Working Paper No. 624

A Reassessment of the Use of Unit Labor Costs as a Tool for Competitiveness and Policy Analyses in India*

by

Jesus Felipe
Utsav Kumar
Asian Development Bank, Manila, Philippines

September 2010

* This paper represents the views of the authors and not those of the Asian Development Bank, its executive directors, or the member countries they represent. Contacts: jfelipe@adb.org (corresponding author); ukumar.consultant@adb.org.

Levy Economics Institute
P.O. Box 5000
Annandale-on-Hudson, NY 12504-5000
http://www.levyinstitute.org

ABSTRACT

We reinterpret unit labor costs (ULC) as the product of the labor share in value added, times a price adjustment factor. This allows us to discuss the functional distribution of income. We use data from India's organized manufacturing sector and show that while India's ULC displays a clear upward trend since 1980 (with a decline since the early 2000s), this is exclusively the result of the increase in the price deflator used to calculate the ULC. The labor share of India's organized manufacturing sector has been on a downward trend, from 60 percent in 1980 to 26 percent in 2007. This means that the sector's capital share increased from 40 to 74 percent over the same period. We also find that real wages have increased minimally during the period analyzed—well below labor productivity—while the real profit rate and unit capital costs have increased substantially. We conclude that if India's organized manufacturing sector has lost any competitiveness, it is the result of the increase in unit capital costs. Our analysis questions policy recommendations that advocate wage moderation, which result from simply looking at the evolution of the ULC, and that blame the loss of competitiveness on high or increasing wages.

Keywords: Capital Productivity; Capital Share; Competitiveness; Functional Distribution of Income; India; Labor Productivity; Labor Share; Real Rate of Profit; Real Wage Rate; Unit Capital Cost; Unit Labor Cost

JEL Classifications: D31, D33, E25, J30, O47

1. INTRODUCTION

Unit labor costs (ULC) are a commonly used measure to analyze the *competitiveness* of a country or a sector. ULCs are defined as the cost of labor (labor compensation) per unit of output. Standard analyses, following the comparative cost theory, often lead to statements such as "the lower the ULC the more competitive an economy or sector is." The policy implication is that growing ULCs (in particular *vis-à-vis* those of the competitors) harm the economy.

The purpose of this paper is to put forward an alternative interpretation of ULCs and, as a consequence, to question standard policy implications. We show that ULC is always the product of the labor share in output times a price adjustment. Therefore, it embodies the functional distribution of income between labor and capital. This cannot be neglected in normative statements. Our analysis has important implications for policies that promote lower ULCs, as they effectively might be lowering the labor share and titling the distribution of income towards capital, which has economic consequences.

The rest of the paper is organized as follows. Section 2 discusses the concept of unit labor cost and how it is calculated. In section 3, we relate unit labor costs to the functional distribution of income. Section 4 shows how unit labor costs have evolved in India. We use data from India's organized manufacturing sector and show that while India's ULC displays a clear upward trend since 1980 (with a decline since the early 2000s), this is exclusively the result of the increase in the price deflator used to calculate the ULC. India's labor share has been on a downward trend since 1980, from 0.6 in 1980 to 0.26 in 2007. This means that capital's share in India's organized manufacturing sector has increased from 0.4 to almost 0.74 over the same period. We also find that real wages have increased minimally, much less than labor productivity, and that the profit rate and unit capital costs have increased substantially. Section 5 provides a discussion of the implications of a falling labor share for the Indian economy.

2. THE CALCULATION OF UNIT LABOR COSTS

ULC is defined as the cost of labor required to produce one unit of output.[1] It is used as a measure of competitiveness because labor compensation is often a major component of the cost structure and, therefore, influences prices. It is calculated as the ratio of average labor compensation in nominal terms to average labor productivity: [2]

$$ULC = w_n \,/\, LP = w_n \,/\, (VA_r \,/\, L) = \frac{w_n}{(VA_n \,/\, P) \,/\, L} \qquad (1)$$

where, ULC is the unit labor cost, w_n is the nominal wage rate (i.e., rupees per worker), LP is labor productivity, VA_r is real value added (in rupees of a base year), L is the number of workers, and P is the deflator for value added.[3,]

The argument is that, in low productivity countries (sectors), a high wage rate can make production costly and jeopardize long-run profitability. In high productivity countries (sectors), however, a high average wage rate can be offset by high productivity and, therefore, can be fully compatible with long-run profitability. In other words, the argument that competition from lower foreign wages can damage domestic industries is not fully correct. What matters is the wage rate (average labor compensation) relative to labor productivity, i.e., the unit labor cost.

A common use of ULC is the comparison of cost competitiveness across countries. A common argument is that a lower ULC makes a country more competitive. In other words, if a country's ULC increases faster than that of its foreign competitors,

[1] It should be noted that output should theoretically be measured in volume/physical units.
[2] Average labor productivity (or simply labor productivity) is measured as ratio of output measured in physical terms to the number of workers. Since at any level of aggregation there are no physical units, we have to use real (i.e., deflated) value added.
[3] Output is proxied by deflated (i.e., real) value added. The deflator used to obtain real value added could be a single deflator, or we could obtain real value added by adding real labor compensation and real operating surplus, where the two (labor compensation and operating surplus) are deflated with appropriate deflators. Real value added thus obtained could then be used to obtain the implicit price deflator. No matter which method we use, the equations shown here, as well as the empirical results shown later, continue to hold. As discussed later, we use the second method to calculate real value added.

this will reduce the competitiveness of the home country, thereby reducing market shares and negatively affecting economic growth.

