

Do Determinants of FDI to Developing Countries differ among US and European Investors? Insights from Bayesian Model Averaging

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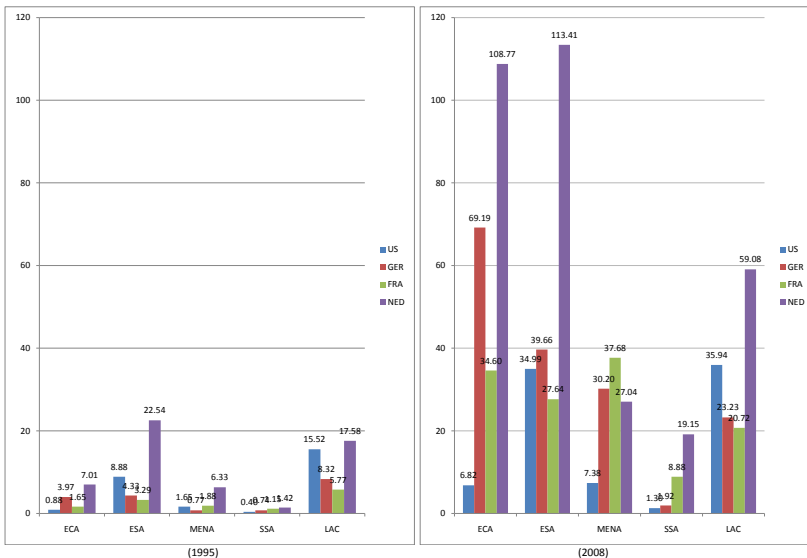
Outline

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Surge of OECD FDI into developing countries

- Since the mid 1990s OECD countries started to place an increasing share of their FDI into developing countries in ECA, ESA, MENA, SSA, LAC.
- Major 4 OECD investors' (US, Germany, France and Netherland) presence varied substantially in these regions in terms of value and time.

Figure 1: OECD FDI per capita position (US\$) by region of destination



Important questions raised

These facts raise several important questions:

- 1 What determines FDI from high income countries to different developing regions?
- 2 Which are indeed the most crucial ones?
- 3 Are they homogenous among distinct regions?

Answers to such questions are of great importance for the design of appropriate policies to attract FDI in specific regions.

Theoretical & Empirical Literature

Theoretical and Empirical Survey of Faeth (2009) presents 9 theoretical models explaining FDI:

- no single theory of FDI, but a variety of theoretical models.

Thus, analysis of FDI determinants should be explained more broadly by a combination of factors from a variety of theoretical models.

- No sufficient guidance for selecting the proper empirical model => the issue of model uncertainty arises.
- So far the empirical literature has not attempted to evaluate the robustness of FDI determinants.

Determinants of FDI

Annual data for 129 developing countries classified into 5 developing regions (ECA, ESA, MENA, SSA & LAC based on WB classification) for the 1995–2008 period.

- Dependent variable:
 - Bilateral FDI stocks per capita from major 4 OECD investors (US, GER, FRA & NED), *FDIpc*.
- Explanatory Variables:
 - Market size & Market Potential: *GDP, GDPpc, GROWTH*.
 - Labor cost & Productivity: *WAGE & LPROD*.
 - Resources: *OIL, GAS & MINORES*.
 - Host Country's Openness, Bilateral Trade Experience & Common Policy Framework: *OPEN, BTRADE & FTA*.
 - Human Capital Development: *NETP & NETS*.
 - Macroeconomic Factors: *EXC, STDEXC, INF, STDINF & DEBT*
 - Geographical & Cultural proximity: *DIST, LANG & COLON*.
 - Institutional Factors: *ACC, CORR, GOV, LAW, POL & REG*.
 - Double Taxation Treaties & Bilateral Investment Treaties: *DTT & BIT*.
 - Infrastructure & Corporate Tax: *MOBFIX, INT & TAX*.

Methodology: Bayesian Model Averaging

Alternative models M^j , with $j = 1, \dots, J$ defined by a subset of k^j included from K .

$$y_i = a_i \iota_T + X_i^j \beta^j + \varepsilon_i \quad (1)$$

If $\theta^j = \beta^j, \sigma, \alpha_i$ is the quantity of interest, then its posterior distribution given the data, y , is:

$$p(\theta^j | y_i) = \sum_{j=1}^{2^K} p(\theta^j | y_i, M^j) p(M^j | y_i) \quad (2)$$

This is an average of the posterior distributions under each of the models considered, weighted by their PMPs:

Have to compute PMPs \Rightarrow choose prior distribution over the space \mathcal{M} of all 2^K . We allocate equal prior model probability to each model:

$$p(M^j) = 2^{-K} \quad (3)$$

Yields uniform distribution; implies prob. of including a regressor is 0.5, independent of the combination of regressors included in the model.

