Understanding food inflation in India

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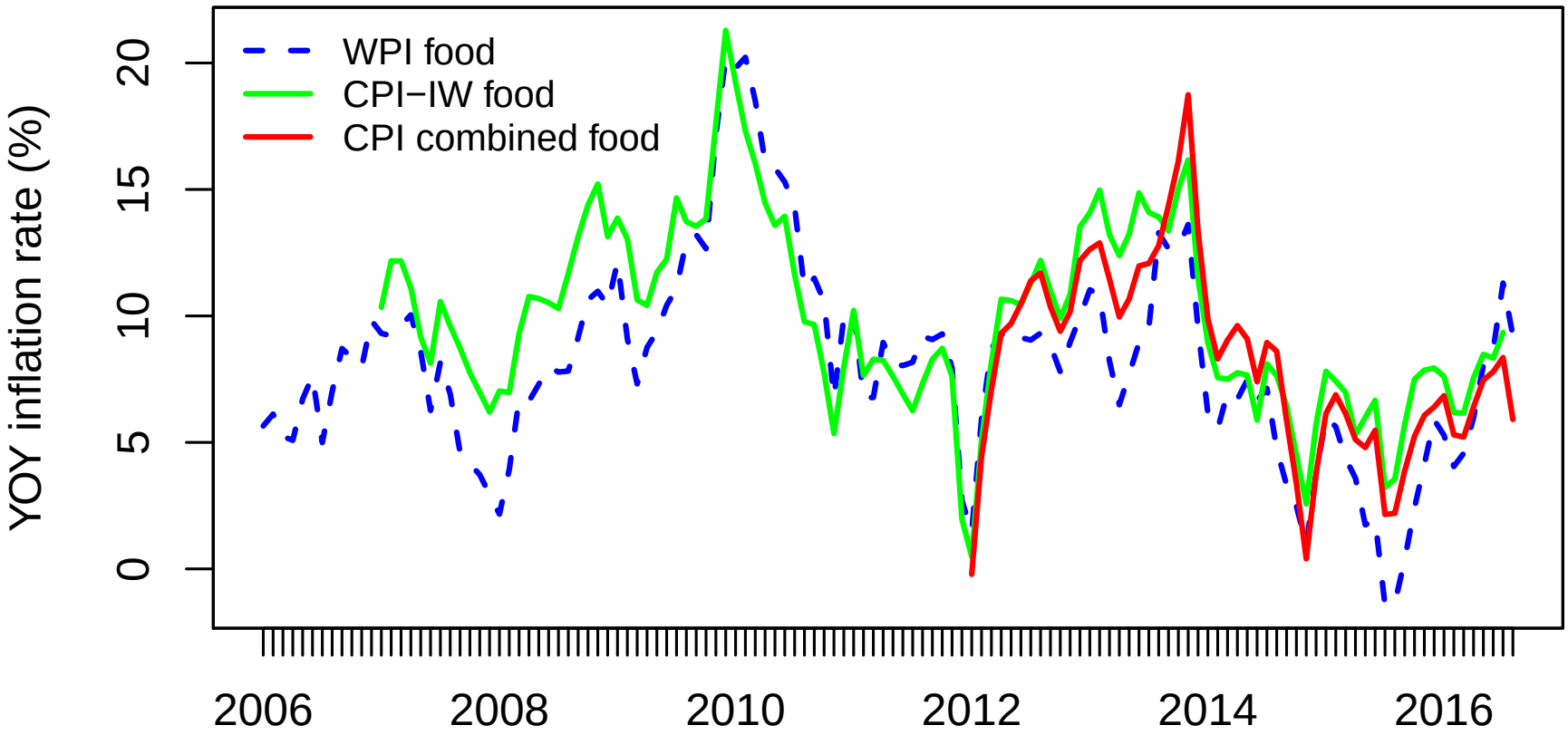
September 21, 2016

Outline

- Motivation and questions
- Stylised facts about food inflation in India
- Drivers of food inflation
- Role of supply chain distortion
- Conclusion

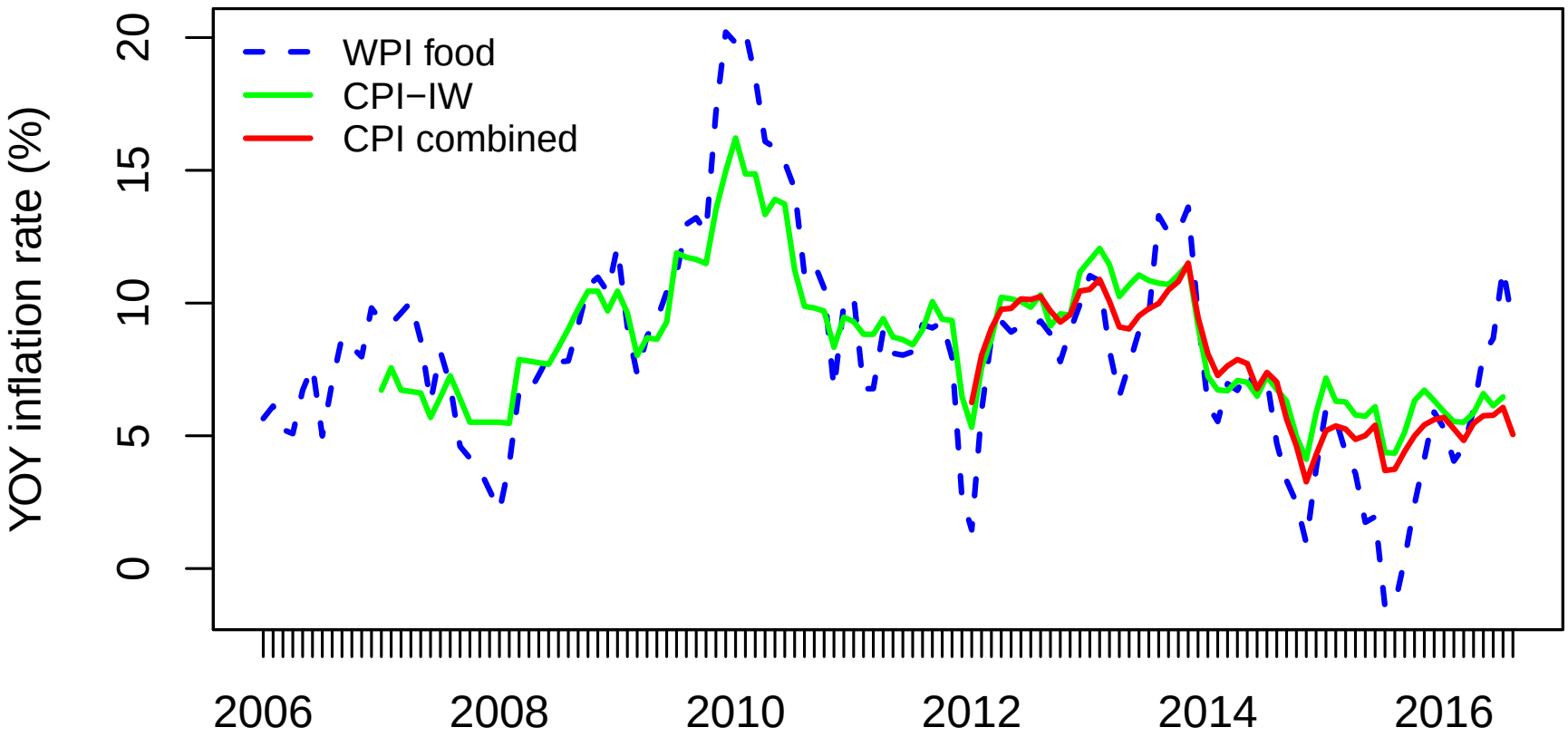
Co-movement in wholesale and retail food inflation

Food prices grew at an average rate of 8-10% during last 5-10 years



source: Office of Economic Adviser, Labour Bureau, CMIE Economic Outlook

Food inflation driving headline inflation



source: Office of Economic Adviser, Labour Bureau, CMIE Economic Outlook

What causes persistently high food inflation in India?

Literature

- Demand pull
- Cost push
  - Rise in agricultural wages (MGNREGA)
  - Role of fuel prices
- Role of global food price inflation
- Role of government policies
  - Continuous hike in minimum support prices (MSP)
  - High fiscal deficit
  - Increase in liquidity
  - Segregated agricultural market structure causing rent seeking activities by food suppliers

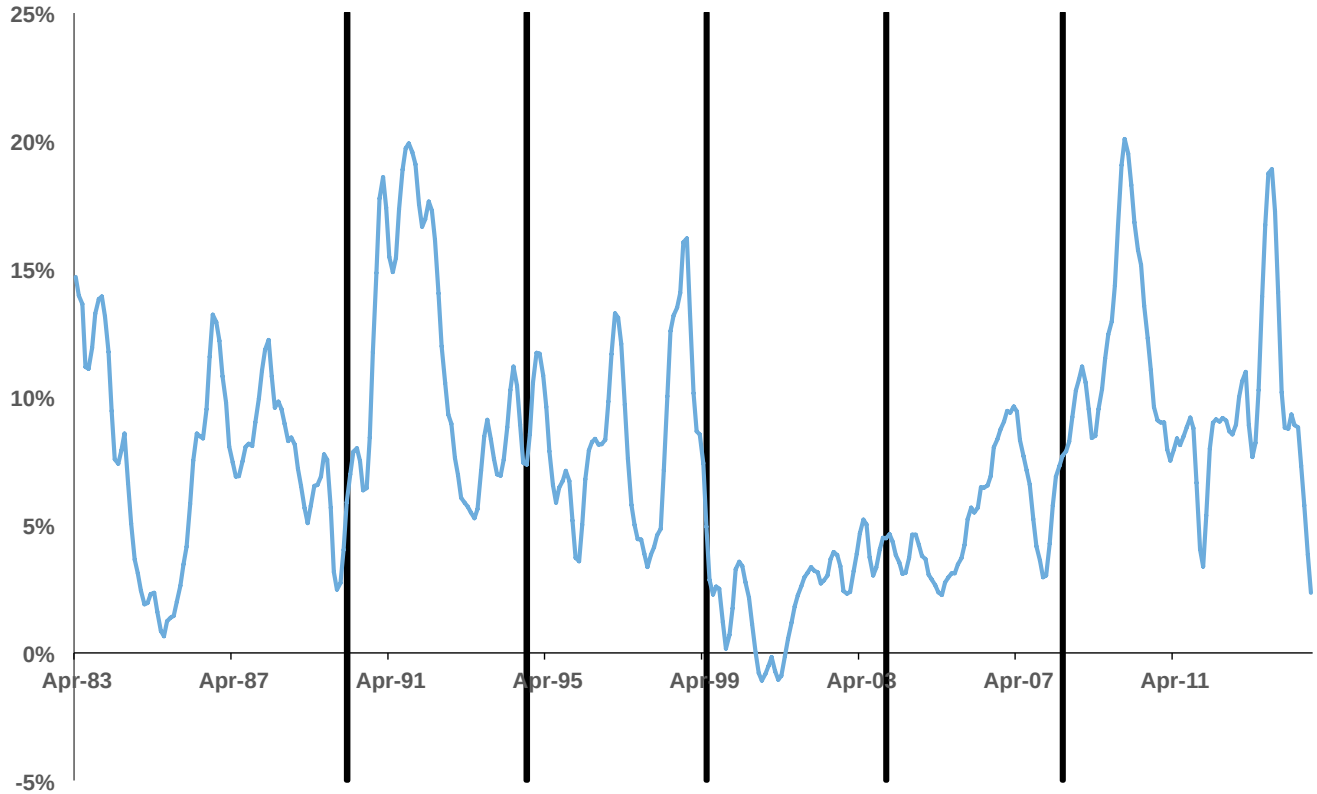
Questions

- How much is the contribution of demand supply mismatch in food inflation?
- What are the extent of cost-push inflation and pass-through of global food inflation into domestic food inflation? Does MGNREGA play any role?
- How does the supply chain distortion affect food inflation?