A meaningful comparison, however, requires expressing the costs in common currency units (see for example, Hooper and Larin [1989], Maddison and van Ark [1994], and van Ark [1996]). Note that the ULC has two components, the nominal wage rate and labor productivity, both measured in domestic currency.

The most common approach when making comparisons of ULC levels across countries is to convert the wage rate into a *numeraire* currency, usually the U.S. dollar, using the exchange rate of the domestic currency with respect to the U.S. dollar. It is the conversion of the second component, namely, the nominal value added, that has attracted substantial attention in the literature on international comparisons of productivity (see van Ark [1993 and 1996] and Maddison and van Ark [1994]). This is because it refers to physical units of output.

For comparison purposes, therefore, output needs to be adjusted for differences in relative prices across countries. This, however, does not happen when converting into dollars using nominal exchange rates. This is because it is not unusual the price of a given good to differ across countries when converted into a common currency using nominal exchange rates. International comparisons of productivity are thus inhibited by lack of a conversion factor. Two alternative conversion factors have been suggested in the literature. First is to use unit value ratios (UVR). UVRs are calculated as the ratio of the unit values (measured in local currency) of a commodity in the two countries (the base country usually being the United States). These are, in turn, derived from value and quantity data from production statistics, which are matched across countries.[4] The second conversion factor used is the expenditure-based purchasing power parities (PPP). These are calculated as the ratio of local currency price of a basket of goods in the domestic country to the price of the same basket of goods in the base country, usually the United States.[5]

[4] This approach was pioneered by Paige and Bombach (1959).
[5] For a further discussion of the UVR approach and the PPP approach see van Ark (1996).

When comparing two countries, we divide the ULC of both, expressed in the same currency. We refer to it as relative ULC (*rULC*):

$$rULC_{iUS} = \frac{\left(\frac{w_n^i L^i}{VA_n^i / P^i}\right)\left(\frac{PPP^i}{ER^i}\right)}{\left(\frac{w_n^{US} L^{US}}{VA_n^{US} / P^{US}}\right)} = \frac{\left(\frac{w_n^i L^i}{VA_n^i}\right)}{\left(\frac{w_n^{US} L^{US}}{VA_n^{US}}\right)} * \left(\frac{P^i}{P^{US}} * \frac{PPP^i}{ER^i}\right) = \frac{\left(\frac{w_n^i L^i}{VA_n^i}\right)}{\left(\frac{w_n^{US} L^{US}}{VA_n^{US}}\right)} * xr^i \quad (2)$$

where, $rULC_{iUS}$ is the relative ULC of country *i* with respect to that of the United States. VA_n^i is the nominal value added of country *i*, w_n^i is the nominal wage rate of country *i*, L^i is the number of workers in country *i*, ER^i is the exchange rate of country *i* with respect to the U.S. dollar, and PPP^i is the purchasing power parity with respect to the United States (benchmarked for a particular year). VA_n^{US} is the nominal value added in the United States, P^{US} is the deflator for value added for the United States, w_n^{US} is the nominal wage rate in the United States, L^{US} is the number of workers in the United States, and $xr^i = \left(PPP^i / ER^i\right)$ is the ratio of PPP to the nominal exchange rate (ER). It measures the extent of undervaluation (if $xr<1$) or overvaluation (if $xr>1$) of the nominal exchange rate.

There are three possible ways for a country to lower its ULC and thereby improve its competitiveness. The three components of ULC—wage, productivity, and price term— contribute to lowering of ULC in their own way. The first option is to keep nominal wage rates or average labor compensation (w_n) and its growth rate as low as possible. Firms do this through their bargaining with labor, especially in developing countries where there is lack of organized labor through unionization, as well as the existence of surplus labor. Second is by increasing labor productivity (VA_r/L). Improvements in labor productivity can offset wage increases and thereby lower ULC,

making a country more competitive.[6] Third is through an undervalued exchange rate; in terms of equation (2), this means that $xr<1$, which is often the case in developing countries. Rodrik (2008) argues that just as overvaluation (of the real exchange rate) hurts growth, undervaluation facilitates it, and that this is particularly true of developing countries: periods of high growth in developing countries are associated with undervalued currencies.[7]

3. UNIT LABOR COSTS AND INCOME DISTRIBUTION

To understand the connection between income distribution and unit labor costs, consider the national income accounting identity according to which nominal value added (VA_n) equals the total nominal wage bill/labor compensation (W_n) plus total profits (Π_n).[8] This can be written as:

$$VA_n \equiv W_n + \prod_n \equiv w_n L + r_n K \tag{3}$$

W_n can be expressed as the product of the average nominal wage rate (w_n) and number of workers (L); total profits can be expressed as the product of the ex-post nominal profit rate (r_n) times the capital stock (K). Dividing both sides of equation (3) by VA_n, we obtain the following:

$$1 \equiv \left(\frac{w_n L}{VA_n} \right) + \left(\frac{r_n K}{VA_n} \right) \equiv s_l + s_k \tag{4}$$

[6] Increase in labor productivity can come from increase in physical or human capital, institutional factors (such as change in work rules), or by increasing unpaid labor time, as might be case in developing countries due to lax implementation of labor laws.

[7] Eichengreen (2008) warns that keeping the real exchange rate low for too long is not a desirable long-run strategy, and that policymakers should consider a shift in strategy, from keeping a weak currency to letting it appreciate, while there is rapid growth.

