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The New Global Determinants of FDI Flows to Developing Countries

The Importance of ICT and Democratization

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Abstract

Foreign direct investment (FDI) has increased dramatically in recent years. However, the distribution of FDI is highly unequal and very poor countries face major difficulties in attracting foreign investors. This paper investigates the determinants of FDI inflows to developing countries, with a particular emphasis on the impact of the 'third wave of democratization' that started in the early 1980s and the spread of information and communication technology (ICT) that began in the late 1980s. These two global developments must now be taken into account in any explanation of what determines FDI flows. Using a large sample of countries, together with panel data techniques, the paper explores the determinants of FDI. The causal relationship between FDI, GDP growth, trade openness and ICT is investigated. The main findings are that democratization and ICT increase FDI inflows to developing countries. The paper concludes that more assistance should be given to poorer countries to help them to adopt ICT and to break out of their present 'low ICT equilibrium' trap.

Keywords: foreign direct investment, ICT, democracy, panel data

JEL classification: O0, O3, C23

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1 Introduction

Foreign direct investment (FDI) is increasingly important to developing countries. In 2000, they received US$ 168 billion in FDI inflows, the largest item in US$ 197 billion of net long-term resource flows to this group (UNCTAD 2001: xiii). The share of developing countries in FDI inflows has also risen from 17.1 per cent in 1988-1990 to 21.4 per cent in 1998-2000 (see Table 1).

The scale and character of foreign direct investment (FDI) flows to developing countries have long been affected by successive waves in the invention and adoption of new technologies. The latest wave—the revolution in information and communication technology (ICT)—is facilitating a global shift in the service industries, which are now relocating to select developing countries, following the earlier shift in manufacturing. Global political change also affects FDI flows. Since the early 1980s, a 'third wave' of democratization has pushed aside many authoritarian regimes, and the opening up of political systems is often a catalyst for economic reforms that favour investors.[1] These two waves, one technological, one political, are interacting to reshape trade and capital flows, including FDI.

Table 1
Share of regions in global FDI inflows, GDP and exports (%)

	FDI inflows	
Region/country	1988–1990	1998–2000
Developed countries	82.7	76.3
Western Europe	43.3	45.3
European Union	41.4	43.8
Other developed countries	39.4	31.0
Developing countries and economies	17.1	21.4
Africa	1.8	0.8
North Africa	0.7	0.2
Other Africa	1.1	0.6
Latin America and the Caribbean	4.7	9.2
South America	2.5	6.1
Other Latin America and the Caribbean	2.1	3.2
Asia and the Pacific	10.6	11.1
Asia	10.5	11.1
West Asia	0.6	0.4
Central Asia	0.0	0.3
South, East and South-East Asia	9.9	10.4
The Pacific	0.1	0.0
Central and Eastern Europe	0.2	2.3

Source: UNCTAD (2001).

1 On the 'third wave' of democratization, see Huntington (1991). Of 147 countries for which data are available, 121 had some or all of the institutions of democracy in 2000, compared with only 54 countries in 1980 (UNDP 2002: 14).

These new global forces must be seen alongside the longstanding determinants of FDI flows to developing countries: their natural-resource endowments, geographical characteristics (country location in particular), human capital, infrastructure, and institutions, factors emphasized in the existing literature (see for example De Mello 1997; Noorbakhsh *et al*. 2001). These factors have contributed to a highly skewed distribution of FDI across countries: 15 countries account for over 80 per cent of FDI to developing countries, and the 49 least developed countries (LDCs) attracted only 0.3 per cent of world FDI inflows in 2000 (UNCTAD 2001: xiii).

FDI to LDCs has been concentrated in natural resource intensive sectors, particularly mining. FDI in mining is often enclave in nature, with limited multiplier effects on output and employment in the rest of the economy (although it does provide much-needed foreign exchange and public revenue). Investment in ICT infrastructure and skills helps to diversify economies from dependence on their natural-resource endowments and offsets some of the locational disadvantages of landlocked and geographically remote countries. This can attract more FDI—particularly investment in non-traditional sectors—an effect enhanced if democratization encourages economic reforms and other policy measures that improve the investment climate. But as the availability of ICT infrastructure and skills becomes increasingly important in the decisions of foreign investors, poorer countries could fall further behind if they are unable to build this capacity.

It is therefore essential to keep in mind that the environment for FDI in developing countries is undergoing significant change. Hence any empirical assessment of the determinants of FDI flows to these countries must take account of new technological and political developments alongside the more traditional determinants.

The structure of the paper is as follows. Section 2 presents a conceptual framework, focusing on the role of ICT in determining FDI flows and using the Ricardian model of trade (Dornbusch *et al.* 1977) to illustrate the effects of ICT on a developing economy. This section also discusses the link between democratization and FDI through the effect of the former on the expected returns to FDI. Section 3 discusses the data used in the empirical part of this article, section 4 sets out the empirical model to be estimated, and section 5 discusses the estimation procedure. The causality relationship between FDI, GDP growth, openness and ICT is investigated. A distinguishing feature of this study is that a number of relevant factors previously not tested in the FDI literature (e.g., Asiedu 2002; Gastagana *et al*. 1998 and Bjorvatn *et al*. 2001) are examined. The data include the most recent statistics, and the analysis is based on a larger number of countries. We explore whether factors that affect FDI in developing countries affect countries differently and quantify the magnitude of heterogeneity in effects by region and level of development. Section 6 presents the results. We find that both democratization and ICT attract FDI inflows. Section 7 concludes the paper by emphasizing the need for aid donors to give more support to ICT adoption and democratization. In particular, many poor countries have insufficient resources to build an ICT infrastructure and are therefore in a 'low-ICT equilibrium trap', and external resources are needed to help them out of it.

2 Conceptual framework

Technical change has strong effects on FDI flows to developing countries. Innovation creates new demands for raw materials leading to FDI in their extraction and production: oil and rubber for motorized vehicles in the early twentieth century; copper for large-scale electricity generation and distribution in the 1920s; uranium in the 'atomic age' of the 1940s; and coltan for the manufacture of ICT equipment today. And new international transport technologies raise the returns from exploiting the climate and location of countries; cheap airline travel accelerated FDI in tourism from the 1950s onwards, for example. A country can support such resource-based FDI through investments in infrastructure, skills, and institutions, often with contributions from foreign investors themselves; much of the infrastructure that we see today was built in the nineteenth century when large amounts of capital flowed into the European colonies and Latin America's newly independent states, bringing with it the latest technology of the day (the railway and the telegraph in particular).

Although governments can do much to raise the returns to resource-based FDI, such capital inflow ultimately depends, however, on the country's (God-given) resource endowment. In contrast, governments have greater powers to encourage 'vertical' FDI, which entails the relocation of intermediate stages of production to take advantage of lower costs. Aside from a supportive policy framework, the human capital stock heavily influences FDI flows and the associated technology transfer (Keller 1996; Noorbakhsh *et al.* 2001; Saggi 2002). As large investments in education and training raised THE national supplies of skilled labour, Malaysia, Singapore, Taiwan and later China were able to move up the value-added 'ladder' from manufacturing-intensive unskilled labour, enabling them to create highly effective partnerships with foreign investors to import, use and (soon after) develop high technology.

ICT infrastructure and skills are now critical in integrating local producers into international 'B2B' networks, and in attracting vertical FDI in services as well as manufacturing. Routine tasks such as customer support and data processing in financial services, as well as higher value-added tasks such as design and product development together with software development, are examples. Multinationals providing business services and consultation are now large investors in India where they can draw on the local ICT skills to develop business solutions for international clients. ICT capacity also influences 'horizontal' FDI to produce manufactures and services for sale in the host country market, particularly in large markets such as Brazil, China and India, where ICT is increasingly used to manage supply chains (with greater efficiency and lower inventories reducing business costs).[2] National capacities to adapt ICT to local needs (languages, preferences, and regulations) are essential. South Korean companies producing locally for the Indian consumer-goods market are heavy users of local ICT skills, and ICT has been central to organizing the global expansion of South Africa's companies (in the brewery sector for example).

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2 Horizontal FDI in developing countries has traditionally been much less important than vertical FDI. For example, only 4 per cent of production by the affiliates of US multinationals in the European Union is sold back to the United States, whereas the proportion is 18 per cent for developing countries (Shatz and Venables 2000).

2.1 The impact of adopting information and communication technology

The economic implications of importing superior technology (in this case ICT)—whether directly or through the technology transfer of FDI—can be shown using the Ricardian (two country) model of trade (Dornbusch *et al.* 1977). In Figure 1, the wage of the developing country relative to the developed country is given by w/w^*, and $A(z) = a^*(z)/a(z)$ is the relative unit labour requirement of the commodity (z) in the developed country relative to the developing country (both are measured along the vertical axis in Figure 1). The range of goods (z) is ranked along the horizontal axis so that the developing country is more efficient in the production of goods nearest the origin (our exposition closely follows that of Dornbusch and Park 1987: 407-9).

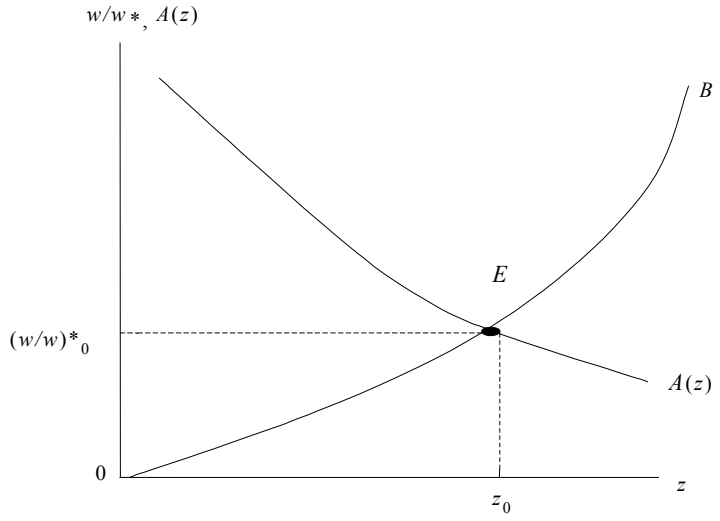
Relative wage costs then determine the pattern of trade. The home country will specialize in producing those goods for which the unit labour costs are lower locally than abroad. So for any good z, production will be located at home if $wa(z)<w^*a^*(z)$. A given relative wage w/w^* therefore determines the competitiveness of the home country. The relative wage itself is set by demand and the level of spending: demand conditions are shown by the schedule *OB* along which the demand for home-produced goods is equal to (full employment) supply. If the range of goods produced by the home country increases (i.e. the country moves rightward along the horizontal axis) then an excess demand for labour is created and the equilibrium relative wage increases. Equilibrium is at point *E*: the goods market clears, and production is in the lowest cost location (hence the developing country produces up to z_0).

