FDI Project Notes

IGERT

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Abstract

Our paper examines the determinants of foreign direct investment (FDI) inflows within a network structure. The political economy of FDI literature has shown that a number of political and economic variables such as security alliances, preferential trade agreements, migration networks, and colonial history shape the patterns of FDI flows. However, most existing studies based on monadic or dyadic models overlook the complex dependencies in the network. Global FDI flows operate as a network and therefore the independence assumptions of generalized linear models are not met and network dependencies such as reciprocity and transitivity are not controlled for. In this paper, we utilize bilateral FDI inflow data from UNCTAD and examine the political and economic networks of FDI flows using generalized exponential random graph models (GERGM). These models allow researchers to control for higher order dependencies as well as node and edge variables within the same model. The GERGM uses Markov Chain Monte Carlo algorithms to simulate weighted graphs from which the likelihood of coefficients can be estimated.

1 Introduction

Research examining foreign direct investment (FDI) and its relationship with economic and political determinants is expansive. Much of this work is conducted using the gravity model, which was originally developed to predict trade flows. This framework models FDI flows using dyadic data and the product of partner GDPs as mass and some variant of distance as an independent variable. Our work highlights a key weakness of these models that rely on standard panel regression models. There has been a growing body of literature that brings into question the way we estimate models for dyadic data (add list of papers). The primary challenge is that dyadic data is an edge-list and therefore represents a network. Ignoring this unmodeled network structure violates assumptions within a generalized linear model, potentially leading to biased estimates.

2 Preliminary Valued ERGM Results

1. Model 1: Only fit with network terms

2. Model 2: Add gravity variables

3. Model 3: Add Trade in Intermediate goods and PTA Depth

	Model 1	Model 2	Model 3
sum	2.83***	−0.14***	0.31***
	(0.04)	(0.01)	(0.01)
sum0.5	−7.41***	−3.44***	−3.60***
	(0.15)	(0.02)	(0.02)
nonzero	2.25***	−0.13***	0.12***
	(0.13)	(0.02)	(0.02)
mutual.geom.mean	0.69***	0.27***	0.23***
	(0.02)	(0.03)	(0.02)
edgecov.fdi_net.mass.sum		0.01***	0.00***
		(0.00)	(0.00)
edgecov.fdi_net.distance.sum		−0.19***	−0.09***
		(0.01)	(0.01)
edgecov.fdi_net.trade_int.sum			0.07***
			(0.00)
edgecov.fdi_net.depth.sum			0.03***
			(0.01)
AIC	-16240.55	-21673.28	-22166.65
BIC	-16209.90	-21627.29	-22105.33
Log Likelihood	8124.28	10842.64	11091.32

$^{***}p < 0.001$, $^{**}p < 0.01$, $^{*}p < 0.05$

Table 1: Statistical models

3   Outline

- Intro

  - Paragraph providing an overview of the ways folks have used FDI data to study FDI in the past, and statement of our overall research question. **BZ**

  - Paragraph about the background on networks in polisci

    * Recent discussion in ISQ (Vol 2, issue 60) and other work **JS**

    * Mention that there is even less work on FDI network

- Methods background

  - Discussion of the possible approaches OLS with FE, Latent, ERGM **JS**

  - Explanation of what is ERGM and why it is preferable **BD**

- Discussion of theoretical expectations

  - Explanation of substantive reasons for network terms

  - Explanation of covariates

- Discussion of data sources and model

  - For each variable that may be included in the model, we should have a short paragraph description of the variable, a citation of the source where we got the data, and a statement regarding how we expect it to be related to FDI flows. **JS**

  - Add in descriptive statistics for each variable—a table of min, max, mean, quartiles, sd, and number of cases covered; a histogram for each quantitative variable, possibly on the log scale, and a bar chart for qualitative variables, network plots for the FDI network. We will probably cut lots of this, but its necessary for us to take a look at it, and we'll definitely include some. **JS**

- Results

- Conclusion and future work

4 Data Collection

1. FDI Data

   - Downloaded from UNCTAD
   - Cleaned and appended into panel format

2. GDP

   - Downloaded from WB WDI

3. Distance

   - Downloaded from CEPII
   - Mayer, T. & Zignago, S. (2011) Notes on CEPII?s distances measures: the GeoDist Database CEPII Working Paper 2011-25
   - Includes Common Language, Contiguity, Ethnolinguistic similarity, and Colonial ties