[8] This holds at any level of aggregation—national, sector, industry, or firm. It does not involve any assumption about the production structure or the nature of markets.

where, $s_l \equiv \left(w_n L / VA_n \right)$ is the share of labor in total output and $s_k \equiv \left(r_n K / VA_n \right)$ is the share of capital in total output. By definition, they add up to 1.

Given this, it is obvious that we can rewrite equations (1) and (2) in terms of the labor share as follows:

$$ULC = \frac{w_n}{(VA_n / P) / L} = \left(\frac{w_n L}{VA_n} \right) P = s_l * P \tag{5}$$

and

$$rULC_{iUS} = \frac{\left(\frac{w_n^i L^i}{VA_n^i} \right)}{\left(\frac{w_n^{US} L^{US}}{VA_n^{US}} \right)} * xr^i = \left(\frac{s_l^i}{s_l^{US}} \right) * xr^i \tag{6}$$

where, $s_l = \left(w_n L / VA_n \right)$ is nothing but the share of the wage bill (labor compensation) in the total value added, $s_l^i = \left(w_n^i L^i \,/ VA_n^i \right)$ is the share of labor in total value added in country *i*, and $s_l^{US} = \left(w_n^{US} L^{US} \,/ VA_n^{US} \right)$ is the share of labor in total value added in the United States. It is in this sense that ULC embodies the functional distribution of income between labor and capital.

Note that in equations (5) and (6), we have expressed the labor share as the share of the nominal wage bill in nominal value added. If one prefers to use the labor share in "real" terms (i.e., labor share calculated as the ratio of real wage bill to real value added, each deflated appropriately) there is no problem. In this case, ULC is the labor share in real terms multiplied by the wage deflator. Equation (5), for example, would be written as follows:

$$ULC = \left(\frac{w_n L}{VA_n} \right) P = \left(\frac{(w_r P_w) L}{(VA_r P)} \right) P = \left(\left(\frac{w_r L}{VA_r} \right) \frac{P_w}{P} \right) P = \left(\frac{w_r L}{VA_r} \right) P_w = s_l * P_w \tag{7}$$

where w_r is the real wage-rate and P_w is the wage deflator.

4. UNIT LABOR COST AND INCOME DISTRIBUTION IN INDIA'S ORGANIZED MANUFACTURING SECTOR

In this section, we use data for India's organized manufacturing sector to calculate the ULC and examine its distributional implications. Table 1 provides the data definition for the various variables and their respective sources.

Table 1: Data Definition and Sources

Variable	Definition
Nominal output/value added (VA_n)	Net value added. This is obtained by subtracting total input costs and depreciation from the value of total output. **Source:** Annual Survey of Industries (ASI)
Total number of workers (L)	Total number of employees (includes production workers employed directly or through contractors and all other employees). **Source:** ASI
Nominal labor compensation/total wage bill (W_n) [9]	This is defined as the sum of wages and salaries, employers' contribution (such as provident fund and other funds), and workmen and staff welfare expenses. **Source:** ASI
Wage deflator (P_w)	Consumer price index for industrial workers (index series for different base years spliced and rebased to 1993–94). **Source:** Reserve Bank of India
Nominal wage rate (w_n)	Nominal labor compensation divided by total number of workers ($w_n=W_n/L$)
Real wage rate (w_r)	Nominal wage rate deflated by P_w ($w_r=w_n/P_w$)
Operating surplus/profits (OS_n)	Value added net of total labor compensation ($OS_n=VA_n-W_n$)
Deflator for capital stock and operating surplus (P_r)	Wholesale price index for machinery and equipment (1993-94=100). **Source:** Reserve Bank of India

