# Determinants of German Foreign Direct Investment in Latin American and Asian Emerging Markets in the 1990s

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## Abstract

Many empirical studies in the area of foreign direct investment (FDI) exclusively focus on flows between industrialized countries. This article makes a contribution to the still relatively sparse literature on FDI in emerging markets by estimating determinants of German FDI flows to Latin America and Asia during the past decade. Using data contained in a newly available Bundesbank microdatabase, an FDI flow variable, constructed from year-to-year differences in FDI stocks adjusted for certain otherwise distorting factors, is empirically tested with respect to several exogenous variables previously found to be significant in the literature. These include so-called non-traditional factors such as country risk and agglomeration effects which are widely regarded as influential for FDI in emerging market economies. This study therefore focuses on estimating the effects of various risk measures and finds that country risk, and partially political risk, is indeed detrimental to investments of German enterprises. Moreover, German FDI in Latin America are found to have been market-seeking while those in emerging Asia tended to exploit low factor costs. Methodically, this paper uses the SUR estimation technique which allows for the contemporaneous correlation of disturbances as well as first-order autocorrelation of the time series disturbances and cross-sectional heteroskedasticity. In arriving at a parsimonious regression for each region, an Extreme Bounds Analysis (Leamer, 1983 & 1985) is performed to select individual variables robust to the inclusion of other explanatory variables. Making empirical use of German firm-level data, additional estimations are performed for direct investment of the manufacturing sector and three of its sub-sectors. Regarding the latter, the hypothesis that capital-intensive industries react particularly strongly to the changes in the regulatory environment of the host country is confirmed by the data.



**Key words:** foreign direct investment, emerging markets, country risk, panel data analysis

**JEL Classification:** F21, C33

## Zusammenfassung

Viele empirische Studien im Bereich der ausländischen Direktinvestitionen (“foreign direct investment” – “FDI”) beziehen sich ausschließlich auf Investitionsströme zwischen Industrieländern. Dieses Arbeitspapier trägt zu der noch vergleichsweise spärlichen Literatur zu Direktinvestitionen in Schwellenländern bei. Es schätzt die Determinanten deutscher FDI-Ströme in ausgewählten „Emerging Markets“ während der letzten Dekade. Mit Hilfe von Daten, die in einer seit kurzem verfügbaren Mikrodatenbank der Bundesbank enthalten sind, wird eine Stromgröße, die sich aus den Bestandsveränderungen der Direktinvestitions-bestände errechnet und die um verzerrende Einflüsse bereinigt wird, empirisch hinsichtlich verschiedener exogener, in der Literatur als signifikant befundener Variablen überprüft. Diese schließen sogenannte nicht-traditionelle Faktoren wie Länderrisiko und Agglomerations-effekte ein, die allgemein als einflussreich für Direktinvestitionen in Schwellenländern erachtet werden. Die vorliegende Studie konzentriert sich demnach auf die Schätzung der Bedeutung verschiedener Risikomaße und findet, dass das Länderrisiko und teilweise auch das politische Risiko den Investitionen deutscher Unternehmen abträglich sind. Außerdem wird gezeigt, dass deutsche Direktinvestitionen in Lateinamerika eher markterschließend waren, während jene in den Schwellenländern Asiens stärker die Nutzung niedriger Faktorkosten zum Ziel hatten. Methodisch wird die SUR Schätzmethode angewandt, die eine Berücksichtigung gruppenweiser Korrelation der Störgrößen, eines autoregressiven Prozesses erster Ordnung und Heteroskedastizität ermöglicht. Um ein sparsames Modell schätzen zu können, wird eine „Extreme Bounds“-Analyse nach Leamer (1983 & 1985) durchgeführt, welche die Auswahl von solchen Variablen bezweckt, deren Einfluss gegen die Einbeziehung anderer exogener Variablen robust ist. Zudem werden Einzeldaten deutscher Firmen genutzt, um weitere Schätzungen der Direktinvestitionen des Verarbeitenden Gewerbes und dreier Untersektoren durchzuführen. Bezüglich Letzterer kann die Hypothese, dass kapitalintensive Sektoren besonders stark auf Änderungen im regulatorischen Umfeld der Empfängerländer reagieren, mit Hilfe der Daten bestätigt werden.

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## 1. Introduction

With hindsight, the 1990s were the decade of initial emerging market exuberance and subsequent disillusionment. Foreign direct investment flows to prospering regions such as Latin America and, most prominently, Asia grew by leaps and bounds – from about the mid-1980s to the second half of the 1990s average annual worldwide FDI flows to developing countries increased eightfold[1] – nourishing hopes for sustainable growth by transforming the host countries' infrastructure and enhancing their ability to withstand global economic downturns. As a matter of fact, German FDI stocks (at book values) in the six largest Latin American economies more than doubled between end-1989 and end-1997, while those of German subsidiaries in the eight largest markets in Asia almost quadrupled during that period. However, when the Asian crisis broke out, the long-held belief of these fast-growing economies' invulnerability was shattered, and it became apparent that warning signs such as real overvaluation of the currency, high short-term foreign indebtedness of the country as a whole or of individual sectors, as well as the absence of long-overdue structural reforms may not have been heeded by a majority of foreign enterprises.

The question then is: were those "red flags" in the sense of worsening country and/or political risk assessments – representing a subjective probability of certain adverse outcomes[2] – perceived by international investors? This study aims at identifying the determinants of German FDI in the emerging economies of Latin America and Asia throughout the past decade, and, in particular, those relating to "governance" aspects, measured by indices of country or political risk. Governance issues have consistently been, and still remain a major challenge for emerging market economies. Despite having undertaken substantial stabilization or liberalization efforts[3] and pursuing appropriate fiscal and monetary policies, many of these countries are suffering from a wide range of political and regulatory deficiencies which need to be tackled to appease investors. At first glance, emerging economies feature proper investment regimes when in fact obscure licensing procedures and discretionary administrative regulations characterize the true nature of the country's investment policy.

[1] See Nunnenkamp (2001b), p. 4, who presents UNCTAD data.

[2] Definition by Lehmann (1999), p. 22.

[3] Lora (2001) provides cross-country evidence on the extent of trade, tax, labor and financial market reforms as well as privatization in Latin America (see section 2.2.2).

Even willing governments are thus often unable to convey credible signals to foreign investors.[4]

Most empirical research using German FDI data[5] has been undertaken with respect to industrialized economies. Only a few studies are devoted exclusively to the investment behavior of German enterprises in developing countries or emerging markets. Hubert and Pain (1999) find in regressions restricted to non-EU countries, i.e. essentially developing countries, that only stocks of research & development, unit labor costs in Germany relative to the host country and real exchange rate volatility turn out to be significant with the expected signs.

Similarly, only some German FDI studies employ political risk variables. Agarwal et al. (1991), in a very comprehensive study of the traditional and risk-related determinants of German investment abroad, generally find no deterring effect of political risk (composite risk and, separately, strikes and lockouts) on FDI flows to developing countries in the 1980s. Moore (1993) identifies an index of labor unrest in the 17 OECD countries examined. Surprisingly, the number of days lost in strikes is mildly significant and *positively* correlated with FDI flows. Jost and Nunnenkamp (2002) run cross-section and pooled regressions for German FDI in more than 60 developing countries between 1989 and 2000. Apart from the usual results for host country per-capita GDP and population, they find good scores for country risk as measured by the Euromoney index and an openness measure (adjusted for country size) as well as, in separate regressions, low political risk and a skill variable (rate of secondary schooling) to exert a strong positive influence on FDI stocks.[6] Interestingly, the importance of country risk and a skill variable is shown to rise over the course of the last decade.

The paper is organized as follows. The subsequent section first explains how the FDI flow variable used in this study is derived. It then gives an overview of the literature on determinants of FDI in emerging markets, and, particularly, those factors relating to risk aspects. Section three provides details on the econometric approach and the selection process used for identifying robust variables among a pool of exogenous variables. The regression results are presented in section four, with a distinction being made between the country, sector and sub-sector level. Section five has the concluding remarks.

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[4] See Lehmann (1999), p. 21.

[5] For a good overview of German studies on FDI, see Fischer (2000).

[6] It is quite likely, however, that most of the series containing the FDI stocks are non-stationary – a phenomenon that is not appropriately accounted for in the purely static estimation. The authors additionally examine flow data from the German balance of payments (note that the openness measure turns insignificant, p. 63) which is doubtful considering the conceptual shortcomings (see section 2.1.1 of this paper, second indentation mark).

## 2. Data

### 2.1 Endogenous variable

There is no unanimously agreed method of measuring FDI. Different studies proceed in different ways. It, therefore, seems important to make as clear as possible how FDI has been defined here and why this particular definition has been chosen. In this study, the endogenous variable is the net inflow or outflow of direct investment capital of German investors into emerging market economies during a given calendar year. Depending on how one looks at it, foreign direct investment may be understood purely as a flow variable or as a stock variable. The IMF Balance of Payments Manual does not exclusively recur to the cumulative stock of FDI capital but defines direct investment as comprising "not only the initial transaction establishing the relationship between the investor and the enterprise but also all subsequent transactions between them and among affiliated enterprises, both incorporated and unincorporated".[7]

The direct investment capital flows used in the estimations are derived from the direct investment stock statistics compiled by the Deutsche Bundesbank since 1976 as an annual complete survey and published on a partly aggregated basis in Special Statistical Publication No. 10 ("*Kapitalverflechtung mit dem Ausland*" – "International capital links"). These data are now also available in the form of a computer-aided microdatabase for the years 1989 to 2000.[8] During the sample period, German enterprises reported minority interests (of at least 10% but less than 50%) in foreign enterprises if the balance-sheet total of the investment target exceeded DM 10 million (in 1999: €5 million). Controlling interests (50% or more) had to be reported if the investment target's balance-sheet total exceeded DM 1 million (in 1999: €0.5 million). In 2002 the threshold for both categories became €3 million. Indirect participating interests likewise must be reported if a "dependent" (i.e. majority-owned) enterprise itself holds a stake of at least 10% in another enterprise. It should be stressed, therefore, that foreign direct investment merely represents the provision of financial capital – in this case by German enterprises to their foreign subsidiaries.[9]

The direct investment stocks included in the database are book values and are calculated as the sum total of the investor's share in the nominal capital of the investment target, the capital

[7] IMF (1997), p. 86. "Direct investment capital transactions include those that create or dissolve investments as well as those that serve to maintain, expand, or reduce investments"; ibid., p. 88.

[8] In the 1989 reporting year methodological changes were made which eliminated the comparability of the stocks with those in the years 1976 to 1988.

[9] Thus, the term "direct investment" has to be clearly distinguished from the neo-classical concept of investment which is based on the change in value of capital goods (i.e. property, plant & equipment) on the assets side of the balance sheet; see also Lehmann (1999), p. 10, Jost (1999), p. 141, Hausmann and Fernández-Arias (2001), p. 33, or Razin (2002), p. 2.

reserves, and the retained profits/profits brought forward (cumulative reinvested earnings). Loans granted by the capital owners or affiliated enterprises are added to this equity capital. To finally obtain the direct investment stock pursuant to the IMF's "directional principle", the subsidiary's lending to or claims on the parent company must be subtracted.[10] It should be noted that the stock data quoted in foreign currency by the enterprise subject to reporting requirements have to be converted into German currency at the current exchange rate on the individual balance-sheet date (as mandated by the OECD Benchmark Definition).[11]

### 2.1.1 Stocks Versus Flows

The use of stock data for estimating a flow variable is an imperfect approach due to several distorting factors. Here is why this is and how the distortions are minimized:

- In the Bundesbank's stocks statistics the acquisition of assets is recorded in the form of balance-sheet book values. However, in the case of takeovers, an additional amount (goodwill) is frequently paid on top of the pure book value of the assets. These additional sums were particularly significant in recent years in cases of technology company takeovers. Therefore, evaluating the transaction data, which are recorded at market values in the balance of payments, would be preferable – yet this raises other problems (see below). However, as advanced developing countries rather than industrialized countries are at the heart of this study, it may be assumed that, owing to the relatively uncertain profit expectations and a political environment which is often difficult to gauge, the difference between market and book values may not be substantial. In the case of newly established subsidiaries (i.e. greenfield investment) these problems do not arise to begin with.

- While transaction-based balance of payments data in this respect seem superior for studying FDI flows, they have other serious shortcomings. For one thing, the FDI flows in the German balance of payments statistics do not list the individual recipient abroad which is a precondition for the sectoral analysis in (see section 4.2). What is more, only

[10] See Lipponer (2003), p. 219. The "directional principle" requires the direct investments to be separated according to the direction of the capital flow. Loans from subsidiaries to the investor therefore have to be deducted from the direct investment capital; see IMF (1997), p. 81. This practice contrasts with the asset liability principle, which presents such assets as autonomous – counterbalancing – direct investments.

[11] There is also the question of whether or not the stock data and thus also the FDI stock differences (which, after suitable correction, are interpreted as flow data), should be adjusted for inflation in the host country – as is done by Moore (1993), who deflates the stock differences using foreign price indexes for capital goods – or for exchange rate effects as recommended by Wagner (1991), who eschews Bundesbank stock data for these implicit effects. Accordingly, previous-year FDI stocks or, more correctly, the stocks of fixed assets and other long-term assets, would have to be adjusted for both inflation and the change in the bilateral exchange rate in the reporting year. Alternatively, one might rightfully assume that relative purchasing power parity holds and the inflation differential between Germany and the host country in question is absorbed by the exchange rate, having both distorting factors cancel each other out. To be sure, most empirical studies do not test nominal values but either deflate the FDI variable or relate it either to GDP or some other scaling factor (see section 2.1.3).

immediate direct investment relationships (as to equity capital) are recorded under participating interests in the German balance of payments statistics, but not indirect ones, i.e. those held via a holding company, which likewise compulsorily fall under the FDI definition. Reinvested earnings stemming from indirect capital links are not included, either. On balance, and leaving accounting issues aside, merely considering balance of payments data means failing to use a fully consolidated system encompassing indirect ownership and, therefore, in all likelihood greatly understating actual FDI capital.[12] Therefore, in measuring the investment activity of German multinationals, the only "relevant" flow variable – if there is one to be had – should be derived from (adequately modified) differences in stocks and not by using flows recorded in the balance of payments. Accordingly, this study uses a modified FDI "flow" variable, i.e. the difference in FDI stock from one year to another, adjusted for actual participation rates, deviating reporting years, balance-sheet depreciation and repatriated profits.[13] This variable nevertheless corresponds – apart from the distortions mentioned above – to the basic definition of direct investment capital transactions contained in the IMF's Balance of Payments Manual.[14]

- The balance-sheet values are shown in the stock statistics at the respective reporting date of the direct investment enterprise concerned, which sometimes differs from the end of the calendar year. For practical reasons the unadjusted figures are not divided between the two calendar years included in the reporting year of such enterprises.[15] Instead, all balance-sheet values of enterprises whose reporting date falls *before* June 30 – i.e. whose reporting year therefore mostly does not coincide with the current reporting year of the stock statistics – are included in the preceding calendar year.

### 2.1.2 Adjustment for Participation Rates, Balance-Sheet Depreciation, Repatriated Profits

- The FDI microdatabase contains participation rates for indirectly owned interests (usually held via a holding company) which need to be adjusted for the share of FDI capital that

[12] See OECD (1996), p. 11.

[13] For a good methodological overview see Bellak (1999), p. 120-122.

[14] "The components of direct investment capital transactions ... are equity capital, reinvested earnings, and other capital associated with various intercompany debt transactions"; IMF (1997), p. 87. Hausmann and Fernández-Arias (2001) explicitly adhere to the flow concept: "FDI is defined as the increase in the equity position of a non-resident owner..." (p. 33).

