

# Determinants of foreign direct investment in services

Ivar Kolstad  
Espen Villanger

**WP 2004: 2**

# Determinants of foreign direct investment in services

Ivar Kolstad  
Espen Villanger

WP 2004: 2

## **CMI Reports**

This series can be ordered from:

Chr. Michelsen Institute  
P.O. Box 6033 Postterminalen,  
N-5892 Bergen, Norway  
Tel: + 47 55 57 40 00  
Fax: + 47 55 57 41 66  
E-mail: [cmi@cmi.no](mailto:cmi@cmi.no)  
[www.cmi.no](http://www.cmi.no)

Price: NOK 50

ISSN 0805-505X

ISBN 82-8062-075-3

This report is also available at:  
[www.cmi.no/public/public.htm](http://www.cmi.no/public/public.htm)

### **Indexing terms**

Foreign direct investment  
Services

JEL classification: F23, L80

### **Project title**

Social Development Study (World Bank)

### **Project number**

22080

## Contents

1.	Introduction	1
2.	Past studies of service sector FDI	3
3.	Data and variables included	6
4.	Results	10
4.1	Determinants of FDI flows in the tertiary industries	10
4.2	Determinants of FDI in the financial industry	12
4.3	Determinants of FDI in the business industry	14
4.4	Determinants of FDI in the transport industry	16
4.5	Determinants of FDI in the trade industry	17
5.	Concluding remarks	19
	References	20
	Appendix 1	24

## Figures

1	A breakdown of total FDI according to the major industry groups 1986-2001	2
2	Shares of service sector FDI attributed to the four major service industries 1986-2001	3

## Tables

1	Econometric results for financial services	4
2	Variables and sources of data	6
3	Regression results of fixed estimation for the tertiary sector	11
4	Regression results of fixed effects estimation for the finance industry	13
5	Regression results of fixed effects estimation for the business industry	15
6	Regression results of fixed effects estimation for the transport industry	17
7	Regression results of fixed effects estimation for the trade industry	18

## **1. Introduction\***

A key feature of the evolution of foreign direct investment (FDI) flows in recent years, has been the expansion of FDI in the service industries. According to UNCTAD (2003), the service industries accounted for a massive 63% of world FDI flows in 2001. FDI stocks reflect the recent dominance of service sector flows, 55% of world FDI stocks in 1999 were in the service industries (UNCTAD, 2001). Given the large and growing importance of service sector FDI, establishing the determinants of FDI flows in this sector can improve our understanding and predictions of the future pattern of total FDI flows. Even more importantly, information of this kind can help guide host country policies to attract FDI. In this study, we use industry level data to estimate the determinants of FDI in the service sector as a whole, and in the major service industries.

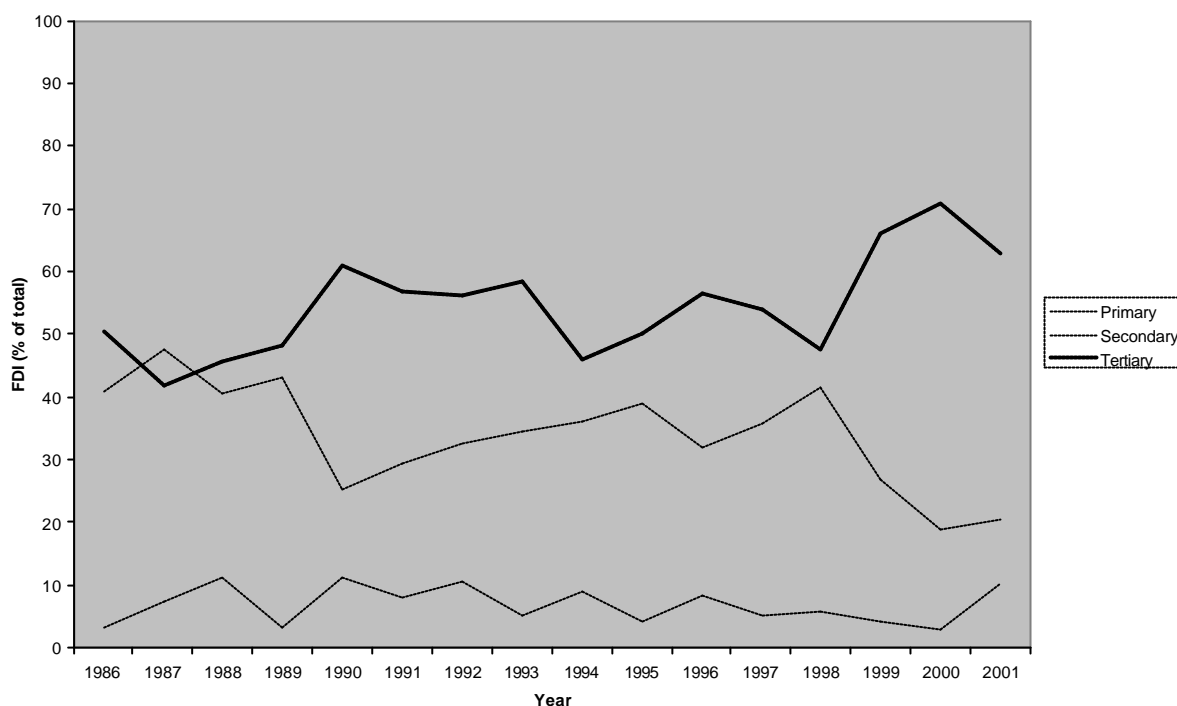
As an illustration of recent trends, figure 1 provides a decomposition of total FDI flows, into shares attributable to the primary, secondary and tertiary industries over the period 1986-2001. While the secondary and tertiary industries accounted for comparable shares of total FDI in the late 1980s, the figure reveals that the service industries have increased their share markedly since then. The spike in tertiary FDI in 1999-2000 is perhaps a bit exaggerated, reflecting extensive mergers and acquisitions activity in this sector, but nevertheless the trend is clear. Service sector FDI has grown more important in total FDI flows, manufacturing FDI less so. The primary sector only contributed 3-11 per cent of total FDI in the period graphed.

Most empirical studies of FDI determinants have used data on FDI flows aggregated across industries (see e.g. Noorbahksh et al, 2001, for a review). There is, however, reason to believe that the determinants of service sector FDI might differ from those of FDI in aggregate. Though international trade in services is on the rise, the fact remains that many services are non-tradable or costly to trade. And for a sector whose products to a large extent cannot be subjected to cross-border trade, the trade openness of a host country can be expected to have less of an impact on FDI inflows in that sector. Moreover, tapping the demand for services in a host country requires a physical presence when services are difficult to trade, which implies that FDI in services is likely to be market-seeking. The idea that domestic market size affects service sector FDI, whereas trade openness does not, is tested empirically in this study.

