



Disaggregated Evidence for
Exchange Rate and Import Price Pass-through
in the Light of
Identification Issues, Aggregation Bias and Heterogeneity

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Motivation-I

- Exchange rate and import prices play an important role for inflation dynamics in emerging markets.
 - In the case of Turkey, foreign costs weigh more than domestic costs (Başer, Küçük and Öğünç, 2014)
- When exchange rates and import prices are concerned, monetary policy makers is interested in both the speed and the size of the pass-through to inflation.
- Therefore, it is of crucial importance to understand the nature of the foreign price pass-through to domestic consumer inflation.
- In today's global economy, the spillovers of global economic policies may hinder identification problems for the effects of import prices.



Motivation-II

- First strand of literature focus on the pass-through of exchange rate on import prices in domestic currency (Campa and Goldberg (2002), Irandoust (2000), Pollard and Coughlin (2004))
- Some studies focus on the impact of exchange rate on producer and consumer prices (McCarthy, 2000; Hahn, 2003); some focus the size of the pass through (Aksoy and Riyanto (2000), McCarthy (2000), Choudri and Hakura (2001))
- Recent studies on exchange rate and import price pass-through in Turkey:
 - Kara and Öğünç (2005, 2008, 2011); Arat (2003), Arbatlı (2003), Yüncüler (2011), and Damar (2010))
- *The literature extensively studies the aggregate price indices as target variables*

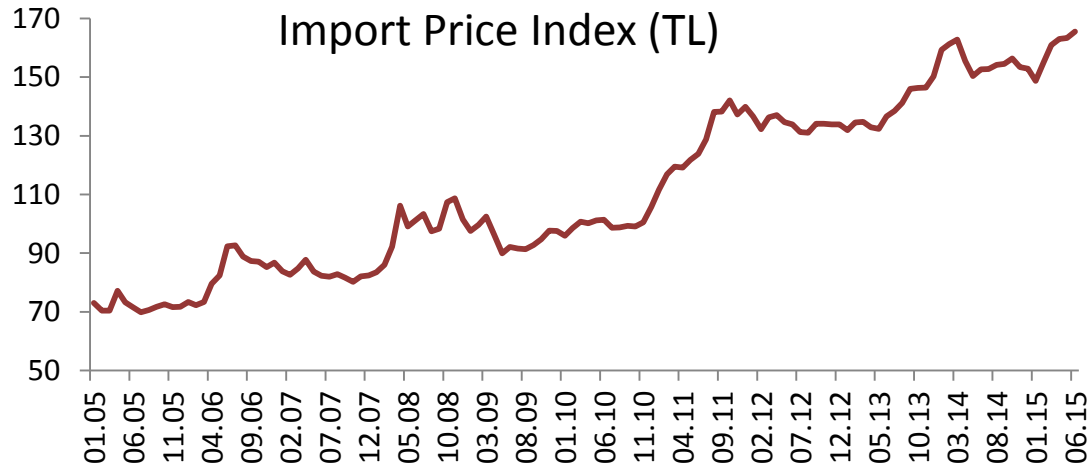
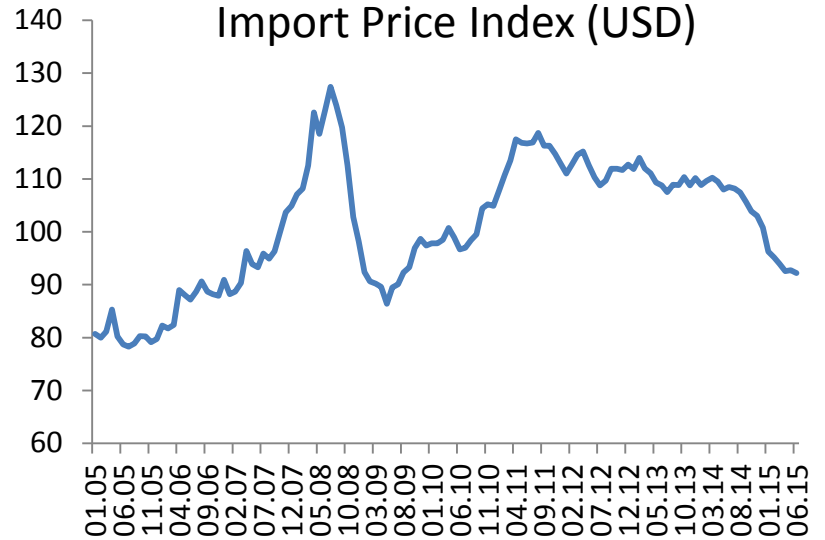
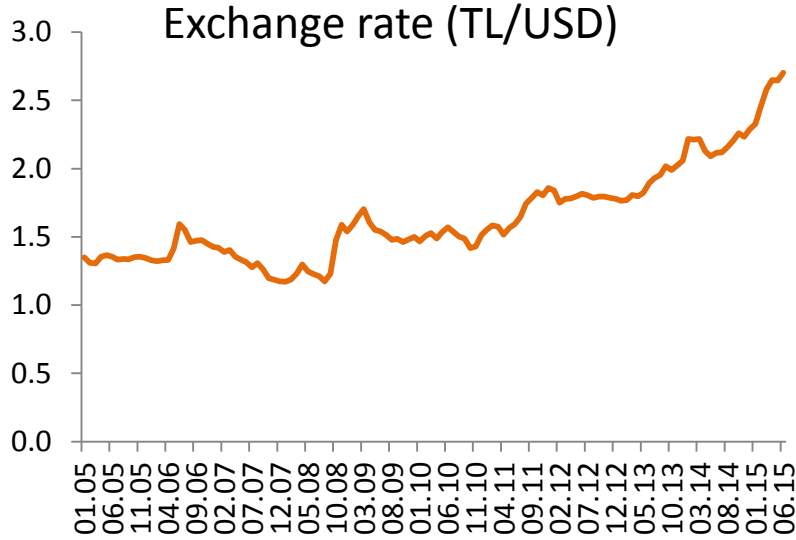