[15] This applies to 2,923 of 32,240 reports (9.1%) for the 14 emerging markets considered here. Theoretically, it would be possible in these cases to include the balance-sheet values in the previous year linearly with the period not coinciding with the year under review (for example, if May 31, 1999, were the reporting date, seven-twelfths of the balance-sheet values originally included in 1999 would be assigned to the 1998 reporting/calendar year, with the value for 1999 being adjusted accordingly). For technical reasons – this breakdown would require a "matching" of the reporting numbers of the investor and the investment target over all of the sample years at the microdata level, which is not feasible – this is not an option.

German investors effectively hold. That is, the "real" participation rate is calculated as the product of the vertical ownership shares. Doing so is necessary to account for multiple ownership in holding companies. For example, if a holding company has a 50% stake in a direct investment company and is itself equally owned by two German investors, the adjusted participation will be 25% for each parent.

- As the assets are recorded as book values and are depreciated by a certain rate mandated by foreign tax regulations, the left-hand side of the balance sheet does not correspond to the actually existing (historical) capital stock. This pure taxation effect needs to be removed. Accordingly, by using a perpetual inventory model,[16] FDI stocks are adjusted for the original tax depreciation undertaken when calculating the profit of the subsidiary; the aim of this adjustment is to determine which fixed assets are available for production each year. To this end, the net capital stock (fixed assets) of the investment target is marked up for each year using a notional depreciation rate of 8%,[17] which is multiplied by the share of FDI capital in total assets. The resulting gross capital stock of the following period is adjusted for increases or decreases in productive capital. By contrast, write-downs of financial assets, especially those of service providers, are not adjusted because the depreciation rate is uncertain. The inflow of direct investment capital in a given period therefore is the difference of the stocks[18] between the current year's stocks and preceding years' stocks plus the imputed depreciation of the adjusted capital stock.[19]

- The resulting flow variable still includes the total annual surplus rather than merely the profits remaining in the investment target after transferring the parent company's share of the profit – i.e. reinvested profits. Accordingly, the profits of the previous year repatriated in the current year would need to be deducted from this flow variable.[20] As this information cannot be extracted directly from the FDI stock statistics, a suitable approximation is called for: in the case of *direct* participating interests, the item "income

[16] This adjustment is recommended by Bellak (1999), p. 125.

[17] The rate of 8% used here is calculated as the average of economic depreciation rates for "industrial buildings" (3.6 %) and for "industrial plant and machinery" (12.3%). These rates were suggested by Chennels and Griffith (1997), p. 92.

[18] In this connection it should be noted that, in the case of direct participating interests, those in dependent holding companies which themselves hold at least a 10% stake in another company have to be excluded from the stock of direct investment capital in order to avoid double counting – these own participating interests are recorded separately as indirect FDI. This approach is not applied to dependent holdings without participating interests required to be reported or to minority-owned holdings with their own participating interests; see Lipponer (2003), p. 218, and Jost (1999), p. 144.

[19] To give an example, the inflow (exclusive of repatriated profits) for the year 1991 is calculated as follows:

$$\text{FDI Flow}_{1991} = \Delta\text{FDI}_{1991} + (\Delta\text{FA}_{1991} + (\Delta\text{FA}_{1990} + \text{FA}_{1989} * (1+\delta)) * (1+\delta)) * \delta,$$

where

$\Delta$FDI = difference between the "original" direct investment stocks in the reporting year and the previous year

FA = fixed assets * percentage share of assets (i.e. investor's share of capital)

$\delta$ = notional depreciation rate (8%)

[20] As was done, for instance, by Singh and Jun (1995), p. 11.

from dividends and other profits" relating to German outward FDI (as recorded in the German balance of payments statistics[21]) is used. For *indirect* participating interests, unfortunately, no such information is available.[22] For simplicity, a full profit transfer from the investment target to the holding company (by virtue of a corresponding agreement) is assumed.[23] Accordingly, total profits are subtracted from the indirect FDI capital in each year, yielding reinvested earnings as the difference between the following year's retained profits/profits brought forward and those of the current year. This difference is already reflected in the variation of FDI stocks across years.[24] A comparison of the flows derived from "raw" and adjusted differences in FDI stocks illustrates that while these deviations may not dramatically alter the econometric outcome, they can cause individual variables to gain or lose significance.[25]

### 2.1.3 Absolute and Normalized FDI Flows

The study uses a principal endogenous variable, *FDIGDP*, defined as outflows of German foreign direct investment to a given host country as a percentage of its GDP (both in nominal values (D-Marks)). The countries comprise the largest emerging market economies[26] in Latin America (Argentina, Brazil, Chile, Colombia, Mexico and Venezuela) as well as South and Southeast Asia (People's Republic of China, India, Indonesia, Republic of Korea, Malaysia, the Philippines, Singapore and Thailand). Given that larger economies have consistently been shown to receive larger FDI inflows (see section 2.2.1, market size), the above normalization is performed to eliminate size effects and thus to determine the linkage between FDI flows and the variations in external factors over and above absolute market size as implied by GDP. Correspondingly, estimations are centered on deviations from an implied average value of FDI flows and size of host countries. In addition, a related variable, *FDIFLOW*, is defined in absolute values, adjusted for inflation differentials and nominal exchange rate changes, i.e. the

[21] Deutsche Bundesbank, Statistical Supplement No. 3, Table 5b "Factor income – income from direct investment", column 2.

[22] See Jost (1999), p. 133.

[23] This adjustment was carried out for 993 out of 2941 positions (or 33.7%) at the sector-aggregated level.

[24] In principle, retained profits/profits brought forward would have to be subtracted in the case of newly acquired direct investment companies. However, it is only for 1997-1999 that such positions can be identified in the microdata by checking whether an investment target surfaces in the database the following year. This is no longer possible for the years 1989-1996 as data prior to 1996 have already been rendered anonymous. Therefore, in order to avoid additional bias due to incomplete adjustments, these equity positions are left unchanged.

[25] Referring to regressions in section 4, at the country level (Latin American sub-sample) the trade taxation variable drops from a 1% level of significance (unadjusted flows) to the 5% level (adjusted flows) while the reverse is true for the agglomeration variable. Similarly, at the sector level (Asian sub-sample), country risk and exchange rate volatility now lose their respective weak significance (otherwise significant at the 10% level if unadjusted), and trade barriers suddenly matter somewhat.

[26] Selection criterion: $\frac{1}{2} * (\text{real GDP}_{i,1990} + \text{real GDP}_{i,1999})$, at constant 1995 US dollars (World Development Indicators). The cut-off point was arbitrarily set at an average GDP of US$ 60 billion (next in line were Pakistan ($ 58.4 billion) and Peru ($ 50.0 billion)). Taiwan and Hong Kong were excluded owing to data insufficiencies.

FDI inflows are measured in constant 1990 US dollars.[27] In anticipation of quantitative results in section four, note that in the tentative regression for *FDIFLOW* (see Table 10, Appendix) size effects contained in the exogenous variables clearly govern the econometric outcome: for Latin America, only absolute real GDP, in addition to country risk, tested significant. The Asian sample also exhibits fewer significant variables than if the other and arguably more meaningful variable *FDIGDP* is used. Moreover, both regressions exhibit a comparatively low R-squared.

Apart from log-linearizing FDI stocks, use of normalized FDI variables (FDI inflows as share of GDP) is relatively widespread in the literature on foreign direct investment. Froot and Stein (1991), Singh and Jun (1995), Barrell and Pain (1999), Hausmann and Fernández-Arias (2001), Nookbakhsh et al. (2001), Mody and Murshid (2002) and Razin (2002) use the FDI to GDP ratio proposed in this study. Similarly, Pistoresi (2000), Chakrabarti (2001) and Nunnenkamp (2001b) link their FDI variable to host country population, i.e. per-capita FDI, while Lehmann (1999) computes country shares in total U.S. capital expenditures as an investment variable. Wheeler and Mody (1992) relate FDI in a given sample country to investment in an arbitrarily chosen numeraire country. Desai et al. (2003), while incorporating absolute GDP in their regressions, do not even bother to report the estimates for the market size variable because of the intuition that larger economies tend to receive greater volumes of foreign direct investment.

### 2.1.4 Descriptive Statistics

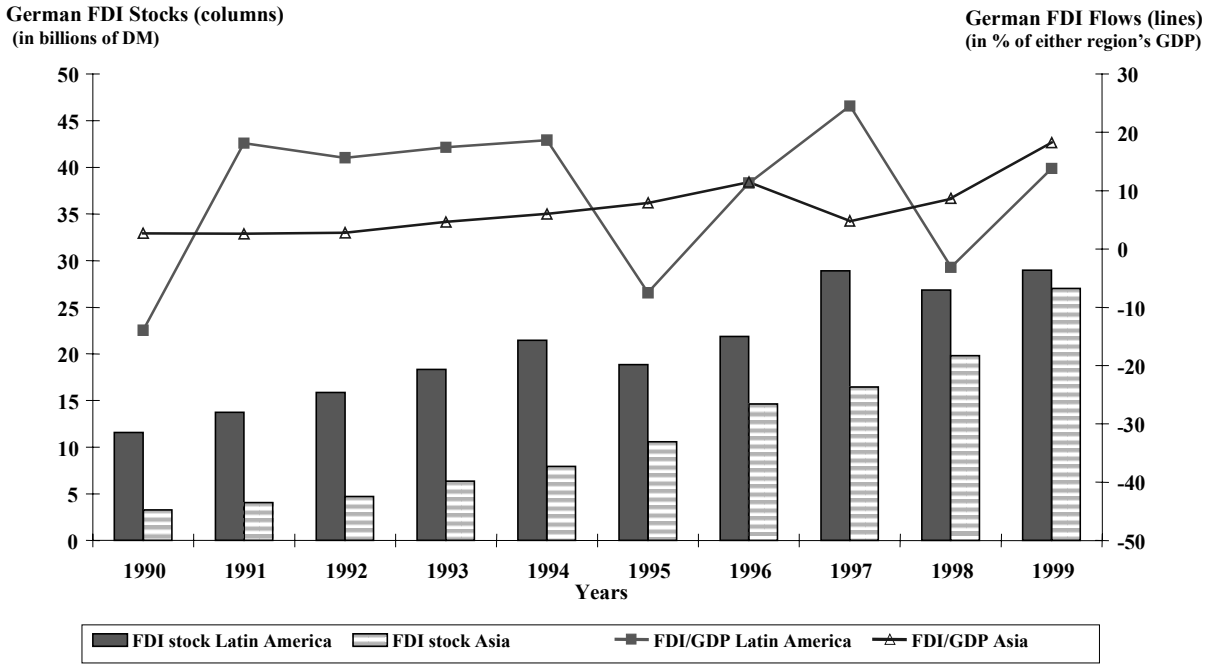
As Figure 1 shows, developments in the build-up of German FDI positions differed markedly between the two regions. Emerging from a small base, Asia experienced a pronounced, yet stable inflow of direct investment in the 1990s that eventually almost closed the huge initial gap to Latin America, which, partly due to the 1995 Mexican crisis, displays more volatile FDI flows. This fact corresponds to the fluctuations of global FDI flows to both regions.[28] The fast recovery from the Asian crisis, at least as far as FDI inflows are concerned, has to be credited to hurried liberalization efforts on the part of crisis countries in the region. For example, South Korea, formerly hesitant to allow foreign investors to exert a controlling influence, swiftly opened the economy to FDI after the crisis had hit. Other countries set in motion a wide range of structural reforms.[29]

[27] According to the adjustment method proposed by Pain (2003), p. 112.

[28] See Fernández-Arias and Hausmann (2001), p. 96.

[29] For example, Singapore: strengthening of competitiveness, Malaysia: reform of banking system, Thailand and Indonesia: institutional and regulatory reforms; see Thompson and Poon (2000), pp. 2-3.

**Figure 1: German FDI Stocks and Flows**

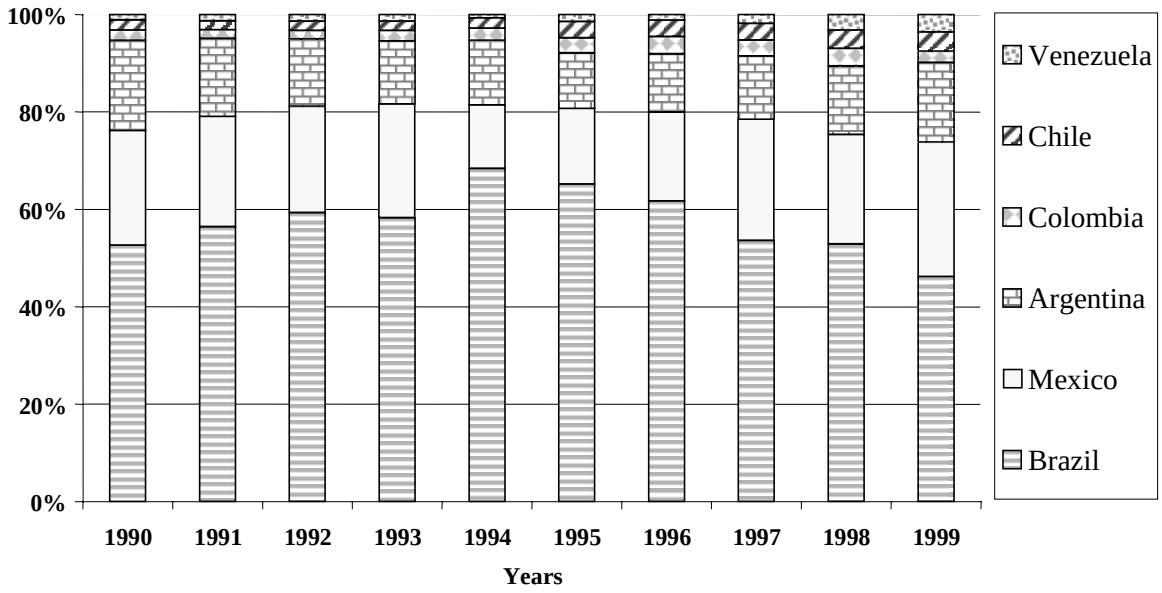



More importantly, though, reform *expectations* might have been the driving force behind rebounding FDI flows: Thompson and Poon (2000), surveying multinational companies operating in the ASEAN countries, show investors anticipated that reforms would bring about operational benefits at firm level, likely making the region a more attractive location for sales and production over the longer term. The long-term orientation of foreign investors taking controlling stakes in host country firms is the unique quality of FDI, according to Mallampally and Sauvant (1999), who observe that overall FDI flows to the five most affected Asian countries declined only slightly in 1997, contrasting sharply with negative flows for bank lending and portfolio investment. Mody and Murshid (2002) furnish evidence of the resiliency of FDI flows going to those emerging markets temporarily in distress. For flows to 60 developing countries between 1981 and 1998, they report a very significantly positive coefficient for a crisis dummy that captures the interaction between lagged crises and FDI inflows which points to the persistence of FDI inflows in the aftermath of a crisis relative to other flows.[30]

Within the regions, Latin America displays a relatively stable distribution of German FDI stocks throughout the 1990s, with Brazil's startling dominance reaching its maximum of two-thirds of total German FDI in the mid-1990s and receding thereafter (figure 2).