Following Dornbusch and Park (1987), we now show what happens when new technology—ICT in our case—is introduced in a developing country. In Figure 2, $w/w^*=1$, so that at the initial equilibrium point, *E*, $w/w^*<1$ by construction. The foreign country has superior technology for the goods produced by the developing country. This is still the case for most ICT software and hardware, although developing countries such as China and India are becoming significant innovators. Assume now that the developing country imports the new technology. This can happen in two ways. If the country has the relevant human capital, it can import the hardware and software and apply its existing stock of skilled labour to their use. Over time, it can both expand the supply of that skilled labour, and change its training, so that it is able not only to use the imported ICT technology but also to modify and develop it. This is the path followed by India, where prior investment in good quality technical education has provided a ready supply of IT staff (and this has been the pattern in earlier successful adoptions of new technologies in East Asia: see Amsden 1992).

When the country lacks the necessary human and managerial capital, it may try to develop these itself (through public programmes for example), but this can be prohibitively expensive for the poorest countries. Moreover, the ICT skills that a country needs may be specialized to a particular type of company. For this, and for budgetary reasons, foreign investment that transfers ICT and the necessary skills offers for many countries the best option for building domestic ICT. Foreign investors, however, are attracted to countries that already have an ICT infrastructure (indeed such countries may effectively use ICT to signal their technological advantage to foreign investors). Consequently, poorer countries may find themselves in a 'low-ICT trap': they cannot attract ICT-intensive FDI because they have neither the ICT infrastructure to begin with nor sufficient private or public resources to develop it. Consequently, two groups of developing countries emerge: those that are attractive to ICT-intensive FDI,

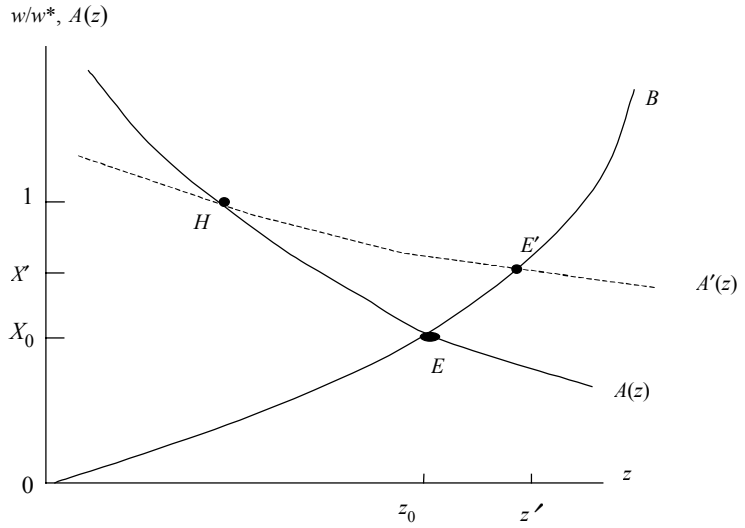
and those that are not. Moreover, over time what little skilled ICT labour is available in the latter group may migrate to the former group. Hence over time the ICT gap may not only widen between developed and developing countries, but also within the developing-country group itself.

Figure 1
The Ricardian model



Source: Dornbusch and Park (1987).

Figure 2
Importing ICT technology



Source: Dornbusch and Park (1987).

What are the domestic economic effects if a country is successful in attracting ICT-intensive FDI? As a result of importing ICT, the recipient country's relative unit labour requirements will fall. The *A(z)* schedule rotates upward. The new equilibrium is at *E′*. The country has now expanded the range of goods it can produce (from z_0 to z'). It may have increased its own ability to supply ICT services (software development for instance) and/or it may now be able to supply more services that are ICT intensive. As a consequence, its wage level rises relative to the foreign wage level (it now produces more goods, and this raises the demand for labour). The rise in the wage level may also enable the country to secure ICT-skilled labour from other developing countries, thus reinforcing the effect of ICT-polarity noted previously.

2.2 The impact of democratization

Geo-political shifts can—for good or bad—rapidly overturn investors' expectations regarding the protection of their property rights and the profitability of their investment. Before the First World War the global political climate favoured all forms of private capital flows, but turned hostile thereafter, and was discouraging for much of the twentieth century (Obstfeld and Taylor 2002; Williamson 2002). FDI flows to developing countries stalled, and became concentrated on a narrow range of countries, after the Russian, Chinese, and Cuban revolutions and the expansion of Soviet rule into Eastern Europe. Distrust of FDI rose as the dependency theory became influential across much of Latin America and the former colonial world in the 1960s and 1970s (Cardoso and Faletto 1979).

In the last twenty years, attitudes towards FDI have shifted again. Ideological change is important—waning of the dependency theory and the rise of the 'Washington Consensus' which favoured opening up trade and foreign investment (Velasco 2002; Kuczynski and Williamson 2003). But this is not to say that the caution of the earlier period was entirely wrong.[3] The need to attract more private capital has also risen with the decline, in real terms, of official development assistance. The 'third wave of democratization' (a term applied by Samuel Huntingdon to democracy's global spread) may also have increased both the demand for FDI and its supply.[4]

First, democratization has stimulated market reforms that are favourable to foreign investors (privatization for example), particularly in Eastern Europe and the former Soviet Union. Second, economic policy in the new democracies is now subject to oversight by parliamentarians and civil society, and this may encourage a more stable policy environment for investors. Third, oversight may encourage a more development-focused allocation of public spending, particularly public investment for creating the skills and public goods that attract foreign investors. Fourth, democratic oversight may stimulate legal reforms that protect the property rights of all investors, including foreign investors.

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3 Each foreign investment project must be assessed on its merits and relative to a well-defined strategy on how to use external capital for development See Buffie (2001) for a careful evaluation of FDI's effects, both positive and negative, as a source of capital, technology transfer, and employment.

4 The third wave of democratization started with Latin America's transition from military dictatorship and then, from the mid-to-late 1980s, moved across Eastern Europe, the FSU, Sub-Saharan Africa as well as South Korea and Taiwan (Huntingdon 1991).

However, for a democracy to function well, more is needed than simply introducing multi-party competition into the political system; considerable institution-building is essential (Addison 2003). Hence, democratization's potential benefits for investors will not appear overnight; the delays could be considerable. Moreover, democratization is no guarantee for macroeconomic stability (witness Argentina in 2002). And democratization may not significantly improve skills and public goods if a country lacks the resources to finance those public investments (a problem for much of Sub-Saharan Africa [SSA]). Neither does it guarantee effective legal reform (a problem in the countries of the former Soviet Union). These weaknesses may not deter FDI entirely (foreign investment in mining is generally resilient in the face of economic instability) but they could deter FDI other than natural resource extraction. Hence, the impact of democracy on FDI is an empirical issue, to which we now turn.

3 Data

3.1 Data sources

The data are obtained from various sources. The main part is from the World Bank's World Development Indicators. Other sources are The Freedom House Democracy Database, the Polyarch Dataset (Vanhanen 2001) and Digital Planet.[5] The original data from WDI timeseries indicators consist of a sample of 207 countries observed for 1960 to 1999. The Vanhanen democracy data contain information from 182 countries observed for the period 1810-1998. The Digital Planet Data consist of only 49 countries observed for the period 1992-99. The datasets are unbalanced and several countries in the different data sets are not observed every period.

Missing information on the dependent and key explanatory variables reduced the effective larger sample used in the estimation to an unbalanced panel data covering 110 countries observed during 1970-99. The total number of observations used is 2840. The number of years during which different countries are observed vary from 5 to 30. A total of 72 out of the 110 countries are observed for the entire period of 1970 to 1999. Our alternative model specification incorporating information and communication technology variables is based on an unbalanced panel of smaller sample of 39 countries observed during 1992 to 1999. The total number of observations is 308.

A number of missing (by unit) explanatory variables are imputed, using lag values or alternatively using countries mean values of the variables considered. The imputed values are obviously not actual ones but proxies and could thus bias the results. The employed imputation procedure is used here to minimize bias. In our view, the gain achieved in the reliability of results that is generated by using the greatest number of observations outweighs the risk of bias.

The variables used are classified as dependent, independent, and country characteristic variables. The independent variables include those perceived to be determinants of FDI: openness, GDP growth, government consumption, wages, inflation, education, return to saving, infrastructure, and ICT spending. The country charactertistics variables

[5] For public access to data on democracy please see: http://hypatia.ss.uci.edu/democ/archive.htm

Table 2
Summary statistics of the data

Variable	Definition	Mean	Std dev	Minimum	Maximum
		Large sample (nt=2840)			
year	Year of observation	1985.4877	8.5292	1970.0000	1999.0000
nyear	Number of years observed	27.8148	4.9960	5.0000	30.0000
fdi	Foreign direct investment	1.5958	2.8540	-19.7837	39.7747
open	Openness	75.0994	45.4882	6.3203	439.0288
gdpgrow	GDP growth	3.3759	5.6994	-50.2000	39.4871
govcon	Government consumption	16.2129	6.2577	2.9755	54.5154
wages	Wages	25.4123	11.4711	1.5385	61.1768
inflat	Level of inflation	23.9753	73.0561	-13.0566	709.0000
vinflat	Variance of inflation	4142.0902	14844.4067	2.3648	104573.2899
educat	Secondary school enrolment	51.4792	33.3187	1.1000	152.7000
indust	Industrialization	29.6002	10.8934	6.2475	82.5154
return	Interest rate/return to saving	5.3909	12.6646	-97.8122	100.0000
infras	Infrastructure	121.2343	167.0468	0.1000	699.0000
risk	Interest rate spread/risk	10.4065	29.3166	-10.9958	500.0000
size	Market size (total GDP)	87.5940	239.5461	0.0641	2604.2943
trend	Time trend	16.4877	8.5292	1.0000	30.0000
fuel	Fuel producing	0.6891	0.4629	0.0000	1.0000
mineral	Mineral resources	0.5979	0.4904	0.0000	1.0000
metals	Metal resources	0.7697	0.4211	0.0000	1.0000
demindex	Democracy index	13.4721	13.6976	0.0000	47.1100
		Small ICT sample (nt=308)			
year	Year of observation	1995.4578	2.2790	1992.0000	1999.0000
nyear	Number of years observed	7.9156	0.3415	6.0000	8.0000
fdi	Foreign direct investment	2.7429	2.9570	-1.9262	24.8808
open	Openness	80.7387	55.2104	14.7310	361.0065
gdpgrow	GDP growth	2.8081	3.9020	-14.5311	12.9128
govcon	Government consumption	17.1504	5.6688	2.9755	29.8442
wages	Wages	14.7277	7.7284	2.0165	39.7006
inflat	Level of inflation	16.5129	62.5720	-1.1666	709.0000
vinflat	Variance of inflation	5323.7256	14326.1576	2.3648	61821.9029
educat	Secondary school enrolment	94.2842	26.3326	34.7000	152.7000
tyr	Year of schooling	8.5450	2.1207	4.0070	12.4107
indust	Industrialization	31.4842	5.9703	20.3419	49.3154
return	Interest rate/return to saving	6.9697	9.2759	-82.4660	71.1735
infras	Infrastructure	340.9026	199.4510	8.9000	699.0000
risk	Interest rate spread/risk	7.3769	15.5914	-6.9125	218.3500
size	Market size (total GDP)	324.0179	483.8096	10.9487	2604.2943
trend	Time trend	4.4578	2.2790	1.0000	8.0000
ict	Info.& comm. technology	5.1217	2.0218	1.5400	10.8700
fuel	Fuel producing	0.9513	0.2156	0.0000	1.0000
mineral	Mineral resources	0.6916	0.4626	0.0000	1.0000
metals	Metal resources	0.9513	0.2156	0.0000	1.0000
demindex	Democracy index	27.5394	12.1148	0.0000	47.1100

Note: Dummy variables representing: regions, degree of indebtedness and income classes not reported here.