Methodology: BMA continued...

With this prior model probability we get the following expression for the PMPs:

$$p(M^j | y_i) = \frac{p(y_i | M^j)}{\sum_{i=1}^{2^K} p(y_i | M^j)} \quad (4)$$

where $p(y_i | M^j)$ is the marginal likelihood of Model M^j given by:

$$p(y_i | M^j) = \int p(y_i | \alpha_i, \beta^j, \sigma, M^j) p(\alpha_i, \sigma) p(\beta^j | \alpha_i, \sigma, M^j) d\alpha_i d\beta^j d\sigma \quad (5)$$

with $p(y_i | \alpha_i, \beta^j, \sigma, M^j)$ the model corresponding to eq. (1), and $p(\alpha_i, \sigma)$, and $p(\beta^j | \alpha_i, \sigma, M^j)$, the parameter priors defined in the next slide.

Methodology: BMA continued...

Challenging to compute the relevant distributions:

- No. of estimated models increases with the No. of regressors exponentially, 2^K .
- Integrals may not exist in closed form.

We approximate the posterior distribution by applying MC^3 (Madigan and York, 1995). MC^3 based on Random Walk Metropolis-Hastings algorithm. Choice of Priors influences results. Thus, non-informative priors preferable.

- The prior for $p(\alpha_i, \sigma)$ has a g-prior structure; resembles the one suggested by the risk inflation criterion of Foster and George (1994) and has a good small sample performance (FLS, 2001b).
- We adopt a uniform prior for the scale parameter common to all models which implies equal prior weight.

Table 4: Determinants of FDI to developing countries

	US			GER			FRA			NED					
	PIP	Mean	SE	PIP	Mean	SE	PIP	Mean	SE	PIP	Mean	SE			
FTA	1.0000	0.0666	0.0077	BTRADE	1.0000	49.692	1.5968	BTRADE	1.0000	42.506	2.3513	BTRADE	1.0000	60.618	2.9512
BTRADE	1.0000	10.172	0.4487	GOV	0.9997	0.0220	0.0043	FTA	0.9909	0.0406	0.0100	WAGE	1.0000	-5.2551	0.7391
WAGE	1.0000	-1.2460	0.1749	INT	0.9939	0.0053	0.0010	DTT	0.6956	-0.0247	0.0184	WAGELPROD	1.0000	0.4947	0.0675
WAGELPROD	1.0000	0.1214	0.0159	LPROD	0.9886	0.0487	0.0112	INT	0.6771	0.0036	0.0028	INT	0.9584	0.0103	0.0029
GDPLANG	0.9994	0.0760	0.0158	WAGELPROD	0.1303	0.0172	0.0490	LPROD	0.6739	0.0238	0.0179	STDINF	0.8272	-0.0406	0.0220
GDPDIST	0.9983	0.0063	0.0021	WAGE	0.1263	-0.1818	0.5201	STDEXC	0.6366	-0.0127	0.0106	GOV	0.4979	0.0118	0.0130
GDP	0.7882	-0.0387	0.0237	FTA	0.0764	0.0019	0.0072	GAS	0.5262	0.0047	0.0049	ACC	0.2646	0.0040	0.0073
MOBFIX	0.6120	-0.0045	0.0040	OPEN	0.0553	0.0001	0.0007	GDP	0.3530	0.0158	0.0230	INF	0.0995	-0.0019	0.0061
INT	0.5409	0.0020	0.0020	OIL	0.0474	-0.0006	0.0032	MOBFIX	0.3273	0.0028	0.0044	GDPDIST	0.0651	-0.0005	0.0021
OPEN	0.3576	0.0009	0.0012	DTT	0.0233	0.0004	0.0031	REG	0.1685	0.0015	0.0036	MOBFIX	0.0553	0.0008	0.0037
STDEXC	0.1909	-0.0024	0.0054	GDPDIST	0.0106	0.0000	0.0003	STDINF	0.1640	-0.0034	0.0083	REG	0.0466	0.0007	0.0036
STDINF	0.0975	-0.0011	0.0037	ACC	0.0150	-0.0001	0.0006					STDEXC	0.0347	-0.0009	0.0059

