative) prices. A similar quantity-led export growth pattern has been followed by Bangladesh. In the case of Bangladesh the increase in quantity has been driven entirely by the surge in low-quality textile production. Pakistan is again an exception: it is the only South Asian country in the panel to experience a downward trend in the quantity index. This fact together with a rising relative export quality may actually hint at the exit of some exporting firms at the low end of the quality spectrum in Pakistan. The Southeast Asian countries display a constant trend in the index, with a slight decline for Indonesia.

<sup>18</sup> We use the SITC-rev. 3 classification.

<sup>19</sup> Note that due to the big gaps in trade data, we could not compute the index for a few countries in some years.

<sup>20</sup> This break occurs in part because of the use of 1991 to 1995 aggregate values for weighting earlier data in the aggregation, and the use of 1991–2002 aggregate values for later years' aggregation. The database for this paper was constructed in two years, the first part in 1988, the second part in 2004/05.



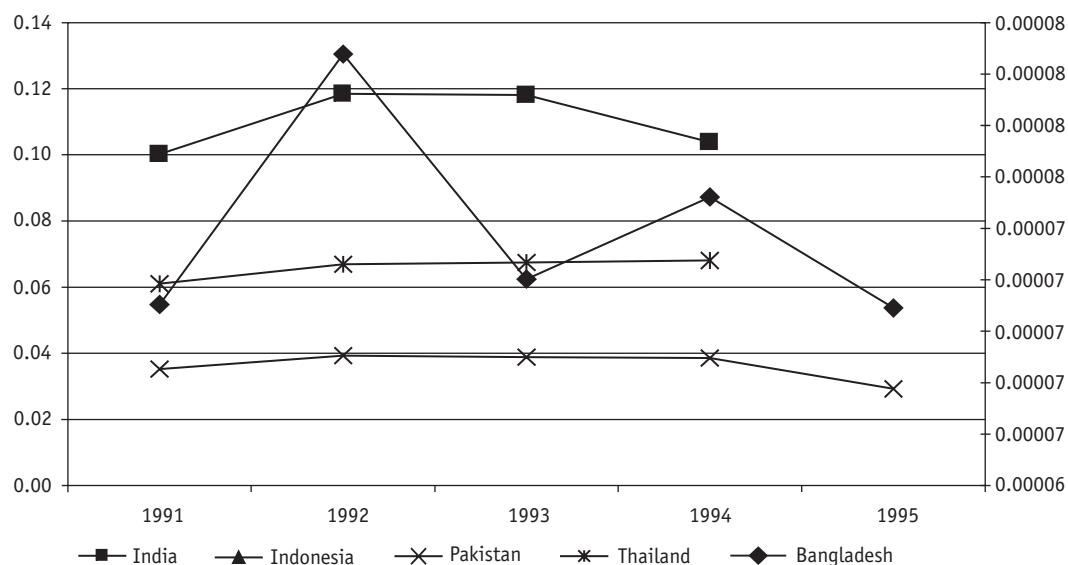
**TABLE 1**  
**EXPORT QUANTITY AND QUALITY INDEX**

|                                    | 1991  | 1992  | 1993  | 1994  | 1995  | 1996  | 1997  | 1998  | 1999  | 2000  | 2001  | 2002  |
|------------------------------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| <b>Export Quality Index (XPI)</b>  |       |       |       |       |       |       |       |       |       |       |       |       |
| Bangladesh                         | 0,005 | 0,005 | 0,005 | 0,004 | 0,004 | 0,031 | 0,024 | 0,038 |       |       |       |       |
| India                              | 0,388 | 0,421 | 0,337 | 0,444 | 0,418 | 0,383 | 0,437 | 0,375 | 0,352 | 0,286 | 0,290 | 0,315 |
| Indonesia                          |       |       |       |       | 0,219 | 0,202 | 0,171 | 0,191 | 0,157 | 0,160 |       |       |
| Pakistan                           | 0,114 | 0,097 | 0,126 | 0,129 | 0,120 | 0,268 | 0,271 | 0,290 | 0,285 | 0,294 |       |       |
| Thailand                           | 0,483 | 0,504 | 0,504 | 0,557 | 0,870 | 0,743 | 0,743 | 0,770 | 0,726 | 0,781 | 0,901 |       |
| <b>Export Quantity Index (XQI)</b> |       |       |       |       |       |       |       |       |       |       |       |       |
| Bangladesh                         | 0,013 | 0,016 | 0,016 | 0,017 | 0,019 | 0,021 | 0,022 | 0,024 |       |       |       |       |
| India                              | 0,258 | 0,282 | 0,350 | 0,234 | 0,181 | 0,209 | 0,181 | 0,191 | 0,214 | 0,220 | 0,213 | 0,230 |
| Indonesia                          |       |       |       |       | 0,219 | 0,202 | 0,171 | 0,191 | 0,157 | 0,160 |       |       |
| Pakistan                           | 0,308 | 0,406 | 0,309 | 0,300 | 0,243 | 0,135 | 0,126 | 0,108 | 0,094 | 0,084 |       |       |
| Thailand                           | 0,126 | 0,133 | 0,134 | 0,122 | 0,142 | 0,165 | 0,163 | 0,144 | 0,156 | 0,138 | 0,118 |       |

Source: Authors' calculation based on PC-TAS data.

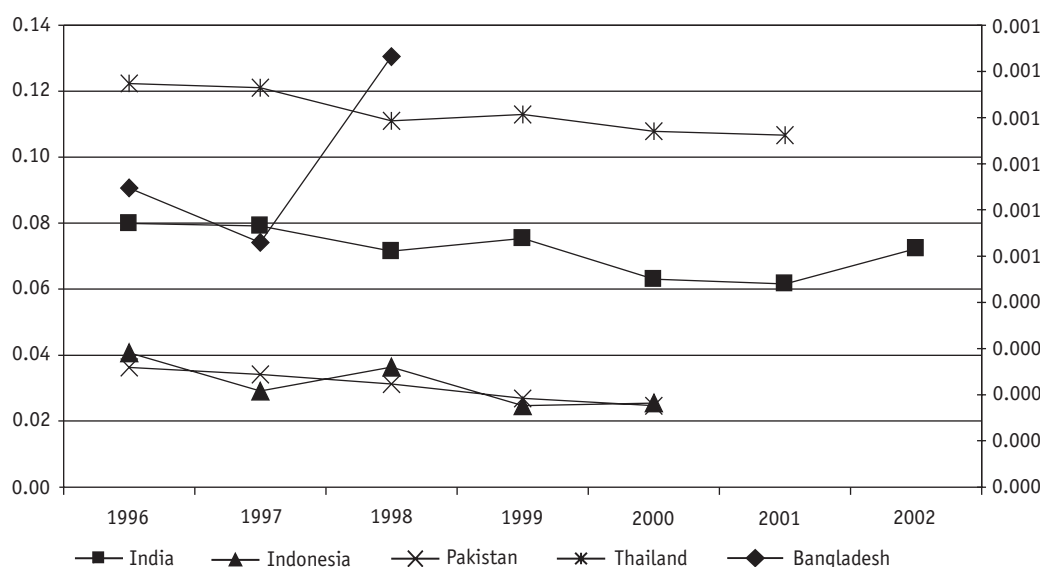
Combining the two indexes as in method (6), we obtain a summary indicator of relative export competitiveness (XCI) in the world markets (using OECD as the term of comparison). From Figure 3a and 3b (separated due to the statistical break in 1995) it is evident that no clear trend is manifest for the South Asian countries, which oscillate around the mean value throughout the period. The Southeast Asian countries show instead a slightly downward trend, which in the case of Thailand comes about after the 1997 crisis. So, the export competitiveness of South Asian countries seems to have slightly improved relative to the Southeast Asian neighbors mainly due to an upsurge in quantities sold at decreasing rates and to the 1997 crisis.