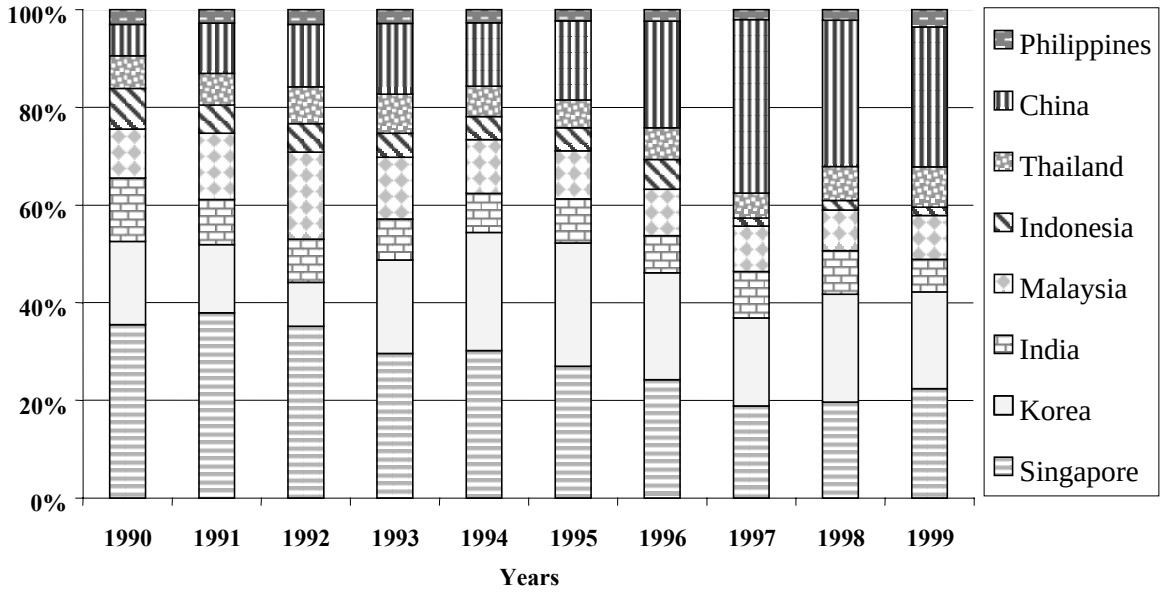
[30] See also Nunnenkamp (2001a), pp. 19-21, who reports much higher volatilities of portfolio and other investment (mostly bank loans) relative to FDI flows to 13 Latin American and Asian nations in the 1980s and 1990s.

**Figure 2: Distribution of German FDI Stocks Across Latin America**
**(in % of sample country total)**




In the Asian emerging markets, Singapore's traditional supremacy gradually gave way to China's FDI boom in the latter part of the decade (figure 3). In both regions, the distribution of FDI stocks is generally quite uneven across countries. This is especially true for Latin America where Brazil, Mexico and Argentina comprise roughly 90% of German FDI stocks.

**Figure 3: Distribution of German FDI Stocks Across Asia**
**(in % of sample country total)**



## 2.2 Exogenous Variables

In the vast FDI literature a great many explanatory variables are employed to explain cross-border capital flows. Over time, however, a distinctive set of factors frequently used in econometric modeling has emerged. Lim (2001), surveying the FDI literature, comes up with a list of seven important factors: size of the host market, agglomeration effects, factor costs, fiscal incentives, business/investment climate, trade barriers/openness, and economic distance/transport costs. The latter factor can be neglected in this study as the host countries included are all located overseas and thus more or less equally far away from the country of FDI origin, Germany. Theory and empirical evidence on the determinants cited above are reviewed in the following section (for details on the variables used see table 11, Appendix).

### 2.2.1 Traditional Variables

*Market Size/Level of Income*

Among the traditional variables, GDP or GDP per capita is widely used in the literature as a proxy for market size or purchasing power. Lim (2001) finds market size in terms of the size of the whole economy (absolute real GDP) or the level of income (GDP per capita) to be the most robust determinant, although both factors depict quite different market characteristics. In virtually all the studies surveyed, either indicator of market size is highly positively significant. This finding is validated by Chakrabarti (2001) for 18 studies in the past 30 years.

Since the endogenous variable is already scaled to GDP and as absolute real GDP, by virtue of favoring large populations, is a rather poor indicator of market potential, the paper includes GDP per capita, *GDPCAP*, following Chakrabarti (2001) who finds this variable strongly positively related to scaled (per-capita) FDI in an extreme bounds analysis (see section 3.2) for 135 countries in 1994.

*Wage Competitiveness*

Cost competitiveness – especially relevant for efficiency-seeking FDI – is probably best expressed by productivity-adjusted real wages, assuming that labor is largely immobile and labor costs therefore differ across countries, while other cost drivers such as capital and intermediate goods are traded on international markets with price-equalizing effects.[31] Moreover, measuring capital productivity is more difficult than deriving unit labor costs, due

[31] See Turner and Golub (1997), p. 7.

to the widespread unavailability of capital stocks at market values and capital goods price indices as suitable deflators.[32]

Among empirical studies, Barrell and Pain (1996) find a much smaller long-run elasticity for relative capital costs than for relative labor costs. Using unit labor cost indices, the authors also detect a positive relationship between U.S. unit labor costs relative to those abroad and the level of outward FDI, i.e. a negative impact of rising relative labor costs seen from the angle of the host countries. Hubert and Pain (1999) argue that unit labor costs already include – apart from deviations from average productivity levels – differences in labor quality. For this reason, Lehmann (1999) negates the necessity of including an educational attainment or "skill" variable when testing unit labor costs in his regressions. Mody et al. (1999) find for Japanese FDI in Asia that it is mainly driven by high-quality labor and not merely by cheap labor abroad, the coefficients of which are, in fact, insignificant. Measuring labor quality by secondary schooling rates may, as they argue, be misleading, as quality is more related to industrial experience – i.e. on-the-job performance – rather than formal educational attainments.[33] Also, one should not underestimate the time lag with which improvements in school enrollment are manifested in a more productive workforce. Testing for effects of secondary school enrollment on FDI inflows to 36 developing countries, Noorbakhsh et al. (2001) report strong significance for this skill variable – but only if productivity-adjusted wages are excluded from the regression. While educational attainment does seem to matter, this particular finding leads to the conclusion that a skill variable may not add a great deal of new information in the presence of labor productivity measures. By contrast, Wheeler and Mody (1992) and Wei (2000) find a positive relationship between wages (not productivity-adjusted) and FDI inflows to developing countries.

Here, the wage variable is *unit labor costs, ULC, which is defined as the labor costs per worker in manufacturing divided by the gross value added per worker in manufacturing*.[34] Ideally, weighted labor costs for all sectors of the economy should be used, but it is only for the manufacturing sector that data are available across all countries in the sample. Still, such a

[32] See Lipsey (2002), p. 36. Barrell and Pain (1996) were forced to leave out the Latin American region due to lack of reliable time series data on indigenous costs (p. 203).

[33] Survey results reported by the authors allegedly indicate that, despite lower secondary enrollment rates, labor quality in Thailand is higher than in the Philippines.

[34] This measure conforms to the definition recommended by the Federal Statistical Office (Statistisches Bundesamt). Yet, there are also other definitions. For example, Turner and Van 't dack (1993, pp. 87, 136-137) compute unit labor costs on the basis of total earnings of labor in manufacturing expressed in US dollars divided by value added in manufacturing at current prices expressed in constant purchasing power parity (PPP) rates. This ratio allows for relating labor costs to output per unit of time, with the resulting unit labor costs being expressed in terms of a common currency. The merit of this approach is that currency fluctuations influencing the value added are excluded. However, computing unit labor costs on this basis would require data on pure host country output (i.e. units produced per year) which is generally not available for less developed countries; see Turner and Van 't dack (1993), p. 91.

generalization is not uncommon in FDI research.[35] Barrell and Pain (1999) also use manufacturing unit labor costs for their *country-level* estimations, and later in their paper run a separate regression for Japanese FDI flows to *manufacturing* sectors abroad.

*Trade Barriers/Openness of the Economy*

Traditionally, direct investment was used by foreign firms to circumvent trade barriers ("tariff-hopping") and thus to establish market presence by physically erecting production facilities or buying existing ones abroad. It has been argued that host country governments will be more likely to establish trade barriers if a particular domestic industry facing import penetration is still at an infant stage or if the product life cycle is already beyond the hump.[36] On the other hand, incipient trade restrictions may prompt anticipatory or "quid pro quo" direct investment. In that sense, the possibility of FDI, or "threat of FDI", may limit the level of trade protection that the government can impose.[37] In the past, import protection instituted by host governments promised such high rates of return to foreign investors that the efficiency of the subsidiaries was not viewed as a major concern. However, as the majority of emerging economies have chosen to ease restrictions on imports, so-called "market-seeking" or "horizontal" direct investment is likely to have fallen over time[38] (greater openness coinciding with lower FDI inflows), giving way to "efficiency-seeking" or "vertical" direct investment that requires a liberal trade environment. This newer form of direct investment aims at exploiting sources of competitiveness such as lower (unit) labor costs, a skilled workforce or a more conducive business environment.[39] A high degree of openness is required for stimulating vertical FDI which relies on substantial flows of intermediate inputs and goods in and out of the host country. In sum, the overall impact of trade barriers is uncertain and depends on the nature of FDI (horizontal versus vertical) undertaken in each case.

While the case for trade barriers fostering FDI inflows appears quite convincing, the relationship between traditional openness measures and FDI is less clear. The "natural" openness or outward orientation of an economy can be thought of as the trade intensity absent any interventionist policy measures. Thus, the ordinary openness proxy, trade intensity in

[35] Unit labor costs are not widely available for services despite that sector's growing importance in emerging markets; see Turner and Golub (1997), p. 7.

[36] See Stehn (1992), p. 73.

[37] See Konishi et al. (1999), pp. 290-291.

[38] As Nunnenkamp (2001b) notes, FDI was formerly preferred to trade by resource-abundant countries for accessing large amounts of capital necessary for resource extraction and foreign technical skills unavailable at home. With the advent of trade liberalization and more integrated financial markets, "resource-seeking" FDI may have decreased in importance relative to joint ventures or arm's-length trade deals that make use of growing domestic expertise (p. 11).

[39] See Nunnenkamp (2001b), pp. 12-13, and also Mallampally and Sauvant (1999) who, in addition, list a third category: "resource/asset-seeking" FDI trying to capture host country advantages in raw materials, skilled labor, innovative assets or physical infrastructure.

terms of either share of imports or exports (or both) in GDP, constitutes a trade flow outcome measure and is confirmed as being influential for FDI inflows to developing countries by, for example, Noorbakhsh et al. (2001) and Hausmann and Fernández-Arias (2001). However, Pritchett (1997), Lehmann (1999), and Jost and Nunnenkamp (2002) propose that this type of openness measure be adjusted for structural, non-policy determinants of trade intensity such as geographic size, per-capita income or resource endowment.[40] Doing so, Lehmann as well as Jost and Nunnenkamp find a significantly positive impact of trade openness in panel estimations for developing countries, whereas Wheeler and Mody (1992) report a negative correlation of their openness measure (index by *Business International*) with relative FDI inflows to manufacturing sectors. At any rate, the overall flow of trade relative to domestic activity does not reveal the degree of trade distortion caused by other factors.[41]

Furthermore, non-tariff barriers, existing in the form of quantitative restrictions, subsidies to domestic producers, standards and regulations on import good characteristics, government purchasing policies and arbitrary customs procedures (commonly known as "red tape"), act in a trade-distorting manner. Evidently, many of the aforementioned incidents are difficult to measure quantitatively[42]; in particular, a cross-country comparison would appear "forbidding".[43] While price-impact measures (tariff equivalents, subsidy measures, effective rates of protection) undertaken by international organizations such as the OECD might provide an answer, there are numerous data and information problems in isolating the immediate impact of non-tariff restrictions, largely relating to the influence that market imperfections and exchange rate fluctuations exert on the price differentials surveyed.[44] Even if it were possible to comprehensively quantify non-tariff barriers to trade, the severity of the distortions would not be determined as those restrictions are generally not transparent in their operation.[45]

Pritchett (1997) cautions that none of those openness measures can compare trade policies both across countries and over time because each of them was constructed to compare countries during a different time period. This implies that they cannot plausibly used in a panel setting. Therefore, this study uses as a measure of trade barriers the *share of taxes on international trade in current government revenue*, *DUTY*, whereby a positive coefficient can be expected for horizontal FDI. This very definition is used by Singh and Jun (1995), who

[40] The aforementioned authors suggest the use of residuals from a trade intensity regression which employs structural country characteristics indicating the amount by which a country's openness differs from that expected for a country of its size; see, for example, Pritchett (1997), p. 312.

[41] See Pritchett (1997), p. 327.

[42] Barrell and Pain (1996) rightfully note in this context that "such barriers are notoriously difficult to measure, especially as the most effective barriers are those that are anticipated but not yet (if ever) implemented" (p. 202).

[43] See Pritchett (1997), p. 311.

[44] See Baldwin (1989), pp. 9-12.

[45] See Pritchett (1997), p. 309.

report it as significantly positively correlated to relative FDI inflows for a set of 31 developing countries. A similar measure, namely the average level of tariffs (UNCTAD data), is tested by Pritchett (1997) in regressions for 72 developing countries. It is the only variable to be significantly correlated to both the openness measure by Leamer (1988)[46] and an indicator of non-tariff barriers.[47] In addition, this study checks the validity of a *conditioned openness variable*, *OPEN*, i.e. modified trade intensity measured by the residuals of regressing the logs of GDP per capita and population on a given host country's trade intensity (imports and exports as share of GDP). The coefficient should be positive for vertical FDI.

*External Indebtedness*

Despite being an important indicator of a country's solvency often foreshadowing an imminent financial crisis, measures of foreign indebtedness are used in FDI research less often than for analyzing other capital flows. At the theoretical level, Ghura and Goodwin (2000) argue that a rising external debt ratio, indicating a debt overhang, induces economic agents to anticipate future tax liabilities to service the debt. If the integration of capital markets is rather low, the ensuing capital flight would then raise the domestic cost of capital. Apart from conceivable political reverberations, this effect is likely to negatively impact the overall profitability of foreign subsidiaries. Arguments from corporate finance theory[48] may be transposed to the macro level in the sense that a relatively high degree of risky debt may weaken a country's ability to realize growth possibilities via new investment. A valuable real option may be forgone if the additional investment and payments to bondholders (in case the option is exercised) exceed the value of the investment. On the other hand, if the debt level of the host country is still below a certain level perceived critical by investors, this consideration may not apply and FDI flows may actually increase with rising external indebtedness.

The aforementioned profitability argument is also put forward by Agarwal et al. (1991) who in addition advance the notion that unbearable indebtedness may lead to an arbitrary default on sovereign debt and, subsequently, to expropriations and restrictions on the capital account. The authors test their hypotheses empirically by including in their estimations for German FDI to developing countries in the 1980s a variable that proxies debt overhang. For lack of data on market valuation of emerging market debt, they, methodically questionably, employ the change in undifferentiated country risk[49] throughout the decade and find that, unlike

[46] Leamer (1988) constructs both an openness and a trade distortion index that measure deviations from trade flows predicted by a modified Heckscher-Ohlin-Vanek model, using data from 1982.

[47] See Pritchett (1997), pp. 318, 320, 324-325. The author uses as indicator or non-tariff barriers the import-weighted percent of tariff codes lines covered by various types of non-tariff barriers (licenses, quotas, prohibitions) as a percentage of all tariff code lines within the aggregate (p. 314).

[48] See, for example, Myers (1977), and there in particular pp. 155, 164-165.

[49] Risk index used is by *Institutional Investor*. To differentiate the supposed debt overhang variable from the one used for measuring country risk (see section 2.2.2), in that estimation only sample countries with initially favorable index ratings were included; see Agarwal et al. (1991), p. 81.

foreign investors as a whole, German firms did not restrict their exposure when country ratings plummeted. Among the few empirical studies to consider the level of external debt, Pistoresi (2000) reports a significantly negative coefficient for emerging markets' foreign debt per capita which is especially relevant for the Latin American sub-sample.

As the measure of external indebtedness carries only a minor weight in the composite PRS country risk rating (5%), a separate variable, *DEBT*, measuring the ratio of host country external debt to GDP, was added to the regressions in recognition of the postulated impact of rising indebtedness on FDI outcomes.

