# Unit Labour Costs as a Tool for Competitiveness and Policy Analysis: A Reassessment

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The analysis in this paper shows that while India's unit labour costs in organised manufacturing 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 labour share in value added of India's organised manufacturing sector has been on a downward trend, from 0.6 in 1980 to 0.26 in 2007. The study also finds that real wages have increased minimally during the period analysed – well below labour productivity – while the real profit rate and unit capital costs have increased substantially. The 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.

## 1 Introduction

Unit labour costs (ULC) are a commonly used measure to analyse the competitiveness of a country or a sector. They are defined as the cost of labour (labour compensation) per unit of output. Standard analyses, following the comparative cost theory, often lead to statements such as: "Countries with a lower level of ULC [unit labour cost] relative to other countries may be regarded as competitive" (Erumban 2009: 40). The policy implication is that growing ULC (in particular vis-à-vis those of the competitors) harm the economy.

India's ULC in the organised manufacturing sector displays an upward trend. In this paper, we reinterpret this evidence and as a consequence, question standard policy implications. We show that ULC are always the product of the labour share in output times a price adjustment. Therefore, it embodies the functional distribution of income between labour and capital. This cannot be neglected in normative statements. Our analysis has important implications for policies that promote lower wages to lower ULC, as they effectively lower the labour share and tilt the distribution of income towards capital, which has economic consequences. We also show that (aggregate) ULC is not just a weighted sum of the firms' unit labour costs.

The rest of the paper is organised as follows. Section 2 discusses the concept of ULC and how it is calculated. In Section 3, we relate ULC to the functional distribution of income. Section 4 discusses the aggregation of firm-level ULC into an aggregate. Section 5 shows how ULC have evolved in India. We use data from India's organised 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 share of labour (in the total value added) of India's organised manufacturing sector has been on a downward trend since 1980, from 0.6 (60% of gross domestic product (GDP)) in 1980 to 0.26 (or 26%) in 2007. This means that the sector's capital share increased from 0.4 (or 40%) to almost 0.74 (or 74%) over the same period. We also find that real wages have increased minimally, much less than labour productivity, and that the profit rate and unit capital costs have increased substantially. Section 6 concludes the analysis.

## 2 The Calculation of ULC

ULC is defined as the cost of labour required to produce one unit of output. It is used as a measure of competitiveness because labour compensation is often a major component of the cost

This paper represents the views of the authors and not necessarily of their organisation or the countries that they represent.

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structure, and therefore, influences prices. They are calculated as the ratio of average labour compensation, i e, the nominal wage compensation plus all other labour-related costs to the firm (such as payments in kind related to labour services, social security, severance and termination pay and employers' contributions to pension schemes, casualty and life insurance and workers compensation, and in some cases payroll taxes as well as fringe benefits taxes, etc) to labour productivity. Assuming the numerator is measured in rupees per worker and the denominator is measured in numbers of tables per worker, the ULC is measured in rupees per table (i e, total labour cost per unit of output, or the cost in terms of labour for the products we get). Algebraically:

$$ULC_q = w_n/(q/L) \quad \ldots(1)$$

where $w_n$ denotes labour compensation per unit of employment, $q$ is physical output and $L$ is employment (e g, number of workers, or number of hours).

Firms, obviously, do care about ULC because they track the relationship between their total labour costs and how productive workers are. If a firm's ULC increases, and even more so vis-à-vis those of its competitors, it is most likely to lose market share and its growth expectations will be negatively affected. The solution to this problem is a combination of wage restraint and labour productivity increase, the latter usually achieved by introducing labour-saving techniques that are profitable.

Increasing productivity is not easy and does not happen overnight. Besides, the determinants of productivity are not well known. In a recent survey, Syverson (2011) summarises a wealth of literature and classifies its determinants into two groups: (1) factors that operate primarily within firms and under the control of the management;[1] and (2) factors external to the firm. The latter operate indirectly through the environment by affecting producers' willingness and ability to harness factors that affect firms.[2] Syverson admits that it is not clear which one of the determinants is more important quantitatively and further research is needed. In discussions, often the policy recommendation to increase productivity is to reform, especially the labour market.