---

\* The authors thank Kjetil Bjorvatn, Arne Wiig, Leo A. Grünfeld, and Hildegunn Nordås for valuable input.

**Figure 1. A breakdown of total FDI according to the major industry groups, 1986-2001**



*Data source: UNCTAD*

There are also likely to be differences in locational determinants across individual service industries. Figure 2 maps the shares of total service sector FDI attributable to the four industries in which FDI flows are the heaviest; finance; business activities (including real estate, rentals, computer and related activities, and research and development); transport (which includes post and telecommunications); and trade. For the 1986-2001 period, these four industries have contributed 86% of total service sector FDI flows. The three largest of the service industries in terms of FDI (finance, business, and transport) are commonly referred to as producer services (Nordås, 2001). Given a global trend towards a vertical disintegration of production (Feenstra (1998) and Hummels et al (1998)), producer services are essential in binding the chain of production together. It is thus plausible that there is a positive relationship between manufacturing FDI in a country, and FDI in producers services, whereas there is less of a rationale for such a link to other service industries. Our data set includes both FDI in manufacturing and in the four largest service industries, allowing us to test this hypothesis.

**Figure 2. Shares of service sector FDI attributed to the four major service industries, 1986-2001**



*Data source: UNCTAD*

The study is structured as follows. As the review of past empirical studies in section 2 demonstrates, econometric studies of FDI flows in services are sparse, with the exception of financial services. We therefore conduct an econometric analysis of determinants in the service sector as a whole and in the four major service industries. Section 3 presents the data set used, which has observations from 57 countries for the period 1989-2000, and discusses the explanatory variables included. The results of our analysis are presented in section 4. Section 5 provides concluding remarks.

## **2. Past studies of service sector FDI**

The econometric evidence on service sector FDI flows is extremely limited. With the notable exception of financial services, there do not appear to be any recent econometric studies of service sector FDI published in the major economic journals. To be fair, there are a few non-econometric empirical studies, for instance Kind and Strandenes (2002) on the maritime sector. The relationships suggested by these studies have yet, however, to be subjected to rigorous econometric testing.

The econometric studies of FDI in financial services, differ substantially in scope and design. Table 1 summarizes the results from three recent studies. Yamori (1998) analyzes Japanese finance industry FDI flows into 39 countries, 1990-94. Miller and Parkhe (1998) study the determinants of US banks' asset in 32 countries. And Moshiran (1997) examines determinants of FDI stocks in the US insurance industry, using time series data. The three studies examine FDI flows in different sections of the financial industry and from different home countries, and use different dependent variables and estimation techniques, so their results are difficult to compare. Nevertheless, table 1 provides an indication of some broad conclusions that can be drawn from them.

**Table 1. Econometric results for financial services (significance at 5% level)**

<b>Finance</b>			
<b>Independent variable</b>	<b>Positive</b>	<b>Negative</b>	<b>Insignificant</b>
GNP/cap	Yamori (1998)		
Wealth	Moshiran (1997)		
Deposits	Miller and Parkhe (1998)		
Long run change GNP		Yamori (1998)	
Trade with home countries	Yamori (1998)	Miller and Parkhe (1998), Moshiran (1997)	
FDI aggregate	Miller and Parkhe (1998)		
FDI manufacturing	Yamori (1998), Moshiran (1997)		
Stock FDI in banking		Moshiran (1997)	
Exchange rates	Moshiran (1997)		
Exchange rate change			Yamori (1998)
Rate of return	Moshiran (1997)		Yamori (1998)
Wages			Moshiran (1997)
Country risk	Yamori (1998)		Yamori (1998)

The results of the three studies show that the implications drawn from the non-tradability of services, are to some extent supported by empirical data from the finance sector. Both Yamori (1998) and Moshiran (1997) find market size to be positively associated with finance FDI, using GNP per capita and wealth as proxies for market size.<sup>1</sup> Miller and Parkhe (1998) find a similar result for the banking sector, where host countries with a greater sum of deposits get

<sup>1</sup> In an earlier study, Goldberg and Johnson (1990) confirm the importance of market size for finance industry FDI.



more banking FDI. However, Yamori finds a negative association between market growth and FDI in finance.

The three studies conflict, however, on the impact of trade openness on FDI in financial services. Yamori (1998) finds host country trade with Japan to increase Japanese FDI in financial services. Miller and Parkhe (1998), on the other hand, suggest that host country trade with the US decreases US banking assets abroad. Moshiran (1997) arrives at a similar result; FDI in the US insurance industry decreases as the weighted average of trade with the major home countries increases. Though each of the three studies finds a significant impact of trade, the conflicting signs suggest that the relationship is not a very robust one.

Evidence of a relationship between FDI in financial services and FDI in other sectors is found in all three studies. Both Yamori (1998) and Moshiran (1997) find FDI in manufacturing to be positively associated with FDI in financial services. Similarly, Miller and Parkhe (1998) see a positive relation between total FDI and FDI in banking.<sup>2</sup> This is consistent with the idea of finance as one of the producer services, binding a vertically disintegrated chain of production together. On the other hand, Moshiran uncovers a negative relationship between FDI in banking and FDI in insurance, which might reflect a tendency of foreign banks to set up their own insurance operations, leaving less room for new entrants.

The impact of several other variables on FDI in finance is also tested. Moshiran (1997) finds exchange rates significant, according to his results a host country currency appreciation increases FDI in the insurance industry. This result is contrary to that typically found for manufacturing industries (Campa et al (1998), McCorriston and Sheldon (1998), Gopinath et al (1999), Kogut and Chang (1996)). Yamori (1998) finds no evidence that long term exchange rate changes affect FDI in financial services. Moshiran finds a positive relationship between the rate of return and finance FDI, whereas Yamori finds no such association. Host country wages are found insignificant in Moshiran's study. Finally, Yamori gets conflicting results on whether host country risk affects FDI in finance, using the country risk index from Euromoney.

---

<sup>2</sup> In earlier studies, Nigh et al (1986), Sabi (1988), and Goldberg and Johnson (1990) all find FDI in finance to be positively related to total FDI flows.

From past studies of the financial sector, we thus see that host country market size, and FDI in other sectors are important determinants of finance FDI. The impact of trade openness is however more of an open question, which needs to be revisited. In what follows, we estimate the relationship of these and other variables to FDI in finance and the three other major service sectors, and in services as a whole. We are thus able to evaluate whether the above results for the finance sector hold, whether they can be generalized to services in general, and whether there are important differences in FDI determinants across service industries, and between producer services and other services in particular.

### 3. Data and variables included

The data panel consists of observations from 57 countries for the period 1989-2000. The 57 countries include developed economies, transition economies, and developing countries (see appendix 1). Table 2 presents the dependent and independent variables used, and the corresponding sources of data (see appendix 2 for summary statistics).

