Introduction

Does trade liberalization foster FDI in emerging countries?

The answer is not straightforward. Are trade and FDI substitutes or complements, or can they be either, depending on the type of FDI or other factors? If trade and FDI are complements, does trade lead to FDI or the other way around? How do we account for other variables which could affect the trade-FDI relationship such as foreign exchange rate stability, adequate infrastructure, domestic financial liberalization, good governance and local skills availability? And last but not least, what is the adequate indicator of trade liberalization itself? The trade output ratio? The external tariff? The effective protection rate? The foreign exchange premium? Or others?

There are numerous empirical studies which attempted to verify the relationship between trade and FDI in the case of emerging countries. Several of them offer different, often conflicting, results. A large part of these differences can be attributed to the theoretical underpinnings, the models’ specification, the degree of disaggregation of trade and FDI flows, the choice and measurement of the selected variables, and the effort which was made to test for causality.

In this survey, I try to summarize in a rather detailed manner these empirical results derived from 21 selected studies published between 1999 and 2007, with in mind the

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1 This paper was written at the request of the international research network on Poverty and Economic Policy (www.pep-net.org). Comments should be addressed to: andre.martens@umontreal.ca. I am grateful to my colleague Benoit Perron (Department of Economics, University of Montreal) who helped me to have a better understanding of the econometric procedure used in some of the studies I surveyed. I am also grateful to John Cockburn (PEP and Department of Economics at University Laval) for having made suggestions which enabled me to refine my concluding remarks.

2 For a thorough empirical survey on FDI determinants, see Bloningen (2005).

3 For an in-depth discussion on the merits and deficiencies of different trade liberalization indicators, see Rodriguez and Rodrik (1999).
possibility of integrating some of the estimates of the trade-FDI relationship into further computable general equilibrium (CGE) modeling.\textsuperscript{4}

**FDI terminology**

FDI is an investment made to acquire lasting interest in enterprises operating outside of the economy of the investor. The parent enterprise and a foreign affiliate form together a transnational or multinational corporation. In order to qualify as FDI the investment must afford the parent enterprise control over its foreign affiliate. It is considered that such a control exists when the parent company owns 10% or more of the ordinary shares or voting power of an incorporated firm or its equivalent for an unincorporated firm. If it does not, investment is known as portfolio investment.

*Inward FDI* is when foreign capital is invested locally. *Outward FDI* is when local capital is invested abroad.

There is *horizontal FDI* if the investment is made by the parent firm in the same activity in which it operates at home. There is *backward vertical FDI* if the parent firm provides inputs to its affiliate. There is *forward vertical FDI* if the parent firm sells the output of its affiliate.

**Preliminary theoretical considerations**

In the context of the 2x2x2 Heckscher-Ohlin trade model of factor endowments, commodity trade leads to international factor-price equalization and, as such, does not provide any incentive for international factor mobility. If one reverses the argument, international factor mobility, as in the form of FDI, should lead to international factor-price equalization without trade in commodities. In such a context, factor mobility and trade are substitutes.\textsuperscript{5}

It has, however, been demonstrated that this symmetry of situations does not necessarily hold when one or more of the assumptions underlying the Heckscher-Ohlin model are not satisfied. These assumptions are the existence of identical production functions across countries and the absence of economies of scale, market imperfections, factor distortions, impediments to trade and factor intensity reversals (Markusen and Svensson, 1985; Wong, 1986; Markusen and Melvin, 1988: 295-299; de Melo and Grether, 1997: chap. 9). When there are, for instance, differences in technologies across countries, an increase in

\textsuperscript{4} We ignored studies which make reference to the trade-FDI relationship but do not provide empirical estimates. Only the significant estimates are reported below and, when a sample includes emerging countries and developed countries, only the emerging countries’ estimates are given.

\textsuperscript{5} A corollary is the *tariff-jumping* argument according to which a tariff imposed by a labor-abundant country increases the return to local investment and attracts consequently foreign capital while reducing trade (Mundell, 1957).
FDI may promote an increase in domestic investment which can be trade enhancing. In such a case, FDI and trade are complements.

The general picture is further clouded when one introduces issues such as market sizes or proximity of sources of demand (Tadesse and Ryan, 2002).

In other words, the question of substitutability or complementarity between FDI and trade remains largely empirical.

**Format of presentation of the empirical evidence**

In the two following sections, the studies (S) are given in chronological order.

The following abbreviations are used. CO: countries or country. PE: period of analysis. FDI: definition of the FDI variable. TR: definition of the openness or trade liberalization variable of the host country. DV: dependent variable, i.e. FDI or TR according to the case. ID: independent variable, i.e. FDI or TR according to the case. OVA: other explanatory variables. MO: model specification. CA: test for causality (yes or no). GR: general results. EST: estimates obtained for the parameters linking trade and FDI.

