Wage- Productivity Linkages in Indian Industries

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This paper examines wage- productivity linkages in rural, urban and aggregate industries of India covering the period from1998-99 to 2007-08. In order to clearly understand the links between wages and productivity in selected industries, the study had used a simple step-wise regression model. Based on the results obtained it was suggested that nation-wide linkage of wages with productivity may be the best option for neutralization of a rise in the cost of living. The productivity of capital and total factor productivity may be taken into account along with labour productivity while granting wage increase so that wage increase is not of inflationary nature. Effective utilization of capital should be the correct criterion for a country like India where capital is a scarce factor.

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Introduction

Industrial development is the key factor for the rapid economic development of any country. It is true more in the case of developing countries, since it would be helpful to combating many economic ills, which they have been facing. Economic reforms introduced in India, particularly since 1991, are aimed at making the economy and industry more competitive. Liberalization and globalization have provided opportunity for growth and expansion of the industry, and the manufacturing sector in particular (Krishnamurthy 2007).

The wage- productivity relationship in Indian industries has been a vexed and indecisive issue. It has been agreed by all that wages should move so as to bear positive relationship with productivity. The Royal Commission of Labour, the Fair Wages Committee on Sharing the Gains of Productivity, the study group on Productivity and Incentives and the Five-year Plans, have therefore, regarded productivity as one criterion in wage determination. It is also important to remember wages should not go up to the extent of compelling employer to replace labour by capital which will

lead to unemployment problems. The National Commission on Labour (1969) observed, "Any sustained improvement in wages cannot be brought without increasing productivity. The urgency of improving productivity level to sustain increase in real wage cannot be over emphasised. It is therefore, desirable to establish some positive relationship between productivity and wages in the interest of both employers and employees".

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The economic development of a country depends mainly on industrial development. In the manufacturing sector, scope for internal as well as external economies is greater than in the other sectors. It acts as an instrument both for creating capacity to absorb excess labour and for diversifying the market required to boost economic development. The present study has attempted to analyse the productivity and wages in the manufacturing sector of India, disaggregating in to rural and urban industries.

Selection of the Variables

Net Value Added (NVA) was taken as output, since the trends are not affected significantly by the use of net value added. Also ambiguity in the calculation of depreciation can be overcome if net value added is taken as a measure of output. Labour input consisted of both workers directly involved in production and also persons other than workers like supervisors, technicians, managers, clerks and similar type of employees. The invested capital was taken into account as capital. Wages included remuneration paid to workers.

Data

The basic data source of the study was Annual Survey of Industries (ASI) published by Central Statistical Organisation (CSO), Government of India covering the period from1998-99 to 2007-08. All the referred variables were normalised by applying the Gross Domestic Product (GDP) deflator. The GDP at current and constant prices were obtained by referring to Economic Survey, published by Government of India, Ministry of Finance and Economic Division Delhi. The data on Consumer Price Index for Industrial Workers (CPIIW) was also drawn from the same source to fit the functional relationship between wage and productivity, since CPIIW was one of the factors influencing productivity changes.

Partial Factor Productivity Indices

Partial factor productivity measures the ratio of output to one of the inputs setting aside interdependence of the use of inputs. Labour productivity (NVA/L) is measured as a ratio of value added to total number of persons employed. Capital Productivity (NVA/K) is measured as a ratio of value added to gross fixed capital.

Total factor productivity (TFPI)

A broader gauge of productivity, the total factor productivity, is measured by combining the effects of all the resources used in the production of goods and services (labour, capital, raw material, energy, etc.). Total factor productivity indices were calculated by applying the direct method-square root of PFPK multiplied by PFPL, where PFPL represents partial factor productivity of labour and PFPK represents partial factor productivity of capital.

Step-wise Regression Model

In order to clearly understand the links between wages and productivity in selected industries, this study has used a simple step-wise regression model (used by Laxmi Narayan 2003). Different models, depending upon the number of variables in the exercise, were selected so as to give us relation between wages and productivity. As various measures of productivity may affect wages differently, the models were so designed to include one or more measures of productivity. The analysis was based on the wage rate (W) as the dependent variable and labour productivity (NVA/L), capital intensity (FC/L), Consumer Price Index for Industrial Workers (CPIIW), Net Value Added (NVA), Total Factor Productivity Index (TFPI) and trend variable (T) as explanatory variables. The variables included and the models estimated are :