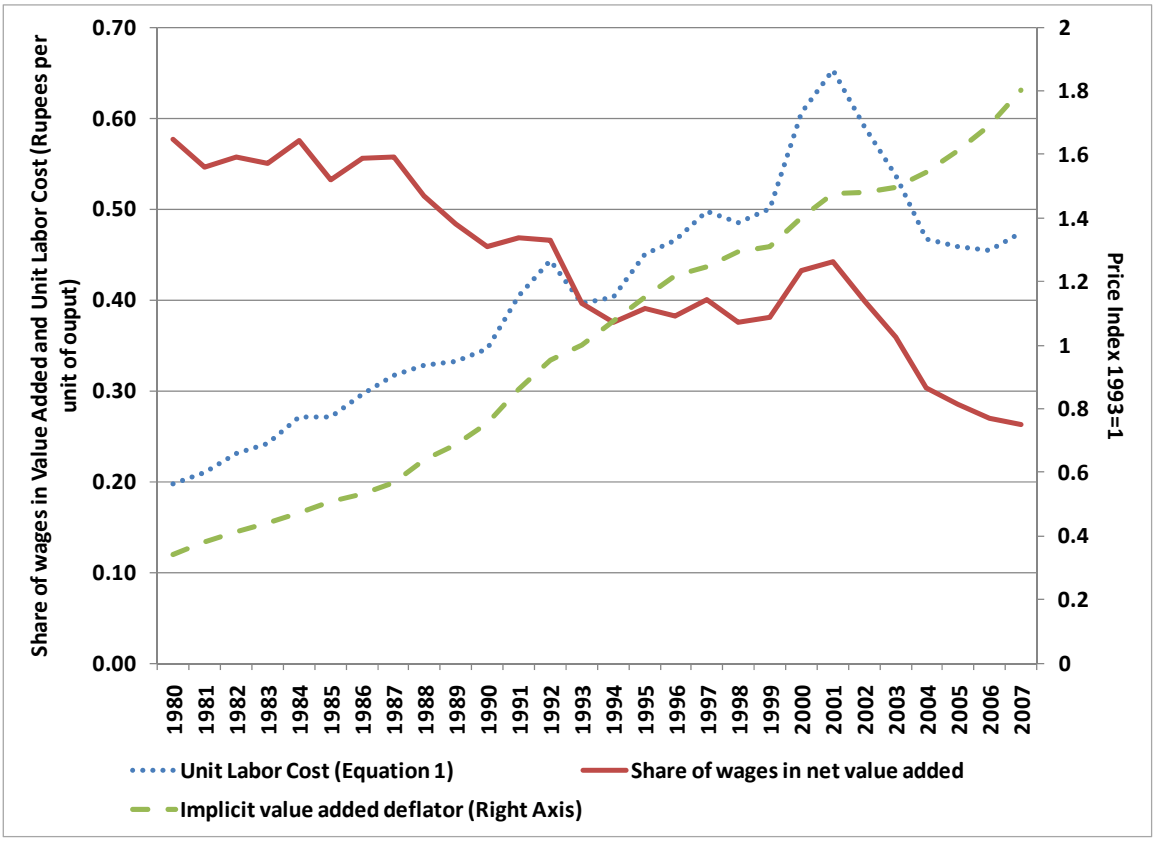
[9] We use total labor compensation and not just on total wages or earnings. The latter is a take-home pay measure that provides an incomplete picture of labor costs. Total labor compensation is a more comprehensive measure of labor cost for the employer. In addition to wages and salaries, labor compensation includes payroll taxes paid by the company, including employer contributions to social security schemes, social benefits paid by employers in the form of child, spouse, family, education, or other dependant allowances, payments made to workers because of illness, accidental injury, maternity leave, etc., and severance payments.

Real capital stock (K)	Book value of fixed capital, deflated by P_r ($K=Fixed\ Capital/P_r$). Fixed capital stock is obtained from ASI and is defined as the depreciated value of fixed assets owned by the factory on the closing day of the accounting year. Fixed assets are those that have a normal productive life of more than one year. Fixed capital includes land including lease hold land, buildings, plant and machinery, furniture and fixtures, transport equipment, water system and roadways, and other fixed assets such as hospitals, schools, etc. used for the benefit of the factory personnel.
Ex-post nominal profit rate (r_n)	Nominal operating surplus divided by real capital stock ($r_n=OS_n/K$)
Ex-post real profit rate (r_r)	Nominal profit rate deflated by P_r ($r_r=r_n/P_r$)
Real value added (VA_r)	This is computed as the sum of real wages and real operating surplus ($VA_r=W_n/P_w+OS_n/P_r$)
Price deflator for value added (P)	Implicit price deflator backed out from the computed real value added and nominal value added. ($P=VA_n/VA_r$)
Labor productivity (LP)	Real value added divided by total number of workers ($LP=VA_r/L$)
Share of labor in output (value added)/labor share (s_l)	$s_l=w_n*L/VA_n$ in nominal terms $s_l=w_r*L/VA_r$ in real terms
Capital productivity (KP)	Real value added divided by real capital stock ($KP=VA_r/K$)
Share of capital in output (value added)/capital share (s_k)	$S_k=r_n*K/VA_n$ in nominal terms $s_l=r_r*K/VA_r$ in real terms
Unit labor cost (ULC)	Equation (1)
Unit capital cost (UKC)	Equation (8)
Purchasing power parity (PPP)	Erumban (2002), EUKLEMS
Exchange rate (ER)	World Development Indicators
Total labor compensation, number of workers, and nominal value added for U.S. manufacturing sector in equation 2	EUKLEMS (March 2008 release). Aggregation based on NAICS classification used.
Relative ULC ($rULC$)	Equation (2)

Figure 1 shows the ULC of India's organized manufacturing sector, calculated as in equation (1). The figure shows that it has increased significantly over time (though it declined between 2001 and 2006), which in standard analyses would be taken as a sign that Indian organized manufacturing industry has lost competitiveness. The reason would be that nominal wage rates have increased faster than productivity and the policy

recommendation would be a combination of wage growth restraint and productivity increase.