**FIGURE 3A**  
**EXPORT COMPETITIVENESS INDEX, 1991-1995<sup>a</sup>**



Note: Bangladesh's scale is on the right hand vertical axis.  
Source: Authors' calculation based on PC-TAS data.

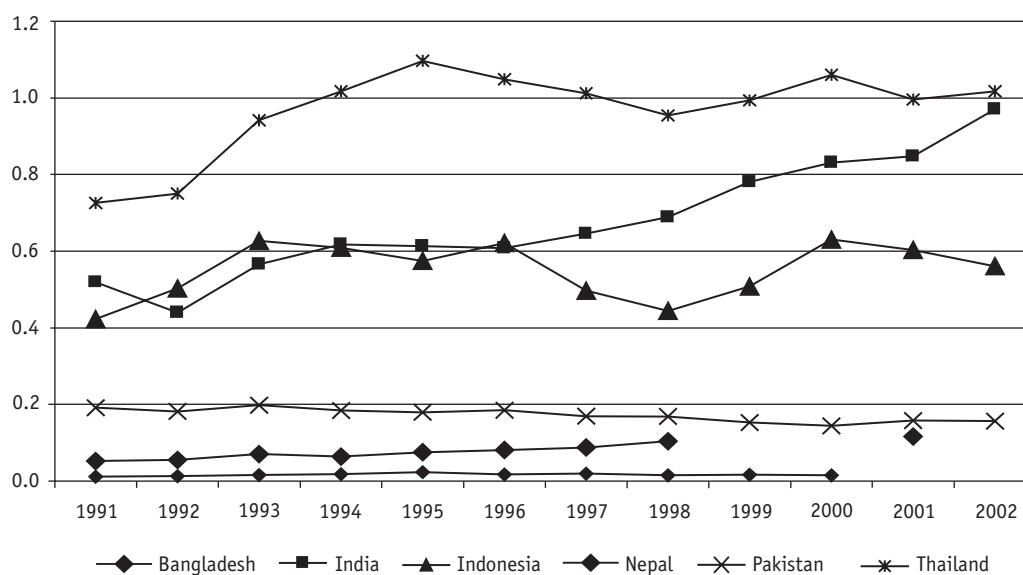
**FIGURE 3B**  
**EXPORT COMPETITIVENESS INDEX, 1996-2002<sup>a</sup>**



Note: Bangladesh's scale is on the right hand vertical axis.  
Source: Authors' calculation based on PC-TAS data.

Such analysis is partially reflected in the dynamics of manufacturing shares of world export (Figure 4). South Asian countries fare quite well throughout the 1991–2002 period: India and Bangladesh's shares constantly increase over time; Nepal has a moderate upward trend (which is partially reversed after 1997—not visible in the graph because of the scale); while Pakistan experiences a moderate decline, mainly due to the lack of quantity growth highlighted above. Indonesia and Thailand start the 1990s as larger exporters than any South Asian country. This is not surprising due to the export orientation of their policies and the greater competitiveness of their production structures. However, over the 1990s, South Asian economies seem to have achieved an export growth relatively higher than Indonesia (which was hit hard by the Asian financial crisis) and comparable to that of Thailand. India in particular is the country that gains most shares over the period, overtaking the Indonesian share and approaching that of Thailand in 2002 (with a 100% increase in one decade). It is worth exploring why such trends are not exactly in line with the XCI values. For example, such index shows a stagnating trend for Bangladesh and India, while they increase their world manufacturing exports' share over the period. The XCI is slightly decreasing for Thailand, while the country's export share increases. The XCI in the way we constructed it, weighs a country's sector UV (quantity) also according to how important that country is in OECD exports' quantities (UV). To illustrate, suppose that India is increasing its UVR in a sector over time (say, via intense innovative activity), while the relative export quantity remains constant (therefore its share of world export will increase in that sector). If that sector is not very relevant in the advanced economies (say, an industry whose innovative content is stagnating at the world level), the quality increase, which has determined Indian growth in that sector, will be dampened in the XCI. Thus the gap between the XCI and the share in world manufacturing trends may be signaling, for example, that innovative activity in Asian countries tends to be concentrated in sectors stagnating at the world level (and vice-versa). This hypothesis is supported by the evidence collected by Montobbio and Rampa (2005).

FIGURE 4  
SHARES IN WORLD MANUFACTURING EXPORTS (PERCENT)



Source: World Development Indicators (World Bank, various years).

A rise in global market share may reflect two very different circumstances. On one hand, it may come from product innovation and rising relative product values. On the other hand, it may be determined by a reduction in relative costs, for instance through increase in process efficiency, and a disproportionate increase in trade volumes (Kaplinsky and Readman 2005). Following the above analysis, the determinants of the Indian rise in market share are to be found mainly in a quantity expansion (with a moderate relative price increase in the first half of the 1990s) due to the reduction in relative costs.

As Table 2 shows, quantity growth appears to be driven particularly by resource-intensive sectors, such as nonmetallic mineral manufactures (in particular construction stones and materials); iron and steel-based manufactures; and chemical industry (in particular, organic compound, medicaments, and synthetic organic dyestuffs categories). The nonmetallic mineral manufactures includes worked diamonds, where smaller firms are more prevalent. The miscellaneous manufactured articles sector also gives a significant contribution, particularly through the jewelry and precious metals categories. The latter sector is also dominated by smaller, entrepreneurial players. These sectors enjoy important increases throughout the period, as shown in the second to the last column of Table 2, which measures the percentage increase of the 2000–2002 average relative to the 1996–1998 average.

Such quantity growth determines the sector increases in export values (the product of export quantity and unit value). Therefore the main contributors to the increase in Indian export values are the abovementioned sectors, although the increase in the export value does not match the quantity increase (Table 3). While the quantities in those sectors rise significantly, the unit values are either sticky or falling. The other main sector contributing to the surge in export values is the low-technology, labor-intensive textile sector.

This analysis confirms the good performance of the Indian manufacturing industry by international standards, although it suggests a note of caution: export growth is accompanied (in most sectors)

TABLE 2  
INDIA'S EXPORT QUANTITIES, 1996–2002 (TONS)

