FDI Flows in Europe: Endogeneity and Credibility

Aleksandar STOJKOV
Associate Professor of Economics
Ss. Cyril and Methodius University (Macedonia)
Thierry WARIN
Associate Professor of International Business
HEC Montreal (Canada)

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Outline

- Research Motivation
- Few Stylized Facts
- Literature Review
- Data issues
- Model
- Results

Some context

- **2019: Euro at 20**

- **Real effects of the euro**. How has the creation of the Euro affected allocation of resources for members and non-members? How has it affected competition, economic geography, trade and real convergence in output and income?

1. Research Motivation

- (1) Is there a credibility effect in favor of a country belonging to the euro area?

- (2) We want to measure Mundell's (1973) intuition about the better allocation of capital that would result from the use of a common currency.

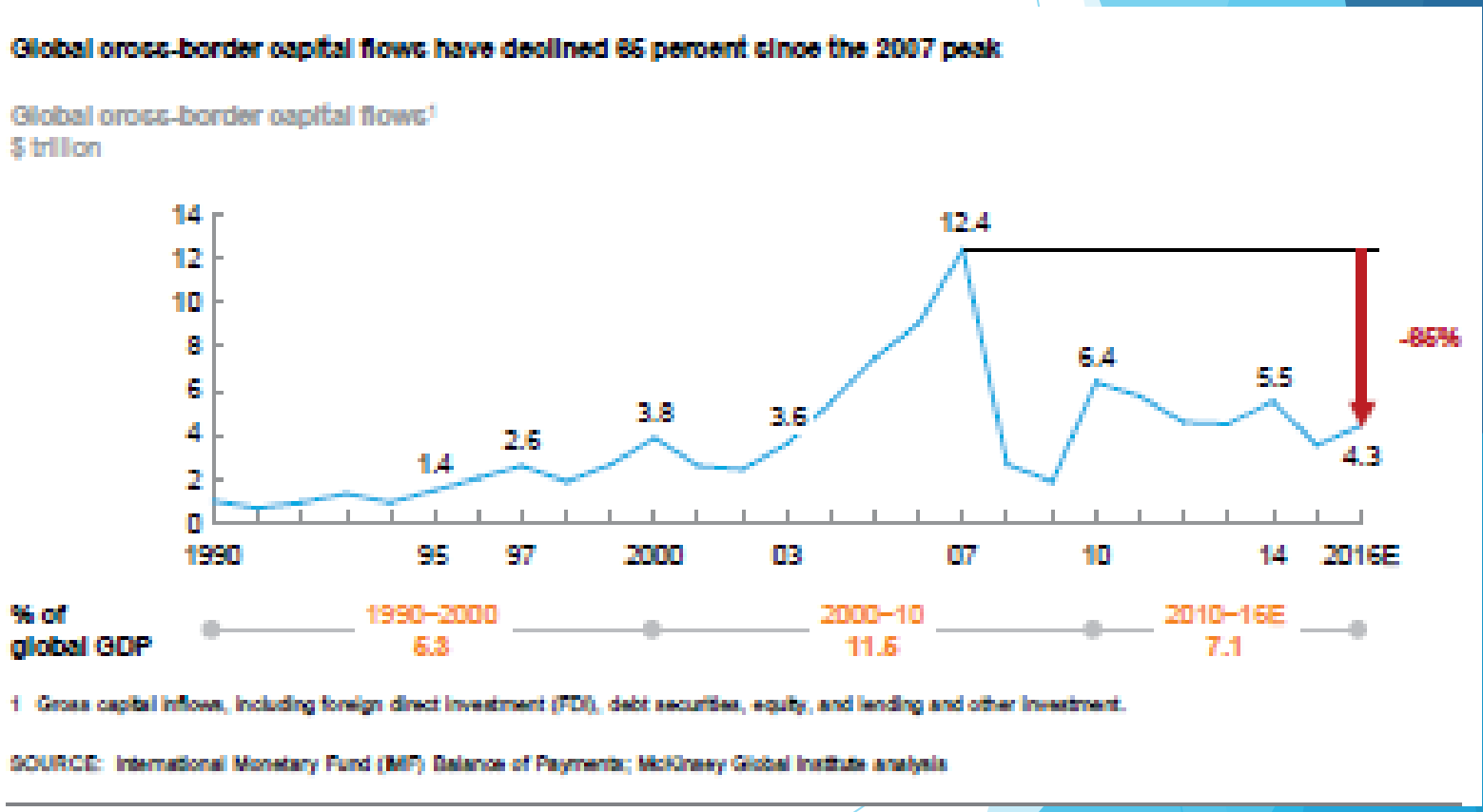
1. Research Motivation

- To what extent the adoption of the Euro has endogenously affected the allocation of capital within the Economic and Monetary Union (EMU)?

- Has the Euro brought the expected benefits? If so, has the global financial crisis wiped out some or all benefits of the European monetary integration?

