DEUTSCHE BUNDESBANK
EUROSYSTEM

Collateral imbalances in intra-European trade? Accounting for the differences between gross and value added balances

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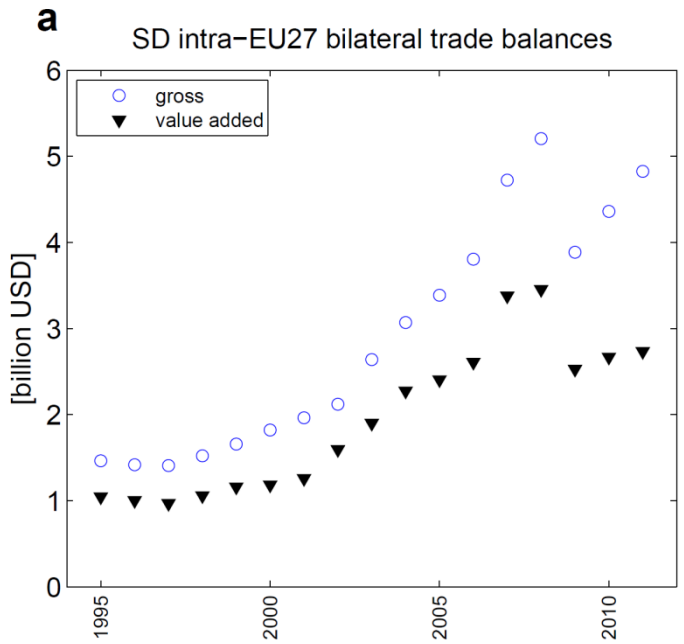
Johnson & Noguera (2012)

1) Bilateral balances differ in value added and gross terms
2) Aggregate trade balance unchanged

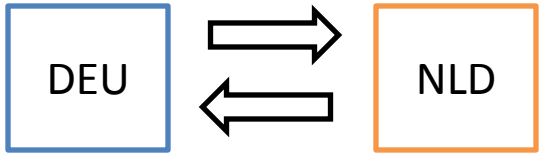


- Intra-European imbalances have increased substantially over time particularly after 2002
- Growing divergence between gross and value added balances
- Increase in value added imbalances less pronounced

⇒ Why are value added and gross balances different?
⇒ What are the factors that determine the differences between the two concepts?

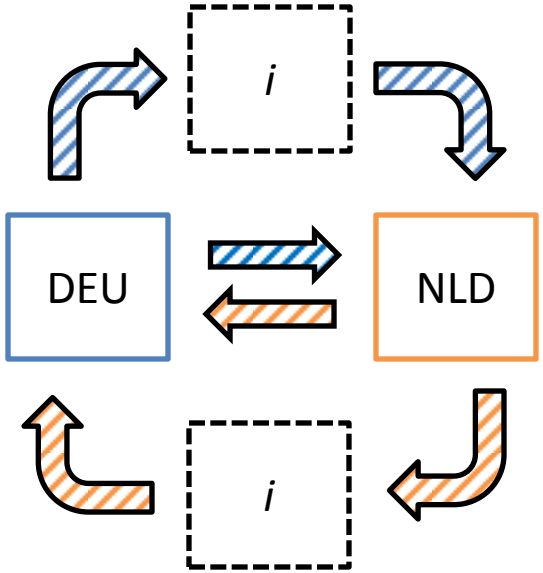
Trade balances in gross and value added terms

gross trade balance



$$NX^{12} = e^{12} - e^{21}$$

value added balance



$$NVAX^{12} = VAX^{12} - VAX^{21}$$
$$= \sum_{i}^{N} v^1 l^{1i} f^{i2} - \sum_{i}^{N} v^2 l^{2i} f^{i1}$$

German value added ultimately absorbed in final demand in the Netherlands

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Dutch value added ultimately absorbed in final demand in Germany

Decomposition: two simple criteria

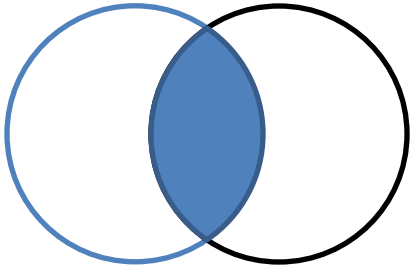
In order to understand the differences between gross and value added balances, we decompose bilateral gross trade balances according to two simple criteria:

(a) the origin of the value added embedded in gross trade flows (the source)

(b) the country, which ultimately absorbs the value added in its final demand (the sink)