Table 5: Determinants of FDI to developing countries (Restricted)

	US			GER			FRA			NED					
	PIP	Mean	SE	PIP	Mean	SE	PIP	Mean	SE	PIP	Mean	SE			
FTA	1.0000	0.0610	0.0086	BTRADE	1.0000	48.279	1.9101	BTRADE	1.0000	41.094	2.7567	BTRADE	1.0000	55.705	3.5014
BTRADE	1.0000	10.520	0.4962	WAGE	1.0000	-4.4514	0.6675	TAX	1.0000	-0.2116	0.0373	WAGE	1.0000	-10.423	1.2245
WAGE	1.0000	-3.4656	0.3019	WAGELPROD	1.0000	0.4342	0.0629	GDPLANG	0.9991	0.2446	0.0478	WAGELPROD	1.0000	1.0390	0.1152
WAGELPROD	1.0000	0.3406	0.0282	GOV	0.937	0.0235	0.0087	GDP	0.9712	0.0798	0.0290	TAX	1.0000	-0.4915	0.0820
GDPLANG	1.0000	0.1321	0.0214	GDP	0.9639	0.0691	0.0216	WAGELPROD	0.7246	0.1538	0.1055	MOBFIX	0.8481	0.0186	0.0108
GDPDIST	0.9931	0.0062	0.0019	TAX	0.5406	-0.0822	0.0837	WAGE	0.7195	-1.5786	1.0907	INF	0.7615	-0.0254	0.0161
MOBFIX	0.9799	-0.0123	0.0037	INF	0.0727	-0.0008	0.0031	DTT	0.6984	-0.0291	0.0218	OIL	0.7337	0.0514	0.0356
TAX	0.9716	-0.1101	0.0335	GDPFCOLON	0.0551	0.0090	0.0420	STDEXC	0.5089	-0.0120	0.0129	ACC	0.366	0.0084	0.0121
OPEN	0.7927	0.0026	0.0016	GDPDIST	0.041	-0.0002	0.0014	INF	0.1288	-0.0013	0.0038	GDPDIST	0.2697	-0.0033	0.0060
REG	0.4762	-0.0055	0.0063	STDEXC	0.0322	-0.0005	0.0033	STDINF	0.1224	-0.0027	0.0079	STDINF	0.2449	-0.0135	0.0255
STDEXC	0.4497	-0.0092	0.0111	OPEN	0.0321	0.0001	0.0005	FTA	0.1067	0.0027	0.0086	GOV	0.1658	0.0046	0.0111
INF	0.3285	-0.0029	0.0046								INT	0.1334	0.0011	0.0031	
GDP	0.2021	-0.0099	0.0216												
ACC	0.145	-0.0010	0.0026												

Table 6: Determinants of FDI to ECA by OECD investor

	US				GER				FRA				NED		
	PIP	Mean	SE		PIP	Mean	SE		PIP	Mean	SE		PIP	Mean	SE
OIL	1.0000	0.0388	0.0054	BTRADE	1.0000	48.194	2.7066	BTRADE	1.0000	69.292	4.7032	BTRADE	1.0000	166.41	7.1054
MOBFIX	0.9993	0.0123	0.0032	OPEN	0.9949	0.2036	0.0484	OIL	0.9998	0.0719	0.0137	WAGE	0.9905	-20.894	4.2063
WAGELPROD	0.9990	0.1895	0.0411	STDEXC	0.6313	-0.0305	0.0260	WAGELPROD	0.9561	0.6044	0.2897	WAGELPROD	0.9905	2.0911	0.4201
WAGE	0.9952	-1.8541	0.4386	GDPDIST	0.5618	-0.0178	0.0196	WAGE	0.9011	-5.5912	2.8885	GDPDIST	0.9844	0.0875	0.0212
ACC	0.9923	-0.0103	0.0025	MOBFIX	0.4268	0.0146	0.0198	INF	0.8345	-0.0125	0.0068	GDP	0.9833	-0.3824	0.0956
DTT	0.8806	-0.0177	0.0085	STDINF	0.2463	-0.0117	0.0230	GDP	0.4942	-0.0748	0.0844	OIL	0.9666	0.1007	0.0324
GAS	0.4877	0.0039	0.0044	GDP	0.2252	0.0292	0.0615	GDPDIST	0.4616	0.0146	0.0171	MOBFIX	0.8986	0.0432	0.0194
LPROD	0.3794	-0.0075	0.0106	INT	0.1358	-0.0018	0.0053	LAW	0.4454	-0.0099	0.0123	GAS	0.538	0.0218	0.0227
GDP	0.2471	-0.0054	0.0104	ACC	0.1073	-0.002	0.0066	MOBFIX	0.418	0.0091	0.0121	OPEN	0.4479	0.0647	0.0804
				WAGE	0.0628	-0.2793	1.4013	OPEN	0.3919	0.0307	0.0426				
				WAGELPROD	0.0597	0.0261	0.1335	POL	0.2814	-0.004	0.0070				