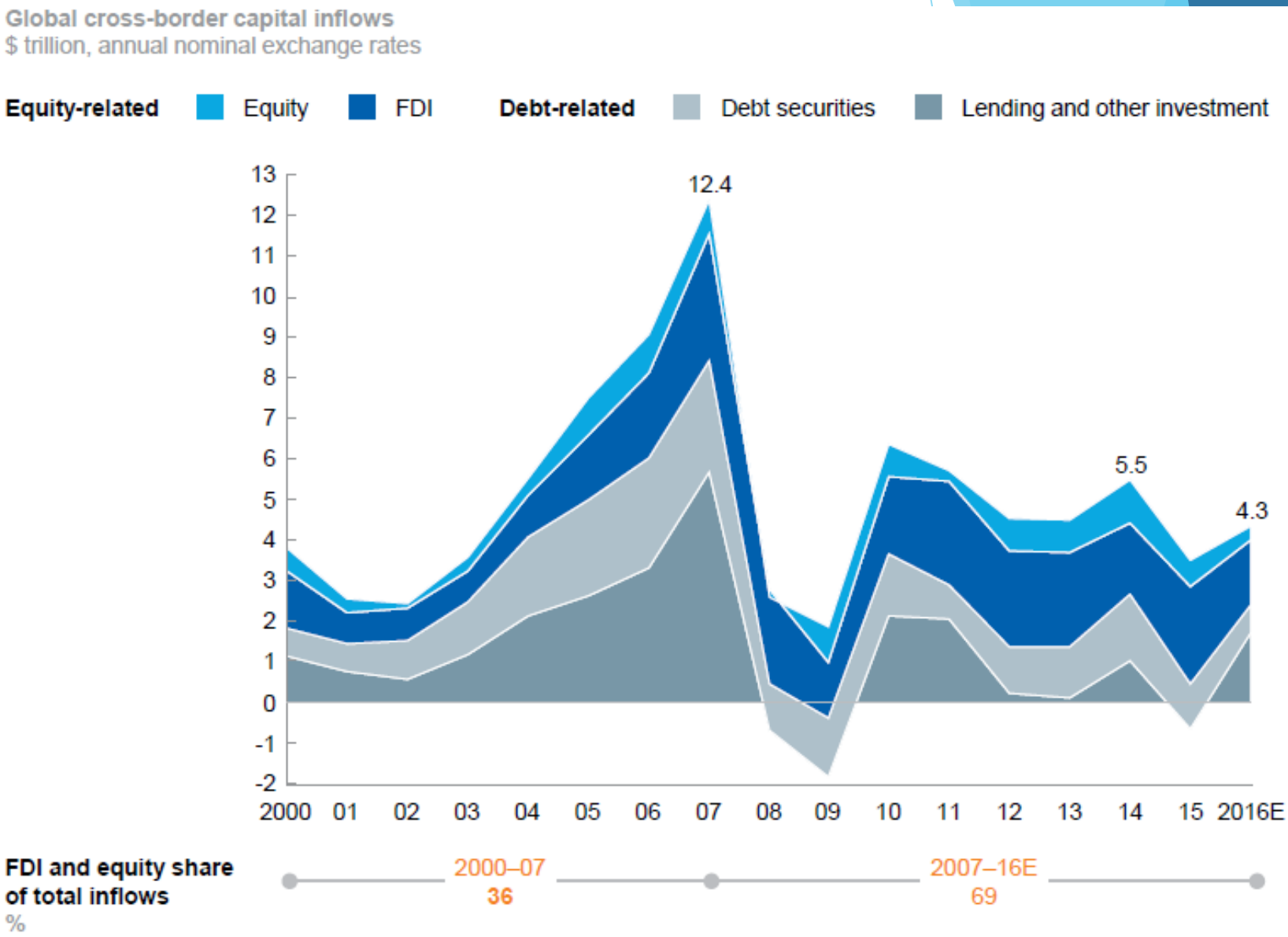
2. Few Stylized Facts

- The **financial deglobalization** is essentially banking deglobalization.
- Banking deglobalization: The collapse of cross-border lending has been concentrated among banks in Europe.



2. Few Stylized Facts

- Post-crisis, global cross-border capital flows have more equity and less debt.
- FDI and equity flows now account for 60 percent of cross-border capital flows, up from 36 percent before 2007.