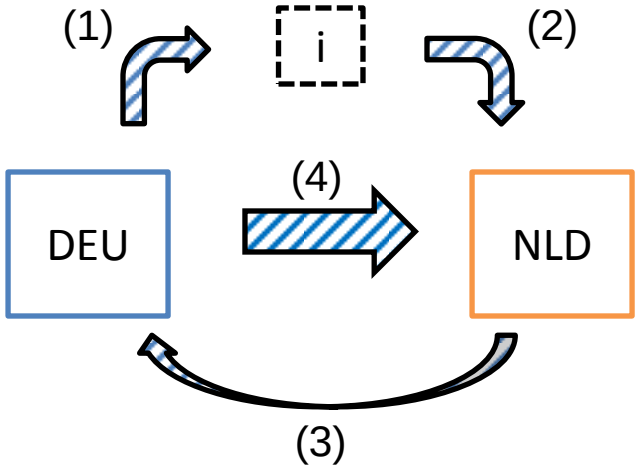
What is the intersection between value added and gross exports?

value added exports



gross exports

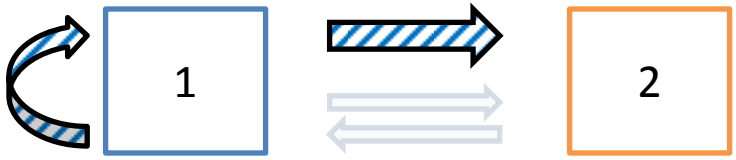
Phrasing the question differently: How should we distribute the value added exports from 1 to 2 to bilateral gross trade flows between countries?



Intersection: source-based approach

Domestic value added of country 1 that is ultimately consumed in country 2 is assigned to VAX^{12} only when it leaves country 1 for the first time.

The remainder has by definition been re-imported by 1 after processing abroad and hence has crossed international borders at least twice (*double counting*)



VAX^{12} or double counting?

$$v^1 .. f^{.2} = v^1 l^{11} f^{12} + v^1 l^{11} a^{12} \sum_i^N l^{2i} f^{i2}$$

$$l^{11} \rightarrow I + a^{11} + a^{11} a^{11} + a^{11} a^{11} a^{11} + ... = (I - a^{11})^{-1}$$

- l^{11} describes all possible ways that value added from country 1 travels embedded in intermediate goods through international production networks back to country 1
- Use $(I - a^{11})^{-1}$ instead of l^{11}

Decomposition

Bilateral gross trade balances are decomposed into

1) the intersection with the respective value added trade balance (*value added in gross trade balance*)

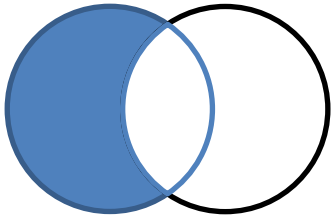
2) value added of the two trading partners that is double counted or reflected back via third countries for consumption in the country of origin (*residual*)

3) foreign value added consumed by the respective trading partner (*foreign value added*)

4) domestic and foreign value added ultimately absorbed in final demand of third countries (*third country demand*)

* Value added balance *minus* value added in gross trade balance (*value added correction*)