Table 7: Determinants of FDI to ESA by OECD investor

US				GER				FRA				NED			
	PIP	Mean	SE		PIP	Mean	SE		PIP	Mean	SE		PIP	Mean	SE
GROWTH	1.0000	-0.0685	0.0090	GROWTH	1.0000	-0.0538	0.0075	LPROD	1.0000	0.1998	0.0293	OPEN	1.0000	0.4098	0.0529
LPROD	1.0000	0.3545	0.0453	LPROD	1.0000	0.3016	0.0318	GROWTH	0.9998	-0.0347	0.0072	LPROD	0.9994	0.3252	0.0692
OPEN	1.0000	0.2467	0.0267	BTRADE	1.0000	28.998	2.1820	GDPCOLON	0.9997	-0.1301	0.0261	BTRADE	0.9978	18.272	4.2428
GDPLANG	1.0000	0.2747	0.0471	OPEN	1.0000	0.1572	0.0185	BTRADE	0.9996	17.460	3.4313	GOV	0.9927	0.0827	0.0214
MOBFIX	1.0000	-0.0403	0.0074	DTT	0.9994	0.1021	0.0210	OPEN	0.9963	0.0816	0.0190	GROWTH	0.9792	-0.0717	0.0209
INT	0.4129	0.0034	0.0044	MOBFIX	0.9978	-0.0195	0.0053	GOV	0.9866	0.0351	0.0094	CORR	0.5424	0.0265	0.0275
GOV	0.2027	0.0039	0.0087	GOV	0.9966	0.0330	0.0087	EXC	0.9364	0.0371	0.0151	WAGELPROD	0.215	0.0852	0.2376
GDP	0.1889	0.019	0.0442	OIL	0.7334	-0.0440	0.0312	CORR	0.6683	0.0143	0.0117	WAGE	0.1955	-0.9224	2.6946
EXC	0.1726	0.0049	0.0121	LAW	0.286	-0.0037	0.0066	BIT	0.2342	0.0081	0.0163	GAS	0.1373	-0.0035	0.0101
ACC	0.1679	0.0018	0.0046	EXC	0.2756	0.0083	0.0150	MOBFIX	0.1901	-0.0019	0.0045	STDINF	0.0624	0.0058	0.0277
CORR	0.1125	0.0017	0.0054	DEBT	0.2024	-0.0035	0.0077	STDEXC	0.1514	-0.0069	0.0190				
OIL	0.0938	-0.0037	0.0134	INT	0.1419	0.0007	0.0020	LAW	0.1376	-0.0016	0.0045				
				POL	0.1046	-0.0008	0.0027	ACC	0.1234	0.0011	0.0033				