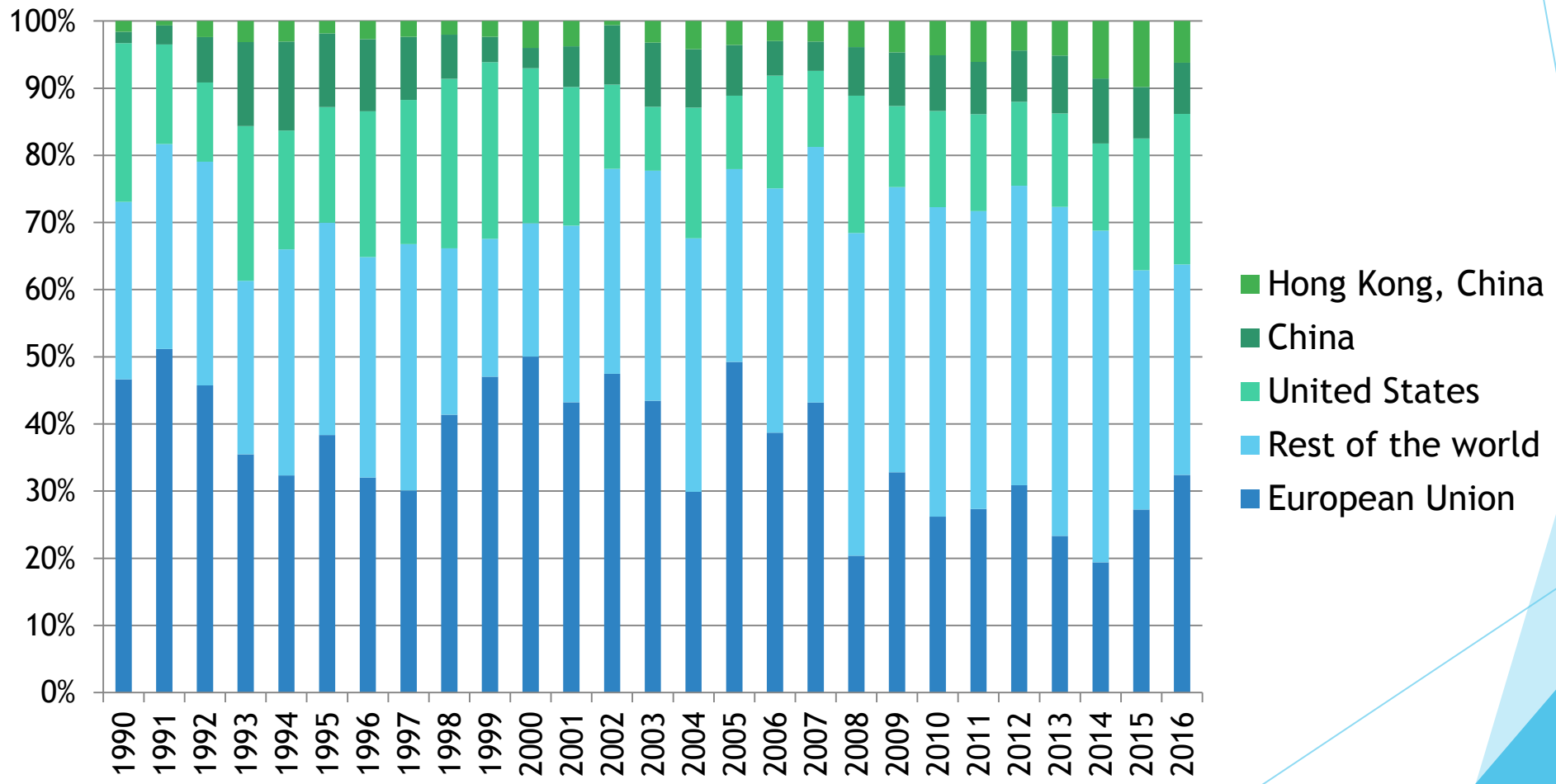


Source: McKinsey Global Institute, August 2017.

2. Few Stylized Facts

The European Union is the largest net recipient of FDI flows across the globe

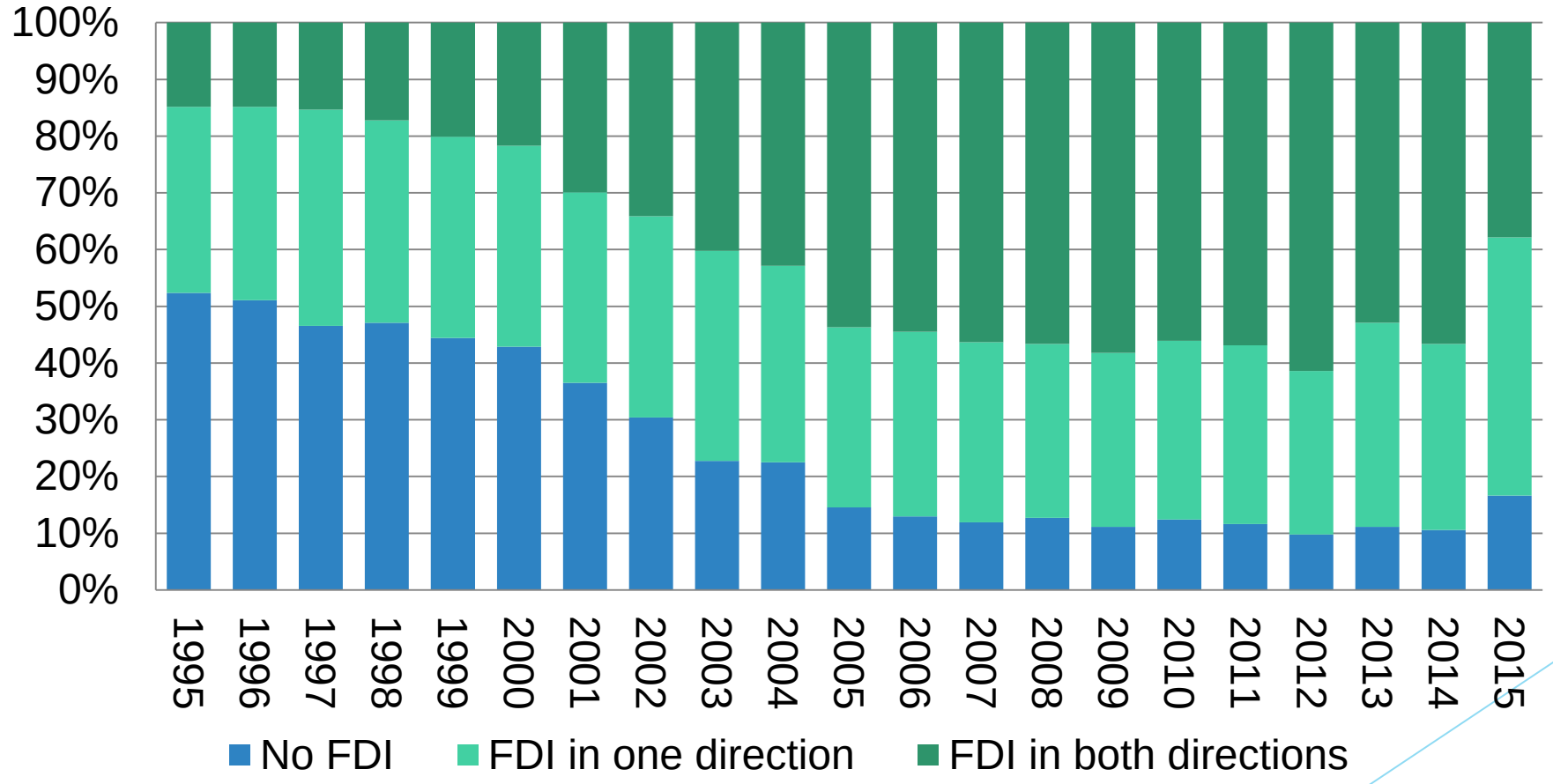
Figure 1. World Trends in FDI Inflows across the Globe, 1995-2015 (In percent)



Source: Authors' calculations based on UNCTAD data, 2018.

2. Few Stylized Facts

Figure 2. Distribution of EU-28 Country Pairs Based on Direction of Inward FDI, 1995-2015 (756 country pairs)



Source: Authors' calculations based on Eurostat data, 2017.

3. Literature Review

- Gravity models have also been used to analyze bilateral FDI flows (e.g., Petroulas, 2007; Brouwer, Paap, and Viaene 2008; Warin, Wunnava, and Janicki 2009; de Sousa and Lochard 2011).

- The rationale is that similar explanatory variables shape the decisions of multinational enterprises whether to proceed with additional fixed cost of a production plant abroad or with additional variable cost of continued exports.

- The gravity-focused research of the behaviour of bilateral foreign investment has mainly focused on the flows among the members of the currency areas.