value added exports



gross exports

Individual country results

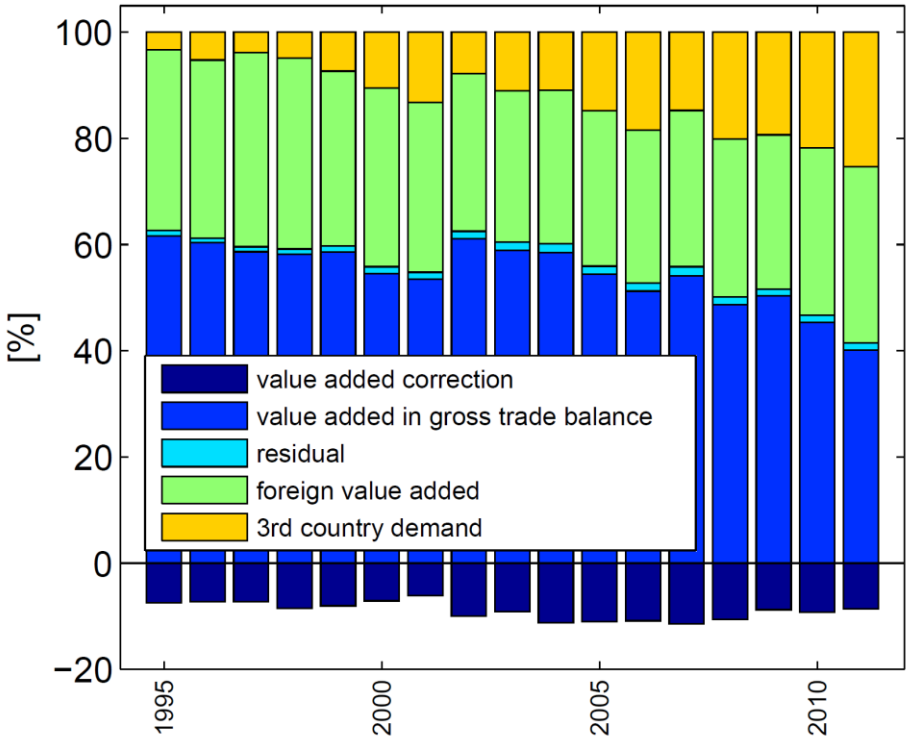
	(1) gross trade balance	(2) value added trade balance	(3) value added in gross trade balance	(4) value added correction: (3)-(2)	(5) foreign value added (trade partner demand)	(6) domestic and foreign value added (3rd country demand)	(7) residual
in million USD							
NLD-DEU	43,969	14,374	11,131	−3,243	20,098	12,514	226
DEU-FRA	39,098	27,961	22,461	−5,500	9,946	5,599	1,092
NLD-BEL	23,990	4,230	3,917	−312	2523	17,498	52
GBR-IRL	22,504	3,472	3,927	455	−2,878	21,272	183
NLD-ITA	22,134	13,166	11,118	−2,048	6,864	4,000	152
in % of gross trade balance							
NLD-DEU	100	33	25	−7	46	28	1
DEU-FRA	100	72	57	−14	25	14	3
NLD-BEL	100	18	16	−1	11	73	0
GBR-IRL	100	15	17	2	−13	95	1
NLD-ITA	100	59	50	−9	31	18	1

Table 1: Decomposition of the five largest bilateral trade balances between EU27 countries in 2011.
(Deviations from totals and 100 % are due to rounding.)

Variance decomposition: intra-EU27 bilateral trade balances

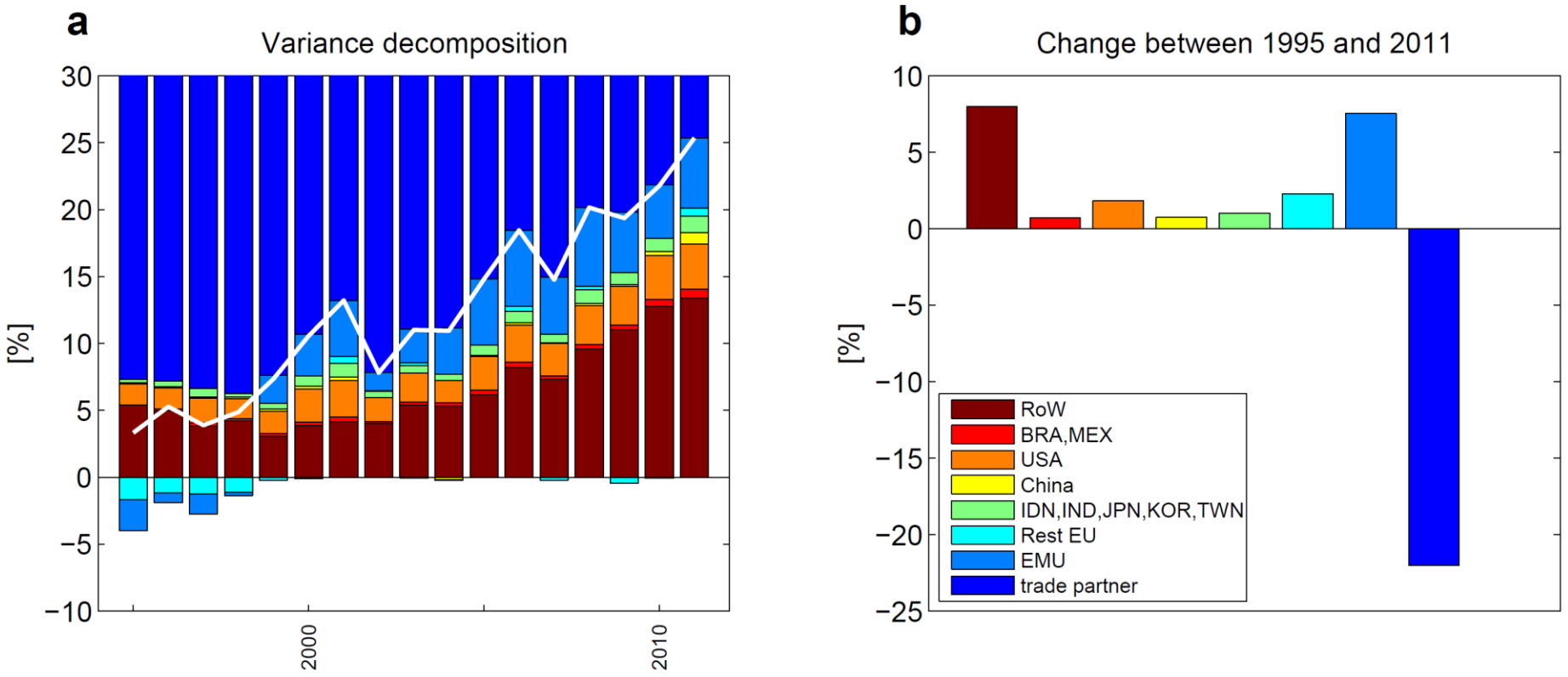
$$\mathrm{var}(\sum_i x_i) = \sum_i \mathrm{var}(x_i) + \sum_i \sum_{j \neq i} \mathrm{cov}(x_i, x_j)$$

