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The Relationship between Real Wages and Output: Evidence from Pakistan

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INTRODUCTION

Information on wage levels is essential in evaluating the living standards and conditions of work and life of the workers. Since nominal wage fails to explain the purchasing power of employees, real wage is considered as a major indicator of employees purchasing power and can be used as proxy for their level of income. Any fluctuations in the real wage rate have a significant impact on poverty and the distribution of income. When used in relation with other economic variables, for instance employment or output they are valuable indicators in the analysis of business cycles.

There has been a long debate regarding the relationship between real wages and the employment (output). Despite the apparent simplicity, the relationship between real wages and output has remained deceptive both theoretically and empirically. Keynes (1936) viewed cyclical movements in employment along a stable labour demand schedule thus indicating counter cyclical real wages. His deduction is in line with sticky wages and sticky expectations, which augments models like Phillips curve. In these models real wages behaved as counter-cyclical as nominal wages are slow to adjust during recession (decrease in aggregate demand and associated slowdown in price growth). Stickiness of wages or expectations shifts the labour supply over the business cycles [Abraham and Haltiwanger (1995)]. Barro (1990) and Christiano and Eichenbaum (1992) have associated these labour supply shifts with intertemporal labour-leisure substitution. This in response to temporary changes in real interest rates (fiscal policy shocks) could yield counter-cyclical real wages. However, Long and Plosser (1983) and Kydland and Prescott (1982) while studying the real business cycle models highlight on the technology shocks which leads to pro-cyclical real wages.

Thus according to Abraham and Haltiwanger (1995) the counter or pro-cyclical of real wage cannot be associated with any particular approach.

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“Equilibrium models that assume competitive markets can yield counter-cyclical real wages via inter-temporal labour-leisure substitution in response to cyclical movements in real interest rates as well as pro-cyclical real wages via technology shocks. New Keynesian models with imperfect competition can yield pro-cyclical wages, while the more familiar Keynesian models with sticky wages and prices yield counter-cyclical wages [Abraham and Haltiwanger (1995), pp. 1217].” While elaborating on theoretical under-pinning of any relationship, Neftci (1978) explains that during business cycles labour market observes shifts in the supply and demand curves. These shifts generate a sequence of observations on real wages and employment which, depending on the magnitude of the corresponding shifts, will be positively or negatively correlated.

The empirical literature studying the relationship between the changes in output and wages does not confirm the relation in any particular direction either. The earlier studies of Dunlop (1936) and Tarshis (1939) confirm the pro-cyclical character of the real wages. On the basis of which, they questioned the counter-cyclical nature of the real wages explained by Keynes in 1936 [Kuh (1966)]. Kuh (1966) and then Bodkin (1969) also presented some evidence in favour of pro-cyclical nature of real wages. On the other hand, Otani (1978); Neftci (1978) found a negative correlation between real wages and output. This debate continues ever since. In a recent study, Gafar (1999) finds a pro-cyclical nature for the real wages in most of the Latin American and Caribbean countries.

Pakistan, like many other developing countries, is passing through a period when wide ranging reform agenda is pursued to improve structural imbalances. The aim of the adjustment programme is to increase national income or output in such a way that it results in equitable distribution of wealth. That is, the two objectives of enhanced growth and reduced poverty are being pursued through more efficient use of resources and policy instruments like exchange rates adjustment, monetary and fiscal policies, and banking sector reforms to improve cash-flow situation. However, it is now well recognised that the non-judicious use of policy instruments on the one hand and wrong sequencing of policies on the other have prolonged the on-going recession. Consequently there is an adverse impact on growth and distribution targets. Since the wage-employment link has been seriously affected during the last decade the study of real wages and its relationship with output has become important to tackle labour market issues.

This paper attempts to study how real wages behave when studied in relation with output in Pakistan. The study focuses on sectoral relationship between the two variables with particular focus on the manufacturing sector. The paper is arranged as follows: introduction also explaining the theoretical as well as empirical background is followed by the details of the methodology to be used. Third section will discuss the results. Fourth and final section is the conclusion.