Part I

Food inflation: Trend and structure

Recent episode of high and persistent food inflation associated to a structural break



source: Office of Economic Adviser & Authors' estimates

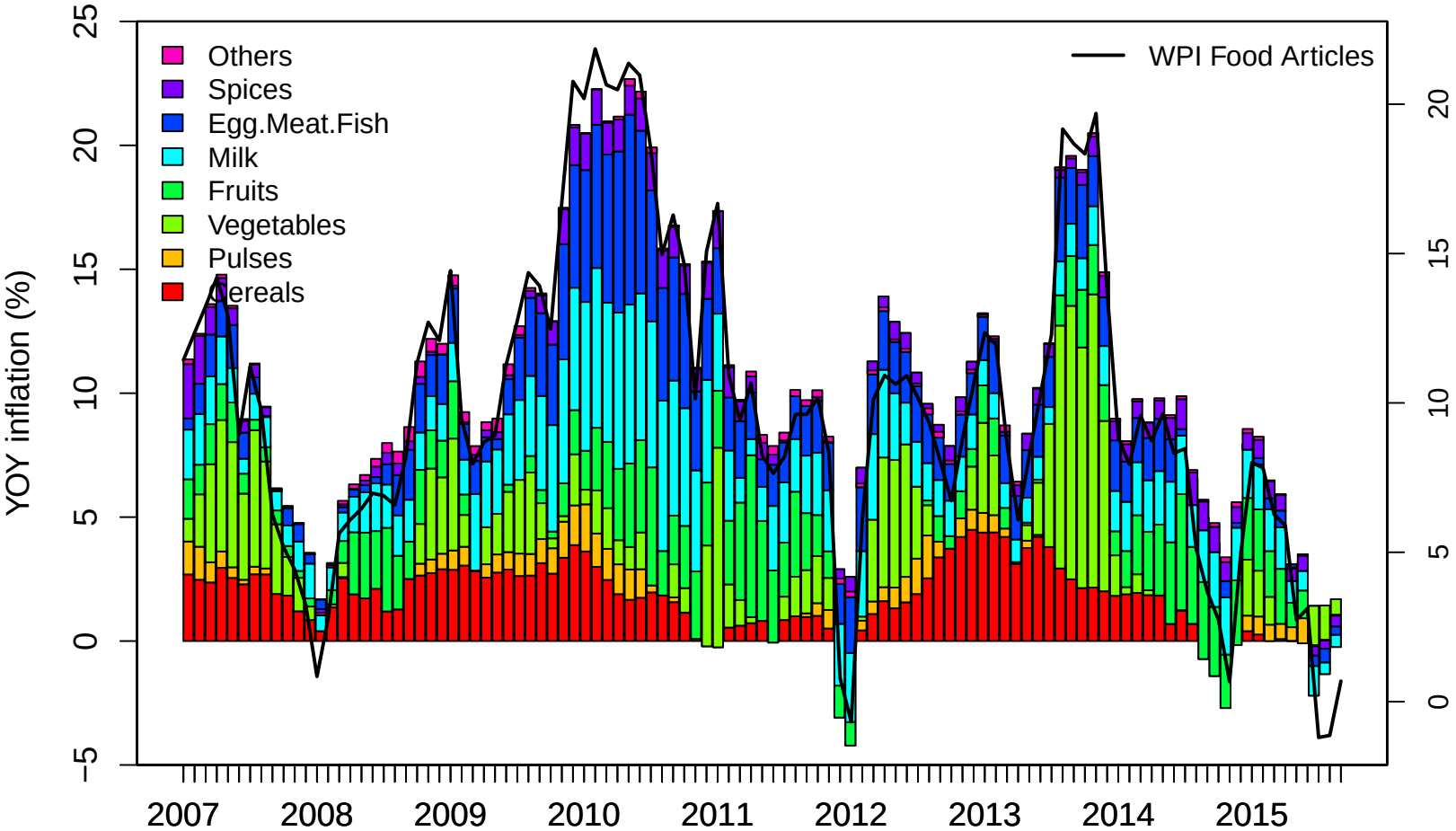
Steady increase in persistence of food inflation since 1990

	Apr-83 to Oct-14	Apr-83 to Mar-90	Apr-90 to Oct-94	Nov-94 to May-99	Jun-99 to Dec-03	Jan-04 to Jun-08	Jul-08 to Oct-14
I Month Lag	1.704***	1.816***	2.147***	2.196***	1.865***	1.804***	1.472***
	(15.66)	(13.94)	(15.75)	(14.99)	(14.05)	(11.93)	(8.752)
2 Month Lag	-0.919***	-1.116***	-1.690***	-1.951***	-1.265***	-1.039***	-0.598**
	(-4.637)	(-4.374)	(-5.113)	(-5.663)	(-3.813)	(-3.459)	(-2.423)
3 Month Lag	0.151*	0.198*	0.413*	0.955***	0.240	0.301	0.136
	(1.844)	(1.840)	(1.835)	(2.754)	(1.620)	(1.176)	(0.645)
4 Month Lag	0.0533*	0.092*	0.109*	-0.219*	0.140*	-0.0774*	-0.0163
	(1.645)	(1.873)	(1.790)	(-1.869)	(1.770)	(-1.616)	(-0.130)
Sum of Coefficients	0.989	0.990	0.979	0.981	0.980	0.989	0.994
Observations	376	80	51	51	51	50	73
R-squared	0.989	0.993	0.997	0.992	0.979	0.994	0.980

Source: Authors' Estimates

Drivers of wholesale food inflation

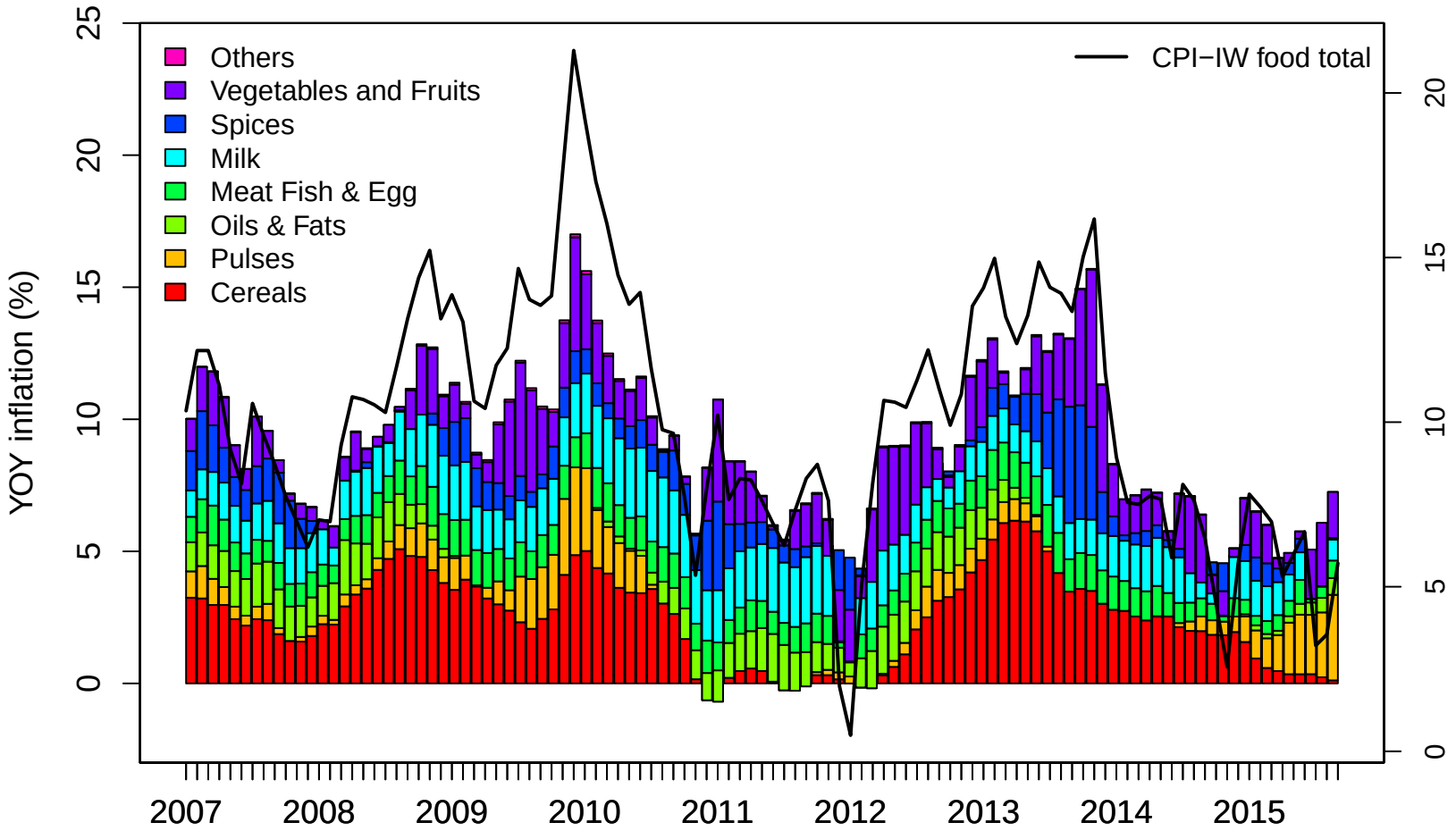
Various components driving food inflation at different points in time



source: Office of Economic Adviser & Authors' estimates

Drivers of retail food inflation

Various components driving food inflation at various points in time

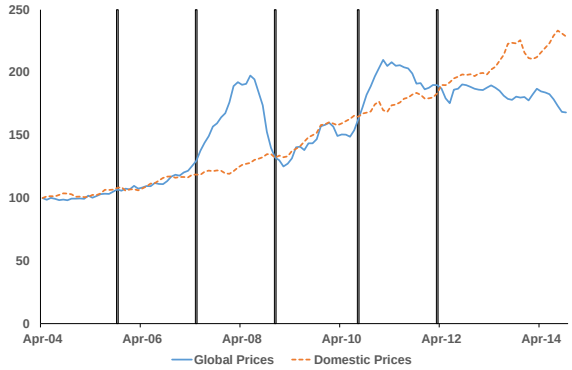


source: Labour Bureau & Authors' estimates

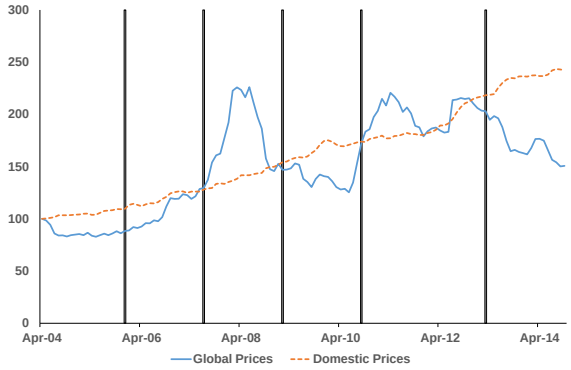
Part II

Factors influencing food inflation: Supply-side channel

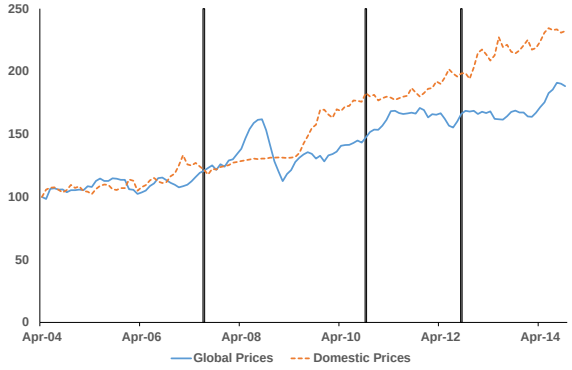
International vis a vis domestic food prices



