

U.S. and Euro Area External Adjustment: The Role of Commodity Prices and Emerging Market Shocks

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Introduction

Major changes in world economy since early 2000s:

- **Enormous variation in terms of trade & commodity prices**
- **Growth acceleration in Emerging Economies**
- **Boom-Bust cycle in Euro Area (EA) and US**
- **Major trade balance (TB) adjustments**

Before 2009:

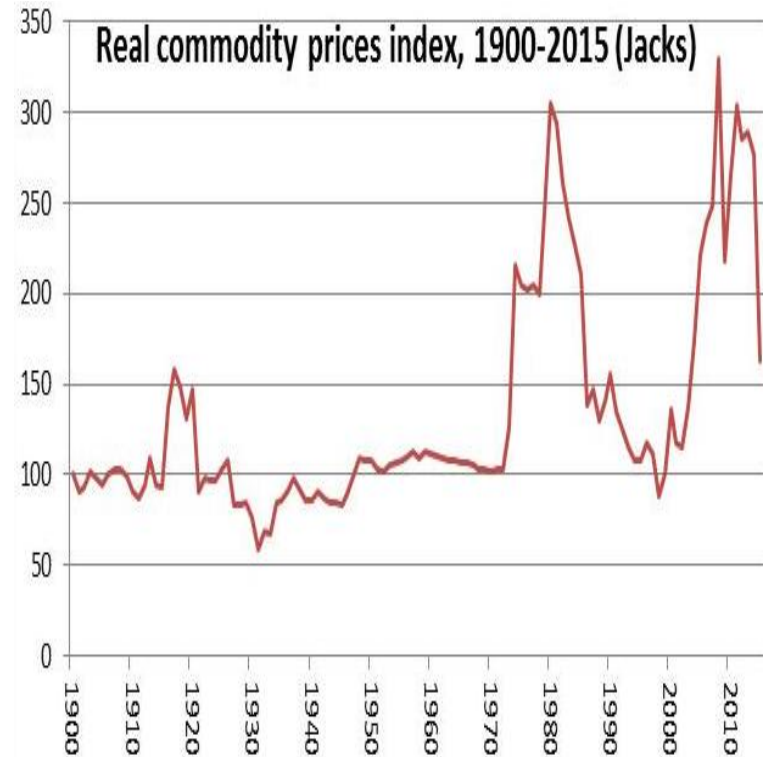
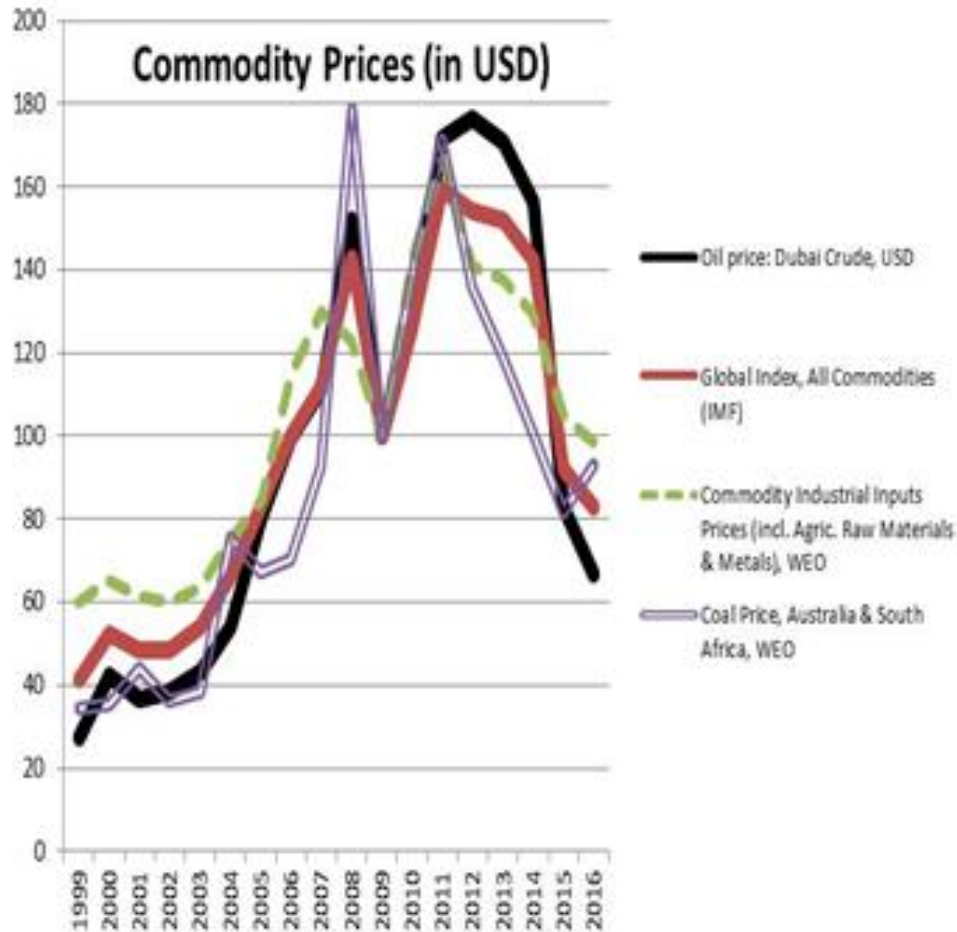
US TB deteriorated markedly, reaching -6% of GDP in 2005-07

EA TB fluctuated around zero

After 2009: EA & US TBs rose noticeably

Research Question: What shocks & mechanisms account for these external balance developments ?

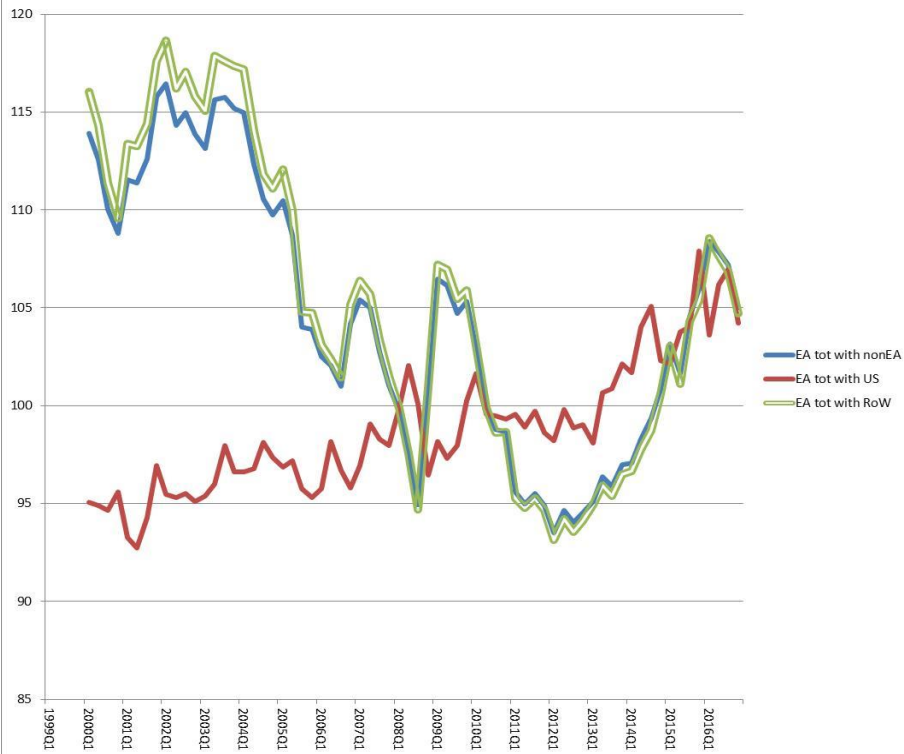
- **Huge fluctuations of commodity prices**
- Strong comovement across individual commodities