A further issue in the area of public finances relates to taxation. The case for measuring the negative influence of high corporate tax rates abroad appears clear: by depressing after-tax investment returns, high tax rates discourage FDI inflows. The problem with using statutory tax rates or the share of corporate tax receipts in GDP is that the former is generally biased upward because of numerous tax exemptions (apart from not being a good variable in a panel setting because of little variation from year to year) while the latter effectively measures government collection of taxes in a given year that may differ from the year in which German companies actually pay their taxes. Moreover, in the taxation literature effective marginal tax rates incorporating data on statutory corporate tax rates, inflation rates, depreciation allowances for assets and discount rates for financing are increasingly utilized. The obstacle to an empirical investigation of the distorting effects of fiscal policy on FDI is that these marginal tax rates are readily available only for industrialized or at best OECD countries as the computation of marginal tax rates for developing economies for cross-section applications is seriously hampered by data availability.[50] Hence, a taxation variable is omitted in this paper.

### 2.2.2 Non-Traditional Variables

This section gives an overview of the literature on non-traditional factors, with emphasis on the research previously undertaken in the area of governance.

*Country Risk/Political Risk*

Most studies reviewed here control for specific measures of host country political risk. Only some refer to a broader definition of country risk, as is the case in the aforementioned study by Jost and Nunnenkamp (2002). For example, Mody/Srinivasan (1998) find a strong correlation between country safeness (measured by the *Institutional Investor* index) and host country share of U.S. FDI outflows by means of the within estimator.

[50] See Easterly and Rebelo (1993), p. 6, and Mendoza et al. (1994), p. 2.

The issue of political risk has attracted more interest among researchers. In a pioneering paper Schneider and Frey (1985) furnish evidence that in emerging markets political and socioeconomic factors are relevant on top of the "classical" macro factors. As the authors show, estimation results for FDI inflows into industrial as well as developing countries are significantly improved if also controlling for governance variables such as political instability and the ideological thrust of government. Similarly, Beyer (2002) in a study of transition countries shows that the fit of his regressions improves when combining both economic and political variables relating to the base year of transition. The author finds political factors depicted by the *Freedom House* Economic Freedom Index or the efficacy of privatization bureaus to have great explanatory power. Stevens (2000), investigating plant and equipment spending of U.S. corporations in Mexico, Brazil and Argentina, shows that the inclusion of political factors detrimental to the operations and earnings of U.S. investors – occasional hostile attitude of government towards FDI, occurrence of a debt crisis, devaluations in a fixed-exchange-rate system, existence of exchange controls or repatriation restrictions – improves the regression's goodness-of-fit for Argentina greatly (R-squared rises from 0.19 to 0.90).[51]

"Headline" political risk, or rather the absence thereof, is found to be a driving factor of developing country FDI inflows by Singh and Jun (1995), who subject a composite variable merging six internal causes of political risk (as defined by *BERI*) to econometric testing. Brunetti and Weder (1997) examine the most prominent uncertainty measures in investment regressions using the same specifications while holding constant the sample of 60 countries as well as the time period (1974-1989). They find a number of categories (with individual variables) – government instability (revolutions), political violence (political executions/war casualties), political uncertainty (black market premium on foreign exchange, variation of real exchange rate distortion) – that are consistently significant at least at the 5 percent level and thus robust to changes in specification. Comparable insights are related by Pfeffermann et al. (1999) who evaluate survey data covering nearly 4,000 enterprises in 74 countries.

Within the set of political risk measures one can distinguish between corruption alias administrative deficiencies and governmental instability in the host country. The question of how devastating corruption can be is investigated by Wei (2000) who evaluates OECD data on industrial countries' FDI flows to 45 economies. Higher taxation and higher corruption are shown to reduce inward FDI by 4.8% and 26%, respectively (using the *Business International* risk index). The author asserts that corruption and political stability are negatively correlated, arguing that corruption may breed public discontent which may eventually topple the government or alternatively induce short time horizons among officials. Studying the impact of wide-spread corruption on the rate of private investment in developing countries, Everhart and Sumlinski (2001) find an indirect negative effect of corruption via the quality of public

[51] The regression for Brazil shows a lesser improvement; for Mexico the adjustment is only marginally positive.

investment. Put differently, any given level of public investment will be characterized by a higher quality than would be the case with a higher degree of corruption present.[52] As Lehmann (2002) argues, poor governance introduces asymmetric information, thereby raising agency costs of market participants incurred in dealing with supervisory agencies. Consequently, increasing capital costs obstruct inflows of FDI substantially.

Bubnova (2000) contends that corruption acts to prevent democratic development and results in poor infrastructure. In relating governance to risks facing private infrastructure investment (measured by spreads of emerging market infrastructure bonds) she identifies four clusters of strong positive relationships in the set of explanatory variables: in addition to economic performance and religion-induced tensions, which play a lesser role in the sample countries here, political factors include regulatory risk (corruption/bureaucratic delays/contract enforceability) and political disorder risk (domestic conflict/expropriation risk). Corruption and autocracy risk account for most of the bond spread variation. For a subset of weak-governance countries the political risk measure has the largest influence on the bond spread, and the R-squared is significantly higher than for the set of stable countries.

By contrast, Singh and Jun (1995) and Hubert and Pain (1999) fail to find significance for the occurrence of strikes[53] in developing and non-EU countries, respectively. The same goes for German FDI flows to developing countries in the 1980s, as shown by Agarwal et al. (1991). Singh and Jun do, however, report a significantly negative coefficient for strikes in a sub-sample of "low FDI countries" where standoffs are more frequent.

In light of this overwhelming evidence, the bottom line of research on governance issues is that high country/political risk does represent an obstacle to higher inflows of FDI capital. Accordingly, *several measures of country and, more specifically, differentiated political risk* are used here. The risk data were obtained from two professional providers of country risk estimates, the *Political Risk Services Group* (in short: PRS) with its International Country Risk Guide[54] and the business magazine *Euromoney* with its bi-annual country risk surveys.[55]

[52] See also Tanzi and Davoodi (2000), p. 12, who argue that poor public infrastructure due to corruption is likely to reduce private productivity and thus depress a country's growth prospects. Interestingly, the authors find that of 53 countries in the 1990s, those with high corruption tended to have a higher ratio of lawyers to engineers. Thus, they conclude: "Ceteris paribus, it would seem that a more corrupt society needs more lawyers" (p. 13).

[53] Number of work days lost in each of the host countries through strikes (Hubert and Pain) or industrial and civic strife (Singh and Jun); see Hubert and Pain (1999), p. 173, and Singh and Jun (1995), p. 16.

[54] The PRS Group uses estimates based on information collected by its own staff which results in the publication of 22 variables in three subcategories for 140 countries on a monthly basis. For more information see http://www.prsgroup.com/commonhtml/methods.html#_International_Country_Risk and, more specifically, http://www.icrgonline.com/icrgMethods.asp.

[55] See, for example, Euromoney (2000), pp. 106-109. As a political risk rating was added only in September 1992, no such variable could be derived from the Euromoney data. The country risk score is calculated using nine individual, weighted categories; for explanation of the different categories see Euromoney (1997), pp. 60-62. The individual scores are based on a survey of economists at leading financial and economic institutions.

Both indices assign high scores to "safe" countries. Far from being the only sources of country risk information,[56] these publications enjoy a good reputation among researchers (ICRG[57] used by Brunetti and Weder (1997), Lehmann (1999), Wei (2000), and Everhart and Sumlinski (2001); Euromoney data used by Ramcharran (1999) and Jost and Nunnenkamp (2002)) and supply continuous data for the relevant time period. Inevitably subjective, the survey data often provide the best information available on the less visible aspects of governance, and such perceptions are frequently as important as hard-to-obtain evidence.[58]

**Figure 4: Country Risk in emerging Latin America and Asia (regional averages)**

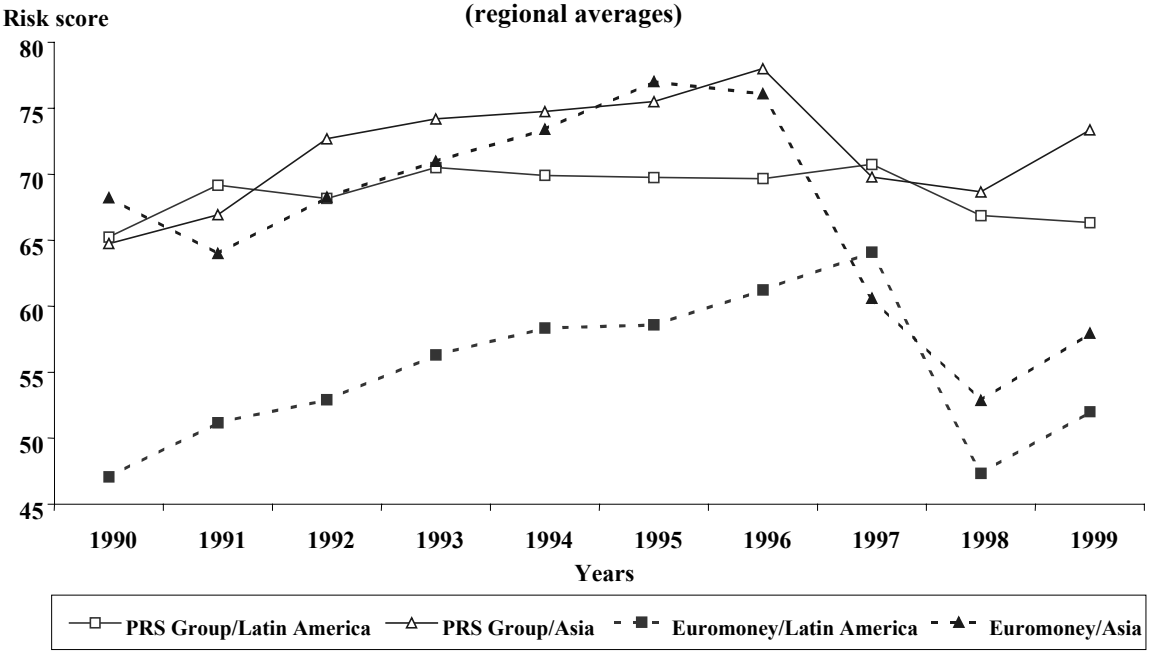



Figure 4 illustrates how country risk in both regions evolved throughout the last decade. Note that both country risk measures include the respective political risk rating. To isolate genuine macroeconomic risk, which, incidentally, could also be picked up by the variation in other variables, the variable *PRSERISK* was formed. Following the approach of Bubnova (2000)

[56] As already hinted at, there are in fact many more, such as *Freedom House*, *Business International*, *Transparency International*, to name just a few professional ones. Furthermore, risk indices have been developed by academics and international development institutions (such as the World Bank's Country Policy Institutional Assessment). Some of the risk indices could not be used in the first place, either because the period covered did not match this study's time frame or because the index did not report data for the emerging markets examined in this study.

[57] For example, Brunetti/Weder (1997) find PRS' corruption measure more comprehensive (and more significant) than that of Business International because the former does not focus on narrow business transactions but rather "asks whether high government officials are likely to demand special payments and whether illegal payments are generally expected throughout lower levels of government" (p. 14). Conversely, Wei (2000) criticizes that PRS does not reveal how the ratings are derived (p. 3). The PRS Group itself – at www.idrgonline.com/icrgMethods.asp – asserts that its measure of corruption is "more concerned with actual or potential corruption in the form of excessive patronage, job reservations, 'favor-for-favors', secret party funding, and suspiciously close ties between politics and business".

[58] See Bubnova (2000), p. 11. Inherent subjectivity makes comparisons of individual risk assessments difficult, inspiring Kaufmann et al. (1999) to embark on aggregating indicators from several sources into a meta index.

described above, in this paper the political risk dimension is further divided into subcategories of orderly business dealings, i.e. corruption and autocracy risks, called *PRSADMIN*, and of political disorder risks, *PRSSTAB* (see figure 5 for average political risk scores).[59] Grouping corruption and "red tape" due to their connectivity was brought up by Mauro (1995) as a more precise measure of corruption than corruption alone.[60]

Accordingly, the variable *PRSADMIN* can be thought of as a measure of administrative uncertainty surrounding official decisions that immediately affect foreign investors (at the "micro-level"). It involves subjective assessments of the degree of corruption (with a high rating meaning a low degree of "sleaze"), the quality of the bureaucracy (high score for countries where the bureaucracy has the strength and expertise to govern without drastic changes in policy or interruptions in government services), and the so-called investment profile (measuring risk of expropriation, restrictions on profit repatriation[61] and payment delays, again with high points for low-risk countries). This exact specification was tested by Pistoresi (2000) who, as expected, finds a significantly negative relationship between FDI inflows to a similar set of emerging markets and this combined administrative quality variable, which, in that case, depicts an inefficient and undependable bureaucracy.

The same result holds true in Pistoresi's estimations for a measure of political instability.[62] In this study, the corresponding variable *PRSSTAB* is composed of "macro-level" factors foreign firms have to put up with: the stability of the government (assessing both of the government's ability to carry out its declared programs and its ability to stay in office), the aspect of law and order (evaluating the strength and impartiality of the legal system as well as the degree of popular observance of the law), and the prevalence of internal conflict (the highest rating being given to countries without armed opposition to the government and absence of arbitrary governmental violence, direct or indirect, against its own people; lowest rating given to a country embroiled in an on-going civil war). Figure 5 describes the development of political risk scores and their sub-components across regions.

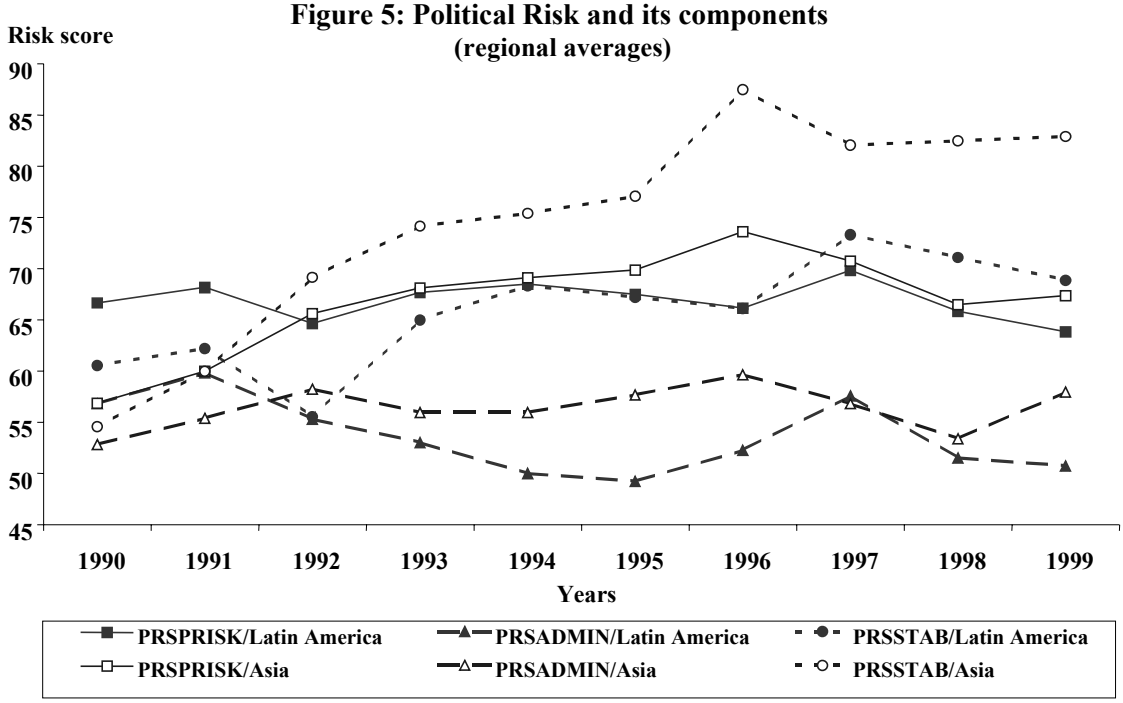
[59] Other subcategories of PRS' political risk measure – external conflict, socioeconomic conditions, military in politics, religion in politics, ethnic tensions, democratic accountability – were omitted because they largely pertain to developing countries and do not seem to play a decisive role in the countries assessed in this study.

