Do Higher Wages Cause Inflation?
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Introduction

Does an increase in nominal wage cause price inflation? Or does the causality run the other way - price inflation causes wage inflation? These are questions faced by monetary authorities when looking at the relationship between changes in wages and in prices. In this article, we look into the economic theory behind this relationship and on the empirical evidence.

What does economic theory tell us?

It is commonly believed that higher wages lead to higher inflation. This view takes its root from the Keynesian theory of cost-push inflation which attributes the basic cause of inflation to supply-side factors. Specifically, inflation results from increases in the wage rate. Wages are determined in the labor markets and they are assumed to be dependent on the unemployment rate (i.e., an increase in the unemployment rate reduces the rate of growth of wages). Given the wage rate, firms set their prices by adding a mark-up which determines their profit margin. Thus, when wages are increasing, firms face higher costs of production and they pass on the higher costs in the form of increased prices (Bridgman and Trehan, 1996).

How does monetary policy affect wages and prices in this framework? Consider the case when monetary authorities want to reduce inflation. To do so, they will increase the interest rates. Higher interest rates would cause consumers and firms to reduce the money they spend (i.e. consumers might be enticed to save given the higher interest rates offered while firms might postpone investments because of the high cost of borrowing funds). Lower spending leads to a

decline in demand. With declining demand, firms would cut back on their production and employment. This would result in higher unemployment which, in turn, would slow down the rate of wage increases. Once the desired level of inflation has been achieved, the monetary authorities could reduce the interest rates. This could lead spending to increase again. Thus, the tightening (loosening) of monetary policy could lead to a decrease (increase) in the rate of inflation as well as to slowing (rising) growth of nominal wages.

Friedman (1968) offers a contrasting view to the effects of monetary policy in the economy. His example assumes that monetary authorities want to reduce the unemployment rate. In order to achieve this objective, they increase the rate of money growth, causing interest rates to temporarily fall. Spending increases as a response. As demand increases, output and employment will likewise expand. Firms are able to raise the prices of their products faster than the rise in the prices of the factors of production (i.e. including labor). Firms would therefore find it profitable to expand output. However, workers would soon catch on to the fact that with rising prices, the purchasing capacity of their wages is being eroded. They will then demand higher wages to compensate for the higher prices. Consequently, wages adjust fully to the rise in prices. This causes unemployment to rise to its previous level, as the cost of labor increases.

These views on the relationship of monetary policy with wages imply that movements in inflation precede changes in the wage level. While these notions may be supported by sound economic theory, the empirical evidence to support the claim that wage changes cause price inflation points to a weak relationship between these two

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variables. On the contrary, it is more often observed that price inflation results in wage inflation (Jonsson and Palmqvist, 2004).

Price and wage inflation in the Philippines

While wage inflation displayed more wild swings than price inflation (Figure 1), the two series generally shared the same trend (they have a correlation coefficient of 0.46). Wage inflation followed the movements in price inflation during the late 1980s till the mid-1990s. The path of the two series diverged in the late 1990s but they again tracked the same trend in the 2000s with wage inflation leading price inflation by a few quarters. One important implication of this is that wage and price changes are related. However, the direction of causation between the two variables (e.g. if higher wages cause higher prices or vice-versa) is not evident.
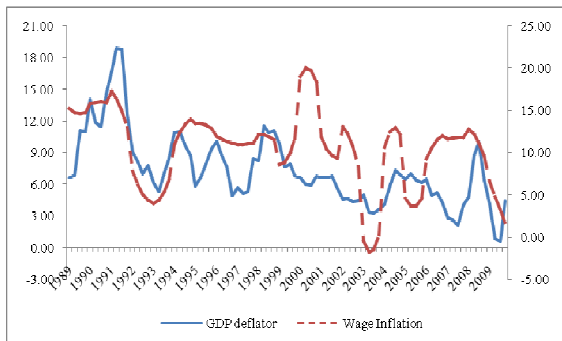
FIGURE 1: Price and Wage Inflation

Figure 1 plots the annual growth rate of GDP deflator (as measure of price inflation) and annual growth rates of labor compensation[2] (as measure of wage inflation) over the period of 1988-2009.

Hess and Schweitzer (2000) noted that the growth of nominal wages may not be a good measure of the cost pressures faced by firms. If the wage growth is due to productivity growth, then it should not translate to higher prices. This implies that employers have to compensate their workers for increased productivity. Thus, productivity should be accounted for when looking into the effects of wages on inflation. The unit labor cost[3],

which is the cost to the firm of producing one unit of output, is used as a measure of wages adjusted for labor productivity. From the graph (Figure 2), we see that unit labor cost tends to follow inflation closely. However, as in the previous case of inflation and labor compensation, the causation between these two variables cannot be easily discerned.
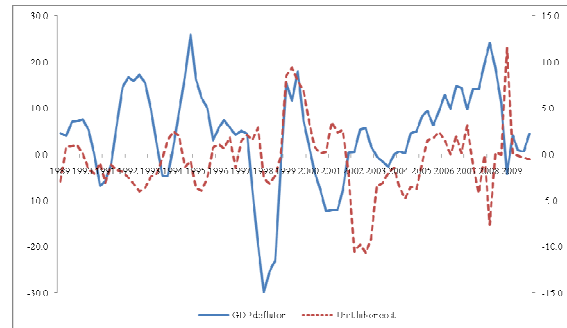
FGURE 2: Price Inflation and Unit Labor Cost

Figure 2 graphs inflation and the unit labor cost.