**Table 2. Variables and sources of data**

VARIABLE	SOURCE
<b>Dependent variables</b>	
Industry level foreign direct investment per capita (logged)	UNCTAD
<b>Independent variables</b>	
Gross domestic product per capita (logged)	World Bank <sup>3</sup>
Growth in gross domestic product	World Bank
Trade (Imports + exports) as % of GDP	World Bank
Inflation (logged)	World Bank
FDI secondary industries	UNCTAD
Time trend	
Political risk	PRS group ICRG
Democratic accountability	PRS group ICRG
Institutional quality	PRS group ICRG
Stability	PRS group ICRG

Our dependent variables, are logged FDI inflows per capita in the service sector as a whole, and in each of the four major service industries; finance, business activities, transport, and trade. For data on industry FDI flows, we use UNCTAD's new database, which contains data on flows in 33 industry categories. The industrial classification used by UNCTAD is a variant of the United Nations International Standard Industrial Classification of All Economic

<sup>3</sup> <http://www.worldbank.org/research/growth/GDNdata.htm>

Activities (ISIC).<sup>4</sup> We correct for country size by dividing FDI flows by population size. This is by no means uncontroversial, previous studies demonstrate that results are sensitive to the way in which the dependent variable is normalized (Kolstad and Villanger, 2004b). A common alternative is to divide FDI flows by GDP. Harms (2002) argues that adjusting for population size is a preferable strategy, since many of the independent variables typically included in FDI studies can be expected to influence GDP.

Consistent with the preceding discussion, we include independent variables that reflect host country market size, trade openness, and foreign direct investment in other sectors. As a measure of market size, we use GDP/capita. One can argue that GDP/capita is more a measure of how developed a market is, than of market size. Though this argument has merit, to stay consistent with the terminology of previous studies of FDI, we refer to it as a measure of market size. In studies of aggregate FDI, GDP/capita proves a highly robust determinant, Chakrabarti (2001) finds that it is the only variable to pass a robustness test based on the extreme-bounds analysis (EBA) principles of Leamer (1983). Apart from the results from the financial sector, there are also sound analytical arguments that FDI in services might be correlated with GDP/capita, since a greater proportion of income is spent on services when per capita income increases.

As a proxy for trade openness, we use the sum of imports and exports as a percentage of GDP. This is the standard measure of openness in the FDI literature, and Chakrabarti (2001) finds that though it does not pass the EBA test, it is the variable most likely to be correlated with aggregate FDI besides market size. A number of other studies of aggregate FDI flows also find this variable significant, such as Singh and Jun (1995), Noorbakhsh et al (2001), Asiedu (2002), Kolstad and Villanger (2004a). The measure of trade openness adopted deviates from those used by the studies of finance FDI, though, which makes the results less directly comparable.

To assess whether there is a relationship between FDI in other sectors, and FDI in the service industries, we include FDI in manufacturing (in per capita terms) as an independent variable. The data on this variable is taken from UNCTAD's database on FDI flows at the industry level. Though one might alternatively use aggregate FDI as an explanatory variable, as done

---

<sup>4</sup> See [http://r0.unctad.org/en/subsites/dite/fdistats\\_files/WIDindustrial.htm](http://r0.unctad.org/en/subsites/dite/fdistats_files/WIDindustrial.htm) for details.

by one of the studies of finance FDI, the use of manufacturing FDI has the following motivation. The literature on vertical disintegration of production processes, commonly refers to a fragmentation taking place in the manufacturing industries. And since the term producer services refers to services that are intermediate goods in these production processes, FDI in manufacturing is the relevant variable to consider when assessing whether FDI in producer services is indeed governed by determinants different from those of other service industries. Though the question of causality is a difficult one, using manufacturing FDI as an explanatory variable for service FDI, might provide evidence on the progression of the agglomeration process identified by studies showing that aggregate FDI is positively related to lagged FDI (Singh and Jun (1995), Lipsey (1999), Cheng and Kwan (2000), Noorbakhsh et al (2001) and Urata and Kawai (2001)).

In addition to these explanatory variables, we also include a number of other variables deemed important by studies of aggregate FDI or of FDI in the finance industry. While GDP growth is more often than not found to be insignificant in studies of aggregate FDI flows (Kolstad and Tøndel, 2002), we include it since it might matter for FDI in financial services. Macroeconomic stability, as measured by inflation, is found not to matter for FDI flows in most aggregate studies (Noorbakhsh et al (2001), Asiedu (2002), Urata and Kawai (2001), and Harms (2002)). There are a few exceptions though (Harms and Ursprung (2002), Kolstad and Villanger (2004b)), so we include the variable here.

Finally, we include a set of variables capturing socio-political conditions in host countries. The first of these is the *political risk rating* of the International Country Risk Guide (ICRG), which is a composite index of a range of different socio-political characteristics.<sup>5</sup> The basic idea behind including a variable like this is that investors gauge the socio-political environment of a country to determine the risks and/or costs of doing business. To the extent that these commercially available indices are used by investors, their correlation to FDI should be strong. Several studies have found a relationship between aggregate FDI flows and composite socio-political indices. Globerman and Shapiro (2002) find a positive association between aggregate FDI and a governance index derived from Kaufmann et al (1999a,b), Harms (2002) and Biswas (2002) find positive relationships between FDI and composites of

---

<sup>5</sup> See Howell (2001) for details.

International Country Risk Guide (ICRG) indices, and Singh and Jun (1995) estimate a positive correlation between the BERI political risk index and FDI flows.

The basic idea of using composite socio-political indices is that disaggregate indices might be fraught with measurement errors, which even out in their aggregation. Though the validity of such an argument certainly depends on the structure of measurement errors, an additional argument for using composite indices is that disaggregate indices exhibit little variation within countries over time, making their inclusion in fixed effects estimation problematic. However, a major drawback of composite indices, is that they contain too many elements to provide useful policy implications. If improved governance increases foreign investment, which particular feature of governance do you improve to effectively attract investors?

We attempt to strike a balance between getting useful policy implications, and avoiding measurement error and insufficient variation, by combining the constituent indices of the ICRG political risk index, into more disaggregate indices reflecting more distinct socio-political characteristics. Our index of *institutional quality* is an aggregate of the ICRG indices of socio-economic conditions, government stability, corruption, law and order, and bureaucratic quality, where we have taken the ICRG weights as given. The studies of Oliva and Rivera-Batiz (2002), Wei (2000) and Habib and Zurawicki (2002) suggest that different aspects of institutional quality matter for aggregate FDI.