MODEL AND METHODOLOGY

In line with the literature, model is specified to study the real wage-output relationship. Here real wages are specified to depend on output as follows:

$$W_t = \beta_0 + \beta_1 Y_t + e_t \quad \dots \quad \dots \quad \dots \quad \dots \quad (1)$$

$$W_t = \beta_0 + \beta_1 Y_t + \beta_2 Y_{t-1} + e_t \quad \dots \quad \dots \quad \dots \quad \dots \quad (2)$$

Where W_t represents the real wage and Y_t is the output and e is the error term. Equation 1 is the traditional static model. In Equation 2 lagged output is included to emphasise many possible dynamic interactions between wages and employment (output). These include costs of adjustments, intertemporal substitution and the price inflexibilities. [Neftci (1978); Sargent (1978) and Kennan (1988).]

Since the analysis crucially depends on the measurement of the two variables, (real wages and output), the definitions and sources of data are explained in some detail. Annual data is used for the real wages and output for the manufacturing, agriculture, transport and communication, and construction sectors and for the overall economy, from 1980 to 1995. The choice for more recent data points is restricted by the availability of consistent time series for some of the sectors except the manufacturing sector for which a longer time series is evaluated (1967–1997). The data are taken from the different issues of National Accounts Statistics: main Aggregates and Detailed Tables, Pakistan Economic Survey, and the Yearbook of Labour Statistics. For the manufacturing sector the nominal wages are the average annual earnings of factory workers in perennial industries. Real wages are obtained by deflating the nominal wage index by the consumer price index (CPI), wholesale price index (WPI) and the manufacturing price index (MPI).¹ Figure 1 displays alternative measures of real wages in the manufacturing sector. These measures exhibit a high degree of co-movements. All the real wages have exhibited the same basic behaviour whether deflated by using CPI, WPI or MPI. There are minor fluctuations or differences in the three series and no significant or sharp jump. All imply that real wage growth was relatively higher in the earlier period i.e., till 1980s compared to the latter period in which there are many jumps. This can also be seen and confirmed from the trend growth rates in Table 1. All the three estimates of real wage showed a higher growth in the earlier period (1967–80) compared to the latter period (1981–96).

For the output variable (the cyclical indicator) the index of value added and production for the corresponding sector are used in alternative model specifications. Figure 2 depicts the behaviour of value added and the industrial production index for

¹As it is indicated in the empirical literature that different measurement and specifications have a critical impact on the implied cyclical of the real wage.

Table 1

	Period		
	1967–80	1981–96	1967–96
MW/CPI	3.77	2.18	1.86
MW/WPI	3.21	1.43	1.24
MW/MPI	4.31	1.28	1.90
Value Added	5.35	6.62	6.75
Production	3.43	5.88	5.87

Note: MW/CPI is manufacturing wage deflated by consumer price index; MW/WPI is manufacturing wage deflated by wholesale price index; and MW/MPI is manufacturing wage deflated by manufacturing price index.

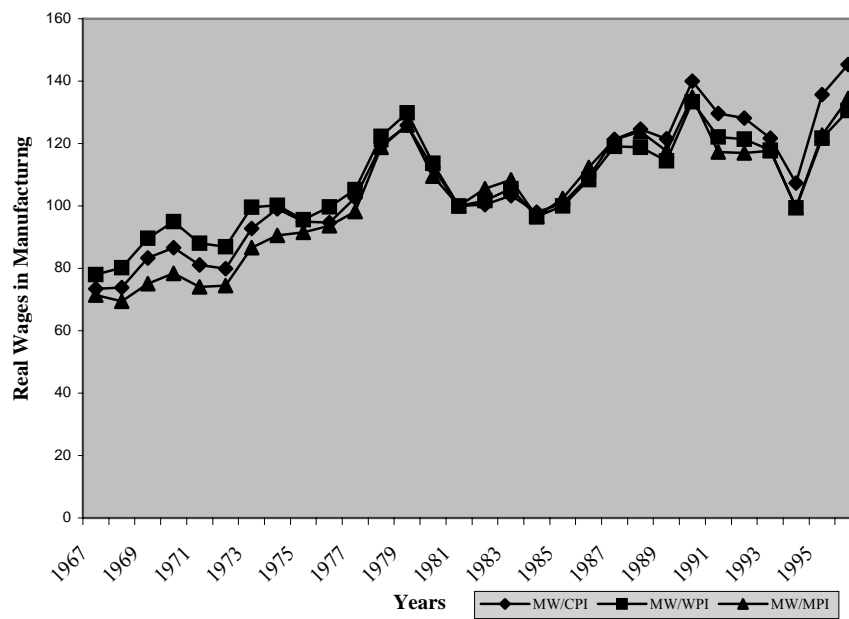


Fig. 1.