Motivation-III

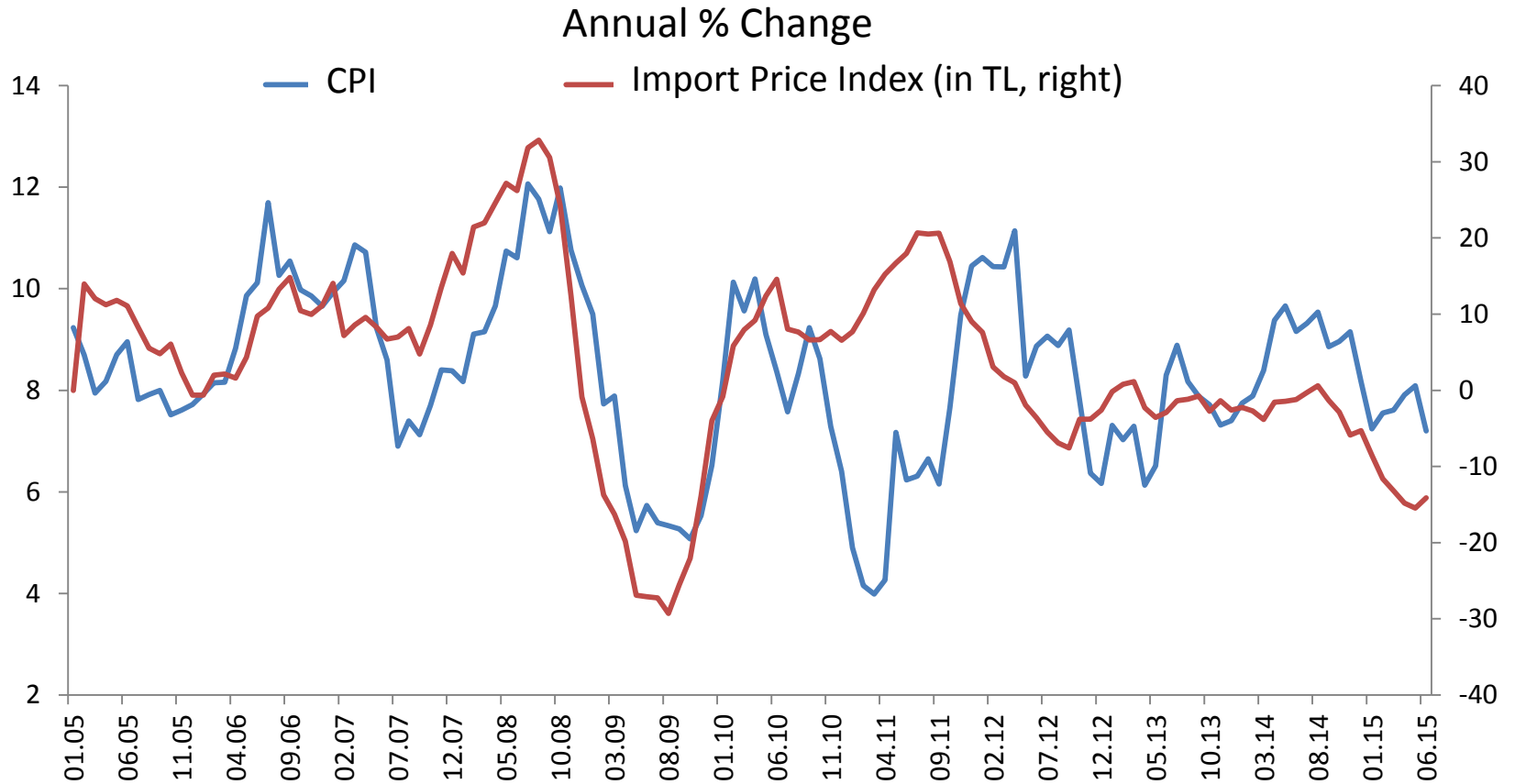
- The studies for Turkey reported an exchange rate pass-through to CPI of the range of 10 to 35 percent after 2002.
- Most of the studies on Turkey only focused on exchange rates and considered aggregate price indices.
- However, CPI is not homogeneous. It is composed of heterogeneous sub groups with possibly very different exchange rate and import price pass-through coefficients.
- Neglecting this heterogeneity may lead to an aggregation bias.
- Instead of focusing on aggregate CPI, working with disaggregated price series and then aggregating the individual pass-through coefficients might yield a bias free and more complete information.



Observations



Observations



Data

- Consumer Prices
 - 152 sub indices of CPI, Turkstat, quarterly percent change, SA
- Import Price Index (USD), Turkstat, quarterly percent change
 - IMP : General Index
 - IMP-Raw : Raw materials import prices
 - IMP-Cons : Consumer goods import prices
- Exchange rate, quarterly percent change, CBRT
 - Basket (0.5*Euro+0.5*USD)
 - USD
 - Euro
- Output gap (from Alp, Ögünç and Sarıkaya (2012))
- Wages (Non-farm, real unit wage)
- Exogenous controls: Global risk indicator (EMBI), global output gap, energy tax rate, unprocessed food price index (exc. fresh fruits&vegetables) *ala* Ögünç, Özmen and Sarıkaya (2016)



Methodology-I

- Construct a 5-variable VAR model for each 152 sub components of CPI:
 - Import prices (in USD)
 - Exchange rate
 - Output gap
 - Inflation
 - Non-farm real unit wage
- Sample: 2005Q1-2015Q2
- Baseline model:
 - Exchange rate : Basket
 - Import prices : IMP (General index)
- Check the impulse-response functions
- Determine the prices affected by exchange rate/import price
- Then aggregate the pass-through values over different groups



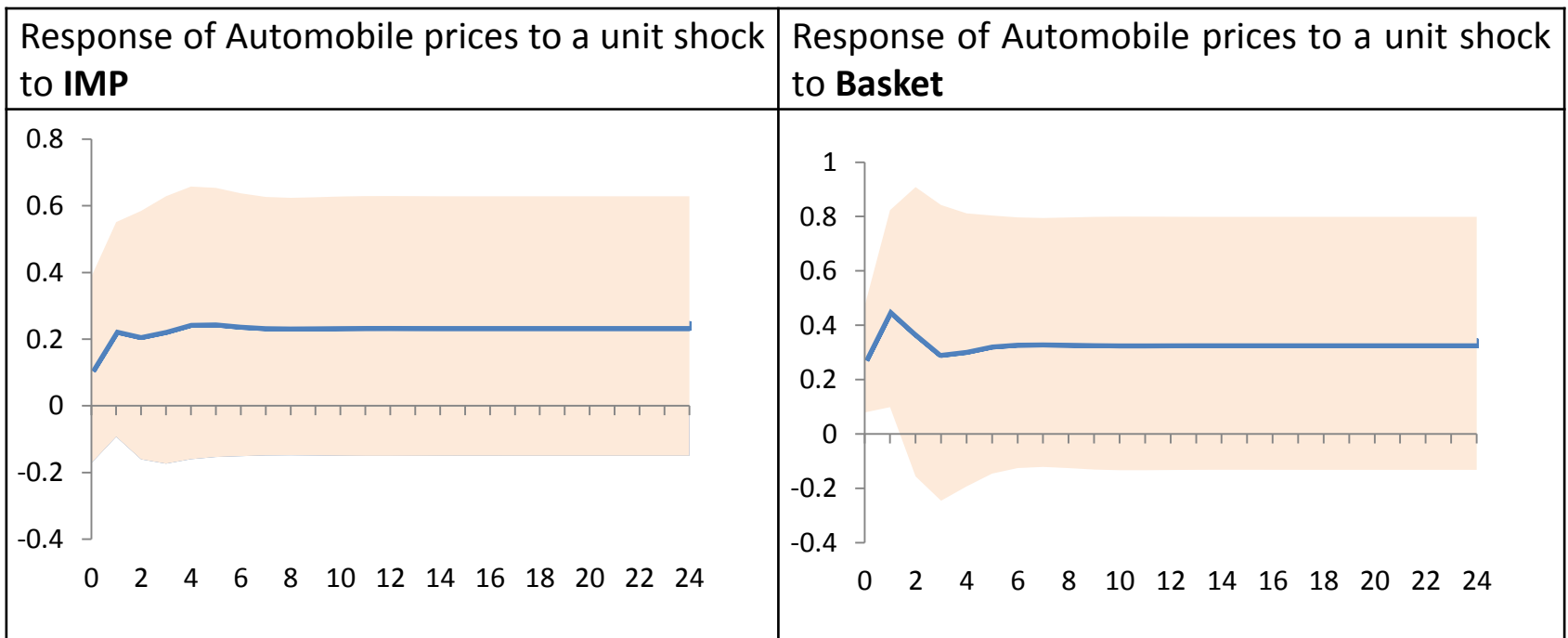
Methodology-II

- **Identification issues**
- Strategy through exogenous variables :
 - *global output gap* and *EMBI*:
 - to control for global growth channel
 - global growth & increase in risk appetite (*a rise in import prices*)
 - followed by capital inflows, growth, appreciation in local currency
 - contrary to the idea of a cost shock
 - *taxes on energy* items:
 - to control for tax changes
 - *unprocessed food price index (exc. fresh fruits&vegetables)* :
 - to control for domestic supply shocks