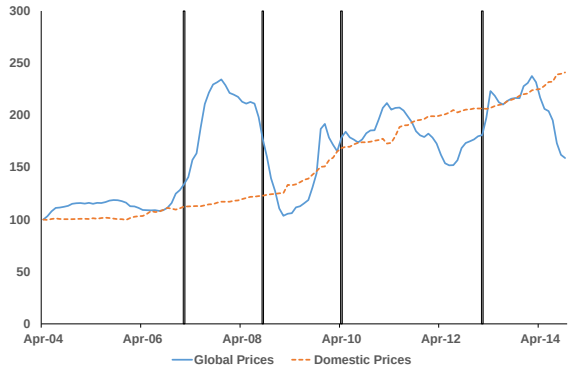
(a) Food



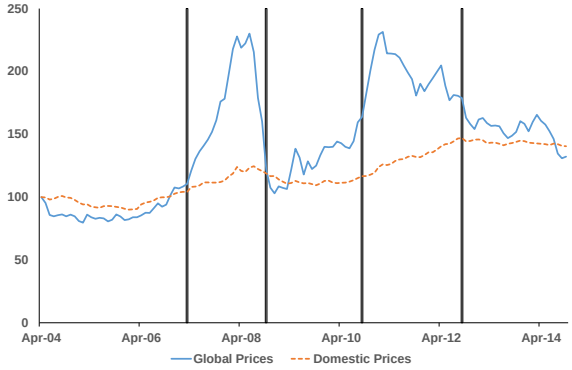
(b) Cereal



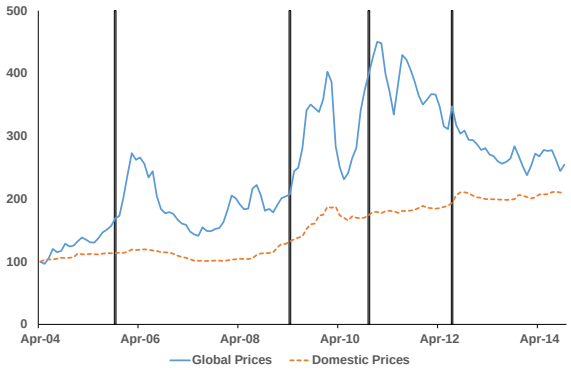
(c) Meat



(d) Dairy Products



(e) Edible oil



(f) Sugar

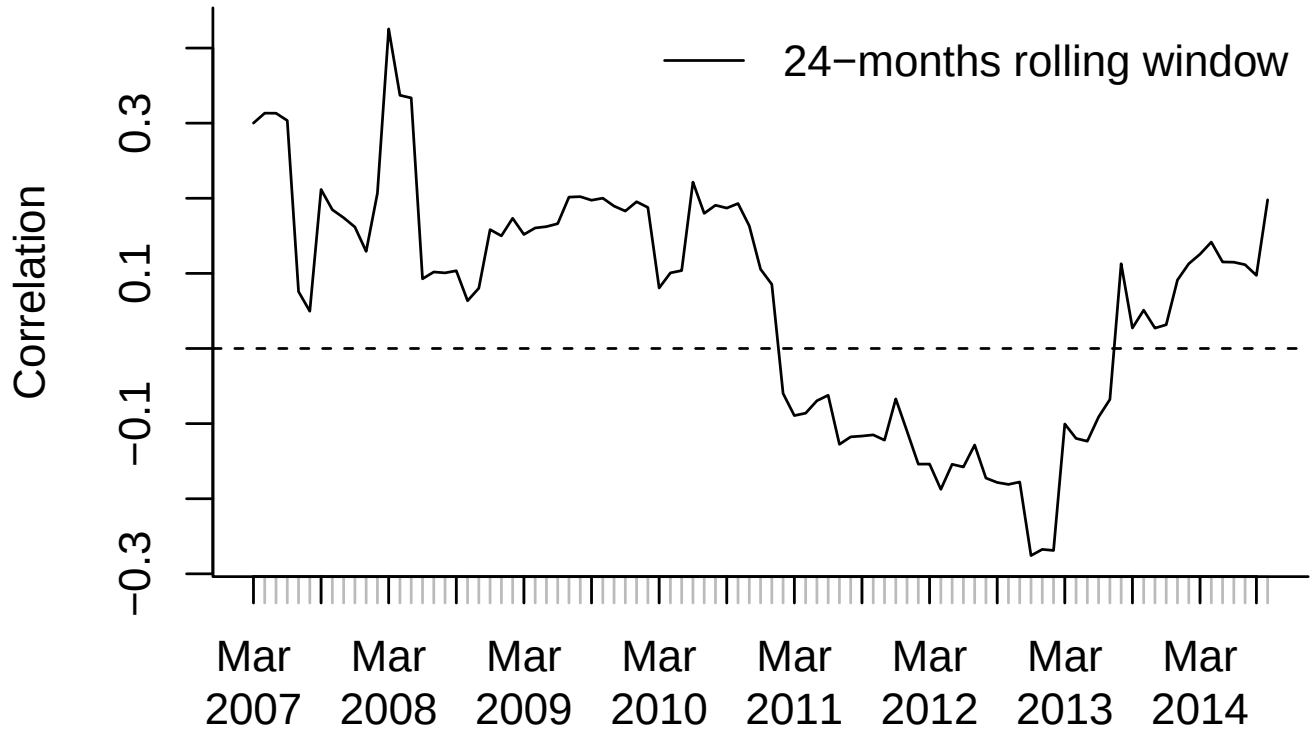
Source: FAOSTAT, Office of the Economic Advisor, Ministry of Commerce,FAO & Authors' Estimates

Role of international food prices

- India's restricted trade policies prevent transmission of large spikes in international prices into domestic prices
- Correlation analysis between inflation in international and domestic food prices shows co-movement of the two series when global inflation is negative/less than 7%
- The period of high global inflation associated to negative/weak positive correlation

Fuel and food inflation

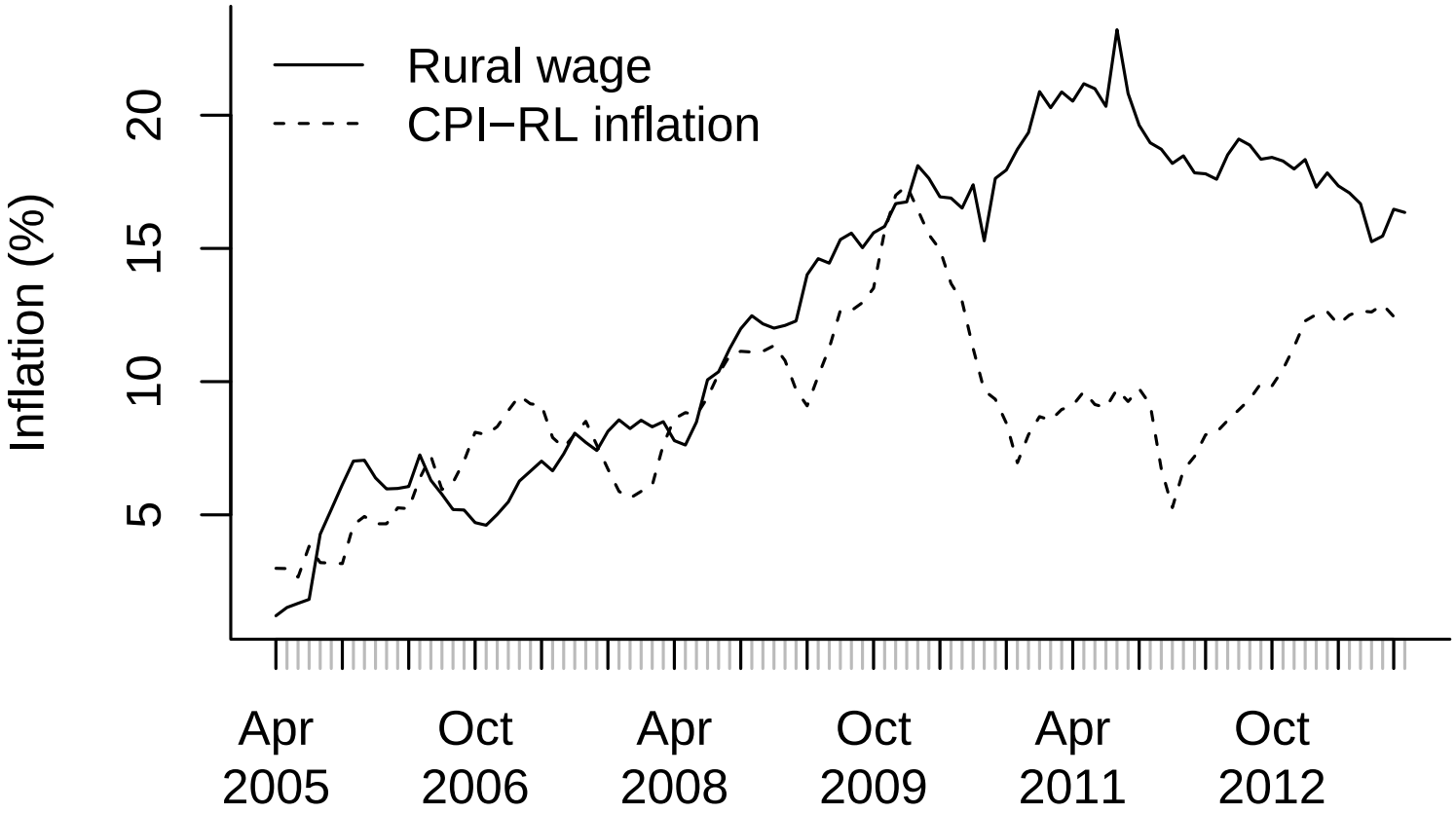
Moderate positive correlation except for period 2011-2013



