Link between Food Price Inflation and Rural Wage Dynamics

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In exploring the link between food price inflation and rising rural real wages, this paper examines the dynamic relations between rural wages in different sectors and the relationship these wages share with increasing food prices. It looks into the possibility of a Lewsian transformation causing an increase in real rural wages, but the result of the analysis suggests that the rise in wages is because of an increase in bargaining power due to public works programmes, which employ unskilled rural workers. Food price inflation induces them to bargain for higher wages.

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1 Introduction

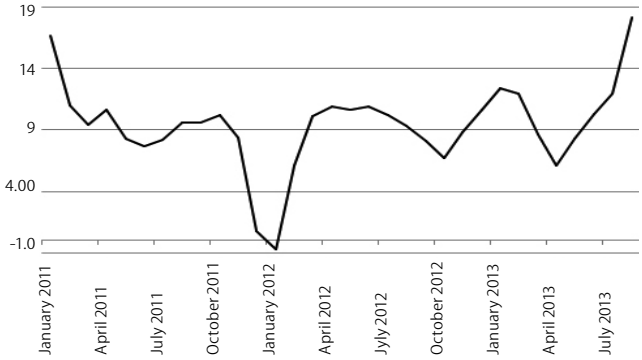
Persistent and high food price inflation over the last few years has become a major concern for the Indian economy. The concern is not only about ensuring food security, but also about it stimulating an economy-wide inflationary situation, which will affect growth and income distribution adversely. Food inflation based on the wholesale price index (WPI) for food articles for the last two years shows that it is roughly around 9.37% on average. But it crossed the 18% level in August 2013 (Figure 1, p 67).

Persistent food price inflation has led to an intense debate among academicians and policymakers on its causes. Various studies have tried to identify the reasons for the acceleration in food prices. The different reasons that have been cited include a fall in agricultural output between 2008-09 and 2009-10; an increase in the domestic demand for food; higher food exports; high minimum support prices for foodgrains; large-scale procurement of foodgrains by governments; hoarding and speculation; high world food and oil prices; and an exchange rate pass-through to domestic prices (Kumar et al 2010; Chand 2010; Carrasco et al 2012; Nair and Eapen 2011, 2012; Khundrakpam 2008).

This period of high food inflation has also been characterised by high rural real wages. Daily real agricultural wages (deflated by food WPI) went up from Rs 63.05 in April 2004 to Rs 80.05 in November 2012 whereas rural daily real non-agricultural wages went up from Rs 83.64 to Rs 92.24 (based on data published by the Labour Bureau of India). The increase in rural wages can influence food prices both by enhancing demand and pushing up the cost of production. Increasing food prices, in turn, stimulate inflationary expectations among workers, inducing them to bargain hard for higher nominal wages to neutralise the impact of inflation on their standard of living. There is a need to explore the empirical validity of the theoretical two-way relationship between increasing rural wages and food inflation. To understand this relationship, it is essential to understand the structure of changes in different categories of rural wages and food prices (that is, in rural wages, agricultural and non-agricultural; and in food prices for different items). To do this, this paper attempts to trace food price and rural wage dynamics and their effect on each other.

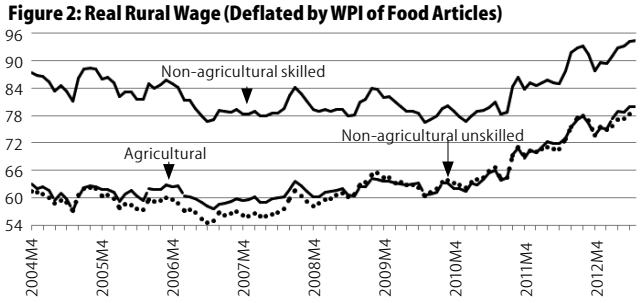
The monthly WPI at base year 2004-05 of food articles, published by the office of the economic adviser, is used as the price deflator. We have categorised rural workers' occupations into three broad categories – (i) skilled non-agricultural; (ii) unskilled non-agricultural; and (iii) agricultural workers.

Figure 1: Monthly Food Inflation (WPI, 2004-05 = 100)



Source: RBI database.

Figure 2: Real Rural Wage (Deflated by WPI of Food Articles)



Skilled non-agricultural workers are employed as carpenters, blacksmiths, cobblers, masons, and tractor drivers. Agricultural workers are involved in ploughing, sowing, weeding, transplanting, harvesting, winnowing, threshing, picking, herding, digging wells, and crushing cane. The simple average of daily wage rates of agricultural occupations for men has been considered as a proxy for daily agricultural wages, while the daily unskilled labour wage for men in the category of non-agricultural occupations has been considered as a proxy for the daily wages rates of rural unskilled workers. The simple average of daily rural wage rates of skilled non-agricultural occupations for men has been considered as a proxy for daily skilled rural non-agricultural wages. The data published by the Labour Bureau of India in its *Indian Labour Journal* has been used for the average daily agricultural and rural wages of skilled and unskilled workers at the all-India level.

The structure of the paper is as follows. Section 2 describes rural wages dynamics, and Section 3 describes the relationship between rural wages and food prices. Section 4 comprises concluding remarks.