3. Literature Review

Study	Period	Direction	Impact
Petroulos (2007)	1992-2001	Intra-EMU From EMU to non-EMU From non-EMU to EMU	16% 11% 8%
Brouwer, Paap, and Viaene (2008)	1990-2004	From EMU to new EU member states	18.5%-30%
Warin, Wunnava, and Janicki (2009)	1994-2005	From EMU to new EU - Small economies	102%
de Sousa and Lochard (2011)	1992-2005	intra-EMU	30%
Bruno (2016)	1985-2013	EU members only	28%

3. Literature Review

- There are at least three important corollaries from the literature survey.
- The first one is that the reliance on a single econometric method must be avoided.
- The second corollary is that heteroskedasticity causes severe problems, both *in the traditional gravity equations* inspired by Tinbergen (1962) and *in gravity equations with multilateral resistance terms or fixed effects*, as outlined by Anderson and van Wincoop (2003).
- The third one is that the ignorance of the zero investment data tends to lose important information on investment patterns.

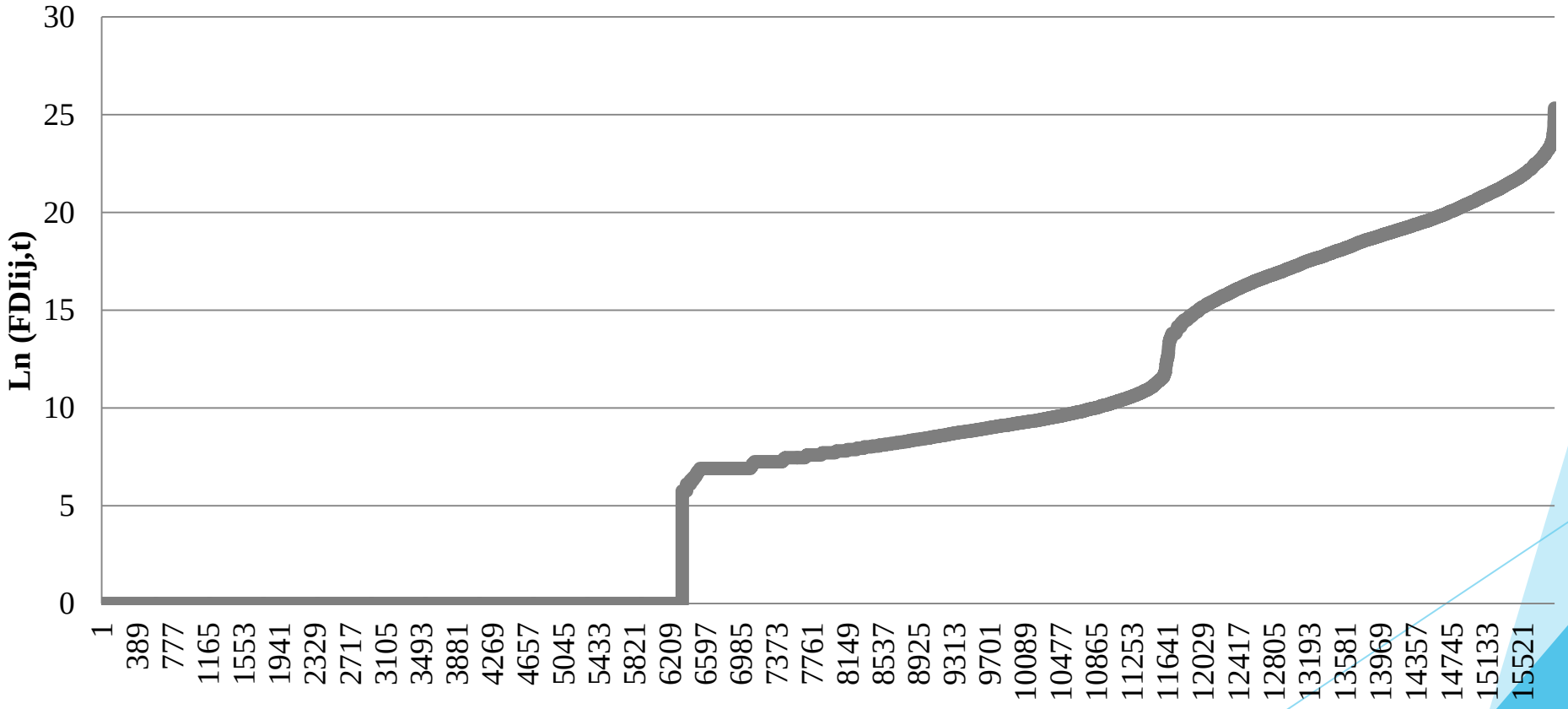
4. The Model

The dependent variable

- The destination country reports the amount of inward FDI flows from each origin country, whereas the origin country reports the amount of outward FDI towards each destination country.
- Therefore, we initially use three types of data for the dependent variable:
- natural logarithm of **inward FDI data**, as reported by the destination country *j* (*lnifdi*);
- natural logarithm of **outward FDI data**, as reported by the origin country *i* (*lnofdi*), and
- **average bilateral FDI data** (*lnfdi*) [=0.5 x (natural logarithm of the inward FDI data + natural logarithm of the outward FDI data)].

The dependent variable

Figure 3. The dependent variable [ln($FDI_{ij,t}$)] ordered by the size



Data availability: C, D, P or R?

- Lack of comprehensive official data on direct investment.
- The strange sub-section title should now make sense: C stands for confidential - and therefore, undisclosed - data, D denotes a change in the definition or methodology, P is provisional data and R is revised data.
- Most central banks of the EU member states maintain comprehensive publicly available datasets for at least six years.
- The official Eurostat data goes back to 1995, whereas the UNCTAD bilateral FDI statistics is only updated up to 2012. Some agencies are not doing the job they are established for.
- While our main data source is Eurostat, we also rely on central banks' Balance of Payments Statistics on FDI flows whenever data is missing.

Shocking Statistical Discrepancies

- The shocking statistical discrepancies among official FDI data are another source of frustration.

