The Effects of Financial Development on Foreign Direct Investment: Appendices

A Flows and stocks of FDI

Our measures of FDI are gross flows. However, the effects that we discuss in Section 2 can be understood as influencing the aggregate desired capital stock in manufacturing sector s of destination country j at time t of MNEs headquartered in source country i (K^D_{ijst}). We can nevertheless make a link between flows and stocks by assuming, as is frequently done in the investment literature, that the stock of investment adjusts gradually towards its equilibrium level: $K_{ijst} - K_{ijst-1} = FDI_{ijst} = \lambda(K^D_{ijst} - K_{ijst-1})$, with $0 < \lambda < 1$. This process of partial adjustment reflects the fact that capital adjustments are likely to involve costs and to take time to occur.[1] It can also be assumed that K^D_{ijst} is a positive function of past capital stock due to the presence of agglomeration and information externalities (Kinoshita and Mody, 2001; Bobonis and Shatz, 2007): $K^D_{ijst} = \alpha K_{ijst-1} + x_{ijst}\beta + \epsilon_{ijst}$, with x being determinants of the aggregate desired FDI stock.

These two assumptions imply that a one-time change in any fundamental determinants of the desired capital stock can lead to large FDI flows for a long period of time.[2] Furthermore, even in a steady state, gross FDI flows proportional to K^D_{ijst} can still occur at each time period. This will be the case if there is a fixed share of foreign firms which exit the market each year, if positive FDI flows are required to sustain steady-state economic growth in an open debtor economy (Obstfeld and Rogoff, 1996), or if fundamentals such as market size grow at a common exogenous rate in every country (Fernandez-Arias, 1996; Bacchetta Philippe, 2000). Hence, financial development, by influencing K^D_{ijst}, can be expected to have a persistent effect on gross FDI flows.[3]

The positive relationship between gross FDI flows and desired capital stock, outwith and within the steady state, can explain why FDI flows and FDI stocks tend to be used interchangeably in the literature, despite the latter being a

[1] See Dixit and Pyndick (1994) Hamermesh and Pfann (1996), Caballero (1999), and Bond and Van Reenen (2007) for surveys of the literature. Bertola and Caballero (1994) and King and Thomas (2006) explain how microeconomic behaviours can be reconciled with the good performance of partial adjustment models at the aggregate level.

[2] Among other studies, Cheng and Kwan (2000), Bobonis and Shatz (2007), or Egger and Merlo (2007) find that FDI stocks adjust slowly.

[3] In the case of developing countries, Fernandez-Arias (1996) Sarno and Taylor (1999) find evidence that FDI flows have very large permanent components, possibly due to the externalities generated by the existing FDI stock.

theoretically more appropriate variable.[4] One worry may be that our estimators are biased because we cannot estimate the following dynamic model: $FDI_{ijst} = \lambda(\alpha - 1)K_{ijst-1} + x_{ijst}\beta\lambda + \lambda\epsilon_{ijst}$, in the absence of data on K_{ijst-1}. Indeed, given that $\phi = \lambda(\alpha - 1)$ is certainly negative, our estimators may suffer from a downward bias. However, the fixed effects that we include in our econometric model will partly account for the existence of past investment and, with ϕ likely to be small, the omitted variable bias affecting the determinants of the desired capital stock ought to be small too.[5]

B Measures of financial vulnerability and matching with FDI data

The *fDi Markets* database classifies the FDI projects into very broad recipient sectors, which are loosely aligned with 1987 U.S. SIC codes. We match these broad sectors to the corresponding three-digit ISIC codes (rev.2) reported in Rajan and Zingales (1998) and Kroszner et al. (2007); when the *fDi Markets* categories covered several sectors, we used the median value of the financial vulnerability measure for these sectors.[6] Table A1 indicates how the matching was done. We aggregate data in the same way when using the *Zephyr* database.

