The FDI-Growth Nexus in Latin America: The Role of Source Countries and Local Conditions*

Patricia Prüfer
Netherlands Bureau for Economic Policy Analysis (CPB) &
CentER, Tilburg University†

Gabriele Tondl
Vienna University of Economics and Business‡

June 3, 2009

Abstract

Foreign Direct Investment (FDI) has surged in Latin America (LA) since the mid 1990s. European and North American FDI is of capital importance. We investigate the FDI-growth nexus in LA allowing for different source countries, regional heterogeneity, more than 20 growth determinants, and interaction terms with FDI. We use Bayesian Model Averaging to address model uncertainty and to select the best models and most robust parameters. The principal finding is that a positive FDI-growth nexus in LA requires a functioning legal framework and macroeconomic stability. We also find that European FDI is only indirectly correlated with productivity growth, whereas North American FDI is more robust and, thus, directly correlated with productivity growth.

JEL Classification: C52, F21, F43, O54
Keywords: FDI-growth nexus, Latin America, Model uncertainty, Bayesian model averaging

---

*We are indebted to Harald Badinger, Jan Boone, Katie Carman, Matteo Ciccarelli, Ron Davies, Steven Durlauf, Jan Magnus, Enrique Moral-Benito, Jan Mutl, Owen Powell, Dean Williamson, and Maurizio Zanardi for very helpful comments and advice. Moreover, we thank seminar participants at Tilburg University and conference attendants at ETSG 2006, SMYE 2007, VfS "Development Economics" 2007, ESEM 2007, FIW "International Economics", ISI "Growth and Development Conference" 2008, and DEGIT XIV 2009. Support by the Austrian Nationalbank, Anniversary Fund Project 11701, is gratefully acknowledged. An earlier version was titled "Does it make a difference? Comparing growth effects of European and North American FDI in Latin America".

†Van Stolkweg 14, 2585 JR Den Haag, The Netherlands, e-mail: p.prufer@cpb.nl

‡Institute for European Affairs, Althanstr. 39-45, A-1090 Vienna, Austria, email: tondl@wu-wien.ac.at

1 Introduction

In response to the severe debt crises of the 1980s, Latin American (LA) countries adopted outward-looking development policies. Since then, they have considered the attraction of foreign direct investment (FDI) as a key strategy to promote growth and development. At the end of the 1990s, FDI accounted for more than 80% of the net private capital flows into the region (Levy Yegati et al. 2007). FDI from North America (NA) and Western Europe (EUR) is of capital importance culminating in 70-80% of the stocks in the large LA countries.[1] Recently, EUR has become the largest direct investor in South America, ahead of NA (UNCTAD 2004; Vodusek 2004). Consequently, several questions arise: To what extent can FDI flows into LA contribute to growth? Which conditions must be met for FDI to be beneficial for growth? Are growth effects different when source countries differ; in particular, does it make a difference whether FDI comes from EUR or NA?

The theoretical literature proposes many arguments for FDI having a positive impact on growth.[2] First, FDI is considered to act as the main channel for international technology transfers. It increases the productivity of the host country through direct and indirect effects: productivity effects in the recipient firm and productivity spillovers to upstream and downstream industries. Second, foreign firms are supposed to increase competition thus inducing local firms to become more productive. Third, foreign firms are assumed to invest in training of the work force thereby improving human capital in the host country.

Relatively few studies analyze the FDI-growth nexus for LA. On a macroeconomic level, De Gregorio (1992) investigates growth determinants for the period 1950-85. He finds that FDI inflows are a significant determinant for GDP per capita growth, having a 3–6 times higher impact than regular investments. Bengoa and Sanchez-Robles (2003) examine the relationship between economic freedom, FDI, and per capita growth in a panel for the period 1970-99. They also find a significant positive impact. Performing Granger causality tests between FDI and output growth for the period 1975-97 for the three main FDI recipients, Cuadros et al. (2004) confirm a positive FDI-growth nexus in Mexico but reject it in Argentina and Brazil. Finally, a few studies investigate direct productivity and spillover effects of FDI on the firm level in LA (Blomström and Wolff 1994; Aitken and Harrison 1999; Kugler 2006.)

Two major drawbacks are related to these empirical studies. First, it is not possible to derive clear conclusions or robust policy implications due to the use of varying econometric methods, model specifications, country samples, and time spans. Second, these studies do

[1] Henceforth, the abbreviation EUR is used to address our European countries sample. A detailed description of the respective countries is given in the Appendix.

[2] Among others Blomström and Kokko 1997; Borensztein et al. 1998; Markusen and Venables 1999; Rodriguez Clare 1996; Görg and Greenaway 2004.

not investigate the role of different source countries, most notably EUR or NA for LA. However, evidence suggests that the pattern of and motivation for EUR-FDI and, thus, its impact on the host country differ from NA investment projects. EUR companies, striving to gain new product markets in LA, have invested in manufacturing and, recently, in public utilities and the service sector mainly through acquisitions. In contrast, NA companies have been striving for cost reduction by dislocating part of their production to LA. Thus, they have invested primarily in the manufacturing sector in greenfield plants (UNCTAD 2004; Vodusek 2004).

This paper focuses on LA for three reasons: First, LA is especially interesting because this region was hypercritical against outward orientation and FDI for a long time but reversed these attitudes completely. Second, LA provides a relatively homogenous country sample thereby helping to avoid an 'inappropriate pooling of wealthy and poor countries in empirical FDI studies' (Bloningen and Wang 2004) which could easily lead to inconclusive or wrong conclusions. On the other hand, the region is characterized by enough policy experiments to provide the necessary variations in the sources of growth and the effects of FDI. Third, in contrast to the Asian region being considered as a showcase of effective outward oriented growth strategies, the evidence for LA is less conclusive.

Moreover, this paper takes the evidence on varying patterns of FDI in LA seriously and incorporates it in the most comprehensive empirical investigation conducted up to now. We analyze the impact of FDI in the period of rapidly increasing FDI inflows, 1990-2003. First we analyze the effect of total FDI in LA, then we distinguish between NA- and EUR-FDI. This split enables us to allow for potentially different productivity effects of the different investment patterns of the two sources. To consider potential conditional factors for a positive FDI-growth nexus, we look at more than 20 different indicators which can be clustered into human capital, institutions, infrastructure, trade, macroeconomic policies, and economic structure. In addition to numerous interaction terms of these indicators with FDI, we allow for parameter heterogeneity between different groups of LA countries to control for the remaining differences within LA.

Our study is the first that applies Bayesian Model Averaging (BMA) to the FDI-growth nexus. Thereby, we are able to estimate the underlying comprehensive canonical growth regression properly, and to identify robust model specifications. BMA was introduced in cross-country growth regressions by Fernández, Ley, and Steel (henceforth FLS) (2001a) and Brock and Durlauf (2001), and later adapted to a panel framework by León-González and Montolio (2004). Since then its applications to growth empirics, but also to other areas, have surged.[3] BMA is flexible with respect to the size and exact specification of

[3]Among others Sala-i-Martin et al. 2004; Jones and Schneider 2004; Eicher et al. 2007a; Malik and Temple 2008; Masanjala and Papageorgiou 2008.

a model and does not require the a priori selection of any model. Inference is based on a weighted average over all models, and a ranking in terms of explanatory power of all variables and models is endogenously determined. Thus, BMA addresses the problem of parameter and model uncertainty in growth empirics. Uncertainty arises due to lacking theoretical guidance caused by the 'openendedness' of growth theory as there exists no specific model that could rule out all others (Brock and Durlauf 2001). The abundance of potential growth determinants, which are often variations of the same theoretical aspect, aggravates uncertainty.[4] In the final part of our analysis, these robust model specifications derived from the BMA analyses are then estimated with the GMM system estimator to verify robustness and identify causality.

Our combined BMA and GMM analyses allow us to distinguish new results. First, the FDI-growth nexus in LA depends on a country's dissemination of the rule of law and on macroeconomic stability. Second, EUR-FDI is only indirectly correlated with productivity growth, whereas NA-FDI is more robust and, thus, directly correlated with productivity growth.

The paper is organized as follows: Section 2 presents the hypotheses on the FDI-growth nexus and specifies our models. Section 3 describes the methodology and estimation issues while Section 4 explains the data and samples used. Section 5 discusses the results and their robustness, and Section 6 concludes. An Appendix presents all variables, data sources, and estimation results in detail.

2 Hypotheses and model specification

2.1 FDI in Latin America

Growth in LA was high in the 1960s and 1970s but faded due to the debt crises of the early 1980s. Then, economic reforms in line with the Washington consensus were induced: a reduction of government interventions combined with an increase in economic liberalization and macroeconomic stabilization . As a result, growth has regained momentum again since the first half of the 1990s. Economic liberalization also entailed an opening towards FDI. Since then, the attraction of FDI is one of the key strategies to promote growth and development in LA.

Consequently, the stock of FDI rose steeply at a rate of around 30% per year since the mid 1990s (Levy Yegati et al. 2007). In 2003, the stock of FDI as share of GDP reached 84% in Bolivia, 74% in Chile, and 63% in Panama.[5] The increase in FDI affected

[4] For in-depth surveys on the (problems of) growth econometrics see Temple (2000) and Durlauf et al. (2005).

[5] We excluded Panama as an outlier from our sample that distorted our estimation results substantially.

all LA countries. NA- and EUR-FDI accounted for the major share of FDI culminating in 70-80% in the large LA countries. In some of the smaller LA countries, the share of EUR- and NA-investors is lower due to intra-LA-FDI. While NA-investment has always played an important role in LA, EUR-FDI surpassed NA-FDI stocks in South America in the 1990s. In 2003, EUR-FDI dominated in Argentina, Bolivia, Chile, Colombia, Ecuador, Peru, Paraguay and, slightly, in Brazil. Concerning EUR-FDI, we observe that all major EUR countries have been investing in LA to a similar extent. Only recently, Spain has increased its share substantially in some countries, such as Argentina, Chile, and Peru.

One can observe clear differences between EUR- and NA-FDI in LA. We address the potentially different growth effects in the next subsection while discussing recent literature on varying motives, types, and sectors of FDI and the arising implications for productivity growth.

2.2 The role of FDI in the host economy

The aggregate productivity effects of FDI on the macro level are the sum of several effects: (i) a direct productivity effect within the firm, since foreign investors commonly operate with superior technology and managerial practices; (ii) horizontal externalities on domestic firms operating in the same industry, either in the form of a rise in productivity in response to increased competition, or as knowledge spillovers when workers are trained in the foreign firm and afterwards change employment; and (iii) vertical productivity spillovers to upstream and downstream industries when the foreign firm establishes linkages and requests improved technological standards.[6]

The extent of these productivity effects depends (i) on the way in which foreign investment is provided (greenfield FDI versus mergers and acquisitions); (ii) the type of FDI (market-seeking/horizontal FDI versus efficiency-seeking/vertical FDI) which is often related to the distance of the source country and the applicability of free trade regimes; and (iii) the main sector of investment and the sectoral diversity of FDI.