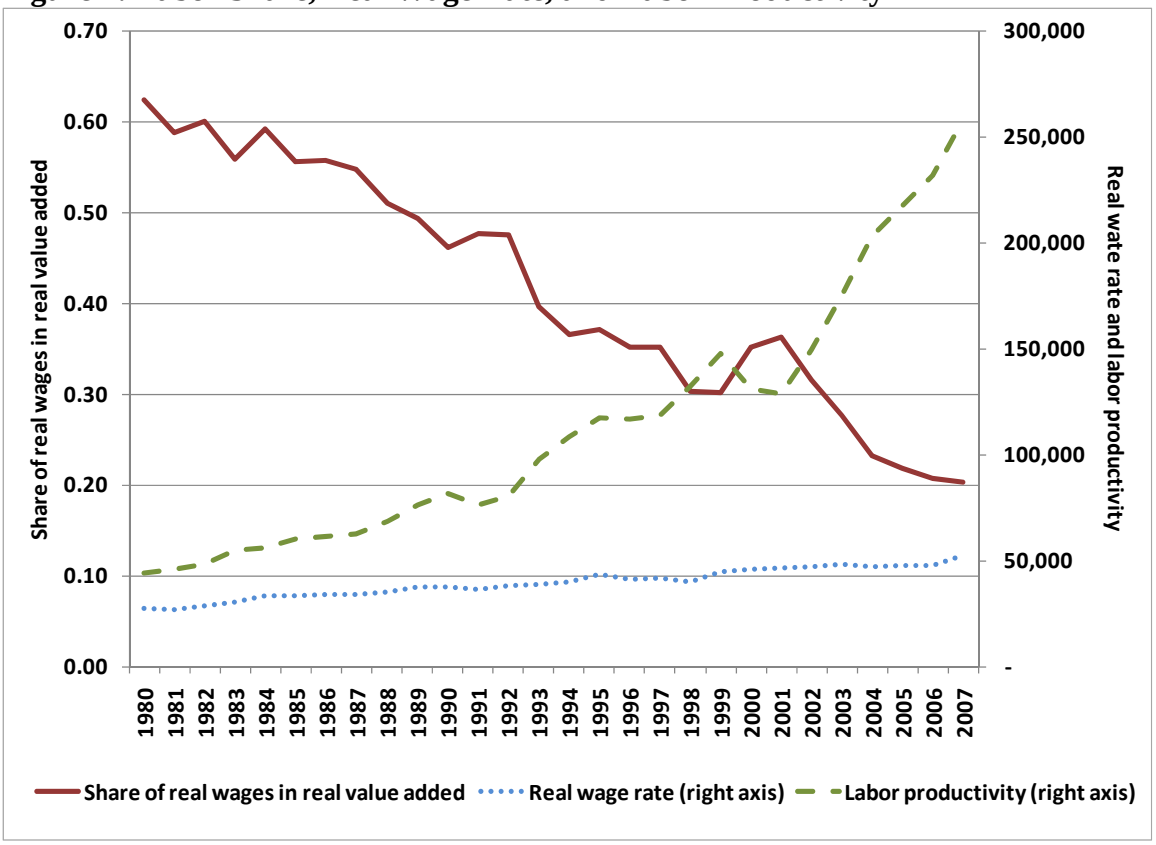
Figure 1: Unit Labor Cost in India's Organized Manufacturing Sector



However, according to our argument in equation (5), the ULC can be interpreted as the product of the labor share in total output times a price factor. Figure 1 shows these two components. We find that the share of labor in gross value added fell by about 50% between 1980 (when it was about 0.6) and 2007, while the value-added deflator quadrupled, more than offsetting the decline in the labor share. Under this interpretation, the previous policy recommendation becomes dubious: the increase in the ULC in India's organized manufacturing sector is, exclusively, the result of an increase in the manufacturing sector's value-added deflator.

It is also possible to show the ULC in terms of real shares [equation (7)]. We show this in figure 2. The share of labor in total output in real terms has also fallen. This decline in the share of labor has been offset by an increase in the wage deflator (this led to the increase in ULC, shown in figure 1). Figure 2 also shows the real wage rate and labor productivity. The figure shows that organized manufacturing productivity has grown much faster than real wages.

Figure 2: Labor Share, Real Wage Rate, and Labor Productivity



ULCs are used as a measure of competitiveness because, typically, labor costs are the major portion of total value added, (about 65–70% of the total value added in advanced countries). However, as we have seen above, the labor share of India's manufacturing sector has fallen drastically since 1980s and today it represents about 25% of value added. This means that the share of capital in value added takes the other 75%.

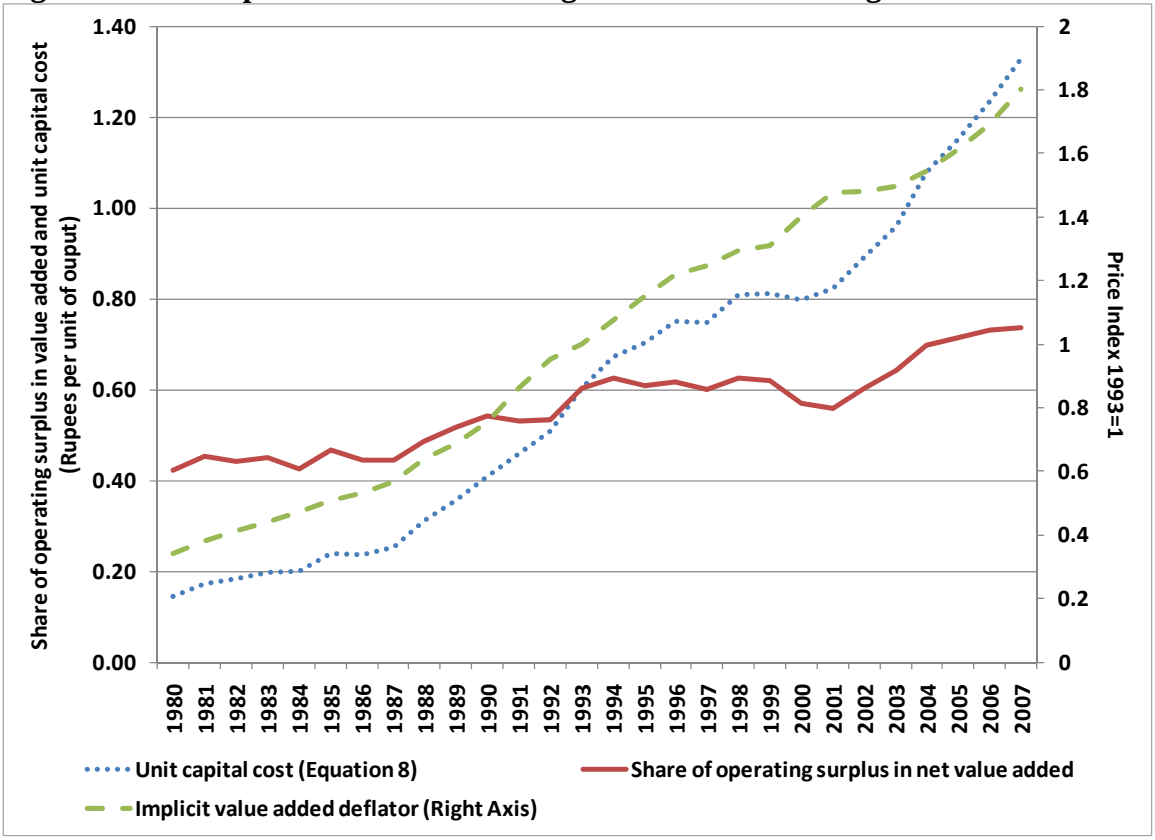
Although it is not standard in the literature, we construct a parallel measure, the unit capital cost, as follows:

$$UKC = \frac{r_n}{KP} = \frac{r_n}{(VA_r / K)} = \frac{r_n}{(VA_n / P) / K} = \left(\frac{r_n K}{VA_n}\right) P = \left(\frac{(r_r P_r) K}{(VA_r P)}\right) P = \left(\frac{r_r K}{VA_r}\right) P_r = s_k * P_r \quad (8)$$

where UKC is the unit capital cost, r_n is the nominal profit rate, KP is capital productivity, VA_r is real value added (in rupees of a base year), VA_n is nominal value added, K is the real capital stock (obtained by deflating fixed capital with the price index for machinery and equipment), P is the deflator for value added, r_r is the real profit rate (obtained by deflating operating surplus with the price index for machinery and equipment), P_r is the price index for machinery and equipment, and s_k is the share of capital in total value added.

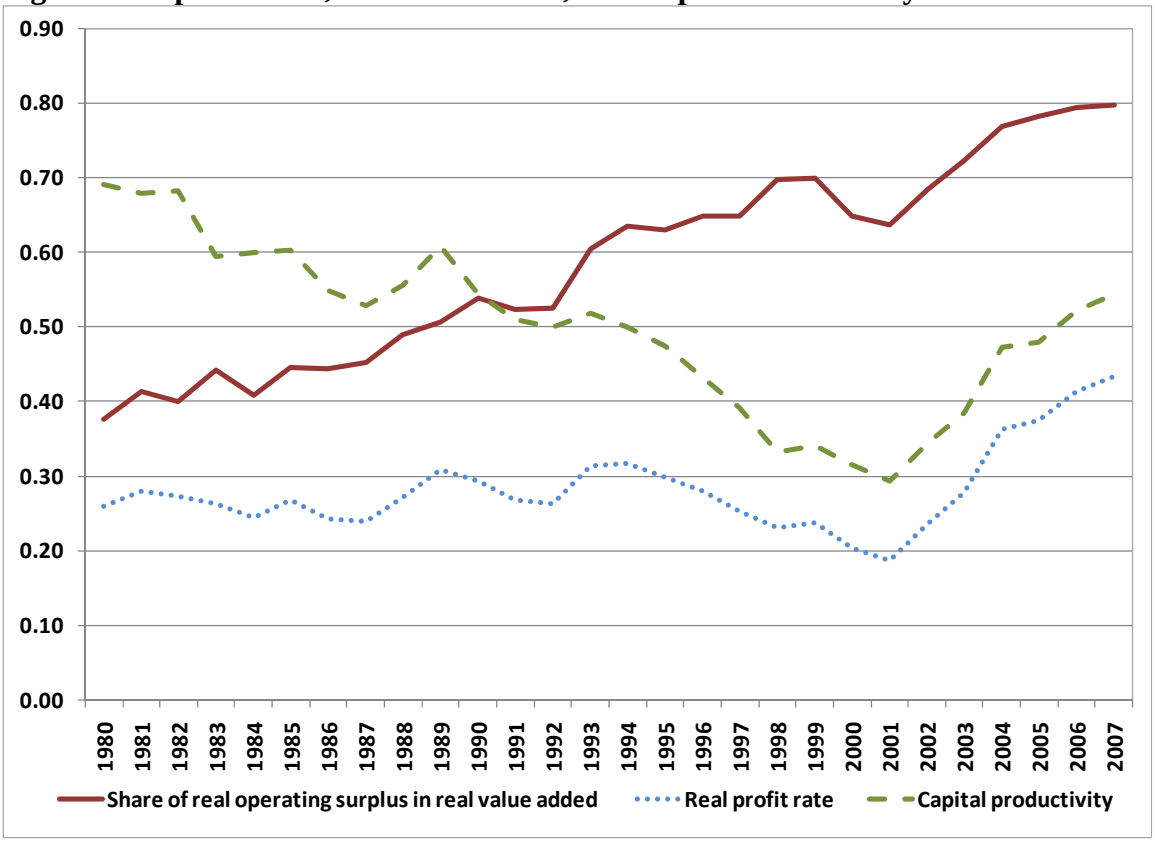
Figure 3 shows the share of operating surplus in net value added (both measured in nominal terms), the implicit deflator for value added, and the unit capital cost. Unit capital cost increased by almost nine-fold during 1980–2007. Both the share of capital in value added and the price index have increased. This is different from what we observed when we analyzed the unit labor cost (figure 1). One could argue that India's manufacturing sector has lost competitiveness because the unit capital cost has increased dramatically, the result of the increase in both the share of capital in value added and in the deflator.