- For instance, the Bank of Italy in 2016 reports outward FDI flow to Greece in the amount of 121 million EUR, whereas Bank of Greece publishes inward FDI flow in Greece coming from Italy in the amount of 962 million EUR.

- These statistical differences are far from negligible and are brutally reminding us that the conclusions from the entire research exercise can only be indicative.

4. The Model

- We group the list of explanatory variables into three building blocks:
- (1) **The 'core' of the model** consists of four Heckscher-Ohlin variables (market size, market similarity, relative endowment, and distance) that resemble the Helpman (1987) specification.
- (2) The second building block consists of three **European macroeconomic convergence** variables: the absolute differences in the European convergence interest rates (*intdif*), in the general government budget balances as a percentage of GDP (*bgtdif*), and in the debt-to-GDP ratios between countries *i* and *j* (*dbtdif*).
- (3) The third building block encompasses six variables that control for the **European institutional convergence**. These World Bank good governance indicators are introduced later in the robustness analysis.

4. The Model

The ‘core’ of the model

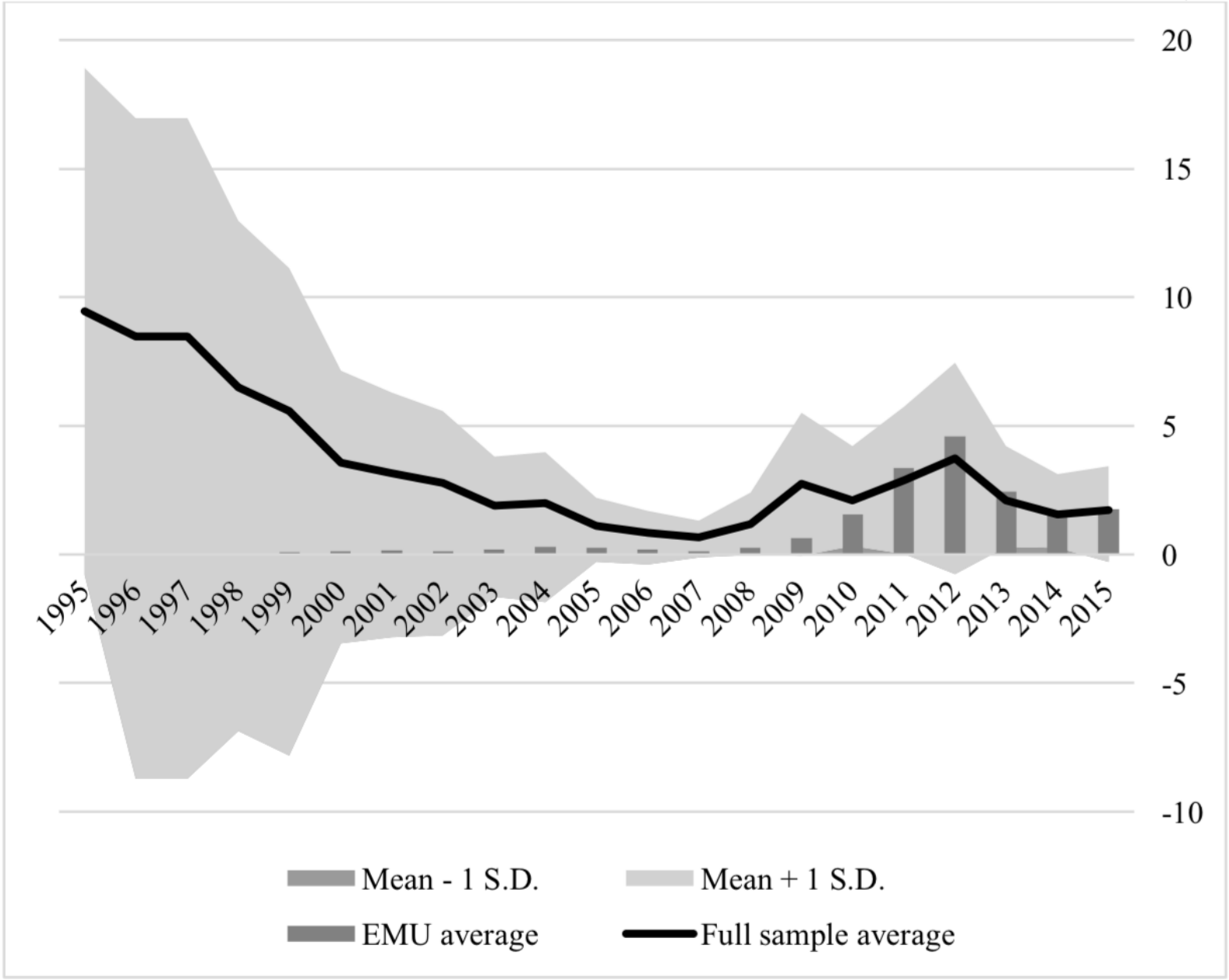
Hecksher-Ohlin variables	Description	Expected sign
Market size $G_{ij,t} = \ln\left(Y_{it} + Y_{jt}\right)$	Overall “economic space” capturing market expansion motives	[+] Under circumstances of horizontal firm integration
Market similarity $S_{ij,t} = \ln\left[1 - \left(\frac{Y_{it}}{Y_{it}+Y_j}\right)^2 - \left(\frac{Y_{jt}}{Y_{it}+Y_j}\right)^2\right]$	The relative size of the two economies If two countries have roughly equal GDP, the coefficient approaches − 0.69 = ln(0.5). Perfect dissimilarity yields a coefficient value that approaches ln(0).	[+] evidence of horizontal firm integration
Relative factor endowment $R_{ij,t} = \left\lvert \ln\left(\frac{gcf_{it}}{N_{it}}\right) - \ln\left(\frac{gcf_{jt}}{N_{jt}}\right)\right\rvert$	Relative difference between the gross fixed capital formation per capita (movement toward equalization should yield increase in bilateral FDI)	[-] Vertical firm integration [0] Horizontal firm integration theory