Although many firms surely do have data to calculate their ULC as in equation (1), at the aggregate level (e g, economywide, or just a sector), there is a problem. This is that although the numerator can be an average of the total money-wage compensation, and thus, also be measured in rupees per worker, the denominator, labour productivity, cannot be measured in tables per worker. To calculate it, researchers use the economy's (or sector's) value added in real terms (i e, nominal value added divided by the GDP deflator, rupees of a base year) divided by the number of workers, that is:

$$ULC = w_n / ALP = w_n / (VA_r / L) = \frac{w_n}{(VA_n / P)/L} \quad \ldots(2)$$

where *ULC* is the unit labour cost, $w_n$ is the average money wage rate or labour compensation (we use both terms interchangeably), *ALP* is labour productivity, $VA_r$ is real value added (in rupees of a base year), $L$ is the number of workers, $P$ is the value added deflator.[3] This means that the aggregate ULC unlike that of a firm, is a unitless magnitude. Equation (2), however, is not the same as equation (1).

This argument brings two important issues to the discussion of the interpretation of ULC. The first one is whether there is an alternative interpretation of ULC as calculated in equation (2). We discuss this issue in Section 3. The second one is whether ULC (equation 1) is a good approximation to the average of the individual firms' unit labour costs (equation 1). If the answer is yes, then it could be used to discuss competitiveness. If the answer is no, how misleading is it? We discuss this issue in Section 4.

## 3 ULC and Income Distribution

To answer the first question, we need to unveil the connection between income distribution and ULC. Consider the national income accounting identity according to which nominal value added ($VA_n$) equals the total nominal wage bill/labour compensation ($W_n$) plus total profits ($\Pi_n$).[4] This can be written as:

$$VA_n \equiv W_n + \Pi_n \equiv w_n L + r_n K \quad \ldots(3)$$

$W_n$ can be expressed as the product of the average nominal wage rate ($w_n$) times the number of workers ($L$); total profits ($\Pi_n$) 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:

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

where $s_l^n \equiv (w_n L/VA_n)$ is the share of labour in total value added (both in nominal terms) and $s_k^n \equiv (r_n K/VA_n)$ is the share of capital in total value added (both in nominal terms). By definition, they add up to 1.

Given this, it is obvious that we can rewrite equation (2) in terms of the labour share as follows:

$$ULC = \frac{w_n}{(VA_n/P)/L} = \left(\frac{w_n L}{VA_n}\right) P = s_l^n * P \quad \ldots(5)$$

where $s_l^n \equiv (w_n L/VA_n)$ is nothing but the share of the wage bill (labour compensation) in total value added (both in nominal terms). It is in this sense that ULC embodies the functional distribution of income between labour and capital.

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

$$ULC = \left(\frac{w_n L}{VA_n}\right) P = \left(\frac{(w_r P_w)L}{(VA_r P)}\right) P = \left(\left(\frac{w_r L}{VA_r}\right)\frac{P_w}{P}\right) P = \left(\frac{w_r L}{VA_r}\right) P_w = s_l^r * P_w \quad \ldots(6)$$

where $w_r$ is the real wage-rate, $P_w$ is the wage deflator, and $s_l^r = (w_r L / VA_r)$ is the share of the wage-bill (labour compensation) in the total value added (both in real terms).

This implies that (aggregate) the ULC as calculated in equation (2) can be interpreted as the labour share times the deflator.

If this is the case, the conclusion "the lower the better" becomes questionable. Moreover, an increase in ULC can be driven by the increases in both components (i e, both labour share and deflator) or only in one of them.

## 4 The Aggregation Question

To address the second question posed at the end of Section 2, we rewrite the aggregate labour share as a weighted average of the firms' labour shares as follows:

$$s_l^n = \sum_{i=1}^{k}\left[\left(\frac{p^i q^i}{\sum_{i=1}^{k} p^i q^i}\right) * s_l^i\right] = \sum_{i=1}^{k} \phi^i * s_l^i \qquad ...(7)$$

where $\phi^i$ is the share of firm *i's* value added in total value added, and $s_l^i$ is the share of labour in firm *i's* value added. Furthermore, $s_l^i$ can be written as the ratio of labour compensation in firm *i* to value added of firm *i*. Algebraically:

$$s_l^i = \frac{w_n^i l^i}{p^i q^i} = \frac{ulc_q^i}{p^i} \qquad ...(8)$$

where $s_l^n \equiv (w_n L/VA_n)$ is the share of labour in total output (both in nominal terms) at the aggregate level, $w^i$ is the average labour compensation in firm *i*, $l^i$ is the number of workers (or hours) in firm *i*, $p^i$ is the price charged by firm *i*, $q^i$ is the quantity produced by firm *i,* and $ulc_q^i$ is the unit labour cost of firm *i*. Equation (8) shows that the firm's labour share equals its unit labour cost divided by the selling price.