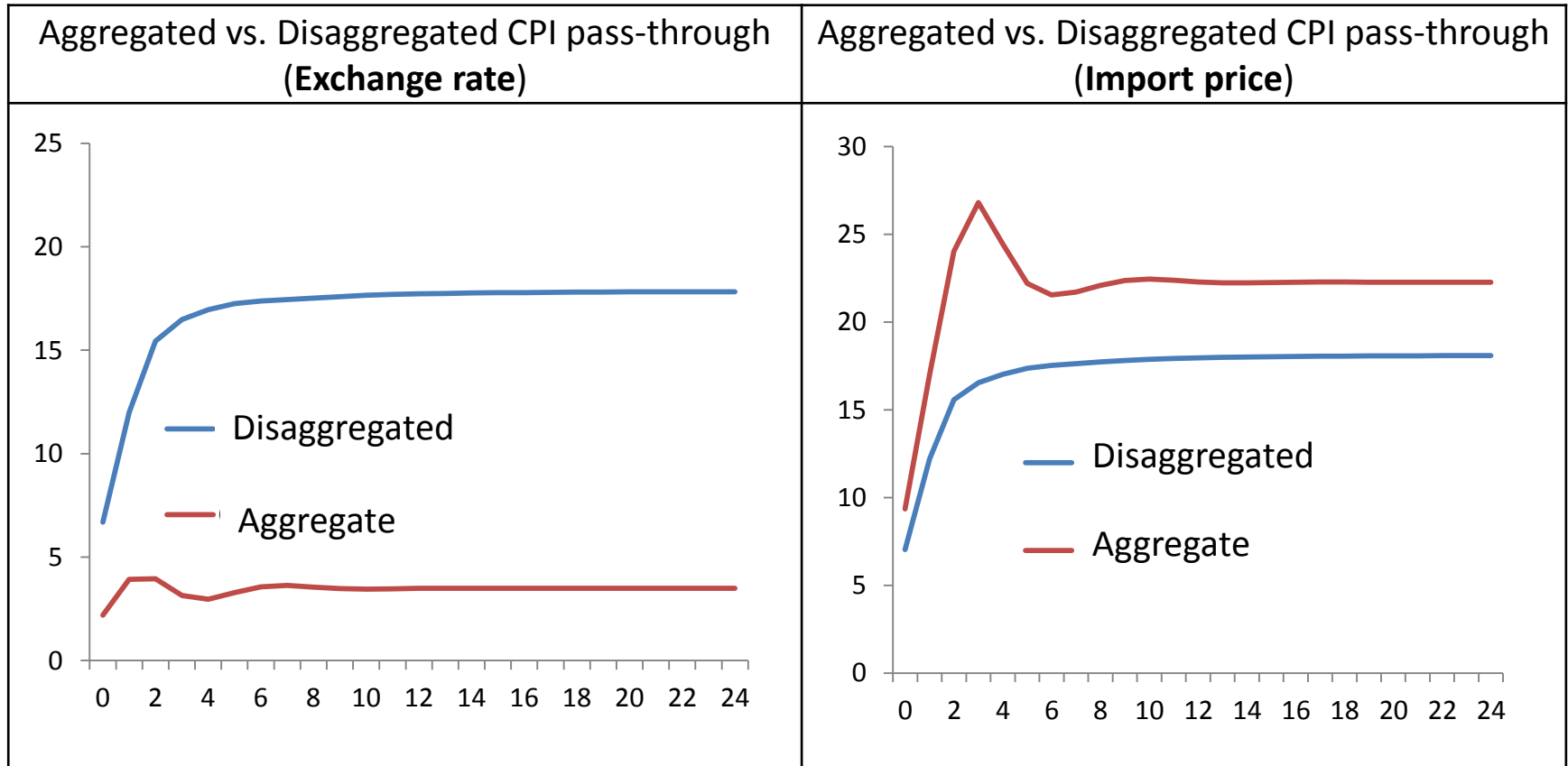
Methodology-III

- Determining items which are affected by exchange rates/import prices:
 - Check the impulse-responses
 - Exercise a "subjective" criteria
 - At least 75% of the confidence interval lies on the positive side
 - Seems to be a plausible approach:
 - consider Automobile prices:



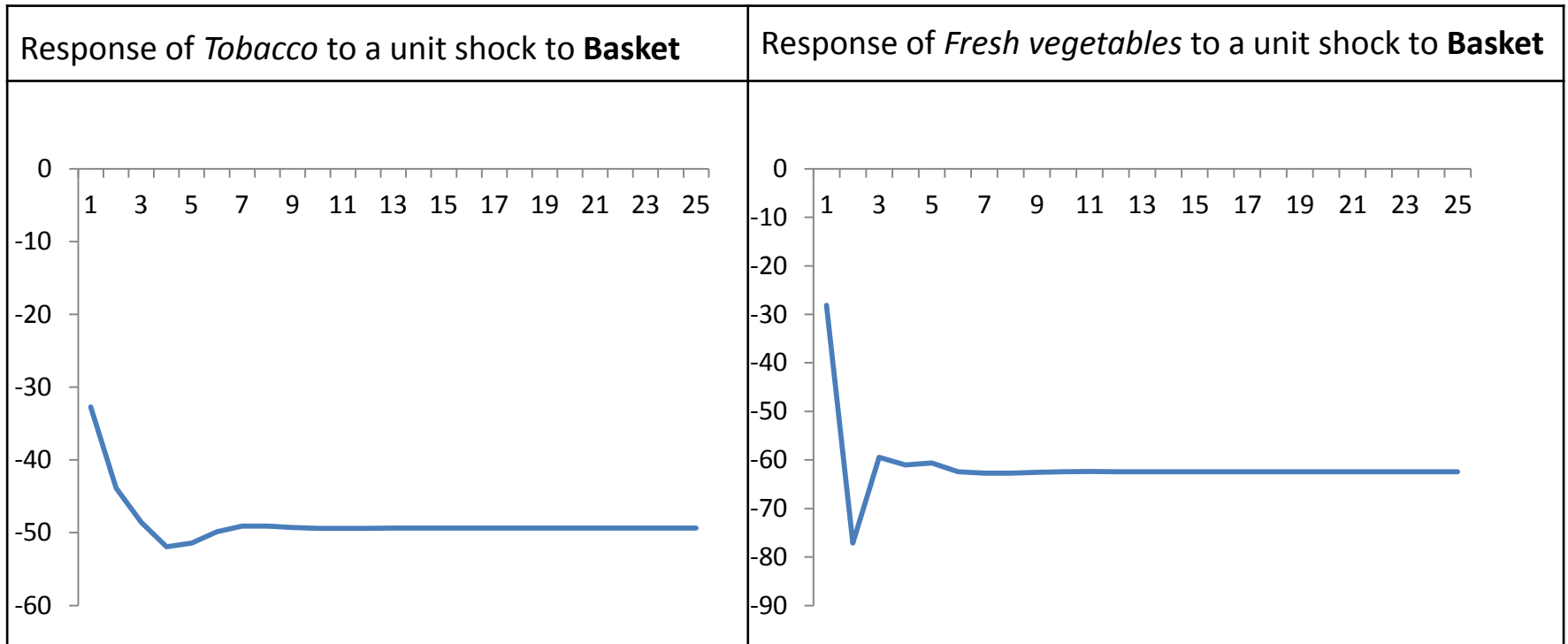
Results-I

- **Aggregation Bias**



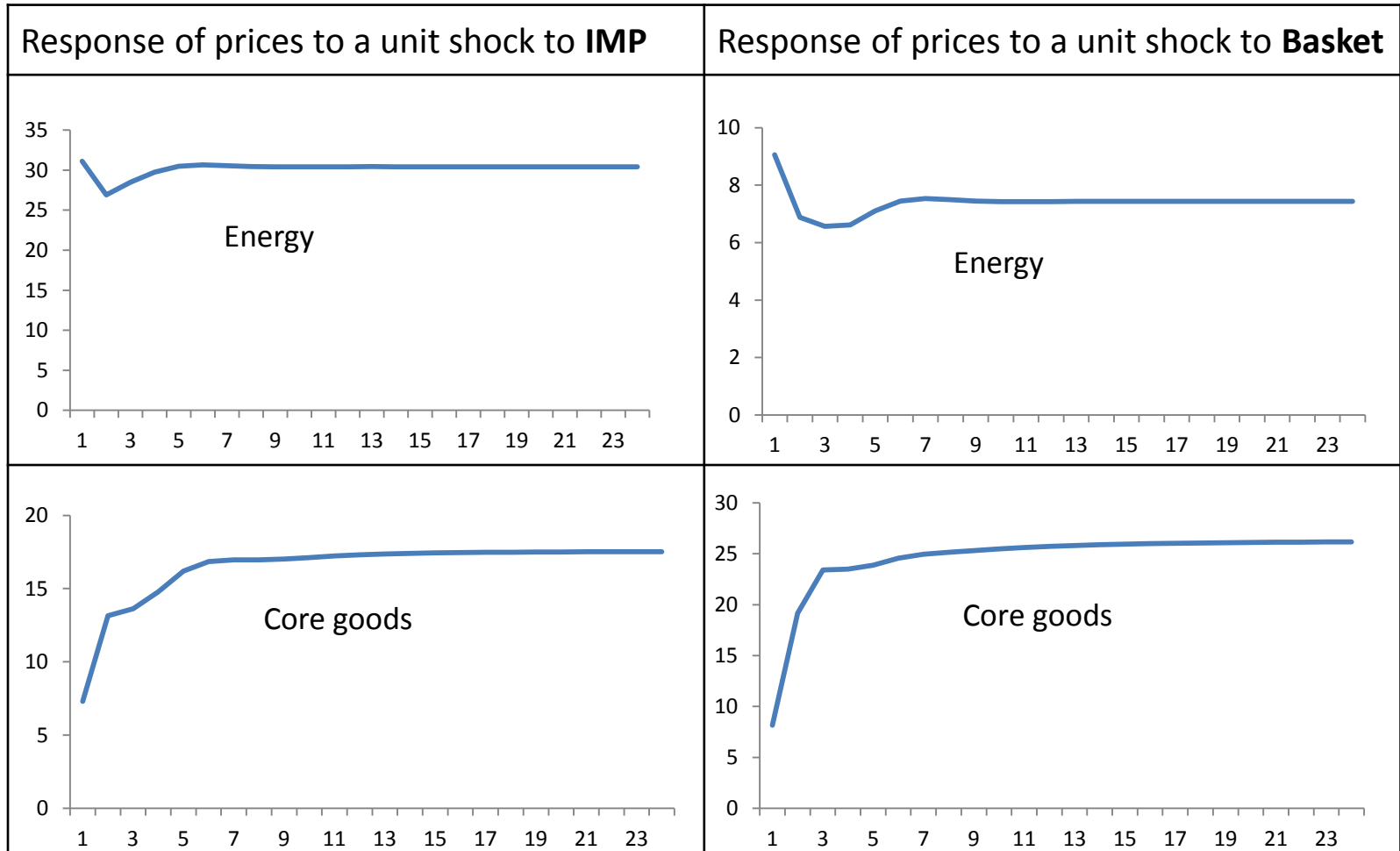
Results-I

- **Aggregation Bias**
 - Due to abruptly high and negative exchange rate pass-through for several items with a high weight in CPI:
 - i.e. Tobacco products, Fresh vegetables, ...