Table 3
Mean explanatory variables in the large and small (ICT) samples over time

	nobs	fdi	open	gdp	govcon	wages	vinflat	inflat	educt	tyr	indust	return	infras	risk	ict	fuel	mineral	demindex	size
1970	74	0.93	58.85	6.42	14.50	27.79	3360.39	9.41	28.39	–	26.74	5.72	36.97	10.11	–	0.76	0.59	8.46	41
1971	74	1.25	59.23	4.79	15.18	27.96	3360.39	10.04	28.39	–	26.64	6.58	36.97	10.10	–	0.78	0.61	8.53	42
1972	76	1.25	62.25	5.28	15.27	28.94	3272.79	12.43	29.66	–	27.07	5.85	85.44	9.90	–	0.79	0.62	8.59	43
1973	76	1.16	64.66	5.14	15.11	28.81	3272.79	18.14	35.56	–	27.67	5.28	85.44	9.81	–	0.75	0.63	7.86	46
1974	77	0.98	74.33	6.09	14.87	27.95	3230.89	24.67	36.23	–	29.41	4.51	87.54	9.72	–	0.74	0.64	7.77	47
1975	85	1.31	70.43	2.86	16.13	26.37	2929.15	21.48	40.25	–	29.78	4.88	64.18	9.16	–	0.80	0.65	9.02	66
1976	89	0.88	71.56	6.25	16.07	27.37	2803.60	19.35	42.56	–	29.58	4.46	72.53	8.73	–	0.75	0.65	10.08	66
1977	89	0.99	72.81	4.33	16.08	26.98	2803.60	17.24	42.56	–	29.34	3.73	75.81	9.16	–	0.76	0.65	10.47	68
1978	89	1.24	72.90	4.85	16.45	26.69	2803.60	14.93	48.26	–	29.51	3.64	79.76	8.49	–	0.73	0.64	10.72	71
1979	89	1.43	76.97	4.90	16.36	26.90	2803.87	17.51	47.31	–	30.39	1.91	79.20	8.48	–	0.80	0.64	10.83	72
1980	91	1.12	78.92	3.10	16.36	26.21	3154.94	20.42	46.33	–	31.29	0.88	82.47	8.53	–	0.75	0.66	10.64	72
1981	93	1.16	77.16	3.05	17.06	25.88	3088.24	19.73	47.36	–	30.27	4.45	89.36	8.15	–	0.81	0.65	11.38	73
1982	93	0.98	73.14	1.56	17.19	25.67	3088.24	19.28	48.39	–	29.50	4.40	93.50	8.14	–	0.74	0.65	11.93	73
1983	94	0.83	71.52	1.60	17.22	25.74	3055.42	24.97	50.01	–	29.69	3.55	101.69	7.95	–	0.79	0.65	12.05	73
1984	95	0.81	73.11	3.35	16.92	25.39	3082.99	33.69	51.08	–	30.23	3.66	105.53	11.28	–	0.63	0.64	12.71	77
1985	96	0.89	73.25	2.66	16.74	24.82	3054.13	34.80	52.38	–	30.46	4.25	110.65	11.45	–	0.58	0.63	13.00	78
1986	96	0.74	69.10	3.44	17.28	25.36	3054.13	23.36	53.21	–	29.55	6.42	116.16	7.92	–	0.66	0.64	13.20	79
1987	97	1.33	70.64	2.99	16.77	24.73	4171.99	26.48	53.82	–	29.87	3.62	123.06	8.67	–	0.59	0.64	13.61	82
1988	97	1.23	72.95	3.84	16.23	24.92	4171.99	35.11	54.12	–	29.72	5.10	128.40	11.83	–	0.57	0.61	13.60	84
1989	97	1.51	75.16	3.42	15.80	25.09	4737.95	42.07	54.62	–	30.56	2.73	132.93	11.13	–	0.55	0.61	13.99	87
1990	103	1.45	75.95	2.34	16.16	25.17	5024.29	47.89	56.67	–	31.15	4.14	139.61	17.57	–	0.59	0.61	15.23	95
1991	105	1.51	76.07	0.96	16.18	24.55	5690.93	39.21	58.12	–	30.81	4.65	148.65	14.18	–	0.63	0.55	15.94	93
1992	106	1.96	79.22	0.95	16.19	24.41	5638.00	34.22	60.41	–	30.04	6.76	155.13	14.28	–	0.61	0.50	16.77	115
1993	109	1.91	80.94	1.47	16.74	24.15	5558.67	40.94	61.98	–	29.79	7.16	160.29	15.42	–	0.65	0.49	17.08	115
1994	109	2.13	81.60	2.49	16.43	23.97	5558.67	27.37	62.48	–	29.72	5.73	166.87	10.68	–	0.67	0.50	17.70	116
1995	110	2.37	82.39	3.66	16.10	23.73	5548.37	23.75	63.59	–	29.56	7.56	173.72	11.58	–	0.71	0.55	17.92	117
1996	110	2.54	82.25	3.96	15.78	23.06	5548.37	13.41	64.12	–	29.61	9.05	182.10	10.30	–	0.72	0.55	18.61	120
1997	109	3.05	84.41	3.99	15.91	22.98	5599.20	15.37	63.58	–	29.67	8.74	190.53	9.01	–	0.66	0.55	18.52	124
1998	108	3.61	85.63	2.62	16.12	23.11	5650.78	8.47	63.29	–	29.13	10.32	195.68	8.62	–	0.67	0.55	18.13	127
1999	104	3.57	84.66	2.43	16.02	23.36	5867.49	9.48	62.02	–	28.90	8.87	192.45	8.83	–	0.61	0.54	17.77	133
A.2 Sample mean and standard deviations, large sample (nt=2840)																			
Mean	2840	1.60	75.10	3.38	16.21	25.41	4142.09	23.98	51.48	–	29.60	5.39	121.23	10.41	–	0.69	0.60	13.47	88
Std Dev	2840	2.85	45.49	5.70	6.26	11.47	14844.4	73.06	33.32	–	10.89	12.66	167.05	29.32	–	0.46	0.49	13.70	240
B.1 Mean by year of observation, small ICT sample (nt=308)																			
1992	39	1.65	76.42	1.61	17.53	15.55	5255.80	16.62	88.82	8.20	32.61	8.37	299.87	8.40	4.55	0.90	0.72	26.78	300
1993	39	1.88	74.82	1.91	17.93	15.22	5255.80	28.83	92.85	8.20	31.89	7.80	310.15	7.51	4.71	0.92	0.69	27.18	301
1994	39	2.13	76.02	3.86	17.39	14.97	5255.80	18.42	94.21	8.59	31.41	6.22	322.13	7.22	4.74	0.95	0.72	27.60	309
1995	39	2.46	79.20	3.79	16.92	14.86	5255.80	15.34	95.95	8.63	31.41	7.87	335.95	11.45	4.76	0.95	0.72	27.85	317
1996	39	2.38	80.24	3.28	16.82	14.51	5255.80	12.73	96.35	8.62	31.37	7.81	349.93	8.28	4.93	1.00	0.69	28.41	323
1997	39	2.89	83.35	3.84	16.80	14.61	5255.80	24.53	95.74	8.60	31.13	4.50	365.05	5.68	5.19	1.00	0.67	27.94	333
1998	38	3.78	87.84	1.63	16.89	14.10	5393.37	7.88	95.76	8.85	31.02	6.97	374.52	5.01	5.94	0.97	0.68	27.55	345
1999	36	4.96	88.82	2.48	16.88	13.92	5691.71	6.80	94.64	8.69	30.98	6.17	372.96	5.25	6.26	0.92	0.64	26.96	367
B.2 Sample mean and standard deviation, small ICT sample (nt=308)																			
Mean	308	2.74	80.74	2.81	17.15	14.73	5323.73	16.51	94.28	8.55	31.48	6.97	340.90	7.38	5.12	0.95	0.69	27.54	324
Std Dev	308	2.96	55.21	3.90	5.67	7.73	14326.2	62.57	26.33	2.12	5.97	9.28	199.45	15.59	2.02	0.22	0.46	12.11	484

include the degree of industrialization, investment risk, natural resources, political instability, and a number of dummy variables associated with regional location, income groups and the degree of indebtedness. These are summarized in Table 2. The individual variable means across time together, with the sample mean and standard deviations, is given in Table 3.

3.2 Variable definitions

In defining the dependent variable, FDI, we do not distinguish between local market and non-local market seeking FDI (Asiedu 2002). There are a number of definitions of FDI,[6] and ideally we would like to specify and analyse the sensitivity of the results according to the different definitions. We refrain from using other existing definitions because of the higher frequency of missing values versus the selected definition. Following the tradition in existing literature, we define FDI as the net foreign direct investment expressed as a percentage of GDP.

Openness of the economy is defined as the trade (import plus export) share of GDP. The expected effects may differ by the type of investment regarding local market or export orientation, the host country's foreign exchange control laws and applied capital taxation. Investment in capital-scarce poor countries is expected to yield higher return indicating an inverse relationship between GDP and FDI. Here we use GDP growth measured by the annual growth rate. We expect a positive association between GDP growth and FDI. Government consumption is expressed as a percentage of GDP. A high consumption rate may indicate a high taxation of the corporate sector, with expected negative effects on FDI. A high share of government consumption can also indicate stability in consumption patterns. Part of government consumption is invested infrastructure, which promotes FDI. In the latter case we expect a positive impact of the government consumption on FDI.