[60] Wide-spread corruption may lead to further bureaucratic delay as a result of officials "dragging their feet" until receiving the expected bribe.

[61] The issue of repatriation restrictions facing multinational enterprises, a specific facet of political risk, is touched upon by Ihrig (2000) in a case study of US subsidiaries in Brazil between 1977 and 1991. The model she employs is able to capture the effect of such restrictions on capital investment and technology transfer to the Brazilian subsidiaries. Partial remittance restrictions are shown to cause multinationals to remit funds to the home country, whereas full blocking, logically, prompts reinvestment of funds. However, the Brazilian case suggests that countries who notoriously impose restrictions or threaten to do so can increase foreign capital investment if they credibly abolish these restrictions.

[62] Made up of six *Business International* indices; see Pistoresi (2000), p. 41.

**Figure 5: Political Risk and its components**
**(regional averages)**




*Agglomeration Effects*

There is considerable disagreement in the literature as to what exactly constitutes agglomeration. Some authors equate clustering effects of that kind with the size of the existing FDI stock (perhaps lagged) or "herding" of foreign firms, whereas others perceive the quality of the host country's infrastructure as a suitable proxy.[63] Positive spillover effects through the widespread establishment of foreign subsidiaries play a prominent role. Commonly, once a large multinational corporation sets up shop in one location, others will quickly follow suit ("follow-the-leader" effect). This is because foreign firms unable to enter in the same period as the leader does will incur a large welfare loss compared to a scenario where all firms enter more or less simultaneously. In the extreme, potential late entrants may not get a foothold in the market because of the productivity advantage already attained by the first mover.[64] Well-known examples of such positive agglomeration effects are typified by automobile production in Mexico or the Asian electronics industry[65] as well as high-tech manufacturing FDI in Ireland.[66]

In an innovate study on that issue, Wheeler and Mody (1992) check both factors – clustering of FDI inflows and quality of the infrastructure – on their validity for 42 developing *and*

[63] See Lim (2001), p. 7. As an example for quality-of-infrastructure-proxies, Razin (2002) finds a high positive significance of developing country telephone density for FDI inflows (p. 10).

[64] See Markusen (1990), p. 2

[65] See Lim (2001), pp. 5-6.

[66] Respondents to a survey among foreign investors in several technology-oriented manufacturing industries stated that their location decision was influenced by the fact that other key markets were already located in Ireland; see Barry and Bradley (1997), p. 1804.

industrialized countries. Both coefficients are of the same magnitude and highly significant for the manufacturing sector. The quality of infrastructure seems especially important for developing countries, and specifically the electronics industry. Mody and Srinivasan (1998) examine data on U.S. FDI to 35 countries and posit that the stock of past FDI is strongly positively correlated with current FDI inflows in all estimations, whereas the infrastructure variable (output of electricity per GDP) is found to be significant only if measured by the "between" estimator, having the authors conclude that only major infrastructure investment may act to attract investors. Lehmann (1999) uses lagged U.S. total investment as proxy for agglomeration and finds it to be significantly positive in all regressions. A first-mover effect is observed by Mody et al. (1999) in a strong partial correlation between a Japanese firm's plans to invest in elsewhere in Asia and its expectation of competitors having similar plans. Braunerhjelm and Svensson (1996) examine agglomeration effects on the industry level, regressing the relative share of a particular industry in total manufacturing employment. The results of a Tobit estimation imply that in terms of agglomeration "the more important the industry of the investing firm is in the host country, the more the firm's affiliate will produce in that country" (p. 837) or, interpreted differently, the higher the probability that FDI has occurred. Agglomeration effects are found to be most pronounced in high-tech industries.

The agglomeration variable used here, *AGGLO*, is defined *as the moving-three year average of contemporary and lagged total FDI inflows relative to respective host country GDP*. Note that this is not simply a partially lagged endogenous variable since it recurs to FDI flows from the rest of the world and not just Germany. The variable aims at capturing both first-mover advantage effects (by including contemporary flows) and the magnitude of privately supplied infrastructure abroad over the past couple of years.

*Corporate Financing Conditions*

Rarely used in empirical research, the varying availability of relatively low-cost internal financing should intuitively play a fundamental role in the magnitude and timing of corporate investment decisions, particularly with respect to efficiency-seeking FDI. Cushman (1985) includes a corporate cash flow variable which he lags by one year and finds significantly positively correlated to U.S. FDI to industrialized countries. Barrell and Pain (1996) add to their regressions for outward U.S. FDI lagged corporate profits (significantly positive).

The relevance of the level of corporate profits for Germany is underscored by Heiduk and Hodges (1992) in a case study of the investment activity of German multinationals. The authors purport that, given the higher volatility of foreign compared to domestic investment, German firms facing financial distress tend to trim FDI before they decrease domestic investment.

As using cash flows generated within the firm is arguably the most inexpensive way of financing investment, this study incorporates the *lagged aggregated cash flow of German firms normalized to total corporate assets, CFLOW*. Note that there is logically no variation across host countries such that the variable can be rendered significant only by fluctuations over time. Put differently, *CFLOW* resembles a time dummy of changeable magnitude.

*Real Exchange Rate (Volatility)*

There are opposing views on the impact of the real exchange rate (RER) on FDI inflows. An upward movement in the host country's RER may stir fear of protectionism among foreign investors and lead them to invest abroad in anticipation of additional trade barriers.[67] Conversely, Froot and Stein (1991) show that under credit rationing, i.e. imperfect capital markets, a (real) exchange rate depreciation induces foreign investors' wealth to rise, enabling them to outbid their competitors abroad for information-intensive assets having monitoring costs. Therefore, aggregate FDI flows will increase in proportion to a depreciation of the domestic currency.[68] Razin (2002) illustrates a similar wealth effect: foreign firms would be put at an advantage over domestic borrowers by being able to post more valuable collateral in borrowing from domestic banks.[69] Yet, as Ghura and Goodwin (2000) point out, the overall impact of a real depreciation is uncertain, as imported inflation raises the price of investment goods and consequently depresses investment.[70] In the arguably most relevant empirical investigation on exchange rate volatility with respect to this study, Goldberg and Klein (1997) find that a depreciation in the bilateral RER of large Asian countries to the yen attracts FDI inflows from Japan while FDI from the U.S. falls. Interestingly, U.S. flows do not react to changes in the bilateral RER to the dollar,[71] nor are there significant effects for the Latin American sub-sample. To avoid colinearity with the unit labor cost variable,[72] the main model forgoes a particular exchange rate variable in levels. However, the significance of the *bilateral real exchange rate, RER,* is tested in a separate regression excluding labor costs.

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[67] See Kosteletou and Liargovas (2000), p. 139

[68] See Froot and Stein (1991), p. 1202. This shift in relative wealth is caused by nominal exchange rate movements that not matched by domestic price level adjustments, rendering deviations from purchasing power parity possible.

[69] This effect naturally applies mostly to mergers and acquisitions and less to greenfield investment. However, the latter can be expected to grow, too, as (nominal) exchange rate depreciations – according to the "relative labor cost theory" – give foreign production a competitive edge in labor costs over domestic output and will thus lead to higher FDI inflows; see Kosteletou and Liargovas (2000), p. 139, and Goldberg and Klein (1997), p. 12.

[70] Generally speaking, a widely-perceived deviation of the real exchange rate from its estimated equilibrium level may affect long-run investment decisions via a shift in relative production costs; see Barrell and Pain (1996), p. 202.

[71] This may be due to the fact that real and nominal exchange rates of the sample countries were closely related as the observed weight of the US dollar in Asian currency baskets was often between 90 and 100 percent; see Goldberg and Klein (1997), p. 21. Hence, movements in RER to the dollar were either caused by very strong shifts in exchange rates to other currencies within the basket or by bilateral inflation differentials.

[72] This would expressly apply to those countries with fixed exchange rate regimes or de facto nominal exchange rate stability over the sample period.

It is, however, quite justified to look beyond pure *level* effects. The expectation of short-term changes in exchange rates may influence the timing of investment transactions: for example, firms may precipitate payments in currencies expected to appreciate.[73] In the area of exchange rate *volatility*, several theoretical studies show that higher variability is positively correlated with outward direct investment flows (Cushman (1985), Aizenman (1991, 1992)[74], Goldberg and Kolstad (1995), and Sung and Lapan (2000)). In a theoretical model based on the view taken in the real options literature, Sung and Lapan demonstrate that by erecting more than one production facility, i.e. opening another plant abroad, and postponing the decision as to where to produce, a multinational firm acquires a real option whose value increases with greater exchange rate fluctuations.[75] They posit that more volatile exchange rates induce the relative value of opening the foreign plant to rise. This contradicts the traditional view that firms would then reconsider foreign investment to reduce their risk exposure.[76] Depending on the degree of volatility, firms will open only the foreign plant or both.[77] Therefore, high exchange rate variability will promote FDI outflows to alternative production sites.

This hypothesis is confirmed by several empirical studies. Stockman and Vlaar (1996) observe that higher exchange rate volatility significantly increases the growth rate of Dutch FDI outflows.[78] A similar result is found by Hubert and Pain (1999) who test both real and nominal exchange rate fluctuations separately for German data and find that nominal exchange rate volatility negatively impacts FDI outflows, whereas the reverse holds for the real exchange rate. The latter finding is, as the authors point out, consistent with the production shifting hypothesis. Love and Lage-Hidalgo (2000), testing whether past volatility in the US$-peso rate affects FDI flows to Mexico, also report a strongly positive coefficient.[79]

In this study, exchange rate volatility is therefore modeled along the lines of Hubert and Pain (1999) by constructing a *two-year moving average of past real exchange rate fluctuations*. It is important to note that, contrary to some of the previously mentioned studies that simply

[73] See Barrell and Pain (1996), p. 205.

[74] Aizenman (1992) shows that under a flexible exchange rate higher volatility of monetary shocks induces disparities in the real wage at home and abroad, and thus induces geographic diversification via foreign direct investment, while concurrently lowering aggregate investment (pp. 909, 914).

[75] The real option's value is calculated as the expected value of additionally opening the plant abroad, i.e. value of the firm with both plants exclusive of the value of merely the home plant, minus the sunk cost incurred by opening the foreign plant. It is shown that the differential profits increase with higher exchange rate volatility; see Sung and Lapan (2000), p. 415, and, similarly on the real options argument, Aizenman (1992), p. 897.

[76] See Goldberg and Kolstad (1995), pp. 856-857.

[77] See Sung and Lapan (2000), p. 415.

[78] The authors do not specify whether they test nominal or real exchange rate fluctuations.

[79] Furthermore, Barrell and Pain (1996) find that an expectation of a depreciation in the host country's currency will postpone US investment. Cushman (1985) reports rising U.S. FDI to G7-countries in response to an increase in the standard deviation of the expected change in the real exchange rate. By contrast, Sin and Leung (2001) do not find a strong impact of the nominal exchange rate on flows to developing countries up to 1992.

first-difference the exchange rate, here volatility is measured as the variance of the indexed real exchange rate over past years, i.e. regardless of the direction of the individual change:

$$RERVOL_{i,t} = \sqrt{0.5\sum_{k=1}^{2}\log\left(\frac{RER_{i,t-k} - RER_{i,t-k+1}}{RER_{i,t-k+1}}\right)^2} \qquad \text{(I)}$$

where $RER_{i,t}$ is the real exchange rate between Germany and the i[th] country in a given year.[80]

*Structural Reforms*

Recent studies have been increasingly incorporating structural reform measures in FDI host countries. The intuition is that current or envisaged reforms in the regulatory realm will positively affect investment conditions for foreign firms over the longer term. However, during such adjustment periods FDI flows may actually dwindle, as is shown by Tuman and Emmert (1999) for Japanese FDI in 12 Latin American countries for the period 1979-1992. During a given year of implementing economic adjustments, the sample countries received an average of roughly $30 million less in FDI. Agarwal et al. (1991) fail to find a positive impact of lagged World Bank adjustment loans on total German FDI flows to developing countries.

A genuine measure of structural reform has been developed by Lora (2001, drawing on earlier work of 1997). This unique meta-index for Latin American countries consists of five subcategories (trade, financial, tax and labor market reforms, and privatization) measured by individual indices and now covers the period from 1985 to 1999. Lora himself does not subject his data to econometric testing, but Fernández-Arias and Montiel (2001) do so, exploring how structural effects, which the index measures, relate to growth in Latin America up to 1995. Reassuringly, they find that Lora's structural policy index contains independent information not already captured by four other stabilization regressors.[81] In fact, the index's coefficient is significantly positive and eliminates the unexplained excess of Latin American growth (low growth despite reforms)[82] observed in their baseline regressions. To test whether this holds true for the impact of structural reforms on FDI flows, Lora's recently updated index, called *STRUCT*, is included in the estimations for the Latin American sub-sample.

[80] Real exchange rates computed using consumer price indices. The RER itself is normalized to base year 1990. An increase in the RER denotes a real appreciation of the host country's currency. The variances are measured as the squared annual differences relative to the previous year. One could have used unit labor costs as indicator of the real exchange rate as proposed by Hubert and Pain (1999, p. 174) but doing so would mean neglecting changes in the nominal exchange rate and thus a greater degree of noise; see Barrell and Pain (1996), p. 202.

[81] These are: lower public consumption (relative to GDP), lower inflation, financial deepening (broad money to GDP), exchange rate unification (black market premium), and, allegedly, trade intensity (imports and exports to GDP, estimates not given); see Fernández-Arias and Montiel (2001), pp. 526, 529.

[82] This often-voiced "puzzle" is discarded by the authors "in the sense that unidentified region-specific factors depressed growth in Latin America during the 1990s, offsetting the large positive growth impetus of the reforms". They conclude that "the growth response of recent reform in Latin America – that is, its marginal effect – was adequate"; Fernández-Arias and Montiel (2001), pp. 543, 535.

# 3. Methodology

In the following sections, the estimation method selected for the study is described, followed by a presentation of the procedure of selecting robust variables and, finally, the econometric results at both the country and industry level.

## 3.1 Estimation Method

In principle, the parameters for each country could be estimated, however inefficiently, by ordinary least squares (OLS). Given the geographic proximity of the countries in question to one another, it would be a strong assumption that each cross section behaves entirely independent of the others, particularly given the fact that the model assigns the same parameter vector to all units (countries).[83] Therefore, the error terms in the FDI equations are likely to include factors common to all sample countries and thus to be correlated between cross sections at a given time. This supposition renders a pooled analysis of FDI data using the SUR[84] estimation method more efficient than applying OLS to each country separately since the common, immeasurable influences are accounted for. The SUR technique allows for integrating contemporaneous correlation by estimating the full variance-covariance matrix of the system's disturbance vector. This, of course, requires that the panel be balanced. Another prerequisite for using SUR estimation is that T be greater than N, otherwise the feasible GLS estimator cannot be calculated.[85]

To obtain general results for each region, only one coefficient per regressor is estimated (and the subscript of **ß** dropped). Thus, in the stacked form the regression model is:

$$\begin{bmatrix} \mathbf{y_1} \\ \mathbf{y_2} \\ \vdots \\ \mathbf{y_M} \end{bmatrix} = \begin{bmatrix} \mathbf{X_1} & \mathbf{0} & \cdots & \mathbf{0} \\ \mathbf{0} & \mathbf{X_2} & \cdots & \mathbf{0} \\ & & \ddots & \\ \mathbf{0} & \mathbf{0} & \cdots & \mathbf{X_M} \end{bmatrix} \boldsymbol{ß} + \begin{bmatrix} \boldsymbol{\varepsilon_1} \\ \boldsymbol{\varepsilon_2} \\ \vdots \\ \boldsymbol{\varepsilon_M} \end{bmatrix} \quad or \quad \begin{bmatrix} \mathbf{y_1} \\ \mathbf{y_2} \\ \vdots \\ \mathbf{y_M} \end{bmatrix} = \mathbf{X}\boldsymbol{\beta} + \boldsymbol{\varepsilon}. \qquad \text{(II)}$$

Under the assumption that the disturbances are uncorrelated across observations, the disturbance system becomes:[86]

[83] See Greene (2003), p. 333.