| COMMODITY                                | 1996           | 1997           | 1998           | 1999            | 2000            | 2001            | 2002            | CHANGE,<br>96-02<br>(%) | CHANGE,<br>3-YR<br>AVE. (%) | CONTRIB,<br>96-02<br>(%) |
|--|----------------|----------------|----------------|-----------------|-----------------|-----------------|-----------------|-------------------------|-----------------------------|--------------------------|
| Ores, coal, nonferrous metals            | 986210         | 972546         | 650947         | 970979          | 764633          | 746556          | 1169459         | 19                      | 37                          | 3.5                      |
| Iron and steel, metal manufactures       | 300583         | 293469         | 563623         | 564611          | 1380521         | 1226628         | 1309570         | 336                     | 559                         | 19.3                     |
| Chemical industry                        | 417522         | 468267         | 400373         | 485773          | 643029          | 551513          | 796727          | 91                      | 125                         | 7.2                      |
| Cork and wood                            | 2287           | 1027           | 2794           | 3347            | 9302            | 6963            | 10943           | 379                     | 721                         | 0.2                      |
| Paper-pulp/board                         | 25787          | 20216          | 21626          | 24738           | 41411           | 50723           | 93393           | 262                     | 303                         | 1.3                      |
| Rubber manufactures                      | 41634          | 45867          | 50832          | 51678           | 63671           | 59118           | 65963           | 58                      | 116                         | 0.5                      |
| Machinery industries                     | 75046          | 80892          | 99242          | 90864           | 169275          | 163706          | 167281          | 123                     | 221                         | 1.8                      |
| Road vehicles                            | 185212         | 143808         | 135301         | 163821          | 216735          | 179942          | 212026          | 14                      | 85                          | 0.5                      |
| Electrical machinery, telecommunications | 50092          | 37933          | 38701          | 42791           | 95214           | 113167          | 107519          | 115                     | 149                         | 1.1                      |
| Precision machinery, optical instruments | 6336           | 5018           | 7203           | 5454            | 8419            | 3835            | 4005            | -37                     | -12                         | 0.0                      |
| Office machines                          | 14253          | 11507          | 3139           | 3127            | 5199            | 7461            | 9840            | -31                     | -13                         | -0.1                     |
| Miscellaneous manufactured articles      | 204488         | 257669         | 355371         | 391272          | 562757          | 646033          | 703104          | 244                     | 134                         | 9.5                      |
| Sanitary, heating, lighting fixtures     | 2398           | 1777           | 1405           | 2313            | 4935            | 3551            | 3524            | 47                      | 115                         | 0.0                      |
| Nonmetallic mineral manufactures         | 4083995        | 4695632        | 4979763        | 6626702         | 5136468         | 5190284         | 6478924         | 59                      | 91                          | 45.8                     |
| Wood manufactures and furniture          | 12636          | 11620          | 12028          | 14892           | 22860           | 25619           | 39941           | 216                     | 144                         | 0.5                      |
| Leather, leather manufactures, footwear  | 49049          | 50407          | 56872          | 63718           | 84297           | 82285           | 82616           | 68                      | 59                          | 0.6                      |
| Textiles                                 | 775297         | 800743         | 786750         | 927673          | 1051036         | 875887          | 994261          | 28                      | 85                          | 4.2                      |
| Food and beverages                       | 1116576        | 1060120        | 1057070        | 1179811         | 1034514         | 1131154         | 1344773         | 20                      | 61                          | 4.4                      |
| Tobacco and tobacco manufactures         | 43890          | 43990          | 28593          | 45591           | 31482           | 31825           | 32406           | -26                     | 9                           | -0.2                     |
| <b>TOTAL</b>                             | <b>8393290</b> | <b>9002509</b> | <b>9251637</b> | <b>11659156</b> | <b>11325759</b> | <b>11096248</b> | <b>13626277</b> | <b>62</b>               | <b>35</b>                   | <b>100.0</b>             |

Source: Authors' calculation based on PC-TAS data.

by falling (relative) quality. This evolution is different from that of Thailand, whose industry seems to be maintaining fairly stable quality standards. In fact the quality indexes may well indicate that the country is returning on the increasing export quality curve, which it had left at the time of the crisis.

In order to look into the determinants of these trends, we perform, wherever possible, the UVR aggregations of the 20 macro sectors according to both methods in equation (2) and equation (3).<sup>21</sup> There are a few things to be learned from these aggregations (see Figure 5). First as expected,

<sup>21</sup> We show the UVR aggregations for 16 out of the 20 sectors. We exclude the petroleum sector because of the high price variability not linked to quality. The other sectors are not included because of their tiny size, which tends to determine inconsistent results over time.