2 Rural Wages Dynamics

Figure 2 plots the daily real wage data (monthly average) from April 2004 to November 2012. It shows that real rural wages in India have gone up during this period. One would like to believe that this is due to a shortage of labour. What is causing this labour shortage? Is it high growth in modern industry and services, which pulls labour to urban centres, or is it growth in some non-farm sector, say construction, in rural India? Or is it something else?

Figure 2 shows that rural wages of skilled labour are higher than agricultural and unskilled non-agricultural rural wages. The real wages of all the three categories have gone up without showing a uniform trend. The real agricultural wage showed a stable trend between April 2004 and April 2006. Over the next three months, it fell sharply, followed by relatively low stable real wages for roughly one year, September 2006 to August 2007. As a result, the average growth rate of agricultural wages from April 2004 to September 2007 was negative. It has grown continuously after that. The real unskilled wage was more or less equal to the real agricultural wage for the initial year, from April 2004 to March 2005. It then declined, compared to the agricultural wage, till August 2007. Again, roughly for a year, September 2007 to September 2008, it grew at a much faster pace than the agricultural wage. From October 2008 to June 2012, both were more or less equal. From June 2012 onwards, the agricultural wage grew at a faster pace than the wage of rural unskilled workers. The skilled rural wage showed a declining trend from April 2004 to December 2009, before registering growth. Even so, the average growth rate was lower than agricultural and unskilled rural wages.

So, it is very clear that the wages of rural unskilled workers began growing first, followed by agricultural wages. Behind this came the wages of rural skilled workers. Is the increase in rural wages caused by a Lewsian transformation? The key to a Lewsian transformation is labour absorption in the modern

Table1: Average Growth Rate of Rural Real Wages (in %)

	Agricultural	Non-agricultural Skilled	Non-agricultural Unskilled
April 2004 to August 2007	-0.15	-0.27	-0.21
September 2007 to December 2009	0.12	0.0034	0.33
January 2010 to November 2012	0.81	0.58	0.75

sector and urban informal sector. If that happens, it first creates a labour shortage in the rural skilled labour market, as those who are better skilled get absorbed in the modern sector and urban informal sector compared to agricultural labourers and unskilled non-farm workers. This gets reflected in the wage growth structure, which is absent here. Further, the increase in wages for rural skilled labour should percolate down to the wages of agricultural labour and unskilled rural labour. And there should be a long-run convergence of wages across these three sectors, with feedback coming from rural skilled non-farm wages to the other two rural wages. If additional demand for rural labour comes from the rural construction sector instead of the modern and urban informal sector, the dynamics of rural wages could be similar to that of a Lewsian transformation.

The long-run convergence of wages has been primarily predicted by the standard neoclassical theory of the labour market. This assumes the homogeneity of workers and jobs, no information asymmetry, and no issues to do with worker motivation and risk shifting. The theory predicts that an equilibrium wage exists at the point where the curve of the demand for labour intersects that of the supply of labour. The long-run equilibrium wage is equal to the value of the marginal product of the marginal worker across all firms. Any temporary wage difference is caused by differences in labour productivity, probably due to fluctuations in the demand for labour, both at the firm and sectoral levels. This will cause the movement of labour between

sectors and lead to the equalisation of productivity and wages across sectors. Hence, this theory predicts a long-run wage rate convergence across sectors. If a Lewsian transformation occurs, we should experience a substantial degree of rural labour market integration or a long-run convergence of all the three rural wages, and the causal relationship should move from wages of rural non-farm skilled to the other two wages.

We have tested this empirically by tracing the long-run relationship and feedback mechanisms between these three wages. The wage rate of skilled labour is integrated of order two; the wage rates of agricultural labourers and unskilled rural non-farm workers are integrated of order one respectively (Table 2). This indicates no possibility of the existence of a long-run convergence between skilled rural non-farm workers wages and the other two rural wages.

Table 2: Unit Root Test Result

Variables	Model	Adj t-Stat	Prob	Test Critical Values			Lag
				1% Level	5% Level	10% Level	Length
Augmented Dickey-Fuller unit root test in the levels							
LNSKILL	Constant	7.885	1.00	-3.495	-2.8898	-2.582	0
LNAGRI	Constant	4.179	1.00	-3.495	-2.8898	-2.582	0
LNUNSKILL	Constant, linear trend	-2.621	0.27	-4.049	-3.454	-3.153	0
Augmented Dickey-Fuller unit root test in First Difference							
D(LNSKILL)	None	1.546	0.969	-2.590	-1.944	-1.614	11
D(LNAGRI)	Constant	-8.689	0.00	-3.496	-2.890	-2.582	0
D(LNUNSKILL)	Constant, linear trend	-11.165	0.00	-4.051	-3.454	-3.153	0
Augmented Dickey-Fuller unit root test in Second Difference							
D(LNSKILL,2)	None	-7.028	0.00	-2.590	-1.944	-1.614	10

LNSKILL stands for log representation of skilled rural non-farm wage, LNAGRI stands for log representation of rural farm wage, LNUNSKILL stands for log representation of unskilled rural non-farm wage.