First, it makes a difference whether FDI takes place as greenfield investment or through mergers and acquisitions. Greenfield investment usually implies larger up-front transfers of capital and introduces more advanced technologies in the new production site providing substantial direct productivity effects. However, it is less likely to source locally thus producing less spillover effects to backward industries (Javorcik 2004). These spillovers are more important in the case of mergers and acquisitions where the supplier relations of the

It serves as an off-shore tax haven and has become the company site of many NA holdings registering exceptionally high FDI inflows.

[6]Rodriguez Clare 1996; Aitken et al. 1997; Blomström and Kokko 1997; Borensztein et al. 1998; Markusen and Venables 1999; Görg and Greenaway 2004.

acquired firm are kept (Javorcik 2004; Javorcik and Spatareanu 2008). The FDI share of mergers and acquisitions substantially increased in LA from 20% in the early 1990s to 50% in 2000 (De Gregorio 2003) because mostly EUR investors used the process of privatization in LA in the 1990s to acquire public utilities, firms in the energy and telecommunication sector, and banks. Spain was particularly active in this field (UNCTAD 2004; Vodusek 2004). In contrast, NA companies were largely making greenfield investments in Mexico and Central America with vertical, efficiency seeking FDI in the automative, electronics, and textile industry to benefit from low labour costs the region (Vodusek 2004).

Second, the type of FDI matters because vertical FDI typically generates less spillover effects on the local industry. Only one stage in the production is transferred to the host country to benefit from cost advantages, and the supplies are commonly imported from the source country. In such a case, the benefits of FDI culminate in a direct productivity effect, and the provision of additional production capacity offering employment and upgrading of skills (Peters 2000). With horizontal FDI, on the other hand, the entire production process of a product is placed in the host country providing substantial direct and indirect productivity effects. Geographically close partner countries, labor cost differentials, and free trade regimes promote vertical FDI. Javorcik et al. (2004) show for Eastern Europe that the distance to the source country and the existence of free trade arrangements result in different types of investment and, therefore, different magnitudes of spillovers.

In 1990–2003, EUR-FDI in LA consisted of a larger share of horizontal FDI because home markets were too distant and the extent of free trade between EUR and LA countries was limited. EUR-FDI in the automotive industries in Brazil, Mexico, and Argentina or in the machinery industry in Chile constituted market-seeking investments in sophisticated products to conquer new markets (Vodusek 2004). In contrast, for NA investors, LA countries are close and free trade arrangements are well established with Mexico (in the NAFTA, North American Free Trade Area) and Central America (in the CAFTA, Central American Free Trade Area). Consequently, a large share of NA-FDI in Central America takes place as vertical FDI to benefit from cheap labor costs. All intermediary goods are easily imported under the free trade regime and final products are re-exported to NA. This type of 'maquila' industry is widespread in Mexico and Central America in the machinery, textile, and electronics industry (Gomez Vega 2004). For example, the imports to local sales ratio of NA-FDI in the electronics sector was 131% in 1994, while American affiliates from all sectors exported 40% of their sales in Mexico in 1998 (Hanson et al. 2001).

Third, the sector of FDI matters. Investments in the manufacturing sector are likely to generate more spillover effects to the local economy through linkages than investments in the primary sector, which uses imported capital goods, and operates rather independently

(Alfaro and Rodriguez-Clare 2003). However, FDI in the service sector generates an even higher magnitude of spillovers as it improves the efficiency of local services. Thus, it enables general productivity gains in the economy (Arnold et al. 2006). Examining UNCTAD data of the largest affiliates of EUR- and NA-investors in 2002, we find that in almost all countries the share of EUR-FDI invested in the service sector is larger than the share of NA-FDI, and that EUR firms are present in many important areas such as telecommunications, banking or supply of gas, water, and electricity. Moreover, EUR firms are more numerous, smaller, and more dispersed over all types of industries than NA firms in South America. In Central America, in contrast, the number of NA-affiliates is larger than that of EU-firms. There, EUR-FDI tends to be more concentrated (UNCTAD 2002).

Finally, productivity effects from FDI seem to depend on the conditions provided in the country, most notably a sufficient basis of human capital (Borensztein et al. 1998), the level of income (Blomström et al. 1994), the openness of the economy (Balasubramanyam et al. 1999), and financial development (Alfaro et al. 2004).

2.3 Model specification and control variables

As argued by de Mello (1997, 1999), FDI has a constant marginal product, unlike physical capital. Thus, it should have a permanent effect on the growth rate. Since FDI (i) incorporates new technologies in the production function and (ii) leads to (knowledge) spillovers, De Mello (1997, 1999) and Borensztein et al. (1998) identify an endogenous growth model as a suitable framework to analyze the FDI-growth nexus. We follow this approach and consider FDI as a factor determining the technology level and thus productivity. Therefore, FDI is included in an endogenous growth model with physical and human capital and numerous other growth determinants. Consequently, we specify the following canonical growth regression (subscripts i and t suppressed for simplicity):[7]

$$\begin{aligned} y = \alpha + \beta_1 GDPlag + \beta_2 INV + \beta_3 \mathbf{HC} + \beta_4 FDI + \beta_5 OPEN + \beta_6 \mathbf{MACRO} + \\ + \beta_7 \mathbf{INFRA} + \beta_8 \mathbf{INST} + \beta_9 \mathbf{STRUC} + \beta_{10} FDI * \mathbf{HC} + \beta_{11} FDI * OPEN + \\ \beta_{12} FDI * \mathbf{MACRO} + + \beta_{13} FDI * \mathbf{INFRA} + \beta_{14} FDI * \mathbf{INST} + \varepsilon. \end{aligned} \quad (1)$$

In this panel data model with annual observations, a country's productivity growth, y, is explained by lagged GDP, GDPlag; gross fixed capital formation, INV; 3 different human capital variables contained in matrix **HC**; our regressor of major interest, FDI; real trade openness, OPEN; 3 macroeconomic variables in matrix **MACRO**; 6 infrastructure

[7] A detailed list of all variables including their definitions and sources can be found in Table 1 in the Appendix.

variables in matrix **INFRA**; 5 different institutional variables in matrix **INST**; 2 structural variables in matrix **STRUC**, and country specific fixed effects, α, to account for unobserved heterogeneity among countries. Additionally, we include 17 interaction terms of FDI with institutions, trade, human capital, macroeconomic variables, and infrastructure.[8] For the estimation with decomposed EUR- vs. NA-FDI the number of interaction terms doubles.[9] Introducing interaction terms is in line with the literature which assumes threshold effects for the positive growth effects of FDI. Moreover, it allows us to account for heterogeneity in the spillover effects of FDI between our countries by making the coefficients of the interaction terms to be themselves functions of FDI. Additionally, we allow for parameter heterogeneity in our estimations by including slope dummy variables for two different country groups: the large economies, D1, and the rich economies, D2. We apply these dummies to all variables in **HC**, FDI, OPEN, and **STRUC**.

What are the hypotheses concerning the direction of influence for the variables other than FDI? We start from a convergence specification using three-year lagged GDP as a proxy for the convergence term which we expect to be negatively correlated with productivity growth. Gross fixed capital formation is our proxy for physical capital which is supposed to have a positive influence on productivity growth. Since we have 14 years of observations, the bias claimed by Nickel (1981) for the within group estimator of such a dynamic panel should be negligible.

Growth theory suggests that the availability of human capital plays an important role for growth (for a recent survey see Benhabib and Spiegel 2005). Therefore, we test for the impact of primary, secondary, and tertiary level education. As argued in the human capital literature, we use the change in educational attainment instead of enrolment rates as the latter are too volatile to yield reliable estimation results (among others Temple 2001). Our data show that the share of population who completed each level of education increased in LA over the period considered. In primary and secondary education, the increase was only modest, whereas it was very pronounced in tertiary education. The growth impact of education may differ for our country subgroups (D1 and D2), though. For rich economies, an increase in tertiary education will be more important while poor countries may benefit

[8]Since BMA is capable of handling highly collinear regressors, we use simple products as interaction terms. The algorithm described below appropriately weights information added to a regression from two collinear variables: the Markov Chain will not incorporate models containing regressors that are collinear to those already included as there is no additional information provided in such a model. In fact, the algorithm avoids such models and assigns high posterior model probabilities only to models not characterized by this problem (FLS 2001a).

[9]Concerning EUR- and NA-FDI, inherited and present cultural ties could also be conditioning factors to benefit from FDI. However, particularly investment from EUR originates from quite different countries, only some of which having historical links with LA. Furthermore, recent socio-economic relationships between LA and both EUR and NA are very diverse.

more from an increase in primary and secondary education. Similarly, tertiary education may be more important in bigger economies because the availability of employment opportunities for university graduates is generally larger in big countries. In general, the dummies should capture differences between social costs and benefits among the different levels of education (Jimenez 1986). Aside from being a growth factor, human capital could be an important precondition for productivity gains from FDI (Borensztein et al. 1998). Therefore, we also interact human capital with FDI.

There is wide theoretical and empirical evidence for the positive effects of trade openness on growth. Increased openness of a country should force local exporters to improve their productivity to compete on world markets whereas imports should constitute a channel of technology transfer (for recent surveys see Alesina et al. 2005; Ventura 2005). Trade openness generally increased in LA countries during the period although some countries (Venezuela, Paraguay, Colombia) also faced a prolonged decline of exports. We test the impact of real openness on growth, with real openness being the share of exports and imports in current international US$ to GDP in purchasing power parity (PPP) current international dollars. According to Alcalá and Ciccone (2004), this measure is superior to regularly used nominal measures for trade openness. It appropriately accounts for potential price changes in nontradable goods due to productivity effects from openness accruing more to tradables. Moreover, we account for the possibility that the initial income level and the (market) size of a country have an effect on productivity gains from trade openness. Loayza et al. (2005) interact their measure of openness with GDP per capita and find that the growth effects of trade openness increase with the level of income. Alesina et al. (2005) analyze the relation between size, openness, and growth and find a complementary relationship between the benefits of trade openness and (market) size. Therefore, we interact real openness with both dummies for the rich and the big economies. Furthermore, trade openness may act as a conditional factor for a positive FDI-growth nexus because open economies are supposed to be more adapted to external competition and to take advantage of technology transfers (Balasubramanyam et al. 1999). Thus, we interact FDI and real openness.

The evidence for the importance of macroeconomic policies for economic growth is ample (for a recent survey see Easterly 2005). In LA, macroeconomic stability became a particular concern after the debt crises of the 1980s. The countries faced high inflation (sometimes hyperinflation), high external debts, and government deficits. This was accompanied by high interest rates and substantial currency devaluations (Corbo et al. 2005). Extensive reforms increased macroeconomic stability, most notably in inflation and exchange rate volatility. We test whether the improved macroeconomic stability was beneficial for growth in LA using inflation volatility, debt to export ratio, and exchange rate volatility as macroeconomic indicators. High values in our indicators are supposed to increase economic uncertainty, worsen the business climate, and, consequently, reduce growth. Since the generated uncertainty might also reduce the productivity effect of FDI, we interact these macroeconomic variables with FDI.