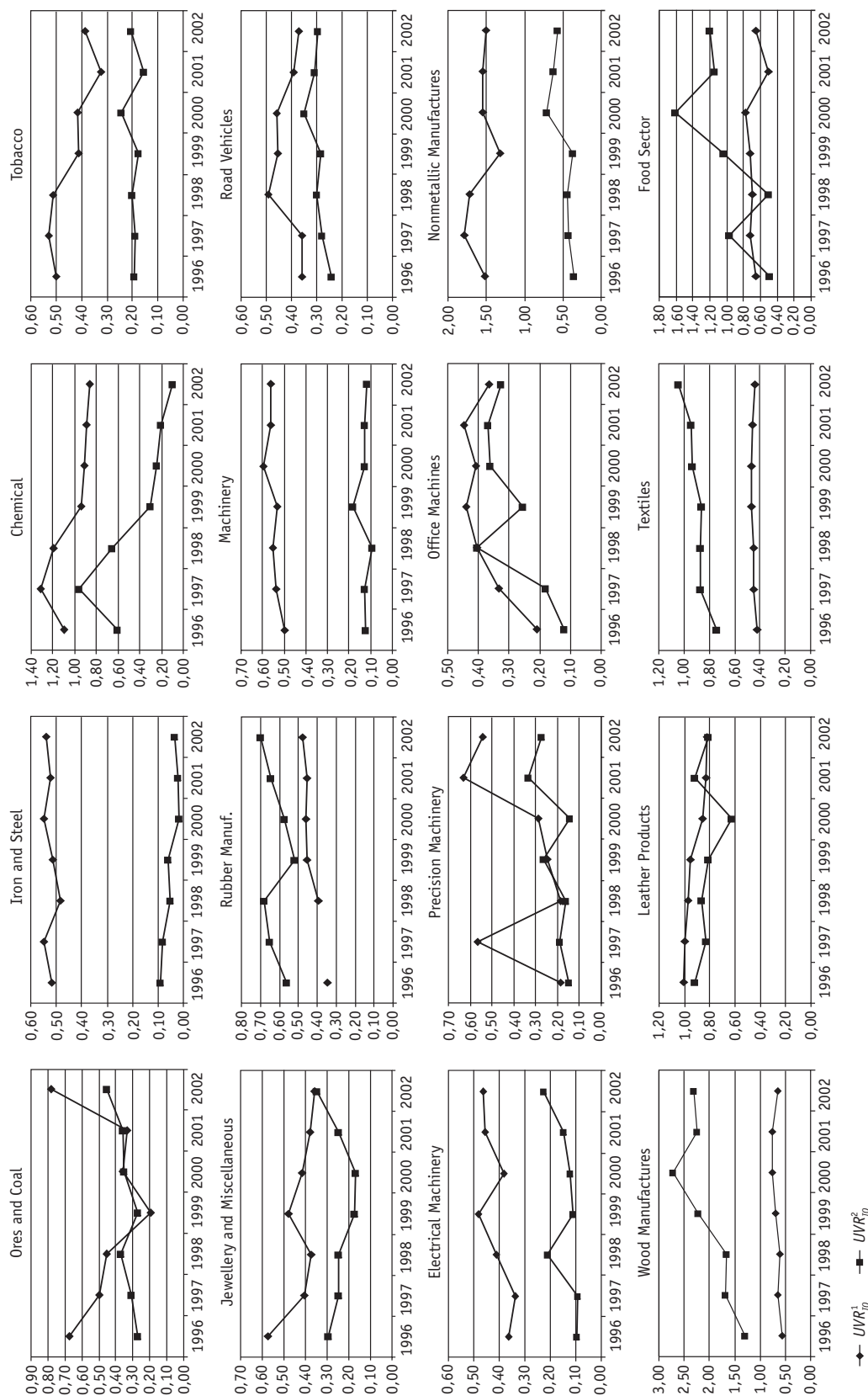
**TABLE 3**  
**INDIA'S EXPORT VALUES**

| COMMODITY                                | 1996            | 1997            | 1998            | 1999            | 2000            | 2001            | 2002            | CHANGE,<br>02-96<br>(%) | CHANGE,<br>3-YR<br>AVE. (%) | CONTRIB,<br>02-96<br>(%) |
|--|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-------------------------|-----------------------------|--------------------------|
| Ores, coal, nonferrous metals            | 523781          | 504917          | 399292          | 351511          | 349494          | 301962          | 526828          | 1                       | 15                          | 0.0                      |
| Iron and steel, metal manufactures       | 1605881         | 1985225         | 1833623         | 2384886         | 2688419         | 2177788         | 2795756         | 74                      | 113                         | 14.0                     |
| Chemical industry                        | 2947736         | 3331886         | 2872732         | 3149685         | 3510439         | 3593910         | 4476821         | 52                      | 84                          | 17.9                     |
| Cork and wood                            | 920             | 370             | 678             | 908             | 3194            | 2725            | 3625            | 294                     | 640                         | 0.0                      |
| Paper-pulp/board                         | 49557           | 35323           | 37914           | 40210           | 64808           | 66887           | 116569          | 135                     | 192                         | 0.8                      |
| Rubber manufactures                      | 143938          | 157921          | 168253          | 172688          | 212118          | 205748          | 270920          | 88                      | 128                         | 1.5                      |
| Machinery industries                     | 636912          | 803901          | 780525          | 785023          | 1067226         | 983017          | 1189723         | 87                      | 125                         | 6.5                      |
| Road vehicles                            | 625537          | 511266          | 501649          | 535731          | 672551          | 488746          | 653348          | 4                       | 60                          | 0.3                      |
| Electrical machinery, telecommunications | 621882          | 538401          | 531391          | 650681          | 904655          | 1062544         | 1320065         | 112                     | 94                          | 8.2                      |
| Precision machinery, optical instruments | 150071          | 139715          | 139978          | 147386          | 145262          | 147236          | 148480          | -1                      | 3                           | 0.0                      |
| Office machines                          | 177155          | 179312          | 56631           | 54732           | 97662           | 133449          | 173874          | -2                      | 14                          | 0.0                      |
| Miscellaneous manufactured articles      | 1392634         | 1449540         | 1853394         | 1853363         | 2166062         | 2403465         | 2965569         | 113                     | 60                          | 18.5                     |
| Sanitary, heating and lighting fixtures  | 7417            | 5788            | 6524            | 8563            | 19813           | 15398           | 13799           | 86                      | 148                         | 0.1                      |
| Nonmetallic mineral manufactures         | 5763414         | 6159512         | 6898118         | 8582368         | 6449261         | 5909739         | 7113199         | 23                      | 63                          | 15.8                     |
| Wood manufactures and furniture          | 42170           | 42721           | 43803           | 65889           | 94469           | 110483          | 146446          | 247                     | 173                         | 1.2                      |
| Leather, leather manufactures, footwear  | 1284655         | 1181102         | 1272030         | 1268112         | 1470651         | 1530640         | 1518888         | 18                      | 21                          | 2.7                      |
| Textiles                                 | 11454246        | 11598865        | 11183550        | 11967020        | 13053783        | 11450230        | 12871549        | 12                      | 62                          | 16.6                     |
| Food and beverages                       | 4495523         | 4644067         | 4275151         | 4686160         | 4387326         | 3749738         | 4181621         | -7                      | 35                          | -3.7                     |
| Tobacco and tobacco manufactures         | 113374          | 124385          | 79861           | 111696          | 79479           | 63005           | 73185           | -35                     | -9                          | -0.5                     |
| <b>TOTAL</b>                             | <b>32036803</b> | <b>33394217</b> | <b>32935097</b> | <b>36816612</b> | <b>37436672</b> | <b>34396710</b> | <b>40560265</b> | <b>27</b>               | <b>14</b>                   | <b>100.0</b>             |

Source: Authors' calculation based on PC-TAS data.

in the Indian case  $UVR_{IO}^1 > UVR_{IO}^2$  for most of the sectors. This indicates that OECD countries tend to specialize in product categories with higher UVs than those of India within the same industries. OECD specializes in technology-intensive sectors. The UVR difference tends to be even more pronounced for the more capital-intensive sectors, such as for machinery-related industries, chemical industries, and iron- and steel-based sectors. Second, as Figure 5 shows, India specializes in sectors that are natural-resource-intensive (rubber, food items) and where goods are produced with standard technology (so-called Heckscher-Ohlin, or HO goods). Third, the Indian sector UVRs trends appear to be generally flat or decreasing over time (1995–2002), with three exceptions that are worth highlighting, as these are sectors in which OECD normally specializes. The main one is the road vehicle sector, whose UVR almost trebles between 1995 and 2002. Even if some of the increase

FIGURE 5  
INDIAN UVRS CALCULATED WITH THE TWO METHODS, 1996-2002

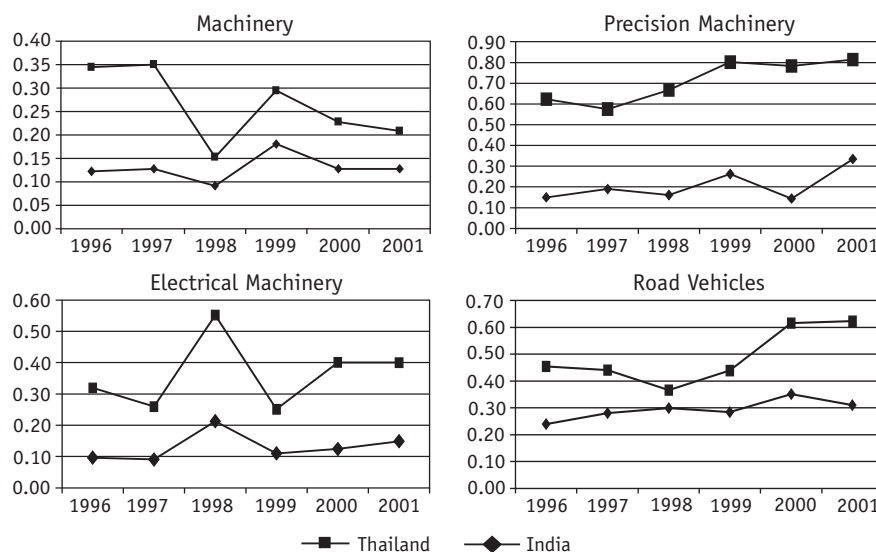


Source: Authors' calculation based on PC-TIAS data.

may be due to a statistical artifact (the 1995 break), the upward trend is still noticeable in a sector, in which India has lagged behind international standards. A substantial networking with foreign direct investment is behind this development. In fact this result is in line with other empirical evidence that shows how the removal of product market barriers at the beginning of the 1990s has led to a dramatic growth in the Indian automotive industry (Palmade 2005). This trend in quality upgrading seems to be continuing also in 2003 and 2004, a period that registered a growth rate of exports of over 50% (EIU 2005).<sup>22</sup> The other exceptions to the downward trend appear to be the office machine (computer) sector, which may have benefited from the positive spillovers from the software industry; and in a lesser way, the electrical machinery sector.

In order to put these results in perspective, we relate them to the analogous UVR sector aggregation for Thailand.<sup>23</sup> Thailand UVRs lie almost systematically above India ones. The gap is notably wider for the more technology-intensive sectors, denoting a quality gap of Indian to Thai exports (Figure 6). This is likely to mirror the slow catching up of India to Thailand in high-technology goods (such as machinery-related industries). Maybe surprisingly, this seems to hold even for the vehicle sector, which may be affected by the different policies pursued by the two countries: the Thai government started to promote export orientation for the automotive industry in 1993, trying to turn the country into the regional center of automotive production and sales in ASEAN for multinational corporations (Fujita 1999). The growth of the domestic market (in terms of demographics and purchasing power) has been a powerful driving force for FDI in the Indian

FIGURE 6  
UVRs: INDIA VS. THAILAND—MAIN TECHNOLOGY-INTENSIVE SECTORS



Source: Authors' calculation based on PC-TAS data.