Table A1: Measures of sectors' financial vulnerability

Broad *fDi Markets* Sectors	Corresponding ISIC codes	ED	H	DUR	KL	CI	TANG
Beverages	313	0.08	1.13	0.00	53.71	0.73	0.40
Food & Tobacco	311+314	-0.16	1.08	0.00	25.65	0.34	0.28
Textiles	321+322+323+324	-0.03	0.69	0.00	8.20	0.67	0.14
Wood Products	331+332	0.26	0.72	1.00	15.36	0.56	0.30
Paper, Printing & Packaging	341+342	0.19	1.04	0.00	27.76	0.54	0.32
Alternative Energy, Biotechnology, Chemicals, Pharmaceuticals	352	0.22	1.21	0.00	31.08	0.52	0.27
Rubber	355	0.23	0.99	0.00	22.46	0.60	0.36
Plastics	356	1.14	0.83	0.00	41.09	0.45	0.38
Ceramics & Glass, Building & Construction Materials	361+362+369	0.06	0.95	1.00	29.96	0.44	0.42
Metals	371+372+381	0.09	1.10	1.00	39.35	0.34	0.32
Business Machines & Equipment, Engines & Turbines, Industrial Machinery, Equipment & Tools, Space & Defence	382	0.45	1.12	1.00	21.78	0.84	0.22
Communications, Consumer Electronics, Electric/Electronic Components, Medical Devices, Semiconductors	383	0.77	1.06	1.00	19.53	0.82	0.21
Aerospace, Automotive OEM, Automotive Components, Non-Automotive Transport OEM	384	0.31	1.32	1.00	19.63	0.89	0.23
Average		*0.28*	*1.02*	*0.46*	*27.35*	*0.59*	*0.30*
Standard deviation		*0.35*	*0.18*	*0.52*	*12.03*	*0.18*	*0.08*

Notes: ED: external dependence (Rajan and Zingales, 1998);1980-1989 median level of the fraction of capital expenditures not financed with cash flows. H: human capital intensity (Braun and Larrain, 2005); 1986-1995 median of the industry's mean wage over that of the whole manufacturing sector in the U.S. DUR: durable goods production (Kroszner et al., 2007); binary variable indicating whether the sector produces durable goods. KL: capital to labour ratio (Kroszner et al., 2007); 1980-1999 median level of the ratio of fixed assets over number of employees. CI: contract intensity (Nuun, 2007); 1997 proportion of intermediate inputs that are relationship-specific (not sold on an organized exchange or reference priced). TANG: asset tangibility (Kroszner et al., 2007); 1980-1999 median level of the ratio of fixed assets to total assets.

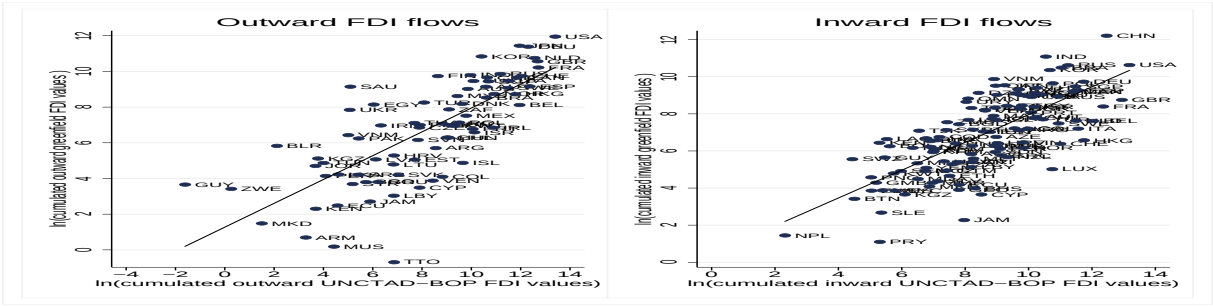
[4] Albuquerque et al. (2005), Baker et al. (2009), Coeurdacier et al. (2009), Asiedu and Lien (2011), or Eicher et al. (2012) are recent studies which have used FDI flows as dependent variable in econometric models which assume long-run positive flows even in the absence of changes in the fundamentals.

[5] Using data for the 1970-2011 period from the External Wealth of Nations II database constructed by Lane and Milesi-Ferretti (2007), we find that the elasticity of net FDI flows with respect to existing FDI stock in a simple autoregressive model with country/time fixed effects and the log of GDP is small, as expected: -0.12.

[6] We always use the ED value for the three-digit broad ISIC sectors. In some cases, these broad sectors may not include data on subsectors, for which Rajan and Zingales (1998) and Kroszner et al. (2007) provide four-digit level specific ED values.

C Summary statistics

Figure A1: fDi Markets FDI flows vs.UNCTAD-BOP FDI flows



Note: Cumulated values over the period 2003-2006. fDi Markets FDI flows: manufacturing sectors only; UNCTAD-BOP FDI flows: all sectors.