The Model

The European Macroeconomic Convergence

European Convergence Variables	Description	Expected sign
Interest rate difference	The difference in interest rates between country *i* and *j*	[-] Convergence in structural policies increases incentive to invest
Budget balance difference	The difference in the general government budget balance as a percentage of GDP between the origin and destination country	[-] Convergence in public deficits should lead to a rise in FDI
Difference in the debt/GDP ratios	The difference of the “debt-to-GDP ratio” between each country pair	[-] Convergence in public debts should reassure the investors of a sound situation

Figure 3. Evolution of the interest rate differences in the EU and EMU member states, 1995-2015



The Model

The European Institutional Convergence

European Institutional Convergence Variables	Description	Expected sign
Voice and accountability	Differences in the scores for the World Bank Good Governance indicators between countries *i* and *j*	[-] Convergence is likely to lead to increased bilateral FDI flows
Political stability		
Government effectiveness		
Regulatory quality		
Rule of law		
Control of corruption		

Data issues

Variable	Symbol	Obs	Mean	Std. Dev.	Min	Max
Natural logarithm of FDI	*Ln (FDI)*	13440	-0.25	4.76	-4.61	12.14
Market size	*G*	15876	13.44	1.13	10.10	15.68
Market similarity	*S*	15876	-1.54	0.89	-5.20	-0.69
Relative endowment	*R*	15876	0.91	0.70	0.00	4.45
Ln (Distance)	*D*	15876	7.07	0.66	4.04	8.23
Interest rate difference	*INTDIF*	15876	4.37	11.49	0.00	113.73
Budget balance difference	*BGTDIF*	15876	3.50	2.99	0.00	32.50
Public debt difference	*DEBTDIF*	15876	34.48	26.79	0.00	169.70
EMU	*EMU*	15876	0.21	0.41	0.00	1.00
Voice and accountability diff.	*VADIF*	15120	0.41	0.31	0.00	1.98
Political stability diff.	*PSDIF*	15120	0.49	0.36	0.00	2.15
Government effectiveness diff.	*GEDIF*	15120	0.76	0.55	0.00	2.69
Regulatory quality diff.	*RQDIF*	15120	0.53	0.39	0.00	2.20
Rule of law diff.	*RLDIF*	15120	0.75	0.53	0.00	2.49
Control of corruption diff.	*CCDIF*	15120	1.01	0.70	0.00	3.19

Empirical specification

- $$\ln(FDI_{ij,t}) = \alpha_s + \beta_1 G_{ij,t} + \beta_2 S_{ij,t} + \beta_3 R_{ij,t} + \beta_4 D_{i,j} + \beta_5 IRDIF_{ij,t} + \beta_6 BGTDIF_{ij,t} + \beta_7 DBTDIF_{ij,t} + \lambda_0 EMU_t + \lambda_1 (G * EMU)_{ij,t} + \lambda_2 (S * EMU)_{ij,t} + \lambda_3 (R * EMU)_{ij,t} + \lambda_5 (IRDIF * EMU)_{ij,t} + \lambda_6 (BGTDIF * EMU)_{ij,t} + \lambda_6 (DBTDIF * EMU)_{ij,t} + \varepsilon_{ij,t}$$
- where bilateral country pairs are denoted *ij*= Austria-Belgium, Austria-Denmark,…, UK-Sweden [756 pairs], and time t = 1995, 1996,…,2015 [21 years]. The dependent variable is the natural logarithm of total inward FDI inflows in the destination country.

Estimation techniques

- **Pooled OLS with Driscoll and Kraay (1998) Standard Errors:** For a large *T* dimension, the standard nonparametric time series covariance matrix estimator is robust to very general forms of cross-sectional and temporal dependence.
- **System GMM estimation:** case of omitted variable bias arises.
- **Poisson Pseudo-Maximum Likelihood Model:** consistent in the presence of fixed effects, deals with problems of zero investment data and potential sample selection bias as a special case of the omitted variable bias. The method is robust to different patterns of heteroskedasticity.
- **Threshold Probit Model:** consistent when adding a constant (minimum observed amount of investment)
- **Heckman Selection Model:** deals with omitted variable bias.

5. Empirical Results

Explanatory variables	Driscoll and Kraay (1998) $\ln(1+FDI_{ij,t})$ [1]	System GMM Estimation $\ln(1+FDI_{ij,t})$ [2]	PPML Estimation $FDI_{ij,t}$ [3]	Threshold Tobit Model $\ln(a+FDI_{ij,t})$ [4]	Heckman Selection Model $\ln(1+FD_{Iij,t})$ [5]
Market size	**7,56** ***	**0,94** ***	**1,42** ***	**1,27** ***	**9,95** ***
	[3.71]	[12.41]	[18.21]	[10.0]	[3.99]
Market similarity	**4,79** ***	**0,44** ***	**0,42** ***	**0,89** ***	**4,50** **
	[4.57]	[5.35]	[3.09]	[12.63]	[1.97]
Relative endowment	**-0,38** *	0,03	**-0,40** ***	**-0,59** ***	**-1,00** *
	[-1.84]	[0.33]	[-3.20]	[-15.2]	[-1.65]
Ln (Distance)	**-2,75** ***	**-1,03** ***	**-0,91** ***	**-1,83** ***	**-0,41** ***
	[-6.19]	[-10.45]	[-8.26]	[-43.83]	[-2.50]
Interest rate difference	-0,01	**-0,04** ***	**-0,14** ***	0,002	-0,004
	[-1.47]	[-6.97]	[-2.86]	[1.14]	[-0.26]
Budget balance difference	**-0,08** ***	0,00	**0,07** **	0,01	-0,06
	[-2.99]	[0.12]	[2.13]	[1.54]	[-1.05]
Public debt difference	-0,01	**-0,004** *	**-0,009** ***	**-0,003** ***	-0,005
	[-1.25]	[-1.78]	[-2.86]	[-2.95]	[-0.50]