Model I : $W = A_e^{u} (LP)^{\alpha}$

Model II : $W = A_e^{\lambda t + u} (LP)^{\alpha}$

Model III : $W = A_e^{\lambda t + u} (LP)^{\alpha} (V)^{\beta}$

Model IV : $W = A_e^{\lambda t + u} (LP)^{\alpha} (V)^{\beta} (K/L)^{\delta}$

Model V : $W = A_e^{\lambda t + u} (LP)^{\alpha} (V)^{\beta} (K/L)^{\delta} (CPIIW)^{\lambda}$

Model VI : $W = A_e^{\lambda t + u} (LP)^{\alpha} (TFPT)^{\beta} (K/L)^{\delta} (CPIIW)^{\lambda}$

Model VII : $W = A_e^{u} (LP)^{\alpha} (V)^{\beta}$

Model VIII : $W = A_e^{u} (LP)^{\alpha} (V)^{\beta} (K/L)^{\delta}$

Model IX : $W = A_e^{u} (LP)^{\alpha} (TFPT)^{\beta} (K/L)^{\delta}$

Wage - Productivity Relationship

To examine the wage–labour productivity linkages, the following variables were selected.

Labour Productivity: The movement in real wages based on the movement in labour productivity was examined. Therefore, labour productivity was the first variable considered. And a positive relationship between wage rate and labour productivity was expected.

Consumer Price Index for Industrial Workers: The second variable was consumer price index for industrial workers. Since there are certain universally accepted requirements, which must be fulfilled for a worker to live in a civilized community, like food, clothing and bedding and a shelter for self and family, there must be a standard budget that is sufficient to meet the above mentioned minimum needs of workers. However, when this standard budget in terms of the need-based minimum wage is determined, the question of maintaining the same purchasing power arises. The system generally prevailing in India for the adjustment of wages against fluctuation in the value of money is that of paying dearness allowance over and above the basic wage. The cost of living index thus was taken as a correction for the loss of purchasing power. The justification is that the real wages of workers should not be allowed to be whittled down by the price increase. The correction method adopted to neutralize the fall in value of money, so as to keep the workers real wages constant at a given level is based on consumer price index. Generally, any increase in the price of consumer goods depresses the real wages. Thus, a negative relationship between consumer price index and change in real earnings can be visualized.

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Capital Intensity: The capital intensity is another variable, which is theoretically and empirically taken to be a factor determining wages. In the present study, capital-labour ratio was taken as a measure of capital intensity. It is argued that the availability of higher per capita wage requires more skilled manpower and therefore, workers are paid, higher wages. Moreover capital intensity may also affect wages via the productivity route, i.e. rising capital intensity which increases labour productivity leads to higher wages. And higher wages may induce a substitution of capital for labour. Therefore, a positive relationship is expected between changes in capital intensity and changes in wages.

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Net Value Added: The capacity to pay is yet another variable or a factor determining wages. It is generally believed that capacity of the industry to pay should be taken into account while fixing the wages, other than minimum wages. The capacity of the industry to pay is one of the essential circumstances being taken into consideration except in the cases of bare subsistence for minimum wages which employer is bound to pay irrespective of the capacity to pay. Expansion in output (value added) may be taken as the measure of the industry's capacity to pay and a positive relationship between earnings and valued added is expected.

Table 1 Wage – Productivity Relationship in Rural Industries

Model No	Constant	LnNVA/L	LnNVA	LnK/L	LnCP II W	LnTFPI	LnT	R^2	DW Statistic	F-ratio
I	85.599*	.217								
	(16.456)	(7.730) *	-	-	-	-	-	.882	1.369	59.757
II	88.807 *	.132					2.085			
	(14.622)	(1.500)	-	-	-	-	(1.017)	.897	1.449	30.525
III	144.830	-.931 ***	.441 * *				2.145			
	(5.874) *	(-2.0050)	(2.316)	-	-	-	(1.452)	.946	2.175	34.820
IV	42.733	-.454	.884	.132			4.467			
	(1.162)	(-1.347)	(3.077)**	(.831)	-	-	(1.761)	.981	1.650	65.348
V	64.947	-.462 ***	-.141	.918 ***	-.066		5.588			
	(.312)	(-2.000)	(.720)	(2.057)	(-.109)	-	(.570)	.981	1.663	41.941
VI	31.842	1.332 ***		.828	.016	-.208	2.787			
	(.211)	(1.389)	-	(1.768)	(.032)	(-1.511)	(.404)	.977	1.709	53.247
VII	85.296*	.222	-.003							
	(6.110)	(.998)	(-.024)	-	-	-	-	.882	1.371	26.146
VIII	-10..567	.108	-.124	1.161 *						
	(-.435)	(.866)	(-1.675)	(4.158)	-	-	-	.970	1.783	63.761
IX	-100.911	-1.193 *		2.045 *		1.183 *				
	(-2.650)	(-3.401)	-	(5.437)	-	(3.270)	-	.984	1.805	122.61