Table A2: Summary statistics of main variables

Variable	Mean	Std. Dev.
1. Value of bilateral **greenfield** FDI (US$M)	21.52	189.26
Number of bilateral greenfield projects	0.23	0.95
Average value of bilateral greenfield projects (US$M)	90.48	279.92
2. Value of bilateral **expansion** FDI (US$M)	14.43	89.53
Number of bilateral expansion projects	0.20	0.67
Average value of bilateral expansion projects (US$M)	73.22	156.38
3. Number of bilateral cross-border **M&A** transactions	0.16	0.53
Source (S.) ln(credit/GDP)	4.54	0.65
Destination (D.) ln(credit/GDP)	3.78	0.91

Note: Samples are those used in the regressions of Tables 1-4.

D Robustness checks

In Table A3, we provide additional robustness checks. In columns (1)-(3), we account for potential influential observations by removing, in turn, the largest source of FDI (United States), the largest recipient of FDI (China), and the two most outlying sectors in terms of external dependence ('Food and Tobacco': ED=-0.16; 'Plastics': ED=1.14). Our results are qualitatively unchanged. In column (4), we test for potential non-linear effects of financial development by interacting the ED variable with SFD/DFD and their squared values.[7] We cannot reject the absence of non-linear effects, given that the coefficients on these additional interaction terms are small and not statistically significant. As another way to to rule out the possibility of a simultaneity bias, we use the value of the private credit to GDP ratio in 1980 in column (5). Our main results are unaltered (we lose about half of the sample due to missing data).

In column (6), we investigate the sensitivity of our results to the omission of the greenfield FDI of firms which have invested in separate manufacturing sectors (or different industries) over the period 2003-2010. The coefficients are larger than those in column (2) of Table 1, notably on the source side. Hence, by not taking into account that

[7] For ease of interpretation, we subtract the sample mean from the financial development variables for this regression.

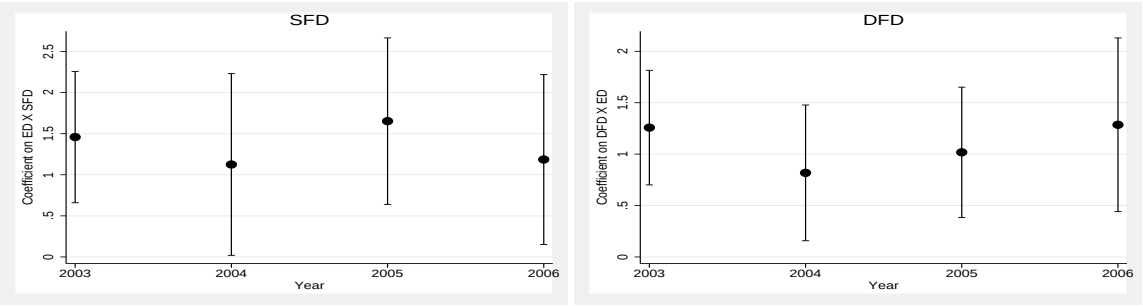
Table A3: Financial development and greenfield FDI: robustness checks

	Volume of bilateral greenfield FDI, by sector					
	Omission S. largest (U.S.A.)	Omission D. largest (China)	Omission ED extreme values	Non linearity	CRED/GDP 1980 values	FDI in one sector only
	(1)	(2)	(3)	(4)	(5)	(6)
S. ln(CRED/GDP) X ED	0.853***	1.307***	2.131***	1.424***		1.443***
	(0.311)	(0.327)	(0.515)	(0.405)		(0.306)
D. ln(CRED/GDP) X ED	0.940***	1.196***	1.329***	1.079***		1.164***
	(0.245)	(0.254)	(0.328)	(0.193)		(0.241)
S. ln(CRED/GDP)^2 X ED				0.297		
				(0.405)		
D. ln(CRED/GDP)^2 X ED				0.056		
				(0.249)		
S. ln(CRED/GDP)_1980 X ED					1.461***	
					(0.467)	
D. ln(CRED/GDP)_1980 X ED					1.724***	
					(0.462)	
Observations	30706	31941	25575	33618	17914	28977

***p-value$<$0.01 **p-value$<$0.05 *p-value$<$0.10. Cluster-robust standard errors in parentheses. S: Source. D: Destination. ED: external dependence. Time-varying country-pair fixed effects and sector fixed effects are included in all regressions.

investing firms can operate in different sectors, we may underestimate the effect of SFD on relative FDI in financially vulnerable sectors.

Our key hypothesis is that an industry's need for external finance is driven by deep technological reasons, implying that sector-specific external dependence tends to be stable across time and countries. Hence, we would not expect to see major differences in the sensitivity of a given industry to financial development across years. However, it is possible that our results hold only for specific years, such as the period 2005-2006, which corresponds to the peak of the lending boom in many countries. In that case, our findings may simply reflect opportunistic FDI driven by unusually good external financing conditions and not necessarily a long-term dependence of some sectors on external finance. To test this possibility, we estimate year-specific coefficients on the interaction terms between our sector-specific measure of external dependence and SFD/DFD. As can be seen in Figure A2, these coefficients tend to be stable across time, suggesting that we capture a genuine structural need for external finance of some firms to engage in FDI.