Similarly, we compute an index of *stability* from the ICRG indices of internal conflict, external conflict, religious tensions, and ethnic tensions. Aspects of stability have a significant association with aggregate FDI in the studies of Tuman and Emmert (1999) and Kolstad and Tøndel (2002). Finally, we include the ICRG index of *democratic accountability* as an explanatory variable, since a link between democracy and FDI has been drawn by several studies of aggregate FDI (Harms and Ursprung (2002) and Kolstad and Villanger (2004b)). As discussed above, the use of an individual index with little variation causes estimation problems, which our results on this variable will confirm. Note that on all the socio-political indices, a higher score implies improved conditions (i.e. less risk, better institutions, more stability, or more accountability), so we expect a positive coefficient for these indices.

A range of potentially important determinants of FDI flows are not included here, for a variety of reasons. The human capital and infrastructure variables available to us restrict our

sample too much to be included. Since our FDI data only measures flows to host countries, and does not indicate which home countries the flows originate in, it is difficult to incorporate explanatory variables that are relational by nature, such as exchange rates and cultural and geographical distance. For variables such as wages, rates of return, and taxes, it is difficult to find relevant data.

#### **4. Results**

Our estimated equations contain one to seven explanatory variables, including a time trend. We do not include more than one socio-political variable at a time, due to their correlation. To test the robustness of initial results, we run regressions featuring all permutations of the explanatory variables. We use fixed effects estimation with country specific fixed effects, to explain within-country variation in service FDI. The results do not differ much if we use random effects estimation, or simple OLS, however. Below, the major results of our analysis are reviewed. Section 4.1 examines determinants of FDI flows in the service sector as a whole. Section 4.2 through 4.5 review the results for each of the four major service industries; finance, business activities, transport, and trade.

##### *4.1 Determinants of FDI flows in the tertiary industries*

The major results when FDI flows in the service sector are used as the dependent variable, are shown in table 3. Since we use fixed effects estimation, the results thus indicate how changes in explanatory variables within countries, affect FDI in the service sector. The table shows the results of regressions including the full set of explanatory variables, using the composite political risk index in column 1, and the three disaggregate socio-political indices in columns 2-4. As the table indicates, higher levels of GDP/capita, FDI in the secondary sector, democracy and institutional quality, are associated with more FDI in the service sector as a whole. On the other hand, economic growth, trade, inflation, political risk and in particular stability, do not have a significant association with FDI in services.

To check how robust these results are to changes in the specification, we tested all combinations of the four variables deemed significant by table 3, and the other explanatory variables. GDP/capita, FDI in the secondary sector, and institutional quality are significant in all combinations of explanatory variables where they are included, which implies that these variables are robust in the sense of passing an Extreme Bound Analysis (EBA) test. The democracy variable, however, is not as robust to changes in the set of explanatory variables

included, in particular, it becomes insignificant in many specifications that do not include FDI in the secondary sector.

**Table 3. Regression results of fixed effects estimation for the tertiary sector. Dependent variable: Ln (tertiary FDI per capita)**

Expl. Variables	Tertiary 1	Tertiary 2	Tertiary 3	Tertiary 4
Ln GDP/cap	1.248** (0.52)	1.257** (0.504)	1.35*** (0.502)	1.503*** (0.537)
GDP growth	0.02 (0.019)	0.027 (0.019)	0.017 (0.019)	0.019 (0.019)
Trade	-0.008 (0.009)	-0.012 (0.019)	-0.006 (0.009)	-0.006 (0.009)
Ln Inflation	0.075 (0.077)	0.058 (0.077)	0.081 (0.077)	0.068 (0.078)
Ln FDI secondary	0.362*** (0.046)	0.385*** (0.045)	0.357*** (0.046)	0.37*** (0.045)
Year	0.145*** (0.039)	0.148*** (0.039)	0.142*** (0.039)	0.152*** (0.039)
Political risk	0.016 (0.012)			
Democracy		0.218** (0.095)		
Institutional quality			0.04* (0.024)	
Stability				-0.009 (0.025)
Constant	-5.229 (4.353)	-4.557 (4.341)	-6.04 (4.337)	-5.984 (4.434)
R <sup>2</sup>				
Within	0.50	0.51	0.51	0.50
Between	0.63	0.58	0.64	0.64
Overall	0.63	0.61	0.62	0.62
# obs.	344	344	344	344
# groups	57	57	57	57

\*\*\* significant at 1 %, \*\* significant at 5 %, \* significant at 10%

We also tested whether the results obtained were sensitive to small changes in the country sample. FDI in the secondary sector proved insensitive to all exclusions of individual countries from the sample. GDP/capita becomes insignificant if Colombia is excluded from the sample. The democracy variable becomes insignificant when India, Paraguay or Tunisia are excluded from the sample. And institutional quality proves sensitive to the exclusion of a range of countries. FDI in the secondary sector is thus the only variable whose significance is not driven by the observations from any single country.

Including between country effects, by using OLS or random effects estimation, reinforces the impressions from the preceding robustness tests. GDP/capita and FDI in the secondary sector

both stay significant in these estimations, whereas democracy and institutional quality do not. Attempts to use lagged values of the variables, in order to say something about causality, do however paint a different picture. The one- through four-year lags of GDP and FDI in the secondary sector are all insignificant when replacing their current values in the specifications of table 3, while one- and two-year lags of democracy, and one- through three-year lags of institutional quality are significant.

Summing up, our estimations provide a strong case for the idea that FDI in services is related to FDI in manufacturing. The following sections provide evidence on whether this relationship can be traced to the producer services (finance, business, and transport). Moreover, our results largely confirm the hypothesis that FDI in services is conducted to access domestic markets, rather than serving as an export platform, as established by the significance of GDP/capita and the insignificance of the trade variable. Though we do find some evidence of a relationship between democracy and institutional quality and FDI in services, it is not very robust to changes in the specification, sample or methodology.

#### *4.2 Determinants of FDI in the financial industry*

For FDI in the financial industry, the main results are summarized in table 4, which explores the same combinations of explanatory variables as table 3. The number of countries for which we have observations on FDI in finance is smaller than the sample for which FDI in services is available, and our explanatory variables explain much less of the variation in finance FDI than in services FDI. The variables that have a significant association with finance FDI, are GDP/capita and FDI in the secondary industries. Variables such as growth, trade, inflation, and all socio-political variables are insignificant.

The association between FDI in the secondary industries and FDI in finance remains significant in all possible combinations with the other explanatory variables. Secondary FDI is also insensitive to exclusions of individual countries from the sample. Furthermore, including between country effects through OLS and random effects estimations, also yields significant results for this variable. Using lagged values, we find that the one-year lag of secondary FDI is significant when substituting it for the current value in the column 1 specification of table 4. To the extent that this suggests a causal relationship, the lead time from manufacturing investment to finance investment appears short.