Source: Calculations are based on ASI data

Note: * Significant at 1 % level

** Significant at 5% level

*** Significant at 10% level

Figures in brackets indicate 't' values

Other variables: The rate of productivity advances as measured by total factor productivity index and trend variable are taken as other explanatory variables.

Results

Table 1 gives statistics regarding the coefficients of the step-wise regression model which explains wage-productivity relationship in rural industries.

The outcomes of regression analysis of relationship between wages and productivity in rural industries showed a strong association of wage rate (Lnw) and labour productivity (LnNVA/L) in 5 out of 9 models in these industries. The coefficient of labour productivity (LnNVA/L) was positive and statistically significant consistently in all the functions. Model I revealed that, when taken as the sole factor to explain the relationship, the coefficient of labour productivity (LnNVA/L) was positive and significant. Elasticity of real wage rate (Lnw) with respect to labour productivity (LnNVA/L) was equal to 0.217, the explaining power of the relation being as high as 0.882. Introduction of a trend variable (LnT) in model II increased the explaining power of the model and slightly reduced the co-efficient of labour productivity (LnNVA/L). In model III when net value added (LnNVA) was included, the coefficient of labour productivity (LnNVA/L), the explanatory power of the function had improved. However, the influence of net value added (LnNVA) on wage rate (Lnw) was negative and statistically significant only at 10 percent level. Introduction of capital intensity (LnK/L) in model IV had further improved slightly the explanatory power of the model ($R^2 = 0.981$) as well as labour. Introduction of consumer price index for industrial workers (LnCPIIW) in model V showed that LnCPIIW took negative sign and was statistically not significant, indicating increase in consumer price had reduced the real earnings of the workers. In model VI, introduction of total factor productivity (LnTFPI) had reduced the explanatory power of the model to 0.977. However, the coefficients of all the variables including total factor productivity had positive sign. Model VII, VIII and IX excluding trend variable (LnT) showed negative coefficient for labour productivity (LnGVA/L), but the explaining powers of the model had been increased.

Table 2 provides details regarding the wage – productivity relationship existing in urban industries of India.

The results of regression analysis of wage – productivity relationship in urban industries revealed a positive and statistically significant association between wage rate (LnW) and labour productivity (LnNVA/L) according to model I, III and IX. Introduction of trend variable (LnT) in model II had increased the R^2, but it has reduced the value and significance of labour productivity (LnGVA/L). Inclusion of net value added (LnNVA) in model III showed that net value added (LnNVA) had taken a positive sign and the co-efficient of labour productivity (LnNVA/L) and trend variable (LnT) had increased their values and their statisti-

Table 2 Wage-Productivity Relationship in Urban Industries

Model No	Constant	LnNVA/L	LnNVA	LnK/L	LnCP II W	LnTFPI	LnT	R^2	DW Statistic	F-ratio
I	81.665	.279*								
	(12.212)	(6.068)	-	-	-	-	-	.821	.878	36.817
II	91.767 *	.089					2.979			
	(10.883)	(.746)	-	-	-	-	(1.707)	.874	1.040	24.271
III	103.698*	-.302***	.264				3.645 **			
	(6.749)	(1.930)	(.933)	-	-	-	(2.385)	.890	1.349	16.170
IV	84.662	-.178	.0.51	.814	-.043		5.211			
		(-.633)	(.436)	(0.157)	(-.107)	-	(.280)	.894	1.246	36.164
V	7.998*	-.162	0.58	1.074*	.409		4.928***			
	(.283)	(-.631)	(.335)	(3.573)	(.984)	-	(-1.828)	.969	2.722	39.100
VI	92.006*	1.332		-.228	.203	-.1808	-.3115			
	(9.690)	(1.389)	-	(-.384)	(.783)	(-1.553)	(-.911)	.988	2.287	64.164
VII	82.378*	.253	0.21							
	(6.546)	(.655)	(.069)	-	-	-	-	.822	.875	16.121
VIII	57.308*	-.356	.210	.577*						
	(5.842)	(-1.296)	(1.166)	(3.836)	-	-	-	.948	1.845	36.704
IX	210.380*	2.056*		-.493		-2.665 *				
	(5.819)	(4.261)	-	(-2.013)	-	(-4.402)	-	.985	2.398	131.465