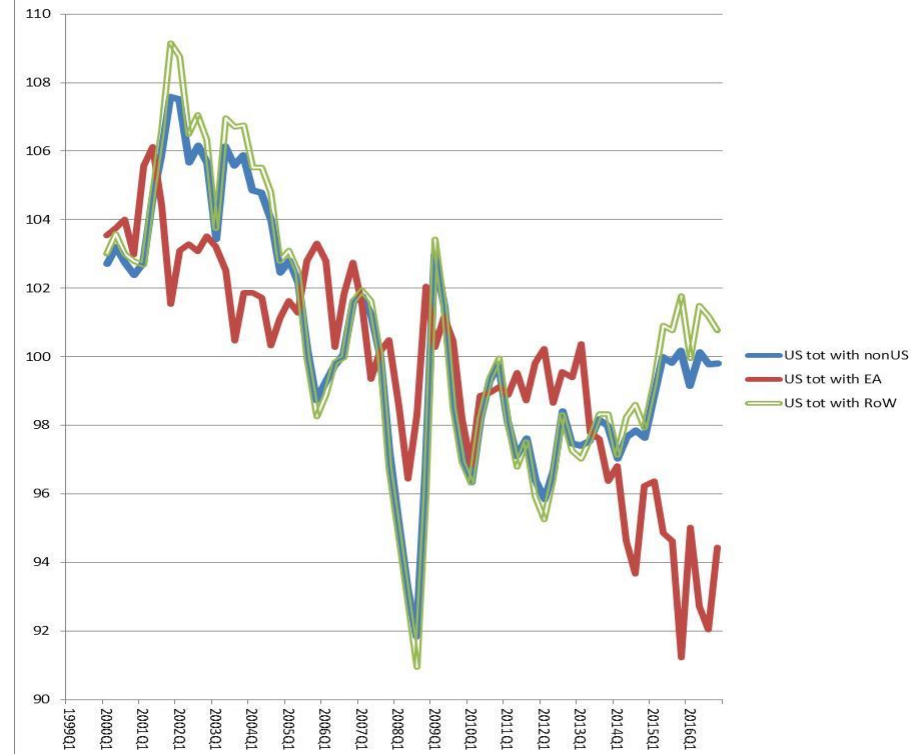
EA & US terms of trade

- Overall t.o.t. driven by t.o.t. against RoW
- Highly negatively correlated with commodity prices

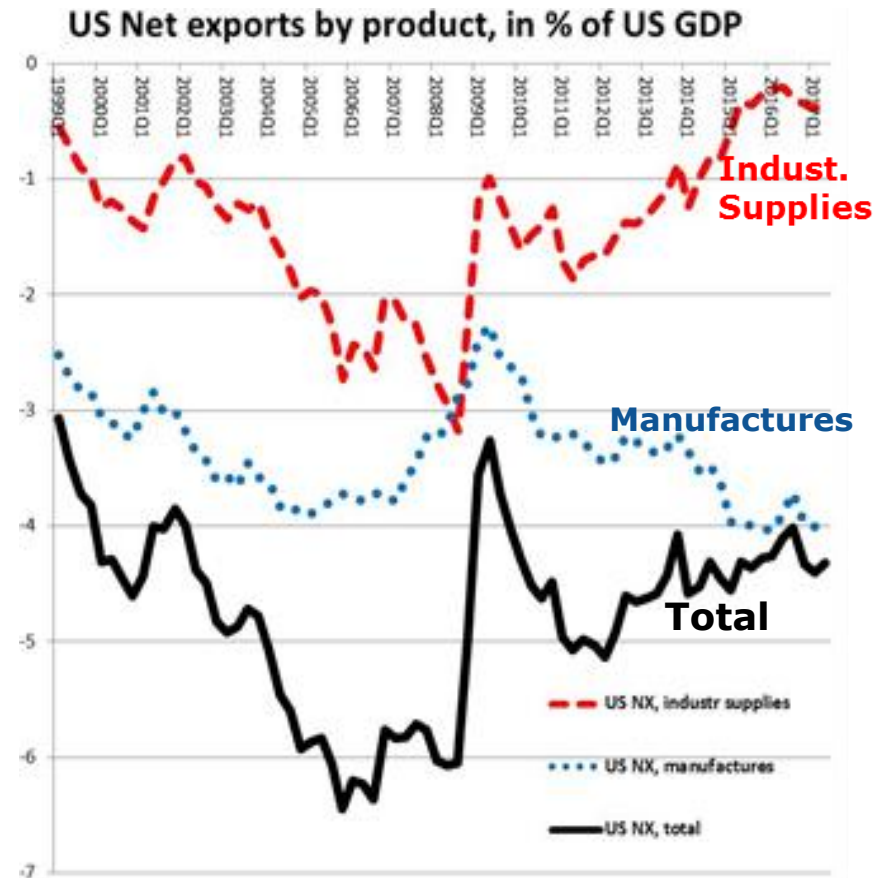
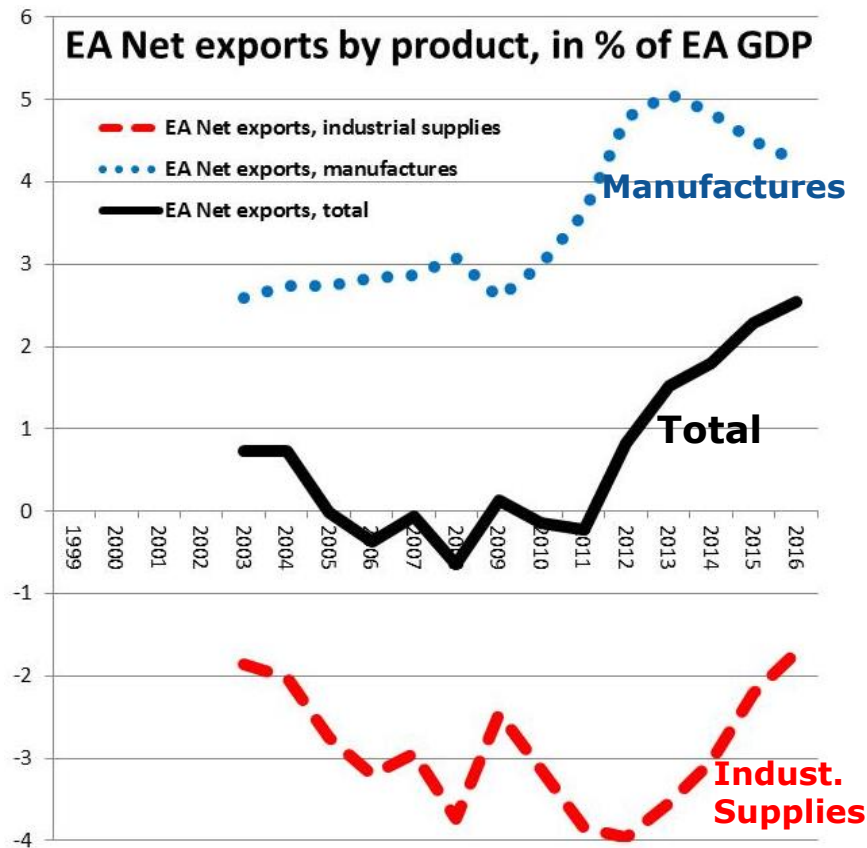
EA terms of trade, by TRADE PARTNER (2009=100)



US terms of trade, by TRADE PARTNER (2009=100)