Source: Office of the Economic Adviser, Authors' Estimates

Increase in real wages in rural sector

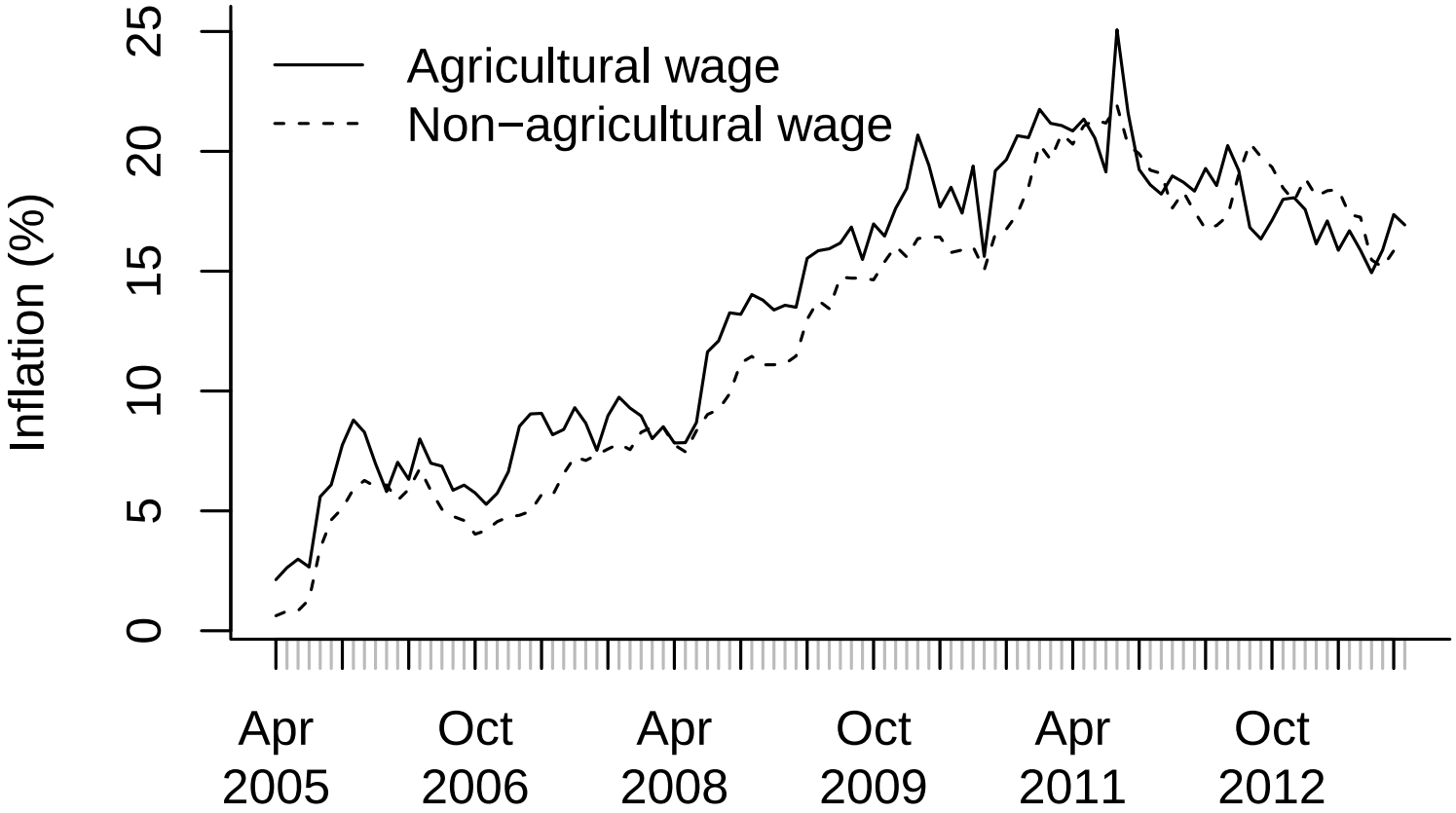
Rural wages grew at a higher rate then CPI-RL post 2007



Source: Labour Bureau and Authors' Estimates

Agricultural vis a vis Non-agricultural wage growth

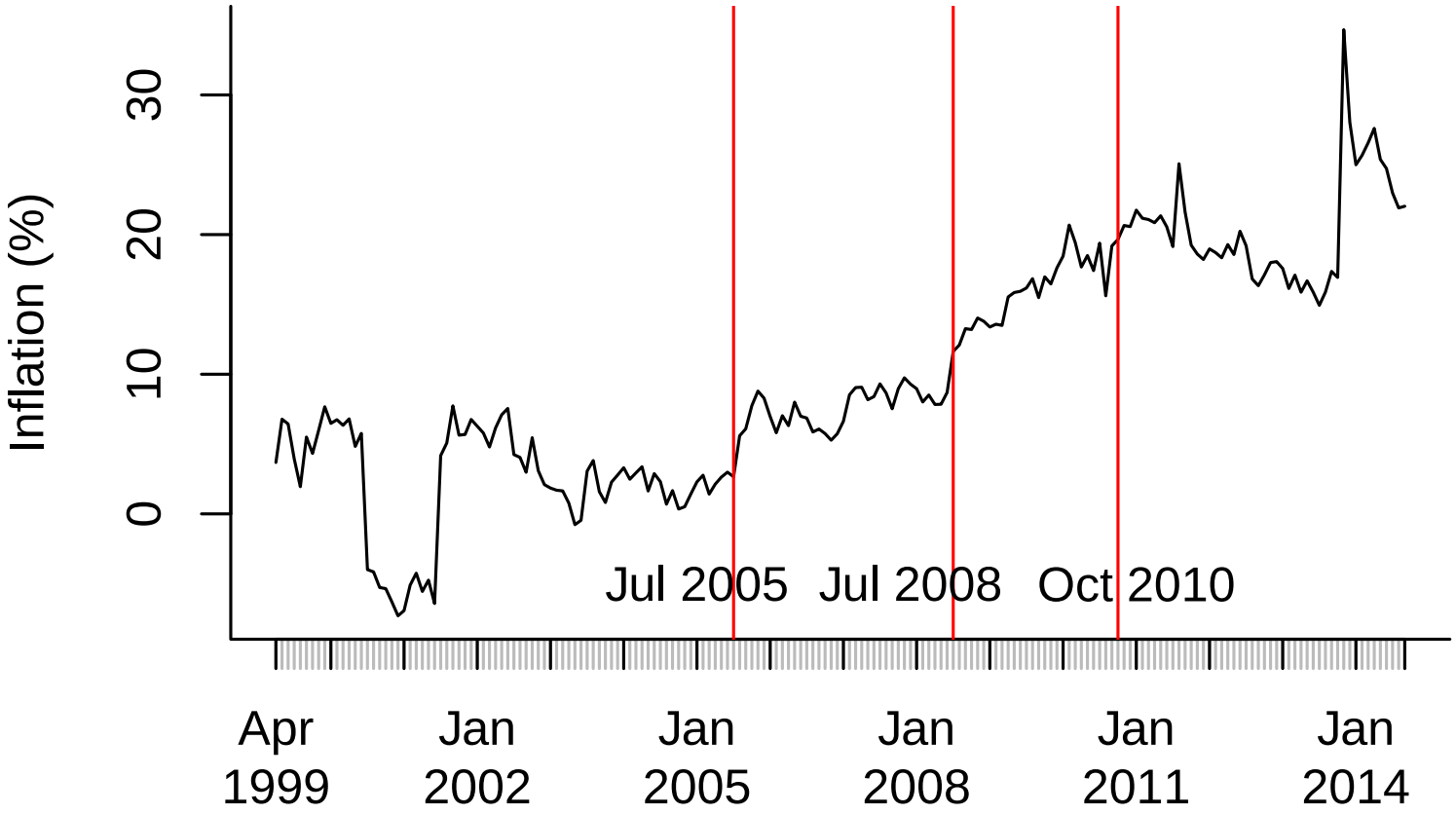
Agricultural wages grew at a higher rate than non-agricultural wages till mid-2011



Source: Labour Bureau and Authors' Estimates

Structural break in average wage index growth in 2008

Average wage growth entered double digit in 2008



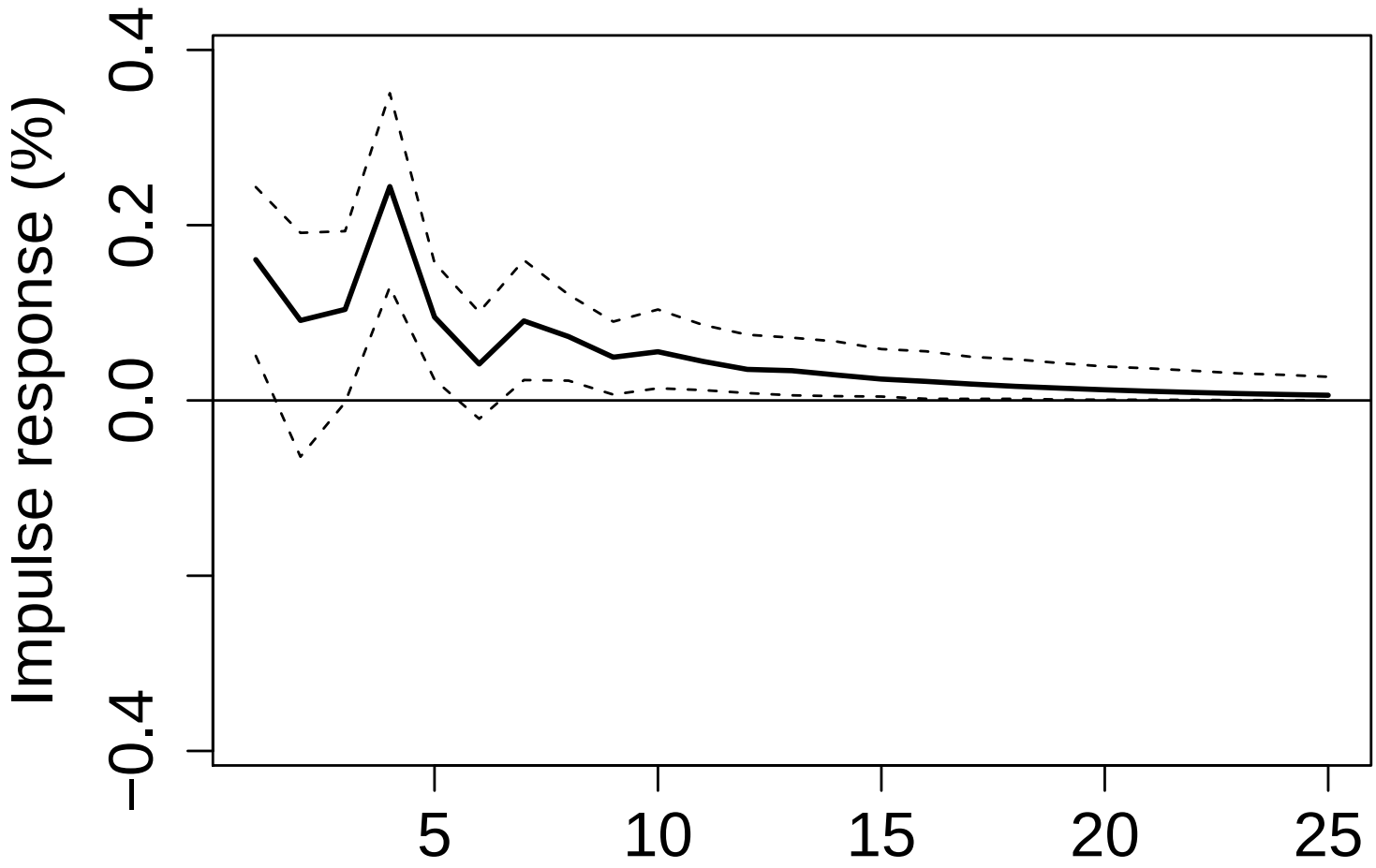
Source: Labour Bureau and Authors' Estimates