<sup>22</sup> It may appear surprising that the road vehicle industry is not contributing much to the export growth (Table 1 and 2). This is due to the relatively small size of exports for an industry, which is still mainly concentrated on the domestic market (more so in the period which our analysis refers to).

<sup>23</sup> Data availability restricts this comparison to the 1996–2001 period only.

automotive industry (see Chaturvedi 2002). The sector dynamics of the two countries are similar over the period considered. Exchange rate movements may explain a good part of Thai UVRs' dynamics. Thai UVRs grow generally faster than Indian ones in the late 1990s to the early 2000s. So, despite the Asian (Thai) currency crisis, India's export quality still seems to be far from catching up to that of its Southeast Asian neighbor.

## B. Indian Manufacturing Data

What has been driving the Indian (and to certain extent South Asian) quantity export growth? The quantity growth with falling UVRs may reflect relative cost reduction from process efficiency gains (Kaplinsky and Readman 2005). In order to explore these hypotheses and gain more insight into the features of countries' structural change, we combine the findings from trade data with the analysis of the manufacturing domestic production structures. In this way, it will also be quite straightforward to compute also the RC index following equations (7) and (8).

The upper part of Table 4 shows the wage ratios (to OECD) dynamics. A slightly downward trend is clear for all countries, except for Thailand, where this trend is quite steep (possible indication of a flexible labor market that seems to adjust fairly quickly to the crisis) and for India, which experiences a moderate increase.

The output per worker ratio relative to OECD countries shows a marked increase for India throughout the period. On the contrary, Pakistan experiences a steep decline, while Bangladesh and Nepal display quite steady trends. Indonesia and Thailand are clearly affected by the crisis, which explains the 1997 trough (partially recovered afterwards).<sup>24</sup>

The combination of the two indexes gives the most commonly used measure of labor productivity: unit labor cost (relative to OECD). As shown in the bottom part of Table 4, this index is constantly falling for India, increasing for Pakistan, and stable for Bangladesh and Nepal (although spotty in this case). The crisis has determined a significant decrease in the value of Thailand, while it has almost left unaffected Indonesia (except for a peak in 1997). The decreasing index for India and Thailand is determined by two different factors: in the former case it is pushed by a steep increase in the output per worker ratio (over that of wage ratio), indicating a clear sign of process efficiency gains. In the case of Thailand it is determined by the big wage cut in the post-crisis period.

As it is apparent from equation (7) and equation (8) that unit labor costs represent labor shares in output. It may appear surprising that these shares for Asian countries (where the share of labor should be supposedly higher) range only between 5% and 25% of those of the OECD. A first explanation of this apparent paradox may be related to the lack of adequate information on labor compensation from the national accounts of low-income countries. Labor compensation measures need to include employers' cost such as social security contributions, etc., which are often not well registered in those countries (van Ark et al. 2005); and in addition, data on enterprises are not fully accounted for. While output data generally include data from unincorporated enterprises (i.e., most of small businesses), the wage bill is not likely to reflect what is known as "income of unincorporated enterprises." This is usually part of profits in the statistics, although in developing

<sup>24</sup> The high level of output per worker for India may reflect the widespread use of informal, unreported labor in this labor-abundant economy.



**TABLE 4**  
**MANUFACTURING COMPETITIVENESS IN SOUTH AND SOUTHEAST ASIA (RELATIVE TO OECD)**

|   | 1991 | 1992 | 1993 | 1994 | 1995 | 1996 | 1997 | 1998 | 1999 | 2000 | 2001 | 2002 |
|---|------|------|------|------|------|------|------|------|------|------|------|------|
| <b>Wage Ratio (relative to OECD)</b>              |      |      |      |      |      |      |      |      |      |      |      |      |
| Bangladesh  | 0,03 | 0,02 | 0,02 | 0,02 | 0,02 | 0,03 | 0,02 | 0,02 | 0,03 | 0,02 | 0,02 | 0,02 |
| India   | 0,04 | 0,04 | 0,04 | 0,04 | 0,04 | 0,04 | 0,04 | 0,04 | 0,05 | 0,05 | 0,05 | 0,05 |
| Indonesia   | 0,03 | 0,04 | 0,04 | 0,04 | 0,06 | 0,06 | 0,04 | 0,03 | 0,04 | 0,03 | 0,04 | 0,04 |
| Nepal   | 0,03 | 0,03 | 0,02 | 0,03 | 0,04 | 0,03 | 0,03 | 0,04 | 0,02 | 0,02 | 0,02 | 0,02 |
| Pakistan  | 0,02 | 0,02 | 0,01 | 0,02 | 0,02 | 0,01 | 0,02 | 0,02 | 0,02 | 0,02 | 0,02 | 0,02 |
| Thailand  | 0,13 | 0,12 | 0,12 | 0,14 | 0,14 | 0,15 | 0,09 | 0,10 | 0,08 | 0,10 | 0,09 | 0,10 |
| <b>Output per Worker Ratio (relative to OECD)</b> |      |      |      |      |      |      |      |      |      |      |      |      |
| Bangladesh  | 0,10 | 0,10 | 0,11 | 0,11 | 0,09 | 0,08 | 0,08 | 0,07 | 0,07 | 0,06 |      |      |
| India   | 0,42 | 0,46 | 0,45 | 0,49 | 0,47 | 0,53 | 0,51 | 0,49 | 0,57 | 0,57 | 0,60 | 0,65 |
| Indonesia   | 0,73 | 0,46 | 0,53 | 0,50 | 0,51 | 0,60 | 0,20 | 0,30 | 0,37 | 0,34 | 0,37 | 0,44 |
| Nepal   | 0,04 | 0,05 | 0,04 | 0,04 | 0,05 | 0,05 | 0,05 | 0,05 | 0,05 | 0,06 |      | 0,05 |
| Pakistan  | 0,40 | 0,40 | 0,18 | 0,19 | 0,15 | 0,12 | 0,10 | 0,10 | 0,09 | 0,07 |      |      |
| Thailand  | 0,53 | 0,53 | 0,47 | 0,48 | 0,46 | 0,51 | 0,29 | 0,43 | 0,42 | 0,36 | 0,38 | 0,39 |
| <b>Unit Labor Cost Ratio (relative to OECD)</b>   |      |      |      |      |      |      |      |      |      |      |      |      |
| Bangladesh  | 0,18 | 0,16 | 0,16 | 0,13 | 0,17 | 0,19 | 0,15 | 0,18 |      | 0,17 |      |      |
| India   | 0,06 | 0,06 | 0,06 | 0,06 | 0,06 | 0,05 | 0,05 | 0,05 | 0,05 | 0,05 | 0,05 | 0,04 |
| Indonesia   | 0,03 | 0,05 | 0,05 | 0,05 | 0,07 | 0,06 | 0,12 | 0,06 | 0,06 | 0,05 | 0,06 | 0,06 |
| Nepal   | 0,29 |      | 0,25 | 0,24 |      | 0,18 | 0,19 | 0,21 | 0,20 | 0,22 |      | 0,18 |
| Pakistan  |      |      | 0,10 | 0,11 | 0,17 | 0,17 | 0,22 | 0,22 | 0,16 | 0,20 |      |      |
| Thailand  | 0,17 | 0,16 | 0,18 | 0,19 | 0,20 | 0,18 | 0,20 | 0,14 | 0,11 | 0,16 | 0,15 | 0,15 |