Unlike in other studies where the inverse of the real GDP per capita is used to measure the return on capital, we define return as the real annual interest rate. If the rate of inflation is low and estimated correctly, the latter is preferred to the former. FDI is expected to be positively correlated with the real interest rate. Another factor affecting yield is the rate of inflation. Here inflation is measured both as level of inflation as well as the variance of inflation. A high return promotes FDI, while a high rate or variability of inflation indicates macroeconomic instability that induces uncertainty and counteracts inflows of FDI. Net return is a crucial factor in investment decisions not least in the case of FDI. Here the net return or the interest rate gap is defined as the interest rate spread (lending minus deposit rates). For a given level of risk, the larger the gap the higher the rate of inflow of FDI. The inflation adjusted return, the level and variability of inflation, together with interest rate gap, capture very well the financial stability in the host country.

Wages include both wages and salaries measured as a percentage of total national expenditure. A high wage share reduces the inflow of FDI. In the context of a developing economy, the causal effects of FDI in the skilled labour-intensive sector on

6 There are four other definitions of FDI found in the WDI data including: (i) net FDI, BoP in current US$, (ii) net FDI inflows as % of gross capital formation, (iii) net FDI inflows BoP in current US$, and (iv) gross FDI as % of GDP in PPP.

relative wages is to lower these (Das 2002). The human capital variable is given as a per cent of the gross secondary school enrolment.[7] The higher the level of education, the higher the potential for an investment decision and achievement of expected outcome. However, skill-biased technological change indicates that a part of the production from industrialized countries is increasingly moved or outsourced to less developed countries. In the later case, the expected positive association between FDI and human capital is reversed.

The manufacturing share of GDP is a proxy for the host country's degree of industrialization and production potential. Infrastructure is defined as the number of phones per 1000 people. Various measures of phone intensity are used in applied works to proxy infrastructure. We have been unable to construct, as an alternative, a weighted composite infrastructure index incorporating various factors like transportation, communication, information, education and health investment factors in a single index. The appropriate method to construct such an index is a principal component analysis. Size of the market is a key variable in attracting FDI, and we measure this as the total GDP produced (population x GDP per capita in 1995 prices). We expect a positive relationship, i.e. the larger the size of a country the higher the inflow of FDI. The ICT variable is defined as the sum of total spending on information technology plus communications equipment and services as a percentage of gross domestic products. However, the ICT variable is available only in the smaller sample and together with the year of schooling distinguishes the two datasets by their size used in the empirical analysis of FDI.

It should be noted that the choice of shares instead of value terms for the dependent and most of the explanatory variables makes the use of price indexes in our case redundant. In such case the international data are easily comparable. Finding appropriate price indexes to convert data to fixed international prices is difficult.

The sample countries are observed consecutively but the first period of observation (prior to 1994) differs from one country to the next. A global trend is defined to capture the unobservable time specific effects and technological change. In order to capture the same year effect, the trend starts with 1970 for all countries regardless of each country's first year of observation.[8]

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7 Ideally one would decompose the human capital into educational and health capital components. Health care expenditure or some rate of mortality or life expectancy is used to proxy health capital. Year of schooling is often used to proxy educational capital. To correct for input factor differences, it is desirable to use a quality-adjusted measure of human capital, if available. Due to the high presence of missing values we have not been able to test any of these variables in the larger sample as determinants of FDI.

8 The variable global trend is defined as TREND=(YEAR–1970+1), where YEAR indicates the year of observation and 1970 is the first year that any country has been observed. Alternatively one can create country-specific trends where the trend is given the value of one for the first years regardless of when the period starts or to use time dummies, one for each year. In comparison with a trend, the latter has the advantage that it captures the shifts between positive and negative growth rates over time. A time trend is restrictive. It only enables the capture of increasing, decreasing or constant and smooth patterns of technological change. The specification can be more flexible by allowing for square and interaction of trend with other explanatory variables.

3.3 New determinants of FDI

A number of dummy variables are introduced to capture the effects of natural resources in attracting FDI. We include dummy variables to indicate whether or not a country is a fuel exporter; to indicate mineral depletion, and to indicate whether the country is an exporter of ores and metals. We expect positive effects from the presence of natural resources on the inflow of FDI.

In order to capture country heterogeneity, the countries are divided into groups according to (i) regional location (East Asia and Pacific, Europe, Europe and Central Asia, Latin America, Middle East and North Africa, South East Asia and Sub-Saharan Africa); (ii) level of income (high income OECD, high income non-OECD, upper medium income, lower medium income and low income groups), and (iii) degree of indebtedness (debt not classified, less indebted, moderately indebted and severely indebted). In addition, countries are classified according to whether or not they belong to the heavily indebted poor countries (HIPC). The HIPC countries are the severely or moderately indebted low income countries from East Asia and Pacific, Middle East and North Africa and Sub-Saharan Africa. All of the characteristics variables listed above are time invariant.

To quantify the impacts of stability on FDI inflow, we use three indicators: competition, participation and democratization. These indices are taken from the Vanhanen database. A detailed description of the concept of democracy together with the construction and definitions of indicators is given by Vanhanen (2001).[9] Competition indicates the degree of competition and is based on the smaller parties' share of votes in parliamentary or presidential elections. This is calculated by subtracting the percentage of votes won by the largest party from 100, or alternatively on the basis of the distribution of seats in parliament. The participation variable measures the degree of participation in elections, and is calculated using the percentage of the total population who actually voted in the same election. The index of democratization is a weighted average of the two indicators. Due to a lack of information on the degree of importance of the two dimensions of democracy, equal weights are given to competition and participation in construction of the index of democratization. For given risk and return, a higher index of democracy positively affects the inflow of FDI.

4 The empirical model

Following the literature in empirical modelling of FDI, some measure of FDI is regressed on a number of variables identified as determinants of FDI expressed as:

$$(1)\quad FDI_{it} = \alpha_0 + \sum_j \alpha_j X_{jit} + \sum_k \gamma_k Z_{kit} + \sum_g \delta_g M_{gi} + u_{it}$$

where FDI is the FDI share of GDP of country i ($i = 1,2,\ldots..,N$) in period t ($t = 1,2,\ldots..,T$), α, γ and δ are vectors of unknown parameters to be estimated, X is vector of exogenous time and country variant determinants of FDI, Z is a vector country characteristic variables varying in both country and time dimensions, M is a vector of variables that vary by country but constant over time, and u is the error term. The error

[9] The database and descriptions can be downloaded from http://www.svt.ntnu.no/iss/data/vanhanen/

term follows a two-way error component structure (see Baltagi 2001) and can be broken down into an unobservable country-specific (μ_i), a time-specific (λ_t) and a random error term (ν_{it}) components as:

(2) $u_{it} = \mu_i + \lambda_t + \nu_{it}$.

In matrix form the model in equation (1) can be rewritten as:

(3) $FDI_{it} = \beta_i + \sum_j \beta_j x_{jit} + \sum_t \lambda_t D_t + \nu_{it}$

where β_i is a vector of overall intercept and N-1 country specific effects represented by country dummy variables, D_t is a vector of T-1 time dummy variables, x_j ($j = X, Z$ and M) is a vector explanatory variables and β_j ($j = \alpha, \gamma$ and δ) is vector of associated unknown parameters. A number of the *x*-variables that are not measured as shares of GDP enter the relation in logarithmic form.

The error term, ν_{it}, represents the effects that are beyond the control of the country, such as shocks-related demand, wages, labour market conflicts, business cycle, international business situation as well as measurement error in the dependent variable and omitted explanatory variables. The error term is assumed to be independently and identically distributed with zero means and constant variance, σ_v^2. The country and time-specific effects, μ_i and λ_t, are factors representing unobserved country heterogeneity and exogenous technological change respectively and are assumed to be independent of each other and of the x_{it} and ν_{it}.

5 Estimation procedure

5.1 Causality between key variables

The FDI, GDP growth, openness and ICT variables in some studies appear as endogenous variables, while in others these are exogenous. The causal relationship between these variables is rarely investigated. Here we examine their causal relationship by regressing each of the four variables on their own and remaining variables lag values and testing for their significance. A statistically non-zero values of lag of independent variables are indications of causality relationships between the two. According to Granger's concept of causality, a variable GDP causes a variable FDI if inclusion of past GDP values leads to improved predictions for FDI, all other things being equal. The most common approach for answering the question of relationship between GDP and FDI is to regress FDI on GDP and to test the GDP coefficient for significance. In the current case, it is important to establish and test for the direction of causality.

Causality is tested first by looking at the relationship between pairs of variables, and by looking at all of the four variables simultaneously (see Appendix 1). The joint test results based on different lag structure (results with 3 lags are presented in Table 4)

Table 4
Granger causality test

	FDI dataset			ICT dataset			
Dependent variable	FDI	GDPgrowth	Openness	ICT	FDI	GDPgrowth	Openness
Intercept	-0.0317	1.4836 a	2.0721 a	0.1565	-0.3370	1.2574 c	0.7862
11fdi	0.5646 a	0.2202 a	0.0403	-0.0127	0.9419 a	0.1694	-0.4556
12fdi	-0.0746 a	0.0243	0.2870 a	0.0009	0.1042	-0.0914	0.7447 c
13fdi	0.1550 a	-0.0645 b	-0.2572 a	0.0665 b	-0.1368	0.0323	-0.3098
11gdpg	0.0113	0.2648 a	0.0105	0.0133	0.0443	0.4528 a	0.4430 a
12gdpg	-0.0163	0.0533 a	0.0276	-0.0287 b	-0.0532	-0.0694	-0.0942
13gdpg	-0.0074	0.0682 a	-0.0018	0.0282 a	0.0035	0.0420	-0.1719
11open	0.0103 c	0.0420 a	0.8249 a	-0.0038	0.0427 c	0.0777 b	1.0408 a
12open	0.0096	-0.0140	0.0573 a	-0.0011	-0.0434	-0.0163	-0.1113
13open	-0.0087 c	-0.0254	0.0987 a	0.0036	0.0021	-0.0583	0.0856
11ict	–	–	– a	1.2650 a	0.3397	0.0718	0.3969
12ict	–	–	– a	-0.2007	-0.1688	-1.5712 c	-0.0206
13ict	–	–	– a	-0.0454	-0.0176	1.4717 b	-0.4869
F-test0	252.1000 a	69.9100 a	7198.6100 a	360.3500 a	25.5400 a	6.7400 a	1330.4200
F-test1 FDI	–	34.8100 a	12.6200 a	3.6700 a	–	0.5700	1.4800
F-test2 GDP	12.6100 a	–	0.3000	2.7700 b	0.4100	–	3.9700 a
F-test3 Open	7.2300 a	9.3600 a	–	1.3500	1.1200	2.8600 b	–
F-test4 ICT	–	–	–	–	1.7800	1.9500	0.2100
F-test5 All	99.5500 a	27.5300 a	6.5700 a	2.7900 a	1.0300	1.8400 c	1.9700 b
R-adjusted	0.3955	0.1522	0.9494	0.9483	0.5562	0.2267	0.9855
RMSE	3.3225	5.3281	10.1793	0.4836	2.1708	3.3328	6.4266

Notes: Zero slope coefficients (F-test0); zero coefficients of lagged FDI (F-test1); zero coefficients of lagged GDP (F-test2); zero coefficients of lagged openness (F-test3), zero coefficients of lagged ICT (F-test4); zero coefficients of lagged non-dependent variables (F-test5.

indicate the presence of causality from GDP growth and openness to FDI, but weak causal effects from ICT on FDI. FDI, in turn, also affects GDP growth and openness. The overall patterns of causality relationship show that FDI can be estimated as a single equation, as is done here.[10] It is to be noted that, although the causality is found to be unidirectional, one should account for the endogeneity of regressors using instrumental variable methods.