**Table 4. Regression results of fixed effects estimation for the finance industry. Dependent variable: ln (finance FDI per capita)**

Expl. Variables	Finance 1	Finance 2	Finance 3	Finance 4
Ln GDP/cap	1.264 (0.785)	1.74** (0.745)	1.57** (0.727)	1.868** (0.822)
GDP growth	-0.011 (0.027)	-0.019 (0.028)	-0.018 (0.027)	-0.02 (0.028)
Trade	-0.005 (0.015)	0.003 (0.015)	-0.001 (0.014)	0.004 (0.015)
Ln Inflation	0.045 (0.112)	0.013 (0.11)	0.044 (0.111)	0.005 (0.112)
Ln FDI secondary	0.33** (0.129)	0.338*** (0.13)	0.317** (0.129)	0.339*** (0.129)
Year	0.071 (0.057)	0.062 (0.057)	0.065 (0.057)	0.058 (0.058)
Political risk	0.032 (0.022)			
Democracy		-0.02 (0.157)		
Institutional quality			0.054 (0.036)	
Stability				-0.017 (0.045)
Constant	-7.714 (7.012)	-9.754 (7.046)	-9.758 (6.892)	-10.407 (7.254)
R <sup>2</sup>				
Within	0.22	0.21	0.22	0.21
Between	0.70	0.73	0.72	0.73
Overall	0.54	0.53	0.54	0.53
# obs.	238	238	238	238
# groups	45	45	45	45

\*\*\* significant at 1 %, \*\* significant at 5 %, \* significant at 10%

The relationship of GDP/capita and finance FDI is a less robust one. As table 4 reveals, the significance of the variable depends on the socio-political variable included. Moreover, in specifications 2, 3 and 4 of table 4, GDP/capita becomes insignificant if Colombia or Paraguay are dropped from the sample. Since excluding Colombia produced a similar result for FDI in services as a whole, there is possibly a connection here. However, in random effects and OLS estimations, GDP/capita is significant in all four specifications of table 4. We also find evidence of a significant relationship between the three-year lag of GDP/capita and FDI in finance.

Foreign direct investment in finance, thus seems to be most robustly linked to FDI in manufacturing. This is consistent with the fact that finance is counted as one of the producer services, and with previous studies of finance FDI. Though GDP/capita is less robustly associated with FDI in finance, our results do not entirely negate those of previous studies of

finance FDI, where different measures of market size are found significant. Foreign investors in the financial industry do, however, appear indifferent to other host country characteristics such as trade and socio-political conditions.

#### *4.3 Determinants of FDI in the business industry*

Of the four individual industries analyzed here, the business industry is the one for which the fewest observations of FDI flows are available, and the one for which the explanatory power of our independent variables is the poorest. It is also difficult to find robust relationships between our independent variables and business FDI, in our data. Table 5 recounts the results from an initial specification. Contrary to the specifications of previous tables, the specifications in table 5 do not include the time trend variable. There appears to be some sort of complicated relationship between the time trend and the other independent variables, and estimations that include the time trend attach more importance to variables that are less robust, and less importance to variables more robust.

In fact, none of the explanatory variables are significant in all possible combinations with other variables. In terms of robustness, as measured by the percentage of combinations in which a variable is significant, the variables rank as follows. Institutional quality is significant in all combinations, except some that include the time trend. GDP/capita is significant in all combinations, except those that include the time trend. Stability is significant (and with a sign opposite of the expected), only in combination with GDP/capita or the time trend. Growth is significant in combinations with the time trend, and in a small set of other combinations. Trade is significant only when combined with the time trend, inflation only when combined with the time trend and growth, and FDI in manufacturing only when combined with trade and year. Performing auxiliary regressions on the variables involves, we have tested whether these results might be due to multicollinearity, but this does not seem to be the case.

Since only institutional quality and GDP/capita are significant in more than half of all possible combinations, we limit further analysis to these variables. Using specification 3 in table 5, we find that the significance of GDP/capita is insensitive to the exclusion of individual countries from the sample. Institutional quality is, however, sensitive to the exclusion of Thailand and the US. Including between country effects provides mixed results, while random effects estimation deems both GDP/capita and institutional quality significant, only GDP/capita is significant in the OLS estimation. One- through three-year lags of

GDP/capita are significant, whereas the one-year lag of institutional quality proved significant.

**Table 5. Regression results of fixed effects estimation for the business industry. Dependent variable: ln (business FDI per capita)**

Expl. Variables	Business 1	Business 2	Business 3	Business 4
Ln GDP/cap	2.124*** (0.808)	2.27*** (0.705)	2.033*** (0.68)	4.167*** (0.803)
GDP growth	0.039 (0.03)	0.038 (0.031)	0.037 (0.029)	0.007 (0.028)
Trade	0.013 (0.019)	0.013 (0.02)	0.014 (0.019)	0.018 (0.018)
Ln Inflation	0.024 (0.144)	0.007 (0.141)	0.093 (0.144)	-0.026 (0.133)
Ln FDI secondary	-0.0004 (0.072)	0.008 (0.077)	-0.028 (0.072)	-0.009 (0.068)
Year				
Political risk	0.012 (0.03)			
Democracy		0.029 (0.221)		
Institutional quality			0.089** (0.044)	
Stability				-0.213*** (0.055)
Constant	-19.406*** (6.63)	-19.85*** (6.577)	-20.518*** (6.349)	-29.864*** (6.614)
R <sup>2</sup>				
Within	0.13	0.13	0.15	0.21
Between	0.32	0.32	0.32	0.31
Overall	0.30	0.31	0.30	0.31
# obs.	182	182	182	182
# groups	38	38	38	38

\*\*\* significant at 1 %, \*\* significant at 5 %, \* significant at 10%

It is hard to draw firm conclusions based on these results. If any of the explanatory variables included here do have an effect on business FDI, GDP/capita and institutional quality seem the most likely candidates. The fact that FDI in manufacturing does not appear to affect business FDI, is noteworthy since the business industry is one of the producer service industries. In general, the lack of firm results on this sector might have several explanations. The group of countries for which we have data is smaller than in the other industries, and the sample might not be as representative. Moreover, the business industry might consist of a more mixed set of sub-industries than the other industries studied here, making it hard to identify determinants that matter across sub-industries.

#### *4.4 Determinants of FDI in the transport industry*

The main results obtained when using FDI in the transport industry as the dependent variable, are captured by table 6. GDP/capita, FDI in the secondary industries, and institutional quality are all significantly related to FDI in transport. Though growth is significant in one specification, it is not robust to changes in the political variable used, nor to other combinations of the explanatory variables. As it turns out, GDP/capita, FDI in the secondary industries, and institutional quality are significant in all combinations of the explanatory variables. However, while secondary FDI and institutional quality both stay significant upon the exclusion of individual countries from the sample, the significance of GDP/capita hinges on the inclusion of Costa Rica in the country sample. The aforementioned three variables are all significant in estimations that include between-country effects (OLS and random effects).