Besides this, there exist a large number of empirical studies that suggest sectoral variations in wage rates.[1] Various attempts have been made to explain these variations within the neoclassical framework – due to a difference in productivity caused by a difference in skill preventing the movement of labour from the low-wage sector to the high-wage sector; and by a difference in the attractiveness of different jobs (primarily arising from non-market characteristics such as geographical location, physical hazards, and so on) and different compensating wages for them. Another explanation comes from the unobserved heterogeneity of job characteristics and workers, which may not be randomly distributed across industries. As a result, high-paying industries may be those with unmeasured high labour quality. A difference in job hazards or a difference in geographical location cannot explain the macroeconomic phenomenon of the Indian rural labour market showing no tendency of long-run convergence among rural wages.

Neo-Keynesian explanations for sectoral wage differentials are based on the efficiency wage hypothesis and rent-sharing models.[2] According to this framework, a particular firm or industry becomes more efficient when workers stay for a longer period. Gains in productivity due to the unrestricted movement of labour across the firm are lower than these efficiencies. In such a case, the structure of the labour market, employment conditions, and the wage structure will adjust to incentivise long-term attachments. Thus, a less-integrated labour market will be created.

The reasons for a longer association causing efficiency have been categorised into four.

(i) Preventing shirking: In high-wage industries, or those with high monitoring costs, an efficiency wage is paid to increase the cost of job loss and to lend greater effectiveness to the threat of firing.[3]

(ii) Reducing turnover: High-wage industries want to reduce the turnover of the workers to avoid the high cost of training new workers to replace them.[4]

(iii) Adverse selection models: High-wage industries, which are more sensitive to labour quality differences and have higher costs of measuring quality, offer higher wages to make better qualified people apply.[5]

(iv) Fair wage: High-wage industries with high profits made due to workers' efforts believe that they should share rents to maintain fairness.[6]

The problem with most of these explanations vis-à-vis sectoral differences in wages is that they do not fit with the structure of India's rural labour market. The explanations under the efficiency wage hypothesis require a long-run association between employers and employees. But more than 78% of the workers in the rural non-farm sector do not have regular employment and salaries (Table 3). Hence, one can expect the proportion of regular employees who have long-term relationships with their employers to be much lower in the rural non-farm sector. Therefore explanations under the efficiency wage hypothesis are less likely to explain the non-convergence among rural wages.

Table 3: Distribution of Rural Workers according to Job Status and Sectoral Composition

Number of Workers (ps + ss)	Agriculture	Non-Agriculture	All
Self-employed (%)	57.6	41.6	52.3
Regular/salaried (%)	0.9	21.9	7.8
Casual (%)	41.5	36.6	39.9
Total	100	100	100

Source: National Sample Survey, 66th round.

Rather, the skill gap between workers who are employed in the farm sector and rural non-farm sector, which remains wide, could be an explanation for the non-convergence of rural wages. Here we define unskilled workers as those who have not studied beyond the primary school level (Table 4). Among casual workers in 1993-94, the proportion of unskilled workers in the farm sector was 92.39%. By 2009-10, it fell to 78.9%. In the rural non-farm sector, the proportion of unskilled casual workers in 1993-94 was 80.63%, which came down to 67.62% by 2009-10.

Table 4: Share of Unskilled in Rural Farm and Non-Farm Sectors for Regular Workers

Row No	Industry	1993-94	2009-10	1993-94	2009-10	1993-94	2009-10
		Not Literate		Literate and up to Primary		Total	
1	Agriculture	63.72	50.37	19.04	31.51	82.76	81.88
2	Non-agriculture	13.56	8.50	19.81	16.54	33.37	25.04
3	The gap (row1/row2)	4.70	5.93	0.96	1.90	2.48	3.27
Share of Unskilled in Rural Farm and Non-Farm Sectors for Casual Workers							
	Agriculture	71.81	49.73	20.58	29.17	92.39	78.9
	Non-agriculture	48.99	36.60	31.64	31.02	80.63	67.62
	The gap (row1/row2)	1.47	1.36	0.65	0.94	1.15	1.17

Source: NSS 50th and 66th rounds.

So, the proportion of unskilled casual workers employed in the rural non-farm sector has declined marginally faster that in the farm sector. There has been a marginal increase in the skill gap of casual workers in these two sectors. The skill gap among regular workers in both these sectors has widened. The use of regular unskilled workers in the farm sector has declined marginally, while it has declined by nearly 8% in the rural non-farm sector. The widening skill gap may fit not only explanations for the non-convergence of rural wages in a neoclassical framework, but also in a Marxian one. This widening of the skill gap between workers in the farm and rural non-farm sectors also indicates that the cost of propagation of the labourer is different and non-convergent for the farm and non-farm rural sectors.[7] The sectoral minimum wages will not converge with each other unless the cost of propagation of the labourer converges across sectors.

Given the state of empirical evidence, it is difficult to point out the actual reasons behind the non-convergence of the rural wages with substantial definiteness. Nonetheless, whatever the explanation underscoring the non-convergence of rural wages, we can definitely note that there is no Lewsian effect on the increase in agricultural wages.