5.2 Estimation of the FDI model

Depending on the type of assumptions made on the correlation between effects and explanatory variables, the parameters $\beta, \mu_i, \lambda_t, \sigma_v^2$ are then to be estimated. In empirical applications the time effects, λ_t, are often replaced with a time trend or a vector of time dummies, reducing the two-way error component model to a one-way error component model. In this paper we choose a time trend representation of the time-specific effects which is more appropriate for cases with relatively long panels, as in our larger dataset where most of the sample countries are observed over a 30-year period.

In panel data literature, the estimation of the model in (3) has been developed in two directions: first, the fixed effects (FE) model, where μ_i is assumed to be fixed and correlated with the explanatory variables, and second, the random effects (RE) model, where μ_i is assumed to be random and not correlated with the explanatory variables. Efficiency, unbiasedness and consistency are properties affecting the choice of FE or RE treatment of the μ_i and λ_t effects. In this study, we use both types of model specifications. In RE instead of μ_i effects, the parameter of its distribution (the variance) σ_μ^2 is estimated.

In a FE model, the number of country-specific effects, μ_i, depends on the sample size, resulting in the large number of parameters to be estimated. On the other hand in a RE model, the number of parameters associated with μ_i is reduced to only two, the mean (zero) and variance, σ_μ^2. One of the advantages of a RE model is that time-invariant regressors can be included in the model specification. On the other hand, the advantage of the FE model is the inclusion of country- and time-specific effects in the FDI model to capture such unobservable effects as policy differences among countries and changes in policy and economic conditions over time.

The FDI models using the traditional and extended specifications are each estimated using four estimation methods, namely: a pooled ordinary least square (OLS), between, within and generalized least square (GLS) methods (see Appendix 2) and are tested against each other to select the model specification finally accepted. A number of hypotheses regarding the functional form and country-specific variance component can be performed: (i) no country-specific variance component, (ii) a homoscedastic variance component, (iii) random or fixed treatment of the country-specific error component, and (iv) the functional form imposed.

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10 Ideally one should estimate FDI, GDP growth and openness jointly in a simultaneous equation system using three stage least squares or generalized methods of moments.

6 Results

6.1 Specification tests

With a large number of parameters to estimate, one could expect multicollinearity to be a problem. A simple test of its degree can be obtained by regressing each of the determinant variables on the remaining determinant variables. The R^2 obtained can then be taken as a measure of the degree of multicollinearity. The R^2 values in the larger sample case were as follows: openness (0.21), GDP growth (0.06), government consumption (0.17), wages (0.34), level of inflation (0.22), variance of inflation (0.26), education (0.79), industrialization (0.22), return (0.10), infrastructure (0.81), risk (0.21), democracy (0.50). Another way to test for multicollinearity is to look at the correlation coefficients among explanatory variables. It varies in the interval ±0.20 with few extreme values.[11] From the regression and the correlation coefficients we can draw the conclusion that with the exception of education and infrastructure, multicollinearity is not a major problem. It has not been possible to use the other definitions of these two variables. The estimated effects of education and infrastructure might also not reflect genuine effects, as they could be influenced by other factors.

Non-linearity is introduced in the functional form by adding squares of the time trend and educational variable. No interaction terms among the other explanatory variables are introduced to avoid difficulties in the interpretation of the result. The functional form was tested against a restricted one excluding the square terms using F-test. The restricted version was rejected in the favour of more general functional form.

The FDI model is specified using identified determinants of FDI and a number of variables characterizing countries. Empirical evidence shows that these characteristics should appear in the deterministic part of the FDI model. Furthermore, due to the temporal patterns of FDI, openness, GDP growth and wages might not be sufficient statistics for the unobserved FDI behavioural differences across countries. Various F-tests performed indicate that variables other than the traditional determinants should be retained.

The pooled OLS does not account for unobservable country-specific effects and is therefore less appropriate estimator of the parameters of the FDI model. Pooled OLS is used as a starting point. The model is also estimated by introducing country and time effects to control for unobservable policy and technology effects. Various tests indicate the presence of unobserved country effects. Hence, the pooled OLS is rejected in favour of a model incorporating country-specific effects. Hausman test shows that the country-specific effects are correlated with the explanatory variables, indicating that a fixed effects approach (within) is an appropriate method of estimation. The results for the pooled OLS and within-estimation methods based on the large sample are given in Tables 5.1 and 5.2, respectively. The corresponding results for the ICT samples are given in Tables 6.1 and 6.2.

[11] In order to preserve space, we do not report the results here but these are available from the authors upon request.

Table 5.1
Pooled least square parameter estimates based on the large sample

	variance of inflation		level of inflation		variance of inflation						
variable	unrestrct.	restricted	unrestrict.	restricted	EastAsPa	EurCenAs	Europe	LatinAca	MidENAfr	SoutAsia	SubSaAfr
Intercep	0.2811	0.3285	0.2580	0.3120	7.2240 a	-0.8390	4.6058 b	-2.3876 b	2.0205	4.4139	0.6018
open	0.0287 a	0.0288 a	0.0288 a	0.0289 a	0.0143	0.0010	0.0284 a	0.0472 a	0.0020	0.0090	0.0333 a
gdpgrow	0.0329 a	0.0330 a	0.0335 a	0.0335 a	-0.0055	0.0341 b	0.0569 a	0.0710 a	0.0188	0.0279	0.0211
wages	-0.0051	-0.0052	-0.0045	-0.0069	-0.0413	0.0344	-0.0175 c	0.0143	0.0416	0.0009	-0.0084
lvinflat	0.0158	0.0157	–	–	-0.4987	-0.1978 a	-0.0709	0.1293 b	-0.5006 b	-1.1136	-0.0450
linflat	–	–	0.0456	0.0458	–	–	–	–	–	–	–
educat	-0.0188 a	-0.0186 a	-0.0195 a	-0.0195 a	0.0137	0.0279	-0.0560 b	-0.0120	-0.0491	-0.0288	0.0375 c
educat2	0.0001 b	0.0001 a	0.0001 a	0.0001 a	-0.0002	0.0001	0.0004 a	0.0000	0.0007	0.0002	-0.0005 b
indust	-0.0174 a	-0.0173 a	-0.0175 a	-0.0174 a	-0.1753 a	-0.0410 b	-0.0675 a	0.0239	-0.0270	-0.0612	0.0156
return	0.0076 b	0.0077 b	0.0089 b	0.0091 b	-0.0271	-0.0011	-0.0581 a	0.0166 b	0.0144	-0.0242	-0.0052
linfras	-0.2007 a	-0.1973 a	-0.2059 a	-0.2015 a	0.0621	0.3853	-0.1061	-0.2371	-0.3147	0.0474	-0.6610 a
risk	-0.0050 a	-0.0050 a	-0.0053 a	-0.0053 a	-0.0131	-0.0002	0.0068	-0.0034	0.2701 c	0.0691	-0.0371
trend	-0.1262 a	-0.1277 a	-0.1291 a	-0.1304 a	0.2247 b	-0.1937 c	-0.1382 a	-0.2758 a	0.1980 b	-0.0070	-0.1591 a
trend2	0.0060 a	0.0060 a	0.0061 a	0.0061 a	-0.0013	0.0097 a	0.0060 a	0.0117 a	-0.0065 a	0.0004	0.0064 a
mineral	0.4458 a	0.4512 a	0.4496 a	0.4551 a	2.3707 b	1.2884 a	0.8226 a	0.2102	-0.9067	0.4525	0.0585
ldemo	0.1224 a	0.1226 a	0.1196 a	0.1200 a	-0.5333 b	0.0838	-0.2625	0.0508 a	0.1828	0.0744	0.1125
lsize	0.0924 b	0.0995 a	0.0954 b	0.1013 a	-0.5423 b	-0.3305 a	-0.1238 c	0.4727 a	0.2061	0.8113	0.1134
HIPC	-0.5440 a	-0.5239 a	-0.5272 a	-0.5070 a	–	–	–	-0.1965	1.1191	–	-0.7021 b
EastAsPa	0.9698 a	0.9272 a	0.9446 a	0.9479 a	–	–	–	–	–	–	–
EurCenAs	0.3884	0.3723	0.3974	0.3800	–	–	–	–	–	–	–
LatinACa	1.2372 a	1.2416 a	1.2319 a	1.2329 a	–	–	–	–	–	–	–
MidENAfr	0.1241	-0.1408	-0.1093	0.1274	–	–	–	–	–	–	–
SoutAsia	-1.2838 a	-1.2673 a	-1.3133 a	-1.2991 a	–	–	–	–	–	–	–
SubSaAfr	0.5077 c	0.4998 b	0.4794 c	0.4716	–	–	–	–	–	–	–
Modindeb	-0.7527 a	-0.7475 a	-0.7489 a	-0.7447 a	–	–	–	–	–	–	–
Sevindeb	-0.5148 a	-0.5155 a	-0.4960 a	-0.4978 a	–	–	–	–	–	–	–
govcon	0.0016	–	0.0022	–	–	–	–	–	–	–	–
fuel	0.0762	–	0.0718	–	–	–	–	–	–	–	–
Elasticities:											
educat	-0.0136 a	-0.0135 a	-0.0143 a	-0.0143 a	0.0034	0.0330	-0.0355 b	-0.0110	-0.0131	-0.0185	0.0118 b
trend	-0.0276 a	-0.0279 a	-0.0280 a	-0.0301 a	0.2033	-0.0342 b	-0.0396 a	-0.0835 a	0.0909 b	-0.0004	-0.0539 a
R2adj	0.2617	0.2621	0.2620	0.2625	0.3668	0.5620	0.5342	0.3078	0.1202	0.6023	0.1804
F-test	39.7000 a	43.0200 a	39.7700 a	43.1000 a	10.1500 a	16.1400 a	49.6300 a	19.3100 a	2.8500 a	5.9500 a	12.8100 a
RMSE	2.4523	2.4516	2.4517	2.4510	2.4710	1.5962	1.7218	2.5954	2.1688	0.3975	2.6961
OBS	2840.0000	2840.0000	2840.0000	2840.0000	238.00000	178.0000	637.0000	660.0000	218.0000	50.0000	860.0000

Note: 0<a<1, 1<b<5, 5<c<10 levels of significance.