The growth effects of infrastructure investments are usually found to be positive. For example, Calderón and Servén (2004b) find that the quantity and quality of infrastructure in general, and in particular of roads; telecommunication; and electric power have a positive impact on growth. Calderón and Servén (2004a) show that infrastructure endowments of LA lag behind other middle-income countries, and that respective investments suffered from the retrenchments of public budgets since the mid 1980s. We find that road networks and electricity generating capacities in LA have grown modestly in general but stagnated in several countries. Modern infrastructure, such as telephone mainlines; internet; or PC-use, steeply increased in the 1990s. Besides its direct contribution to growth, infrastructure is likely to be a conditional factor for a positive FDI-growth nexus. Thus, we also interact the infrastructure variables with FDI.

Recent empirical growth research finds that the quality of institutions is an important prerequisite for and complement of economic growth (for a survey see Acemoglu et al. 2005). In their growth regressions for LA, Bengoa and Sanchez-Robles (2003) use the Fraser Institute's indicator for economic freedom as institutional variable and find a significantly positive impact on growth. This composite index comprises subjective judgements by experts and is often used in growth regressions. As we think it is important to distinguish between single aspects of institutional quality rather than to look at a composite index, we use detailed institutional data for LA available from the International Country Risk Guide (ICRG). We consider the ICRG's composite indicator for institutional quality, political risk. Additionally, we include those components that seem to be most important for LA: corruption, democratic accountability, law and order, and military involvement in politics.[10]

Political risk and corruption decreased while the rule of law generally improved in LA during the 1990s but deteriorated in the second half of the 1990s or after 2000. Democracy generally improved (with the exceptions of Venezuela and Colombia), and the involvement of military in politics generally decreased in parallel.[11] Note however that the roles of democracy and military involvement for growth are ambiguous (Tavares and Wacziarg

[10]An exploratory correlation analysis showed that there is no high correlation between these different institutional subcategories in LA.

[11]Interestingly, in Brazil and Mexico the political role of the military increased. Note, however, that military involvement in politics does not mean necessarily any direct involvement, for example in the form of a military government. It comprises very subtle influences of the military in general executive decisions.

2001; Albornoz and Dutta 2007). Additionally, we expect that FDI and the quality of institutions in the host country, most notably the level of corruption or the rule of law, reinforce each other. In line with the literature that analyzes the interdependence of productivity gains from trade and the quality of institutions (for a survey see Winters 2004), we expect that a stable institutional environment increases spillovers from FDI on productivity growth in a country. Thus, we interact all institutional variables with FDI.

Finally, we consider the structure of the economies in matrix STRUC, which we also regard as proxies for different initial conditions in our country sample. LA countries have been experiencing a steady decline of the agricultural sector, and an increase in the industrial and service sector. However, there are considerable differences between countries. We expect that richer LA economies will enjoy more growth if they possess a substantial industrial sector while an increase in agriculture would be negative for growth at that stage of development. Therefore, we interact the two sectoral variables with the dummies D1 and D2.

3 Methodology

3.1 The need for model averaging

Empirical research on the determinants of economic growth has identified numerous variables as being correlated with the growth rate. Durlauf et al. (2005) provide an impressive overview on variables used in growth regressions culminating in 145 regressors which can be clustered into more than 40 broader areas, or theories, such as education; finance; government or trade. Taking into account the limited number of observations on a national level, the number of growth determinants to be included in a regression is restricted. Any model selection, however, severely influences the results. In addition, standard results based on a single model disregard their conditionality on the model chosen. Therefore, they are often not robust to (minor) changes in the model specification and lead to uncertainty regarding the robustness and relevance of the policy conclusions.

The lacking theoretical guidance has led to the increasing use of model averaging techniques to deal with parameter and model uncertainty. Bayesian methods are of particular benefit for model averaging since models are treated as random variables. Thus, the concept of averaging over models can be given a rigorous statistical foundation. Moreover, BMA does not require selecting any subset of the regressors a priori or fixing any variables as 'base-line' regressors but allows for *any* subset of the explanatory variables to combine in a regression. Then, the posterior probability of any such combination of regressors is estimated as a weighted average given prior information and data as weights (for a nice introduction see Hoeting et al. 1999).[12]

3.2 BMA

Alternative models M^j, with $j = 1, ..., J$, will be defined by the subsets of k^j regressors they include from the set of K regressors. Thus, all differ in their explanatory variables, contain individual effects, α_i, and are linear regression models. Since it is assumed that the individual effects enter in all models, the number of possible models is 2^K. We have data for N countries and T periods. The dependent variables for all countries and all models are grouped in vector y of length NT. The explanatory variables and the N dummy variables for each country are stacked in design matrix X of dimension NT x $(K+N)$. β is defined as the full $(K+N)$-dimensional vector of regression coefficients and individual effects. Any model M^j with T observations for country i is represented by:

$$y_i = \alpha_i \iota_T + X_i^j \beta^j + \varepsilon_i \tag{2}$$

where X_i^j is the T x k^j submatrix of regressors of model M^j and β^j is the k vector of slope coefficients, $\beta^j \in \Re^{k^j} (0 \leq k^j \leq K)$. ι_T is a column vector of T ones, and ε_i is the T x 1 error vector that is normal, with covariance matrix $\sigma^2 I_T$, not autocorrelated and independent of X_i^j, α_i and β^j. Although normality is not necessary for consistency, it guarantees good finite sample properties (FLS 2001b). The effect of variables not contained in X^j is assumed to be zero.

By averaging over all models the marginal posterior probability of including a certain variable is simply the sum of the posterior probabilities of all models containing this variable. Formally, the posterior distribution of any quantity of interest, say $\theta^j (= \beta^j, \sigma, \alpha_i)$, is an average of the posterior distributions of that quantity under each of the models with weights given by the posterior model probabilities (PMPs):

$$p(\theta^j \mid y_i) = \sum_{j=1}^{2^K} p(\theta^j \mid y_i, M^j)\ p(M^j \mid y_i). \tag{3}$$

This procedure is typically referred to as BMA and it follows from direct application of Bayes' theorem (Leamer 1978). $P(\theta^j \mid y_i, M^j)$, the posterior distribution of θ^j under model M^j, is typically of standard form. However, we have to compute the PMPs due to model uncertainty. Thus, we need to choose a prior distribution over the space $\mathcal{M}$ of

[12] Another slightly different approach is Bayesian Averaging of *Classical* Estimates (BACE) first proposed in Raftery (1995) and later on in Sala-i-Martin et al. (2004). This method combines Bayesian with classical estimation techniques and thus abandons the 'truly Bayesian' framework of proper, informative priors.

all 2^K possible models. Following standard practice for BMA in linear regression models, especially in the context of economic growth (Hoeting et al. 1999; FLS 2001a; Masanjala and Papageorgiou 2008), we allocate equal prior model probability to each model and set

$$p(M_j) = 2^{-K}. \tag{4}$$

This yields a uniform distribution on the model space which implies that the prior probability of including a regressor is $\frac{1}{2}$, which is independent of the combination of regressors included in the model.[13] With this prior model probability we get the following expression for the PMPs:

$$p(M^j \mid y_i) = \frac{p(y_i \mid M^j)}{\sum_{i=1}^{2^K} p(y_i \mid M^i)} \tag{5}$$

where $p(y_i \mid M^j)$ is the marginal likelihood of Model M^j. This is given by

$$p(y_i \mid M^j) = \int p(y_i \mid \alpha_i, \beta^j, \sigma, M^j)\ p(\alpha_i)\ p(\sigma)\ p(\beta^j \mid \alpha_i, \sigma, M^j) d\alpha_i\ d\beta^j\ d\sigma \tag{6}$$

with $p(y_i \mid \alpha_i, \beta^j, \sigma, M^j)$ the model corresponding to (2), and $p(\alpha)_i$, $p(\sigma)$, and $p(\beta^j \mid \alpha_i, \sigma, M^j)$, the parameter priors defined below in (7) and (8).

Computing the relevant posterior distributions is still subject to challenges as the number of models to be estimated increases with the number of regressors at the rate 2^K. Furthermore, the derivation of the integrals implicit in (6) may be difficult because the integrals may not exist in closed form. Using at least 50 regressors in our estimations, we approximate the posterior distribution on the model space $\mathcal{M}$ by applying the Markov Chain Monte Carlo Model Composition (MC^3) methodology by Madigan and York (1995) to simulate a sample from $\mathcal{M}$. MC^3 is based on a Random Walk Chain Metropolis-Hastings algorithm which draws candidate models from regions of the model space in the neighborhood of the current draw and then accepts them with a certain probability. Posterior results based on the sequence of models generated from the MC^3 algorithm can be calculated by averaging over the draws.

The Bayesian framework needs to be completed with prior distributions for the parameters in each model M^j, which are α_i, β^j, and σ. The choice of priors influences the results, which is why non-informative priors would be preferable.[14] However, PMPs can-

[13] There is some discussion about priors on the model space as many researchers prefer parsimonious models. However, regular posterior odds ratios already include a reward for parsimony. Brock and Durlauf (2001), among others, object to uniform model priors because of the implicit assumption that a regressor's probability is independent of the inclusion of others. They suggest a hierarchical structure for the model prior. This, however, requires agreement on which regressors proxy the same theories. As stated in Eicher et al. (2007b), such an agreement is often not existent and, thus, independent model priors are preferable.

[14] Two recent studies have analyzed the effects of prior choices in growth regressions regarding robustness

not be meaningfully calculated with improper non-informative priors for parameters that are not common to all models. Thus, FLS (2001b) developed proper priors that do not require subjective input or fine tuning for each individual model. Given their conclusions, we use the following *benchmark priors* for our analysis. We take the $\{\alpha_i\}$ to be independently uniformly distributed on the real line and also adopt a uniform prior for the scale parameter common to all models which gives us

$$p(\alpha, \sigma) \propto \sigma^{-1}. \tag{7}$$

This prior implies that all values of α and σ for $\ln(\sigma)$ are given equal prior weight. Furthermore, this distribution is invariant under scale transformations such as changes in the measurement units. For β^j we choose an informative g-prior structure

$$p(\beta^j \mid \alpha, \sigma, M^j) \sim N(0, \sigma^2[g_j X'^j X^j]^{-1}), \tag{8}$$

with the following choice of the scalar hyperparameter g_j

$$g_j = \min\left\{\frac{1}{NT}, \frac{1}{(K+N)^2}\right\}. \tag{9}$$

3.3 The issue of endogeneity

It is well known that endogeneity of regressors constitutes a serious problem in growth regressions. This endogeneity leads to biased estimates for various estimation methods, among others also for ordinary least squares (OLS). As OLS is the estimation technique used within our benchmark BMA, endogeneity bias could be an issue in our study too. Indeed, several of our regressors have to be considered endogenous: investment, FDI, trade, and institutions. Whenever possible, we choose our variables so that they can be assumed exogenous: infrastructure variables refer to moving averages over the last three years. Instead of the annual inflation rate we take average consumer price volatility over the last five years. Our educational variables are assumed to be exogenous because attainment rates rise only after the degree has been obtained and when the person becomes part of the adult population.