3 Food Price-Wage Dynamics in Rural India

An alternative explanation for the increase in rural wages is associated with public works programmes, including the Mahatma Gandhi National Rural Employment Guarantee Act (MGNREGA). This explores the possible trade-off between public work programmes and food price inflation. In these arguments, the causalities follow the path of rural public works programmes influencing agricultural wages, and then agricultural wages influencing food price inflation. "MGNREGA Sameeksha 2006-12", published by the Ministry of Rural Development in 2013, has surveyed the evidence on the effect of the programme on rural wages. It has tried to examine the evidence on whether this policy is tightening the Indian rural labour market. However, there is no uniformity in the state of tightness in the rural labour market. The report cannot state whether the MGNREGA has made the labour market, in general, tight or not too tight. It fails to provide a macro picture, indicating that the Indian rural labour market is highly segmented. This report argues about an increase in rural wages, not because of labour market tightening but because of an increase in the reservation wage of rural labour. This scheme has been helping rural workers to remedy some of the imperfections in employment contracts.

Nonetheless public works programmes, which employ large numbers of unskilled workers for improving public infrastructure, may increase the wages of rural unskilled workers. If this market shows a good degree of integration with the agricultural labour market, the wages of agricultural workers will go up. Some of the studies indicate marginal increases in agricultural wages due to the MGNREGA. Berg et al (2012) show that on average the MGNREGA boosts real daily agricultural wage rates by 5.3%. Azam (2011) also argues that the MGNREGA has a significant positive impact on the wages of casual workers. He shows that the real wages of casual workers increased by an additional 8% in MGNREGA districts compared to the increase in non-MGNREGA districts.

Figure 3 shows how annual food price inflation and growth in nominal agricultural and unskilled labour wages have moved from 2005-06 to 2012-13. The following inferences may be drawn from the graph. First, nominal rural wages for unskilled workers increased at double-digit rates over the last five years, that is, more than or equal to 15% every year. Growth began picking up from 2007-08 when nominal non-farm

Figure 3: Annual Inflation in Food Prices and Growth in Nominal Agricultural and Unskilled Labour Wages (in percentage terms)

Source: Office of the Economic Adviser (Government of India); Labour Bureau of India.

wages for the unskilled increased by 8.9% over the previous year. The MGNREGA began in February 2006 and was implemented in three phases, with the last phase in 2007-08. And this should have had an impact on rural wages after some gestation time. The year, 2007-08, coincided with the period of implementation of the MGNREGA. Second, the movement of agricultural wages in relation to rural wages for unskilled workers suggests a strong correlation between the two – it shows a similar growth pattern. However, it appears that far from being a reluctant follower, the rural wage of unskilled workers has a strong influence on the wages of agricultural labourers (with some lag). Third, in the line of faster growth in rural wages (including both agricultural and unskilled workers wages), food price inflation has also gone up. The annual inflation in food articles reached 15.6% in 2010-11.

It is in this context that we have undertaken an empirical exercise to examine the long-run dynamics and causal relationship between food prices, agricultural wages, and rural wages for unskilled labourers by using the vector error correction (VEC) model.

Methodology and Estimation

As discussed earlier, the steep rise in rural wages for unskilled labourers in the recent past is expected to push agricultural wages up. As rural wages increase, the demand for wage goods is expected to rise. The increase in demand for wage goods need not be inflationary if it reflects higher productivity. However, agricultural productivity growth having remained constant in the recent past (Subbarao 2011), its effect should be passed on to output prices, resulting in high food price inflation. Further, an increase in agricultural wages should increase the cost of production in agriculture, and this should have an inflationary effect on food prices. Therefore, it looks like food prices, agricultural wages, and the rural wages for unskilled labourers are related to each other through a direct transmission and feedback mechanism.

To analyse the long-run dynamics and the direction of causality between food prices and wages, we have used the VEC model in the framework of the Johansen cointegration test. A group of non-stationary series is cointegrated if a linear combination of them is stationary. A linear combination of these series is known as the cointegrating equation, which indicates a stable long-run equilibrium relationship between the variables. The Johansen cointegration test has been carried out in a vector auto regressive (VAR) mode, and is a reduced form method. This test for cointegration is particularly important when one is dealing with cointegration in a multivariate framework, which takes care of endogeneity as well as the simultaneity problems associated with simple cointegration tests.

To estimate the model, first, the stationarity property of the series has been examined, followed by a lag order specification and identification of the trend pattern. Further, to smoothen the data, the log transformation of all the three variables has been taken.

To check the stationarity of all the three series – log food prices, log agricultural wages, and log rural wages for unskilled labourers – we conducted Augmented Dickey-Fuller (ADF) unit root tests, and the results are in Table 5. The ADF test result for all three variables shows that in all variables were non-stationary as we failed to reject the null hypothesis of a unit root in all the series at conventional significance levels. However, stationarity is reached in all the series after the first difference. Therefore, all the series are integrated of the same order, that is, I(1).

Table 5: Unit Root Test Result

Variables	Model	Adj t-Stat	Prob	Test Critical Values			Lag
				1% Level	5% Level	10% Level	Length
Augmented Dickey-Fuller unit root test in the levels							
LNWPI	Constant, linear trend	-2.717	0.23	-4.0496	-3.454	-3.153	0
LNAGRI	Constant	4.179	1.00	-3.495	-2.8898	-2.582	0
LNUNSKILL	Constant, linear trend	-2.621	0.27	-4.049	-3.454	-3.153	0
Augmented Dickey-Fuller unit root test in first difference							
DLNWPI	None	-7.931	0.00	-2.588	-1.944	-1.615	0
DLNAGRI	Constant	-8.689	0.00	-3.496	-2.890	-2.582	0
DLNUNSKILL	Constant, linear trend	-11.165	0.00	-4.051	-3.454	-3.153	0

We did not get any statistically significant seasonality in these series.