Can we establish if $ULC = \left(\sum_{i=1}^{k} \phi^i * ulc_q^i\right)$? Combining equations (2), (5), (7), and (8), the aggregate ULC can be written as follows:

$$ULC = s_l^n * P = \left[\sum_{i=1}^{k}\left\{\left(\frac{p^i q^i}{\sum_{i=1}^{k} p^i q^i}\right) * s_l^i\right\}\right] * P = \left(\sum_{i=1}^{k} \phi^i * s_l^i\right) * P =$$

$$\left(\sum_{i=1}^{k} \phi^i * \left(\frac{w_n^i l^i}{p^i q^i}\right)\right) * P = \left(\sum_{i=1}^{k} \phi^i * \left(\frac{ulc_q^i}{p^i}\right)\right) * P \qquad ...(9)$$

that is, as the product of the sum of the firms' labour shares (each weighted by its share in aggregate value added) times the economy-wide price deflator. The firm's labour share can be written as the ratio of its ULC divided by the unit price charged. Equation (9) shows that, indeed, the aggregate unit labour cost captures the firms' ULC. However, the former is not just a weighted average of the latter, i e, $ULC \neq \left(\sum_{i=1}^{k} \phi^i * ulc_q^i\right)$. We conclude that ULC is probably not a good proxy for the firm level ULC. Drawing conclusions about the competitiveness of a country's firms based on ULC is likely to lead to misleading conclusions.

## 5 ULC and Income Distribution in Organised Manufacturing Sector

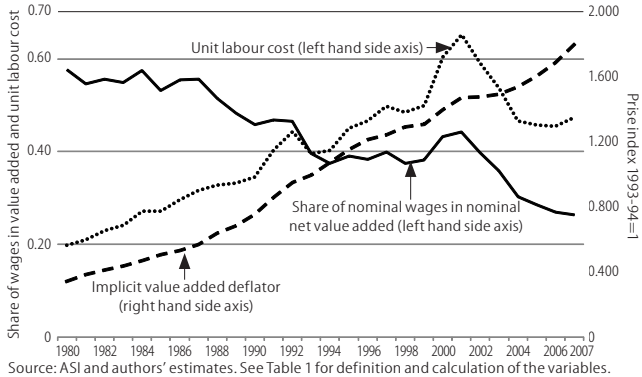
In this section, we use data for India's organised manufacturing sector to calculate the ULC and examine its distributional implications. Table 1 provides the definition of the variables used and their respective sources.

Figure 1 (p 69) shows the ULC of India's organised manufacturing sector, calculated as in equation (1). The figure shows that it has increased significantly over time (though it declined between

**Table 1: Data Definition and Sources**

| Variable | Definition |
|---|---|
| Nominal output/value added (VAn) | Net value added (in rupees). 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 labour compensation/ total wage bill ($W_n$)[5] | 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 (in rupees). 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 |
| Average nominal wage rate ($w_n$) | Nominal labour compensation divided by total number of workers ($w_n=W_n/L$), in rupees per worker. |
| Average real wage rate ($w_r$) | Nominal wage rate deflated by $P_w$ ($w_r=w_n/P_w$), in rupees of 1993-94 per worker. |
| Nominal operating surplus/ nominal profits ($\Pi_n$) | Nominal value added net of total labour compensation ($\Pi_n=Y_n-W_n$), in rupees. |
| Deflator for capital stock and operating surplus ($P_r$) | Wholesale price index for machinery and equipment (1993-94=100). Source: Reserve Bank of India |
| Real capital stock (K) | Book value of fixed capital (in rupees), deflated by $P_r$ (K=fixed capital/Pr). 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. In rupees of 1993-94. |
| Ex post average nominal profit rate ($r_n$) | Nominal operating surplus divided by real capital stock ($r_n=\Pi_n/K$), rupees per unit of real capital stock. |
| Real operating surplus/ real profits ($\Pi_r$) | Nominal operating surplus deflated by $P_r$ ($\Pi_r=\Pi_n/P_r$), in rupees of 1993-94. |
| Ex-post average real profit rate ($r_r$) | Ex post average nominal profit rate deflated by $P_r$ ($r_r=r_n/P_r$), rupees of 1993-94 per unit of real capital stock. It is also equal to the ratio of nominal operating surplus to book value of fixed capital (both in rupees). |
| Real value added ($VA_r$) | This is computed as the sum of real wages and real operating surplus ($VA_r=W_n/P_w+\Pi_n/P_r$), in rupees of 1993-94. |
| Price deflator for value added (P) | Implicit price deflator backed out from the computed real value added and nominal value added, ($P=VA_n/VA_r$). |
| Labour productivity (LP) | Real value added divided by total number of workers ($LP=VA_r/L$), rupees of 1993-94 per worker. |
| Share of nominal wage-bill (labour compensation) in nominal output (value added)/ labour share ($s_l^n$) | $s_l^n=(w_nL/VA_n)$ |
| Share of real wage-bill (labour compensation) in real output (value added)/labour share ($s_l^r$) | $s_l^r=(w_rL/VA_r)$ |
| Capital productivity (KP) | Real value added divided by real capital stock (KP=VAr/K), rupees of 1993-94 per unit of real capital stock. |
| Share of capital in nominal output (value added)/capital share ($s_k^n$) | $s_k^n=(r_nK/VA_n)$ |
| Share of capital in real output (value added)/capital share ($s_k^r$) | $s_k^r=(r_rK/VA_r)$ |
| ULC | Equation (2) |
| Unit capital cost (UKC) | Equation (10) |