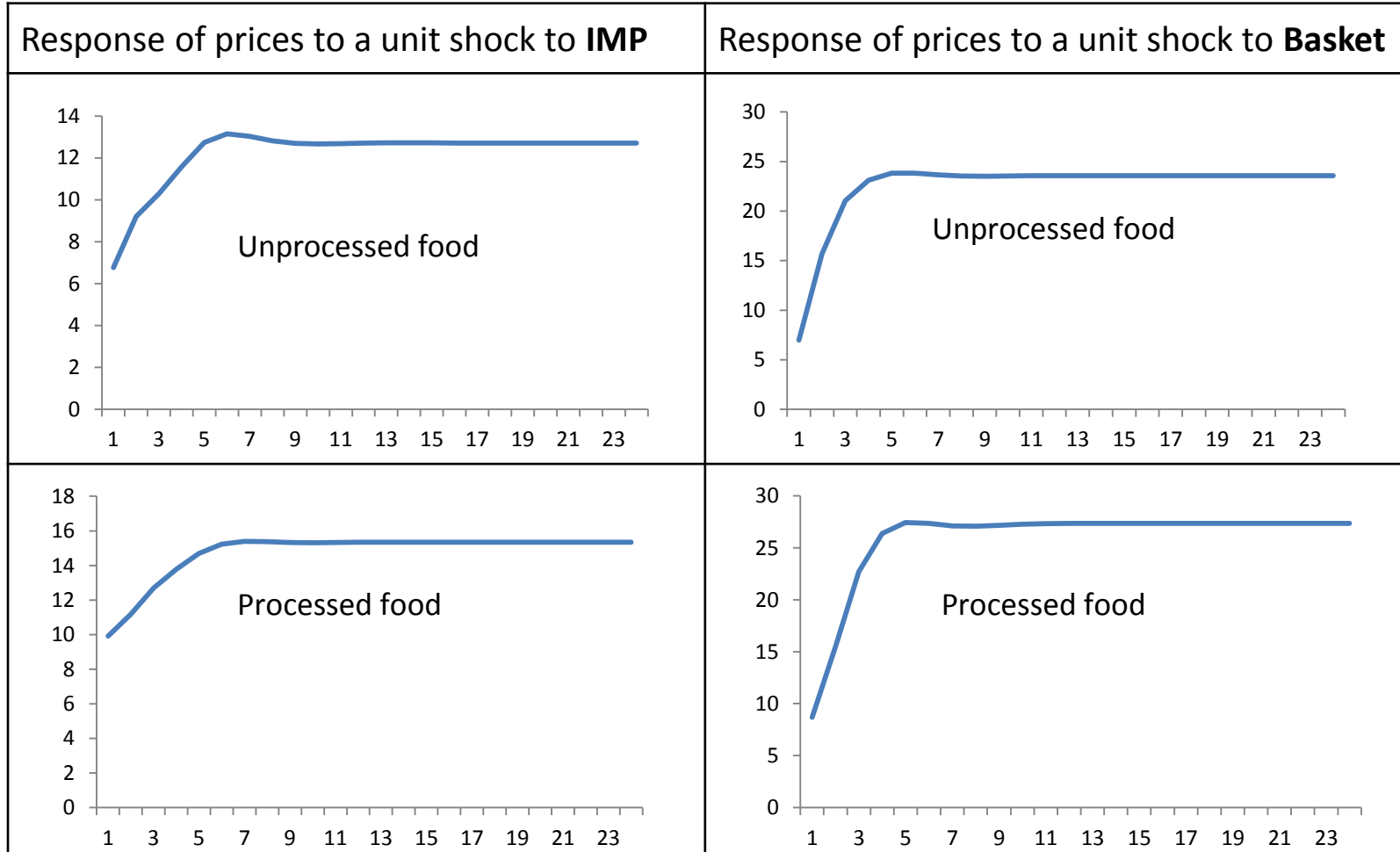
Results-II

- Heterogeneity across sub-groups**



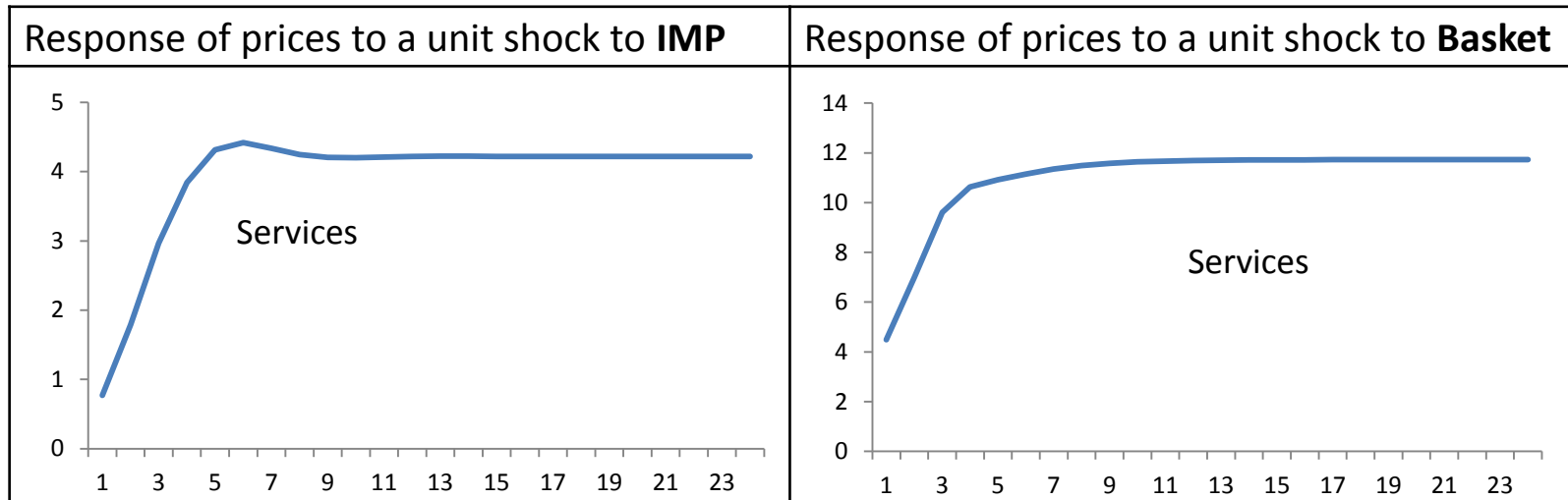
Results-II

- **Heterogeneity across sub-groups**



Results-II

- **Heterogeneity across sub-groups**



Results-II

- **Heterogeneity across sub-groups:** Summary
 - Baseline model: 2005-2015Q2, Basket, IMP
 - Cumulative response (%) after 8 quarters

	CPI	Unprocessed Food	Processed Food	Energy	Core Goods	Services	CPIX	CPI*
Exchange rate shock	17.4	23.5	27.1	7.5	25.1	11.5	17.6	19.2
Import price shock	14.0	12.8	15.4	30.5	17.0	4.2	14.8	15.3

CPIX: CPI excluding unprocessed food and alcohol-tobacco

CPI*: CPI excluding fresh fruits and vegetables, alcohol-tobacco



Results-II

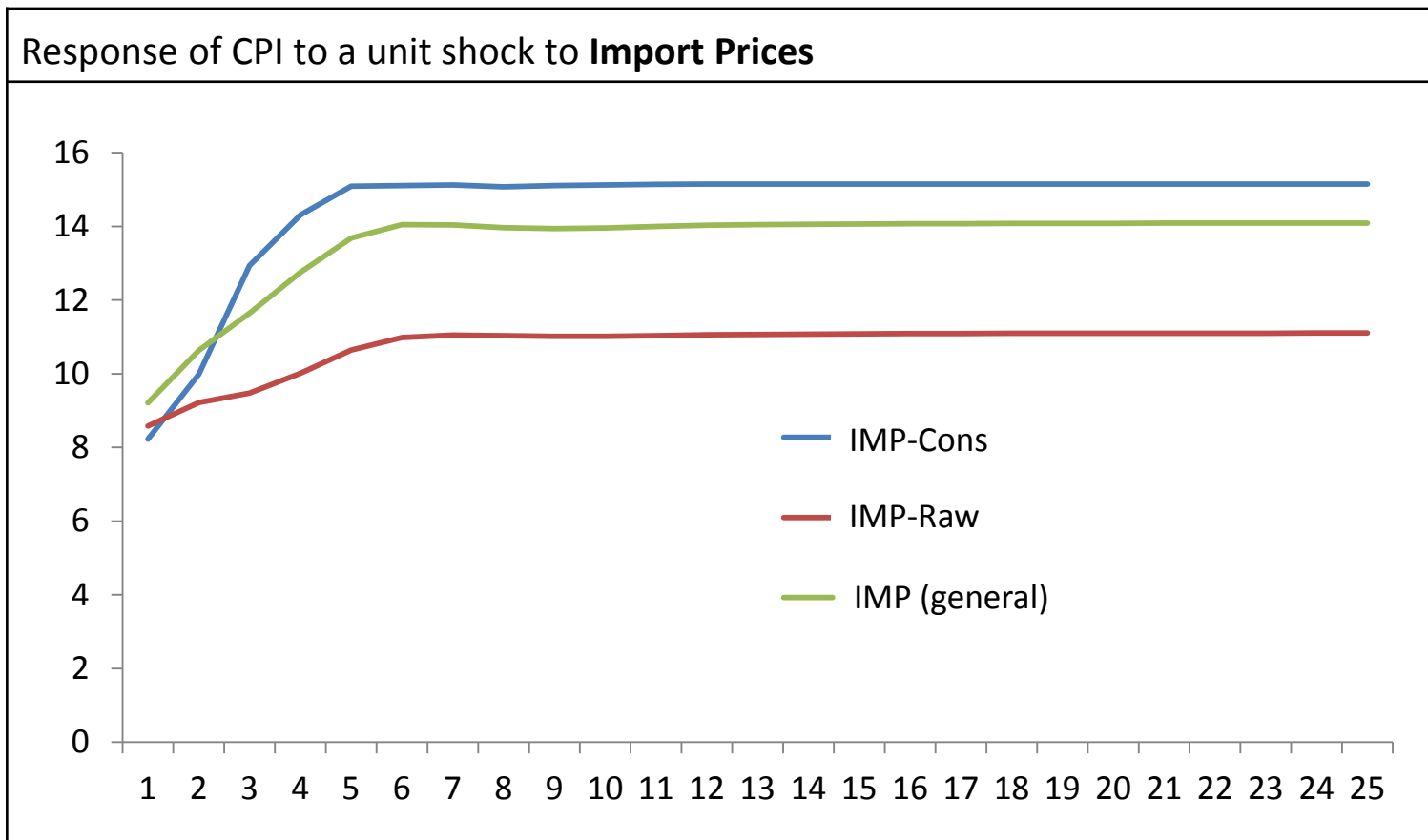
- **Heterogeneity across sub-groups**
 - Results for food prices are striking and never voiced out before for Turkey
 - A very high exchange rate and import price pass-through
 - Exchange rate pass-through is higher
 - Valid even after controlling for various food import prices
 - For services prices, there is a considerable amount of exchange rate pass-through
 - As expected, core goods are subject to high pass-through rates on both grounds
 - For energy prices, the pass-through of import price is higher