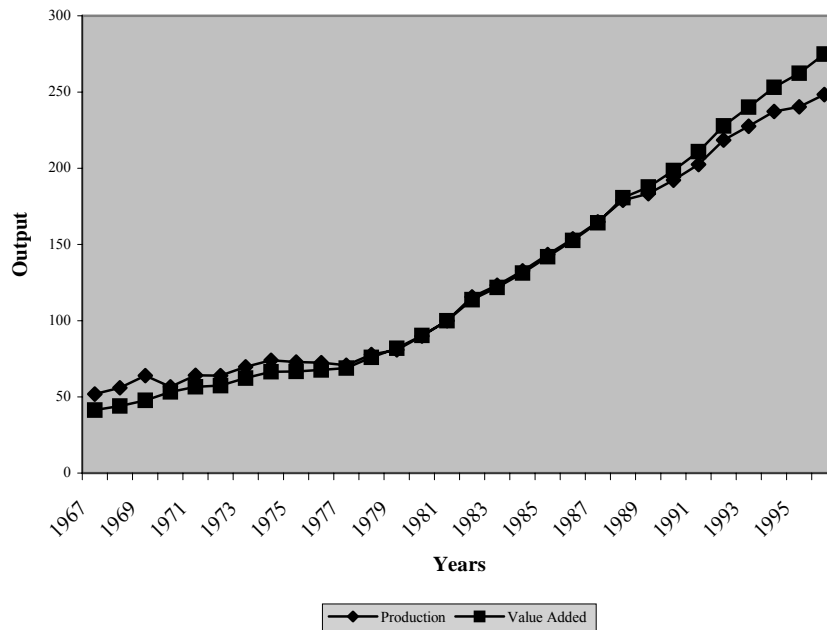


Fig. 2.

manufacturing. The two indicators are highly correlated especially in the middle part of the sample period and minor difference in the initial and the end period. Here the trend growth rate for both value added and production showed a slow growth in the earlier period (1967–80).

For the agriculture, transport and communication and the overall economy the nominal wages are the compensation of employees (used in connection with the national accounts statistics). And for the construction it is the average annual earnings. CPI and WPI are the deflators used to convert them into real wages. Figures 1 to 4 in the appendix displays the behaviour of alternative measures of real wages in the agriculture, construction, transport and communication sectors and the overall economy. No significant difference can be seen with alternative price deflators. Trend growth rates are also estimated for the real wages and the corresponding output for agriculture, transport and communication, construction sectors and for the overall economy. As is obvious from Table 2, all the variables (output as well as real wages) show a positive and high growth trend but of different magnitude. It was only in the construction sector that real wages showed a negative growth in the given period (1980–95).

Table 2

Trend Growth Rates (%)

Sectors	Real Wage Deflated by CPI	Real Wage Deflated by WPI	Real GDP
Agriculture	9.15	7.51	4.05
Construction	-0.24	-1.01	4.57
Transport and Communication	6.08	5.50	5.53
Overall Economy	5.80	5.22	5.65

EMPIRICAL RESULTS

First of all the regression Equation (1) is estimated for the real wage in the manufacturing sector deflated by CPI and the MPI separately for comparison. For the cyclical indicator production index is used.² The results are summarised in Table 3. This equation is estimated in log form as well as in log first-difference forms to remove the trends in the time series and avoid the spurious regression results.³ In log form a linear time trend variable is also included to detrend the series. Equation (2) is also estimated in log first-difference form.