[84] Seemingly Unrelated Regressions. For a good overview on SUR techniques see Dielman (1989), pp. 29-47, Judge et al. (1988), pp. 444-468, or Greene (2003), pp. 340-362.

[85] See Greene (2003), p. 322. Larger sets of countries will therefore usually preclude using the SUR technique which fortunately is not the case in this study as T=10 (years) and N=6 or N=8 (countries).

[86] See Greene (2003), p. 341.

$$E\left[\boldsymbol{\varepsilon}_m \boldsymbol{\varepsilon}_n' \mid \mathbf{X}_1, \mathbf{X}_2, ..., \mathbf{X}_M\right] = \sigma_{ij}\mathbf{I} \qquad or$$

$$E\left[\boldsymbol{\varepsilon}\boldsymbol{\varepsilon}'\right] = \mathbf{V} = \begin{bmatrix} \sigma_{11}\mathbf{I} & \sigma_{12}\mathbf{I} & \cdots & \sigma_{1M}\mathbf{I} \\ \sigma_{21}\mathbf{I} & \sigma_{22}\mathbf{I} & \cdots & \sigma_{2M}\mathbf{I} \\ \vdots & \vdots & & \vdots \\ \sigma_{M1}\mathbf{I} & \sigma_{M2}\mathbf{I} & \cdots & \sigma_{MM}\mathbf{I} \end{bmatrix} \qquad \text{(III)}$$

where *n* and *m* denote the *n*th and *m*th equation, respectively, and **I** is the T×T identity matrix. As can be inferred from (III), the individual equations are linked only by their disturbances, hence "seemingly unrelated regressions." An efficiency gain exists because the pooling approach takes account of correlation between the error vectors and uses information on explanatory variables included in the system but excluded from the individual equation.[87] The greater the correlation of the disturbances, the greater the efficiency gain obtained by applying GLS. The GLS estimator in the SUR case, therefore, is:

$$\hat{\boldsymbol{\beta}} = \left[\mathbf{X}'\mathbf{V}^{-1}\mathbf{X}\right]^{-1}\mathbf{X}'\mathbf{V}^{-1}\mathbf{y}\,. \qquad \text{(IV)}$$

In addition, the SUR estimation with STATA provides for including a first-order autoregressive (AR(1)) process. In this case, the original data are transformed by adding to the residuals a lagged and weighted error term such that

$$\varepsilon_{i,t} = \rho_i\, \varepsilon_{i,t-1} + u_{it} \qquad \text{(V)}$$

which amounts to multiplying the variance-covariance matrix **V** by the transformation matrix $\mathbf{P}_i$ that removes the autocorrelation of the errors. Alternatively, only one common AR(1) coefficient $\rho$ may be estimated. With these, the SUR estimation method does, in a sense, contain dynamic elements which would substitute for a full-fledged dynamic estimation if, say, the common AR(1) coefficient were sufficiently small (less than 0.2, for example). Therefore, FDI panel data may be estimated by a static model if the influence of lagged coefficients and thus the dynamics of the source data are shown to be weak.

To test whether the off-diagonal elements of **V** are indeed non-zero, a likelihood ratio test, which is based on the likelihood ratio statistic[88]

$$\lambda = -2\left(\log L_r - \log L_u\right) = T\left(\log\left|\hat{\mathbf{W}}_r\right| - \log\left|\hat{\mathbf{W}}_u\right|\right) \qquad \text{(VI)}$$

[87] See Judge et al. (1988), p. 450.

[88] See Greene (2003), p. 349. A similar test of the null hypothesis of homoskedasticity is performed for each regression based on: $\lambda = -2\left(\ln L_0 - \ln L_1\right) = n \ln s^2 - \sum_{g=1}^{G} n_g \ln s_g^2$ where $s^2 = \frac{\mathbf{e}'\mathbf{e}}{n}$ and $s_g^2 = \frac{\mathbf{e}_g'\mathbf{e}_g}{n_g}$, with $g$ being the number of groups across which heteroskedasticity may occur; see Greene (2003), p. 236.

is used, where $\mathbf{W}_r$ and $\mathbf{W}_u$ are the residual sums of squares and cross-product matrices using the constrained and unconstrained estimators, respectively. The likelihood ratio statistic is asymptotically $\chi^2$-distributed with degrees of freedom equal to the number of imposed restrictions.

In sum, the SUR model allows for contemporaneous correlation of disturbances as well as first-order autocorrelation of the time series disturbances and cross-sectional heteroskedasticity. The log likelihood function will be instrumental in arriving at the correct specification of the final model, as will be shown in section four.

### 3.2 Selection of Variables

Section 2.2 has illustrated that a wide variety of potential exogenous variables have been tested in the literature. While the merits of using a theoretical model as a basis for estimating determinants of direct investment are obvious, this study nonetheless employs an ad-hoc estimation, which tests an array of variables that in the literature have previously been found to be crucial for FDI flows. The problem of converting structural approaches to modeling FDI into testable hypotheses lies primarily in the scarcity of economic data in developing countries, both across years and types of determinants. This shortcoming has led authors pursuing such an approach (*inter alia*, Lehmann (1999) and Stevens (2000)) to simplify their models, as the variables contained in the structural models were not readily available and thus needed to be substituted by proxy variables in the subsequent regressions. Hence, while most researchers would agree that apart from classical macroeconomic variables one has to account for location factors such as agglomeration effects or idiosyncratic "political" risks pertaining to the maintenance of property rights, it is less clear exactly which of these factors belong in the true regression in any one case.

Although ad-hoc estimations are used here, the approach to selecting the model variables is nonetheless structural in the sense that only those variables are that are found to be robust in an iterative procedure based on the Extreme Bounds Analysis (EBA), originally suggested by Leamer (1983, 1985), are included in the final model. This test, as modified by Levine and Renelt (1992), defines those variables of interest, *z*, as robust if, in a regression of the form

$$\gamma = \alpha_j + \beta_{yj} * y + \beta_{zj} * z + \beta_{xj} * x_j + \varepsilon \ , \qquad \text{(VII)}$$

they are always significant when combined with each of the other variables, with *y* being a vector of fixed ("free") variables that are always included and $x_j$ a vector of up to three variables taken from the pool of N variables. The EBA performs alterations in this subset $x_j$ to

find the widest range of coefficient estimates on the variables of interest *z*, which is then defined as *robust* if the lower extreme bound, being the lowest value of $\beta_{zj} - 2\,\sigma_{zj}$ (slope parameter minus two times the standard deviation), and the corresponding upper extreme bound, $\beta_{zj} + 2\,\sigma_{zj}$, are either both negative or both positive.[89] In other words, a statistical relationship between the FDI flow variable and a variable of interest *z* is deemed robust if the latter remains statistically significant at the five percent level with an unchanged sign when the conditioning set of variables is subjected to changes (see figure 6, Appendix, for further clarification). Otherwise, one has reason to lack confidence in the relationship with the endogenous variable. Such a variable of interest is to be called "fragile" because it does not display enough independent variation to explain cross-country differences in FDI.[90]

The method used in this study to arrive at the regression $\gamma$ differs from the proposed approach in that there is no vector of commonly used (fixed) variables in FDI research,[91] with the exception of market size, usually proxied by GDP or GDP per capita. The lack of universally acknowledged standard regressors thus calls for preselecting fixed variables, much in the same fashion as proposed for choosing the variables of interest, *z*. Accordingly, the set of fixed variables must first be determined by running the EBA solely with the variable of interest and the conditioning information set. In some cases this initial procedure will turn out only one robust variable in the "first round", which is then set as a fixed variable in the next round of regressions in order to find another variable that by virtue of this inclusion now becomes robust as well. Now having a "critical mass" of regressors in place, these *two* variables – not three, given the rather limited number of conditioning factors – will then be used in a "full" EBA to detect more robust factors.

Because of the normalization of the endogenous variable by relating it to GDP, market size has effectively been rendered negligible and thus *GDPCAP* is included to control for purchasing power in the host country. Even so, this variable should not routinely be assumed to be one of the fixed variables but must also be subjected to the Extreme Bounds Analysis.

[89] See Sala-i-Martin (1997), pp. 2-4. The author criticizes this test as too strong because only one regression in which the coefficient sign changes suffices to reject the variable in question, thereby almost guaranteeing that all of the variables tested are labeled as non-robust. He suggests to consider the distribution of the $\beta_z$ and use the fraction of the cumulative distribution function lying of each side of zero as robustness criterion. In the present study, however, the Extreme Bounds Analysis turns out to work nicely in accepting only a narrow number of truly robust variables.

[90] See Chakrabarti (2001), pp. 93-95.

[91] Mauro (1995) applies the Levine/Renelt approach and a similar one by Barro (1991) to growth rates of investment to GDP and includes as fixed variables GDP, population growth and secondary education. The two latter ones are, however, clearly non-standard in the FDI literature.

# 4. Econometric Results

## 4.1 Country Level

Following a "general-to-specific" approach, first a model that includes all explanatory variables is estimated. Subsequently, the list of variables is narrowed down to the ones found robust in the Extreme Bounds Analysis. In addition, alternative variables for risk, cost, and openness measure are estimated separately. The estimation outcome contains standardized coefficients $\beta_j^* = \beta_j (s_{xj}/s_y)$ with $s_{xj}$ being the standard deviation of the $j^{th}$ exogenous variable and $s_y$ the standard deviation of the endogenous variable.[92] As a double-log linear model allowing the coefficients to be interpreted as elasticities was not feasible due to the occurrence of negative FDI flows, this standardization allows for comparing the "weights" with which the individual variables enter the equation. The measure of goodness-of-fit has to be derived from the Wald test statistic and is therefore usually called "pseudo$R^2$".[93]

The regression results for Latin America in table 1 provide a number of valuable insights. Most importantly, it is shown that country risk clearly matters in the region. Both risk indices, *PRSCRISK* in (1) and *EMCRISK* in (2), are strongly significant with the expected sign and carry the greatest weight among the explanatory variables. Further decomposition of the risk aspect reveals that the economic risk measure, *PRSERISK*, if chosen instead of headline country risk is strongly positively significant and robust (coefficient = 0.3132, z-ratio = 4.68); upper bound: 0.0156, lower bound: 0.0068) as opposed to *PRSPRISK* (ß = 0.0606, z = 0.84). Among the political risk components, the index of administrative quality, *PRSADLEA* (replacing headline political risk) is significant and correctly signed (ß = 0.2084, z = 2.37), whereas *PRSSTAB*, measuring domestic stability, is negatively correlated with FDI inflows.

Second, German FDI in that region seems to have been geared towards tapping markets protected against imports[94] over the sample period since the tariff variable, *DUTY*, is robustly positively significant while *ULC*, an indicator of efficiency-seeking FDI, is not. In addition, agglomeration effects have clearly spurred German FDI flows with a view to securing market access in the face of strong competition from abroad. An alternative model (3) using the real exchange rate, *RER*, and the conditioned openness measure, *OPEN*, instead of unit labor costs

[92] For further reference see Pindyck and Rubinfeld (1981), pp. 90-91.

[93] See Greene (2003), p. 97, for derivation. Verbeek (2001), p. 182, discussing alternative measures to $R^2$, makes use of the likelihood ratio statistic (LR) which is asymptotically equivalent to the Wald test statistic (W). The Wald (or F-) statistic is related to pseudo$R^2$ as follows:

$$F \approx \frac{n}{K-1} * \frac{R^2}{1-R^2} \text{ and } (K-1) * F \approx W \approx LR. \quad \text{Therefore, } R^2 \approx \frac{W}{n+W}.$$

[94] For additional evidence (on the strategy of the German automobile industry) see Nunnenkamp (1998), p. 22.

and taxation of trade, respectively, worsens the fit of the regression compared to (1) as both alternative variables end up being insignificant.

**Table 1: LATIN AMERICA; Country Level**

FGLS estimation, with individual country effects, heteroskedastic with cross-sectional correlation
Dependent variable: *FDIGDP*; number of observations: 60

| | **(1)** | **(2)** | **(3)** | **(4)** |
|---|---|---|---|---|
| ***GDPCAP*** | -0.086<br>(-0.62) | -0.084<br>(-0.56) | -0.572<br>(-2.23)** | |
| ***PRSCRISK*** | 0.294<br>(5.75)*** | | 0.222<br>(3.28)*** | 0.273<br>(6.02)*** |
| ***EMCRISK*** | | 0.265<br>(2.55)** | | |
| ***ULC*** | 0.118<br>(1.05) | 0.159<br>(1.12) | | |
| ***RER*** | | | -0.090<br>(-0.71) | |
| ***DUTY*** | 0.174<br>(2.09)** | 0.202<br>(2.45)** | | 0.225<br>(4.12)*** |
| ***OPEN*** | | | 0.269<br>(1.04) | |
| ***DEBT*** | 0.028<br>(0.38) | 0.038<br>(0.35) | -0.304<br>(-1.95)* | |
| ***AGGLO*** | 0.183<br>(2.31)** | 0.168<br>(2.08)** | 0.361<br>(2.94)*** | 0.182<br>(6.63)*** |
| ***CFLOW*** | 0.028<br>(0.41) | 0.084<br>(1.72)* | -0.039<br>(-0.56) | |
| ***RERVOL*** | 0.076<br>(1.23) | 0.105<br>(1.49) | -0.044<br>(-0.66) | |
| **PseudoR$^2$** | 0.65 | 0.41 | 0.40 | 0.54 |

Note: z-values in parentheses; ***=significant at the 1% level, **=significant at the 5% level, *=significant at the 10% level

An unexpected result is found for Lora's structural reform index: contrary to the intuition, *STRUCT*, turns out to be robust (z-value: -4.75) if added to regression (1), and its inclusion improves the regression's fit considerably (pseudoR$^2$ rises to 0.75), leaving room for interpretation. Coinciding with the results of Tuman and Emmert, current crisis conditions might overshadow structural reforms whose beneficial impact may only take root in later periods.[95] However, lagging *STRUCT* by one period does not change the picture greatly (it remains significantly negative at the 1 percent level). Closer inspection of the data series reveals that there is a persistent improvement in index scores for almost all of the Latin

[95] On the other hand, as illustrated in section 1, even *expectations* of structural reforms suffice to prompt investment decisions. Therefore, one can expect actual reforms depicted in the index to contemporaneously affect decision-making.

American sample countries which contrasts sharply with the relatively high volatility of German FDI flows to the region. The negative correlation between FDI and the reform index could also owe something to the fact that index scores rose excessively in the early 1990s when a wave of privatization set in. This is true of all sample countries with the exception of Chile, whose privatization had already begun in the early 1980s.[96] Soaring scores are, however, not mirrored by German FDI flows to the region in the early 1990s, presumably because German firms participated less in the privatization process than did investors from other nations.[97]

The parsimonious "final" regression (4) shows that of the eight original variables, only three are robust according to the Extreme Bounds Analysis (see table 2). *PRSCRISK* and *AGGLO* having been selected by the initial procedure[98] as the two fixed variables, the following EBA produces only one more robust variable, namely *DUTY*. For Asia, the case is more clear-cut: *ULC* and *DUTY* test robust in the initial procedure, and subsequently *CFLOW* is found to be the only truly robust variable in addition.