Results-III

- **Heterogeneity across Import Price Indices:**

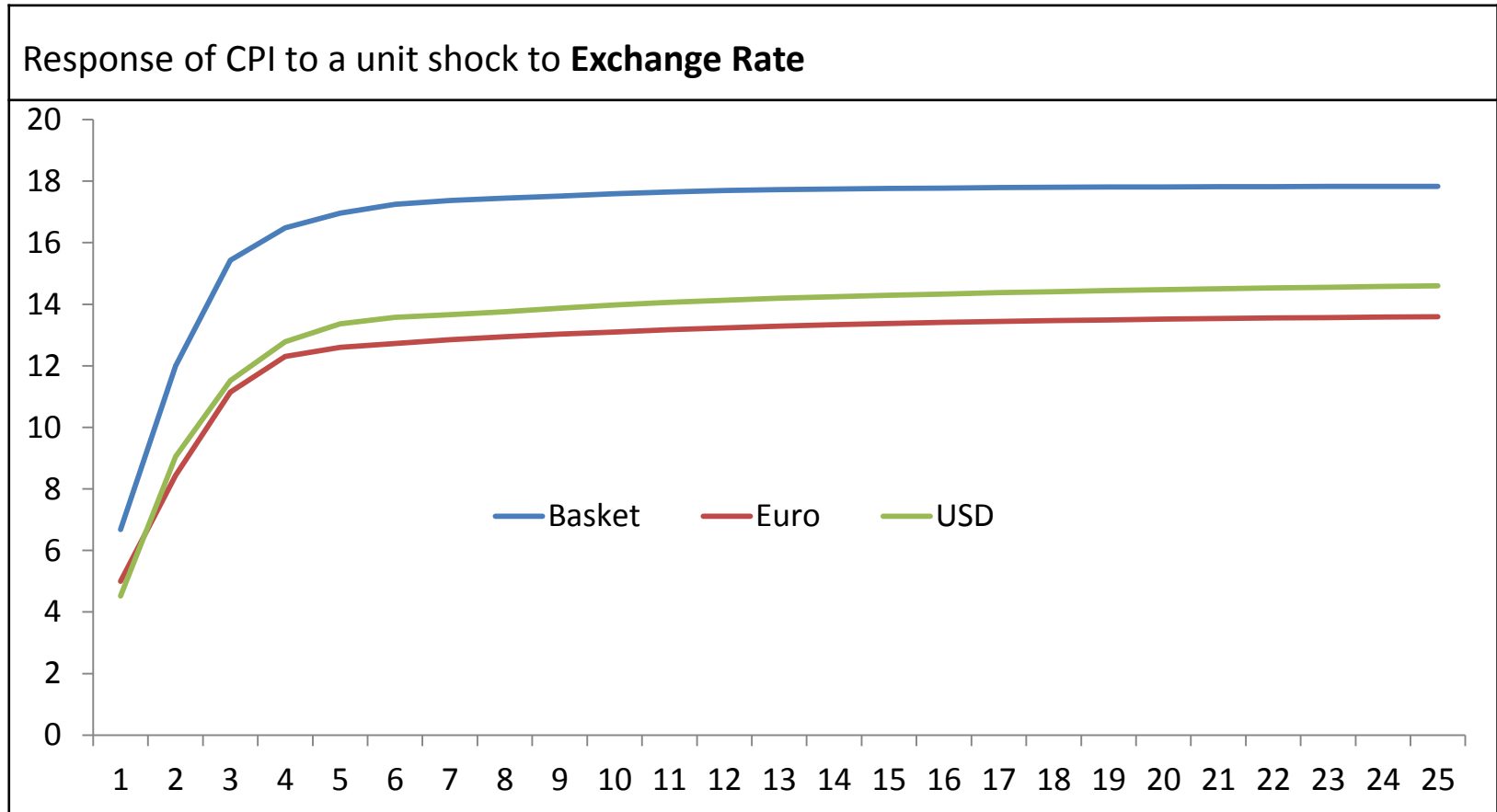
IMP; IMP-Raw, IMP-Cons



Results-IV

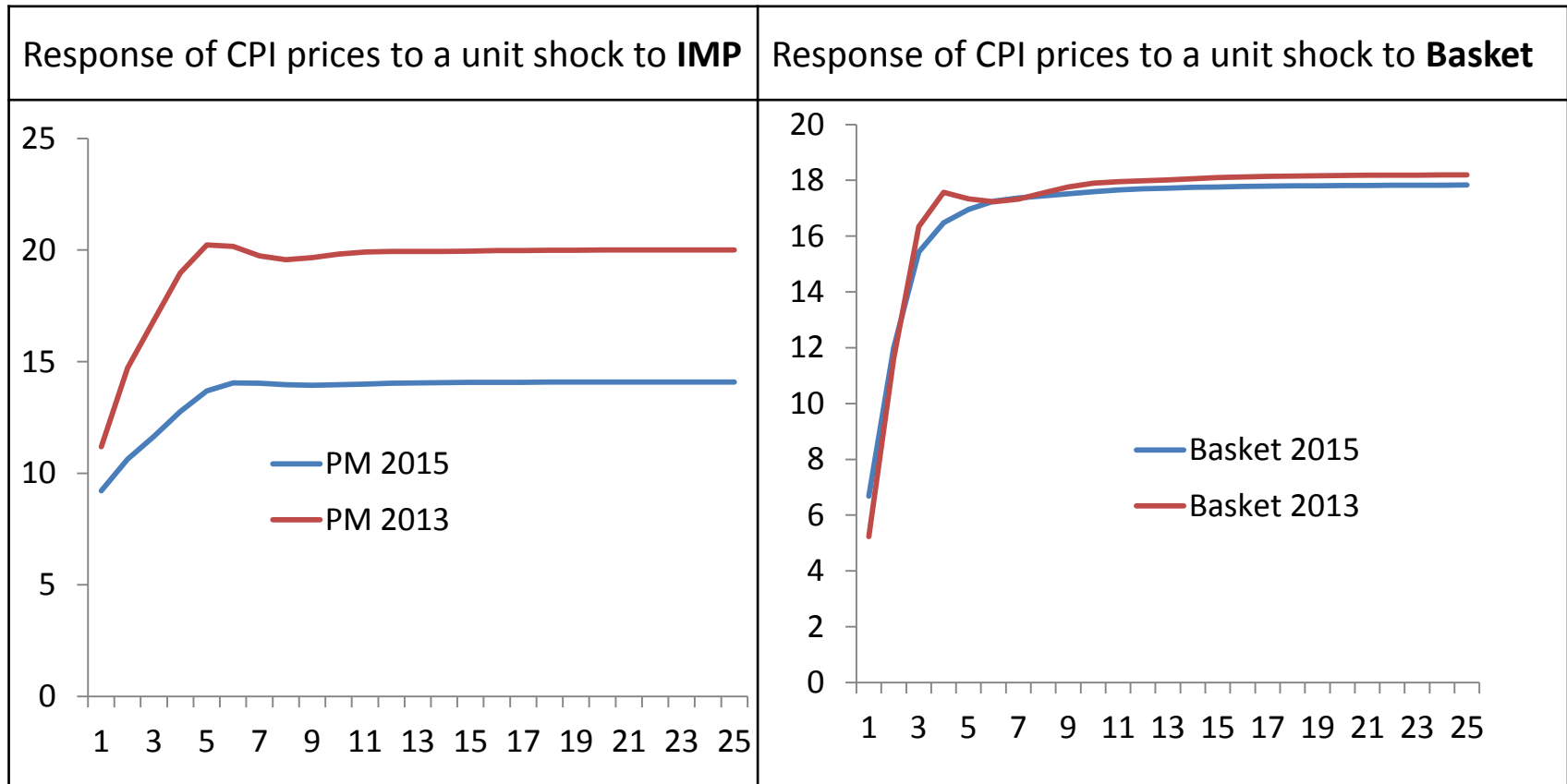
- **Heterogeneity across Exchange Rates:**