Note: Capped spikes delimit a 95% confidence interval.

Figure A2: Time-specific coefficients on interaction terms

References

Albuquerque, R., Loayza, N., Servén, L., 2005. World market integration through the lens of foreign direct investors. Journal of International Economics 66 (2), 267–295.

Asiedu, E., Lien, D., 2011. Democracy, foreign direct investment and natural resources. Journal of International Economics 84 (1), 99–111.

Bacchetta Philippe, Wincoop van, E., 2000. Capital flows to emerging markets: Liberalization, overshooting, and volatility. In: Edwards, S. (Ed.), Capital Flows and the Emerging Economies: Theory, Evidence, and Controversiess. University of Chicago Press, Ch. 3, pp. 61–98.

Baker, M., Foley, C. F., Wurgler, J., 2009. Multinationals as arbitrageurs: The effect of stock market valuations on foreign direct investment. Review of Financial Studies 22 (1), 337–369.

Bertola, G., Caballero, R. J., 1994. Irreversibility and aggregate investment. Review of Economic Studies 61 (2), 223–246.

Bobonis, G. J., Shatz, H. J., 2007. Agglomeration, adjustment, and state policies in the location of foreign direct investment in the United States. The Review of Economics and Statistics 89 (1), 30–43.

Bond, S., Van Reenen, J., 2007. Microeconometric models of investment and employment. In: Heckman, J. J., Leamer, E. E. (Eds.), Handbook of Econometrics. Vol. 6, Part A. Elsevier, pp. 4417–4498.

Braun, M., Larrain, B., 2005. Finance and the business cycle: International, inter-industry evidence. Journal of Finance 60 (3), 1097–1128.

Caballero, R. J., 1999. Aggregate investment. In: Taylor, J. B., Woodford, M. (Eds.), Handbook of Macroeconomics. Vol. 1, Part B. Elsevier, pp. 813–862.

Cheng, L. K., Kwan, Y. K., 2000. What are the determinants of the location of foreign direct investment? the chinese experience. Journal of international economics 51 (2), 379–400.

Coeurdacier, N., De Santis, R. A., Aviat, A., 2009. Cross-border mergers and acquisitions and european integration. Economic Policy 24 (57), 55–106.

Dixit, A. K., Pyndick, R. S., 1994. Investment Under Uncertainty. Princeton:Princeton University Press.

Egger, P., Merlo, V., 2007. The impact of bilateral investment treaties on FDI dynamics. World Economy 30 (10), 1536–1549.

Eicher, T. S., Helfman, L., Lenkoski, A., 2012. Robust FDI determinants: Bayesian model averaging in the presence of selection bias. Journal of Macroeconomics 34 (3), 637–651.

Fernandez-Arias, E., 1996. The new wave of private capital inflows: Push or pull? Journal of Development Economics 48 (2), 389–418.

Hamermesh, D. S., Pfann, G. A., 1996. Adjustment costs in factor demand. Journal of Economic Literature 34 (3), 1264–1292.

King, R. G., Thomas, J. K., 2006. Partial adjustment without apology. International Economic Review 47 (3), 779–809.

Kinoshita, Y., Mody, A., 2001. Private information for foreign investment in emerging economies. Canadian Journal of Economics 34 (2), 448–464.

Kroszner, R. S., Laeven, L., Klingebiel, D., 2007. Banking crises, financial dependence, and growth. Journal of Financial Economics 84 (1), 187–228.

Lane, P. R., Milesi-Ferretti, G. M., 2007. The external wealth of nations mark ii: Revised and extended estimates of foreign assets and liabilities, 1970-2004. Journal of International Economics 73 (2), 223–250.

Nuun, N., 2007. Relationship-specificity, incomplete contracts, and the pattern of trade. Quarterly Journal of Economics 122 (2), 569–600.

Obstfeld, M., Rogoff, K., 1996. Foundations of International Macroeconomics. Cambridge, Massachusets: the MIT Press.

Rajan, R. G., Zingales, L., 1998. Financial dependence and growth. American Economic Review 88 (3), 559–86.

Sarno, L., Taylor, M. P., 1999. Hot money, accounting labels and the permanence of capital flows to developing countries: an empirical investigation. Journal of Development Economics 59 (2), 337–364.