VEC Granger causality test results are very sensitive to the number of lag differences for endogenous variables. It has been suggested that it is always preferable to estimate higher order VAR while making provisions for adequate lag length. Longer lags are required to capture most of the effects that the variables have on each other. E-Views provides optimal lag length size for the estimated VAR model on the basis of information criteria such as sequential modified LR test statistics, final prediction error, Akaike information criterion (AIC), Schwarz criterion (SC), and information criterion. In our case, the optimal lag length is selected by different criteria. Of five information criteria, three have suggested a lag order of six for the VAR model. Therefore, we decided on a VAR model with six lags for endogenous variables. Remember, the lag length orders suggested are at the level for endogenous variables, whereas the lag interval required in the Johansen cointegration test is for different endogenous variables. Therefore, for the cointegration test, the optimal lag length should be five (Appendix 1, p 73).

Having determined the optimal lag length size for different endogenous variables, one has to make an assumption regarding the trend underlying the variables. In carrying out the cointegration test, we have assumed the presence of an intercept and a trend in our model, on the basis of a minimum value of AIC and SC for the model.

Empirical Results

The empirical analysis reported here is based on a two-stage estimation. In the first stage, cointegration analysis has been used to identify a cointegrating relationship between the variables. This is important because if two non-stationary variables are cointegrated, the model should include residuals from the vectors (lagged one period) in the dynamic VECM system.

The estimation procedure involves estimating a cointegration relationship with all the three variables. This has been estimated by the Johansen multivariate cointegration test. The test statistics and asymptotic 5% critical values are shown in Tables 6 and 7. Both tests reject the hypothesis of no cointegration ($r = 0$) at the 5% level, whereas they do not reject the hypothesis that $r < = 1$. Therefore, the conclusion is that $r = 1$. That is, there is one stationary relationship between the levels of variables. Given that a cointegration relationship exists between these variables, empirical tests are performed based on the VECM.

Table 6: Johansen Cointegration Test -Trace Test

Null Hypothesis	Alternate Hypothesis	Statistics	95% Critical Value	Prob
r = 0	r = 1	53.45*	42.92	0.00
r < = 1	r = 2	13.57	25.87	0.69
r < = 2	r = 3	4.46	12.52	0.68

* Significant at 5% level.

Table 7: Johansen Cointegration Test-Maximum Eigen Value Test

Null Hypothesis	Alternate Hypothesis	Statistics	95% Critical Value	Prob
r = 0	r = 1	39.88*	25.82	0.00
r < = 1	r = 2	9.11	19.39	0.71
r < = 2	r = 3	4.46	12.52	0.68

* Significant at 5% level.

The results suggest complex long-run relationships between agricultural wages (LNAGRI), agricultural prices (LNWPI), and the wages of unskilled rural labourers (LNUNSKILL). The long-run relationship between variables is given below.

LNAGRI + 0.036LNWPI - 0.707UNSKILL - 0.005TREND = 0
(0.15816) (0.08437) (0.00100)

The above equation was normalised on the LNAGRI. Due to the normalisation process, the signs have been reversed to enable proper interpretation. Wages of rural unskilled labourers have a significant positive effect on agricultural wages. Considering that the logs of variables have been used, the above relationship expresses the elasticity of agricultural wages on food prices and wages for unskilled rural labourers. Hence, a 1% increase in the wages of rural unskilled labour leads to a 0.71% increase in agricultural wages. Agricultural prices have a negative relationship with agricultural wages although the coefficient is insignificant in the cointegrating equation.

The t-statistics on the variables of the error correction results (Appendix 2, p 73) also indicate that the LNWPI is weakly exogenous to the system because the error correction term is not significantly different from zero at the 5% level. This implies that the feedback mechanism from agricultural wages

and non-agricultural unskilled wages to food prices is weak. However, the estimates of the error correction coefficients are highly significant for agricultural wages and rural wages for unskilled non-agricultural workers with negative signs. This implies that short-run wage movements are stable. The coefficients of the error correction terms indicate the speed of convergence to the long-run equilibrium rate of growth. The estimated coefficients show that while the speed of adjustment to a shock is quicker in the case of agricultural wages and rural wages for unskilled workers, it is very slow in the case of food prices. The estimated coefficients indicate that about 15% to 22% adjustment towards a long-run equilibrium rate of growth occurs in one month in the case of rural wages for unskilled workers and agricultural wages. So, this result indicates that an increase in the wages of rural unskilled non-agricultural labour leads to an increase in agricultural wages. But this increase in rural unskilled non-farm wages does not influence food prices significantly. Hence, the demand impact of an increase in wages of rural unskilled non-agricultural labour on food inflation is statistically insignificant.