The first point to be noticed is there is no difference in the results with the use of different deflators. Secondly different specification of the model also has not affected the cyclicity of the real wage. In all the cases the real wage is counter cyclical. Results are insignificant when the model is estimated in first difference form. The result remains the same even with the inclusion of the lagged output variable, i.e., Equation (2). Thus in the manufacturing sector for the period (1967–97), with and without lagged variable the coefficient of output variable is negative indicating the counter-cyclical nature of the real wage in the manufacturing sector. This evidence tends to support the hypothesis embodied in the neoclassical and Keynesian theories of employment and output. Since there is no difference in results with the use of different deflators, only CPI is used for further analysis.

²Index of value added was also tried as cyclical indicator but there was no significant difference in the results.

³The existence of the unit root was rejected for the rate of growth of real wage rate and the real GDP. Since most economic time series in level form are non-stationary, but when transformed in first differences in log or growth rate are generally stationary.

Table 3

Regression Results for the Manufacturing Sector

	β_0	β_1	β_2	β_3	R^2	DW
Real Wage/CPI Log Form	6.40	-0.53 (-2.99)*	-	0.05 (4.69)*	0.82	1.24
Real Wage/CPI First Difference	0.03 (1.29)	-0.13 (-0.42)	-	-	0.007	1.94
Real Wage/CPI First Difference	0.04 (1.31)	-0.16 (-0.50)	-0.18 (-0.54)	-	0.02	1.90
Real Wage/MPI Log Form	6.80 (9.20)	-0.65 (-3.36)*	-	0.07 (4.96)*	0.80	1.22
Real Wage/MPI First Difference	0.03 (1.20)	-0.15 (-0.47)	-	-	0.01	2.12
Real Wage/MPI First Difference	0.04 (1.22)	-0.18 (-0.51)	-0.16 (-0.47)	-	0.02	2.21

Note: Value in parenthesis is the *t*-statistics.

β_3 is the coefficient of the time trend variable.

The given sample period is break in two periods (1967–80 and 1981–96) only for the first difference form of equations (results are reported in Table 4). In the first period (1967–80) the coefficient of the growth rate of real GDP was positive. But from 1980 onwards the result is the same as for the whole sample. Thus indicating that the later period was more influencing towards the counter-cyclical nature of the real wages (for the whole sample period). In brief different methods of estimation, different deflators have not influenced the cyclical nature of the real wages in the manufacturing sector of Pakistan but different time period does have an impact.⁴ As

Table 4

Result for the Manufacturing Sector for Different Time Period.

Period	B_0	B_1	B_2	R^2	DW
1967-80	0.03 (1.07)	0.08 (0.23)	-	0.01	1.6
1967-80	0.02 (0.57)	0.17 (0.41)	0.16 (0.37)	0.02	1.46
1981-96	0.07 (1.34)	-0.86 (-1.15)	-	0.09	2.31
1981-96	0.09 (1.37)	-0.63 (-0.70)	-0.43 (-0.48)	0.10	2.31

Note: Value in parenthesis is the *t*-statistics.

⁴The study has not taken account of the composition bias—cyclical changes in the combination of work force may affect the behaviour of aggregate wage series.

far as the insignificant results are concerned, it might be the result of relatively small variances in the growth rate of output and real wages. But this argument is not empirically established as seen in Table 9, where coefficient of variation is estimated for all the series.

Equations (1) and (2) are also estimated for the agriculture sector, transport and communication, construction and the overall economy. Results are summarised in Table 5, Table 6, Table 7 and Table 8, respectively. The deflator used is CPI and the cyclical indicator is the index of value added in the corresponding sector.

Table 5

Regression Results for the Agriculture Sector

	B ₀	B ₁	B ₂	B ₃	R ²	DW
Log Form	2.57 (0.16)	0.54 (0.15)	–	0.07 (0.47)	0.53	0.28
First-Difference (Eq. 1)	0.03 (0.35)	1.90 (1.48)	–	–	0.15	1.13
First-Difference (Eq. 2)	0.13 (1.23)	1.16 (0.83)	–1.90 (–1.36)	–	0.27	1.04

Note: Value in parenthesis is the *t*-statistics.

Table 6

Regression Results for the Transport and Communication Sector

	B ₀	B ₁	B ₂	B ₃	R ²	DW
Log Form	4.44 (1.28)	0.01 (0.02)		0.06 (1.42)	0.89	2.17
First-Difference (Eq. 1)	0.03 (0.37)	0.49 (0.41)			0.01	2.90
First-Difference (Eq. 2)	0.07 (0.67)	0.58 (0.45)	–0.83 (–0.60)		0.05	2.79

Note: Value in parenthesis is the *t*-statistics.