The most common response to the endogeneity problem has been the use of instrumental variables (IV) in growth regressions. In the benchmark BMA used here, we cannot handle sophisticated IV techniques. We considered to proxy potential endogenous variables by one specific instrument in our BMAs. However, it is especially difficult to find

of parameter choices and coefficient estimates in detail (Ley and Steel 2009; Eicher et al. 2007b).

valid instruments in the growth context because the openendedness of the theory and the complexity of the matter make it especially hard to find instruments that are not growth determinants themselves or that are definitively uncorrelated with omitted growth determinants. These problems are extensively discussed in Durlauf et al. (2005). There, the authors also provide a survey of instruments usually suggested for growth determinants but advise general caution when using IV estimation in growth empirics.

A panel data framework makes it even harder to find suitable instruments as many of the standard suggestions, for example geographical characteristics, are not time-varying. The generally proposed solution to work with lagged values of the regressors in the IV estimation is also problematic in our case. We considered simple lagged values as instruments for all supposedly endogenous variables. Moreover, we experimented with trade measures and tariffs as instruments for FDI or, alternatively, with tariffs as instruments for trade. All these potential instruments are not highly correlated with the respective endogenous regressors in our data set thereby seriously affecting the efficiency of any IV estimation. We assume that the very low correlation of lagged and original variables stems from the fact that LA data are subject to sudden changes and rapid developments.

These manifold problems with instruments can be circumvented in panel estimations with the system GMM estimator of Blundell and Bond (1998). This estimator uses all possible lags of the variable in levels and differences as instruments instead of one specific instrument. Thus, it improves the suitability of instrumenting and the estimation efficiency. Moreover, it fits the requirements given by highly persistent series such as GDP. In the context of FDI growth regressions this estimator has been previously applied by Carkovic and Levine (2002). We apply the system GMM estimator to analyze the causal effect of FDI on growth in Section 5.3.

4 Samples and data

We include 16 LA countries in our analysis which are listed in the Appendix. The time period considered is 1990–2003. We are interested in the (direct and indirect) productivity effects of FDI on economic growth and take the annual growth rate of GDP per labor force as dependent variable. Table 1 in the Appendix contains the list of included variables with detailed definitions, sources, and compilations.

For total FDI, we take aggregate LA inward stocks from UNCTAD. The FDI stock originating from NA and EUR is calculated using the inwards stocks of LA countries sourcing from NA and EUR reported by UNCTAD. Lists of the respective countries are given in the Appendix. Since these series include missing values, we complement them with inward FDI stocks from LA central banks or statistical offices and with outward FDI stocks from NA and EUR countries reported by the respective central banks and the OECD.

Several growth determinants are steadily increasing over time in LA. Hence, we identified unit roots in the following data: educational attainment shares, FDI stocks, trade openness, consumer price volatility, all infrastructure variables, all institutional variables, urban population growth, and share of agriculture. To avoid spurious regressions we take the change of these variables to obtain stationary series. By virtue of this transformation we analyze FDI flows and their effects on productivity growth. As outlined in Section 2, this is reasonable because current FDI flows should provide immediate productivity spillovers to the host economy.

5 Estimation results

5.1 Posterior probabilities

Our results for the first BMA with total FDI are based on a MC^3 chain with 1,5 million recorded draws. For the second BMA with EUR- and NA-FDI results are obtained from a chain of 2 million recorded draws. To verify convergence of the algorithm, and thus the accuracy of the posterior moments, FLS (2001b) suggest to calculate the correlation between the analytical and MC^3 PMPs for a subset of models (for example every model visited by the MC^3 algorithm) and taking enough replications to ensure this correlation lies above 0.99. The correlation between visit frequencies and posterior probabilities for our two BMAs lies above this recommended threshold.

First, we present results regarding model uncertainty and list the most effective combinations of regressors or model specifications. Thus, we report the PMPs for the ten best models of both BMAs and list them with all included regressors in Tables 2 and 4 in the Appendix. The ten best models for the BMA with total FDI account for more than 12% of the total posterior mass whereas the ten best models for the BMA with decomposed FDI account for more than 8%. The mean number of regressors in a model is seven for the BMA with total FDI and six for the BMA with decomposed FDI.

Second, we present results regarding parameter uncertainty and provide a ranking in terms of regressor importance in Tables 3 and 5 in the Appendix. Thus, we report the posterior inclusion probabilities (PIPs) for each of the explanatory variables in both BMAs. The PIP can be interpreted as probability that the respective regressor should be included in the evaluation as it exerts some influence on the dependent variable, regardless of which other explanatory variables are included. Note that our posterior estimates are *not* conditional on inclusion as conditional estimates would overestimate coefficients but underestimate standard errors.[15] Thereby, we can also minimize the selection bias inherent in the (conditional) estimates that are usually used to derive conclusions from model averaging or selection exercises.[16]

We base our discussions in the next section on the most important regressors having a PIP above the recommended threshold of 0.50. According to Raftery (1995), evidence for a regressor with a posterior inclusion probability from 50–75 % is called weak, from 75–95 % positive, from 95–99 % strong, and > 99 % very strong. Masanjala and Papageorgiou (2008) state that a PIP of 0.50 corresponds approximately to an absolute t-ratio of one. Moreover, we discuss the regressors that are included in at least one of the ten best models. These variables do not exert a robust effect themselves but are relevant in combinations with other regressors. Thus, they are relevant when it comes to advocate policy packages instead of single policy measures.

5.2 Discussion and policy implications

When assessing the relationship of growth with total FDI (Tables 2 and 3 in the Appendix), our BMA indicates that the regressors GDPlag, POLRI, MILI, and FDI in interaction with institutional variables (FDI_t*LAW and FDI_t*DEMO) are the most robust and important growth correlates. Therefore, they are always included in the top ten models. Interestingly, the regressor INV is ranked second in terms of PIP but is not included in the top ten models 5 and 9. These two models seem to put more emphasis on the regressor OPEN which has a dubious relationship with INV due to the documented trade-off between physical capital and openness in growth regressions (among others Fagerberg 1994). Additional variables included in at least one of the ten best models and positively correlated with growth are: PRIM, D1*TERT, OPEN, and EXCH. Regressors that are negatively correlated with growth and included in at least one of the ten best models are TERT, DEBT, and D2*OPEN.

Inspecting the two robust and important interaction terms we see that the FDI-growth nexus in LA depends positively on a sufficiently developed rule of law (the coefficient for FDI_T*LAW is the most important one in terms of PIP and positive). On the other hand, the FDI-growth nexus in LA depends negatively on the level of democracy (the coefficient for FDI_T*DEMO ranks third and is negative). We comment in detail on the thresholds for all interaction terms above which the growth effects of FDI turn positive (or negative) at the end of this Section.

[15] See also the discussion in Magnus et al. (2008).

[16] See, for example, the warning on the interpretation of their Table 2 in Malik and Temple (2008), p.10.

The second BMA distinguishing between the FDI sources EUR and NA (Tables 4 and 5 in the Appendix) identifies INV and FDI_{NA}*EXCH as the most robust and important growth correlates. These variables are again contained in all top ten models. In this specification the regressors GDPlag and FDI_{NA}*LAW are ranked third and fourth in terms of PIP but are not included in all top ten models. Additional regressors that are positively correlated with growth and included in at least one of the ten best models in this second estimation are: OPEN, D1*TERT, ROAD, PHONE and EUR-FDI in interaction with institutional variables (FDI_{EUR}*POLRI and FDI_{EUR}*LAW). TERT is again a regressor that is negatively correlated with growth and included in one of the ten best models.

Inspecting the four interaction terms that enter the top 10 models, we see that both EUR- and NA-FDI are correlated with productivity growth if certain conditions are met in the host country. However, only NA-FDI, under certain conditions, is directly correlated with growth as only FDI_{NA}*EXCH and FDI_{NA}*LAW have PIPs that are sufficiently high. Both sources require a sound legal framework for a positive FDI-growth nexus, while EUR-FDI depends additionally on low political risk. NA-FDI on the other hand is especially sensitive to stable currencies as the interaction with exchange rate volatility is negative.

Summarizing the results from both estimations, we find a positive FDI-growth nexus under a well developed legal framework, low political risk, and a stable macroeconomic environment in terms of low exchange rate volatility. FDI itself is not important, whereas especially domestic and, to a lower extent, infrastructure investments appear to be positively correlated with growth in LA. In combination with other variables, real trade openness (in general and additionally in the rich economies) is important, too. These findings are as expected in Section 2.3 and in line with the literature.

Some of our results are astonishing, though. First, a higher level of education is negatively correlated with growth in our two BMAs. This could point at substantial differences between social costs and benefits among the different levels of education in LA (Jimenez 1986). The level of tertiary education is positively correlated with productivity growth only in the subsample of big countries. One reason for that might be that big economies offer more positions where tertiary education is required and that economies of scale or spillovers among university educated arise only at a sufficient size of the economy. Second, the level of corruption in a country is not important at all, which is especially surprising in LA where the poor performance in this area is usually seen as an impediment to growth. Third, military involvement in politics is positively correlated with growth in our estimations.[17] Although this seems to be astonishing at first sight, it corresponds

[17] As all our institution variables are measured in such a way that a higher index indicates better institutions, the negative sign of MILI means that less military involvement is *negative* for growth.

with the results for the interaction of FDI with democracy that exerts a negative influence in LA. Both results are in line with the literature that establishes ambiguous or even negatives effects of these explanatory variables for LA and other countries (Tavares and Wacziarg 2001; Albornoz and Dutta 2007).

Finally, we present the thresholds for the robust and important interaction terms. We begin with the interaction term FDI*LAW because this relationship is robust and positive for all three FDI variables. Thus, irrespectively of whether we look at FDI_T, FDI_{NA} or FDI_{EUR}, we find that a positive FDI-growth nexus depends on the improvement of the legal framework. The thresholds are 0.02 for FDI_T, 0.001 for FDI_{NA}, and -0.011 for FDI_{EUR}, respectively.[18] Thus, we get a positive growth effect of FDI with practically any improvement in the variable LAW. In the whole period under consideration, 1990-2003, LAW changed between -0.6 and 0.7 in our country sample. The magnitude of the coefficient indicates that the growth sensibility with respect to changes in LAW was particularly pronounced with EUR-FDI.