USD, Euro, Basket



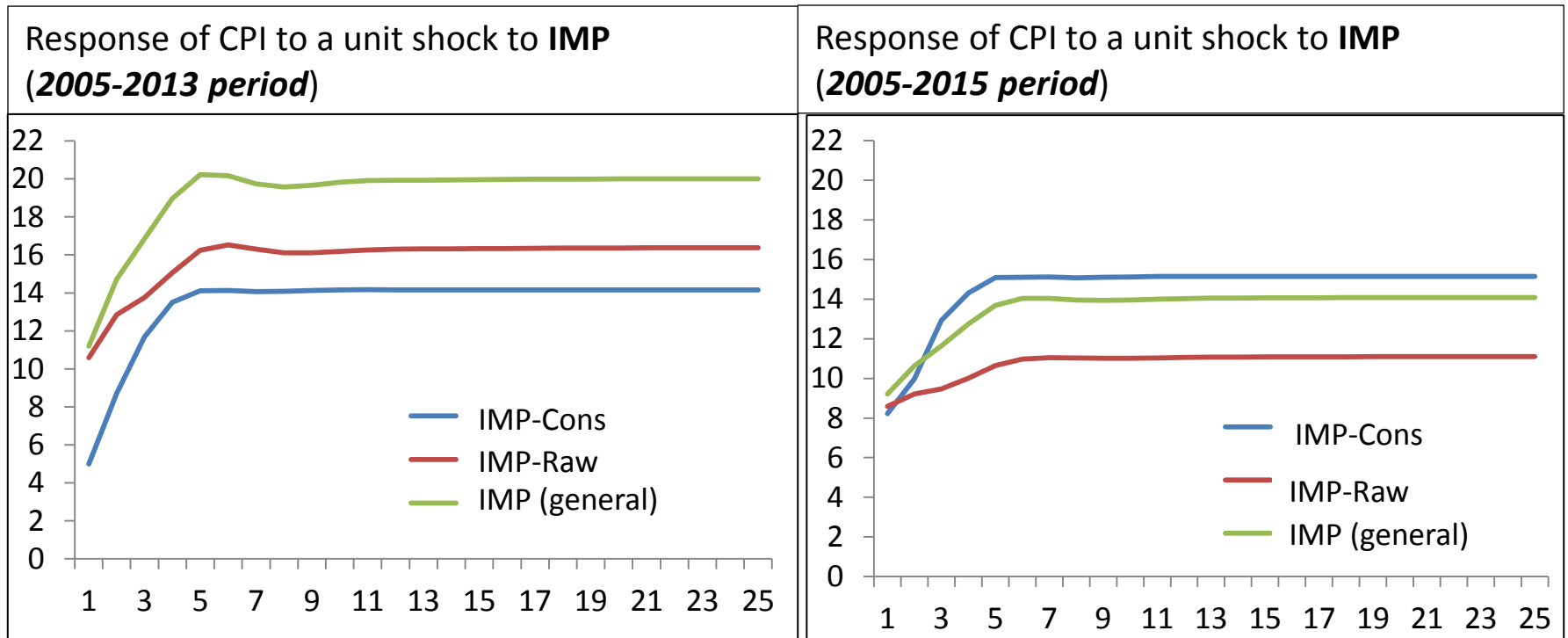
Results-V

- **A closer look at recent periods: 2005-2015Q2 vs. 2005-2013Q2**
 - A significant reduction in import price pass-through recently...



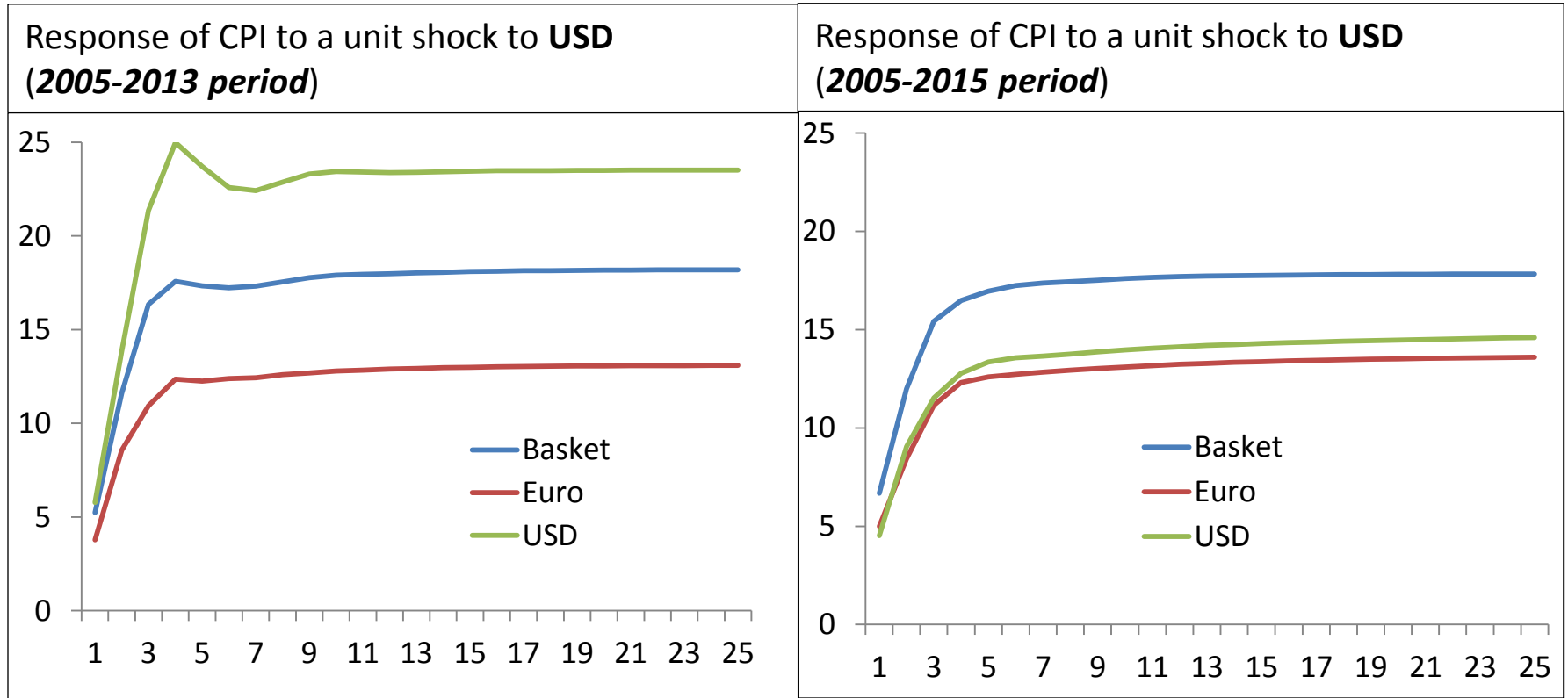
Results-V

- A closer look at recent periods: 2005-2015Q2 vs. 2005-2013Q2
 - The pass-through of IMP-Raw to CPI has come down from %17 to %11
 - Especially due to asymmetric response of energy prices



Results-V

- A closer look at recent periods: 2005-2015Q2 vs. 2005-2013Q2
 - The pass-through of USD to CPI has come down from %23 to %14



Conclusion

- Identification bias
 - VAR specification enhanced with exogenous factors enables a more concrete analysis
- Aggregation bias
 - Using disaggregated price series indicates an aggregation bias in pass-through estimates
- Heterogeneity across CPI sub groups
 - CPI sub-components react differently to exchange rate and import prices
 - Important for policy analysis and story telling



Conclusion

- Heterogeneity across Import price definitions
- Heterogeneity across Exchange rate definitions
- Recent period analysis: the import price pass-through is declining...
 - Oil price shock...
- Overall, using disaggregated CPI data to analyze foreign price pass-through provides valuable insights for policy makers on above mentioned grounds
- This analysis also puts forward another core CPI measure, with a very high coverage, that might be used in aggregate analysis instead of other alternatives
 - CPI*: CPI excluding fresh fruits and vegetables, alcohol-tobacco