**Figure 1: ULC in India's Organised Manufacturing Sector**



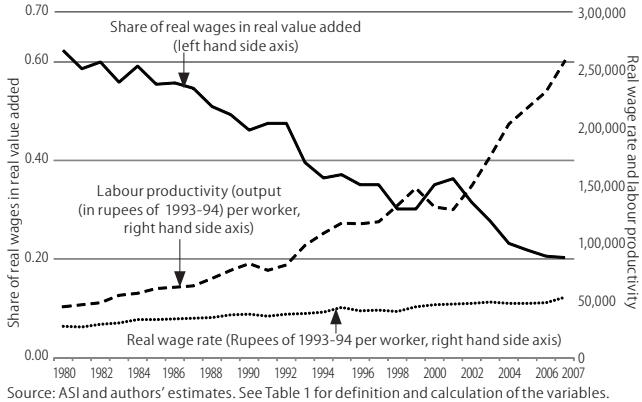

Source: ASI and authors' estimates. See Table 1 for definition and calculation of the variables.

2001 and 2006), which in standard analyses would be taken as a sign that Indian organised manufacturing industry has lost competitiveness. The reason would be that nominal wage rates have increased faster than labour productivity and the policy recommendation would be a combination of wage growth restraint and productivity increase.

However, according to our argument in equation (5), the ULC can be interpreted as the product of the labour share in total output times a price factor. Figure 1 shows these two components. We find that the share of labour 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 labour share. Under this interpretation, the increase in the ULC in India's organised 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 (6)). We show this in Figure 2. The share of labour in total output in real terms has also fallen. This decline in the share of labour 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 labour productivity. The figure shows that productivity in India's organised manufacturing has grown much faster than the real wage rate.

**Figure 2: Labour Share, Real Wage Rate and Labour Productivity**




Source: ASI and authors' estimates. See Table 1 for definition and calculation of the variables.

ULC are used as a measure of competitiveness because, typically, labour 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 labour share of India's manufacturing sector has fallen drastically since the 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:

$$UKC = \frac{r_n}{KP} = \frac{r_n}{(VA_r/K)} = \frac{r_n}{(VA_n/P)/K} = \left(\frac{r_n K}{VA_n}\right) P = s_k^n * P \qquad ...(10)$$

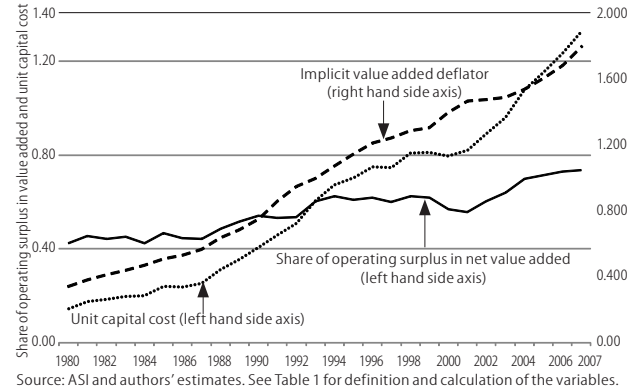
where *UKC* is the unit capital cost, $r_n$ is the nominal profit rate, *KP* is capital productivity, $VA_n$ is nominal value added, *K* is the real capital stock (obtained by deflating fixed capital with the price index for machinery and equipment), *P* is the deflator for value added, *and* $s_k$ is the share of capital in total value added (both in nominal terms). Alternatively one can also write UKC such that share of capital is the ratio of real operating surplus to real value added. This is shown below:

$$UKC = \frac{r_n}{KP} = \frac{r_n}{(VA_r/K)} = \left(\frac{(r_r P_r)K}{(VA_r)}\right) = \left(\frac{r_r K}{VA_r}\right) P_r = s_k^r * P_r \qquad ...(11)$$

where *UKC* is the unit capital cost (same as in equation 10), $VA_r$ is real value added (in rupees of a base year), *K* is the real capital stock (obtained by deflating fixed capital with the price index for machinery and equipment), $r_r$ 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 $s_k^r$ is the share of capital in total value added (both in real terms).