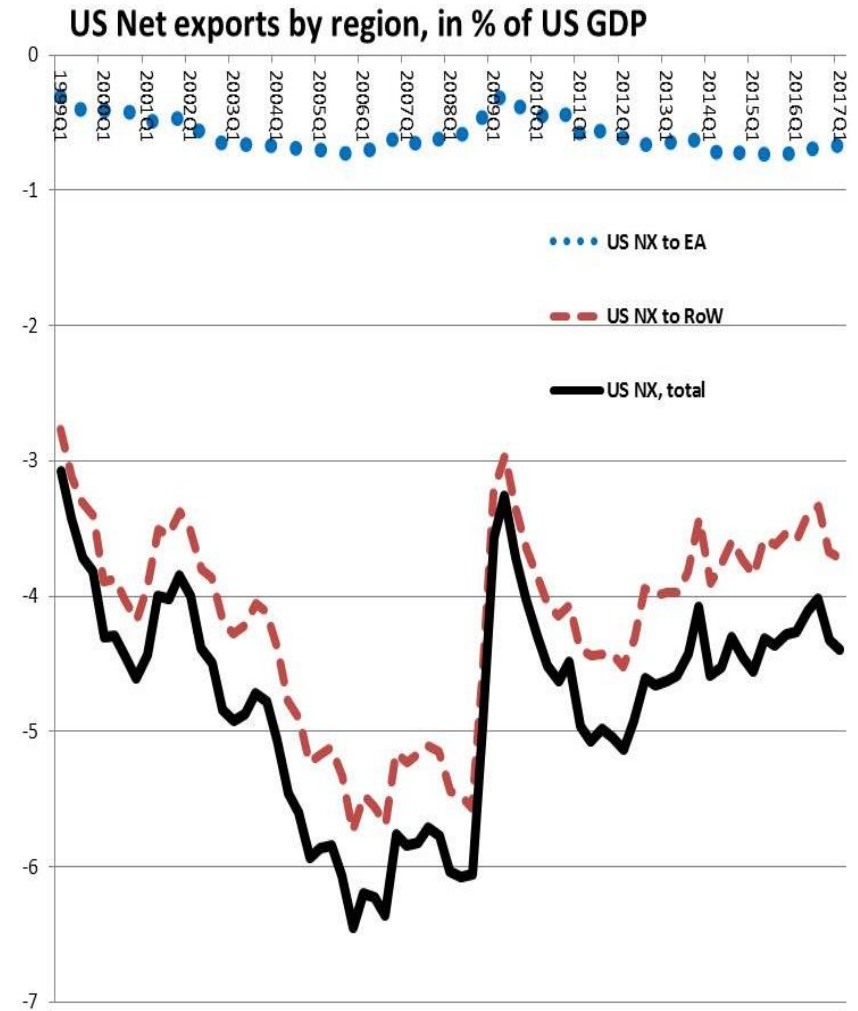
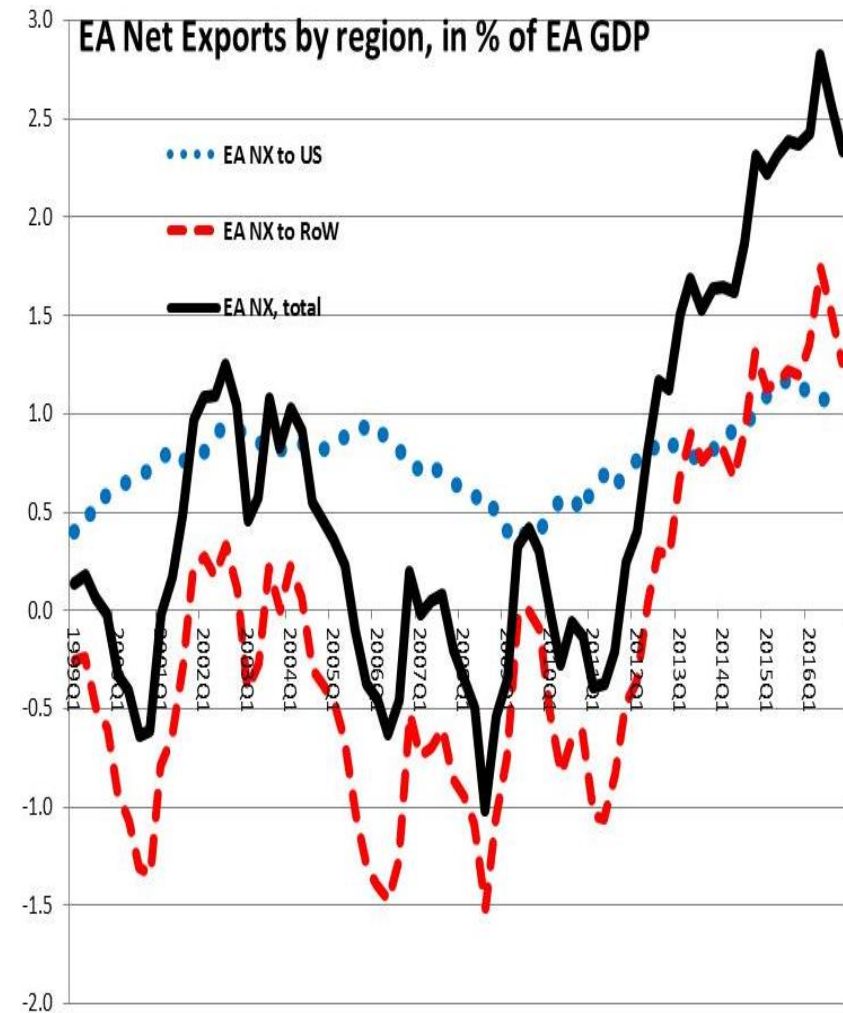
EA & US Net Exports: industrial supplies vs. manufactures (residual), 1999-2016



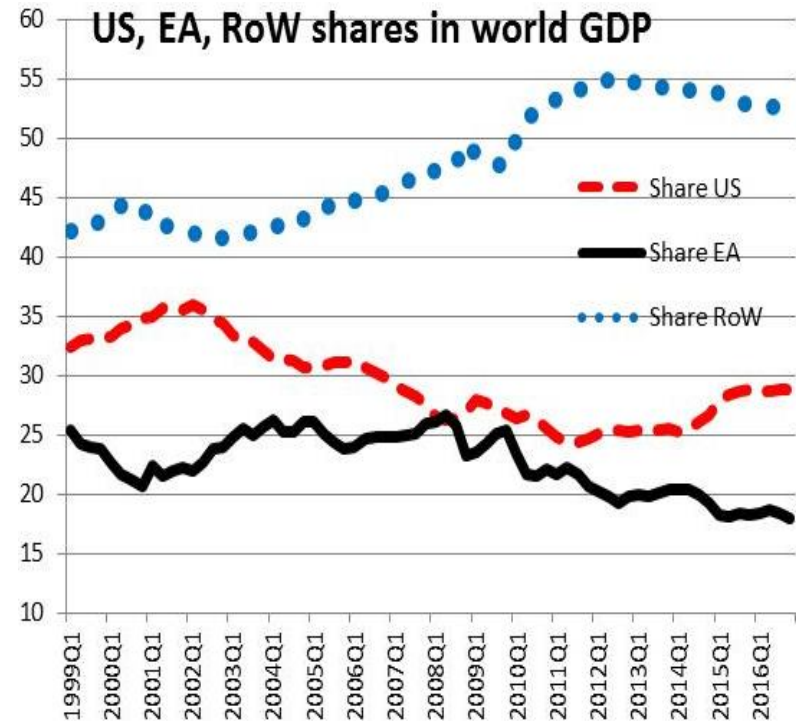
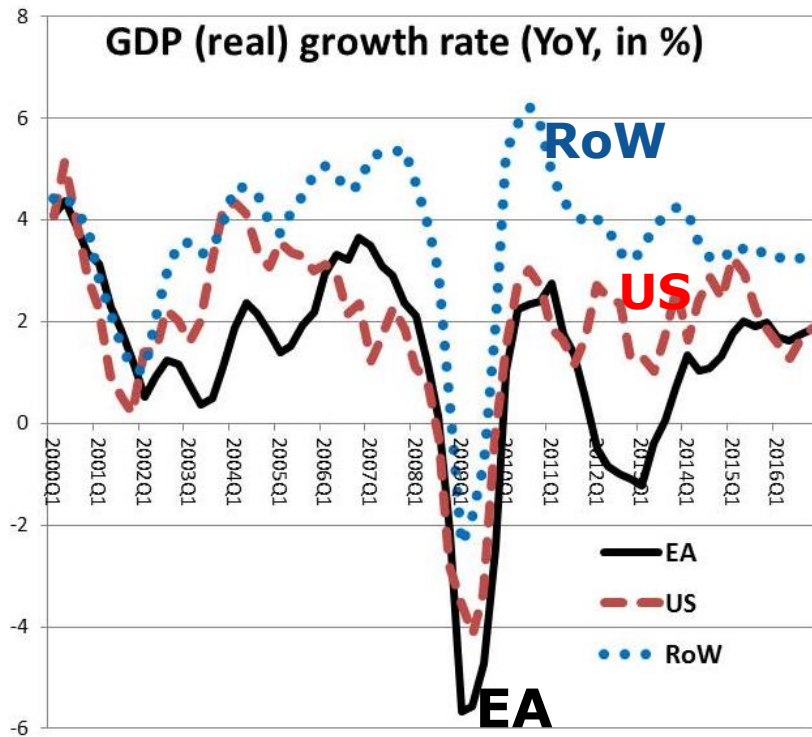
“Industrial supplies“ (IS) == commodities & raw materials

- Industrial supplies: important for net exports
- Role of IS: major difference between EA & US

Trade with RoW drives dynamics of EA & US net exports



RoW Growth acceleration, 2000-16



Questions:

What shocks account for these developments?

What is role of commodity prices & RoW for EA & US TBs & GDP

Methodology for answering questions:

Paper develops & estimates three-region (EA, US, RoW) model with commodity/raw materials sector.

Trade flows disaggregated into commodities & manufactured goods.

Estimation (Bayesian Methods): 1999q1-2017q2 for EA, US, RoW.

Data for estimation: **bilateral trade flows of industrial supplies & manufactured goods**, industrial supplies prices, standard macro variables (GDP, C, I, prices, wages etc.)

Results:

Emerging Markets and commodity prices have noticeable, but modest, effect on EA & US GDP, but matter significantly for EA & US trade balances

No mono-causal explanation for TB dynamics

- Domestic aggregate demand/supply contributed to widening pre-crisis US trade balance deficit, and to post-crisis EA trade balance improvement
- RoW saving shocks contributed to pre-crisis US trade balance deficits (consistent with 'saving glut' story)
- Commodity price fluctuations (driven by commodity-specific demand shocks) were key drivers of EA & US trade balance movements -- contributed to the post-crisis TB increase in EA & US

Link to the literature:

Quantitative analyses of recent oil and commodity fluctuations mostly rely on VAR models (Kilian (2009), Kilian et al. (2009), Peersman and Van Robays (2009), Caldara et al. (2017)).

For stylized *structural* models of the role of energy for international adjustment, see, e.g., Sachs (1981), McKibbin and Sachs (1991), Backus and Crucini (2000) and Gars and Olovsson (2018).