Using lagged values of the three variables, the one-year lag of GDP/capita is significant when replacing the current value in column 3 of table 6. For FDI in the secondary sector, the three- and four-year lags are significant. If this reflects a causal relationship, the lead time from manufacturing to transport investment appears greater than the lead time to financial FDI. For the institutional quality variable, the two- and three-year lags are significant.

As in the finance industry, FDI in manufacturing and GDP/capita are significant for FDI in the transport industry. The fact that FDI in the secondary sector has a robust association to transport FDI, is consistent with the fact that transport is attributed to the producer services. It is difficult to ascertain why institutional quality seems to matter more for FDI in transport than in other services. One reason could be that this industry interacts with public institutions more frequently than others. Another could be that substantial irreversible investment is required in industries like telecommunications, making a predictable regulatory environment essential. To the extent that the result is due to the telecommunications industry, it is also possible that countries with a better institutional environment have gone further in liberalizing this industry.

**Table 6. Regression results of fixed effects estimation for the transport industry. Dependent variable: ln (transport FDI per capita)**

Expl. Variables	Transport 1	Transport 2	Transport 3	Transport 4
Ln GDP/cap	2.256* (1.222)	2.684** (1.175)	2.391** (1.161)	2.856** (1.268)
GDP growth	0.073* (0.042)	0.067 (0.042)	0.065 (0.041)	0.068 (0.042)
Trade	0.019 (0.024)	0.027 (0.024)	0.019 (0.023)	0.027 (0.024)
Ln Inflation	0.104 (0.2)	0.01 (0.2)	0.146 (0.199)	0.101 (0.2)
Ln FDI secondary	0.45** (0.198)	0.497** (0.195)	0.417** (0.195)	0.504** (0.196)
Year	0.259*** (0.09)	0.267*** (0.09)	0.253*** (0.089)	0.263*** (0.09)
Political risk	0.034 (0.032)			
Democracy		-0.081 (0.228)		
Institutional quality			0.125** (0.057)	
Stability				-0.026 (0.061)
Constant	-18.954* (10.668)	-19.83* (10.671)	-21.186** (10.555)	-20.723* (10.89)
R <sup>2</sup>				
Within	0.39	0.39	0.40	0.39
Between	0.58	0.58	0.56	0.56
Overall	0.41	0.40	0.40	0.39
# obs.	236	236	236	236
# groups	48	48	48	48

\*\*\* significant at 1 %, \*\* significant at 5 %, \* significant at 10%

#### 4.5 Determinants of FDI in the trade industry

As displayed in table 7, there are essentially two variables that are associated with FDI in the trade industry. Increases in GDP/capita and in democratic accountability are both related to increases in trade FDI. These relationships are both robust to changes in the specification, and to the exclusion of individual countries from the sample. Moreover, both variables are significant when between-country effects are included through OLS and random effects estimation. Replacing current values with lagged values in equation 2 of table 7, reveals that none of the GDP/capita lags are significant, whereas the one- and two-year lags of democracy are significant.

**Table 7. Regression results of fixed effects estimation for the trade industry. Dependent variable: ln (trade FDI per capita)**

Expl. Variables	Trade 1	Trade 2	Trade 3	Trade 4
Ln GDP/cap	1.074** (0.545)	1.092** (0.52)	1.282** (0.527)	1.218** (0.562)
GDP growth	-0.029 (0.02)	-0.02 (0.02)	-0.032 (0.02)	-0.03 (0.02)
Trade	0.003 (0.01)	-0.003 (0.011)	0.006 (0.01)	0.005 (0.01)
Ln Inflation	-0.057 (0.08)	-0.084 (0.079)	-0.059 (0.081)	-0.066 (0.08)
Ln FDI secondary	0.074 (0.083)	0.094 (0.081)	0.085 (0.083)	0.087 (0.082)
Year	0.091** (0.041)	0.088** (0.04)	0.093** (0.041)	0.096** (0.041)
Political risk	0.021 (0.013)			
Democracy		0.3*** (0.103)		
Institutional quality			0.016 (0.026)	
Stability				0.013 (0.027)
Constant	-8.794* (4.753)	-8.212* (4.692)	-9.548** (4.766)	-8.954* (4.841)
R <sup>2</sup>				
Within	0.29	0.30	0.28	0.28
Between	0.62	0.57	0.62	0.63
Overall	0.54	0.54	0.54	0.54
# obs.	278	278	278	278
# groups	48	48	48	48

\*\*\* significant at 1 %, \*\* significant at 5 %, \* significant at 10%

Consistent with the fact that the trade industry is not included in the producer services, the result that FDI in manufacturing does not affect FDI in the trade industry makes sense. It seems that FDI in the trade industry caters to a domestic market, rather than a globally disintegrated manufacturing sector. Though the democracy variable proves robust to the analyses summarized above, there is little or no variation in this variable for many of the countries in the sample. And further estimations reveal that the simultaneous exclusion of India and the Republic of Korea from the sample, leaves democracy insignificant. It is thus entirely possible that the correlation between democracy and FDI in trade, reflects some process of liberalization, for instance of FDI regulations, which has run parallel to democratization in certain influential countries.

## **5. Concluding remarks**

The service sector is dominant in world foreign direct investment flows. This study shows that FDI in the service sector is market seeking, and unaffected by the trade openness of host countries. The significance of the domestic market, and the insignificance of trade, are evident from the analysis of aggregate service sector FDI, and by and large reaffirmed by the analyses of the four major service industries. There are, however, also important differences in the determinants of FDI flows in different service industries. Consistent with the idea that producer services bind together a globally disintegrated chain of production, FDI in manufacturing is a robust determinant of FDI in certain producer services (finance and transport) but insignificant for FDI in other types of service industries such as trade. The use of lagged variables suggests that the producer services respond with different lags to FDI in manufacturing, the finance industry being quicker to respond than the transport industry. Finally, though composite political risk does not affect FDI in services, we find FDI in the transport sector to be highly correlated with a disaggregate index of institutional quality, which might be attributable to the influence of the telecommunications industry.

Given the large and growing role of services FDI in total FDI flows, eliciting the host country determinants thereof paves the way for efficient and proactive host country FDI policies. In particular, several theoretical contributions have stressed the potential gains from trade in producer services, in terms of increased productivity (Markusen (1989) and Hodge and Nordås (2001)). Where trade is unfeasible, FDI can have similar effects. Our results indicate that a producer services sector broad in variety depends on a foreign manufacturing presence, and a large domestic market, but also on aspects of the institutional environment in the host economy.