Figure 3: Unit Capital Cost in India's Organized Manufacturing Sector



It is possible to express the UKC as the product of the share of real operating surplus in real value added multiplied by the price deflator for operating surplus [see equation (8)]. This share can in turn be written as the ratio of the real profit rate to capital productivity. The three variables are shown in figure 4. We find that the capital share in value added (measured in real terms) is also increasing over time. The real profit rate has increased over time, from about 25% to almost 45% (the increase took place after 2001), whereas the productivity of capital fell during 1980–2007 (though there seems to be a recovery post-2001, but the level remains below that of 1980). The significant increase in the profit rate (on top of the fact that the level is very high) contrasts with the meager increase in the real wage rate, shown above.

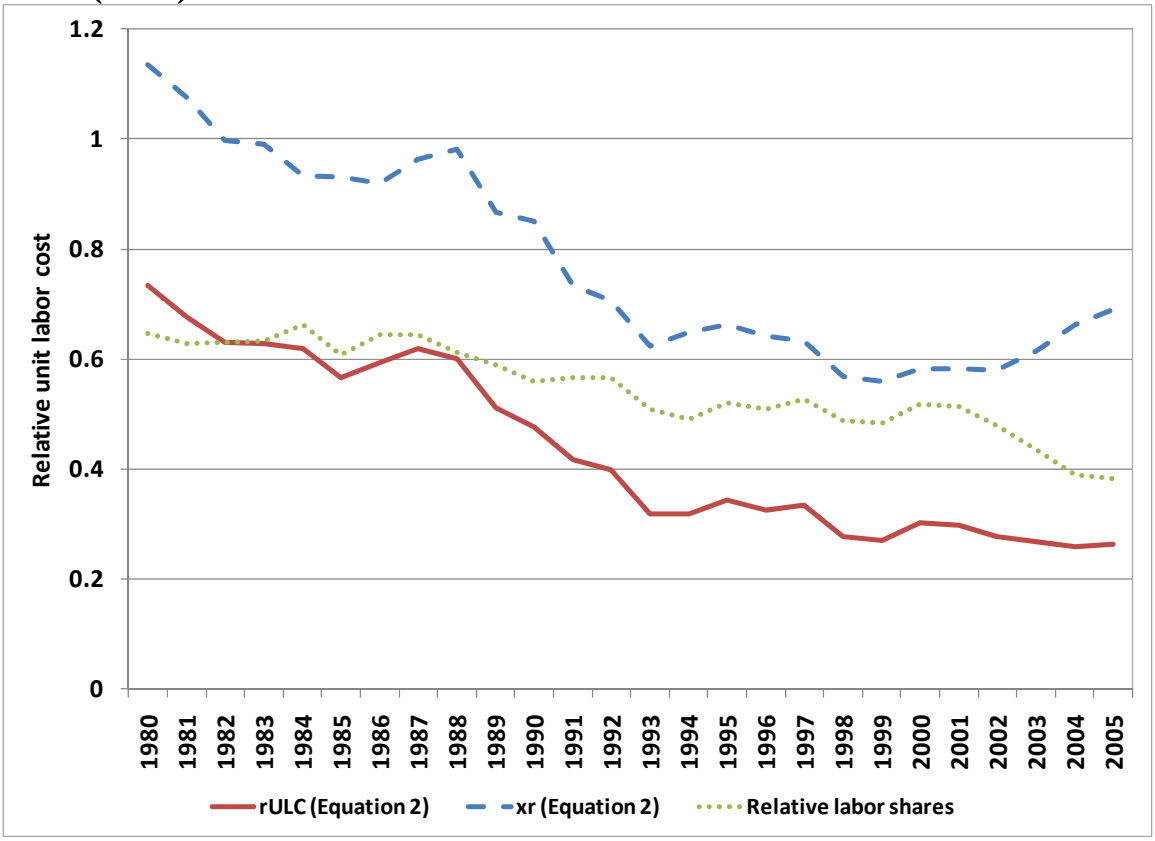
Figure 4: Capital Share, Real Profit Rate, and Capital Productivity



Finally, figure 5 compares how the ULC of India's organized manufacturing sector has evolved with respect to that of the United States (manufacturing sector).[10] This is shown using the relative ULC (*rULC*) as defined in equation (6). A value of *rULC* less than 1 indicates that India's productivity-adjusted labor cost is lower than that of the United States (i.e., more cost effective). Figure 5 shows that *rULC* was 0.73 in 1980, i.e., India's ULC was 73% that of the ULC in the United States; *rULC* fell to 0.48 in 1990, and to 0.30 in 2000. Even though India's labor share continued falling after 2000, *r*ULC has remained fairly constant. This is because even though India's relative labor share continued declining, the degree of undervaluation of the rupee declined and compensated the former.

[10] To be consistent with the definition of value added for the United States, we use gross value added for both India and the United States. The share of wages is calculated with respect to gross value added. In the case of India, the implicit price deflator is based on gross value added (see table 1).

Figure 5: ULC of India's Organized Manufacturing Sector Relative to the United States (US=1).