Having a look at the robust but negative interaction FDI_T*DEMO, we see that the growth effect of total FDI becomes negative if DEMO changes by a value of above -0.0041.[19] Thus, practically any worsening of democracy would turn the growth effect of total FDI positive. There are a few cases in our sample when democracy worsened due to economic crises, for example in Argentina in 2002, in Brazil and Mexico in 1990, in Chile in 1997/98, and in Colombia in 1996/97. Presumably, these more non-democratic episodes have benefited the growth effects of total FDI since they reduced the risk for the investor in the respective countries.

The interaction FDI_{NA}*EXCH is also negatively correlated with the FDI-growth nexus. The threshold value of EXCH for the growth effect to become positive is -0.003. This indicates that practically any volatility of the exchange rate harms the growth effects of FDI_{NA}. Finally, our estimates showed a positive coefficient for FDI_{EUR}*POLRI. The calculated threshold for the change in the political risk index is 0.004, thus practically any improvement in POLRI would yield a positive growth effect of EUR-FDI.[20] In most countries the political risk situation improved over the period 1990-98 and again in 2001 and 2003. Thus, we can expect positive growth effects of EUR-FDI in these periods due to decreasing political risk.

[18]The index of law and order runs from 0 to 1.8.
[19]The index of democratic accountability runs from 0 to 1.8.
[20]The index of political risk runs from 0 to 4.6.

5.3 Robustness and causality

In this section we estimate the 10 best model specifications from both BMA analyses with the Blundell and Bond (1998) GMM system estimator. This exercise provides a robustness check and allows to draw conclusions on the causality of the effect of FDI and other variables on growth.[21] The estimations are applied to the same specifications as in the identified top 10 models however, as is common with interaction terms, FDI per se is also entered as a variable. All variables are instrumented and we always estimate in two steps. The lag length and the number of included lags varies according to possible error correlations with other variables and the test statistics on error autocorrelation and validity of instruments. The results are presented in Tables 6 and 7 in the Appendix.

The estimations with total FDI show that variables which appear in almost all top 10 BMA models become also significant in the GMM estimations. Thus, GDPlag, POLRI, MILI, FDI*LAW, FDI*DEMO and INV have practically always significant coefficients. OPEN becomes only significant in the models without INV, corresponding to the drop of INV in the BMA models where OPEN appears. The variables which appear only once among the ten best models are not significant in the GMM estimations.

The estimates of the top 10 models of the second BMA with NA-FDI and EUR-FDI show that the two variables which appear in all top 10 models, INV and FDI_{NA}*EXCH, are always significant regressors. The next frequent BMA variables, GDPlag and FDI_{NA}*LAW, are almost always significant. Also FDI_{EUR}*LAW and FDI_{EUR}*POLRI, appearing once or twice in the top 10 models, are significant regressors. The other variables which appear in only one or two top ten models, OPEN, TERT and D1*TERT, ROAD and PHONE, are not always significant.

As expected, regressors that have a high PIP in one of the two BMAs are in general also significant in GMM. Moreover, these GMM estimates do have fairly stable coefficients. Thus, the GMM analyses confirm our BMA findings and permit us to state that FDI in LA is a cause for productivity gains in a country if certain conditions are met.

Based on these robust findings, we dare to draw the following conclusions with respect to the role of different sources and their respective investment patterns and types. NA-FDI, in contrast to EUR-FDI, is more robust and thus directly correlated with productivity growth in LA after having controlled for potential differences. The PIPs and the posterior estimates of the interactions of exchange rate stability and rule of law with NA-FDI are higher than the interactions of political risk or rule of law with EUR-FDI. Strictly speaking, only the interaction terms with NA-FDI are able to pass the threshold of a PIP of 50%

[21] Interestingly, Malik and Temple (2008) choose a similar strategy and estimate their ten best models with OLS. The authors claim to get more easily interpretable standard coefficients by doing that.

over which to call a regressor effective. However, both FDI variables appear in interactions among the ten best models implying that both are related to growth in combination with other standard growth correlates in LA.

Thus, we conclude that especially the large up-front capital transfers of NA-FDI contribute directly to productivity growth in LA serving as new vintage capital in key branches. Moreover, NA-FDI seems to be more important for growth because of the higher technology and know-how imports of efficiency-seeking (greenfield) FDI. EUR-FDI, on the other hand, is mainly engaged in mergers and acquisitions. It primarily aims to modernize formerly state-owned firms thereby enabling technological spillovers through upstream and downstream linkages. However, the recent study by Fornero and Tondl (2009) shows that, particularly in the service sector targeted by EUR-FDI, there are important cases in the energy and telecommunications sector where FDI yielded no or only retarded efficiency gains. This could be one of the reasons why EUR-FDI is only indirectly correlated with productivity growth in LA and needs to be combined with other growth enhancing factors.

6 Conclusion

This study investigates the FDI-growth nexus in 16 LA countries in the period of rapidly increasing FDI inflows, 1990–2003. We use a canonical growth regression and estimate robust model specifications by Bayesian Model Averaging (BMA). In line with observed data patterns, we first analyze total FDI inflows but then distinguish between NA- and EUR-FDI. In doing so, we account for the major shifts in the regional composition of these inflows since the 1990s, and for the varying types and motives of FDI coming from EUR as opposed to NA-FDI. We look at more than 20 different controls which can be clustered into human capital, institutions, infrastructure, trade, macroeconomic policies, and socioeconomic structure. To account for potential conditional factors for the FDI-growth nexus in LA, we add interaction terms of these controls with FDI. These interactions also allow us to account for heterogeneity in the spillover effects of FDI in the various countries by making the coefficients of the interaction terms to be themselves functions of FDI. Finally, we allow for parameter heterogeneity between different groups of LA countries.

We apply BMA as it addresses parameter and model uncertainty in growth empirics arising from lacking theoretical guidance. BMA is flexible with respect to the size and exact specification of a model and does not require the a priori selection of any model. Inference is based on a weighted average over all models, and a ranking in terms of explanatory power of all variables and models is endogenously determined. Consequently, our findings entail new insights in the conflicting results on the FDI-growth nexus in LA in two respects: We are in the position to suggest model specifications that are more robust and, therefore, more reliable as they were selected 'conditional on model uncertainty'. On that account, our paper provides an 'external robustness check' for related studies showing contrasting results. Moreover, our own policy implications are more robust because we use consistent time and country samples in one unified, statistically rigorous method.

Our two BMA analyses allow us to distinguish new results: First, FDI is robustly correlated with productivity growth in LA subject to certain local conditions. Necessary prerequisite is a sufficiently developed rule of law. The insights gained from the use of conditioning factors are important and specific to the situation in LA. In other country contexts an educational or income threshold as well as trade openness seem to be important for productivity effects of FDI. For the FDI-growth nexus in LA, in contrast, only a stable legal seems to be most important.

Second, lagged GDP and domestic investments are the most robust growth correlates independent of the other variables included in our two regressions. In combination with other regressors, real trade openness, the degree of political risk and of military involvement in politics, infrastructure as well as human capital are important factors, too. Regional heterogeneity does not seem to be an issue in our study, only the growth effects of tertiary education differ between large and small countries.

Finally, we find evidence in favor of NA-FDI being more robust in and important for the FDI-growth nexus in LA. Therefore, we conclude that NA-FDI with its stronger presence in greenfield investments and vertical FDI generates more productivity spillovers than the primarily horizontal EUR-FDI that is mostly oriented towards mergers and acquisitions. The large up-front capital transfers of NA-FDI directly contribute to productivity growth in LA and serve as new vintage capital in key branches. Moreover, NA-FDI seems to be more important for growth because of the higher technology and know-how imports of efficiency-seeking (greenfield) FDI. EUR-FDI, on the other hand, is mainly engaged in mergers and acquisitions. Thus, it primarily aims to modernize formerly state-owned firms and enables technological spillovers through upstream and downstream linkages. However, EUR-FDI is only indirectly correlated with productivity growth in LA when it is combined with other growth enhancing factors.

References

Acemoglu, D., Johnson, S. and Robinson, J. (2005), Institutions as a fundamental cause of long-run growth, in: Aghion, P., Durlauf, S. (eds.), *Handbook of Economic Growth Vol. 1A*, North Holland, Amsterdam, 385-472.

Aitken, B., Hansen, G. and Harrison, A. (1997), Spillovers, foreign investment, and export behaviour, *Journal of International Economics 43*, 103-32.

Aitken, B. and Harrison, A. (1999), Do domestic firms benefit from direct foreign investment? Evidence from Venezuela, *American Economic Review 89*, 605-618.

Albornoz, F. and Dutta, J. (2007), Political regimes and economic growth in Latin America, University of Birmingham, *mimeo.*

Alcalá, F., Ciccone, A. (2004), Trade and productivity, *Quarterly Journal of Economics 119*, 613-646.

Alesina, A., Spolaore, E. and Wacziarg, R. (2005), Trade, growth and the size of countries, in: Aghion, P., Durlauf, S. (eds.), *Handbook of Economic Growth Vol. 1B*, North Holland, Amsterdam, 1499-1542.

Alfaro, L. and Rodriguez-Clare, A. (2004), Multinationals and linkages: an empirical investigation, *Economia 4*, 113-169.

Alfaro, L., Chanda, A., Kalemli-Ozcan, S. and Sayek, S. (2004), FDI and economic growth: the role of local financial markets, *Journal of International Economics 64*, 89-112.

Arnold, J., Mattoo, A. and Javorcik, B. (2006), Does services liberalization benefit manufacturing firms? Evidence from the Czech Republic, *CEPR Discussion Paper No. 5902*, London.

Balasubramanyam V., Salisu, M. and Sapsford, D. (1999), Foreign direct investment as an engine of growth, *Journal of International Trade and Economic Development 8*, 27-40.

Barro, R., Lee, J. (2001), International data on educational attainment: updates and implications, *Oxford Economic Papers 3*, 541-563.

Bengoa, M., Sanchez-Robles, B. (2003), Foreign direct investment, economic freedom and growth: new evidence from Latin America, *European Journal of Political Economy 19*, 529-545.

Benhabib, J., Spiegel, M. (2005), Human capital and technology diffusion, in: Aghion, P., Durlauf, S. (eds.), *Handbook of Economic Growth Vol. 1A*, North Holland, Amsterdam, 935-936.

Blomström, M., Kokko, A. (1997), How foreign investment affects host countries, *Policy Research Working Paper No. 1745*, The World Bank, Washington.

Blomström, M., Lipsey, R. and Zejan, M. (1994), What explains growth in developing countries?, in: Baumol, W., Nelson, R. and Wolff, E. (eds.), *Convergence of Productivity: Cross-national Studies and Historical Evidence*, Oxford University Press, Oxford, 243-259.

Blomström, M., Wolff, E. (1994), Multinational corporations and productivity convergence in Mexico, in: Baumol, W., Nelson, R. and Wolff, E. (eds.) *Convergence of Productivity: Cross-national Studies and Historical Evidence*, Oxford University Press, Oxford, 263-284.

Bloningen, B., Wang, M. (2004), Inappropriate pooling of wealthy and poor countries in empirical FDI studies, NBER, *Working Paper 10378*, Cambridge.