Contribution of Global versus Domestic Factors: A Structural Vector Autoregression Analysis

- SVAR model with global food, fuel, agricultural wage, WPI food inflation (aggregate and components) and IIP growth
- Period of analysis: April, 1998 to September, 2014
- SVAR restriction assumes global food, fuel, agricultural wage inflation and IIP growth contemporaneously affect food inflation but not vise versa and fuel inflation affects IIP growth instantaneously

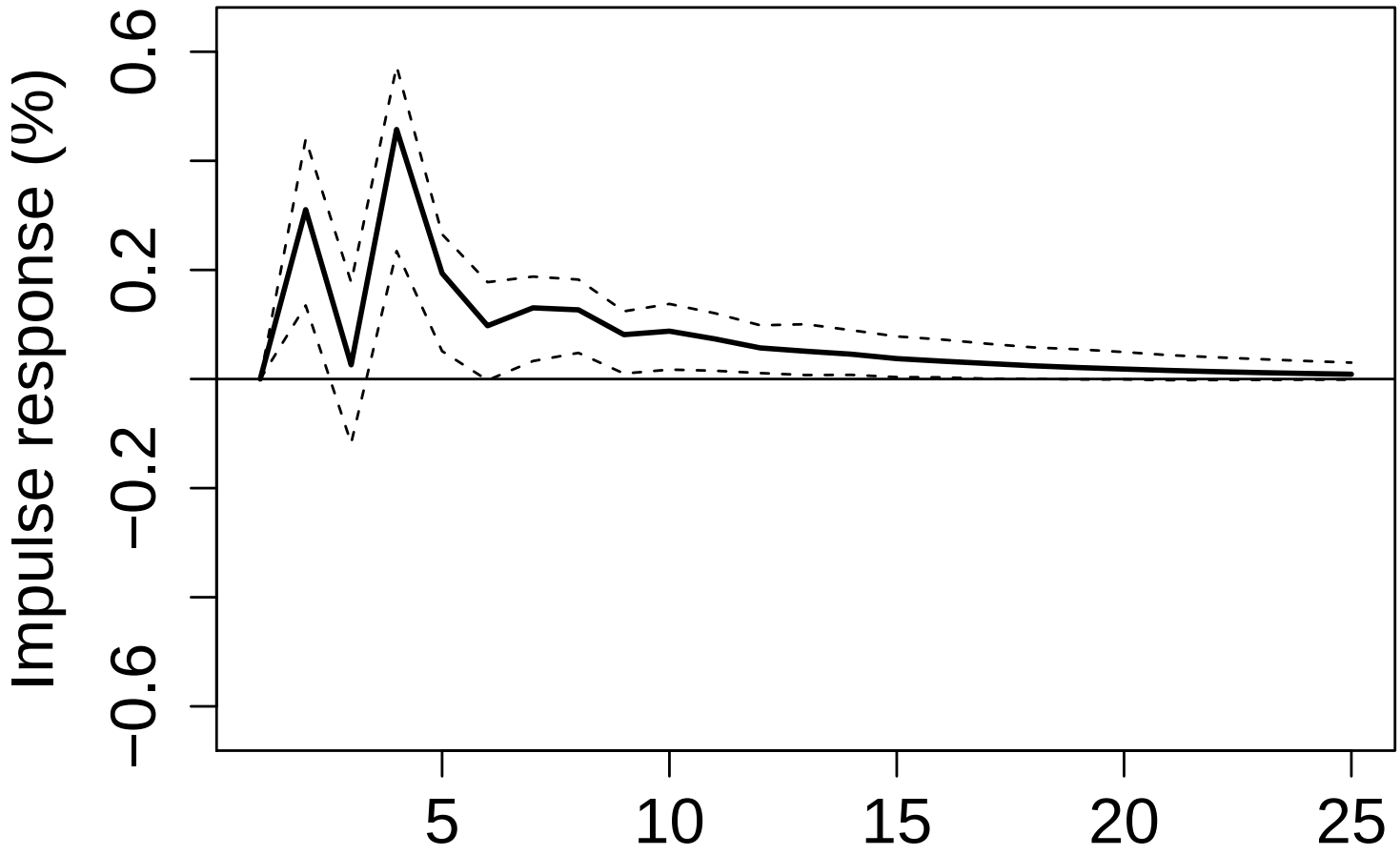
Response of food to wage Inflation

Wage growth the main driver of cost push food inflation



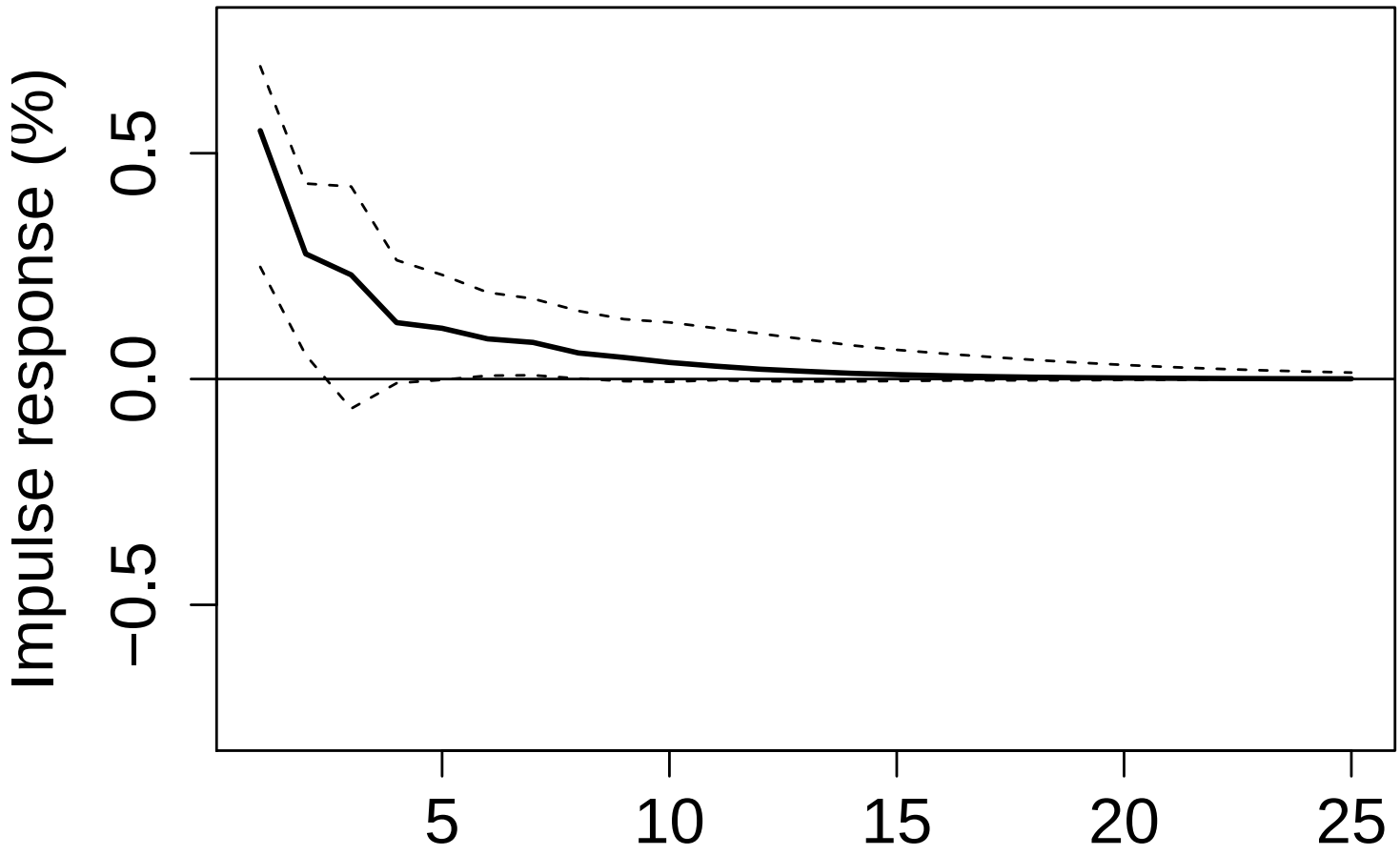
Response of wage to food Inflation

Significant second round effect on wage growth found

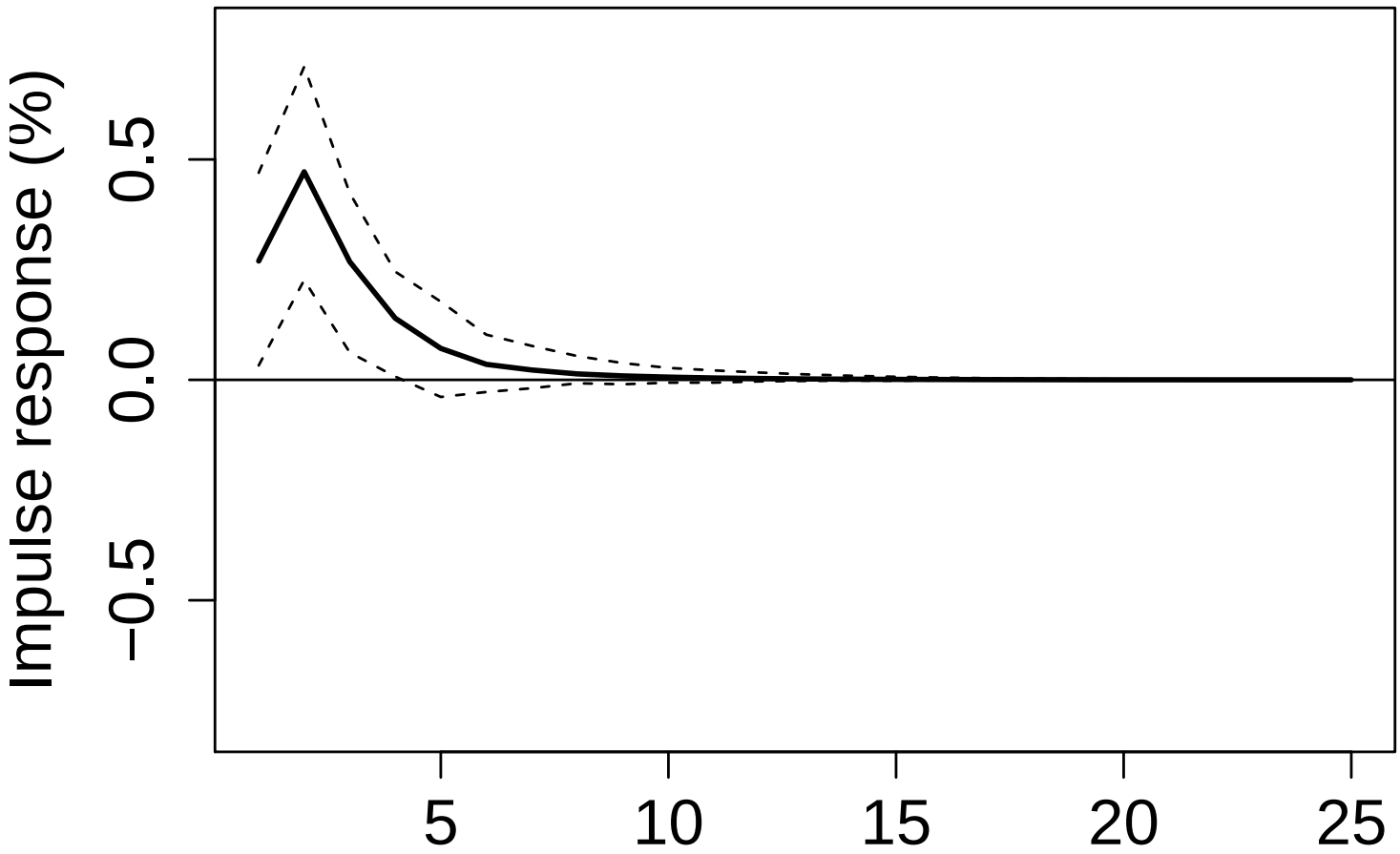


Response of food to wage Inflation post 2008

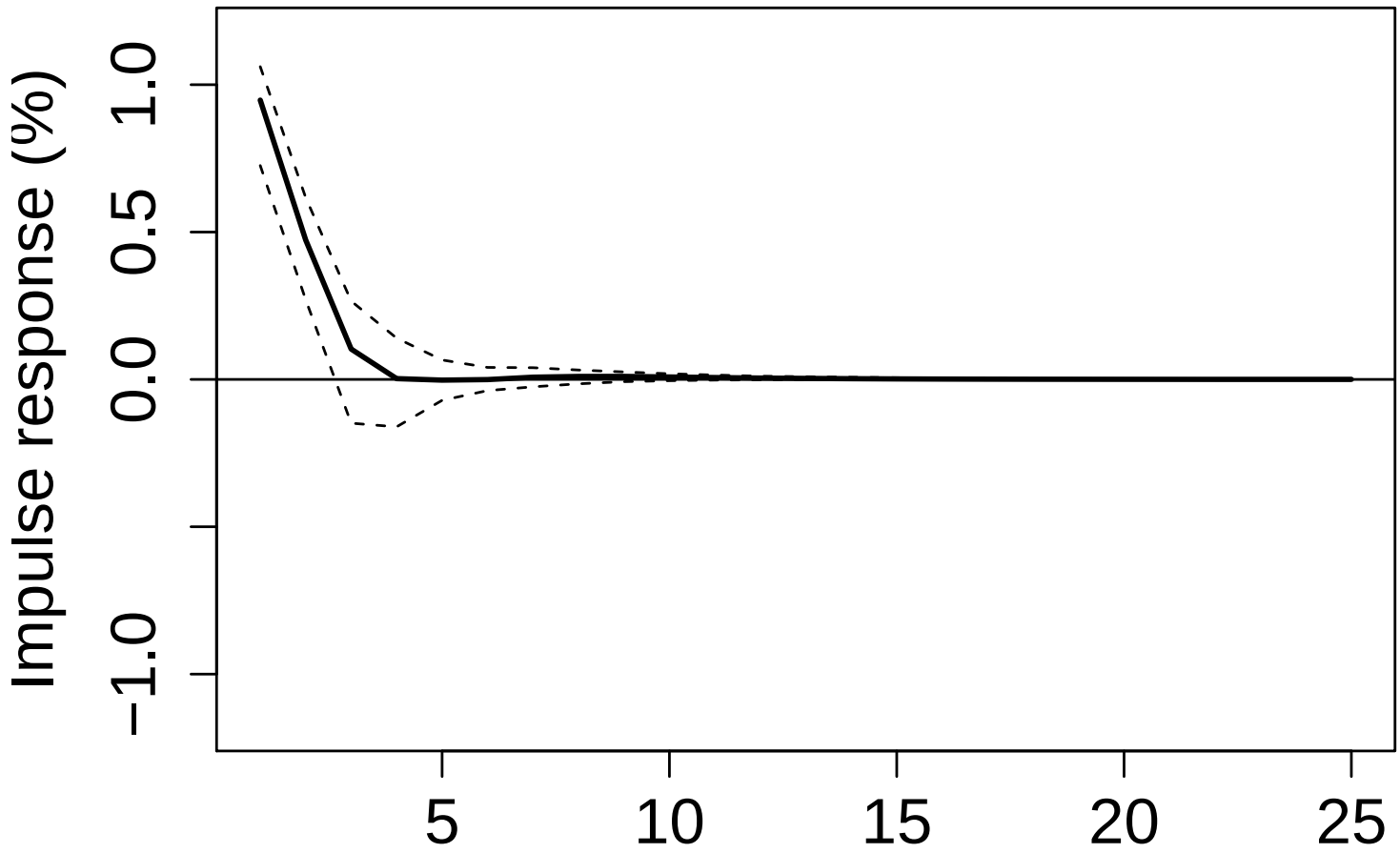
Post MGNREGA, impact of wage growth doubled



Response of sugar to global sugar price Inflation



Response of edible oil to global edible oil price Inflation



Main findings

- Wage growth is the common driver of inflation in aggregate food price index and its components.
- 10% rise in wage growth causes aggregate food inflation to rise by 2.4%. The effect declines but remains significant for long time. Post 2008, the impact is doubled to 5.5%
- Limited role of international prices except for tradeables. 10% rise in global food inflation causes aggregate food inflation to rise by 1.3% after two months and does not remain significant afterwords
- 10% rise in fuel inflation increases aggregate food inflation by 1% instantaneously and the effect does not remain significant afterwords
- 10% rise in global sugar inflation leads to 5% rise in domestic sugar inflation, while we observe almost one-to-one response of domestic edible oil inflation to global edible oil inflation

Part III

Impact of demand-supply gap on food prices

Dietary shift in India, a rapidly growing emerging economy

Bennet's Law: Time series evidence

Region	Year	Cereals ↓	Pulses	Dairy ↑	EFM ↑	Vegetables ↑	Fruit ↑
Rural	1972-73	**55.7**	5.9	10.0	3.4	4.9	1.5
	1987-88	41.1	6.3	13.4	5.2	8.13	2.5
	1993-94	38.3	6.0	15.0	5.2	9.5	2.7
	1999-00	37.4	6.4	14.8	5.6	10.4	2.9
	2004-05	32.7	5.6	15.5	6.0	11.1	3.5
	2009-10	**24.2**	5.8	13.5	8.3	14.5	4.3

Region	Year	Cereals ↓	Pulses	Dairy ↑	EFM ↑	Vegetables ↑	Fruit ↑
Urban	1972-73	**36.1**	5.3	14.4	5.1	6.8	3.1