The paper here is closest to Forni, Gerali, Notarpietro and Pisani (2015), who estimate a two-country DSGE model of the EA and the non-EA RoW, using data for 1995-2012. Our model differs from that work:

- 3-region model (EA, US, RoW): analyze differences between EA and US external adjustment to recent global disturbances.
- Sample period that includes the post-2014 commodity price collapse.
- We consider a broader bundle of raw materials

Model description

EA and US blocks

- Financially constrained and unconstrained (Ricardian) households; government; firms.
- Firms combine domestic value added (labor and capital) & imported commodities

EA & US production process (role of commodities):

- Composite intermediate D_t produced from domestic value added Y_t and imported industrial supplies IS_t

(commodities):

$$D_t = [(1 - s_t^{IS})^{1/\nu} (Y_t)^{(\nu/(\nu-1))} + (s_t^{IS})^{1/\nu} (IS_t)^{(\nu-1)/\nu}]^{\nu/(\nu-1)}$$

s_t^{IS} : commodity-specific demand shock (exogenous).

- Final good produced from composite intermediate & imported final goods:

$$O_t = ((s_t^d)^{1/\phi} (D_t)^{(\phi/(\phi-1))} + (1 - s_t^d)^{1/\phi} (M_t)^{(\phi-1)/\phi})^{\phi/(\phi-1)}$$

- Sticky nominal intermediate good prices and wages.
- Nearly perfect international capital mobility across countries (up to a risk premium which depends on the net foreign asset position), plus exchange risk premium.
- Flexible exchange rates.
- Monetary policy: interest rate rule.
- Government in EA and US levy distortive taxes and issue debt. Public expenditure responds to the government balance.

RoW block

- Technology for intermediates production uses labor -- no capital in RoW.
- RoW total final output O_t produced by combining domestic intermediates Y_t with domestic commodities/industrial supplies IS_t

$$O_t = \left[(1 - s_t^{is})^{\frac{1}{\sigma^o}} (Y_t)^{\frac{\sigma^o - 1}{\sigma^o}} + (s_t^{is})^{\frac{1}{\sigma^o}} (IS_t)^{\frac{\sigma^o - 1}{\sigma^o}} \right]^{\frac{\sigma^o}{\sigma^o - 1}}$$

- New Keynesian Phillips curve.
- Taylor rule for monetary policy.

Production of commodities (INDUSTRIAL SUPPLIES)

- Commodities only produced in RoW; used in RoW and exported to EA & US
- RoW commodity supply price $P_{RoW,t}^{IS}$ (normalized by RoW GDP deflator) is increasing

function of commodity production (supply), IS_t^c :

$$\ln(P_{RoW,t}^{IS}/P_{RoW,t}^{GDP}) = const. + \eta^{IS} \times \ln(IS_t^c) - \mathcal{E}_t^c; \quad c=EC, NEC$$

\mathcal{E}_t^c : exogenous commodity supply shock (reflects discovery of new raw material deposits, technical progress in commodity production etc.)

Model solution and econometric approach

- Model linearized around deterministic steady state.
- Subset of parameters calibrated to match long-run data properties.
- Remaining parameters estimated, Bayesian methods (1999q1-2017q2).

66 exogenous shocks

60 Observables: time series for real GDP, aggregate demand components, prices, trade, employment, fiscal and monetary policy, EXR, commodities

Table 1. Prior and posterior distributions of key estimated model parameters

(1)	Posterior distributions				Prior distributions		
	EA		US		Distrib.	Mean	Std
	Mode	Std	Mode	Std			
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Preferences and technologies							
Consumption habit persistence	0.86	0.03	0.71	0.07	B	0.5	0.1
Risk aversion	1.74	0.20	1.68	0.55	G	1.5	0.2
Inverse labor supply elasticity	2.40	0.39	1.91	0.45	G	2.5	0.5
Import price elasticity	1.20	0.07	1.22	0.15	G	2	0.4
Steady state consumption share of Ricardian households							
	0.72	0.06	0.84	0.06	B	0.5	0.1
Nominal frictions							
Price adjustment cost	22.3	7.99	24.7	6.15	G	60	40
Nominal wage adj. cost	3.83	2.07	3.39	0.94	G	5	2
Monetary policy							
Interest rate persistence	0.87	0.03	0.83	0.03	B	0.7	0.12
Response to inflation	1.30	0.31	1.38	0.31	B	2	0.4
Response to GDP	0.05	0.02	0.07	0.02	B	0.5	0.2
Commodities							
Commodity demand elasticity	0.02	0.02	0.05	0.03	B	0.5	0.2
Inverse commodity supply elasticity (RoW)			1.07	0.15	B	3.00	1.5

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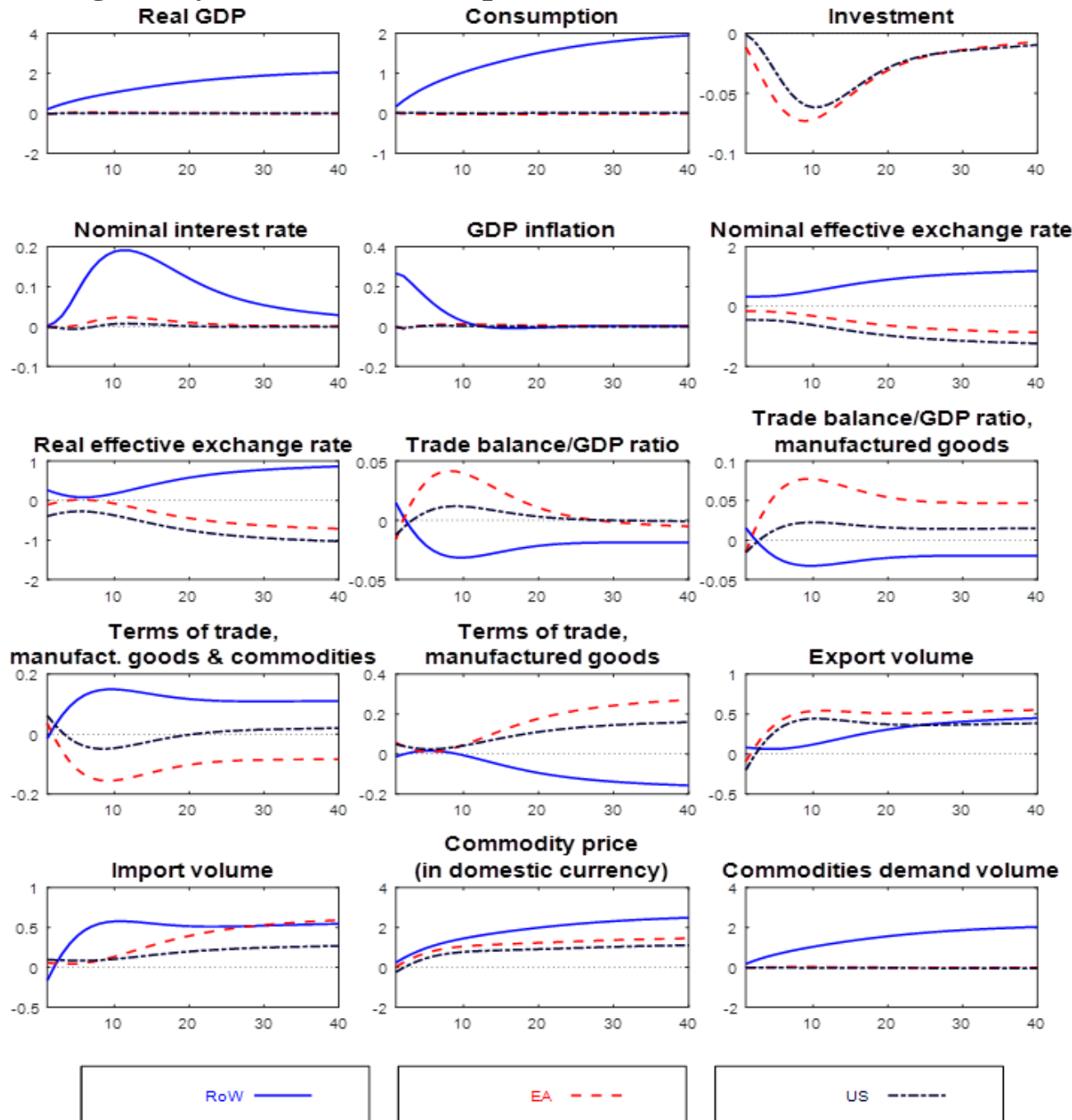
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	Mode	Std	Mode	Std			
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Autocorrelations of forcing variables							
Permanent TFP growth	0.95	0.03	0.92	0.03	B	0.85	0.075
Subjective discount factor	0.78	0.05	0.97	0.30	B	0.5	0.2
Investment risk premium	0.96	0.02	0.95	0.02	B	0.85	0.05
Trade share	0.98	0.01	0.92	0.03	B	0.5	0.2
Commodity specific demand, ρ_1	1.52	0.13	1.32	0.10	N	1.4	0.25
Commodity specific demand, ρ_2	-0.57	0.12	-0.38	0.10	N	-0.4	0.15
Standard deviations (%) of innovations to forcing variables							
Monetary policy	0.10	0.01	0.11	0.01	G	1.00	0.40
Gov. transfers	0.09	0.01	0.47	0.04	G	1.00	0.40
Permanent TFP level	0.08	0.01	0.09	0.01	G	0.10	0.04
Permanent TFP growth	0.02	0.01	0.06	0.02	G	0.10	0.04
Subjective discount factor	1.22	0.35	0.10	0.27	G	1.00	0.40
Investment risk premium	0.16	0.08	0.13	0.06	G	0.10	0.04
Domestic price mark-up	3.62	1.22	4.84	1.06	G	2.00	0.80
Trade share	3.39	0.26	2.32	0.22	G	1.00	0.40
Commodity-specific demand	1.48	0.26	5.87	0.04	G	1.00	0.40
Commodity supply	4.05	0.46	2.36	0.67	G	1.00	0.40