Blundell, R., Bond, S. (1998), Initial conditions and moment restrictions in dynamic panel data models, *Journal of Econometrics 87*, 115–143.

Borensztein, E., De Gregorio, J. and Lee, J. (1998), How does foreign direct investment affect growth?, *Journal of International Economics 45*, 115-135.

Brock, W., Durlauf, S. (2001), Growth empirics and reality, *World Bank Economic Review 15*, 229-272.

Calderón, C., Servén, L. (2004a), Trends in infrastructure in Latin America, 1980-2001, The World Bank, *Policy Research Working Paper No. 3401*, Washington.

Calderón, C., Servén, L. (2004b), The effects of infrastructure development on growth and income distribution, The World Bank, *Policy Research Working Paper No. 3400*, Washington.

Carkovic, M., Levine, R. (2002), Does foreign direct investment accelerate economic growth?, Working Paper Department of Finance, University of Minnesota.

Corbo, V., Hernández, L. and Parro, F. (2005), Institutions, economic policies and growth: lessons from the Chilean experience, Central Bank of Chile, *Working Paper No. 317*, Santiago.

Cuadros, A., Orts, V. and Alguacil, M. (2004), Openness and growth: re-examining foreign direct investment, trade and output linkages in Latin America, *Journal of Development Studies 40*, 167-192.

De Gregorio, J. (1992), Economic growth in Latin America, *Journal of Development Economics 39*, 58-84.

De Gregorio, J. (2003), The role of foreign direct investment and natural resources in economic development, *Central Bank of Chile Working Papers No. 196*, Santiago.

De Mello, L. (1997), Foreign direct investment in developing countries and growth: a selective survey, *Journal of Development Studies 34*, 1-34.

De Mello, L. (1999), Foreign direct investment-led growth: evidence from time series and panel data, *Oxford Economic Papers 51*, 133-151.

Durlauf, S., Johnson, P., Temple J. (2005), Growth econometrics, in: Aghion, P., Durlauf, S. (eds.), *Handbook of Economic Growth Vol. 1A*, North Holland, Amsterdam, 555-677.

Easterly, W. (2005), National policies and economic growth: a reappraisal, in: Aghion, P., Durlauf, S. (eds.), *Handbook of Economic Growth Vol. 1A*, North Holland, Amsterdam, 1015-1059.

Eicher, T., Henn, C. and Papageorgiou, C. (2007a), Trade creation and diversion revisited: accounting for model uncertainty and natural trading partner effects, *UWEC 2007-18*, University of Washington.

Eicher, T., Papageorgiou, C. and Raftery, A. (2007b), Determining growth determinants: default priors and predictive performance in Bayesian model averaging, *UWEC 2007-25*, University of Washington.

Fagerberg, J. (1994), Technology and International Differences in Growth Rates, *Journal of Economic Literature, 32*, 1147-1175.

Fernández, C., Ley, E. and Steel, M.F. (2001a), Model uncertainty in cross-country growth regressions, *Journal of Applied Econometrics 16*, 563-576.

Fernández, C., Ley, E. and Steel, M. (2001b), Benchmark priors for Bayesian model averaging, *Journal of Econometrics 100*, 381-427.

Fornero, J., Tondl, G. (2009), Sectoral productivity and spillover effects of FDI in LA, *FIW Working Paper*, forthcoming, Vienna.

Görg, H., Greenaway, D. (2004), Much ado about nothing? Do domestic firms really benefit from foreign direct investment?, *World Bank Research Observer 19*, 171-197.

Gomez Vega, C. (2004), El desarrollo de la industria de la maquila en Mexico, *Problemas del Desarrollo 35*, 57-83.

Hanson, G., Mataloni, R., Slaughter, M. (2001), Expansion Strategies of U.S. Multinational Firms, WP2001-01, Bureau of Economic Analysis, Washington.

Hoeting, J., Madigan, D., Raftery, A. and Volinsky, C. (1999), Bayesian model averaging: a tutorial, *Statistical Science 14*, 382-417.

Javorcik, B., Spatareanu, M. (2008), To share or not to share: does local participation matter for spillovers from foreign direct investment?, *Journal of Development Economics 85*, 194-217.

Javorcik, B. (2004), Does foreign direct investment increase the productivity of domestic firms? In search of spillovers through backward linkages, *American Economic Review 94*, 605-27.

Javorcik, B., Saggi, K. and Spatareanu, M. (2004), Does it matter where you come from? Vertical spillovers from foreign direct investment and the nationality of investors, The World Bank, *Policy Research Working Paper No. 3449*, Washington.

Jimenez, E. (1986), The public subsidization of education and health in developing countries: a review of equity and efficiency, *World Bank Research Observer 1*, 111-129.

Jones, G., Schneider, J. (2004), Intelligence, human capital, and economic growth: A Bayesian averaging of classical estimates (BACE) approach, *Journal of Economic Growth 11*, 71-93.

Kugler, M. (2006), Spillovers from foreign direct investment: within or between industries?, *Journal of Development Economics 80*, 444-477.

Leamer, E. (1978), *Specification Searches: Ad hoc Inference with Nonexperimental Data*, Wiley, New York.

Leamer, E. (1985), Sensitivity analysis would help, *American Economic Review 75*, 308-313.

León-González, R., Montolio, D. (2004), Growth, convergence and public investment. A Bayesian model averaging approach, *Applied Economics, 36,* 1925-1936.

Levine, R., Renelt, D. (1992), A sensitivity analysis of cross-country growth regressions, *American Economic Review 82*, 942-963.

Levy Yegati, E., Panizza, U. and Stein, E. (2007), The cyclical nature of North-South FDI flows, *Journal of International Money and Finance 26*, 104-130.

Ley, E., Steel, M. (2009), On the effect of prior assumptions in Bayesian model averaging with applications to growth regression, *Journal of Applied Econometrics*, forthcoming.

Loayza, N., Fajnzylber, P. and Calderón, C. (2005), Economic growth in Latin America and the Caribbean: stylized facts, explanations, and forecasts, in: *World Bank Latin American and Caribbean Studies*, The World Bank, Washington.

Madigan, D., York, J. (1995), Bayesian graphical models for discrete data, *International Statistical Review 63*, 215-232.

Magnus, J., Powell, O. and Prüfer, P. (2008), A comparison of two model averaging techniques with an application to growth empirics, *CentER DP No. 2008-39*, Tilburg University.

Malik, A., Temple, J. (2008), The geography of output volatility, *Journal of Development Economics*, forthcoming.

Mankiw, G. (1995), The growth of nations, *Brookings Papers on Economic Activity 1*, 275-326.

Markusen, J. , Venables, A. (1999), Foreign direct investment as a catalyst for industrial development, *European Economic Review 43*, 335-356.

Masanjala, W., Papageorgiou, C. (2008), Rough and lonely road to prosperity: a reexamination of the sources of growth in Africa using Bayesian model averaging, *Journal of Applied Econometrics*, forthcoming.

Nickell, S. (1981), Biases in dynamic models with fixed effects, *Econometrica 49*, 1417–1426.

Peters, E. (2000), *Polarizing Mexico: The Impact of Liberalization Strategy. Critical Perspectives on Latin America's Economy and Society*, Rienner, London.

Raftery, A. (1995), Bayesian model selection in social research, *Sociological Methodology 25*, 111-163.

Rodriguez Clare, A. (1996), Multinationals, linkages, and economic development, *American Economic Review 86*, 852-873.

Sachs, J., Warner, A. (1999), The big push, natural resource booms and growth, *Journal of Development Economics 59*, 43-76.

Sala-i-Martin, X. (1997), I just ran two million regressions, *American Economic Review 87*, 178-183.

Sala-i-Martin, X., Doppelhofer, G. and Miller, R. (2004), Determinants of long-term growth: A Bayesian Averaging of Classical Estimates (BACE) approach, *American Economic Review 94*, 813-835.

Solow, R. (1956), A contribution to the theory of economic growth, *Quarterly Journal of Economics 70*, 65-94.

Tavares, J., Wacziarg, R. (2001), How democracy affects growth, *European Economic Review 45*, 1341-1378.

Temple, J. (2000), Growth regressions and what the textbooks don't tell you, *Bulletin of Economic Research 52*, 181-205.

Temple, J. (2001), Growth effects of education and social capital in the OECD countries, OECD, *Economic Studies No. 33*, Paris.

UNCTAD (2004), *World Investment Directory*, UNCTAD, Geneva.

Ventura, J. (2005), A global view of economic growth, in: Aghion, P., Durlauf, S. (eds.), *Handbook of Economic Growth Vol. 1B*, North Holland, Amsterdam, 1419-1497.

Vodusek, Z. (2004), Foreign direct investment in Latin America: the role of European investors. An update, Inter-American Development Bank, *SOE/IDB Working Paper Series 5*, Washington.

Wacziarg, R. (2002), Review of Easterly's The elusive quest for growth, *Journal of Economic Literature 40*, 907-918.

Winters, A. (2004), Trade liberalisation and economic performance: an overview, *Economic Journal 114*, F4-F221.

Appendix

Countries in estimation

Argentina, Bolivia, Brazil, Chile, Colombia, Costa Rica, Ecuador, El Salvador, Guatemala, Honduras, Mexico, Nicaragua, Peru, Paraguay, Uruguay, and Venezuela.

European source countries

Austria, Belgium, Denmark, France, Germany, Italy, Liechtenstein, Luxembourg, Netherlands, Portugal, Spain, Sweden, Switzerland, and United Kingdom.
The respective EUR countries may vary from one LA country to another since not all European countries are present in all LA countries (e.g. Portugal invests practically only in Brazil). EUR investment is slightly underestimated since official series do not report data for small investors below a certain threshold.

North American source countries

Canada and United States of America.

Table 1: Variables and data sources

Variable	Definition	Source	Remarks
$GROWTH_{LF}$	Share of real GDP growth per labor force	WDI 2005	Constant US$ in 2000.
GDPlag	Lagged GDP per labor force	WDI 2005	Lag length is three years.
INV	Share of gross fixed capital formation in GDP	WDI 2005	
PRIM	Change share of adult population with completed primary education	Barro/Lee (2001)	Missing years interpolated.
SEC	Change share of adult population with completed secondary education	Barro/Lee (2001)	Missing years interpolated.
TERT	Change share of adult population with completed tertiary education	Barro/Lee (2001)	Missing years interpolated.
FDI_T	Change share total FDI stock in GDP	UNCTAD	Generated from inward stocks of LA data by country of origin.
FDI_{EUR}	Change share FDI stock from Europe in GDP	UNCTAD	Data completed with data from OECD International Investment Directory for EUR countries, data from central banks, and statistical offices.