On an average, from September 2007 to October 2013, the group comprising eggs, meat and fish recorded the highest inflation rate of 14.73%, followed by oilseeds (12.02%) and milk (11.37%), fruits and vegetables (11.02%), cereals, and pulses (9.4%) (Table 8). Table 9 shows eggs, meat and fish, milk, fruits and vegetables, and pulses to be the highest growing food items. And these products too, have on average, experienced high inflation. So, low supply cannot be an adequate explanation for inflation. Further, Nair (2013) found by analysing the food expenditure pattern during 2004-12 that rising domestic demand pressures contributed to the upward spiral in the prices of six high-value food commodities – pulses, milk, egg, fish, meat and edible oil. This indicates demand for food articles is a substantive reason for inflation. And a very substantial contributor to this demand is high-value food items that rural unskilled non-agricultural workers and agricultural workers are unlikely to consume to a greater extent. This indicates that the demand impact of increasing rural unskilled non-agricultural wages and agricultural wages on food inflation is rather limited.

Table 8: Average Inflation for Various Food Commodities

	Average Inflation (September 2007 to October 2013) in Percentage
Food articles	10.95
Foodgrains (cereals + pulses)	9.40
Cereals	9.90
Pulses	7.99
Fruits and vegetables	11.02
Milk	11.37
Eggs, meat and fish	14.73
Condiments and spices	8.92
Tea and coffee	11.43
Oilseeds	12.02

Source: Calculated from Central Statistics Office data.

Further, we tried to find out the Granger causality between wages and food prices. The F-statistics have been calculated under the null hypothesis that changes in the regressor do not cause movements in the regress and in the Granger sense. The F-statistics represented in the tables measure the significance of the lagged values of the column variables while explaining the row variables.

Table 9: Annual Compound Growth Rate of Production of Various Food Commodities (in %)

Items	2006-07/2007-08 to 2009-10	2008-09/2009-10 to 2012-13
Rice	-1.14	2.73
Wheat	2.2	4.43
Coarse cereals	-0.5	2.28
Pulses	-0.34	6.45
Fruits	4.42	2.73
Vegetables	2.18	6.03
Tea	0.21	5.46
Coffee	5.14	3.27
Milk	3.86	4.76
Egg	6.05	6.26
Meat	7.24	9.23
Fish (marine and inland)	5.94	4.1
Spices	-3.99	12.89
Oilseeds	-8.55	5.91

1 For rice, wheat, and coarse cereals the growth figures are for 2006-07 to 2009-10; and for others, from 2007-08 to 2009-10.

2 For rice, wheat, and coarse cereals the growth figures are for 2008-09 to 2012-13; for fish, from 2009-10 to 2011-12; and for all others, from 2009-10 to 2012-13.

Sources: Reproduced from Nair (2013). Sources include the *Handbook of Statistics on Indian Economy 2012-13*, RBI (for tea and coffee); *Annual Report 2012-13*, Department of Animal Husbandry, Dairying and Fisheries, Ministry of Agriculture (for milk, egg, meat and fish); Directorate of Vanaspati, Vegetable Oils and Fats, Ministry of Consumer Affairs, Food and Public Distribution (for edible oils); *Indian Horticulture Data Base 2012* and National Horticulture Board (for fruits, vegetables and spices); Department of Agriculture and Cooperation, Ministry of Agriculture (for all others); and *The Economic Times*, 31 December 2012 (for 2012-13 milk, eggs and meat).

The first row of Table 10 reports that F-statistics for rural wages of unskilled labourers is significant at the 1% level. So, the alternative hypothesis stating that movements in rural wages of unskilled labourers, in the Granger sense, cause a movement in agricultural wages has been accepted. However, the F-statistics for agricultural wages and food prices are insignificant, implying that the agricultural wage is not influenced by its own past values or by food prices. F-statistics in the second row of the table imply that food prices are significantly explained by their past values and also by agricultural wages, but this is independent of trends in the rural wage of the unskilled worker. In the case of the rural wage of unskilled workers, F-statistics in the third row show that it is significantly influenced by its own past values and also by food prices, but is independent of the trends in agricultural wages. There fore, in all cases, causality has been found to be unidirectional.

Table 10: F-Statistics Calculated by the Fifth Order VEC Model (April 2005 to November 2012)

	ΔLNagri	ΔLNWPI	ΔLnunskill
ΔLNAGRI	0.64	1.25	5.04**
ΔLNWPI	2.18*	2.79**	1.45
ΔLNUNSKILL	0.70	2.99**	2.36*

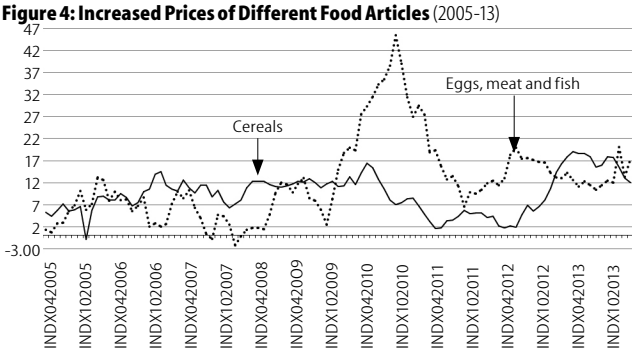
* indicates rejection of the null at least at the 5% significance level; ** indicates rejection of the null at least at the 1% significance level.