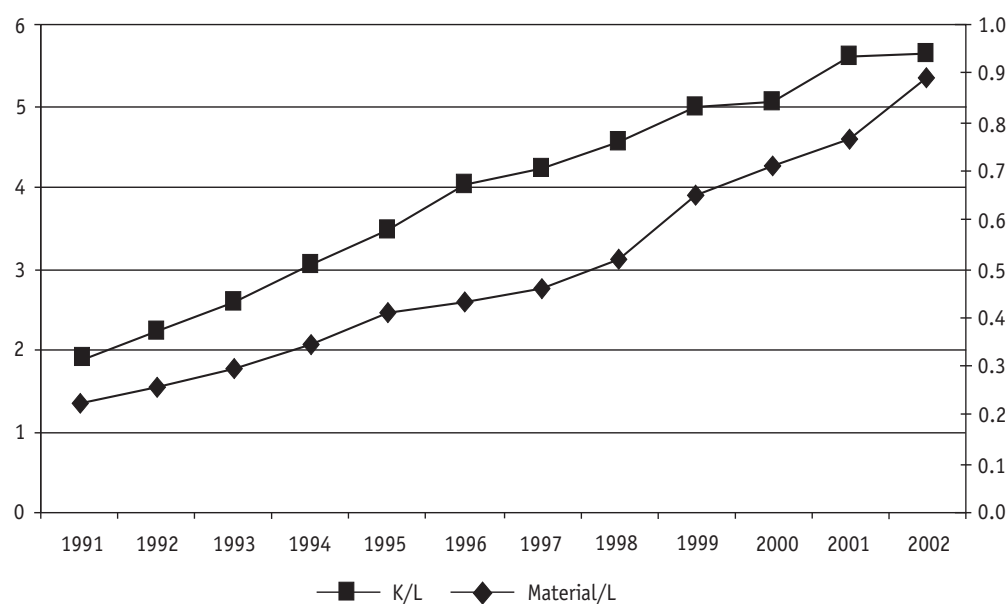
Sources: See Appendix.

countries most of it is wages.<sup>25</sup> Another explanation concerns the possible underreporting of the labor used by firms as a way of overcoming heavy labor regulations. This would seem to be in line with some stylized facts from India, analyzed below. Anyhow, despite the “unrealistic” absolute levels of unit labor cost, the consistency used in constructing the time series for these data allows us to concentrate the analysis on the relative dynamics rather than on the absolute levels.

These data point to a quantity growth determined by process efficiency gains in the Indian manufacturing industry, which has made its products relatively more competitive at an international level. It is interesting to see how this process efficiency gain has come about. There is a clear, steep, upward trend in the capital–labor and materials–labor ratio over the period, which has driven up labor productivity (Figure 7). The relative capital accumulation is particularly striking in a labor-abundant country. Understanding the determinants of such trend is outside the scope of the paper, but a few hypotheses can be sketched here. In line with the findings of Kumar (2004), this may be the result of capital-using technical bias experienced by the Indian manufacturing sectors over the 1990s.

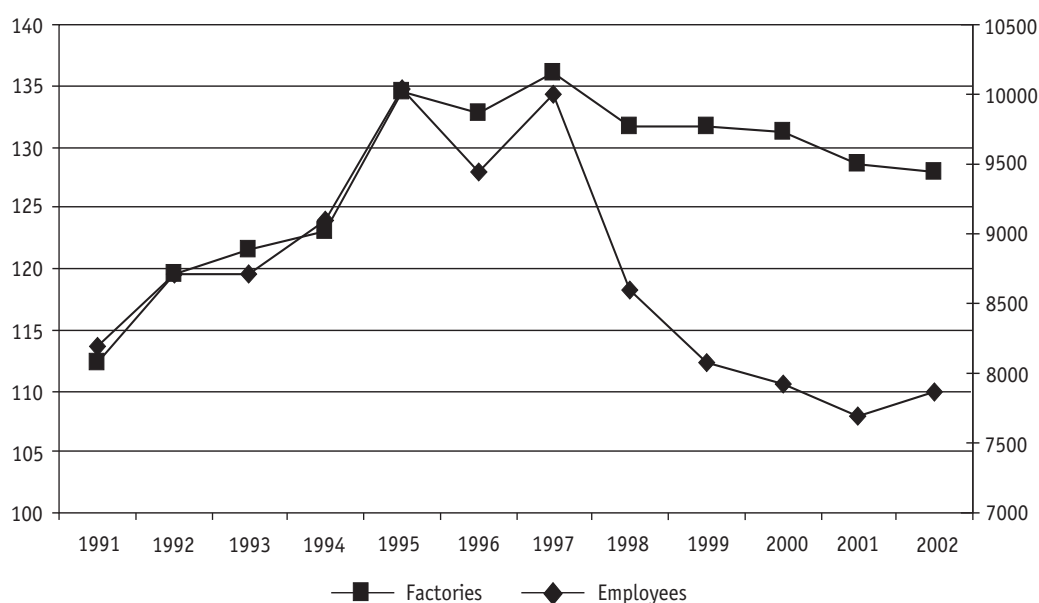
<sup>25</sup> Such bias may be particularly striking in Asian countries, where the share of unincorporated enterprises in output tends to be very relevant.

**FIGURE 7**  
**FACTOR INTENSITIES IN INDIAN MANUFACTURING INDUSTRY**



Source: *Annual Survey of Industries* (Government of India, various years).

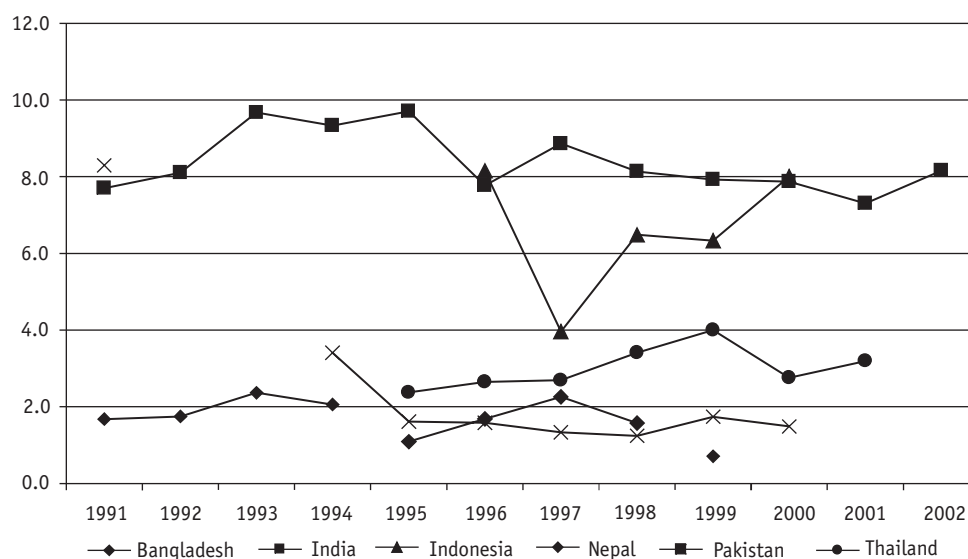
**FIGURE 8**  
**EMPLOYEES AND FACTORIES IN INDIAN MANUFACTURING INDUSTRY**



Source: *Annual Survey of Industries* (Government of India, various years).