Testing for Granger causality[4]

While simple graphical representations of wages and prices show that they move together, the direction of causality between these two variables is not apparent. Causality in this sense refers to what is termed in economics as "Granger causality." Granger causality is a statistical concept which involves testing whether the past values of one variable (e.g. wages) contain information that will help predict another variable (e.g. prices). It is possible, however, that both variables may "Granger cause" each other such as when both economic series are determined simultaneously. In such a case, one cannot conclude that one series has an independent causal effect on the other.

Table 1 presents the results of the test for Granger causality between wages and prices using monthly data for the Philippines.[5] Wage

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[2] Total labor compensation was taken from the National Accounts of the Philippines (NAP).

[3] Unit labor cost was constructed as the ratio of total labor compensation to GDP at factor costs as

recorded in the National Accounts of the Philippines (NAP).

[4] Gujarati, Damodar N. 2003. BasicEconometrics. McGraw-Hill. Fourth edition.

[5] Tables 1 and 2 were taken from an earlier empirical exercise on the impact of nominal wage hike on inflation done by Ms. Haydee L. Ramon, Sr. Research Specialist, Department of Economic Research.

is constructed as an index of the regional minimum wage levels while inflation is measured as the annual percentage change in the CPI. The null hypothesis is that there is no Granger-causation between wages and prices (i.e. wage changes does not cause price inflation). The table shows the level of statistical significance that one can reject this null hypothesis (the p-values) for the given number of lags in wages. In general, when the p-value is less than 0.1, there is Granger causality.

TABLE 1: Granger Causality Test – Wages on Inflation

Number of lags in months	p-value
1	0.829
6	0.002
12	0.041
18	0.292

Null hypothesis: Wage growth does not Granger cause price inflation

From Table 1, a wage change which occurred a month ago does not affect current inflation while those which took place some six to 12 months ago have impacts on inflation. Two possible explanations can be given for this observation. Workers do not immediately change their consumption behavior in response to a change in the wage they receive. However, given a longer period, workers find that their disposable income has increased and this could raise their demand. Higher demand leads to higher prices. On the other hand, intense competition in the market could force firms to squeeze their profits in the face of higher wages (higher production costs) rather than charge higher prices to their consumers. The effect of wage changes in inflation is likewise found to wane over time. This is evidenced by the observation that wage growth which took place 18 months before no longer affects current inflation.

On the other hand, inflation is found to Granger cause wage growth. Table 2 shows the results of the Granger causality test done on inflation and wage. The null hypothesis is that inflation does not Granger cause wage growth. This hypothesis is rejected when we consider inflation which occurred within a year (i.e. 12 lags). The observation, that price inflation causes wage growth with a lag of one month, is consistent with what is commonly

seen in the labor market during times of increasing prices. When workers are faced with increasing prices, they start to lobby for higher wages to compensate them for the decline in their purchasing capacity.

TABLE 2: Granger Causality Test – Inflation on Wage Growth

Number of lags in months	p-value
1	0.038
6	0.009
12	0.089
18	0.406

Null hypothesis: Wage growth does not Granger cause price inflation

Conclusion

The causal relationship between changes in wages and price inflation has been widely studied in the literature. While economic theory is able to explain the possible causality between the two variables, the empirical evidences on the effect of wage growth on inflation point to a weak relationship. On the contrary, it is more often observed that price inflation results in wage inflation.

A simple Granger causality test between wage growth and price inflation was conducted using Philippine data for the period 1989-2009. It was found that causality between wage changes and inflation runs in both directions.

Future research in this area could expand further the analysis to include other variables which can affect wage growth and inflation (e.g., productivity, money supply growth). Moreover, the wage variable in this article was constructed as an index of the regional minimum wage levels. Empirical studies have shown that the use of different measures of wage and price inflation (e.g., unit labor costs for wage; GDP deflator for inflation) can yield varying conclusions. Thus, another possible research extension is on the effect of using different measures of wage and price inflation in the causality analysis.

References

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Appendix

The Granger causality test involves examining whether the lagged values of one series (e.g. wages) contain information relevant to the prediction of another variable (e.g. inflation). The test requires the estimation of the following pair of regressions:

$$\pi_t = \sum_{i=1}^{n} \alpha_i W_{t-i} + \sum_{j=1}^{n} \beta_j \pi_{t-j} + \mu_{1t} \tag{1}$$

$$W_t = \sum_{i=1}^{m} \lambda_i W_{t-i} + \sum_{j=1}^{m} \delta_j \pi_{t-j} + \mu_{2t} \tag{2}$$

where π_t is inflation at time t; π_{t-j} are lagged inflation rates; W_t is wage inflation at time t; and W_{t-i} are lagged wage inflation values. It is assumed that the disturbances μ_{1t} and μ_{2t} are uncorrelated. Equation 1 postulates that the inflation rate is related to past values of itself as well as that of W_t while equation (2) assumes a similar behavior for W_t.

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