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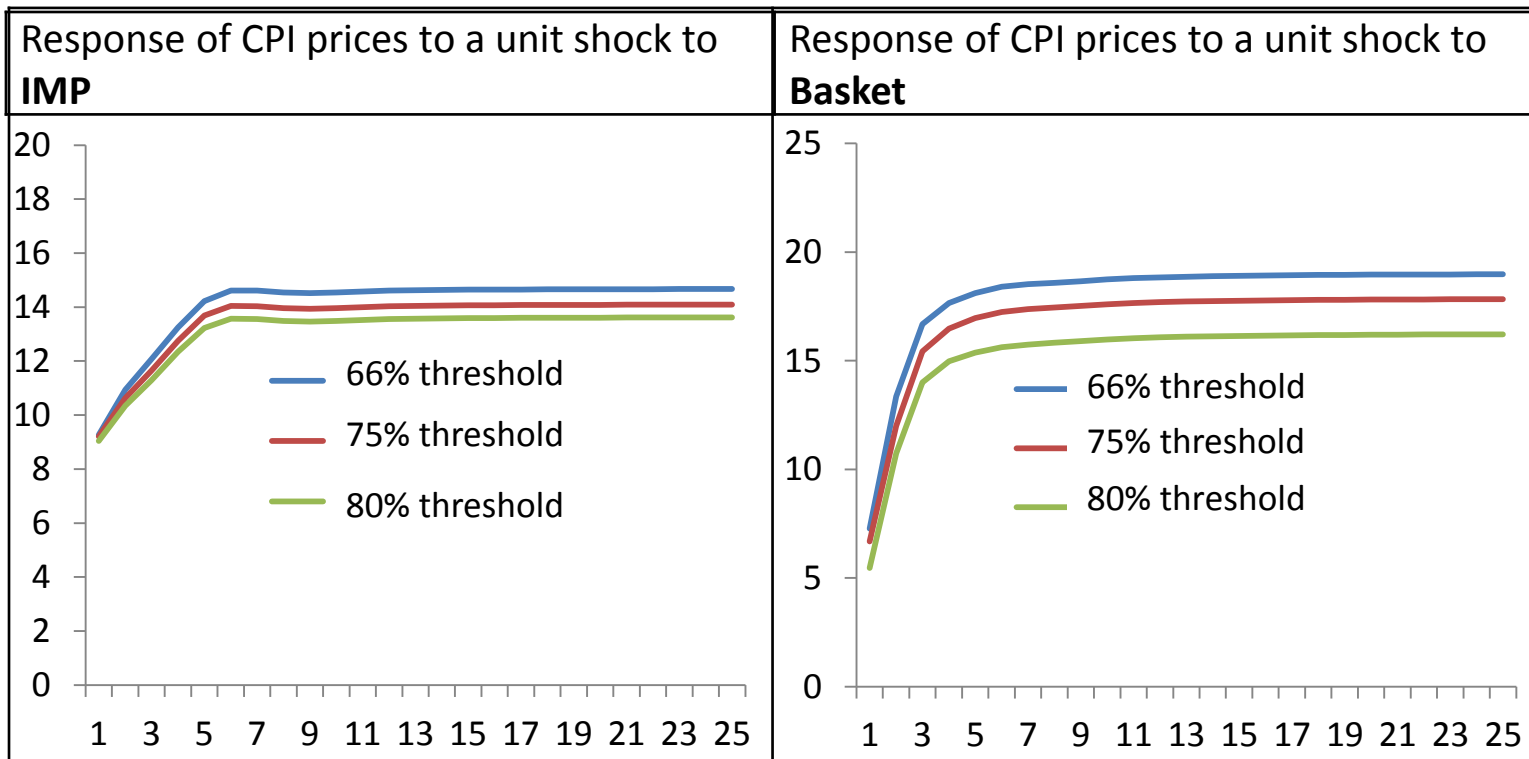
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Results-I*

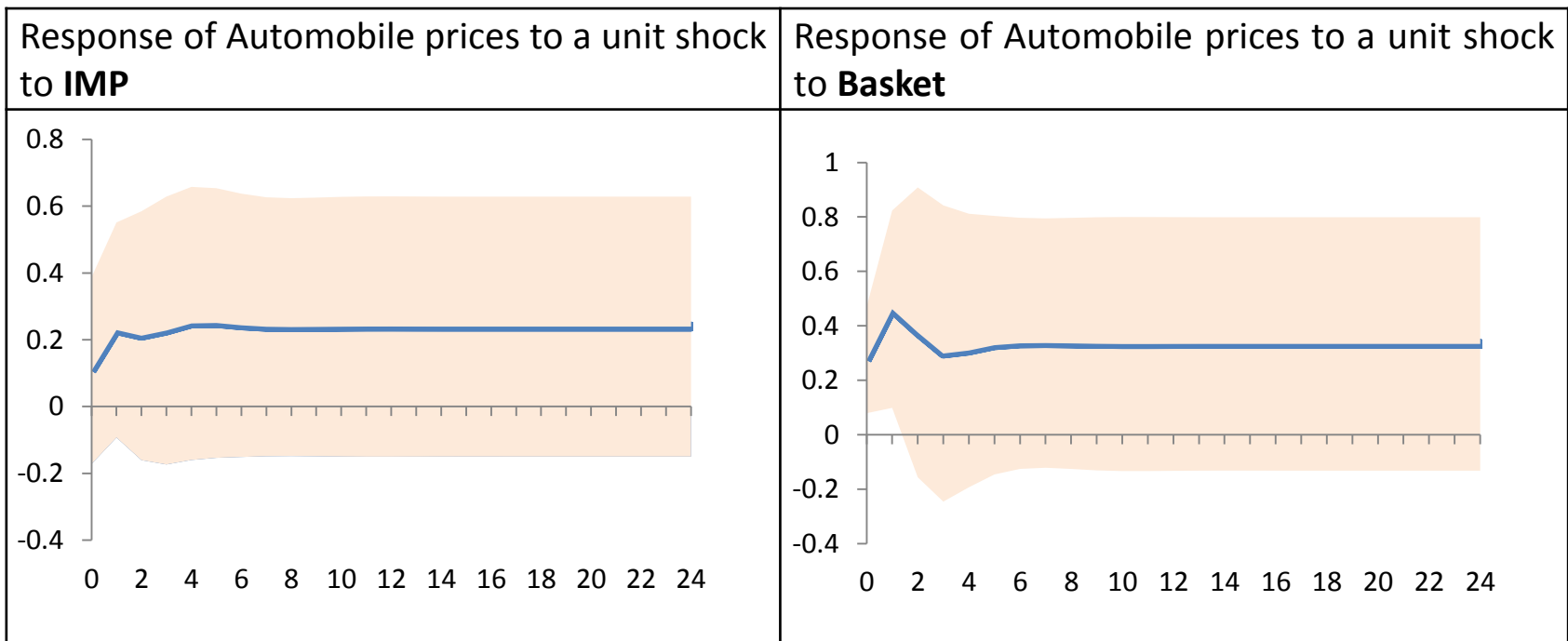
- **Robustness for threshold**

- The results are very robust for Import prices
- Results vary by about 1 percentage point to each side for Exchange rate
- Our approach can be considered as a midpoint, while others as uncertainty bands



Methodology-III

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Results-II*

- Heterogeneity across time

	CPI	Unprocessed Food	Processed Food	Energy	Core Goods	Services	CPIX	CPI*
05_13q2_bas_imptuk_PM	14.08	17.90	18.56	31.23	15.27	4.38	14.32	15.46
05_13q2_bas_impham_PM	16.12	14.41	19.73	26.71	20.13	7.46	17.16	17.66
05_15q2_bas_imptuk_PM	15.07	23.55	18.17	32.21	17.87	3.11	14.81	15.36
05_15q2_bas_impham_PM	11.03	9.82	12.07	24.74	13.01	3.68	11.80	12.13
05_15q2_usd_imptuk_PM	15.64	24.21	19.75	31.16	18.38	4.07	15.39	15.97
05_15q2_usd_impham_PM	10.91	9.98	13.07	23.80	12.78	3.55	11.63	12.00
05_15q2_bas_imptuk_PM	15.07	23.55	18.17	32.21	17.87	3.11	14.81	15.36
05_15q2_bas_impham_PM	11.03	9.82	12.07	24.74	13.01	3.68	11.80	12.13
05_15q2_euro_imptuk_PM	14.45	23.10	17.95	32.54	15.68	3.14	14.12	14.66
05_15q2_euro_impham_PM	10.78	9.15	11.32	25.23	12.38	3.59	11.59	11.85
05_15q2_bas_imp_KUR	17.44	23.54	27.08	7.50	25.14	11.49	17.63	19.23
05_15q2_usd_imp_KUR	13.11	13.88	21.42	2.80	19.09	10.55	13.71	14.41
05_15q2_euro_imp_KUR	12.58	20.68	19.61	6.45	19.47	5.19	12.23	13.87
05_13q2_bas_imp_KUR	17.54	28.31	30.54	3.48	24.43	10.95	17.11	19.34
05_15q2_bas_imp_KUR	17.44	23.54	27.08	7.50	25.14	11.49	17.63	19.23
05_13q2_bas_imp_PM	19.57	18.55	23.31	32.17	25.13	8.33	20.69	21.44
05_15q2_bas_imp_PM	13.96	12.81	15.38	30.46	16.96	4.25	14.84	15.32