## References

Asiedu, E. (2002), "On the determinants of foreign direct investment to developing countries: Is Africa different?", *World development*, 30, 1, 107-119

Biswas, R. (2002), "Determinants of foreign direct investment", *Review of development economics*, 6, 3, 492-504

Campa, J., Donnenfeld, S. and Weber, S. (1998), "Market structure and foreign direct investment", *Review of international economics*, 6, 3, 361-380

Charkrabarti, Avik (2001), "The determinants of foreign direct investment: Sensitivity analyses of cross-country regressions", *Kyklos*, 54, 1, 89-114

Cheng, Leonard K. and Yum K. Kwan (2000), "What are the determinants of the location of foreign direct investment? The Chinese experience", *Journal of international economics*, 51, 379-400

Feenstra, R.C. (1998), "Integration of trade and disintegration of production in the global economy", *Journal of economic perspectives*, 12, 4, 31-50

Globerman, S. and Shapiro, D. (2002), "Global foreign direct investment flows: The role of governance infrastructure", *World development*, 30, 11, 1899-1919

Goldberg, L.G. and Johnson, D. (1990), "The determinants of US banking activity abroad", *Journal of international money and finance*, 9, 123-137

Gopinath, M., Pick, D. and Vasavada (1999), "The economics of foreign direct investment and trade with and application to the U.S. food processing industry", *American journal of agricultural economics*, 81, 442-452

Habib, M. and Zurawicki, L. (2002), "Corruption and foreign direct investment", *Journal of international business studies*, 33, 2, 291-307



Harms, P. (2002), "Political risk and equity investment in developing countries", *Applied economics letters*, 9, 377-380

Harms, P. and Ursprung, H.W. (2002), "Do civil and political repression really boost foreign direct investment", *Economic Inquiry*, 40, 4, 651-663

Hodge, J. and Nordås, H. (2001), "Liberalization of trade in producer services – The impact on developing countries", *The South African journal of economics*, 69, 1, 93-122

Howell, L. D. (2001), *The handbook of country and political risk analysis – Third edition*, New York: The PRS Group

Hummels, D., Rapoport, D. and Yi, K.M. (1998), "Vertical specialization and the changing nature of world trade", *Federal Reserve Bank of New York Policy Review*, June

Kaufmann, D., Kraay, A. and Zoido-Lobaton, P. (1999a), *Aggregating governance indicators*, World Bank working paper 2195, Washington, D.C.: World Bank

Kaufmann, D., Kraay, A. and Zoido-Lobaton, P. (1999b), *Governance matters*, World Bank working paper 2196, Washington, D.C.: World Bank

Kind, H.J. and Strandenes, S. P. (2002), "Causes and effects of FDI by the Norwegian maritime industry", *Maritime policy management*, 29, 3, 223-239

Kogut, B. and Chang, S. J. (1996), "Platform investments and volatile exchange rates: Direct investment in the US by Japanese electronic companies", *Review of economics and statistics*, 78, 2, 221-231

Kolstad, I. and Tøndel, L. (2002), *Social development and foreign direct investment in developing countries*, CMI report 2002:11, Bergen: Chr. Michelsen Institute

Kolstad, I. and Villanger, E. (2004a), *Social development and industry level foreign direct investment*, CMI-report, Bergen: Chr Michelsen Institute

Kolstad, I. and Villanger, E. (2004b), *Social development, FDI, and domestic investment – A double dividend to developing countries*, CMI-report , Bergen: Chr Michelsen Institute

Leamer, E. E. (1983), “Let’s take the con out of econometrics”, *American economic review*, 73, 31-43

Lipsey, Robert E. (1999), *The location and characteristics of U.S. affiliates in Asia*, NBER working paper 6876, National Bureau of Economic Research, Cambridge, Ma.

Markusen, J. R. (1989), “Trade in producer services and in other specialized intermediate inputs”, *American economic review*, 79, 1, 85-95

McCorriston, S. and Sheldon, I. M. (1998), "Cross-border acquisitions and foreign direct investment in the U.S. food industry", *American journal of agricultural economics*, 80, 5, 1066-1072

Miller, S. R. and Parkhe, A. (1998), "Patterns in the expansion of U.S. banks' foreign operations", *Journal of international business studies*, 29, 2, 359-390

Moshirian, F. (1997), "Foreign direct investment in insurance services in the United States", *Journal of multinational financial management*, 7, 159-173

Nigh, D., Cho, K.R., and Krishnan, S. (1986), “The role of location-related factors in US banking involvement abroad: An empirical examination”, *Journal of international business studies*, 17, 59-72

Noorbakhsh, F., Paloni, A. and Youssef, A. (2001). “Human capital and FDI inflows to developing countries: New empirical evidence”, *World development*, 29, 9, 1593-1610

Nordås, H. K. (2001), *Information technology and producer services – a source of economic development: The South African case*, SNF working paper 50/01, Bergen: Foundation for Research in Economics and Business Administration

Oliva, M.-A. and Rivera-Batiz (2002), "Political institutions, capital flows, and developing country growth: An empirical investigation", *Review of developing economics*, 6, 2, 248-262

Sabi, M. (1988), "An application of the theory of foreign direct investment to multinational banking in LDCs", *Journal of international business studies*, 19, 433-447

Singh, H. and Jun, K. W. (1995), *Some new evidence on determinants of foreign direct investment in developing countries*, Policy research working paper 1531, Washington DC: World Bank

Tuman, J. P. and Emmert, C. F. (1999), "Explaining Japanese foreign direct investment in Latin America, 1979-1992", *Social science quarterly*, 80, 3, 539-555

UNCTAD (2001), *World investment report 2001 – Promoting linkages*, Geneva: United Nations Conference on Trade and Development

UNCTAD (2003), *World investment report 2003 – FDI policies for development: National and international perspectives*, Geneva: United Nations Conference on Trade and Development

Urata, Shujiro and Hiroki Kawai (2000), "The determinants of the location of foreign direct investment by Japanese small and medium-sized enterprises", *Small business economics*, 15, 79-103

Wei, Shang-Jin (2000), "How taxing is corruption on international investors", *Review of economics and statistics*, 82, 1, 1-11

Yamori, N. (1998), "A note on the location choice of multinational banks: The case of Japanese financial institutions", *Journal of banking and finance*, 22, 109-120

## **Appendix 1. List of countries**

Argentina, Australia, Austria, Bangladesh, Bolivia, Brazil, Bulgaria, Canada, Chile, China, Colombia, Costa Rica, Croatia, Czech Republic, Denmark, Dominican Republic, Ecuador, El Salvador, Estonia, Finland, France, Germany, Guyana, Honduras, Hong Kong China, Hungary, Iceland, India, Ireland, Italy, Jamaica, Jordan, Lithuania, Malaysia, Mexico, Morocco, Nicaragua, Nigeria, Norway, Oman, Pakistan, Paraguay, Peru, Philippines, Portugal, Republic of Korea, Russian Federation, Spain, Sweden, Switzerland, Thailand, Trinidad and Tobago, Tunisia, United Kingdom, United States, Venezuela, Zambia.