Table 7

Regression Results for the Construction Sector

	B ₀	B ₁	B ₂	B ₃	R ²	DW
Log Form	2.51 (4.26)	0.48 (3.50)	–	–0.02 (–3.83)	0.54	1.15
First-Difference (Eq. 1)	–0.01 (–1.69)	0.18 (1.20)	–	–	0.08	2.22
First-Difference (Eq. 2)	–0.02 (–2.06)	0.15 (0.94)	0.18 (1.16)	–	0.16	2.07

Note: Value in parenthesis is the *t*-statistics.

Table 8

Regression Results for the Overall Economy

	B ₀	B ₁	B ₂	B ₃	R ²	DW
Log Form	-13.12 (-3.15)	3.88 (4.26)	-	-0.16 (-3.13)	0.95	1.60
First-Difference (Eq. 1)	0.02 (0.25)	0.76 (0.63)	-	-	0.03	1.86
First-Difference (Eq. 2)	-0.04 (-0.33)	1.07 (0.84)	0.72 (0.57)	-	0.08	1.78

Note: Value in parenthesis is the *t*-statistics.

When real wage output relation is estimated for agriculture, transport and communication and construction sectors in log first difference form, none of the coefficient is significant. Secondly, no significant change can be observed with the inclusion of the lagged output variable. Thirdly, the coefficient of real growth in GDP is positive in all these cases, irrespective of the fact which method of estimation is used, suggesting a rejection of the Keynesian wage rigidity hypothesis i.e., real wage is counter-cyclical. Rather real wage is pro-cyclical in the agriculture, transport and communication and construction sectors. Similar results are obtained for the overall economy (Table 8). The real wage for the overall economy has turned out to be pro-cyclical.

Table 9

Coefficient of Variation

	W	Y
Manufacturing	0.18	0.51
Agriculture	0.42	0.19
Construction	0.03	0.23
Transport and Communication	0.29	0.25
Overall Economy	0.25	0.25

Here the results are more or less similar to those found by Gafar (1999) for the 18 less developed countries i.e., pro-cyclical real wage. The pro-cyclical real wage rate is consistent with a Keynesian framework under the assumption of sticky prices, flexible wages, and a competitive labour market. However, in Pakistan widespread inflation, wage restraint and unemployment do not provide the evidence to support this Keynesian view. Theoretically, behaviour of the real wage rate supports the business cycle theory in which emphasis is on the technological shocks and the intertemporal substitution of labour. In Pakistan there is widespread poverty and high rate of unemployment like many other developing countries. At the same time no

unemployment insurance benefits are provided therefore the notion of intertemporal substitution becomes irrelevant. According to Gafar (1999) pro-cyclical behaviour of real wage rates in the less developed countries is due to the shifts in labour demand curve over the business cycle. According to him short run fluctuations in output are due to the fluctuations in aggregate demand, “changes in the commodity terms of trade or the real exchange rate exert influence over production, employment, demand, and real wages [Gafar (1999), p. 116].”

CONCLUSION

According to the estimates in this study, the relationship between real wages and output is complex and also inconclusive. Regardless of the fact, which method of estimation is used or which deflator is used for the real wage the results remained the same. Only different time periods (for the manufacturing sector) have affected the cyclical nature of the real wage. For the manufacturing sector the real wage has turned out to be counter-cyclical. While for agriculture, transport and communication, construction and the overall economy real wage is pro-cyclical, i.e., real wage tend to increase with economic growth. And increases in real wage rate tend to reduce poverty. It's the other way round in the manufacturing sector. Its important to mention here that the measure of nominal wages used for manufacturing is different from the measure used for other sectors and the overall economy. This might be the reason for the different results.

Due to mix results its difficult to reach any specific policy implication. And the existing controversy in the empirical literature continues. Given the results in the manufacturing sector, it can be said that there is a need to implement rational and consistent pro growth policies and the maintenance of a stable economic environment.

APPENDIX

Fig. 1.