Looking at the labor market picture may extend the range of hypotheses on this “surprising” relative factor evolution and may provide some possible explanation to the surprisingly high level of Indian output per worker ratio. As Figure 8 shows, after a steep increase the number of employees and factories declines rapidly after 1997 (more so with employees than factories). This pattern seems somewhat out of line with an expanding industry and may signal severe distortions related to the labor market (such as increasing share of informal labor employed because of labor market regulation distortions). Regulatory distortions in India have received some empirical support in recent years (see Besley and Burgess 2004 on labor market regulations and Goswami and Dollar 2002 on administrative burdens).

**FIGURE 9**  
**REAL COMPETITIVENESS INDEX (RELATIVE TO OECD)**



Source: Authors' calculations.

Finally, we compute the real competitiveness index to get some indication of how the production structures are evolving relative to some world benchmark (Figure 9). India's RC is increasing in the first half of the decade, thereafter remaining stable (the fall in 1996 is due to the statistical break). The increase in RC is in line with the rise of UVR in the early 1990s, which has then turned into a stagnating trend for India after 1995, when a process of labor expulsion (or relatively more informal labor) has dominated. Bangladesh experiences a slight increase in RC, which allows the country gaining share in world exports, while Pakistan sees a constant decline, in line with its falling share over the period. Indonesia's value after falling during the crisis goes back to the 1995 value, unlike Thailand, whose RC constantly increases over time (with a trough in 2000), thanks to big cuts in labor cost, combined with an upward trend in relative export quality. Data for Nepal is too spotty to be interpreted.

The RC analysis indicates that South Asian economies (except Pakistan) are just in line with OECD countries in the evolution of their manufacturing competitiveness, although for different

reasons, as highlighted above. Thailand seems to be the only country that shows competitive dynamics above those of the OECD and may thus serve as an important future benchmark for South Asian countries' manufacturing industry.

We have highlighted above some reasons for which the XCI may underestimate the manufacturing export performance of the countries in our panel. In order to explore to what extent the indicators we constructed are actually in line with the relative performance of the export sector, we use regression analysis. In particular, we concentrate on the relation between the countries' shares of world manufacturing export and the dynamics of both the manufacturing export and the manufacturing domestic sector's competitiveness. Although growth is influenced by manufacturing sector competitiveness, we avoid using measures of growth as the dependent variable. This is because one cannot regard our indices as direct indicators of growth, as the range of determinants feeding into growth tends to be much wider.<sup>26</sup> The regressions we run aim to measure statistical correlations between variables rather than the causal effect of right hand-side (RHS) variables on the left hand-side (LHS) variables. Since we use XCI, UVRs, and RC as independent variables, there would not be any clear theoretical meaning in interpreting the coefficients as determining the value of the dependent variable. Moreover, even if we consider that some variables may causally determine the right-hand side ones (as the wage ratio for instance may do), there would still be a problem of endogeneity that might spoil the result.

First, we consider the ratio of the share in world manufacturing export between the Asian and OECD countries as the LHS variable. For the way we have constructed the XCI and RC indexes, this share would be the outcome most closely related to the indexes. As apparent from column 1 in Table 5, the XCI seems to be a very good indicator (although not perfect, as expected) of relative manufacturing export share. Taking into account year effects, the XCI explains over three quarters of the variability in the relative export share across countries.<sup>27</sup> The same does not apply to the RC index, which although being positively correlated with the relative share, accounts only for one third of it (column 2). The reasons for it appear clearer once we regress the dependent variable on the different components of the RC index (column 3). The only variable to have the expected (positive) sign and significance is the output per worker ratio. The UVR, although positive, is not significant (according to the standard levels of significance), and the wage ratio is positive and significant, contrary to the orthodox theoretical expectations. In other words, higher relative salaries are associated with higher competitiveness in the manufacturing sector at the world level. New theory presented in Brunner (2005) explains why this would be the case. This in turn (negatively) affects the RC's explanatory power of the dependent variable. Explaining why the wage ratio bears this relation with the manufacturing export share is out of the scope of our paper, but, as previously noted, it may hint to a somewhat heterodox interpretation of the unit labor cost (see Felipe 2005, Brunner 2005).<sup>28</sup> The fact that UVR is not significant is also bearing some (albeit less relevant)

<sup>26</sup> Anyhow, we have regressed growth rates on our indices, obtaining, as expected, some milder correlations than those in the paper. Results are available from the authors upon request.

<sup>27</sup> The fact that the value of the coefficient is very different from 1 depends on the way in which we have defined the OECD exports, taking into account only the OECD exports to the US, Sweden, and Switzerland (see footnote 17). This determines the XCI to be of a much bigger level than the actual country's share of world export. This is reflected in the small coefficient in the regression.

<sup>28</sup> We also tested for causality, regressing the dependent variable on output per worker and wage ratio variables lagged one and two periods. The results, despite not solving the endogeneity problem, are in line with those presented in the paper (available from the authors upon request).

**TABLE 5**  
**COMPETITIVENESS INDEXES AND SHARES IN WORLD MANUFACTURING EXPORTS**

|                            | SHARE IN WORLD MANUFACTURING EXPORTS<br>RELATIVE TO OECD |                      |                      |                      | SHARE IN WORLD<br>MANUFACTURING EXPORT |                      |                      |
|----------------------------|--|----------------------|----------------------|----------------------|--|----------------------|----------------------|
|                            | (1)  | (2)                  | (3)                  | (4)                  | (5)                                    | (6)                  | (7)                  |
| XCI                        | .0951**<br>(.0094)                                       |                      |                      | .03949**<br>(.00642) | .06917**<br>(.00671)                   |                      | .02778**<br>(.00447) |
| Wage ratio                 |  |                      |                      | .06088**<br>(.00984) | .04438**<br>(.00707)                   | .04470**<br>(.00674) | .03265**<br>(.00496) |
| Output per worker<br>ratio |  |                      | .01222**<br>(.00148) | .00839**<br>(.00152) |  | .00895**<br>(.00103) | .00611**<br>(.00104) |
| Export UVR                 |  |                      | .00291<br>(.00196)   | .00444**<br>(.00132) |  | .00204<br>(.00136)   | .00321**<br>(.00093) |
| RC                         |  | .00069**<br>(.00019) |                      |                      |  |                      |                      |
| Constant                   | .00016<br>(.0013)  | .00092<br>(.00242)   | -.00490<br>(.00200)  | -.00676<br>(.00115)  | .00032<br>(.00102)                     | .00324<br>(.00139)   | -.00452<br>(.00089)  |
| Year Effects               | YES  | YES                  | YES                  | YES                  | YES                                    | YES                  | YES                  |
| Observations               | 47   | 45                   | 45                   | 40                   | 47                                     | 45                   | 40                   |
| R-sq.                      | 0.76   | 0.32                 | 0.93                 | 0.97                 | 0.75                                   | 0.94                 | 0.97                 |

Note: \*Significant at the 5% level; \*\*significant at the 1% level. All regressions performed through OLS. Robust (using the Huber-White correction method) standard errors are in parenthesis. Regressions with XCI do not include Nepal, for which not enough data is available for the construction of the index. See appendix for the data sources.

consequences on the explanatory power of the RC index and may point to the controversial relation between growth in export prices and shares. Once we account for weighted quantity and quality export dynamics through the inclusion of the XCI, the UVR becomes significant (column 4) and the model explains almost entirely the relative share in world manufacturing exports across countries over time.