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. The unit capital cost increased by almost ninefold 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 analysed the ULC (Figure 1). Under standard interpretation of unit factor costs, one might argue that India's organised 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.

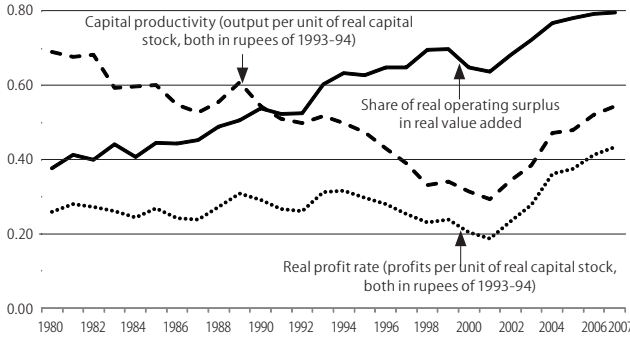
**Figure 3: Unit Capital Cost in India's Organised Manufacturing Sector**




Source: ASI and authors' estimates. See Table 1 for definition and calculation of the variables.

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 11). This share can in turn be written as the ratio of the real profit rate ($r_r$) to capital productivity (KP), i e, $s_k^r = \left(\frac{r_r K}{VA_r}\right) = \frac{r_r}{(VA_r/K)} = \frac{r_r}{(KP)}$. The three variables are shown in Figure 4 (p 70). We find that the capital share in value added (measured in real terms) is also increasing

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




Source: ASI and authors' estimates. See Table 1 for definition and calculation of the variables.

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 meagre increase in the real wage rate, shown above.

## 6 Conclusions

ULC are one of the most widely used variables in the analysis of competitiveness. ULC are defined as the ratio of labour compensation to labour productivity in physical terms. Therefore, at the firm-level, they are measured in the country's currency (e g, rupees) per unit of output (e g, per table). At the aggregate level, however, there is no physical equivalent of output, and real value added has to be used. This has very important implications for analyses and policy. The reason is that although the aggregate ULC is related to the firms' ULC, the former is not a simply weighted average of the latter, and therefore, changes in ULC cannot be related exclusively to changes in the firms' ULC.

Moreover, as shown in the paper, aggregate ULC reflect the distribution of income between labour and capital. ULC can be expressed as the product of the labour 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 organised manufacturing sector, where the labour share has even declined. Indeed, India's organised manufacturing sector labour share has declined by more than 50% since 1980, when it was 0.6, and in 2007 it is below 0.3. Moreover, the real wage rate has marginally increased, well below the increase in labour productivity.

Overall, our analysis questions policy recommendations that advocate wage moderation that result from simply looking at the evolution of the ULC. The conclusion is that it would be very difficult to argue that India's organised manufacturing has lost competitiveness because its ULC has increased, and this way blame high or increasing wages. ULC has increased exclusively as a result of the increase in the price deflator. The labour 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 organised 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.

Finally, it is not easy to predict the consequences of a decline in the labour share, and the corresponding increase in the capital share, of a sector of the economy as opposed to the labour 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 labour 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, and may lead to an underconsumption crisis. Capacity utilisation will have to decline and along with it will come a decline in production, employment, investment and demand.

### NOTES

1 Syverson mentions the following: (a) managerial practice/talent; (b) higher-quality general labour and capital inputs; (c) information technology and research and development; (d) learning-by-doing; (e) product innovation; (f) firm structure decisions.

2 Syverson mentions the following: (a) productivity spillovers; (b) competition; (c) deregulation or proper regulation; (d) flexible input markets.

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 labour compensation and real operating surplus, where the two (labour 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.

4 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.

5 We use total labour compensation and not just total wages or earnings. The latter is a take-home pay measure that provides an incomplete picture of labour costs. Total labour compensation is a more comprehensive measure of labour cost for the employer. In addition to wages and salaries, labour compensation includes all other labour-related costs to the firm such as payments in kind related to labour services, social security, severance and termination pay and employers' contributions to pension schemes, casualty and life insurance and workers compensation and in some cases payroll taxes as well as fringe benefits taxes, etc.

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