	1987-88	26.6	6.0	16.8	6.4	9.4	4.4
	1993-94	25.6	5.5	17.9	6.2	10.1	4.9
	1999-00	25.8	5.8	18.1	6.4	10.6	5.0
	2004-05	23.8	4.9	18.6	6.4	10.6	5.2
	2009-10	**18.4**	5.6	15.6	8.2	12.7	7.2

Source: NSSO Report on Household Consumption Survey, 61st round

Bennett's Law: Evidence from cross section

Monthly per capita consumption (Kg.)	Rural Percentile class of MPCE 0-30	30-70	70-100	Urban Percentile class of MPCE 0-30	30-70	70-100
Cereals	**11.09**	11.84	**12.43**	**9.97**	10.43	**10.07**
Pulse & Pulse Product	0.52	0.69	0.98	0.56	0.81	1.08
Milk & Milk Product	1.83	4.24	8.03	2.34	5.29	8.85
Sugar	0.49	0.76	1.1	0.58	5.29	8.85
Edible oil	0.44	0.6	0.8	0.51	0.74	0.92
Fish & Meat	0.24	0.42	0.81	0.31	0.52	0.83
Vegetables	4.16	4.98	6.16	4.04	5.22	6.78
Fruit Fresh	0.12	0.21	0.46	0.12	0.33	0.82

Source: NSSO Survey, 66th Round & Author's estimates

Estimation of demand supply gap

- Estimate per capita household demand using 66^{th} round of household consumption expenditure survey by NSSO for 2009-10 using Quadratic Almost Ideal Demand System (QUAIDS) framework
- Taking estimated demand for 2009-10 as base, we derive a time series of aggregate household demand for 2004-05 till 2014-15, using estimated elasticity, GDP growth and total population data
- Total demand for a commodity estimated as total household demand and indirect demand for Feed, Seed and Wastage (FSW)

Estimation of demand-supply gap

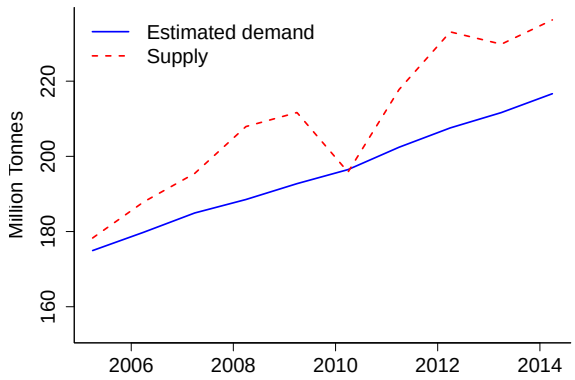
- Shares of indirect demand in total demand for the selected items are sourced from Planning Commission Report, 2011 to arrive at aggregate demand
- Aggregate supply estimated as domestic production adjusted for post-harvest losses from study by Indian Council for Agricultural Research, 2012
- The gap between estimated aggregate demand and aggregate supply of a commodity provides an indicator of demand-supply mismatch

Estimated income elasticities for food commodities

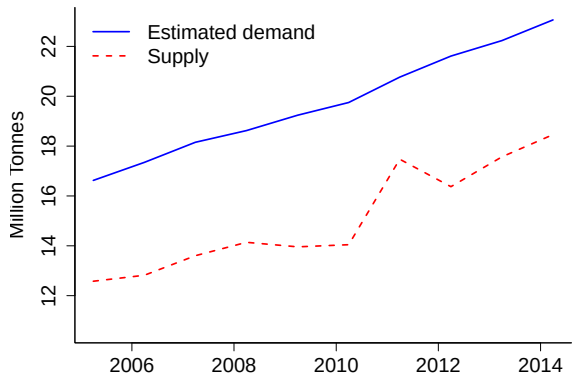
Items	Elasticity
Cereals	0.226
Pulses	0.515
Vegetables	1.535
Fruits	2.210
Milk and Milk Products	2.185
Meat and Fish	**0.796**

- Income elasticities for milk and milk products, vegetables and fruits are greater than one
- High income elasticity for meat and fish
- In a growing economy, higher demand pressure due to high income elasticities of milk and milk products, vegetables, fruits and meat and fish