## Appendix 2. Summary statistics and correlation matrix

**Table 8. Summary statistics**

Variable	Obs	Mean	Std.Dev.	Min	Max
Ln service FDI/cap	344	3.07559	2.270887	-13.58739	7.95514
Ln finance FDI/cap	238	2.398627	1.952543	-4.388447	7.524975
Ln business FDI/cap	182	.9260604	4.287276	-13.75965	7.887764
Ln transport FDI/cap	236	.8246037	2.813925	-12.63265	6.70147
Ln trade FDI/cap	278	1.624796	2.195576	-9.379953	5.790836
Ln GDP/cap	344	8.403794	1.438877	5.586947	10.68371
GDP growth	344	3.291005	3.630478	-11.7	18.83041
Trade	344	65.86925	33.17619	14.73098	257.5854
Ln Inflation	344	1.759505	1.378423	-2.879301	8.920216
Ln FDI second.	344	-11.02416	2.279044	-27.42719	-5.174634
Year	344	6.636628	3.036982	1	11
Political risk	344	70.1657	12.46401	27	91
Democracy	344	4.447674	1.39246	0	6
Inst. quality	344	24.49855	5.262982	9	36
Stability	344	30.35465	4.812742	11	36

**Table 9. Correlation matrix**

	ServFDI	FinFDI	BusFDI	TranFDI	TradFDI	GDP/cap	GDP gr.	
ServFDI	1.0000							
FinFDI	0.8399	1.0000						
BusFDI	0.7184	0.6220	1.0000					
TranFDI	0.7093	0.5045	0.5751	1.0000				
TradFDI	0.8392	0.6052	0.7196	0.5501	1.0000			
GDP/cap	0.6785	0.7039	0.5683	0.5002	0.6654	1.0000		
GDP gr.	-0.1188	-0.0999	-0.1251	0.0030	-0.1864	-0.1067	1.0000	
Trade	0.0184	-0.1057	-0.0880	0.1991	0.1893	-0.0510	0.0578	
Inflation	-0.4576	-0.5212	-0.3264	-0.4755	-0.4760	-0.5839	-0.1432	
FDI sec.	0.7638	0.6669	0.6064	0.5666	0.7077	0.6804	-0.0613	
Year	0.3818	0.2103	0.2050	0.4978	0.3414	0.0456	-0.0487	
Pol. risk	0.6797	0.6687	0.4973	0.5998	0.6758	0.8266	-0.0494	
Dem.acc.	0.5317	0.5571	0.5659	0.3662	0.6489	0.6727	-0.1345	
Inst.qual.	0.6401	0.6349	0.4567	0.5463	0.6043	0.7971	0.0319	
Stability	0.6000	0.5130	0.3917	0.5635	0.6163	0.6973	-0.0843	
	Trade	Inflation	FDI sec.	Year	Pol. risk	Dem.acc.	Inst.qual.	Stability
Trade	1.0000							
Inflation	-0.1162	1.0000						
FDI sec.	0.0284	-0.4138	1.0000					
Year	0.2099	-0.3618	0.2703	1.0000				
Pol. risk	0.1440	-0.6188	0.6894	0.2898	1.0000			
Dem.acc.	-0.0065	-0.4011	0.5676	0.1337	0.7553	1.0000		
Inst.qual.	0.1317	-0.6507	0.6288	0.2282	0.9256	0.6285	1.0000	
Stability	0.1436	-0.4997	0.6088	0.3086	0.8759	0.6366	0.6753	1.0000

# Summary

This study uses industry level foreign direct investment (FDI) data from 57 countries 1989-2000, to examine the host country determinants of FDI flows in services as a whole, and in the major service industries. Consistent with the observation that many services are non-tradable, we find that service FDI is market-seeking, and unaffected by trade openness. Producer services are important in binding together vertically disintegrated chains of production, accordingly we find a strong correlation between FDI in manufacturing and FDI in finance and transport. While composite political risk does not affect FDI in services, disaggregate socio-political indices prove significant in certain service industries.

## Recent Working Papers

- WP 2003: 4 VILLANGER, Espen  
Company influence on foreign aid disbursement: Is conditionality credible when donors have mixed motives? Bergen, 2003, 36 pp.
- WP 2003: 5 VILLANGER, Espen  
Company interests and foreign aid policy: Playing donors out against each other. Bergen, 2003, 40 pp.
- WP 2003: 6 VILLANGER, Espen  
The effects of disasters on income mobility: Bootstrap inference and measurement error simulations. Bergen, 2003, 27 pp.
- WP 2003: 7 SØREIDE, Tina and Kjetil Bjorvatn  
Corruption and market reform. Bergen, 2003, 23 pp.
- WP 2003: 8 WIIG, Arne and Ivar Kolstad  
Lowering barriers to agricultural exports through technical assistance. Bergen, 2003, 15 pp.
- WP 2003: 9 GLOPPEN, Siri, Lise Rakner and Arne Tostensen  
Responsiveness to the concerns of the poor and accountability to the commitment to poverty reduction. Bergen, 2003, 25 pp.
- WP 2003:10 KNUDSEN, Are  
Islamism in the *diaspora*: Palestinian refugees in Lebanon. Bergen, 2003, 23 pp.
- WP 2003:11 BJORVATN, Kjetil and Carsten Eckel  
Winners and losers from an international investment agreement. Bergen, 2003, 20 pp.
- WP 2003:12 FJELDSTAD, Odd-Helge  
What has trust got to do with it? Non-payment of service charges in local authorities in South Africa. Bergen, 2003, 26 pp.
- WP 2003: 13 RAKNER, Lise  
Uncertainty as a strategy: Electoral processes in Zambia 1991-2001. Bergen, 2003, 21 pp.
- WP 2004: 1 KNUDSEN, Are  
License to kill. Honour killings in Pakistan. Bergen, 2004.

CMI's publications, Annual Report and quarterly newsletter are available on CMI's homepage [www.cmi.no](http://www.cmi.no).

### For priced publications:

Surface mail (B-economique) free with prepared orders. For airmail (A-prioritaire) outside the Nordic countries add 20%.

### Three easy ways to pay:

Cheque, issued in Norwegian kroner

Post office giro, paid by International Giro: 0808.5352661

SWIFT: DNBANOB, Den norske Bank no: 5201.05.42308

### Order from:

Chr. Michelsen Institute

PO Box 6033, Postterminalen, N-5892 Bergen, Norway

Fax: +47 55574166, Phone: +47 55574000

E-mail: [cmi@cmi.no](mailto:cmi@cmi.no)