Big commodity supply & commodity-specific demand shocks

IMPULSE RESPONSES

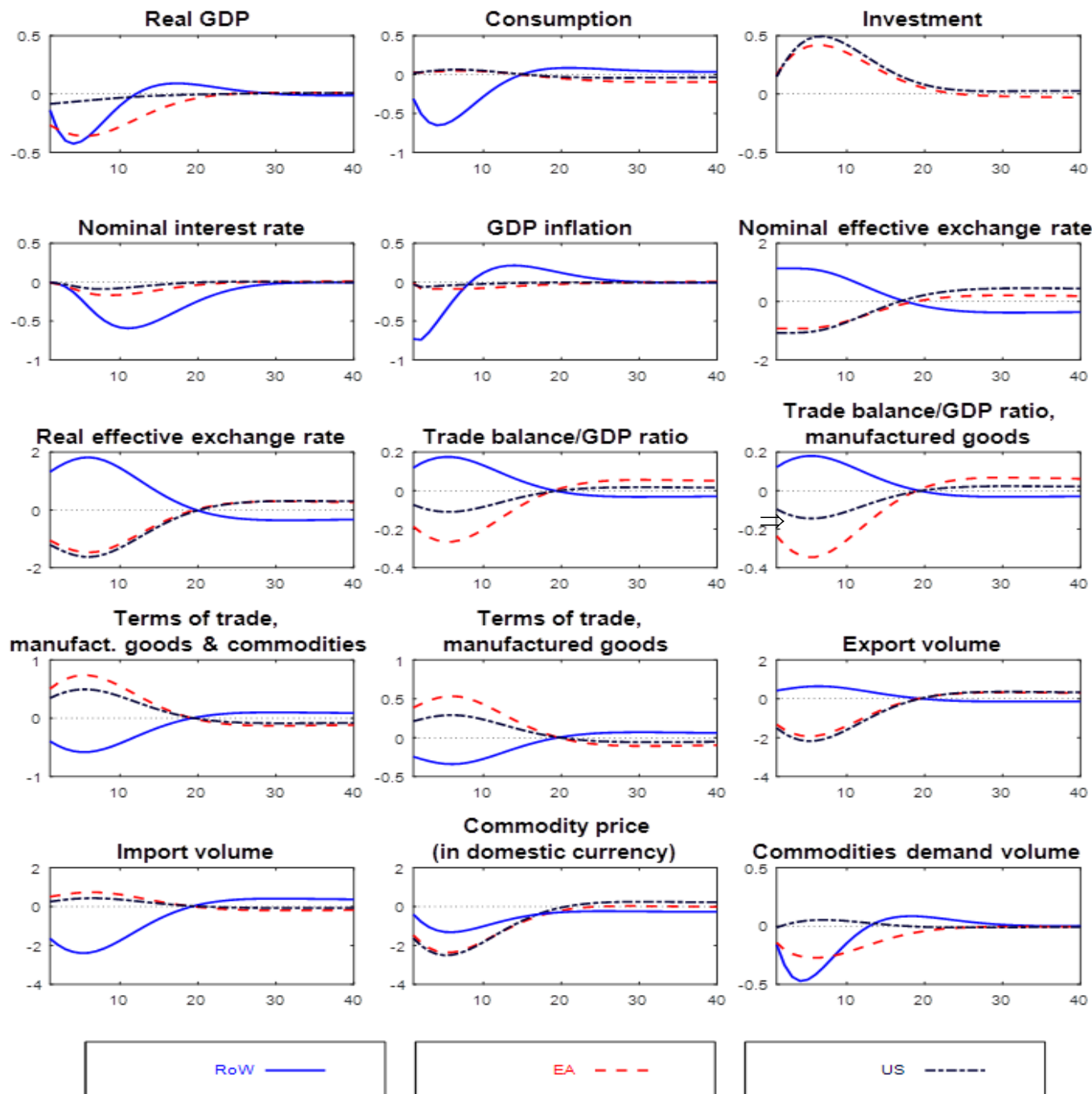
- IRFs for shocks originating in EA & US: in line with previous estimates (e.g., Kollmann et al. (2016))
- Concentrate here on shocks originating in RoW
 - ▶ RoW TFP shocks: main drivers of RoW GDP
 - ▶ RoW aggregate demand shocks (=saving shocks): significant driver of RoW GDP & of EA & US TB
 - ▶ Commodity supply shocks: key drivers of EA & US TB and of tot & RER

Fig. 4a Dynamic effects of a positive shock (1 standard deviation) to trend growth rate of RoW TFP



- RoW trade balance ↓
But: RoW TB response is weak due to adjustment frictions
(RoW aggregate demand tracks GDP)
- Commodity price ↑
- RoW goods terms of trade for manufactured goods ↓
- RoW overall terms of trade ↑ (as commodity prices ↑)
- **Weak cross-country GDP spillover—endogenous commodity price contributes to this**

Fig. 4b. Dynamic effects of a negative demand shock in RoW (1 standard deviation)



• **Commodity prices ↓**
 ⇒ **RoW aggregate demand shocks are candidates for high commodity price volatility**

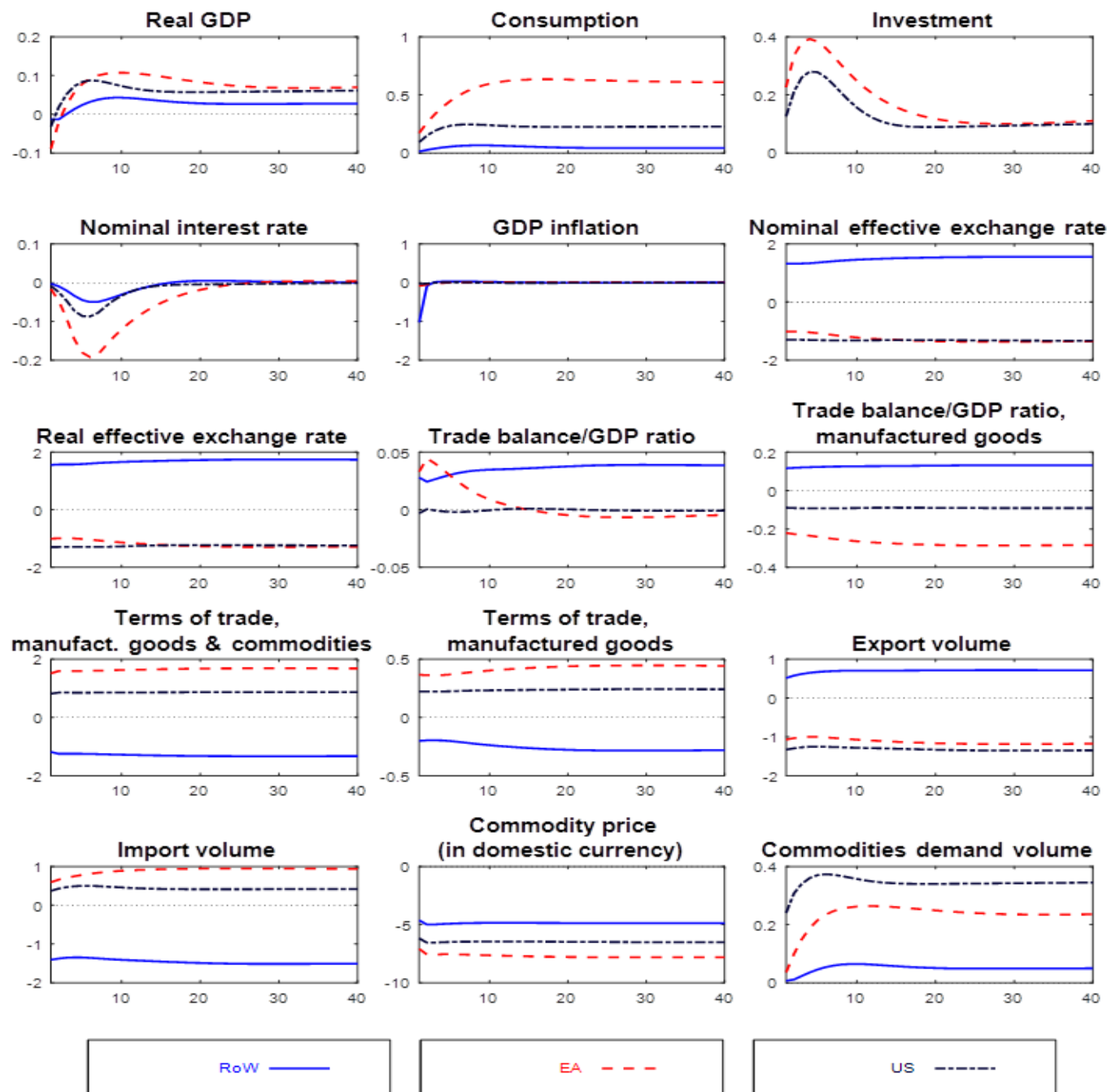
• **GDP falls in the 3 regions**

• Negative transmission to EA & US is partly offset by fall in commodity price

• RoW depreciation

• **RoW trade balance ↑**
 • **US&EA trade balance ↓**

Fig. 4c. Dynamic effects of positive shock to RoW commodity supply (1 standard deviation)



- **Strong drop in commodity price, due to price-inelastic commodity demand**

- 'Immiserizing RoW growth': Lower real RoW income from commodity exports.