$$\varphi(x_i) = \frac{\mathrm{var}(x_i) + \sum_{j \neq i} \mathrm{cov}(x_i, x_j)}{\mathrm{var}(\sum x_i)}$$



- Gross bilateral balances have become less representative of value added balances (1995: 69%; 2011: 49%)
- The contribution of foreign value added consumed by one of the two trade partners is sizable, but has remained relatively constant (32% on average between 1995-2011)
- The importance of 3rd country demand increased from 3% in 1995 to 25% in 2011

Contribution of individual countries to intra-EU27 imbalances

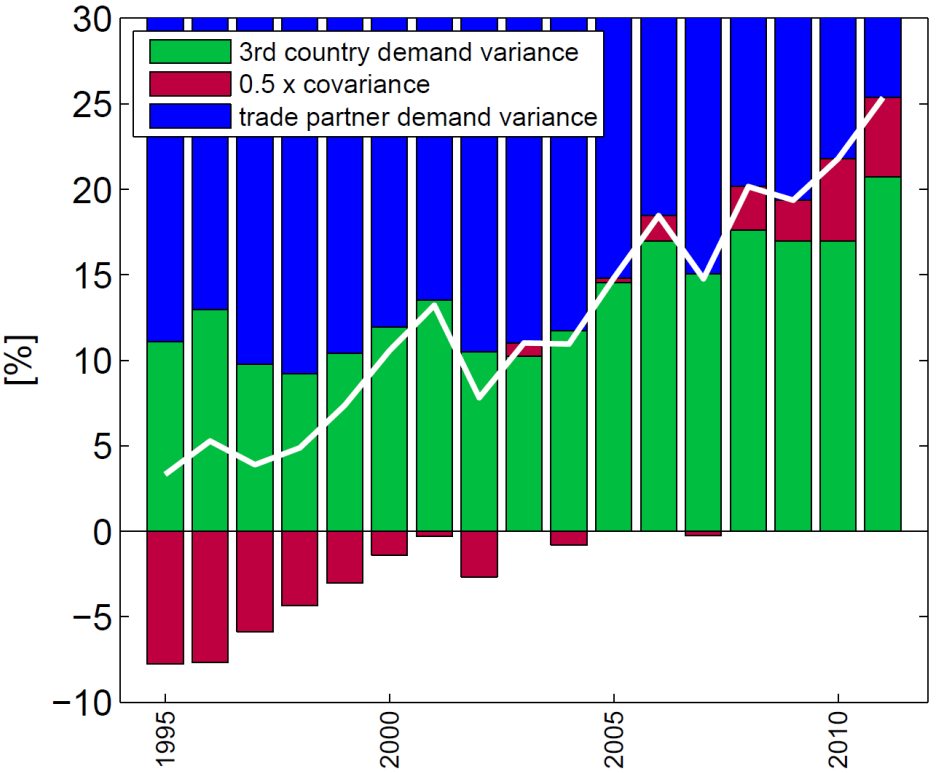


- Any single country only has a minor impact on the average trade balances
- In particular demand in EMU countries and RoW gained in importance
- About one fifth of the variance of intra-EU27 balances in 2011 was due to non-EU demand