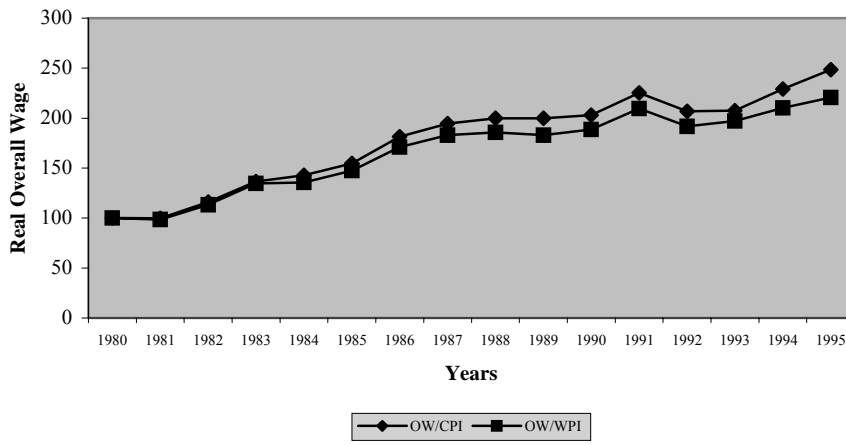


Fig. 2.

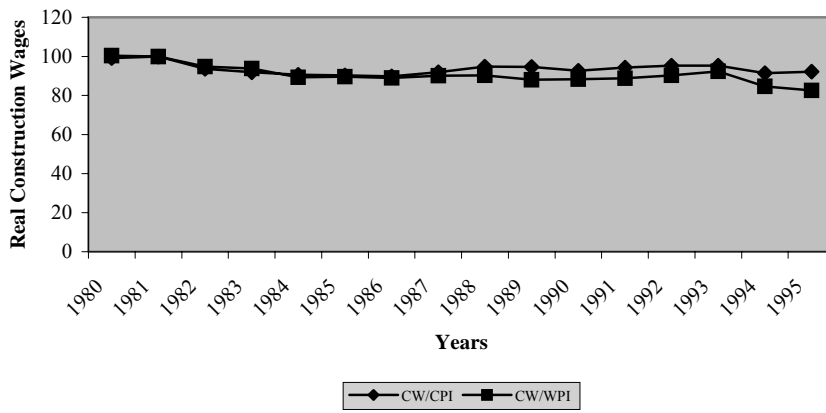


Fig. 3.

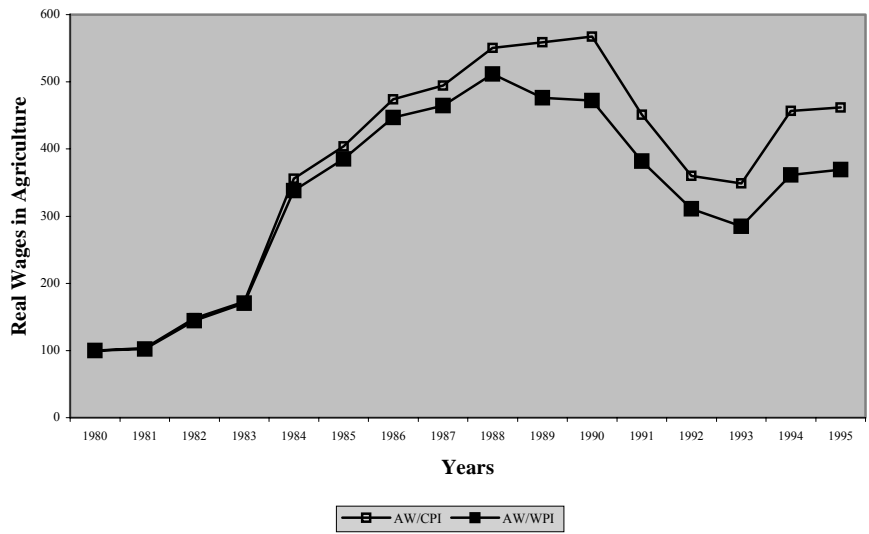
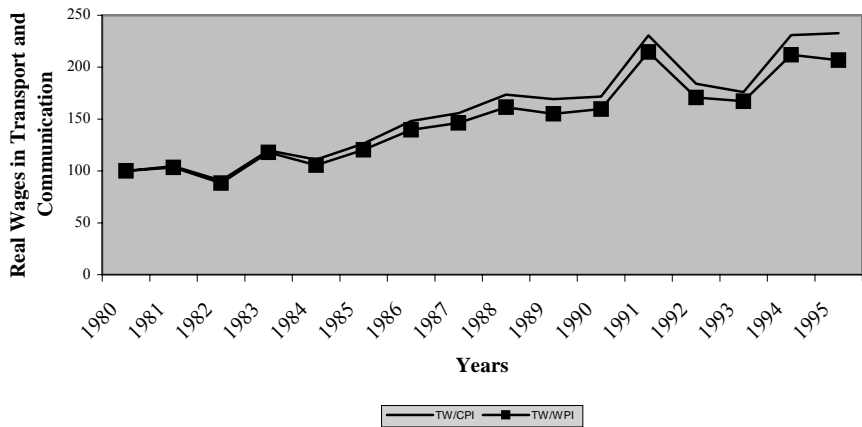