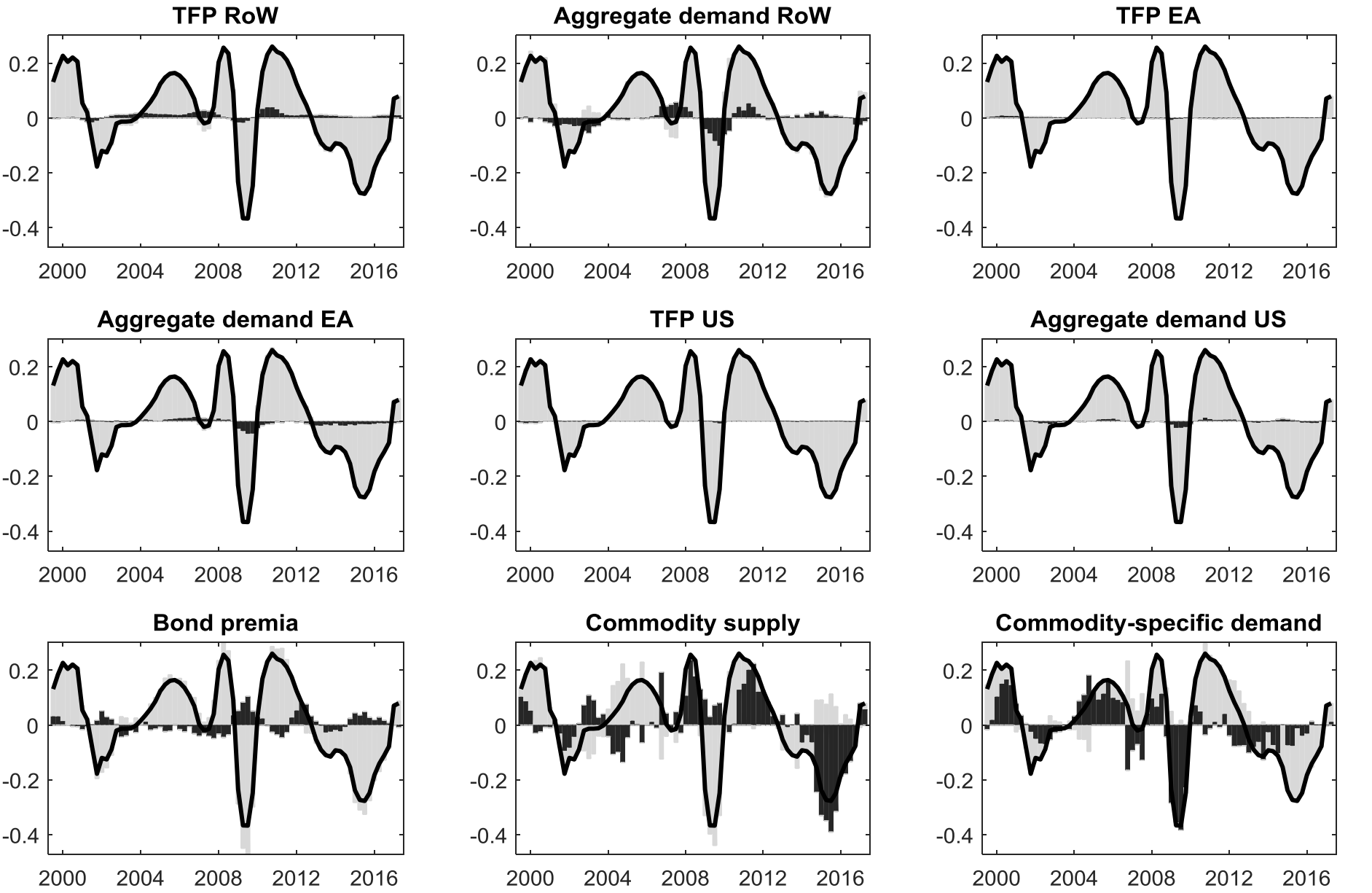
- RoW consumption rises much less than EA & US consumption

- **EA & US commodity trade balances ↑**

- **EA & US manufactures TB ↓**

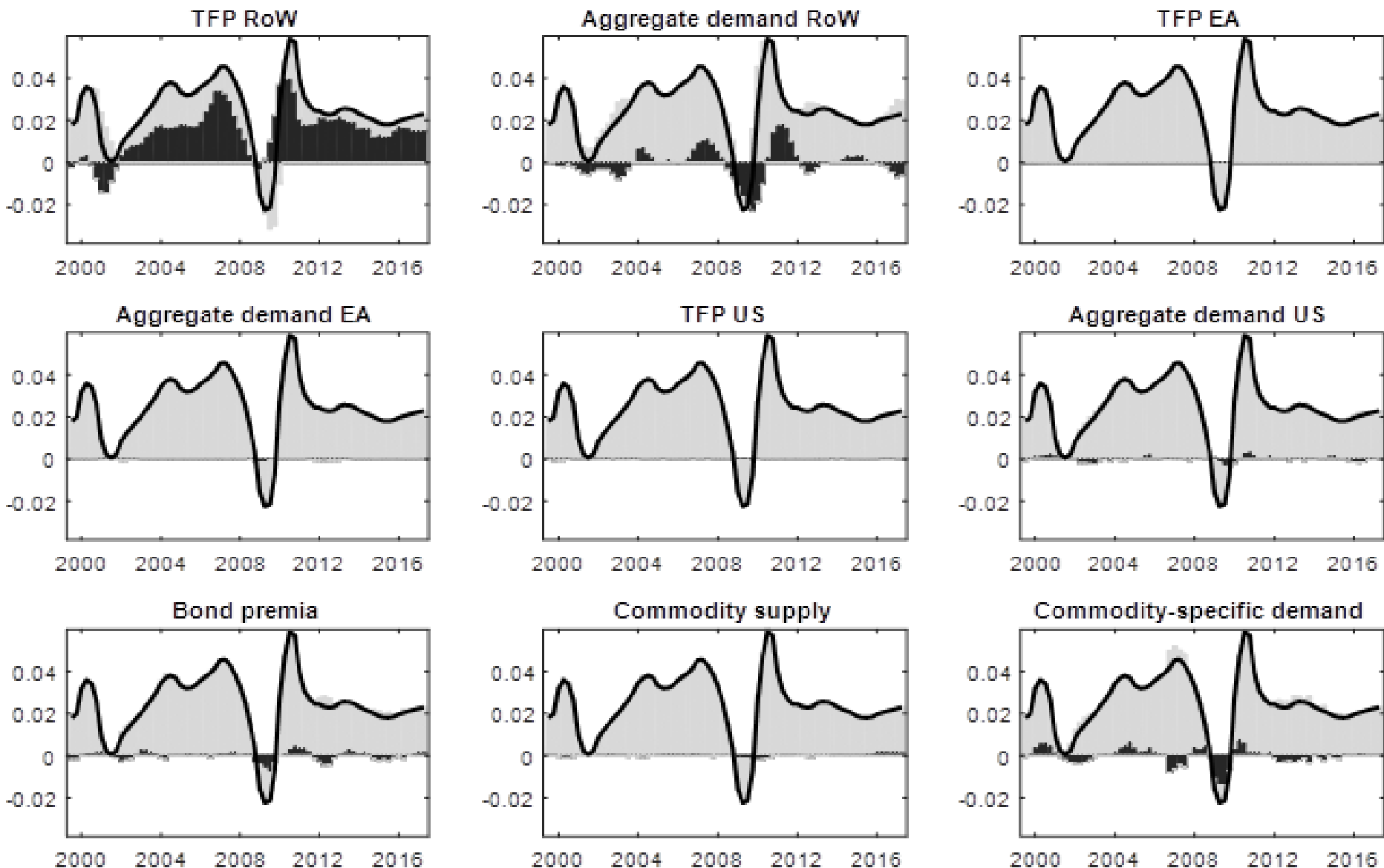
- EA total TB ↑
US total TB not affected