Table 8: Determinants of FDI to MENA by OECD investor

	US			GER			FRA			NED					
	PIP	Mean	SE	PIP	Mean	SE	PIP	Mean	SE	PIP	Mean	SE			
GAS	1.0000	0.0119	0.0014	OPEN	0.9999	0.2745	0.0558	GDPLANG	0.9621	0.2468	0.0839	LPROD	0.9992	-0.2682	0.0588
GDPLANG	0.9967	0.0472	0.0112	GOV	0.9949	0.1074	0.0242	LPROD	0.9209	-0.1609	0.0660	WAGELPROD	0.9984	0.7032	0.1268
FTA	0.8231	-0.0136	0.0077	GROWTH	0.9799	-0.0569	0.0166	INF	0.8319	0.0813	0.0440	WAGE	0.9984	-7.5412	1.3410
MOBFIX	0.5988	0.0038	0.0035	LAW	0.2183	0.0093	0.0199	GDP	0.7661	0.1762	0.1070	MOBFIX	0.9147	0.0417	0.0180
GDP	0.4278	0.0135	0.0170	BIT	0.163	-0.0099	0.0254	CORR	0.6692	-0.0202	0.0164	POL	0.8881	-0.0384	0.0192
DEBT	0.2494	0.0013	0.0026	INF	0.1222	-0.0090	0.0278	WAGELPROD	0.4016	-0.0109	0.0168	OPEN	0.5335	-0.0736	0.0774
EXC	0.1545	0.0016	0.0043	BTRADE	0.0474	-1.4867	8.8368	WAGE	0.3851	-0.1088	0.1754	LAW	0.5305	0.0253	0.0269
INT	0.1502	-0.0003	0.0007	GAS	0.0443	-0.0006	0.0036	OPEN	0.188	0.0182	0.0429	FTA	0.4447	-0.0269	0.0336
BIT	0.1257	-0.0015	0.0046	MINORES	0.0439	0.0432	0.2697	POL	0.1107	0.0017	0.0056	DEBT	0.1674	0.0051	0.0130
LPROD	0.0948	-0.0013	0.0048	DTT	0.0382	-0.0042	0.0295					OIL	0.1008	0.0106	0.0369

Table 9: Determinants of FDI to SSA by OECD investor

	US				GER				FRA				NED		
	PIP	Mean	SE		PIP	Mean	SE		PIP	Mean	SE		PIP	Mean	SE
STDEXC	1.0000	-0.0093	0.0013	GDP	1.0000	0.0707	0.0094	WAGE	1.0000	2.6650	0.4197	ACC	0.9999	0.0286	0.0054
STDINF	0.9999	0.0089	0.0017	LPROD	1.0000	-0.0721	0.0087	WAGELPROD	1.0000	-0.2348	0.0381	POL	0.9988	-0.0219	0.0049
GDPLANG	0.888	0.0061	0.0028	DTT	1.0000	0.1026	0.0077	BTRADE	0.9866	30.378	8.2382	INT	0.9269	0.0081	0.0029
WAGELPROD	0.755	0.0033	0.0020	BTRADE	0.992	18.078	4.6923	STDINF	0.8272	-0.0333	0.0181	DTT	0.4515	0.0386	0.0473
POL	0.3864	0.0003	0.0004	INT	0.9799	-0.0029	0.0009	OPEN	0.6188	0.0016	0.0014	OIL	0.289	-0.0065	0.0114
WAGE	0.259	0.0116	0.0221	MOBFIX	0.5131	-0.0014	0.0015	MOBFIX	0.546	0.0033	0.0033	GAS	0.2655	0.0040	0.0073
OPEN	0.0627	0.0000	0.0000	BIT	0.1422	0.0009	0.0024	OIL	0.2998	-0.0037	0.0063	GOV	0.2616	0.0056	0.0104
EXC	0.0621	0.0000	0.0001	WAGE	0.1156	0.0053	0.0304	INT	0.2768	0.0011	0.0020				
GOV	0.0434	0.0000	0.0002	STDINF	0.1154	-0.0012	0.0040	GDP	0.2696	0.0096	0.0172				
REG	0.0368	0.0000	0.0001	ACC	0.0993	0.0002	0.0006	STDEXC	0.1783	-0.0048	0.0112				
				STDEXC	0.0867	0.0008	0.0029	EXCFRA	0.1761	0.0004	0.0010				
				WAGELPROD	0.0835	-0.0001	0.0026								
				GDPCOLON	0.0665	-0.0011	0.0046								