Second, we also run the same regressions using the absolute shares in world manufacturing export as the LHS variable. Since the OECD exports account for most of world export, the results of these regressions are similar to those of the above analysis, although with lower values of the coefficients, as expected.

## V. CONCLUSIONS

This paper reviewed and summarized the unit value comparison method as a way to compare export quality across economies and over time. The unit value comparison method was used to decompose a country's export into the product of an intensive and extensive export margin, as proposed by Hummels and Klenow. An upward trend in the intensive margin stands for an improvement in a country's export competitiveness against a benchmark, such as a group of OECD or Southeast Asian countries. The work analyzed the evolution of the indicators of export competitiveness and export quality of South Asian manufacturing relative to a group of OECD countries from 1991 to the late 1990s and early 2000s (as for India). We have carried out the analysis in a comparative fashion, benchmarking South Asia on Indonesia and Thailand, which may represent countries at a marginally higher level of economic development (and industry sophistication).

South Asian countries (except Pakistan) have shown a dynamic export pattern over the period relatively to Indonesia (which has been highly affected by the 1997 crisis) and a similar pattern to that of Thailand, which has been more flexible in recovering from the crisis. This performance is subject to a note of caution in that it has been determined by quantity- rather than quality-oriented growth (even though some quality improvement occurred in India in the postreform period just after 1991). Since 1991, Pakistan is the exception with falling share, rising relative quality, and declining relative quantity, but this may be due to the exit of low-quality exporting firms, rather than to a boost of quality production (hypothesis supported by the falling share in world exports).

India's quantity growth is driven by specialization in natural resource- and standard technology-intensive sectors (unlike Bangladesh, where the labor-intensive garment sector is the main quantity driver). Its catching-up process still has far to go in the more technology-intensive sectors, which keep suffering from a quality gap relative to Thailand (possibly due also to the different nature of foreign direct investment). India has however followed OECD technology gains in three exceptional sectors namely, automotive industry, office machines (computers), and electrical machinery, although the absolute technology gap with OECD remains. The export quantity growth in India reflects process efficiency gains, unlike Bangladesh which is dominated by a falling wage ratio; and unlike Thailand, which adjusts to the crisis through wage cuts (but is able to achieve an increase in relative quality). Indian process efficiency gain has come about through capital accumulation and labor expulsion (or relatively more labor informality). A number of hypotheses on the determinants of this factor intensities evolution shall be investigated. An analysis of labor market- and administrative burden-related distortions (out of the scope of this paper) may be needed to shed some light on such determinants.

Following the above analysis some relevant policy questions remain open to discussion. First, is quantity export growth a sustainable option for South Asian countries, given the constraints imposed by the fallacy of composition that such growth may imply in the long run (in terms of declining terms of trade, rising protective resistance from developed economies)?<sup>29</sup> Second, is the labor intensity decline of Indian manufacturing production sustainable in an economy with a large amount of idle labor? Third, will the South Asian region be able to catch up the Southeast Asian

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<sup>29</sup> See Mayer (2003) and the literature therein for a debate on the fallacy of composition argument.

neighbors in terms of technological specialization? Fourth, what is the effect of the PRC's export growth on trade specialization of the region? And to what extent does regulatory burden drive factor intensities and manufacturing specialization in India? Answers to these questions will have significant implications for the welfare prospects of the economies in South Asia and possibly beyond.

## METHODOLOGICAL APPENDIX

### Weighting Scheme

We employ a weighting scheme for UVR computations (both at the economywide and macro sector level), which shall allow us to smooth out data variability over time due often to statistical gaps for single varieties across time. This problem tends to be more important for Asian countries than for OECD countries.

We define  $s$  as the product category belonging to the macro sector  $S$  and  $V_{I,t}^s$  as the value in dollars for that variety (available in the trade data set) of Indian exports (to OECD) in product category  $s$  for year  $t$ . We can then describe the weighting scheme  $z_I^s (\forall s \in X_I)$  as follows:

$$z_I^s = \frac{\sum_{t=1991}^{2002} V_{I,t}^s}{\sum_{t=1991}^{2002} V_{I,t}^s}, \forall s \in S \quad (A1)$$

with the computation of UVs for India in the year  $t$  easily obtained:

$$uv_{I,t}^s = \sum_{s \in S} [uv_{I,t}^s z_I^s] \quad (A2)$$

where:

$$uv_{I,t}^s = V_{I,t}^s / Q_{I,t}^s \quad (A3)$$

### Sector Classification

We construct 20 original macro sectors aggregating various 2-digit sectors (according to the SITC-rev. 3 classification) into Brunner's (2001) OECD categorization of R&D intensive (high-tech) goods, Heckscher-Ohlin (HO) goods produced with standard technology and constant returns to scale, goods with heavy natural resource input, entrepreneurial goods produced in entry sensitive sectors, and goods in sectors where foreign direct investment is predominant. Continuing use of the sector categorization throughout the period 1991–2002 ensures consistency of the trade database.

| SECTOR   | 2-DIGIT CODES |
|--|---------------|
| Ores, coal, nonferrous metals (natural-resource-intensive)                       | 28, 32, 68    |
| Petroleum, petroleum products and related materials (FDI and natural resource)   | 33            |
| Iron and steel, metal manufacturing, ship building (FDI-oriented)                | 67, 69, 79    |
| Chemical industry (high-tech, FDI-oriented)                                      | 51to 59       |
| Cork and wood (natural-resource-intensive)                                       | 24            |
| Paper-pulp/board and articles thereof (entrepreneurs, and natural resource base) | 25, 64        |
| Rubber manufactures (FDI-oriented)   | 62            |
| Machinery industries (high-tech)   | 71 to 74      |
| Road vehicles (FDI-oriented)   | 78            |
| Electrical machinery, telecommunications manufactures (high-tech)                | 76,77         |
| Precision machinery, optical instruments, watches (high-tech)                    | 87, 88        |
| Office machines and automatic data processing equipment (high-tech)              | 75            |
| Miscellaneous manufactured articles, n.e.s.(entrepreneurs)                       | 89            |
| Sanitary, plumbing, heating and lighting fixtures (entrepreneurs)                | 81            |
| Nonmetallic mineral manufactures, n.e.s. (entrepreneurs and HO goods)            | 66            |
| Wood manufactures and furniture and parts thereof (HO goods)                     | 63, 82        |
| Leather, leather manufactures, footwear (HO goods)                               | 61, 85        |
| Textiles (HO goods)  | 65, 84        |
| Food and beverages (natural-resource-based)                                      | 00 to 11      |
| Tobacco and tobacco (FDI-oriented)   | 12            |

Note: FDI means foreign direct investment.

## Sources of Manufacturing Data

The data series on manufacturing production (output, number of employees, wages) have been constructed using different sources:

- (i) for OECD countries: *National Accounts of OECD Countries* (OECD 2005)
- (ii) for India: *Annual Survey of Industry* as the main source for output (Government of India, various years); and number of employees and the *Yearbook of Labor Statistics* (International Labour Organisation, various years) for wages
- (iii) for other countries: *International Yearbook of Industrial Statistics* (UNIDO, various years) as the main source for employees' and output data; *Yearbook of Labor Statistics* (International Labour Organisation, various years) for wages
- (iv) *Key Indicators* (ADB 2004 and 2005) for some data filling processes
- (v) *International Financial Statistics Yearbook* (IMF 2004) for exchange rates and inflation-adjusted price indexes

We try to use a single source for any type of data. Whenever a data series from one source is not complete (which is often the case for South Asian countries), we fill the gap by using data from another source and rescaling this data to the level of the main source (all the details of this procedure are available upon request).



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