Source: Calculations are based on ASI data

Note: * Significant at 1 % level
** Significant at 5 % level
*** Significant at 10% level

Figures in brackets indicate 't' values

Table 3 Wage - Productivity Relationship in Aggregate Industries

Model No	Constant	LnNVA/L	LnNVA	LnK/L	LnCP II W	LnTFPI	LnT	R^2	DW Statistic	F-ratio
I	83.320*	.242*								
	(17.474)	(8.162)	-	-	-	-	-	.893	1.236	66.617
II	85.685*	.146					1.859			
	(14.552)	(1.649)	-	-	-	-	(1.148)	.910	1.326	35.294
III	114.032*	-.504	.354***				4.354			
	(7.531)	(-1.404)	(1.852)	-	-	-	(2.245)	.943	2.111	32.846
IV	105.173*	-.414	.293	.063			3.875			
	(4.889)	(-1.020)	(1.303)	(.616)	-	-	(1.769)	.947	2.234	22.180
V	-189.001	-.066	-.043	-.055	.783		-9.605			
	(-.811)	(-.139)	(-.125)	(-.408)	(1.267)	-	(-.886)	.962	1.949	20.211
VI	-133.900	.060		-.081	.657**	-.144	-7.362			
	(-1.510)	(1.046)	-	(-.638)	(2.361)	(-1.008)	(-1.742)	.963	1.971	32.235
VII	86.559*	.159	.056							
	(7.726)	(.622)	(.324)	-	-	-	-	.894	1.238	29.635
VIII	74.766*	.193	-.001	.127						
	(4.965)	(.765)	(-.006)	(1.143)	-	-	-	.913	1.648	21.054
IX	126.583*	.877		-.174		-.896				
	(3.273)	(1.739)	-	(-.728)	-	(-1.364)	-	.934	1.301	28.203

Source: Calculations are based on ASI data

Note: * Significant at 1 % level
** Significant at 5% level
*** Significant at 10% level

Figures in brackets indicate 't' values

cal significance. Introduction of capital intensity (LnK/L) in model IV improved the explanatory power of the model and the coefficients of all the variables have slightly reduced though the signs and levels of significance continued to be the same. In model V consumer price index for industrial workers (LnCPIIW) took positive sign and was statistically insignificant indicating that increase in consumer price had not reduced real earnings of the workers. In model VI, introduction of total factor productivity index (LnTFPI) showed that while its co-efficient took a negative sign, the numerical value improved. Screening of other models showed that coefficent of labour productivity (LnNVA/L) was showing mixed trends.

Table 3 explains the relationship between wage rate and productivity of all forms in the aggregate industries.

The results of different models of wage–productivity relationship for the aggregate industries revealed a positive and statistically significant association between wage rate (LnW) and labour productivity (LnNVA/L) according to model I. But this model suffered from comparatively low explaining power, indicating that there were factors other than labour productivity (LnNVA/L) that influenced real wage rate (Lnw) in the country. Introduction of trend variable (LnT) in model II had increased the explanatory power, but it has reduced the value and significance of labour productivity (LnNVA/L). Inclusion of net value added (LnNVA) in model III showed that it had taken a positive sign and the co-efficient of labour productivity (LnNVA/L) and trend variable (LnT) had increased their numerical value and statistical significance. Introduction of capital intensity (LnK/L) (model IV) did not improve the explanatory power of the model and the coefficients of all the variables have slightly reduced. In model V consumer price index for industrial workers (LnCPIIW) took positive sign and was statistically not significant indicating that increase in consumer price had not reduced real earnings of the workers. In model VI, introduction of total factor productivity index (LnTFPI) showed that while its coefficient took a negative sign, the numerical value of labour productivity (LnNVA/L) coefficient has not improved. Screening of other models showed that coefficent of labour productivity (LnNVA/L) was positive.

Conclusion

The nation-wide linkage of wages with productivity may be the best option for neutralization of a rise in the cost of living. The productivity of capital and total factor productivity may be taken into account along with labour productivity while granting wage increases so that the same is not of inflationary nature. Effective utilization of capital should be the correct criterion for a country like India where capital is a scarce factor.

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