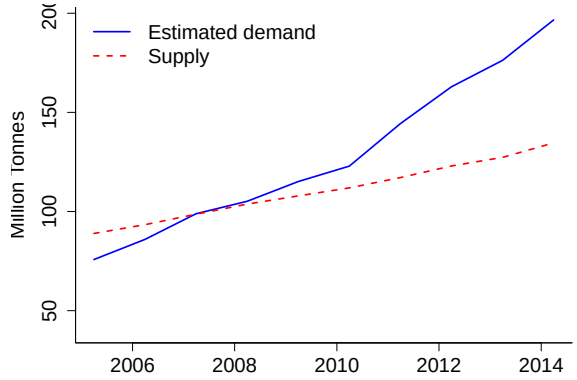
Estimated Demand Supply Gap



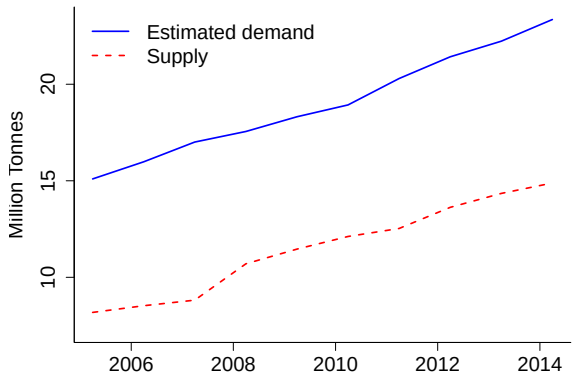
(g) Cereals



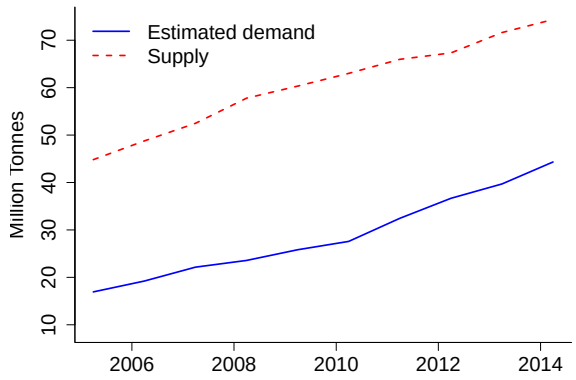
(h) Pulses



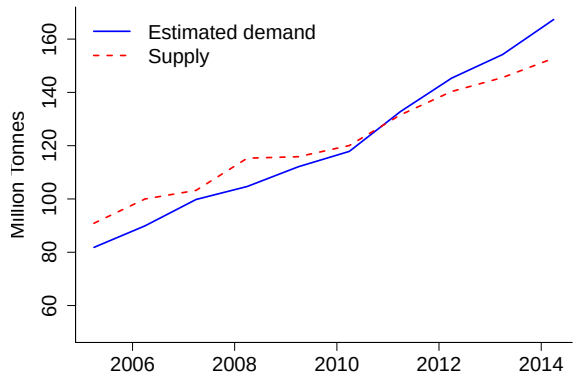
(i) Milk



(j) Meat & Fish



(k) Fruits



(l) Vegetables

Source: NSSO, Department of Agriculture & Authors' Estimates

- Evaluate the impact of estimated demand-supply gap on respective commodity prices in a panel framework, controlling for other factors, such as MSP and global prices for respective commodities, fiscal deficit as a percent to GDP, and wage growth
- Findings: An additional gap of 1 million tonnes in demand for food and supply of food would result in food prices increasing by 0.3% to 1.1% annually.

Part IV

Role of supply chain distortions

Structure of agricultural marketing in India

- Wholesaling activities of food commodities in India conducted by state Agricultural Product Marketing Committee (APMC)
- Under APMC Act, whole geographical area of a State is divided into smaller market areas managed by Market Committee constituted by the State Governments
- APMC Act primarily prevents any individual or agency to freely conduct wholesale marketing activities
- The Act also prohibits farmers from dealing directly with retailers and requires them to sell their produce to licensed middlemen approved by the Committee
- Source of layers of intermediaries and rent seeking activities causing large shocks to mark up

Consequences of restricted trading arrangements

Existing literature

- High and volatile consumer prices
- Lower share to farmers
- Studies found middlemens margin in wholesaling activities as high as 80-90% of farmer-consumer price difference
- Intermediaries margin in retail prices with respect to farm prices is found to be 70-75% for rice, wheat and maize, while it is around 60% for fruits and vegetables
- Fluctuations in intermediaries profit margin due to hoarding and speculative activities

Measuring the pass-through of mark up shock to food inflation

An indicator of mark up in wholesale activities

- Ratio of wholesale to farm price defines an indicator of mark up in wholesale activities
- Wholesale price is defined as *the rate at which a relatively large transaction, generally for further sale is effected* at the following levels
  - Price paid by wholesale purchaser to producer
  - Wholesaler's offer price or selling price to retailers
- Data source: The Directorate of Economics and Statistics, Department of Agriculture and Cooperation, Ministry of Agriculture
- Farm prices defined as average wholesale price at which commodity is disposed of by the producer at village site during specified harvesting period

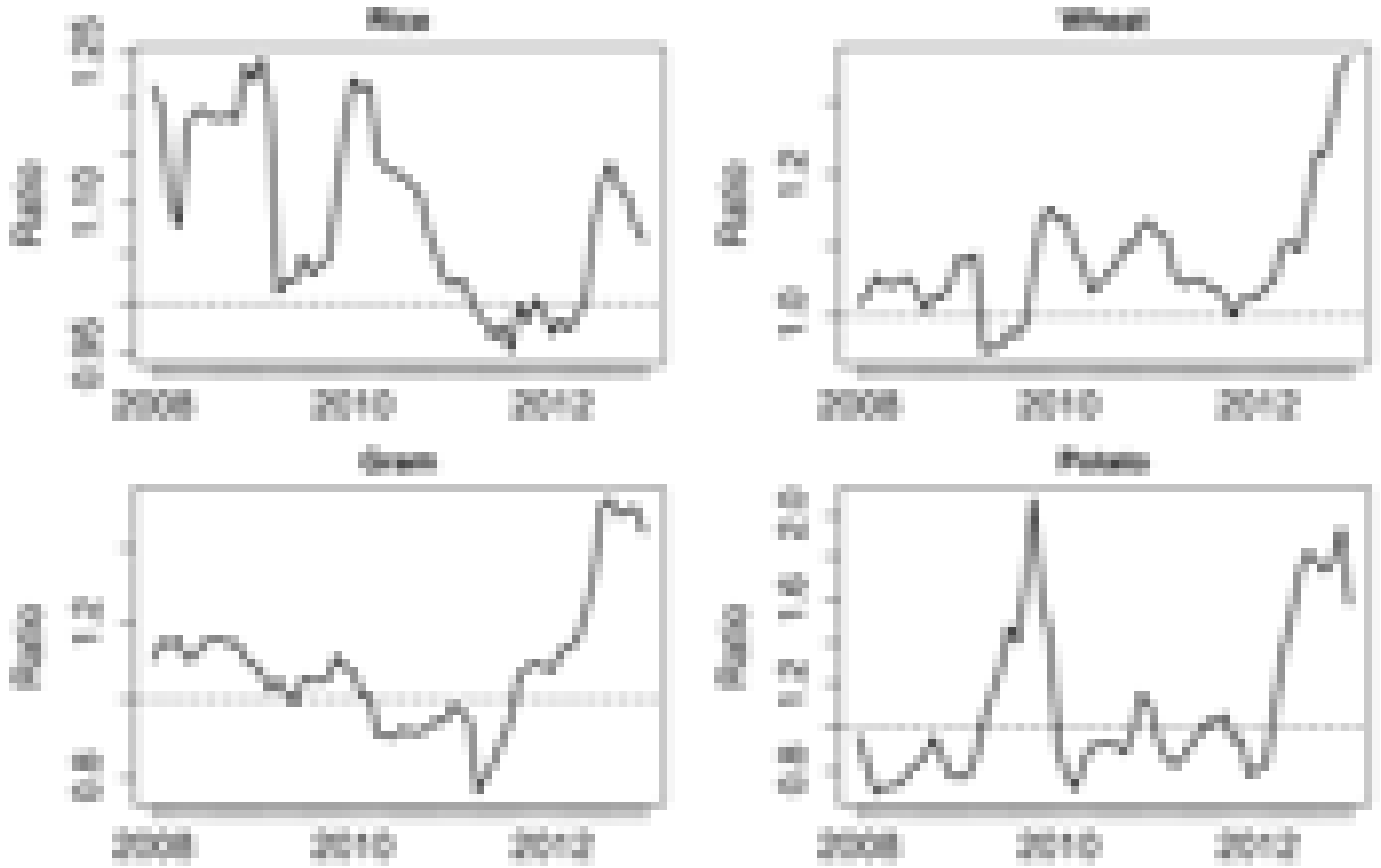
An indicator of mark up at wholesale level

- Directorate collects Farm harvest prices for 25 commodities from 19 States & Union Territories
- Annual time series of farm harvest prices of principal crops in India published by the Directorate
- Monthly time series of commodity-wise wholesale and retail level prices for selected centres in India also published by the Directorate

Choice of commodities for analysis

- We choose four commodities, among the 18 common commodities for which farm harvest prices and wholesale prices are available
- Choice of these items based on maximum share of an item in respective commodity group in WPI basket
- Commodities chosen for analysis: Rice, Wheat, Potato and Gram
- Period of analysis: January, 2008 to December, 2012