Interaction terms

Explanatory variables	Driscoll and Kraay (1998) $\ln(1+FDI_{ij,t})$ [1]	System GMM Estimation $\ln(1+FDI_{ij,t})$ [2]	PPML Estimation $FDI_{ij,t}$ [3]	Threshold Tobit Model $\ln(a+FDI_{ij,t})$ [4]	Heckman Selection Model $\ln(1+FD_{Iij,t})$ [5]
EMU dummy	5.25	**5.00** **	**14.09** ***	**-6.49** ***	**18.74** **
	[0.84]	[2.05]	[7.37]	[-6.92]	[2.18]
EMU x Market size	**-0.80** **	**-0.43** ***	**-0.95** ***	**0.19** ***	**-1.58** ***
	[-2.44]	[-3.66]	[-7.59]	[3.60]	[-3.30]
EMU x Market similarity	**-0.67** *	**-0.30** *	**-0.27** *	0.08	**-1.68** ***
	[-1.97]	[-1.93]	[-1.76]	[1.29]	[-3.13]
EMU x Relative endowment	0.11	-0.22	0.26	**0.68** ***	-0.07
	[0.18]	[-0.69]	[1.07]	[5.74]	[-0.08]
EMU x Ln (Distance)	0.52	0.10	-0.07	**0.54** ***	-0.15
	[1.18]	[0.46]	[-0.53]	[7.33]	[-0.22]
EMU x Interest rate diff.	-0.01	-0.07	0.003	**-0.05** ***	0.02
	[-0.10]	[-1.08]	[0.05]	[-2.68]	[0.12]
EMU x Budget balance diff.	0.05	-0.05	**-0.06** *	0.00	0.05
	[0.91]	[-0.98]	[1.64]	[0.01]	[0.54]
EMU x Public debt diff.	**0.02** **	**0.01** ***	**0.018** ***	**0.004** *	**0.03** **
	[2.42]	[2.65]	[4.09]	[1.94]	[1.97]
Number of country pairs	756	756	756	756	756
Number of observations	15869	13601	15869	15869	15120
Number of instruments	/	55	/	/	/
(Pseudo) R-squared	0.41	/	0.12	0.17	/
AR(1)	/	0.000	/	/	/
AR(2)	/	0.371	/	/	/
Sargan test	/	0.245	/	/	/
RESET test	0.91	0.57	0.11	0.35	0.88
Implied EMU effect	28.5%	22.4%	63.9 M EUR	26.1%	24.2%

The Implied EMU Effect

- The central point of interest is the implied FDI premium from EMU membership – or simply the implied EMU effect – and its driving forces. Because of the log-lin nature of the empirical specification, this effect is calculated as follows:

$$EMU\ effect = [EXP(\lambda_0 + \lambda_1 mean(G_{ij,t}) + \lambda_2 mean(S_{ij,t}) + \lambda_3 mean(R_{ij,t}) + \lambda_4 mean(D_{ij,t}) + \lambda_5 mean(INTDIF_{ij,t}) + \lambda_6 mean(BGTDIF_{ij,t}) + \lambda_7 mean(DBTDIF_{ij,t}) - 1]\ x\ 100$$

$$(\partial \frac{LFDI}{\partial euro}) = \lambda_0 + \lambda_1 G_{ij,t} + \lambda_2 S_{ij,t} + \lambda_3 R_{ij,t} + \lambda_4 D_{ij,t} + \lambda_5 INTDIF_{ij,t} + \lambda_6 BGTDIF_{ij,t} + \lambda_7 DBTDIF_{ij,t}$$