**Table 2: Extreme Bounds Analysis – Country Level**

Fixed variables: Latin America – *PRSCRISK*, *AGGLO*; Asia – *ULC*, *DUTY*.
Regressions include the fixed variables plus one of those listed below (variables of interest) and three of the pool of remaining variables at a time. Bounds are derived from non-standardized coefficients.

| LATIN AMERICA | | | ASIA | | |
|---|---|---|---|---|---|
| Variable | Upper bound | Lower bound | Variable | Upper bound | Lower bound |
| ***ULC*** | 0.3739 | -0.1769 | ***PRSCRISK*** | 0.0645 | -0.0015 |
| ***DUTY*** † | 0.0236 | 0.0016 | ***GDPCAP*** | 0.0876 | -0.0197 |
| ***DEBT*** | 0.0026 | -0.0057 | ***DEBT*** | 0.0033 | -0.0003 |
| ***GDPCAP*** | 0.0934 | -0.5008 | ***AGGLO*** | 0.0045 | -0.0420 |
| ***CFLOW*** | 0.0244 | -0.0272 | ***CFLOW*** † | 0.0313 | 0.0019 |
| ***RERVOL*** | 0.2164 | -0.0890 | ***RERVOL*** | 0.0700 | -0.0454 |

† denotes robust variable as defined by the Extreme Bounds Analysis (in addition to the fixed variables listed above)

Regarding country risk, the outcome of the estimations for Asia paints a similar picture to the Latin American case (see the following table):

[96] See Birch and Braga (1993), pp. 122-123 and 126.

[97] See Nunnenkamp (1998), pp. 25-26.

[98] In fact, in the "first round" only *PRSCRISK* is found to be robust, while *AGGLO* (upper bound: 0.0525, lower bound: -0.0069 with *PRSCRISK* as the free variable) is the variable clearly "next in line" in terms of consistency. *AGGLO* is nonetheless a robust variable since an EBA using *PRSCRISK* and *DUTY* as fixed variables to bring about a critical mass of regressors now yields two positive bounds for *AGGLO* (upper: 0.0486, lower: 0.0021).

**Table 3: ASIA; Country Level**

FGLS estimation, with individual country effects, heteroskedastic with cross-sectional correlation
Dependent variable: *FDIGDP*; number of observations: 80

| | **(5)** | **(6)** | **(7)** | **(8)** |
|---|---|---|---|---|
| ***GDPCAP*** | 0.096<br>(1.42) | 0.093<br>(0.63) | 0.289<br>(2.85)*** | |
| ***PRSCRISK*** | 0.199<br>(2.54)** | | 0.119<br>(2.78)*** | |
| ***EMCRISK*** | | 0.231<br>(2.87)*** | | |
| ***ULC*** | -0.194<br>(-3.44)*** | -0.219<br>(-3.30)*** | | -0.221<br>(-6.61)*** |
| ***RER*** | | | 0.382<br>(10.45)*** | |
| ***DUTY*** | -0.234<br>(-3.69)*** | -0.228<br>(-3.28)*** | | -0.234<br>(-5.25)*** |
| ***OPEN*** | | | 0.153<br>(2.74)*** | |
| ***DEBT*** | 0.247<br>(2.61)** | 0.250<br>(2.67)*** | 0.436<br>(6.14)*** | |
| ***AGGLO*** | -0.409<br>(-3.50)*** | -0.009<br>(-1.67)* | -0.289<br>(-3.28)*** | |
| ***CFLOW*** | 0.117<br>(7.01)*** | 0.121<br>(5.00)*** | 0.060<br>(2.80)*** | 0.125<br>(4.60)*** |
| ***RERVOL*** | 0.042<br>(2.10)** | 0.013<br>(1.17) | 0.066<br>(3.16)*** | |
| **PseudoR$^2$** | 0.79 | 0.70 | 0.86 | 0.75 |

Note: z-values in parentheses; ***=significant at the 1% level, **=significant at the 5% level, *=significant at the 10% level

Again, both risk measures are significantly positive, with *EMCRISK* in this case being marginally more significant but likewise worsening the fit of the regression slightly. However, *PRSCRISK* is not a truly robust variable (minor violation of EBA, see table 2) and is thus omitted from the parsimonious regression in (8). The question as to what accounts for the non-robustness is answered by testing for the other risk sub-components. Even though, at first glance, *PRSERISK* is (with ß = 0.2936 and z = 4.70) as significant as in the Latin American sub-sample, it fails the EBA by a small margin (upper: 0.0085, lower: -0.0002) and as a result is, strictly speaking, non-robust. Headline political risk is again insignificant (*PRSPRISK*: ß = 0.0059, z = 0.98) while its sub-component *PRSADMIN* carries the expected positive sign (ß = 0.2324, z = 7.45) and, as opposed to Latin America, tests robust (upper: 0.0061, lower: 0.0009). Lastly, aspects of political stability cannot be shown to play a major role in the Asian sample countries (*PRSSTAB*: ß = -0.0597, z = -1.21).

Another important finding is that for Asia the signs of the coefficients for *ULC* and *DUTY* are reversed in comparison to Latin America, as both are significantly (robustly) negative. These results are clearly in line with the efficiency-seeking hypothesis as FDI in the Asian emerging markets was indeed driven by low costs and open borders to trade (*OPEN* significant and correctly signed in (7)). This interpretation is backed by the strong results for *CFLOW*, implying that the availability of low-cost financing does matter for investments in emerging Asia. Interestingly, *AGGLO* carries an unexpected negative sign. Evidence from the data series suggests that German multinationals tended to exhibit a counter-cyclical investment behavior. In some country cases they were the front-runners, well ahead of investments by the rest of the world. In others, they apparently "missed the boat", gaining access to markets much later than the average foreign investor. Finally, German companies reacted to the Asian crisis in a much more volatile manner than did other investors. At any rate, the agglomeration variable is not robust against the inclusion of other variables in the Asian case. The positive coefficient of *DEBT* should not come as a surprise considering the arguments put forward in section 2.2.1, because foreign debt ratios were lower on average and thus less critical than in Latin America.

*Specification tests* for the imposed restrictions – individual country effects, heteroskedastic error terms, cross-sectional correlation and within-group autocorrelation – were run one by one, with each additional restriction being compared to the one marginally less restrictive (e.g. merely heteroskedastic error terms). The statistics of the likelihood ratio test (see section 3.1 for derivation) of no individual country effects, solely homoskedastic error terms and no cross-sectional correlation consistently exceeded the critical values for the $\chi^2$-distribution, thus rejecting the null hypotheses. However, the hypothesis of no autocorrelation could not be rejected, corresponding to the result that $\rho$ was generally less than 0.10.

To check whether regional country sample ought to be estimated separately, a t-test is applied to the sub-samples of Latin America (superscript: 1) and Asia (superscript: 2) , see equation (VIII) below. To test the null hypothesis that the two coefficients are identical, the t-statistic

$$t = \frac{\hat{\beta}_j^1 - \hat{\beta}_j^2}{\sqrt{\sigma^2(\hat{\beta}_j^1) + \sigma^2(\hat{\beta}_j^2)}} \qquad \text{(VIII)}$$

is put to use.[99]

[99] The general expression for the t-ratio is: $t_k = \frac{b_k - \beta_k}{\sqrt{s^2 S^{kk}}}$; see Greene (2003), p. 51.

If the absolute t-ratio is larger than 1.96, the null hypothesis of equal coefficients is rejected, implying that separate, i.e. region-wide, testing is called for.

**Table 4: Testing for Joint Estimation of Coefficients**

| Variable | t-ratio |
|---|---|
| ***GDPCAP*** | -0.80 |
| ***PRSCRISK*** | 3.20* |
| ***ULC*** | 2.90* |
| ***DUTY*** | 2.97* |
| ***DEBT*** | -0.76 |
| ***AGGLO*** | 3.87* |
| ***CFLOW*** | -1.57 |
| ***RERVOL*** | 0.70 |

* denotes rejection of hypothesis

The finding that the test statistics for four out of eight variables are strongly significant (see table 4) indicates that estimating FDI flows to the two continents separately is indeed the appropriate procedure. The clearly insignificant t-ratios for the three remaining variables are due to non-robustness of the variables themselves in both regional cases (*GDPCAP*, *DEBT*, *RERVOL*) and should be disregarded accordingly.

## 4.2 Sector Level

Making use of the firm-level data available in the Bundesbank FDI stock statistics, the above country-level regressions are re-estimated for the manufacturing sector and several of its sub-industries to check for the influence of sectoral GDP per capita, and sectoral labor costs, and in the case of sub-sectors, the relationship between capital intensity and political risk. While it would have been interesting to investigate other sectors of the economy such as agriculture or services, data on labor costs in those sectors are available only for some sample countries.

### 4.2.1 Manufacturing Sector

Inevitably, econometric work on individual emerging market industries suffers from scarcity of comparable sectoral data. Apart from the unit labor costs already utilized in the previous regressions, manufacturing GDP abroad and sector-specific cash flows of investing German manufacturers are the only readily accessible data at the industry level. As there was no

compelling reason to exclude individual country-level factors, the whole set of remaining "global" variables was included to control for economy-wide effects. Again, an Extreme Bounds Analysis was performed to identify robust variables (see table 5).

**Table 5: Extreme Bounds Analysis – Manufacturing**

Fixed variables: Latin America – *GDPCAP, PRSCRISK*; Asia – *GDPCAP, AGGLO.*
Regressions include the fixed variables plus one of those listed below (variables of interest) and three of the pool of remaining variables at a time. Bounds are derived from non-standardized coefficients.

| LATIN AMERICA | | | ASIA | | |
|---|---|---|---|---|---|
| Variable | Upper bound | Lower bound | Variable | Upper bound | Lower bound |
| ***ULC*** | 1.4634 | -3.6386 | ***PRSCRISK*** | 0.0036 | -0.0102 |
| ***DUTY*** | 0.1184 | -0.0866 | ***ULC*** † | -0.1963 | -0.9032 |
| ***DEBT*** | 2.5657 | -3.0846 | ***DUTY*** † | -0.0047 | -0.0278 |
| ***AGGLO*** | 0.4667 | -0.0701 | ***DEBT*** | 0.1113 | -0.4024 |
| ***CFLOW*** | 0.1125 | -0.2455 | ***CFLOW*** † | 0.1012 | 0.0393 |
| ***RERVOL*** | 1.4781 | -0.3341 | ***RERVOL*** | 0.0063 | -0.3311 |

† denotes robust variable as defined by the Extreme Bounds Analysis (in addition to the fixed variables listed above)

By and large, the estimation results for the whole manufacturing sector (see table 6) do not differ greatly from those found at the country level. Again, the PRS country risk variable turns out to be robustly positive for the Latin American sub-sample, being joined in this respect by *GDPCAP* (significantly negative), while *AGGLO* and *DUTY* lose their previous significance. For Asia, all variables found robust at the country level as well as *AGGLO* and *GDPCAP* pass the robustness check for the manufacturing sector. Interestingly, while *PRSCRISK* and *RERVOL* now display a negative sign for that region, *GDPCAP* becomes highly significantly positive, carrying by far the greatest weight in the regressions. The joint significance of unit labor costs and per-capita GDP indicates that while "cheap labor" is an important determinant of FDI flows from Germany, the Asian manufacturing market is an attractive location for German investors in its own right.

Specification tests yielded results comparable to those at the country level, except for the one on autocorrelation in the Latin American sample. For regressions (9) and (10), the hypothesis of no autocorrelation in the residuals was rejected – a logical result given a common AR(1) coefficient of $\rho$ = -0.201. Accordingly, the estimations for the Latin American sample include the aforementioned adjustment mechanism to incorporate first-order autocorrelation.

**Table 6: LATIN AMERICA / ASIA: Manufacturing**

FGLS estimation, with individual country effects, heteroskedastic with cross-sectional correlation
Dependent variable: *FDISEC*; number of observations: 60 / 80

| Variable | LATIN AMERICA | | ASIA | |
|---|---|---|---|---|
| | **(9)** | **(10)** | **(11)** | **(12)** |
| ***GDPCAP*** | -0.435<br>(-2.32)** | -0.109<br>(-2.48)** | 1.206<br>(13.72)*** | 0.984<br>(8.34)*** |
| ***PRSCRISK*** | 0.218<br>(3.13)*** | 0.160<br>(3.97)*** | -0.094<br>(-3.90)*** | |
| ***ULC*** | -0.221<br>(-1.39) | | -0.092<br>(-3.87)*** | -0.153<br>(-5.72)*** |
| ***DUTY*** | 0.076<br>(0.83) | | -0.301<br>(-6.95)*** | -0.161<br>(-3.24)*** |
| ***DEBT*** | -0.019<br>(-0.24) | | -0.098<br>(-2.60)** | |
| ***AGGLO*** | 0.214<br>(2.03)** | | -0.412<br>(-5.82)*** | -0.419<br>(-5.18)*** |
| ***CFLOW(sec)*** | -0.072<br>(-1.22) | | 0.138<br>(7.09)*** | 0.138<br>(6.09)*** |
| ***RERVOL*** | 0.048<br>(1.05) | | -0.096<br>(-6.31)*** | |
| **PseudoR$^2$** | 0.32 | 0.32 | 0.97 | 0.86 |

Note: z-values in parentheses; ***=significant at the 1% level, **=significant at the 5% level, *=significant at the 10% level

### 4.2.2. Sub-Sectors in Manufacturing

It has been argued that capital-intensive industries – measured by fixed investment per employee – are more sensitive to shifts in political risks because of considerable plant-specific sunk costs. Agarwal et al. (1991, p. 85) contend that "the risk of selective expropriation is related to the technological diversity of FDI that renders industry-specific factors important for the expropriation decision." Lehmann (1999, p. 20), studying the capital expenditures of U.S. affiliates in the chemical and electronics sectors of lower-income countries, finds that the coefficient of political risk is larger for the relatively capital-intensive chemical industry. This finding along with other evidence[100] appears to be consistent with the real option theory that stipulates the negative influence of an restrictive investment regime on investment decisions of foreign investors. According to Lehmann's model, investors face an incentive to delay an investment abroad the greater the taxes on local production and the higher the probability of a reversal of initial investment liberalization. Therefore, a credible

[100] Among studies of sectoral FDI flows, Froot and Stein (1991) find negative correlations between FDI inflows to 13 US separate industries and the real value of the US dollar. The result for the (capital-intensive) chemical industry turns out to be the strongest within the manufacturing sector.

policy with regard to maintaining a favorable investment environment is needed to stimulate firm owners to go ahead with sizable capital expenditures. Viewed from this angle, it is clear that political risk will exert a negative stimulus to investment in cases of large entry costs in terms of outlays for plant construction.[101] On the other hand, so-called footloose industries such as electronics with comparatively low set-up costs and, correspondingly, high locational flexibility will favor a cost-efficient production environment, i.e. good infrastructure and low labor costs. In turn, as such investment is vertical in nature and re-export of assembled products is intended, host country market size or purchasing power should be of secondary importance.[102]

German firm-level investment data confirm Lehmann's observation of sizable differences in capital endowment per worker, as can be inferred from the following table:

**Table 7: Capital Intensity of German Manufacturing Industries in the Sample Countries**

| Region | Industry | Average fixed assets per worker (thousands of DM) |
|---|---|---|
| **Latin America** | Chemicals (CHE) | 71,230 |
| | Information/communication technologies (ICT)[103] | 33,632 |
| | Machinery and equipment (MAE) | 43,586 |
| **Asia** | Chemicals (CHE) | 73,012 |
| | Information/communication technologies (ICT)[103] | 35,553 |
| | Machinery and equipment (MAE) | 29,449 |

Thus, the chemical sector is compared to each of the other two industries in terms of the significance of the appropriate political risk variable. Here, *PRSADMIN* is selected because it depicts the occurrence of unfavorable action by the host country's authorities to the immediate detriment of investors. Worsening scores should act as a deterrent to FDI flows of capital-intensive industries. Along the lines of the above sector estimations, regressions are run for the three sub-sectors listed above, using as controls the same country-level exogenous variables with the exception of sub-sector cash flows and wages. Unit labor costs had to be replaced by real wages as information on sub-sector productivity was not available.[104]

[101] See Lehmann (1999), p. 9.

