

Testing the gravity model through network analysis

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Gravity model(s)

Explaining international trade through geographical distance, plus....:

- GDP
- GDP per capita
- Population size
- Trade barriers
- Exchange rates
- Language specificity
- Cultural specificity
- Etc.

Methodologies

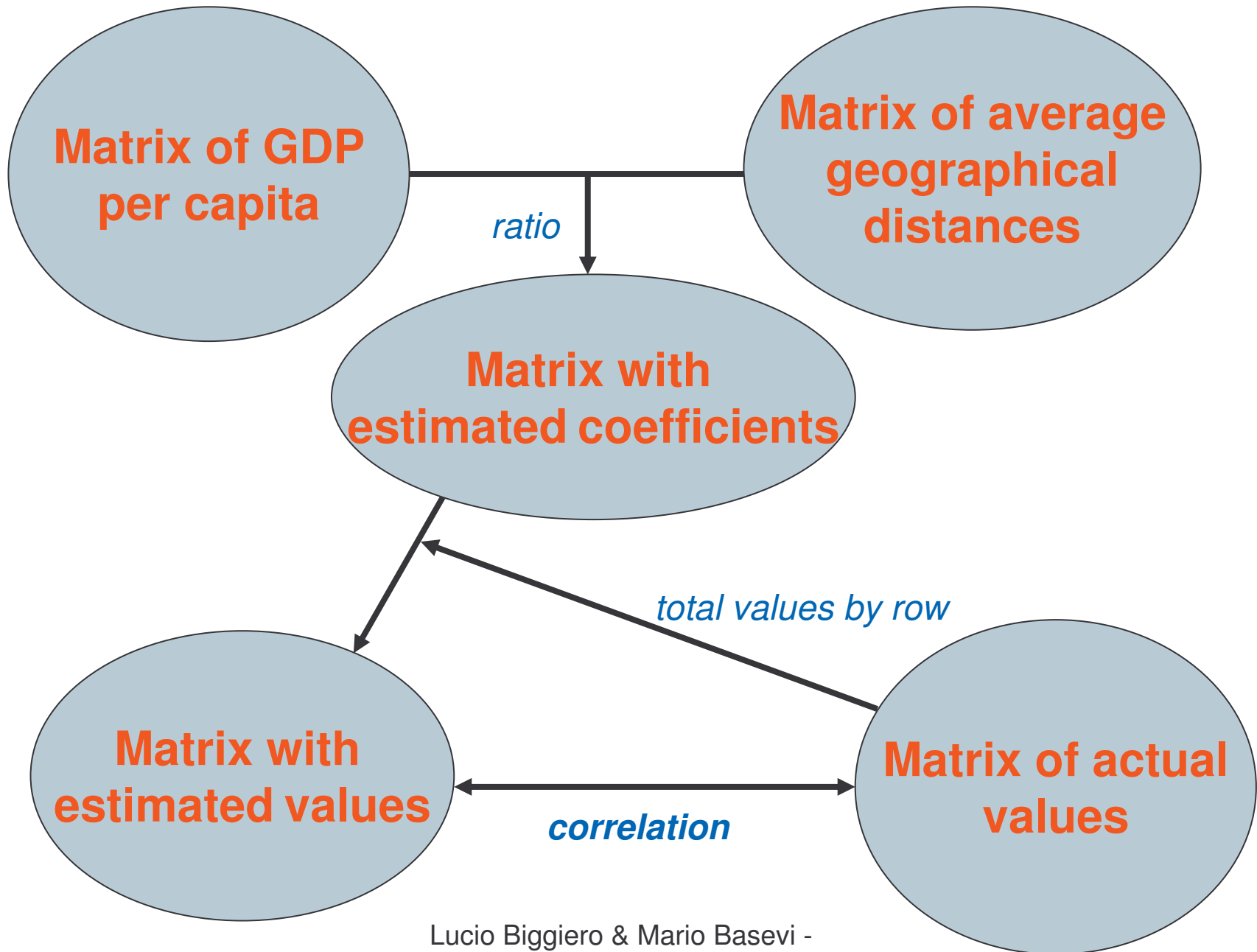
- Standard way: estimating the gravity equation
- Network analysis: estimating the matrix of international trade
- **Advantages of SNA**: taking into account
 - 1) the whole network (including empty (absent) flows);
 - 2) topological (positional) properties, beyond country (node) attributes

Aims of this paper

- **Testing a simple gravity model with 2 variables** : GDP per-capita (IMF DOTS database) plus geographical distances among country capitals (CEPII Institute)
- *We do not estimate the actual volumes of trade, but rather its expected size according to gravity mechanisms*
- *We test the correlation between the actual and the estimated matrix of exchange*

methodology

- Longitudinal analysis (2002-2006) of 179 countries
- Levels of aggregation: world and continent



QAP Correlations of international trade

	2002	2003	2004	2005	2006	var. 2002/2006
World	0.56	0.53	0.52	0.52	0.51	-9%
Africa	0.32	0.24	0.20	0.18	0.18	-44%
North America	0.77	0.77	0.76	0.77	0.74	-4%
South America	0.33	0.41	0.45	0.44	0.46	+39%
Asia	0.57	0.53	0.52	0.51	0.49	-14%
Europe	0.55	0.53	0.53	0.52	0.51	-7%
Oceania	0.95	0.95	0.95	0.93	0.92	-3%

Concentration indexes

Simple

Choosing the pair countries with the highest bilateral trade

Modified (weighted with average distance)

Dividing the simple index by the continent's average distance

Average distance among capitals	
Continent	Km
Africa	3637
North America	1982
South America	2856
Asia	3989
Europe	1764
Oceania	2500

Correlation with the simple concentration index

	2002	2003	2004	2005	2006
World	0.06	0.06	0.06	0.05	0.05
Africa	0.08	0.10	0.08	0.08	0.08
North America	0.57	0.58	0.57	0.58	0.56
South America	0.25	0.29	0.29	0.30	0.28
Asia	0.17	0.17	0.17	0.16	0.15
Europe	0.05	0.05	0.05	0.05	0.05
Oceania	0.77	0.77	0.77	0.74	0.72

Correlation with the modified concentration index

	2002	2003	2004	2005	2006
Africa	0.02	0.03	0.02	0.02	0.02
North America	0.29	0.29	0.29	0.29	0.28
South America	0.09	0.10	0.10	0.10	0.10
Asia	0.04	0.04	0.04	0.04	0.04
Europe	0.03	0.03	0.03	0.03	0.03
Oceania	0.31	0.31	0.31	0.30	0.29

Conclusions

- 1) at world and continent level there is *no evidence of gravity effects* based on GDP per-capita and average distance
- 2) it seems that the presence and size (in GDP per-capita terms) of an ***economic gravitational kernel*** (bilateral trade between one or two pairs of countries) is the key-factor, regardless of average distance