Table 1: continued

Variable	Definition	Source	Remarks
FDI_{NA}	Change share FDI stock from North America in GDP	UNCTAD	See FDI_{EUR}.
OPEN	Change share exports plus imports in current int. US$ to GDP in PPP current int. US$	WDI 2005	Own calculations based on Alcalá and Ciccone (2004).
CPI_{VOL}	Change consumer price volatility	IFS	Standard deviation relative to country mean, quarterly data of past 5 years.
EXCH	Exchange rate volatility	IFS	Calculated from official exchange rate, national currency per US-Dollar, quarterly data of past 5 years.
DEBT	Share external debt to exports, in logs	WDI 2005	
ELEC1	Growth electricity generating capacity per 1000 persons	WDI 2005	3 year moving averages.
ELEC2	Electric power transmission and distribution loss, share of output	WDI 2005	
ROAD	Change paved road, km per square kilometer	Int. Road Fed.	3 year moving averages.
PHONE	Growth telephone mainlines per 1000s	WDI 2005	
PC	Change growth rate of PCs per 1000s	WDI 2005	
WWW	Change growth rate internet users per 1000s	WDI 2005	
POLRI	Change political risk rating (in logs)	ICRG	Increase indicates less risk, index runs from 0 to 4.6, composite index made up of 12 components.
CORR	Change corruption index (in logs)	ICRG	Increase indicates less corruption, index runs from 0 to 1.8.
DEMO	Change index democratic accountability (in logs)	ICRG	Increase indicates more democracy, index runs from 0 to 1.8.
LAW	Change index law and order (in logs)	ICRG	Increase indicates better law, index runs from 0 to 1.8.

Table 1: continued

Variable	Definition	Source	Remarks
MILI	Change index military in politics (in logs)	ICRG	Increase indicates less military, index runs from 0 to 1.8.
AGRI	Change GDP share agriculture	WDI 2005	
IND	GDP share industry	WDI 2005	
$FDI * SEC$	Interaction term		In the first analysis, FDI_T is used to build all interactions. The second analysis uses FDI_{EUR} and FDI_{NA}.
$FDI * TERT$	Interaction term		
$FDI * OPEN$	Interaction term		
$FDI * CPI_{VOL}$	Interaction term		
$FDI * EXCH$	Interaction term		
$FDI * DEBT$	Interaction term		
$FDI * ELEC1$	Interaction term		
$FDI * ELEC2$	Interaction term		
$FDI * ROAD$	Interaction term		
$FDI * PHONE$	Interaction term		
$FDI * PC$	Interaction term		
$FDI * WWW$	Interaction term		
$FDI * POLRI$	Interaction term		
$FDI * CORR$	Interaction term		
$FDI * DEMO$	Interaction term		
$FDI * LAW$	Interaction term		
$FDI * MILI$	Interaction term		
D1	Dummy for big economies obtained from ranking GDP in 2000 USD in 1980 and 1990		ARG, BRA, CHL, COL, MEX, PER, URU, VEN (no change of group members between years).
D2	Dummy for rich economies obtained from ranking GDP p.c. in 2000 USD in 1980 and 1990		ARG, BRA, CHL, CRI, MEX, URU, VEN (no change of group members between years).

Table 2: Ten best models for BMA with total FDI

Model	Regressors	PMP
1	GDPlag, INV, FDI_T*DEMO, FDI_T*LAW, POLRI, MILI	2.78
2	GDPlag, INV, FDI_T*DEMO, FDI_T*LAW, POLRI, MILI, OPEN	2.24
3	GDPlag, INV, FDI_T*DEMO, FDI_T*LAW, POLRI, MILI, OPEN, D1*OPEN	0.65
4	GDPlag, INV, FDI_T*DEMO, FDI_T*LAW, POLRI, MILI, DEBT	0.58
5	GDPlag, FDI_T*DEMO, FDI_T*LAW, POLRI, MILI, OPEN	0.44
6	GDPlag, INV, FDI_T*DEMO, FDI_T*LAW, POLRI, MILI, TERT, D1*TERT	0.41
7	GDPlag, INV, FDI_T*DEMO, FDI_T*LAW, POLRI, MILI, OPEN, EXCH	0.36
8	GDPlag, INV, FDI_T*DEMO, FDI_T*LAW, POLRI, MILI, OPEN, D2*OPEN	4.02
9	GDPlag, FDI_T*DEMO, FDI_T*LAW, POLRI, MILI, OPEN, D2*OPEN	0.33
10	GDPlag, INV, FDI_T*DEMO, FDI_T*LAW, POLRI, MILI, OPEN, TERT, D1*TERT	0.30

Table 3: Posterior moments for BMA with total FDI (unconditional on inclusion)

Rank	Regressor	PIP	Mean	SE
1	FDI_T*LAW	0.9403	2.1870	0.7633
2	INV	0.9130	0.3314	0.1441
3	FDI_T*DEMO	0.7234	-2.9042	2.0875
4	GDPlag	0.7152	-0.0692	0.0502
5	MILI	0.4907	-0.0355	0.0401
6	POLRI	0.4759	0.1204	0.1395
7	D1*TERT	0.4107	22.7676	30.5122
8	TERT	0.3886	-19.2890	26.4033
9	OPEN	0.3440	0.0633	0.0998
10	FDI_T*DEBT	0.2197	-0.0455	0.0952
11	PRIM	0.1894	0.4148	0.9518
12	EXCH	0.1370	0.0018	0.0050
13	DEBT	0.1223	-0.0025	0.0076
14	ROAD	0.1135	0.3935	1.2419
15	FDI_T*POLRI	0.1032	0.4580	1.5403
16	PHONE	0.0628	0.0042	0.0192
17	SEC	0.0572	0.0314	0.1499
18	ELEC2	0.0533	-0.0096	0.0489
19	D2*OPEN	0.0520	-0.0095	0.0531
20	D2*IND	0.0509	0.0084	0.0449

Table 3: continued

Rank	Regressor	PIP	Mean	SE
21	D1*OPEN	0.0499	-0.0087	0.0503
22	PC	0.0496	0.0002	0.0012
23	FDI_T*ELEC2	0.0493	-0.0464	0.2725
24	FDI_T	0.0394	-0.0041	0.0339
25	FDI_T*TERT	0.0309	-1.1465	13.3455
26	CPI_{VOL}	0.0307	-0.0001	0.0010
27	FDI_T*ELEC1	0.0304	-0.0530	0.4089
28	FDI_T*ROAD	0.0303	1.6891	13.3538
29	D1*PRIM	0.0289	0.0429	0.6036
30	DEMO	0.0287	-0.0004	0.0088
31	FDI_T*WWW	0.0282	-0.0031	0.0264
32	D2*PRIM	0.0254	0.0175	0.5404
33	FDI_T*EXCH	0.0241	0.0052	0.0533
34	WWW	0.0234	-0.0001	0.0011
35	FDI_T*OPEN	0.0227	-0.0037	0.0713
36	IND	0.0219	0.0001	0.0184
37	LAW	0.0218	-0.0003	0.0041
38	D2*TERT	0.0210	-0.0970	1.5337
39	D2*AGRI	0.0207	-0.0043	0.0601
40	FDI_T*MILI	0.0201	0.0007	0.0624
41	CORR	0.0197	-0.0002	0.0028
42	$FDI_T * CPI_{VOL}$	0.0194	-0.0006	0.0092
43	FDI_T*PHONE	0.0190	0.0031	0.1062
44	AGRI	0.0185	0.0017	0.0260
45	D2*SEC	0.0173	0.0057	0.1039
46	D1*SEC	0.0172	0.0050	0.1314
47	FDI_T*SEC	0.0171	-0.0574	1.2554
48	FDI_T*PC	0.0170	0.0004	0.0118
49	ELEC1	0.0161	0.0004	0.0099
50	FDI_T*CORR	0.0148	0.0002	0.0616

Table 4: Ten best models for BMA with EUR- vs. NA-FDI

Model	Regressors	PMP
1	GDPlag, INV, FDI_{NA}*EXCH, FDI_{NA}*LAW	3.06
2	GDPlag, INV, FDI_{EUR}*LAW, FDI_{NA}*EXCH	1.72
3	GDPlag, INV, FDI_{NA}*EXCH, FDI_{NA}*LAW, TERT, D1*TERT	1.68
4	INV, FDI_{NA}*EXCH, FDI_{NA}*LAW	1.34
5	GDPlag, INV, FDI_{NA}*EXCH, FDI_{NA}*LAW, OPEN	1.01
6	INV, FDI_{NA}*EXCH, FDI_{NA}*LAW, ROAD	0.97
7	GDPlag, INV, FDI_{NA}*EXCH, FDI_{NA}*LAW, ROAD	0.77
8	GDPlag, INV, FDI_{EUR}*POLRI, FDI_{NA}*EXCH	0.74
9	GDPlag, INV, FDI_{EUR}*LAW, FDI_{NA}*EXCH,OPEN	0.70
10	INV, FDI_{NA}*EXCH, FDI_{NA}*LAW, PHONE	0.64

Table 5: Posterior moments for BMA with EUR- vs. NA-FDI (unconditional on inclusion)

Rank	Regressor	PIP	Mean	SE
1	INV	0.9887	0.4262	0.1084
2	FDI_{NA}*EXCH	0.8340	-1.0974	0.5821
3	GDPlag	0.7173	-0.0692	0.0502
4	FDI_{NA}*LAW	0.5878	2.8426	2.6019
5	D1*TERT	0.3089	14.2098	24.2967
6	TERT	0.2738	-11.6427	20.8541
7	FDI_{EUR}*POLRI	0.2310	2.8316	5.6491
8	OPEN	0.2016	0.0309	0.0690
9	ROAD	0.1962	0.7855	1.7492
10	FDI_{EUR}*LAW	0.1947	1.1256	2.4660
11	FDI_{NA}*TERT	0.1877	-60.0455	141.3990
12	MILI	0.1267	-0.0062	0.0182
13	PHONE	0.1103	0.0087	0.0275
14	PC	0.0856	0.0005	0.0018
15	DEBT	0.0854	-0.0016	0.0058
16	POLRI	0.0739	0.0116	0.0469
17	SEC	0.0723	0.0464	0.1885
18	FDI_{EUR}*SEC	0.0721	-4.2287	17.4658
19	FDI_{EUR}*DEBT	0.0649	-0.0320	0.1456
20	PRIM	0.0648	0.1128	0.5153
21	FDI_{EUR}*EXCH	0.0609	0.0940	0.4460
22	DEMO	0.0453	-0.0021	0.0116
23	FDI_{EUR}*ELEC2	0.0435	-0.1428	0.8754
24	FDI_{EUR}*CPI_{VOL}	0.0377	-0.0080	0.0509
25	ELEC2	0.0351	-0.0058	0.0382
26	FDI_{NA}*ELEC2	0.0350	-0.0524	0.3626