The Implied FDI Premium from EMU Membership

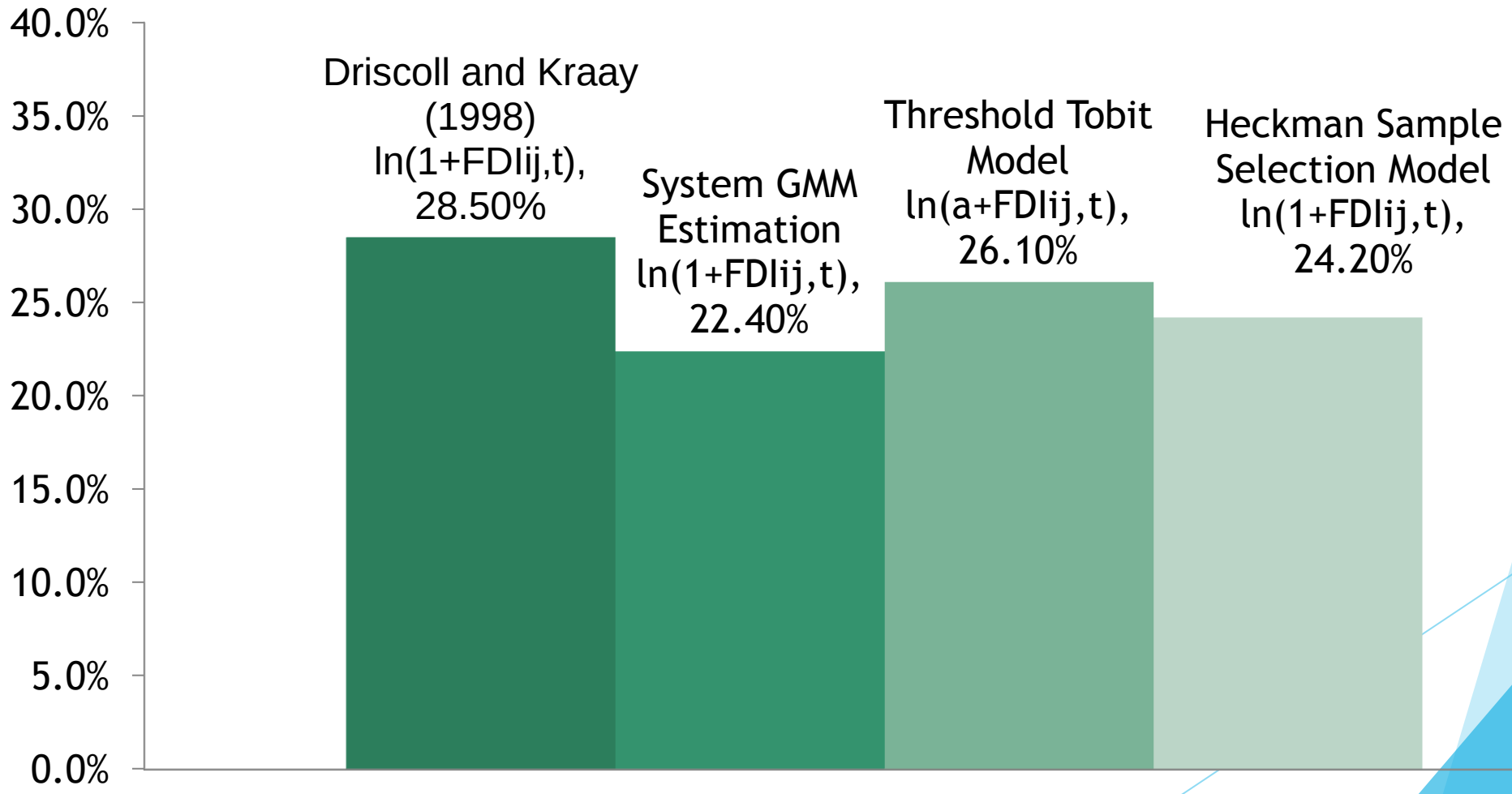
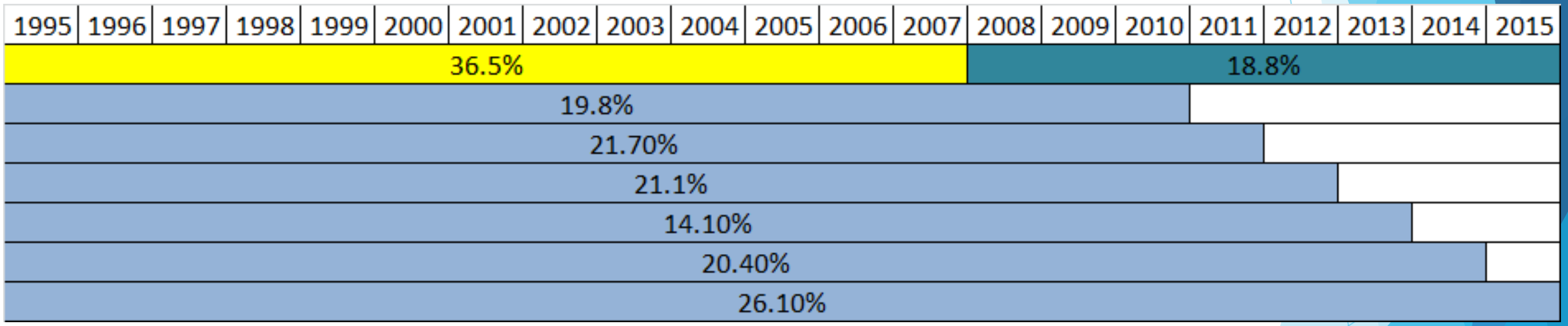


Table 3. The implied EMU effect under alternative bilateral FDI data and estimators

Estimation technique	*lnifdi* [1]	*lnofdi* [2]	*lnfdicorr* [3]
[1] Driscoll and Kraay (1998) (in %)	15.6	42.8	28.5
[2] System GMM (in %)	35.6	57.2	22.4
[4] Threshold Tobit (in %)	69.8	3.5	26.1
[5] Heckman Selection (in %)	2.29	57.8	24.2
Average effect (in %) ([1], [2], [4], [5])	30.8	40.3	25.3
Standard deviation	29.4	25.5	2.6
Coefficient of variation	0.95	0.63	0.10

Notes: *lnifdi* refers to inward FDI data reported by the destination country *j*; *lnofdi* refers to the outward FDI data reported by the source country *i;* and *lnfdicorr* is the average of the logarithmic transformation of the two reported amounts.

Evolution of the Implied FDI Premium from EMU Membership over Time



Conclusions

- **The total market size (G)** is highly significant. The positive relation can be broadly interpreted as the origin country's desire to seek out markets that increase the overall access to consumers.

- **Market similarity (S)** is important, since results support evidence that multinational firms prefer to invest in markets that are similar in size and consumer preferences relative to the destination country.

- The convergence in **factor endowments (capital and labor) (R)** leads to a rise in bilateral FDI flows.
  - The sign of the coefficient suggests multinational firms are not likely to expand production across borders strictly on the premise of lower labor costs in the country of investment within the European Union.

Conclusions (II)

- **Interest rate difference**: Convergence in the long-term interest rate is a sign of a convergence in the structural policies among the EMU countries. Smaller interest rate difference is indeed associated with more bilateral FDI flows.

- **Some ‘reassuring’ effect of fiscal policy:** There is evidence that the convergence in public debts and budget deficits is statistically significant and supportive to bilateral FDI.

- Convergence in **regulatory quality (RQ)** turns out to be the most significant driver (among control variables) of bilateral FDI flows

Conclusions (III)

- When we compare the empirical results, we observe that there is an overall positive impact of belonging to the EMU, even when controlling for the 2008 global financial crisis.

- The implied FDI premium from EU membership is estimated in the range between 22.4% and 28.5%, depending on the employed econometric method.

- A battery of consistency checks provides evidence that the exclusion of investment data for each EMU member state leads to a drop in the implied EMU effect, which is somewhat significant in the cases of Luxembourg, Cyprus and Greece.

Conclusions (IV)

- We observe a moderately negative impact from the Great Recession, which tends to force core countries to repatriate capital within their borders.

- From a political economy perspective, **the study brings hard facts about the credibility of the Euro and its evolution throughout the worst crisis the Euro area in particular has had to live since the inception of the single currency in 1999.**

- A converging Europe measured through the use of the Euro would still reinforce the attractiveness of the Euro zone in terms of FDI. In order to increase the FDI premium from EMU membership, the convergence should occur at several levels: at the structural policy level, and at the fiscal level.