Table 5.2
Within estimation of the model based on the large sample

	variance of inflation		level of inflation		variance of inflation						
variable	unrestricted	restricted	unrestricted	restricted	EastAsPa	EurCenAs	Europe	LatinAca	MidENAfr	SoutAsia	SubSaAfr
wopen	0.0427 a	0.0426 a	0.0426 a	0.0426 a	0.0196 c	-0.0005	0.0453 a	0.0729 a	0.0137	0.0095	0.0304 a
wgdpgrow	0.0348 a	0.0352 a	0.0366 a	0.0372 a	0.0048	0.0405 b	0.0669 a	0.0660 a	0.0310	0.0288	0.0249 c
wwages	0.0185 c	0.0188 c	0.0193 c	0.0197 c	-0.0434	-0.0206	-0.0109	0.0011	0.1741 a	0.0016	0.0204
wlinflat	–	–	0.0130 c	0.0127	0.0521	-0.2806 c	0.1905	-0.0845	0.1543	-0.0207	0.0412
weducat	-0.0276 a	-0.0291 a	-0.0284 b	-0.0300 a	0.1013	0.0640	-0.0205	0.0123	-0.0889 b	-0.0190	0.0863 b
weducat2	0.0002 a	0.0002 a	0.0002 a	0.0002 a	-0.0014	-0.0001	0.0002	-0.0008 b	0.0006	0.0001	-0.0014 a
windust	-0.0244 a	-0.0229 a	-0.0236 a	-0.0219 b	-0.0398	-0.0298	0.0558	-0.1005 a	-0.1119 b	-0.0612	0.0141
wreturn	0.0116 a	0.0111 a	0.0122 a	0.0117 a	-0.0157	-0.0045	-0.0211	0.0146 b	0.0125	-0.0262	0.0132
wlinfras	-0.1985	-0.2037	-0.2077 c	-0.2147	0.3377	-1.2933 c	-0.5937 c	0.1284	-0.9287 a	0.0656	-0.2443
wrisk	-0.0053 a	-0.0053 a	-0.0054 a	-0.0054 a	-0.0048	0.0011	0.0011	-0.0047	0.1433	0.0707	-0.0358
wtrend	-0.1001 a	-0.0992 a	-0.1006 a	-0.1001 a	0.2999 a	-0.1678	-0.1622 a	-0.1002 c	0.3678 a	0.0080	-0.1953 a
wtrend2	0.0053 a	0.0054 a	0.0054 a	0.0055 a	-0.0017	0.0110 a	0.0087 a	0.0065 a	-0.0068 a	0.0004	0.0061 a
wmineral	0.4087 c	0.4184 c	0.4088 c	0.4182 c	–	–	0.4444	0.5438	-0.1104	0.4718	0.4218
wldemo	0.1284 b	0.1270 b	0.1480 a	0.1455 a	0.1148	0.2725	-0.0981	0.3676 a	-0.0659	0.0743	0.1232
wlsize	-0.2367	-0.2463	–0.2555	-0.2630	-3.5165 a	-1.1301	-0.8547	-0.5055	-0.9396	0.7656	1.0912 c
wgovcon	-0.0118	–	-0.0151	–	–	–	–	–	–	–	–
wfuel	-0.1169	–	-0.1215	–	–	–	–	–	–	–	–
Elasticties:											
educat	-0.0176 a	-0.0188 a	-0.0181 b	-0.0197 a	0.0292	0.0598	-0.0102	-0.0289 c	-0.0580 c	-0.0138	0.0142 b
trend	-0.0129 a	-0.0104 a	-0.0118 a	-0.0097 a	0.2719 b	0.0130 b	-0.0189 a	0.0066 b	0.2560 a	0.0145	-0.0950 a
R2adj	0.1604	0.1606	0.1622	0.1622	0.1311	0.5302	0.3142	0.3705	0.1384	0.4308	0.0713
F-test	35.4600 a	40.4300 a	33.3400 a	37.6600 a	3.5600 a	15.3500 a	20.4600 a	26.8900 a	3.3300 a	3.5200 a	5.4000 a
RMSE	2.2611	2.2609	2.2751	2.2750	2.2461	1.4531	1.5582	2.3437	1.9847	0.3916	2.6182
OBS	2840.0000	2840.0000	2840.0000	2840.0000	238.0000	178.0000	637.0000	660.0000	218.0000	50.0000	859.0000

Notes: 0<a<1, 1<b<5, 5<c<10 levels of significance. w on the front of a variable indicates within transformation.

Table 6.1
Pooled least square parameter estimates based on the ICT sample

	enrolment in secondary schooling				year of schooling				
	variance of inflation		level of inflation		variance of inflation		level of inflation		
variable	unrestricted	restricted	unrestricted	restricted	unrestricted	restricted	unrestricted	restricted	
Intercept	-32.4388 b	-28.1168 b	-33.1582 b	-29.9102 b	-30.5173 b	-29.4771 b	-31.7625 b	-31.2281 b	0.9701 a
open	0.0184 a	0.0193 a	0.0183 a	0.0187 a	0.0196 a	0.0172 a	0.0190 a	0.0168 a	–
gdpgrow	0.1119 a	0.1351 a	0.1266 a	0.1515 a	0.1283 a	0.1489 a	0.1328 a	0.1544 a	–
lvinflat	0.1490 b	0.1914 a	–	–	0.0662	0.0925	–	–	–
linflat	–	–	0.0222	0.1009	–	–	0.0128	0.0382	–
educat	-0.0494	-0.0598 c	-0.0564	-0.0636 b	–	–	–	–	–
educat2	0.0004 b	0.0004 a	0.0004 b	0.0004 a	–	–	–	–	–
tyr	–	–	–	–	0.3879	1.1242 b	0.5276	1.3983 a	–
tyr2	–	–	–	–	-0.0208	-0.0647 b	-0.0276	-0.0795 a	–
return	-0.0091	-0.0152	-0.0076	-0.0083	-0.0117	-0.0137	-0.0117	-0.0097	–
linfras	-0.0245	-0.1516	-0.0089	-0.0249	-0.1496	-0.2194	-0.1645	-0.2392	–
trend	-3.6418 b	-3.1302 b	-3.8496 b	-3.3946 b	-3.2355 c	-2.6585 c	-3.3468 b	-2.8005 c	–
trend2	0.0737 b	0.0642 b	0.0781 a	0.0699 b	0.0661 b	0.0552 c	0.0683 b	0.0582 b	–
ict	0.3606 a	0.3042 a	0.3032 a	0.2241 b	0.4029 a	0.3872 a	0.3737 a	0.3456 a	0.3411 a
fuel	-1.6570 b	-1.0832	-1.9854 c	-1.5424 b	-1.7709 b	-1.2283 c	-1.9059 a	-1.4310 b	–
mineral	0.5799	0.5001	0.7064 b	0.6412 b	0.5886	0.3437	0.6394 c	0.4313	–
ldemo	0.0903	-0.3843 c	0.2449 c	-0.2684	0.1764	-0.2370	0.2085	-0.2268	–
govcon	-0.1213 a	–	-0.1288 b	–	-0.0964 a	–	-0.0993 a	–	–
wages	0.0086 b	–	0.0003	–	-0.0133	–	-0.0146 a	–	–
indust	-0.0088	–	-0.0767 c	–	-0.0375	–	-0.0336	–	–
risk	-0.0038	–	0.0011	–	-0.0010	–	0.0020	–	–
size	-0.1305	-0.1130	-0.1676	-0.1728	-0.0409	-0.1362	-0.0843	-0.1741	–
Elasticities:									
educat	-0.0124 c	-0.0229 b	-0.0194 c	-0.0267 b	–	–	–	–	–
tyr	–	–	–	–	0.2102	0.5713 b	0.2918	0.7190 a	–
trend	-3.3195 b	-2.8440 b	-3.5014 b	-3.0830 b	-2.9408 c	-2.4124 c	-3.0423 b	-2.5411 b	–
R2adj	0.3737	0.3695	0.3650	0.3526	0.3440	0.3414	0.3421	0.3375	0.0556
F-test	11.1800 a	15.1900 a	10.8000 a	14.1900 a	09.9400 a	13.5500 a	9.8700 a	13.3400 a	23.2900 a
RMSE	2.2340	2.3016	2.3564	2.3321	2.3951	2.3524	2.3985	2.3592	2.8760
OBS	308.0000	34.0000	308.0000	340.0000	308.0000	340.0000	308.0000	340.0000	380.0000

Note: 0<a<1, 1<b<5, 5<c<10 levels of significance.