4. Alliances

   - Downloaded from COW
   - Gibler, Douglas M. 2009. International military alliances, 1648-2008. CQ Press

5. Regime Type

   - Downloaded from Center for Systemic Peace
   - http://www.systemicpeace.org/inscrdata.html

6. GDP growth rate

   - Downloaded from WB WDI

7. Trade Openness

   - Downloaded from WB WDI

8. Population

   - Downloaded from WB WDI

9. Transparency

   - Downloaded from Transparency International

- Not included in preliminary results, subsets countries to 75

10. PTA Depth

    - Downloaded from DESTA

    - http://www.designoftradeagreements.org

11. Trade

    - Downloaded from OECD.stat

    - http://stats.oecd.org/

    - includes trade in household consumption items, intermediate goods, capital goods, and mixed end-use goods

5   Data Preparation

1. Downloading Data: `FDI_download.R`

   - STP and CIV cannot be scraped due to Uni-code issues:Downloaded and formatted manually

   - Had to rewrite "Sao Tao and Principe" in its file; Changed "Cote d?Voire" to "Ivory Coast"

   - Does not run from makefile due to these manual changes

2. Cleaning Data: `FDI_clean.R`

   - Gets rid of empty columns and empty rows, then appends all countries to together

   - Gets rid of aggregates and adds country codes

   - File output `fdi_clean.csv`

3. Adding data: `FDI_merge.R`

   - Adds control variables

   - File output: replaces `fdi_merge.csv`

4. Subset data: `FDI_subset.R`

   - Subsets data to create full edge list for all variables

5. Preliminary Results: `fdi_MRQAP.R`

   - Runs OLS models

   - Output: FE and MRQAP results

6 Preliminary Panel Regression Results

Table 2: IM/EX FE effects

IV	Dependent Variable: FDI
Contiguity	174.960***
	(8.220)
Common Language_off	7.157
	(6.776)
Common Ethnoliguisitics	−7.846
	(6.869)
Past Colony	142.077***
	(10.464)
Common Colonizer	41.110***
	(5.583)
Common Currency	121.027*
	(73.033)
Distance	−0.005***
	(0.0004)
Destination GDP	0.000***
	(0.000)
Origin GDP	0.000***
	(0.000)
Defense Alliance	12.256
	(13.213)
Non-agression Treaty	154.289***
	(18.991)
Neutrality Treaty	−247.209***
	(28.128)
Entente	131.783***
	(20.122)
Destination Polity	−3.083***
	(0.784)

Table 2: IM/EX FE effects

IV	Dependent Variable: FDI
Origin Polity	−2.265***
	(0.785)
Destination Trade Opennes	0.633***
	(0.081)
Destination GDP growth (%)	−0.682***
	(0.245)
Origin Trade Opennes	0.790***
	(0.081)
Origin GDP growth (%)	−0.876***
	(0.245)
Origin Population	−0.00000***
	(0.00000)
Destination Political Violence	0.401
	(2.016)
Origin Political Violence	6.296***
	(2.016)
PTA depth	2.615
	(1.692)
Trade in Household Consumption Goods	−0.00004***
	(0.00000)
Trade in Intermediate Goods	0.0001***
	(0.00000)
Trade in Intermediate Goods Sq.	−0.000***
	(0.000)
Trade in Capital Goods	0.00001***
	(0.00000)
Trade in Mixed End-use Goods	0.0001***
	(0.00000)
Constant	−136.288***

Table 2: IM/EX FE effects

IV	Dependent Variable: FDI
	(21.681)
Observations	189,000 (126 Countries, 12 years)
R^2	0.317
Adjusted R^2	0.316
Residual Std. Error	494.613 (df = 188710)
F Statistic	303.323*** (df = 289; 188710)

7 Model changes to make

1.

2. Compare panel vs. regression models vs. latent-space

3. Model security-alliance variables

4. Follow Polity explanations like Mansfield et. al.

5. Is there a trade network paper to model?

6. Limit categories in valued ERGM counts

7. Use cubic root of DV for robustness