Table 10: Determinants of FDI to LAC by OECD investor

	US			GER			FRA			NED						
	PIP	Mean	SE		PIP	Mean	SE		PIP	Mean	SE		PIP	Mean	SE	
BTRADE	1.0000	13.934	0.7345		1.0000	0.0749	0.0137		1.0000	72.196	8.1619		BTRADE	1.0000	183.78	20.569
OPEN	0.9985	0.1843	0.0475	FTA	0.9899	-30.476	7.9999	WAGE	0.9929	-5.0735	0.8503	FTA	1.0000	0.2624	0.0371	
DTT	0.9514	0.0979	0.0345	INF	0.9845	-0.0328	0.0090	WAGELPROD	0.9929	0.4981	0.0832	GROWTH	0.9666	0.0539	0.0169	
WAGELPROD	0.5527	0.1383	0.1406	WAGE	0.6443	-3.4927	2.6926	FTA	0.9811	0.0818	0.0218	GAS	0.9003	0.0839	0.0378	
WAGE	0.5513	-1.3881	1.4186	WAGELPROD	0.6439	0.3421	0.2638	DTT	0.9731	-0.1002	0.0297	GDP	0.8688	-0.3179	0.1511	
GDP	0.5369	-0.0451	0.0516	EXC	0.2429	0.0012	0.0023	INF	0.9072	-0.0276	0.0122	MOBFIX	0.8441	0.0546	0.0279	
LPROD	0.3779	0.0125	0.0210					STDINF	0.8433	-0.0521	0.0263	LPROD	0.8026	0.0723	0.0433	
INF	0.1937	-0.0047	0.0108					POL	0.3139	-0.0040	0.0065	STDINF	0.329	-0.0309	0.0495	
INT	0.1696	0.0010	0.0026					STDEXC	0.2041	-0.0073	0.0158	INF	0.291	-0.0152	0.0264	
GAS	0.0966	0.0023	0.0081					GROWTH	0.1668	0.0016	0.0039	ACC	0.1786	0.0055	0.0133	
GDPDIST	0.0832	0.0000	0.0044									OIL	0.1428	0.0073	0.0202	
												EXC	0.1012	0.0011	0.0036	
												STDEXC	0.0765	-0.0033	0.0143	

Conclusion

Purpose of this study:

- shed light on the determinants of FDI in developing countries:
 - FDI data of 4 major OECD investors in 129 countries (5 regions), 30 expl. variables during 1995–2008.
 - BMA technique to overcome parameter & model uncertainty

Results:

- Generally...
 - *BTRADE* and *FTA* (for US, French & German) most robust determinants of OECD FDI.
 - US and Dutch search for low wages *WAGE* with the addition of sufficient productivity *WAGELPROD*.
 - All care for developed infrastructure *INT*. Cultural ties important for US. Macroeconomic stability and institutions also a concern.
 - Corporate tax reduction provides additional incentive for EU investors.
- Individually...

Conclusion continued...

● ECA:

- All but German invest in resource abundant countries, *OIL & GAS*.
- EU prefer destinations with established *BTRADE* but well-developed institutions not robust.
- US double investment strategy: i) risky destinations (resource-seeking FDI), early stage of political transformation, *ACC*, poor development, *WAGE*, with no *DTT* negotiated. ii) market-seeking FDI in more developed countries with good infrastructure, *MOBFIX*, and high productivity at reasonable wages, *WAGELPROD*.
- German FDI in close distance countries, fairly open, developed and macroeconomically stable.
- Dutch and French focus on relatively high productivity and low wage countries. Both invest in small distant countries with well developed infrastructure.

● ESA:

- All focus on *OPEN* and developed with high *LPROD* countries.
- EU investors preference for countries with *BTRADE* and well developed institutions. US & German with cultural & economic related countries.

Conclusion continued...

- MENA:
 - US invest in resource abundant and culturally related countries with good infrastructure & no FTA => market-seeking FDI.
 - Germany invests in open economies with effective public administration but does not care for dynamic markets.
 - French FDI concentrated on countries with common language, large markets with low productivity. Risk-taking involved.
 - Dutch FDI in low wage, low productivity countries. Closed & political unstable economies but with well developed infrastructure and sound legal situation.

Conclusion continued...

- SSA:
 - US prefer destinations with English widely spoken, favorable wage-labor productivity set-up and low *STDEXC*. However, engages FDI in countries with *STDINFL* (Angola & Zimbabwe)=> resource-seeking FDI.
 - For German FDI *BTRADE*, market size and countries with whom *DTT* exist are key determinants. However, FDI also directed to low *LPROD* countries with low infrastructure.
 - French prefers open countries with whom *BTRADE* exists, with good infrastructure, high wages and low *STDINFL*. Not efficiency-oriented.
 - Dutch prefer destinations with advanced democracy good infrastructure but not discouraged by high political risk countries.

Conclusion continued...

● LAC:

- All but German search destinations with established *BTRADE*. EU prefers countries with whom *FTA* have been negotiated => vertical FDI.
- All avoid destination with high inflation.
- All but Dutch search low wage countries with a favorable wage-labor productivity set-up.
- Institutional characteristics not robust.
- US invest in small open economies with which *DTT* exist.
- Dutch FDI placed in small but fast growing countries with high *LPROD*, natural resources, developed infrastructure & macroeconomic stability.

Remaining issues:

- UK among major investors. However, FDI data not publicly available. Results available after visiting ONS.