Table 6.2
Within estimation of the model based on the ICT sample

	enrolment in secondary schooling				year of schooling				
	variance of inflation		level of inflation		variance of inflation		level of inflation		
variable	unrestricted	restricted	unrestricted	restricted	unrestricted	restricted	unrestricted	restricted	
wopen	0.0158	0.0121	0.0159	0.0128	0.0087	0.0069	0.0088	0.0075	–
wgdpgrow	0.1106 a	0.1157 a	0.1039 b	0.1102 a	0.1061 a	0.1205 a	0.1029 b	0.1158 a	–
wvinflat	–	–	–	–	–	–	–	–	–
wlinflat	–	–	-0.0839	-0.1013	–	–	-0.0538	-0.0846	–
weducat	-0.0572	-0.1382 a	-0.0711	-0.1384 b	–	–	–	–	–
weducat2	0.0003	0.0007 a	0.0003	0.0007 b	–	–	–	–	–
wtyr	–	–	–	–	-4.0448 a	-3.7979 a	-4.0328 a	-3.7812 a	–
wtyr2	–	–	–	–	0.3265 a	0.3090 a	0.3252 a	0.3077 a	–
wreturn	-0.0410 b	-0.0335 b	-0.0429 b	-0.0353 b	-0.0492 a	-0.0405 a	-0.0501 a	-0.0419 a	–
wlinfras	0.2182	0.9827	0.3049	1.0408	0.2774	0.5066	0.3176	0.5505	–
wtrend	0.0186	0.0190	0.0179	0.0190	0.0008	-0.0005	0.0006	-0.0004	–
wtrend2	0.0049 a	0.0039 a	0.0046 a	0.0036 a	0.0027 b	0.0025 b	0.0026 b	0.0023 b	–
wict	0.1626	0.1268	0.1458	0.1006	-0.1043	-0.0820	-0.1105	-0.0998	0.8102 a
wfuel	-3.5706 a	-1.1973 c	-3.5393 a	-1.1998 c	-4.2313 a	-1.6401 b	-4.2135 a	-1.6381 b	–
wmineral	1.2219 c	0.7618	1.2082 c	0.7518	0.9239	0.4485	0.9201	0.4447	–
wldemo	0.1333	0.3328	0.1572	0.3442	0.2544	0.4441 c	0.2655	0.4544 c	–
wgovcon	-0.1201 b	–	-0.1288 b	–	-0.1035 c	–	-0.1081 c	–	–
wwages	0.0025	–	0.0004	–	-0.0117	–	-0.0129	–	–
windust	-0.0810 c	–	-0.0767 c	–	-0.1030 a	–	-0.1011 a	–	–
wrisk	0.0035	–	0.0049	–	0.0020	–	0.0027	–	–
wsize	-1.2814	-0.4464	-1.3706	-0.4717	-1.0449	-0.7001	-1.0899	-0.7202	–
Elasticities:									
educat	-0.0295	-0.0736 a	-0.0434	-0.0738 b	–	–	–	–	–
tyr	–	–	–	–	-1.2565 a	-1.1482 a	-1.2539 a	-1.1657 a	–
trend	0.0408 b	0.0363 b	0.0384 b	0.0351 b	0.0128 c	0.0106 c	0.0122 c	0.0098 c	–
R2adj	0.3425	0.3168	0.3412	0.3157	0.3994	0.3565	0.3975	0.3553	0.0549
F-test	10.4400 a	13.1300 a	9.8600 a	12.2000 a	13.0500 a	15.4900 a	12.2900 a	14.3800 a	23.0800 a
RMSE	2.2637	2.2672	2.2659	2.2485	2.1635	2.1804	2.1668	2.1825	2.6350
OBS	308.0000	340.0000	308.0000	340.0000	308.0000	340.0000	308.0000	340.0000	380.0000

Notes: 0<a<1, 1<b<5, 5<c<10 levels of significance. w on the front of a variable indicates within transformation.

6.2 Estimation results

The analysis of the results is based mainly on the within-estimation method. However, several variables (openness and ICT) seem to be statistically significant in a pooled regression, but not in the fixed effect case. Invariability or low variability in the ICT variable over time causes the effects to be eliminated following the within-transformation. We suspect that the ICT effect is confounded with the country-specific effects. In the analysis of the ICT model, we focus on both pooled and within-estimation results.

6.2.1 The large non-ICT sample model

Our results (Table 5.2) can be summarized as follows. Openness to trade (OPEN) is measured by imports and exports as a share of GDP (the standard measure of openness). In line with previous research, we find a positive impact on inward FDI, a fact that suggests that economies in which trade is important also have relatively higher FDI (for instance they pursue policies that are more attractive to foreign investors). But the effect is relatively small and varies by region. Among the regions where it is a significant variable, it is the strongest in Latin America, and the weakest in SSA.

GDP growth (GDPGROW). This is positive and significant in its effect on FDI. It is the strongest in Europe and Latin America, and has the weakest effect in SSA. This is consistent with the fact that horizontal FDI (i.e., FDI seeking a base to produce for the domestic market in the host country) is attracted to countries in which real income, and therefore domestic purchasing power, is growing. Latin America has sought to take advantage of the large domestic markets offered by countries such as Brazil. In contrast, with the exception of South Africa and Nigeria, the domestic markets of SSA countries are very small. FDI to SSA is mostly driven by investment in natural resource sectors: growth rate of the economy is, therefore, largely irrelevant to the investment decision, for example, in the west African oil sector

Wages and salaries as a per cent of total national expenditures (WAGES) have a positive effect on FDI inflow, but this is weakly significant. It is strongest in the Middle-East and North Africa. A higher share of wages and salaries can indicate a larger market (and therefore more scope for horizontal FDI). The wage share is also a proxy for (unobservable) human capital: countries with better stocks of human capital tend to have higher wage shares in national income. Finally, this result may reflect the low capital intensity of production in many developing countries.

Inflation (INFLAT). We use both the variance and the rate of inflation. In the pooled models, they are either insignificant or weakly significant. Countries that have erratic macroeconomic policies (large and unexpected shifts in economic policy) typically have high inflation, but also a high variance in the inflation rate. The variance of inflation is weakly significant for a pooled model, but on the part of separate regions, it is negative for Europe and Central Asia, Western Europe, and Middle-East and North Africa. It is positive for Latin America, perhaps reflecting the fact that Latin American economies can perform reasonably well under high inflation because of the region's experience in indexing contracts.

Education (EDUCAT) is measured by the percentage of children enrolled in secondary school. This has a negative effect on FDI. However, it is significant and positive in

SSA. As mentioned before, this somewhat surprising result may be due to multi-colinearity with the infrastructure variable and the democracy index variable.

Industrialization (INDUST) is measured by the value-added of manufacturing industry as a percentage of GDP. This is negative and significant. This may be due to the natural resource sectors' major role in attracting FDI to most developing countries. A high level of industrialization might also reflect higher relative wages and serve as a deterrent factor to inflow of FDI.

Return (RETURN) is the real interest rate (percentage), which is a standard proxy for the real return on capital. The effect is particularly strong for Latin America. It should be noted that the return variable reflects return to domestic savings. However, it is a good proxy for the expected risk free return to foreign investment as well as the cost to domestic capital in case of a joint domestic and foreign capital investment.

Risk (RISK) is the interest rate spread, or the lending rate minus the deposit rate. This is negative and significant as expected. There are no significant differences across regions in this variable. The return, inflation and risk factors might covariate in their impacts on inflow of FDI.[12]

Infrastructure (INFRAS). This is the number of telephones per 1000 people. This is negative, again reflecting the dominance of natural resource sectors in FDI decisions However, the variable is mostly insignificant across regions. This is not a particularly good measure of infrastructure. A composite index built on several relevant components is preferred.

The common trend in FDI (TREND) is negative and significant. The trend varies greatly by economic region. It is negative for SSA and Europe, but positive and statistically significant for East Asia Pacific, Europe and Central Asia, Latin America and Middle East and North Africa. For the observed temporal patterns of FDI and its determinants, see Table 3.[13]

Mineral resources effect (MINERAL) is positive and weakly significant as expected, reflecting the importance of natural resource sectors in FDI decisions. Inflow of foreign direct investment targeting mineral resources requires long-term engagement, heavy investments and political stability.

Indebtedness (MODINDEB and SEVINDEB) has negative impacts on foreign direct investment. This is to be expected for the reasons set out in section 2: potential foreign investors steer clear of countries with high debt, fearing both macroeconomic instability as well as potential devaluation (which cuts the dollar value of any remitted profit). These variables are time invariant and consequently excluded from the within-estimation, but retained in the pooled model (Table 5.1).

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12 The risk variable should ideally consist of a composite index incorporating variables reflecting threats like terrorism and Severe Acute Respiratory Syndrome (SARS) that affect global and national economies. In particular such risk factor is important to countries (Kenya, Morocco, Greece, Indonesia, Spain) specializing in tourism, for instance, and to China, a main receiver of FDI. However, our fixed effects approach account for such effects but in an unobservable form.

13 Introduction of regional-specific trends at the cost of an over-parametrization of the model might improve the performance of the model.

Democracy (DEMO) has a positive effect on FDI, especially for Latin America. This is one of our most important results, and confirms the hypothesis (section 2) that foreign investors increasingly take note of whether or not a society is a democracy, in part because of the trend towards corporate social responsibility, and also because of indications that well-functioning democracies pursue better economic policies.

The pair-wise correlation coefficient between net FDI inflow and size of the country is positive. A large size promotes ICT investment but reduces openness and GDP growth. This positive relationship is confirmed by the results in Table 5.1 regardless of whether the FDI model is specified with level or variance of inflation. However, the size effects reflect mainly the between-country variations. Variations over time in the total GDP produced at the country level are very small and insignificant.

Two other variables—government consumption (GOVCON) and whether or not a country is fuel producing (FUEL)—are both insignificant. A high level of government consumption reflects high taxation of capital but, at the same time, the presence of better infrastructure and investment in human capital.

6.2.2 The small ICT sample model

In the pooled least squares model with ICT (see Table 6.1), ICT has positive effects on the flow of FDI, but it is a country-specific variable. For example, certain countries have much better conditions for the introduction of ICT in line with the model, so its effect is difficult to isolate from other factors that are unobservable or omitted. The education variable, defined as secondary school enrolment, is again negative. However, a representation of education as the year of schooling in the pooled ICT model is positive. The ICT variable is correlated with government consumption, education and infrastructure. The insignificance of the ICT variables in the within-models is thus due to low variations in ICT investment over time and the fact that its effects are wiped out following the within-transformation of data. In the within-case (Table 6.2), several alternative specifications indicate positive impacts of democracy on FDI inflows.

In general, East Asia-Pacific, followed by Latin America, attracts FDI, while the effect is declining in South Asia (for the period). The small ICT sample, compared to the large sample, produces somewhat unstable parameter estimates. Data on a larger number of countries observed for a longer period would certainly improve the stability of the results.

7 Conclusions

This paper has explored the determinants of FDI. Estimation of the FDI models is based on pooled ordinary least squares and within-estimation methods. The panel property of the data is further exploited by estimating the specified model by pooling data or non-pooled heterogeneous panel for individual years of observation and groups of countries, assuming fixed and random effects models.

The preliminary estimation results support many of the findings of previous research in this area. In particular, (i) there is a positive relationship between the flow of FDI and economic growth; (ii) openness to trade has a positive impact on FDI flows; and (iii) the level of risk affects FDI negatively. Being highly indebted is a significant deterrent to

FDI. In addition the results indicate the presence of regional and income group heterogeneity in FDI flows, which is to be expected since the motives for FDI vary considerably across regions.

Regarding our main hypothesis that recent global developments—particularly the third wave of democratization and the spread of ICT—are likely to affect FDI, we find that both democracy and ICT have significant positive effects (although the sample which includes ICT variables is quite small, and further research to collect more data to expand the sample is needed).

At present there is significant donor support to democratization in developing countries through the operations of bilateral and multilateral governance programmes (such as those of DFID and UNDP). These can be expected to have positive returns to FDI, and therefore our results suggest that democratization assistance has positive externalities for economic performance aside from its more direct social benefits. Our results indicate that the international community needs to step up its assistance to the creation of ICT infrastructure in the poorer countries. The latter have insufficient public resources to fund ICT and, in the case of many, are unable to attract much private funding for ICT (either domestic or foreign). This is because they are viewed as largely unattractive investment possibilities, a viscous circle that leaves them in a 'low-level ICT equilibrium trap'. If such assistance is provided, it will help them attract FDI which, in turn, will lead to further cumulative ICT investment.