Table 5: continued

Rank	**Regressor**	**PIP**	**Mean**	**SE**
27	FDI_{NA}*ELEC1	0.0349	-0.1879	1.2582
28	FDI_{NA}	0.0318	-0.0037	0.0958
29	FDI_{EUR}	0.0317	-0.0130	0.1030
30	FDI_{EUR}*DEMO	0.0315	-0.2027	1.4071
31	FDI_{EUR}*PHONE	0.0312	0.0848	0.6422
32	FDI_{NA}*DEBT	0.0309	-0.0065	0.0474
33	EXCH	0.0300	0.0003	0.0021
34	FDI_{NA}*POLRI	0.0291	0.1672	1.2359
35	FDI_{NA}*OPEN	0.0288	-0.0004	0.2538
36	D1*PRIM	0.0280	0.0420	0.3698
37	FDI_{NA}*WWW	0.0266	-0.0096	0.0756
38	D2*OPEN	0.0264	-0.0036	0.0329
39	D2*IND	0.0262	0.0035	0.0276
40	D2*PRIM	0.0253	0.0331	0.3306
41	D2*TERT	0.0250	-0.2587	2.1460
42	FDI_{EUR}*ELEC1	0.0236	-0.1235	1.1627
43	D1*OPEN	0.0231	-0.0022	0.0261
44	WWW	0.0214	-0.0001	0.0011
45	FDI_{NA}*ROAD	0.0208	1.0933	10.8524
46	D1*SEC	0.0203	0.0218	0.2280
47	CPI_{VOL}	0.0197	-0.0001	0.0008
48	FDI_{EUR}*TERT	0.0179	0.0863	23.0372
49	FDI_{NA}*SEC	0.0177	0.1719	2.8325
50	FDI_{NA}*CPI_{VOL}	0.0176	-0.0009	0.0308
51	FDI_{NA}*PHONE	0.0169	0.0049	0.4040
52	FDI_{NA}*DEMO	0.0166	-0.0240	0.3103
53	D2*SEC	0.0164	0.0101	0.1282
54	FDI_{EUR}*MILI	0.0163	0.0109	0.2717
55	D2*AGRI	0.0160	-0.0039	0.0534
56	AGRI	0.0152	0.0015	0.0238
57	FDI_{EUR}*OPEN	0.0148	-0.0022	0.2221
58	FDI_{NA}*CORR	0.0143	-0.0106	0.1672
59	CORR	0.0142	-0.00001	0.0021
60	FDI_{EUR}*ROAD	0.0141	0.8118	23.9763
61	FDI_{NA}*PC	0.0139	0.0009	0.0244
62	FDI_{NA}*MILI	0.0138	0.0020	0.1786
63	FDI_{EUR}*WWW	0.0137	-0.0027	0.0419
64	IND	0.0136	0.0001	0.0117
65	LAW	0.0131	0.0001	0.0029
66	FDI_{EUR}*CORR	0.0130	-0.0002	0.1786
67	FDI_{EUR}*PC	0.0126	0.0003	0.0329
68	ELEC1	0.0120	0.0000	0.0070

Table 6: GMM system estimation of top ten models with total FDI

Modelspecification	1	2	3	4	5	6	7	8	9	10
GDPlag	-0.0148	-0.0173	-0.0149	-0.0184	-0.0098	-0.0094	-0.0100	-0.0186	-0.0059	-0.0178
	(0.0850)	(0.0640)	(0.0071)	(0.0190)	(0.0900)	(0.0890)	(0.0870)	(0.0530)	(0.1200)	(0.0038)
INV	0.6530	0.5210	0.4970	0.7470	-	0.5140	0.5060	0.5570	-	0.5270
	(0.0810)	(0.0220)	(0.0003)	(0.0170)	-	(0.0008)	(0.0230)	(0.0580)	-	(0.0088)
FDI_T	-0.0590	-0.1660	-0.0948	-0.0295	-0.1160	-0.0754	-0.0529	-0.1160	0.0119	0.0649
	(0.6600)	(0.1400)	(0.3400)	(0.7900)	(0.3200)	(0.5000)	(0.6500)	(0.3400)	(0.9200)	(0.6600)
FDI_T*DEMO	-5.9190	-4.6790	-4.9500	-5.4300	-4.4060	-3.6110	-6.2880	-3.6660	-6.1940	-6.8020
	(0.0690)	(0.0120)	(0.0210)	(0.0920)	(0.0610)	(0.0280)	(0.0830)	(0.2000)	(0.0120)	(0.1200)
FDI_T*LAW	2.4490	2.8980	2.5680	2.6350	3.5030	2.4980	2.5980	2.8110	3.7230	4.7500
	(0.0078)	(0.0001)	(0.0110)	(0.0160)	(0.0000)	(0.0031)	(0.0078)	(0.0070)	(0.0002)	(0.0460)
POLRI	0.4240	0.2950	0.3230	0.4080	0.1880	0.3310	0.5040	0.3150	0.2580	0.3130
	(0.0420)	(0.0690)	(0.0800)	(0.0360)	(0.2600)	(0.1100)	(0.0400)	(0.0610)	(0.0540)	(0.1300)
MILI	-0.1130	-0.1090	-0.0909	-0.1260	-0.0648	-0.0874	-0.1190	-0.0920	-0.0794	-0.1250
	(0.0370)	(0.0110)	(0.0066)	(0.0280)	(0.0870)	(0.0160)	(0.0440)	(0.0410)	(0.0410)	(0.0200)
OPEN	-	0.2200	0.1030	-	0.3510	-	-0.0143	0.2120	0.1980	0.1140
	-	(0.2200)	(0.4700)	-	(0.0550)	-	(0.9000)	(0.6100)	(0.0470)	(0.6400)
D1*OPEN	-	-	-0.0026	-	-	-	-	-	-	-
	-	-	(0.9700)	-	-	-	-	-	-	-
D2*OPEN	-	-	-	-	-	-	-	-0.0178	0.0132	-
	-	-	-	-	-	-	-	(0.9600)	(0.8600)	-
TERT	-	-	-	-	-	-14.6000	-	-	-	-2.2480
	-	-	-	-	-	(0.8300)	-	-	-	(0.9500)
D1*TERT	-	-	-	-	-	0.5240	-	-	-	20.8900
	-	-	-	-	-	(0.9900)	-	-	-	(0.2200)
EXCH	-	-	-	-	-	-	-0.0146	-	-	-
	-	-	-	-	-	-	(0.5400)	-	-	-
DEBT	-	-	-	0.0014	-	-	-	-	-	-
	-	-	-	(0.9500)	-	-	-	-	-	-
Instruments	17	16	19	19	16	21	18	21	17	23
AR(1) p-value	0.0062	0.0061	0.0052	0.0057	0.0078	0.0090	0.0054	0.0051	0.0051	0.0040
AR(2) p-value	0.5820	0.6370	0.5860	0.4410	0.7920	0.5010	0.7040	0.4130	0.6560	0.1920
Hansen p-value	0.3820	0.4140	0.9680	0.6390	0.3010	0.6890	0.4680	0.7060	0.4680	0.8280

Notes: Two-step system GMM estimation with 224 observations. P-values reported in brackets below coefficient estimates. AR(1) provides a test statistic for first order serial correlation and AR(2) for second order serial correlation in the residuals in first differences. The Hansen test statistic tests the validity of instruments. The null hypothesis is that regressors are not correlated with errors, i.e. that the variable is exogenous. A test statistic above 0.10 indicates that the instruments are valid.

Table 7: GMM system estimation of top ten models with EUR- vs. NA-FDI

Modelspecification	1	2	3	4	5	6	7	8	9	10
GDPlag	-0.0152	-0.0081	-0.0132	-	-0.0118	-	-0.0137	-0.0147	-0.0131	-
	(0.1000)	(0.0560)	(0.1100)	-	(0.0780)	-	(0.0880)	(0.0280)	(0.0020)	-
INV	0.5230	0.5500	0.6140	0.4040	0.3980	0.3860	0.5710	0.7780	0.3660	0.1920
	(0.0330)	(0.0230)	(0.0200)	(0.0870)	(0.0440)	(0.0620)	(0.0510)	(0.0120)	(0.0052)	(0.0190)
FDI_{NA}	-0.2360	1.1610	-0.4480	-0.2530	-0.0972	-0.1340	-0.1970	0.2100	0.0065	-0.2570
	(0.2600)	(0.3700)	(0.0750)	(0.2900)	(0.6500)	(0.6100)	(0.2900)	(0.8600)	(0.9700)	(0.2300)
FDI_{NA}*EXCH	-1.0820	-1.2320	-0.9400	-0.3510	-1.2120	-0.3110	-1.0810	-0.7560	-1.0030	-0.8490
	(0.0007)	(0.0330)	(0.0084)	(0.6500)	(0.0044)	(0.6800)	(0.0210)	(0.1400)	(0.0025)	(0.0830)
FDI_{NA}*LAW	4.0260	-	4.1300	5.2280	4.1000	4.7290	3.9920	-	-	4.3500
	(0.1000)	-	(0.0170)	(0.0063)	(0.0840)	(0.0091)	(0.0640)	-	-	(0.0160)
FDI_{EUR}	-	-0.9510	-	-	-	-	-	-0.9580	-0.3090	-
	-	(0.1400)	-	-	-	-	-	(0.1600)	(0.5600)	-
FDI_{EUR}*LAW	-	7.5490	-	-	-	-	-	-	4.6770	-
	-	(0.0044)	-	-	-	-	-	-	(0.0680)	-
FDI_{EUR}*POLRI	-	-	-	-	-	-	-	20.8100	-	-
	-	-	-	-	-	-	-	(0.0170)	-	-
OPEN	-	-	-	-	0.1700	-	-	-	0.2540	-
	-	-	-	-	(0.3600)	-	-	-	(0.0590)	-
ROAD	-	-	-	-	-	5.4700	2.3240	-	-	-
	-	-	-	-	-	(0.0062)	(0.3700)	-	-	-
PHONE	-	-	-	-	-	-	-	-	-	0.1650
	-	-	-	-	-	-	-	-	-	(0.0890)
TERT	-	-	-47.6000	-	-	-	-	-	-	-
	-	-	(0.3800)	-	-	-	-	-	-	-
D1*TERT	-	-	55.3400	-	-	-	-	-	-	-
	-	-	(0.3000)	-	-	-	-	-	-	-
Instruments	12	14	15	12	16	16	15	14	18	16
AR(1) p-value	0.0073	0.0135	0.0053	0.0074	0.0082	0.0068	0.0069	0.0051	0.0076	0.0067
AR(2) p-value	0.7450	0.5740	0.8040	0.7720	0.7330	0.6150	0.6360	0.6540	0.6490	0.7710
Hansen p-value	0.1610	0.5280	0.5850	0.4450	0.1950	0.3580	0.1510	0.6290	0.5190	0.5950

Notes: Two-step system GMM estimation with 224 observations. P-values reported in brackets below coefficient estimates. AR(1) provides a test statistic for first order serial correlation and AR(2) for second order serial correlation in the residuals in first differences. The Hansen test statistic tests the validity of instruments. The null hypothesis is that regressors are not correlated with errors, i.e. that the variable is exogenous. A test statistic above 0.10 indicates that the instruments are valid.