The first result implies that a rise in rural wages of unskilled workers tends to put upward pressure on agricultural wages. This seems reasonable as various studies have shown a rise in real casual labourer wages due to public works programmes (that is, the MGNREGA), with estimates ranging from 5% to 8%. The second result indicates that the agricultural wage is a significant determinant of movements in food prices. It also supports the argument made earlier in this paper. Increased agricultural wages can affect food prices in two ways – first, by increasing the demand for wage goods; and second, by increasing the input cost of agriculture. However, as mentioned earlier,

the increase in demand for wage goods need not be inflationary if there is higher productivity growth. But near stagnant agricultural productivity growth of the recent past has caused inflationary pressures to be passed on to output prices. The third result shows that apart from its own past values, the rural wages of unskilled workers have also been affected by food prices.

The increased prices (Figure 4) of different components of food articles may be divided into two periods – April 2005 to December 2009, and the post-December 2009 period. Cereal (a representative low-value food item) prices started to increase well before September 2007, the month that rural real wages for agricultural workers and non-agricultural workers began to grow. So, it is difficult to link this phase of inflation of cereals primarily with demand-side factors. The inflation rate of eggs, meat and fish (a representative high-value food item) shows a declining trend during the first period. A rapid rise of inflation in this group is seen from January 2010 onwards. Before August 2008,

Figure 4: Increased Prices of Different Food Articles (2005-13)



agricultural real wages were on average lower than between the second half of 2004 and the first half of 2005. During September 2008 to mid-2010, inflation was marginally higher than between the second half of 2004 and the first half of 2005. From the second half of 2010, agricultural wages went up rapidly.

To sum up, all the empirical evidence shows that from the beginning of 2010, a higher demand for high-value food items created an inflationary expectation about increasing food prices (which may have been stoked by increasing energy prices and occasional price hikes due to supply shocks and speculation in one or two food products such as onions and tomatoes), which led to workers, including rural workers, asking for higher nominal wages. And due to the implementation of various public works programmes, including the MGNREGA, rural unskilled non-agricultural workers are in a better bargaining position. Since they are much smaller in number, it did not increase food prices via increasing demand. It, however, enabled agricultural workers to demand higher real wages. This, in turn, has pushed up food prices.

4 Concluding Remarks

This paper argues that real rural wages have been on the increase not because of any Lewsian transformation or growth in the rural construction sector. From the existing literature, the paper argues that there is the possibility the bargaining power of workers increased due to public works programmes and this induced them to bargain for more wages because of food price inflation. The increase in agricultural wages has been pushing up food prices primarily through raising the cost of production. But the greater demand for high-value food items has been an important contributor to food inflation in the post-2009 period.

The increase in the rural real wage has limited the adverse effect of rising food inflation on the standard of living of rural unskilled and agricultural workers, who constitute a large majority of the population. But there is a need to contain food inflation because rural wages are not increasing because of a Lewsian transformation. The high food inflation will have an adverse impact on industrial growth. A high growth of industries is required for sustainable growth of the economy, as industries have the highest backward and forward linkages with the rest of the economy (Guha 2013). The solution to reducing food inflation has to come through increasing productivity and reducing the costs of inputs such as energy, seeds, and fertilisers, not by squeezing the demand for food. For this, the state needs to change the nature of its intervention. It should withdraw taxes on energy used in agriculture and transportation of agricultural commodities; invest more in rural infrastructure, including irrigation, roads, and cold storages; and encourage farmers' marketing and input procurement cooperatives.

NOTES

1 A detailed survey of both theoretical and empirical literature on this is available in Chatterji and Choudhury (2011).

2 Krueger and Summers (1988); Thaler (1989).

3 Shapiro and Stiglitz (1984).

4 Stiglitz (1974).

5 Weiss (1980).

6 Akerlof and Yellen (1990).

7 Cost of propagation of labourers is defined in *Wage, Labour and Capital* by Karl Marx (1891). The argument is that the cost of production of simple labour-power amounts to the cost of the existence and propagation of the worker. The price of this cost of existence and propagation constitutes wages. The wages thus determined are called the minimum of wages. This minimum wage, like the determination of the price of commodities in general via cost of production, does not hold good for the single individual, only for the race. Individual workers, indeed millions of workers, do not receive enough to be able to exist and to propagate themselves; but the wages of the whole working class adjust themselves, within the limits of their fluctuations, to this minimum. As long as this cost of propagation of the labourer is different for different sectors, each sector will have a different minimum wage and the working class will adjust itself to it. And the sectoral minimum wages will not converge with each other unless the cost of propagation of the labourer converges across sectors.