Source: Erumban (2002), EUKLEMS, ASI, and authors' estimates.
Note: The base year for PPP is 1997. Unit value ratios between India and Germany from Erumban (2002) and the PPP for manufacturing sector between Germany and the United States from EUKLEMS (updated to 2002 from 1997 using price changes) is used to obtain PPP between India and the United States for 2002. The PPPs are then adjusted for price changes so that 1997 is the base year.

5. CONCLUSIONS

Under the standard interpretation of unit labor costs (ULC) as a measure of cost competitiveness, the lower the ULC, the more competitive the economy is. In this paper, we have shown that the definition of ULC reflects the distribution of income between labor and capital. ULCs can be expressed as the product of the labor share in output times a price term. Under this interpretation, increases in ULC may be driven by increases in the price effect, as we have seen is the case of India for the organized manufacturing

sector, where the labor share has even declined. Indeed, India's organized manufacturing sector labor share has declined by more than 50% since 1980, when it was 0.6.[11] Today it is less than 0.3. Moreover, the real wage rate has marginally increased, well below the increase in labor productivity.

Overall, our analysis questions policy recommendations that advocate wage moderation, and which result from simply looking at the evolution of the ULC. The conclusion is that it is very difficult to argue that India's manufacturing has lost competitiveness because the ULC has increased, and this way put the burden on high or increasing wages. ULC has increased exclusively as a result of the increase in the price deflator. The labor share has declined and real wage rates have barely increased. The counterpart is a significant increase in unit capital costs, the result of the increase in both the capital share and in the price deflator. Moreover, the real profit rate of India's organized manufacturing sector in 1980 was very high, about 25%. It remained at this level until the early 2000s. Afterwards, it has increased and reached almost 45% in 2007. This is the real loss, if any, in competitiveness of India's manufacturing sector.

As noted above, the increase in the share of the capital (in real terms, figure 4) could be the result of a higher capital-output ratio (i.e., a decline in capital productivity) or of a higher rate of profit. Marquetti (2003) has shown that the usual long-run pattern of growth in many countries entails a decline in capital productivity and an increase in labor productivity. For India's organized manufacturing sector, Felipe and Kumar (2010) show that capital productivity declined and labor productivity increased through the 1980s and 1990s. This seems to conform to the historical experience of other countries. For purposes of our analysis, this implies that unit capital costs will likely increase as a result of the decline in capital productivity. The only way to contain this increase is by lowering profit rates. However, a lower profit rate will negatively affect the incentive to invest, which is an important determinant of labor productivity and, ultimately, of the standard of living. It is crucial, therefore, to strike the right balance between increasing labor productivity and containing unit capital costs through lower profit rates.

[11] The share of wages in China's national accounts has also declined, from almost 55% in the early 1990s to about 36% recently (with the consequent increase in the share of profits).

Finally, it is not easy to predict the consequences of a decline in the labor share, and the corresponding increase in the capital share, of a sector of the economy as opposed to the labor share of the overall economy. Nevertheless, a decline in the share from almost 60% to less than 30% is significant and may have important consequences. An increase in the share of profits probably leads to an increase in investment early on. Simultaneously, a decrease in the share of labor over an extended period of time induces a decline in consumption or prevents consumption from increasing, even if the economy is growing. Sooner or later there is a mismatch between supply and demand as the increase in capacity caused by the increase in investment will not be matched by an increase in consumption demand. This is a problem of lack of demand, an underconsumption crisis. Capacity utilization will have to decline and along with it will come a decline in production, employment, investment, and demand.

REFERENCES

Annual Survey of Industries (ASI). Ministry of Statistics and Programme Implementation. Government of India. 1980-2007.

van Ark, B. 1993. "International Comparisons of Output and Productivity." Monograph series no. 1. Groningen, Netherlands: Groningen Growth and Development Centre (downloadable from http://www.eco.rug.nl/GGDC/ThesisArk.html)

van Ark, B. 1996. "Issues in Measurement and International Comparison of Productivity—An Overview." Research memorandum GD-28. Groningen, Netherlands: Groningen Growth and Development Centre.

Eichengreen, B. 2008. "The Real Exchange Rate and Economic Growth." Commission on Growth and Development Working Paper No. 4. Washington, DC: World Bank.

Erumban, A.A. 2002. "Productivity and Unit Labor Cost in Indian Manufacturing A Comparative Perspective." *Economic and Political Weekly* 44(15): 39–48.

Felipe, J., and U. Kumar. 2010. "Technical Change in India's Organized Manufacturing Sector." Mimeograph. Manila: Asian Development Bank.

Hooper, P., and K. A. Larin. 1989. "International Competitiveness of Labor Costs in Manufacturing." *Review of Income and Wealth* 35(4): 335–354.

Maddison, A., and B. van Ark. 1994. "The International Comparison of Real Product and Productivity." Research Memorandum 567 (GD-6). Groningen, Netherlands: Groningen Growth and Development Centre.

Marquetti, A. 2003. "Analayzing Historical and Regional Patterns of Technical Change from a Classical-Marxian Perspective." *Journal of Economic Behavior and Organization* 52(2): 191–200.

Paige, D., and G. Bombach. 1959. *A Comparison of National Output and Productivity*. Paris: OEEC.

Rodrik, D. 2008. "The Real Exchange Rate and Economic Growth." Unpublished mimeograph. Cambridge, MA: Harvard University. Available at: http://www.hks.harvard.edu/fs/drodrik/Research%20papers/RER%20and%20growth.pdf)