Fig. 4.



REFERENCES

- Abraham, K. G., and J. C. Haltiwanger (1995) Real Wages and the Business Cycle. *Journal of Economic Literature* 33:3, 1215–1264.
- Barro, R. J. (1990) *Macroeconomics*. (3rd ed.). New York: John Wiley.
- Bodkin, R. G. (1969) Real Wages and Cyclical Variations in Employment: A Re-examination of the Evidence. *Canadian Journal of Economics* 2:3, 353–374.
- Christiano, Lawrence J., and Martin Eichenbaum (1992) Current Business Cycle Theories and Aggregate Labour Market Fluctuations. *American Economic Review* 82:3, 430–50.
- Gafar, J. (1999) Real Wages and Output: Some Evidence from Latin American and Caribbean Countries. *The Indian Economic Journal* 46:4, 109–118.
- Pakistan, Government of (Various Issues) *Economic Survey*. Islamabad: Finance Division.
- ILO (Various Issues) *Yearbook of Labour Statistics*. Geneva: International Labour Office.
- Kennan, J. (1988) Equilibrium Interpretations of Employment and Real Wage Fluctuations. *NBER Macroeconomics Annual* 157–216.
- Kuh, E. (1966) Unemployment, Production Functions and Effective Demand. *Journal of Political Economy* 74:3, 238–49.
- Kydland, F. E., and E. C. Prescott (1982) Time to Build and Aggregate Fluctuations. *Econometrica* 50:6, 1345–70.
- Long, J. B., and C. I. Plosser (1983) Real Business Cycles. *Journal of Political Economy* 91:1, 39–69.
- Neftci, S. N. (1978) A Time-series Analysis of the Real Wage-employment Relationship. *Journal of Political Economy* 86:92, 281–291.
- Otani, I. (1978) Real Wages and Business Cycles Revisited. *Review of Economic Statistics* 6:2, 301–304.
- Sargent, T. J. (1978) Estimation of Dynamic Labour Demand Schedules under Rational Expectations. *Journal of Political Economy* 86:6, 1009–44.
- UN (Various Issues) *National Accounts Statistics: Main Aggregates and Detailed Tables*. Geneva: United Nations.

Comments

The paper by Afia Malik and Ather Maqsood Ahmed is an important contribution to the field. The authors have searched for and brought forth empirical regularity in wage-output relationship in Pakistan's economy. For this study they required data on real wages that was not readily available and which they had to generate with great effort.

Like other stylised facts of macroeconomics, for example a positive relationship between consumption, investment and GNP or the empirical truth that investment tends to be more volatile than consumption, many economists have tried to argue for some regular pattern of behaviour of real wages and output (or employment) over a business cycle. This debate has long history in economics literature. It is motivated by not only a search for empirical regularity but also to test the implications of alternate macroeconomic models. The debate is still continuing. The authors of the present paper have reported an inverse relationship (i.e., counter-cyclical movement) between real wages and output in the manufacturing sector of Pakistan while their results for the over-all economy and the other sectors are not so conclusive because of lack of data. One can ask how much the results are consistent with reality? Their results for the manufacturing sector are consistent with following theoretical possibility. We expect strong and statistically significant (positive or negative) relationship between real wages and output for the last decade than for the decade before it due to market reforms. Because these market reforms are expected to forge a relationship between the two variables and indeed we find the results of this paper confirm to this expectation (see Table 4, regression coefficients are much larger and statistically significant for the period 1981–1996 than for period 1967–80). These are some strong points of this paper.