Mark up in wholesale activities for selected food commodities



Source: Ministry of Agriculture & Author's Estimates

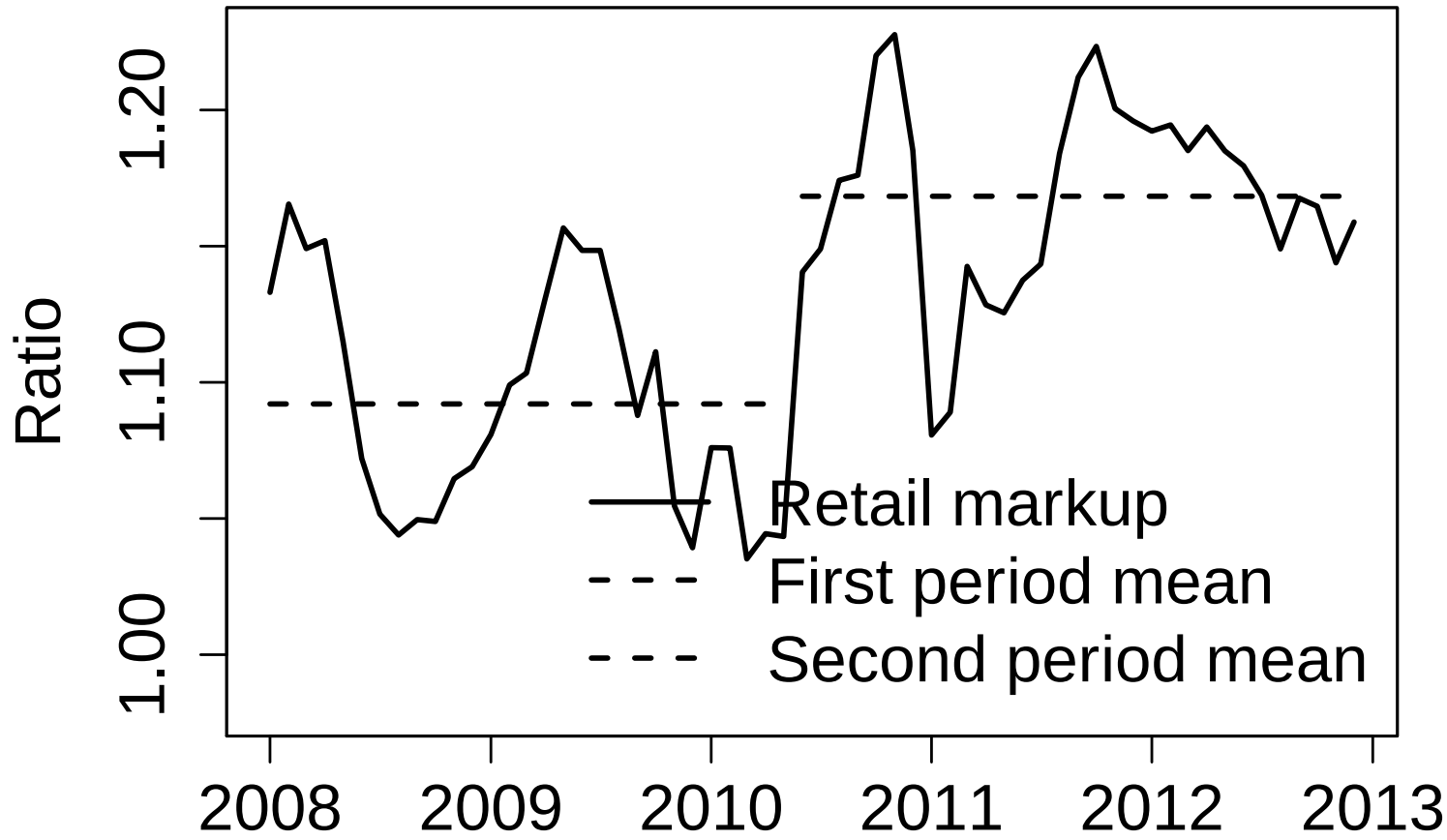
An indicator of retail mark up

- Retail mark up defined as the ratio of retail to wholesale price of a commodity
- Definition of retail price: *retail prices are established in transactions, in which, quantities dealt with are relatively smaller than in wholesale transactions and in which, the final consumers of the agricultural product participate as buyers*
- Sources of agricultural retail price data
  - Labour Bureau, Ministry of Labour collect retail prices at national level
  - National Sample Survey Organisation (NSSO) cover 422 villages for a few commodities
  - The Directorate of Economics and Statistics, Department of Agriculture and Cooperation, Ministry of Agriculture collects daily prices from 90 centres and weekly data from 215 centres for major food commodities

An aggregate indicator of retail mark up

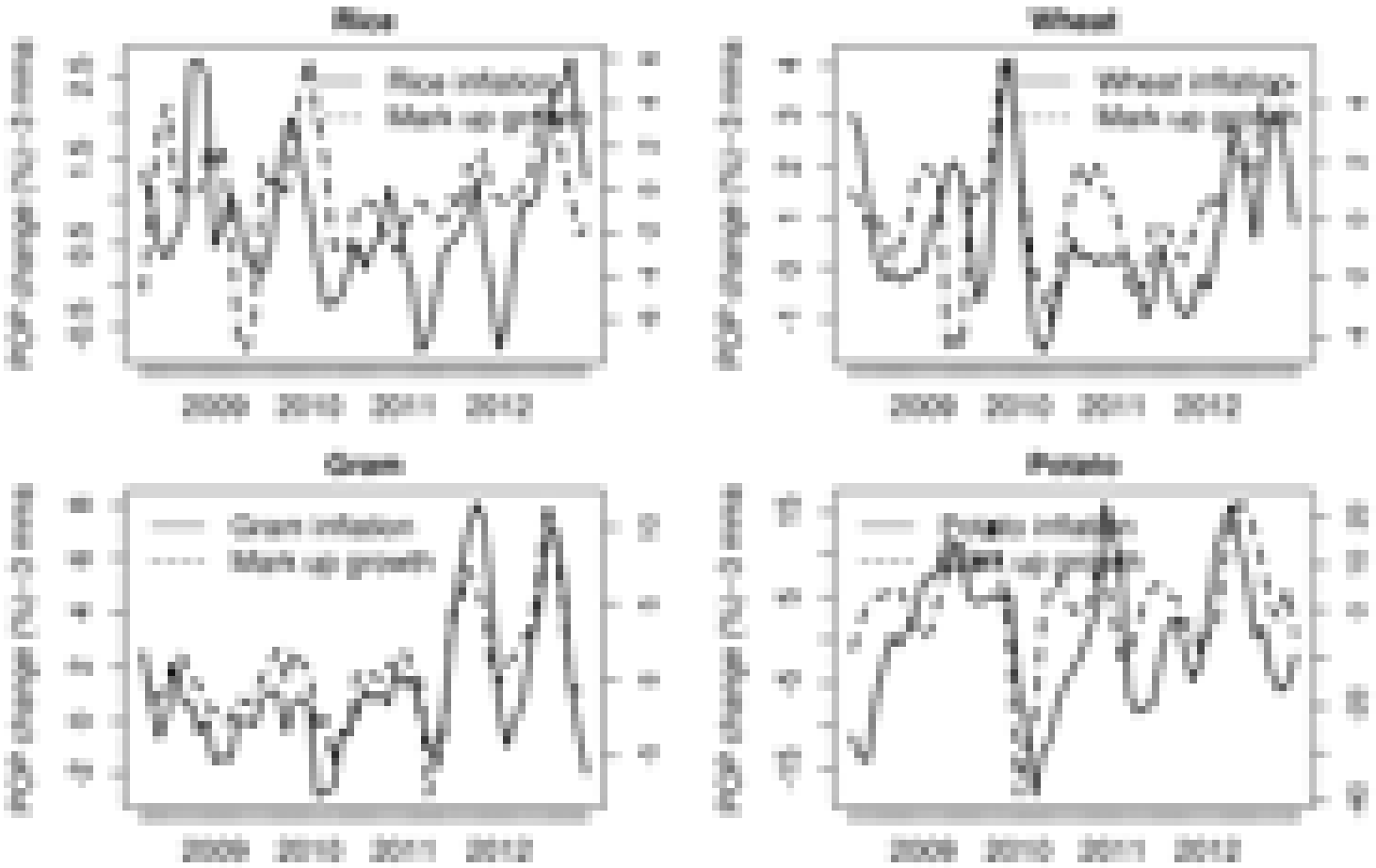
- Ratio of weighted average of retail prices and weighted average of wholesale prices for selected food commodities defines an aggregate index of retail mark up
- Set of commodities covering 80% of a broad commodity group chosen
- Total 12 commodities covering 7.66% of WPI basket and 53.82% of WPI food articles basket selected

Mark up in retail sector



Source: Ministry of Agriculture & Author's Estimates

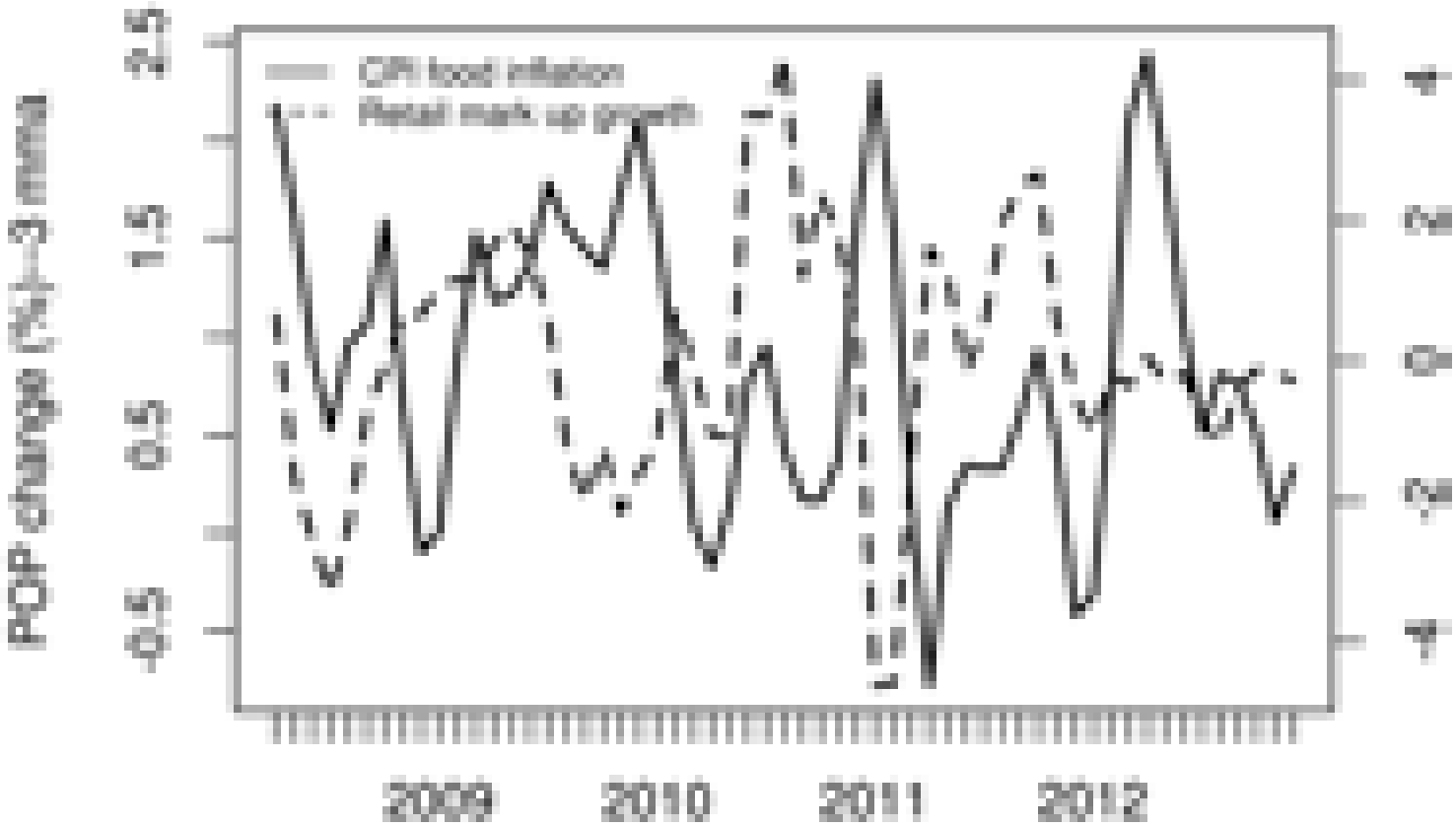
Mark up leading food inflation



Source: Ministry of Agriculture & Author's Estimates

Mark up growth and retail inflation

Mark up leading food inflation



Source: Ministry of Agriculture & Author's Estimates

Contribution of mark up shock in food inflation

- Estimate effect of mark up shock in wholesale and retail food inflation in SVAR framework controlling for other factors such as fuel inflation, agricultural wage growth, IIP growth as a proxy for demand for food from non-agricultural sectors
- For retail sector, we also control for wholesale food articles and food products inflation

Main findings

- Positive and significant impact on food articles inflation found when mark up shock arises in Wheat and Potato markets
- A 10% increase in mark up growth increases WPI food articles inflation by 3.1-3.5%, after two months of shock
- After 5 months of shock, variations in WPI food articles inflation due to mark up shock ranges from 0.21-7.45% depending on origin of shock

Main findings

- An increase in the retail mark up growth by 10% causes CPI food inflation to increase by 2.7% after two months of the shock, and the effect remains significant for the subsequent months
- After 5 months of the shock, mark up at the retail level contributes to 8.85% of variations in CPI food inflation
- WPI food articles inflation and wage growth are found to be the main drivers of CPI food inflation

Conclusion

- Agricultural wage growth is found to be the major driver of food inflation in India
- International prices play limited role except for tradeables like sugar and edible oil
- Moderate but significant pass-through of intermediary margin growth into food inflation found
- In the backdrop of NAM, our results indicate stabilisation of mark up shock through agricultural market development can lower average wholesale and retail inflation in the country

Thank you