[102] See Wheeler and Mody (1992), p. 69.

[103] Including the sub-sector "Manufacturing of equipment for the production and distribution of electricity".

[104] This certainly represents a limitation, and at first glance this bias seems to enter into the results of the sub-sector regressions for Latin America with *RWAGE* being significantly positive in each case (see table 8). However, tentative regressions for Latin America (not shown here) incorporating real wages *adjusted for overall growth of value added in manufacturing* (i.e. not differentiated by sub-sector, which also adds a certain bias) did not reveal major differences to the regressions reported in table 8: the coefficients of *RWAGE* for CHE and MAE

The regression results in tables 8 and 9 confirm the hypothesis that investors in capital-intensive industries react more decisively to variations in the investment climate than do those in the more labor-intensive information/communication technology (ICT) sector. In both regions, the regression coefficients on administrative risk confirm the postulated differences between chemical and the other two sectors, perhaps with the seeming exception of ICT in Latin America for which the coefficient is significant at the 5 % level. Still, the hypothesis holds as the standardized beta coefficient for the chemical sector is twice as high as the one for ICT, apart from the slight difference in significance levels. The results for MAE consistently conform to the hypothesis with the outcome being insignificant in both cases. No clear pattern emerges for the other control variables which may owe something to the possibility that country-level variables may not pick up characteristics of the sub-sectors.

**Table 8: Sub-Sector Level – LATIN AMERICA**

| FGLS estimation, with individual country effects, heteroskedastic with cross-sectional correlation<br>Dependent variable: *FDISUBSEC*; number of observations: 60 | | | |
|---|---|---|---|
| | **(13) CHE** | **(14) ICT** | **(15) MAE**[105] |
| ***PRSADMIN*** | 3.427<br>(3.57)*** | 1.686<br>(2.22)** | 0.391<br>(0.94) |
| ***GDPCAP*** | 0.573<br>(0.27) | 2.488<br>(1.50) | -0.122<br>(-0.12) |
| ***RWAGE(subsec)*** | 6.673<br>(3.71)*** | 7.712<br>(2.45)** | 2.680<br>(2.53)** |
| ***DUTY*** | -0.152<br>(0.19) | 0.849<br>(0.50) | 1.207<br>(2.67)*** |
| ***DEBT*** | -0.427<br>(-0.73) | -2.070<br>(-2.08)** | 0.741<br>(1.89)* |
| ***AGGLO*** | -3.155<br>(-2.88)*** | -2.159<br>(-2.79)*** | 0.009<br>(0.02) |
| ***CFLOW(subsec)*** | 0.793<br>(0.87) | -0.151<br>(-0.32) | -0.452<br>(-1.11) |
| ***RERVOL*** | 1.606<br>(2.44)** | 0.316<br>(0.42) | -0.168<br>(-0.54) |
| **PseudoR$^2$** | 0.61 | 0.36 | 0.31 |

Note: z-values in parentheses; ***=significant at the 1% level, **=significant at the 5% level, *=significant at the 10% level

kept their positive significance levels, and only the coefficient for ICT, while remaining positive, turned insignificant.

[105] As in regressions (9) and (10), the hypothesis of no autocorrelation in the residuals was rejected ($\rho$ = -0.384). Hence, the estimation for MAE in the Latin American sample countries again includes adjustment for first-order autocorrelation.

**Table 9: Sub-Sector Level – ASIA**

FGLS estimation, with individual country effects, heteroskedastic with cross-sectional correlation
Dependent variable: *FDISUBSEC*; number of observations: 50/60 (see below)

| | **(16) CHE** | **(17) ICT** | **(18) MAE** |
|---|---|---|---|
| ***PRSADMIN*** | 2.181<br>(3.34)*** | 0.109<br>(0.75) | -0.664<br>(-1.12) |
| ***GDPCAP*** | 3.669<br>(1.49) | -0.322<br>(-0.39) | -1.680<br>(-0.56) |
| ***RWAGE(subsec)*** | 0.595<br>(0.20) | 2.102<br>(1.66) | -6.870<br>(-1.86)* |
| ***DUTY*** | 5.473<br>(2.80)*** | 0.651<br>(1.99)* | -1.253<br>(-1.04) |
| ***DEBT*** | 6.091<br>(4.86)*** | 0.364<br>(1.56) | -1.850<br>(-2.72)*** |
| ***AGGLO*** | 3.021<br>(1.69)* | -1.568<br>(-2.43)** | 5.723<br>(2.98)*** |
| ***CFLOW(subsec)*** | 0.032<br>(0.07) | -0.896<br>(-4.90)*** | 0.117<br>(0.25) |
| ***RERVOL*** | -1.245<br>(-2.01)** | -0.188<br>(-2.34)** | 2.028<br>(5.85)*** |
| **PseudoR$^2$** | 0.56 | 0.68 | 0.61 |
| **Number of observations** | 50 | 60 | 50 |
| **Sample countries** | India, Korea, Malaysia, Philippines, Thailand | India, Korea, Malaysia, Philippines, Singapore, Thailand | India, Korea, Malaysia, Philippines, Singapore |

Note: z-values in parentheses; ***=significant at the 1% level, **=significant at the 5% level, *=significant at the 10% level

## 5. Conclusion

The contribution of this study to the FDI literature lies in an innovative definition of an investment flow variable and in the affirmation that the issue of country risk does matter in the case of German FDI flows to Latin American and Asian emerging markets in the 1990s. As to the former, the endeavor to virtuously combine fully-consolidated FDI data from the Bundesbank stock statistics with the evident merits of considering flow data has yielded a quasi-flow variable embodying first differences of annual direct investment stocks corrected for effective participation rates, previously included balance-sheet depreciation and subsequently repatriated profits. Put plainly, this new variable seeks to emulate overall FDI flows – unavailable from the balance of payments – at near-market prices and pursuant to the IMF's directional principle as well as the comprehensive OECD benchmark definition of foreign direct investment.

Regarding empirical results, the regression outcome for the size-adjusted FDI flow variable confirms the widely-held hypothesis that a high degree of economic and political risk is detrimental to cross-border equity participation. Aiming to put this verdict on a broader foundation, the study uses two professional country risk indices, both of which turn out to be highly significant for the Latin American and Asian sub-samples. This finding thus confirms the presumption that international investors indeed perceive impending changes in the macroeconomic and regulatory environment. Subdividing country risk into its components, it is found that economic risk represents the main driving force behind this unequivocal result, whereas the evidence for headline political risk is best described as erratic owing to its disparate individual elements. While, for both regions, the measure of administrative quality alias corruption and malfeasance by the host government is consistently strongly associated with marginal FDI inflows, the variable of host country political stability turns out insignificant or even displays a negative sign. Investors' dislike of unwarranted government behavior, inter alia excessive payment of bribes, restrictions on intra-company transfers or outright expropriation, is especially pronounced in the Asian sample countries, with the administrative risk variable being robust against the inclusion of other controls.

With respect to these control variables, the regression results differ markedly between the two regions. In Latin America, FDI inflows throughout the last decade are to be called "market-seeking" in that German firms were apparently impelled to establish a presence abroad by the necessity to overcome critical host country tariff barriers and, in a sense, to react in a timely manner to rising direct investment on the part of foreign competitors. By contrast, German multinationals accessing the Asian markets seemed to have been in search of low labor and financing costs as well as an open trade regime since their direct investment is clearly vertical in nature. These differences cause a test on identity of coefficients between regions to be

rejected, implying that factors determining FDI flows have differed between Latin America and Asia. Hence, as far as Germany is concerned, there does not seem to be a unique pattern of foreign direct investment across regions of emerging market economies. Incidentally, real exchange rate volatility apparently propelled German FDI in Asia, and, in fact, in none of the country-level regressions does this measure end up being significantly negative. These findings tend to strengthen the hypothesized positive impact of exchange rate fluctuations on the willingness of investors to establish production facilities abroad.

In addition, the availability of firm-level data allows for sectoral and sub-sectoral analysis. FDI flows to manufacturing sectors abroad generally mimic the characteristics of those at the country level with the main exception of GDP per capita being negatively related to inflows to Latin America and strongly positively related to those to Asia. Moreover, the measure of trade barriers loses its significance in the Latin American sample, while for the Asian countries the agglomeration variable now also passes the robustness test. Lastly, the hypothesis that capital-intensive industries react more strongly to deteriorating investment conditions is confirmed by German data, as the administrative political risk variable carries strongly positive coefficients in the regressions for the capital-intensive chemical sector in both regions while those for the labor-centered information/communication technology industry are found to be insignificant each time.

In sum, researchers studying foreign direct investment in emerging market economies ought to take increased account of non-traditional variables such as country risk or agglomeration effects. The econometric results of this study affirm that the discernible trend towards factoring in measures of the regulatory environment facing foreign investors is clearly called for. As “soft” locational factors become more material in the eyes of investors, analyses incorporating qualitative assessments of host countries are likely to gain further prominence in FDI research.

# Appendix

**Table 10: Absolute FDI-Flows, LATIN AMERICA/ASIA; Country Level**

FGLS estimation, with individual country effects, heteroskedastic with cross-sectional correlation
Dependent variable: FDIFLOW; number of observations = 60 (Latin America), 80 (Asia)

| | **LATIN AMERICA** | **ASIA** |
|---|---|---|
| ***GDP*** | 401467.1<br>(2.32)** | 804215.1<br>(5.38)*** |
| ***PRSCRISK*** | 161743.85<br>(2.46)** | 622329.8<br>(7.76)*** |
| ***ULC*** | 128567.9<br>(1.46) | 54335.3<br>(0.71) |
| ***DUTY*** | 84559.7<br>(0.95) | 203260.0<br>(1.49) |
| ***DEBT*** | -46180.9<br>(0.78) | 325552.7<br>(2.85)*** |
| ***AGGLO*** | 100.7<br>(0.00) | 490867.4<br>(3.78)*** |
| ***CFLOW*** | 55865.13<br>(1.08) | -13074.4<br>(0.23) |
| ***RERVOL*** | 15233.9<br>(0.21) | 177001.7<br>(2.30)** |
| **pseudo$R^2$** | 0.28 | 0.69 |

Note: z-values in parentheses; ***=significant at the 1% level, **=significant at the 5% level, *=significant at the 10% level

**Figure 6: An Example of the Extreme Bounds Analysis**

$$\underbrace{FDI = \alpha + GDP + CRISK\ (1,2)}_{|\text{---------}y\text{--------}|} + \underbrace{ß_3\ ULC}_{z} + \underbrace{DUTY+DEBT+AGGLO\ (4,5,6)}_{|\text{----------}x_j\text{----------}|}$$

$$+ß_3\ ULC + DUTY+DEBT+CFLOW\ (4,5,7)$$

*(check: is $ß_3$ higher (lower) than the upper (lower) extreme bound so far? If so, adjust bound)*

$$+ß_3\ ULC + DEBT+CFLOW+RERVOL\ (5,6,7)$$

$$+ß_3\ ULC + AGGLO+CFLOW+RERVOL\ (6,7,8)$$

$$+ß_4\ DUTY + CRISK+DEBT+AGGLO\ (3,5,6)$$

$$\Downarrow \quad \textit{and so on until:}$$

$$+ß_8\ RERVOL + DEBT+AGGLO+CFLOW\ (5,6,7).$$

**Table 11: List of Exogenous Variables Employed**

| Variables | Definition | Dimension/Timing | Further explanations | Source |
|---|---|---|---|---|
| **Market size** | | | | |
| **GDP** | Real absolute GDP | in constant 1995 US$ (logs) | | World Development Indicators (WDI) |
| **GDPCAP** | Real GDP per capita (PPP) | in constant 1995 US$ (logs) | Purchasing Power Parity-adjusted | World Bank WDI |
| **Country Risk** | | | | |
| **PRSCRISK** | Country risk | January of following year | 50% Political Risk<br>25% Economic Risk<br>Current Account Balance (7.5%),GDP/capita (2.5%), GDP growth , Inflation, Budget Balance (each 5%)<br>25% Financial Risk<br>Current Account/Exports (7.5%), Import Cover of Currency Reserves (2.5%), Foreign Debt/GDP, Debt Service/Exports, Exchange Rate Stability (each 5%) | Political Risk Services (PRS): International Country Risk Guide (ICRG) |
| **→PRSERISK** | Economic Risk | Financial/economic risk only | | PRS-ICRG |
| **→PRSPRISK** | Political Risk | January of following year | PRSADMIN+PRSSTAB | PRS-ICRG |
| **→PRSADMIN** | Efficiency of bureaucracy | January of following year | 18% Bureaucracy Quality<br>27% Corruption in Government<br>55% Investment Profile | PRS-ICRG |
| **→PRSSTAB** | Stability of government | January of following year | 20% Law & Order<br>40% Government Stability<br>40% Internal Conflict | PRS-ICRG |
| **EMCRISK** | Country Risk/ Macroeconomic Risk (without Political Risk) | Year-end average: sum of scores for September and March divided by two; values were rebased for the years 1990 and 1991 | 25% Political Risk<br>25% Economic Performance (GNP per capita etc.)<br>10% Debt Indicators<br>10% Debt in default/rescheduled<br>10% Credit Ratings<br>5% Access to Bank Finance<br>5% Access to short-term finance<br>5% Access to capital markets<br>5% Discount on Forfaiting | **Euromoney**, various editions |

(Table 11 continued)

| | | | | |
|---|---|---|---|---|
| **Labor costs** | | | | |
| **ULC** | Unit labor costs | Labor costs p.a. per worker/ gross value added per worker | Labor costs and Value added in manufacturing | ILO: Labor costs<br>WDI: Value added |
| **RWAGE** (subsec) | Real wages | Real wages p.a. | Real wages in manufacturing sub-sectors | ILO: Wage data |
| **Degree of Openness** | | | | |
| **DUTY** | Effective taxation of trade | Taxes on international trade (% of current gov't revenue) | | World Bank WDI |
| **OPEN** | Trade Intensity | Total Trade/GDP, adjusted for Real GDP per capita and Population | | World Bank WDI |
| **Foreign Debt** | | | | |
| **DEBT** | Foreign indebtedness | External Debt/GDP (in current US$) | | World Bank WDI |
| **Agglomeration** | | | | |
| **AGGLO** | Present and past FDI flows | Three-year moving average of total (global) FDI inflows/host country GDP | Uses present year and the two previous years | World Bank WDI |
| **Financing conditions** | | | | |
| **CFLOW** (sec/subsec) | Cash flow of German parent | Cash flow (t-1)/total corporate assets | Aggregated at country, sector or sub-sector level | Deutsche Bundesbank |
| **Exchange rate (volatility)** | | | | |
| **RER** | Bilateral real exchange rate | RER (host country vs. Germany) | | IMF (International Financial Statistics) |
| **RERVOL** | Volatility of bilateral real exchange rate (RER) | Two-year moving average of squared percentage changes in the bilateral RER | Uses the two previous years | IMF (International Financial Statistics) and own calculations |
| **Structural reforms** | | | | |
| **STRUCT** | Index of structural reforms *only for Latin America* | Average score | Arithmetic average of 5 individual indices (trade, financial, tax, labor market reforms and privatization) | Lora (2001) |

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