Let us shift attention now to the tests for empirical relationship between real wage and output. An important finding in the literature as surveyed and critically evaluated in [Abraham and Haltiwanger (1995)], (the article on which the present paper is based), is that the relationship between real wage and output (or employment) is sensitive to (i) measurement of variables, (ii) specification of the model, i.e., detrending method used (iii) time period under consideration, and (iv) frequency of the data. In the present paper the authors have put in some effort to check the sensitivity of the results along these lines only to a limited extent. Implications of high frequency data could not be checked for data limitations but at least sensitivity checks of alternate specifications and detrending methods could still be employed. The authors have concluded that “different methods of estimation, different deflators have not influenced the cyclicity of the real wages. This is too broad a conclusion given that the authors have used only two specifications of the

model or two methods of detrending the series. In the literature on different countries it has been demonstrated that results are sensitive to detrending methods. The use of differences in log has the disadvantage that high frequency changes are captured while low frequency movements are filtered out. To address this problem an alternate detrending method Harcourt-Prescott filtering can be used on manufacturing sector wage and the cyclical index.

An interesting question to ask would be that why the regression results of both Equations 1 and 2 for over-all sample period in the manufacturing sector are statistically significant in levels data but insignificant in differenced data (see Table 3). It may be due to some omitted variable working as nuisance variable. Regarding the pro-cyclical relation between real wage and output in other non-manufacturing sectors of Pakistan the authors have pointed that this is consistent with Keynesian framework where it is generated by sticky prices and flexible nominal wages but this is not possible given the high rate of inflation and restraints on nominal wages in Pakistan. To resolve this, they are inclined towards the explanation offered by Gafar (1999) quoted in their article that the short-run fluctuations in the output are due to perturbations in the aggregate demand brought out by factors such as changes in terms of trade and exchange rate that impact production, employment, and real wages. If this is the case then an extension is possible by directly testing the influence of these variables on the relationship between real wages and output.

The relationship between real wages and output is in fact determined by the relative shifts in the demand for labour and supply of labour curves over a business cycle. The relative elasticities of the two curves also have a role to play. To understand this relationship for Pakistani data and to resolve the so far inconclusive results of this paper a VAR model of the type specified in Abraham and Haltiwanger (1995) can be estimated for Pakistan.

Lastly, commenting on ways to improve the exposition I would submit that the paper lacks a good introduction. It is not clear from the first few paragraphs what is the main issue or objective that the researchers want to pursue among the many issues listed by them such as: (i) role of wage levels in evaluation of living standards (ii) possible use of real wages in conjunction with data on employment and output as indicator of business cycle, (iii) study of wage employment link that is thought to be effected due to macroeconomic adjustment programmes in Pakistan, (iv) how real wages behave in relation to output?

In reality it is the last listed objective that is taken up in the paper without mentioning what would be attained by knowing this relationship. There are abrupt shifts in the thought flows. See for example the gulf between paragraph 1 and paragraph 2 of the introduction. Further, it will be better if authors devote more space to the theoretical basis for the expected relationship between real wage and output. As mentioned above that there are many theoretical explanations with conflicting implications that should be elaborated. Moreover, inclusion in the paper

of the wage series data that is constructed by the authors will be helpful to other researchers who will follow their path. In the concluding section first paragraph word “pro-cyclical” is used while it should be “counter-cyclical”.

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REFERENCES

- Abraham, Katharine G., and John C. Haltiwanger (1995) Real Wages and the Business Cycle. *Journal of Economic Literature* 33, 1215–1264.
- Malik, Afia, and Ather Maqsood Ahmed (2001) Relationship between Real Wages and Output: Evidence from Pakistan. Paper presented in the Sixteenth Annual General Meeting of PSDE (January) at Islamabad.