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Appendix 1: VAR Lag Order Selection Criteria

Lag	LogL	LR	FPE	AIC	SC	HQ
0	384.8300	NA	7.04e-08	-7.954791	-7.874656	-7.922399
1	928.6200	1042.264	1.02e-12	-19.09625	-18.77571*	-18.96668*
2	934.2643	10.46560	1.10e-12	-19.02634	-18.46539	-18.79959
3	941.6573	13.24565	1.14e-12	-18.99286	-18.19150	-18.66894
4	953.1988	19.95728	1.08e-12	-19.04581	-18.00404	-18.62471
5	967.6421	24.07217	9.68e-13	-19.15921	-17.87704	-18.64094
6	978.7937	17.88900*	9.32e-13*	-19.20404*	-17.68145	-18.58858
7	986.2738	11.53179	9.70e-13	-19.17237	-17.40938	-18.45974
8	994.0179	11.45482	1.01e-12	-19.14621	-17.14281	-18.33640

* Indicates lag order selected by the criterion.

LR: Sequential modified LR test statistic (each test at 5% level).

FPE: Final prediction error.

AIC: Akaike information criterion.

SC: Schwarz information criterion.

HQ: Hannan-Quinn information criterion.

Appendix 2: Vector Error Correction Estimates

CointegratingEq:	CointEq1		
LNAGRI(-1)	1.000000		
LNWPI(-1)	0.035714		
	(0.15816)		
	[0.22580]		
LNUNSKILL(-1)	-0.707161		
	(0.08437)		
	[-8.38125]		
@TREND(04M04)	-0.004697		
	(0.00100)		
	[-4.71767]		
C	-1.252034		
Error Correction:	D(LNAGRI)	D(LNWPI)	D(LNUNSKILL)
CointEq1	-0.221455	-0.095196	-0.152788
	(0.04050)	(0.07824)	(0.02746)
	[-5.46828]	[-1.21664]	[-5.56443]
D(LNAGRI(-1))	0.022179	0.489096	0.018872
	(0.12148)	(0.23470)	(0.08236)
	[0.18257]	[2.08390]	[0.22913]
D(LNAGRI(-2))	0.059878	0.522191	0.028782
	(0.11884)	(0.22960)	(0.08057)
	[0.50386]	[2.27434]	[0.35722]
D(LNAGRI(-3))	0.095199	0.193671	0.140960
	(0.12011)	(0.23205)	(0.08143)
	[0.79262]	[0.83459]	[1.73099]
D(LNAGRI(-4))	0.196707	0.125833	0.023057
	(0.11925)	(0.23040)	(0.08085)
	[1.64955]	[0.54616]	[0.28518]
D(LNAGRI(-5))	0.073045	-0.259489	-0.036864
	(0.12002)	(0.23188)	(0.08137)
	[0.60862]	[-1.11908]	[-0.45303]
D(LNWPI(-1))	0.018843	0.107207	-0.017122
	(0.05686)	(0.10986)	(0.03855)
	[0.33138]	[0.97584]	[-0.44411]
D(LNWPI(-2))	0.016979	-0.297105	0.023240
	(0.05442)	(0.10515)	(0.03690)
	[0.31198]	[-2.82560]	[0.62982]
D(LNWPI(-3))	0.071055	0.169055	0.098741
	(0.05598)	(0.10815)	(0.03795)
	[1.26934]	[1.56313]	[2.60164]
D(LNWPI(-4))	0.014958	-0.201299	0.056901
	(0.05432)	(0.10494)	(0.03683)
	[0.27539]	[-1.91820]	[1.54511]
D(LNWPI(-5))	-0.081876	-0.096489	-0.033578
	(0.05523)	(0.10671)	(0.03745)
	[-1.48246]	[-0.90425]	[-0.89671]
D(LNUNSKILL(-1))	-0.156244	-0.409315	-0.250026
	(0.19600)	(0.37868)	(0.13289)
	[-0.79717]	[-1.08090]	[-1.88148]
D(LNUNSKILL(-2))	0.059126	0.140602	-0.010377
	(0.19686)	(0.38035)	(0.13347)
	[0.30034]	[0.36966]	[-0.07775]
D(LNUNSKILL(-3))	-0.127920	-0.048755	-0.066176
	(0.18749)	(0.36224)	(0.12712)
	[-0.68228]	[-0.13459]	[-0.52059]
D(LNUNSKILL(-4))	-0.764929	-0.822256	-0.122293
	(0.18481)	(0.35707)	(0.12531)
	[-4.13891]	[-2.30278]	[-0.97596]
D(LNUNSKILL(-5))	-0.618835	-0.225220	-0.325860
	(0.19086)	(0.36876)	(0.12941)
	[-3.24229]	[-0.61075]	[-2.51811]
C	0.021672	0.012743	0.015497
	(0.00363)	(0.00701)	(0.00246)
	[5.97605]	[1.81878]	[6.30289]
R-squared	0.479597	0.378141	0.557959
Adj R-squared	0.376802	0.255305	0.470642
Sum sq resids	0.006145	0.022937	0.002825
S E equation	0.008710	0.016828	0.005905
F-statistic	4.665541	3.078417	6.390047
Log likelihood	335.1247	270.5834	373.2074
Akaike AIC	-6.492341	-5.175171	-7.269540
Schwarz SC	-6.043929	-4.726758	-6.821127
Mean dependent	0.010398	0.007642	0.010507
SD dependent	0.011033	0.019500	0.008116
Determinant resid covariance (dof adj)		5.39E-13	
Determinant resid covariance		3.04E-13	
Log likelihood		995.0750	
Akaike information criterion	-	19.18520	
Schwarz criterion		-17.73446	