References

Addison, T. (2003). 'Economic Perspectives on Democracy', in P. Burnell (ed.) *Democratization through the Looking Glass*. Manchester: Manchester University Press.

Amsden, A. (1992). *Asia's Next Giant: South Korea and Late Industrialization*. Oxford and New York: Oxford University Press.

Asiedu, E. (2002). 'On the Determinants of Foreign Direct Investment to Developing Countries: Is Africa Different?' *World Development*, 30 (1): 107-19.

Baltagi B. H. (2001). *Econometric Analysis of Panel Data*. New York: John Wiley & Sons, Ltd.

Bjorvatn K., H. Jarle Kind, and H. K. Nordås (2001). 'The Role of FDI in Economic Development'. Discussion Paper 2001:31. Bergen: Norwegian School of Economics and Business Administration', Department of Economics.

Buffie, E. F. (2001). *Trade Policy in Developing Countries*. Cambridge: Cambridge University Press.

Cardoso, F. H., and E. Faletto (1979). *Dependency and Development in Latin America*. Berkeley: University of California Press.

Das, S. P. (2002). 'Foreign Direct Investment and The Relative Wage in a Developing Economy, *Journal of Development Economics*, 67: 55-77.

De Mello, Jr., L. R. (1997). 'Foreign Direct Investment in Developing Countries and Growth: a Selective Survey'. *Journal of Development Studies*, 34 (1): 1-34.

Dornbusch, R., S. Fischer, and P. A. Samuelson (1977). 'Comparative Advantage, Trade, and Payments in a Ricardian Model with a Continuum of Goods'. *American Economic Review*, 67: 823-39.

Dornbusch, R., and Y-C. Park (1987). 'Korean Growth Policy'. *Brookings Papers on Economic Activity*, 2: 389-444.

Gastanaga V. M., J. B. Nugent, and B. Pashamova (1998). 'Host Country Reforms and FDI Inflows: How Much Difference Do They Make?' *World Development*, 26 (7): 1299-314.

Huntingdon, S. P. (1991). *The Third Wave: Democratization in the Late Twentieth Century*. Norman: University of Oklahoma Press.

Keller, W. (1996) 'Absorptive Capacity: On the Creation and Acquisition of Technology in Development'. *Journal of Development Economics*, 49: 199-227.

Kuczynski, P-P., and J. Williamson (2003). *After the Washington Consensus: Restarting Growth and Reform in Latin America*. Washington DC: Institute for International Economics.

Noorbakhsh, F., A. Poloni, and A. Youssef (2001). 'Human Capital and FDI Inflows to Developing Countries: New Empirical Evidence'. *World Development*, 29 (9): 1593-610.

Obstfeld, M., and A. M. Taylor (2002). 'Globalization and Capital Markets', in M. D. Bordo, A. M. Taylor and J. G. Williamson (eds), *Globalization in Historical Perspective*. Chicago: University of Chicago Press.

Saggi, K. (2002). 'Trade, Foreign Direct Investment, and International Technology Transfer: A Survey'. *World Bank Research Observer*, 17 (2): 191-235.

Shatz, H. J., and A. J. Venables (2000). 'The Geography of International Investment'. World Bank Discussion Paper 2338. Washington, DC: World Bank.

UNDP (2002). *Human Development Report 2002: Deepening Democracy in a Fragmented World*. New York: Oxford University Press for the United Nations Development Programme.

UNCTAD (United Nations Conference on Trade and Development) (2001). *World Investment Report: Promoting Linkages*. New York and Geneva: United Nations.

Vanhanen T. (2001). 'Introduction: Measures of Democratization'. Manuscript, available at: http://wwww.svt.ntnu.no/iss/data/vanhanen/ .

Velasco, A. (2002). 'Dependency Theory'. *Foreign Policy*, 133: 44-45.

Williamson, J. (2002). 'Winners and Losers over Two Centuries of Globalization' WIDER Annual Lecture 6. Helsinki: UNU/WIDER.

Appendix 1: Causality between key variables

The FDI, GDP growth, openness and ICT variables have been considered both as endogenous and exogenous variables without investigating the causal relationship. Their causal relationship can be examined by regressing each of the four variables on their own and remaining variables lag values and testing for their significance as follows:

$$(4) \qquad FDI_{it} = \alpha_0^1 + \sum_{m=1}^{M} \alpha_m^1 FDI_{i,t-m} + \sum_{n=1}^{N} \alpha_n^2 GDP_{i,t-n} + \sum_{l=1}^{L} \alpha_l^3 OPEN_{i,t-l} + \sum_{k=1}^{K} \alpha_k^4 ICT_{i,t-k} + \omega_{it}^1$$

$$(5) \qquad GDP_{it} = \alpha_0^2 + \sum_{m=1}^{M} \alpha_m^1 GDP_{i,t-m} + \sum_{n=1}^{N} \alpha_n^2 FDI_{i,t-n} + \sum_{l=1}^{L} \alpha_l^3 OPEN_{i,t-l} + \sum_{k=1}^{K} \alpha_k^4 ICT_{i,t-k} + \omega_{it}^2$$

$$(6) \qquad OPEN_{it} = \alpha_0^3 + \sum_{m=1}^{M} \alpha_m^1 OPEN_{i,t-m} + \sum_{n=1}^{N} \alpha_n^2 FDI_{i,t-n} + \sum_{l=1}^{L} \alpha_l^3 GDP_{i,t-l} + \sum_{k=1}^{K} \alpha_k^4 ICT_{i,t-k} + \omega_{it}^3$$

$$(7) \qquad ICT_{it} = \alpha_0^4 + \sum_{m=1}^{M} \alpha_m^1 ICT_{i,t-m} + \sum_{n=1}^{N} \alpha_n^2 FDI_{i,t-n} + \sum_{l=1}^{L} \alpha_l^3 GDP_{i,t-l} + \sum_{k=1}^{K} \alpha_k^4 OPEN_{i,t-k} + \omega_{it}^4$$

where non-zero values of α_n^2, α_l^3 and α_k^4 are indications of causality relationships between the two variables. In Granger's concept of causality, a variable *X* causes a variable *Y* if taking account of past values of *X* leads to improved predictions for *Y*, all other things being equal. Using the relation above for testing causality between the four variables, the values of the maximum lag length, *M*, *N*, *L* and *K* were set to 3. The choice of maximum lag structure was based on significance of lag values. In cases with unidirectional causality, the equations can be estimated separately while in two or more directional causality, they must be estimated as system by accounting for the endogeneity of regressors using instrumental variable methods.

Appendix 2: Generalized least squares (GLS) estimation method

The model in (3) can be estimated ignoring the panel nature of the data using the pooled least squares or between-estimation method neglecting the within-variations as:

(8) $\quad \overline{FDI}_i = \beta_0 + \sum_j \beta_j \overline{x}_{ji} + \overline{u}_i$

or using the within-estimation method by eliminating the between variations as:

(9) $\quad FDI_{it}^{w} = x_{it}^{w\prime} \beta + u_{it}^{w}$

where

(10) $\quad FDI_{it}^{w} = (FDI_{it} - \overline{FDI}_i), \quad x_{it}^{w} = (x_{it} - \overline{x}_i) \quad \text{and} \quad u_{it}^{w} = (u_{it} - \overline{u}_i)$.

Treating μ_i and ν_{it} as random, the following distributional assumptions on the error components are imposed: (i) $\mu_i \sim i.i.d.N(o, \sigma_\mu^2)$, (ii) $\nu_{it} \sim i.i.d.N(o, \sigma_\nu^2)$, (iii) μ_i and ν_{it} are independent of each other and of the explanatory variables. The GLS estimates of β are equivalent to the least square estimates with the following transformed variables

(7) $\quad FDI_{it}^{G} = (FDI_{it} - \theta \overline{FDI}_i), \; x_{it}^{G} = (x_{it} - \theta_i \overline{x}_i)$ and $\theta_i = \left[1 - \sqrt{(\sigma_\nu^2 / (T_i \sigma_\mu^2 + \sigma_\nu^2))}\right]$.

The model in (3) is rewritten as:

(8) $\quad FDI_{it}^{G} = \beta_0^{G} + \sum_j \beta_j x_{it}^{G\prime} + u_{it}^{G}$.

The set of explanatory variables contains a trend to proxy the time-effects. The error term is reduced to a one way case consisting of country and random components.

The variance components, σ_μ^2 and σ_ν^2, are unknown and have to be estimated. A multi-step GLS estimation procedure is used. First, consistent estimates of the variance components are obtained. Second, the estimated variance components are used to transform the data and least square regression is applied to the transformed data. The overall estimation procedure has the following steps:

Step one: We regress the within-mean transformed FDI_{it}^{w} on the within-transformed x_{it}^{w} to get the within-parameter estimates and the mean squared error, which are unbiased and consistent estimates of the variance, σ_ν^2.

Step two: We ignore the country-specific effects and regress the FDI_{it} on the x_{it} variables without any transformation to obtain the pooled OLS residuals, u_{it}, and estimate $\text{var}(u_{it}) = \sigma_u^2 = T_i \sigma_\mu^2 + \sigma_\nu^2$, where T_i is the number of periods a country is observed, which is different for different countries in our unbalanced samples.

Step three: The country-specific variance, σ_μ^2, can be obtained as $\sigma_\mu^2 = (\sigma_u^2 - \sigma_\nu^2)/T_i$ by using the first two steps, and then calculate the transformation parameter, θ. The

transformation parameter, θ_i, vary by T_i and not by σ_μ^2 or σ_v^2. Both variances are assumed to be homoscedastic.

Step four: Given estimated θ_i, transform the *FDI* and *x* variables as in (8) and then regress FDI_{it}^G on $(1-\theta_i)$ and x_{it}^G by using OLS to get GLS estimates of the parameters of the model. If $\theta_i = 0$, the estimator collapses to the OLS estimator and if $\theta_i = 1$, it collapses to the within-estimator. In GLS, θ_i is within the interval 0 and 1.

Finally, using the estimated residuals, parameter estimates and covariance matrices, one can perform various tests for the presence of unobservable country and time-specific effects and to select appropriate estimation method among the pooled OLS, within, between and feasible GLS methods (see Baltagi 2001).

The FDI equation is non-linear in a number of explanatory variables and the trend. The partial derivatives of FDI or elasticity with respect to a percentage change in respective variable and technology at the sample mean are calculated as:

(9) $\overline{E}_j = \beta_j + \beta_{jj} \ln \overline{x}_j$ and $\overline{E}_t = \beta_t + \beta_{tt} \ln TR\overline{E}ND_t$

where β_{jj} and β_{tt} is the coefficient of the squared x-variables and the trend, respectively.