Fig. 5a. Historical shock decomposition: Industrial supplies price, in Euro (yoy growth)



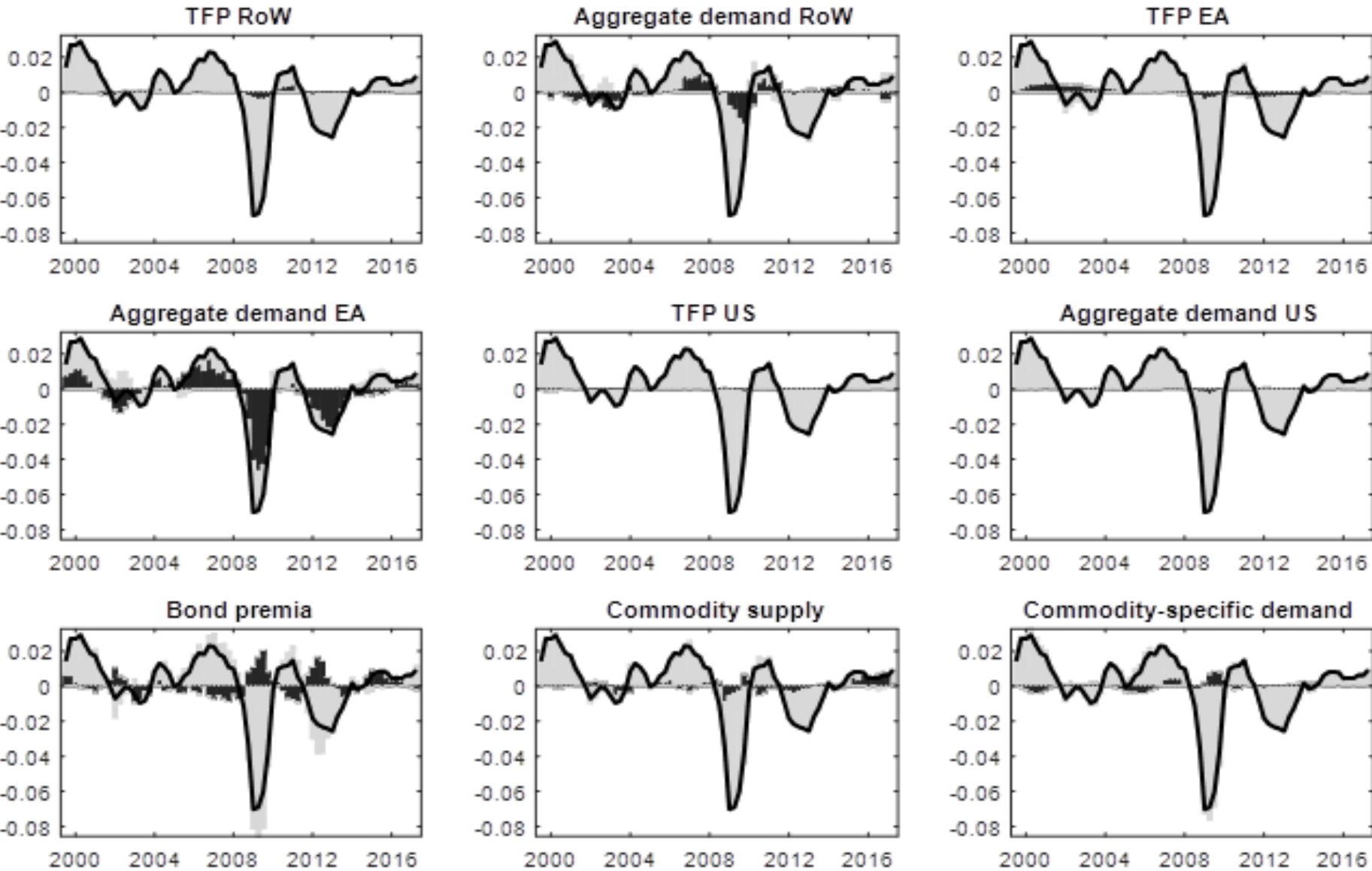
- Commodity prices largely driven by commodity supply shocks & commodity-specific demand shocks
- Aggregate demand in RoW & EA mattered during financial crisis

Fig. 5b. Historical shock decomposition: RoW GDP growth (yoy)



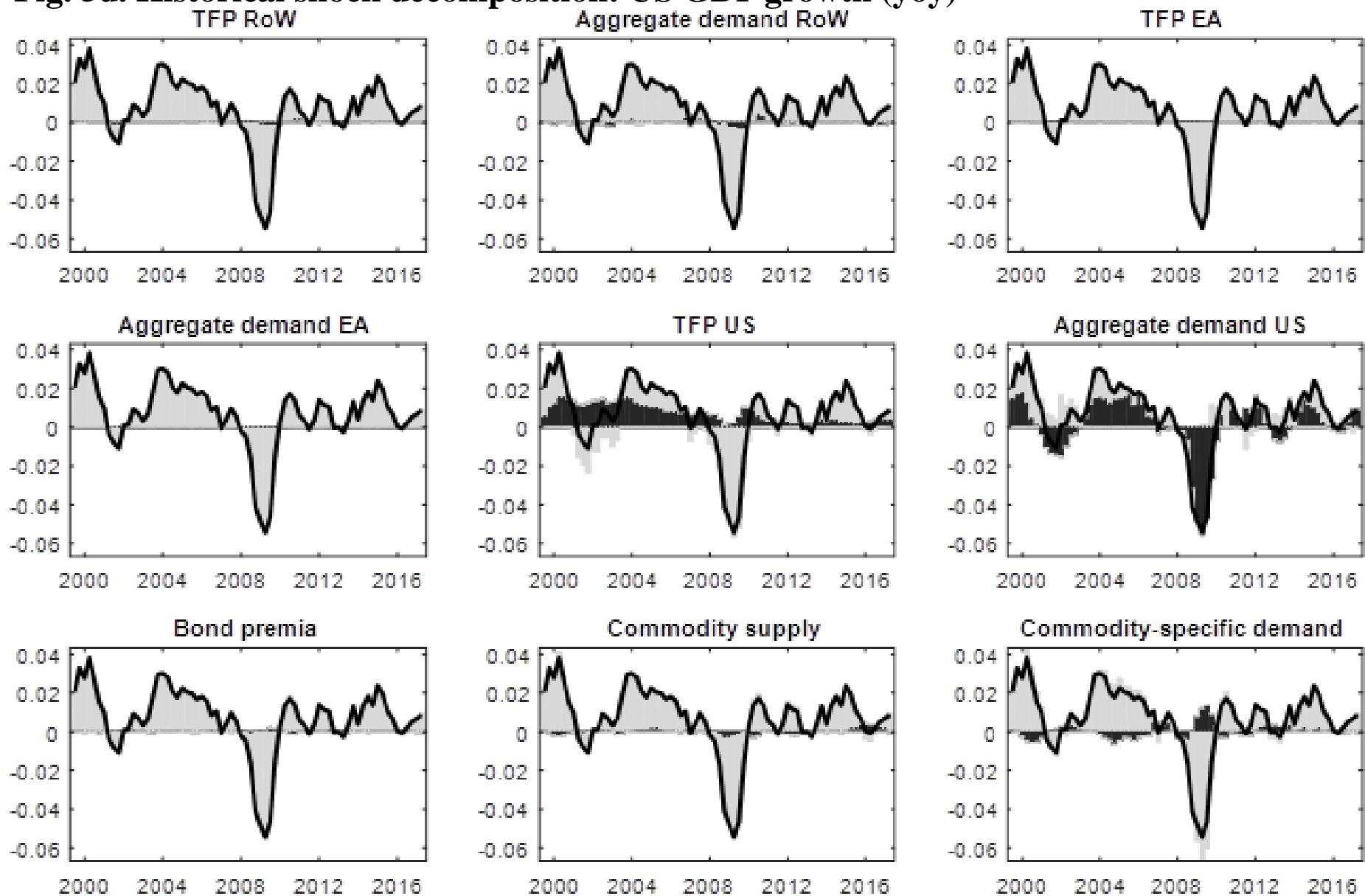
- Persistent productivity growth shocks, interrupted in 2008-9
- RoW aggregate demand shocks too were influential: weak AD (low HH saving) until mid-2000's; big negative RoW aggregate demand shocks in GFC, followed by stronger AD post-GFC

Fig. 5c. Historical shock decomposition: EA GDP growth (yoy)