3rd country demand and bilateral trade balances

$$\mathrm{var}(\sum_i x_i) = \sum_i \mathrm{var}(x_i) + \sum_i \sum_{j \neq i} \mathrm{cov}(x_i, x_j)$$

$$\varphi(x_i) = \frac{\mathrm{var}(x_i) + \sum_{j \neq i} \mathrm{cov}(x_i, x_j)}{\mathrm{var}(\sum x_i)}$$

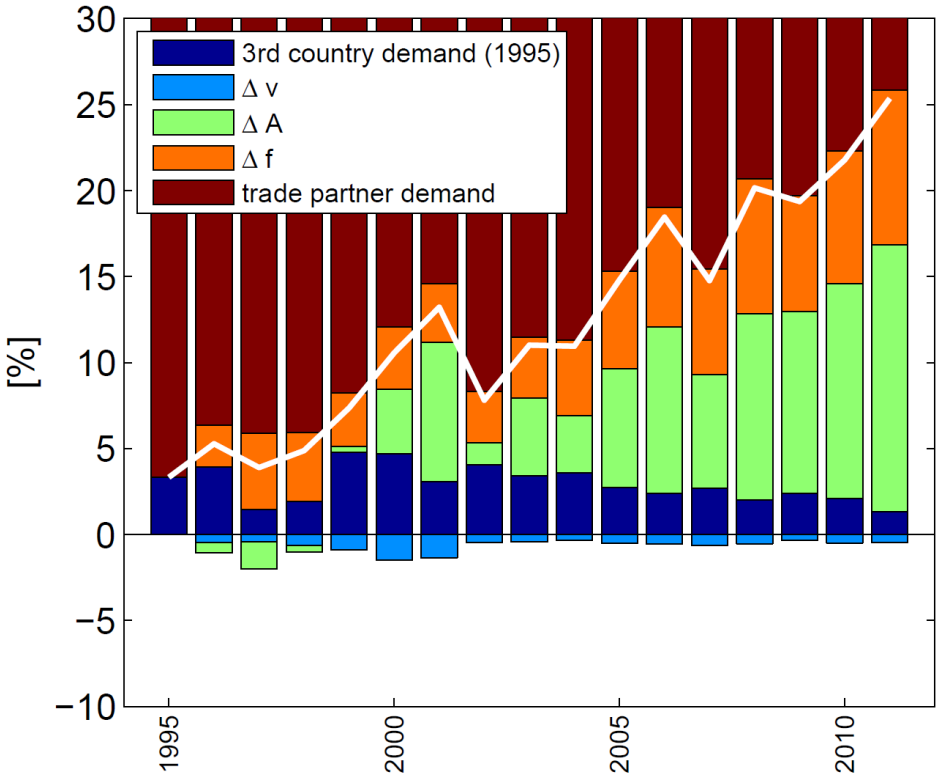


- The rising importance of 3rd country demand was due to
  a) an increase in the magnitude (variance) of 3rd country demand (11.1% in 1995 to 20.7% in 2011)
  b) a stronger alignment (positive covariance) between trade partner and 3rd country demand (-7.7% in 1995 to 4.6% in 2011)

What is driving the change in 3rd country demand?

Structural decomposition analysis

$$\Delta y = \frac{1}{2}\Delta x_1 (x_2^0 x_3^0 + x_2^1 x_3^1)$$
$$+ \frac{1}{2}[x_1^0 \Delta x_2 x_3^1 + x_1^1 \Delta x_2 x_3^0]$$
$$+ \frac{1}{2}(x_1^0 x_2^0 + x_1^1 x_2^1)\Delta x_3$$



- Intensified production sharing in the EU contributed roughly two thirds (+15.5pp) to the larger prominence of 3rd country demand
- Changes in final demand (+9pp) were responsible for the remainder

Conclusions

- We propose a novel decomposition that can account for the differences between **gross** and **value added trade balances**
- Intra-EU imbalances are slightly **overestimated** due to the presence of non-EU demand effects while trade balances with non-EU countries are **understated**
- In the EU gross bilateral balances have become increasingly **less representative** of value added balances
- In this regard, in particular the **intensification of European production sharing** and to a lesser extent the **increase in non-EU demand** were important
- Provides a strong case for considering value added balances instead of balances in gross terms since a sizable portion of gross bilateral trade balances **cannot be influenced** by the direct trading partners themselves

Appendix: Intra-EMU17 bilateral trade balances