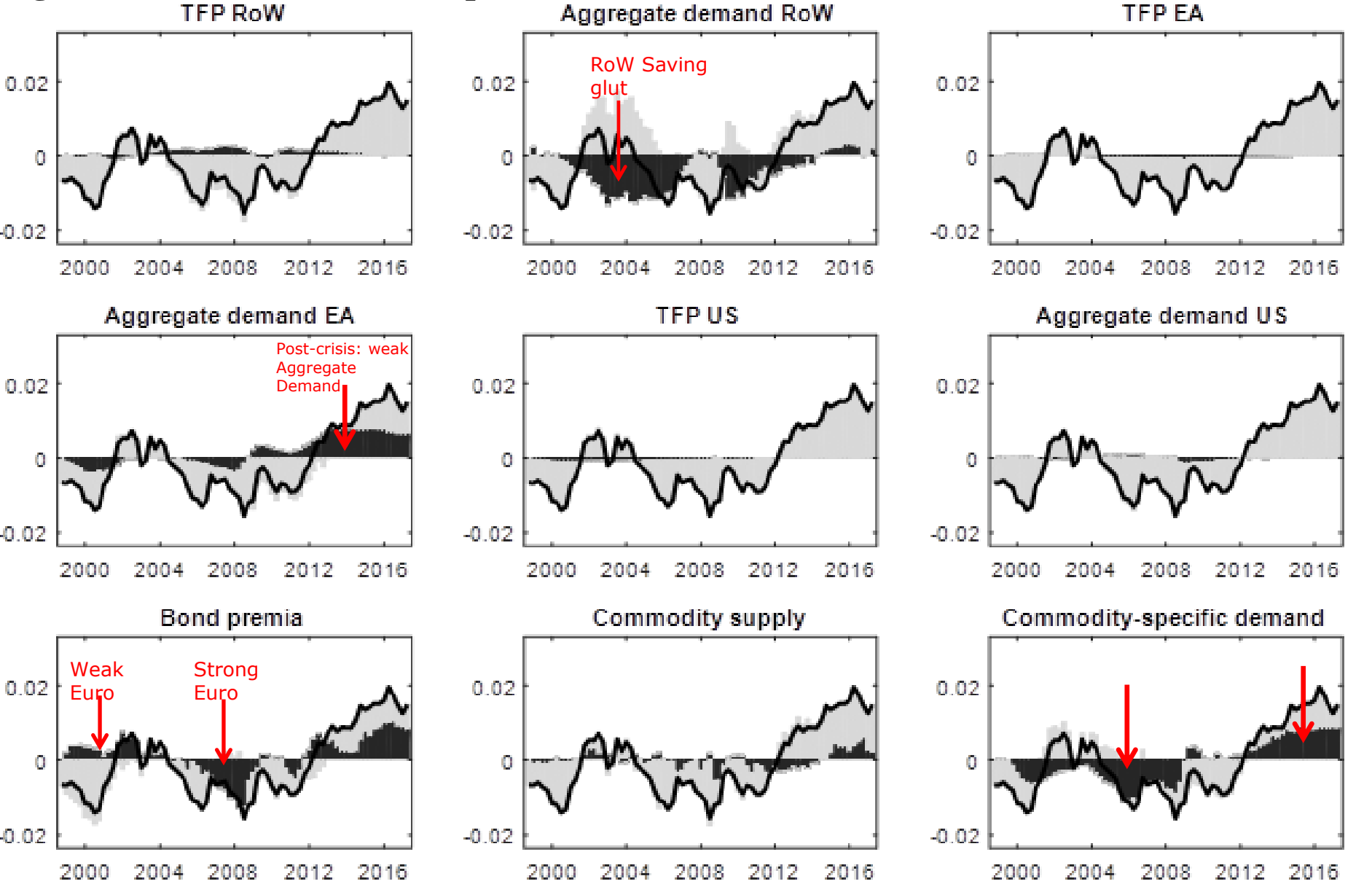
- Domestic aggregate demand shocks (HH saving & investment) were key drivers of EA GDP
- Pro-cyclical contribution of RoW aggregate demand
- Negligible role of EA TFP; some counter-cyclical movements from bond premia and commodity demand, pro-cyclical commodity supply shocks in recent years

Fig. 5d. Historical shock decomposition: US GDP growth (yoy)



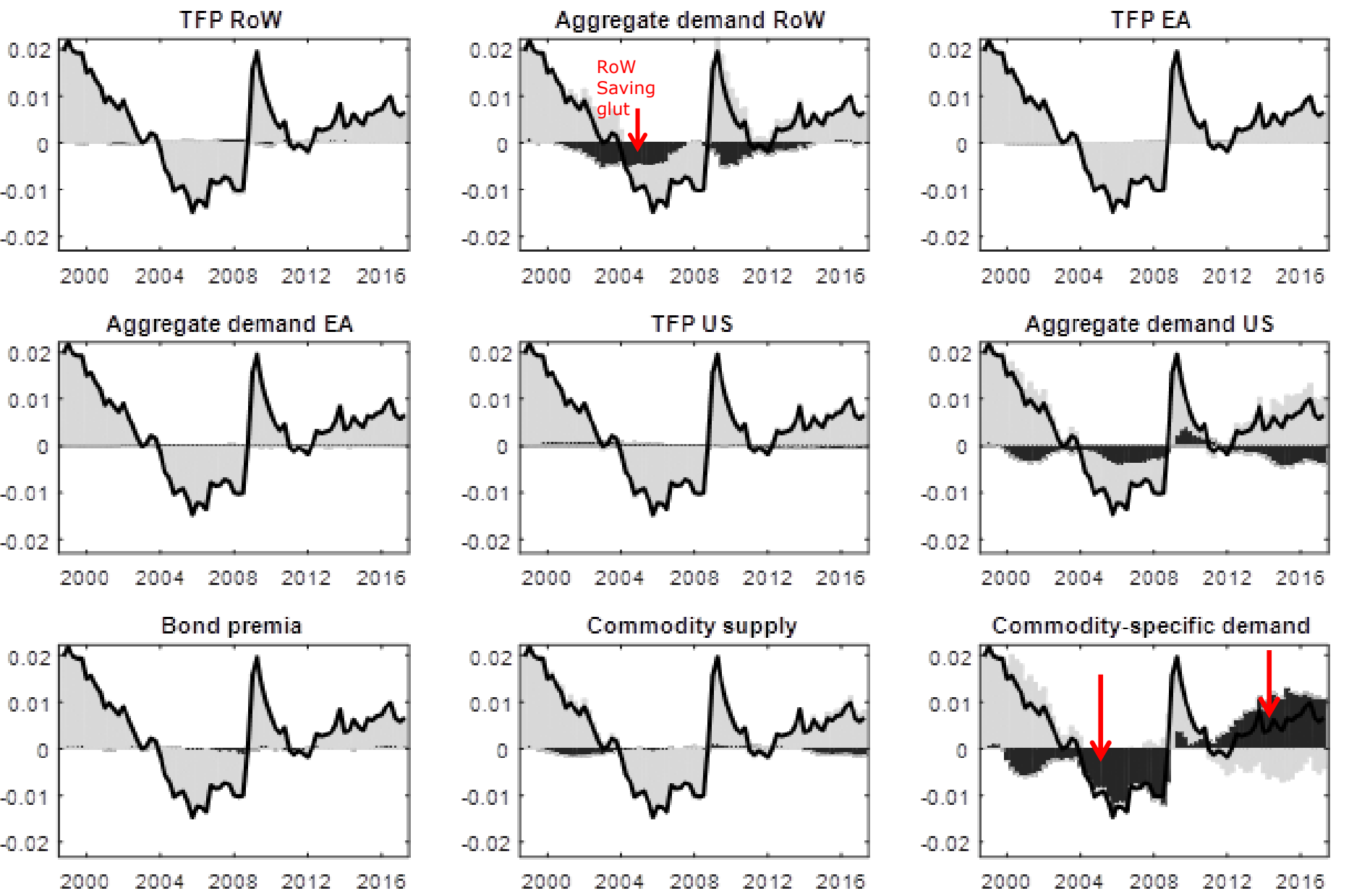
- Domestic aggregate demand shocks were key drivers of US GDP
- Some counter-cyclical movements from commodity-specific demand shocks

Fig. 5e. Historical shock decomposition: EA trade balance/GDP ratio



- Pre-2009: RoW demand + bond premium + domestic aggregate demand + commodity shocks
- Post-2009: Domestic aggregate demand + commodity shocks + bond premium + RoW demand

Fig. 5f. Historical shock decomposition: US trade balance/GDP ratio



- Pre-2009: RoW aggregate demand + domestic aggregate demand + commodity-specific demand
- Post-2009: Domestic aggreg. demand (09) + commodity-specific demand + RoW aggreg.demand

Conclusions

- RoW GDP growth largely driven by persistent productivity growth
- EA & US GDP fluctuations mainly reflect domestic aggregate demand shocks
- Commodity shocks were key drivers of EA & US trade balance, especially of the strong and persistent post-crisis EA & US trade balance improvements
- RoW aggregate demand shocks too had significant impact on EA & US trade balances
- Broader lesson: Emerging Markets (RoW) and commodity shocks are major drivers of advanced countries' trade balances and terms of trade

THANK YOU!