When estimates are followed by *, ** or ***, the latter represent significance at the 10%, 5%, and 1% level, respectively.

**Empirical evidence from multi-country studies**

**S 1 Bénassy-Quéré, Fontagné and Lahrèche-Révil (1999)**


GR: TR has a significant impact on FDI, which suggests, according to the authors, that the emerging countries receive a large part of FDI aiming at re-exporting at least partially their output, which is consistent with the notion of forward vertical FDI.

EST: the elasticity of FDI with respect to trade is 0.910***.

**S 2 Goldberg and Klein (1999)**

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6 When the trade-FDI relationship was tested for causality, the Granger test was generally used by the authors (Granger, 1969).

7 Multi-country studies are either panel studies or studies which provide estimates for the individual countries of the sample.
CO: 7 Latin American countries. PE: 1972 – 1994. FDI: US FDI flow to the individual countries broken down by 4 sectors of destination (industry of the US parent firm or own industry FDI; other industries; wholesale and retail trade; banking, finance, insurance and real estate). TR: absolute change in the host country’s net exports to the US broken down by sectors of origin. DV: TR. IV: FDI. OVA: absolute changes in the US real GDP, in the host country real GDP and in the host country real exchange rate with respect to the US $. MO: linear. CA: yes.

GR: US FDI either increases or decreases the net exports of the individual countries to the US.

EST:

i. When FDI is restricted to the two industrial sectors and considered as having only an impact on the net exports of the own industry FDI and on the net exports of the other industries, the significant impact coefficients are 0.591** (Brazil, own industry FDI), 0.24** (Colombia, other industries) and -0.222** (Mexico, other industries);

ii. When FDI is made in the other sectors (wholesale and retail trade; banking, finance, insurance and real estate) but is also allowed to have an impact on the net exports of the two industrial sectors, e.g. through input-output linkages or labor reallocation, the significant coefficients are -0.242* (Brazil, own industry FDI), -0.716* (Venezuela, own industry FDI), -0.487** (Venezuela, other industries), 0.803***, -13.36** and 1.49** for wholesale and retail trade in the case, respectively, of Brazil, Colombia and Mexico, and 1.259* (Venezuela, banking etc.).

S 3 Stone and Jeon (2000)

CO: Asia-Pacific countries. PE: 1987-1993. FDI: log (total inward and outward FDI flow / total exports and imports of goods and services). TR: log (total trade / total FDI). DV: FDI or TR. IV: FDI or TR. OVA: GDP, population, distance and 3 dummy variables (part of APEC, ASEAN and the DEA group or group of dynamic East Asian countries). Since the model is a gravity model, distance being considered, GDP and population are country indexed whereas distance, FDI and TR are doubly indexed. MO: linear. CA: no.

GR: FDI and trade are complements, but, though not tested for causality, the FDI-trade relationship is estimated in both directions.

EST: When TR is the dependant variable, its elasticity with respect to FDI varies from 0.095*** (1990) to 0.213*** (1993). When FDI is the dependant variable, its elasticity with respect to TR varies from 0.652*** (1990) to 1.642*** (1992).

S 4 Grünfeld and Svindal (2000)
CO: trade and FDI between 28 African countries and the OECD countries. PE: 1980-92. FDI: log (inward FDI / ITT of the host country) where ITT is the Gruber-Lloyd intra-industry trade index; log (inward FDI / total trade of the host country). TR: log of the nominal average tariff of the host country. ID: FDI. DV: TR. OVA: GNP of the host country / total GNP of the OECD countries (%), per capita GNP of the host country, aid flows, distance, member of the Lomé Treaty (which became the Cotonou Treaty) with the UE, member of the WTO, direct access to the ocean, major communication language (English or French). MO: linear but non linear for GNP of the host country / total GNP of the OECD countries. CA: no.

GR: increase in tariffs explains FDI, which suggests, according to the authors, that the tariff-jumping motive for FDI in Africa is rather strong and that FDI and trade are substitutes. Other variables, such as GNP growth, may explain, however, that we observe a simultaneous increase in trade and FDI.

EST: when fixed effects, i.e. variations within countries, are ignored, the elasticity of inward FDI / ITT of the host country with respect to the nominal average tariff is 1.173***. When FDI is inward FDI / total trade of the host country, the corresponding elasticity is 0.365***.

**S 5 Liu, Wang and Wei (2001)**

CO: bilateral trade and FDI between China and 19 countries or regions. PE: 1984-98. FDI: log (FDI stocks in China at constant prices by country or region of origin). TR: log (China’s real exports and real imports of goods and services, respectively by destination and origin). OVA: none. MO: linear. CA: yes.

GR: FDI and TR are complements, but the complementarity process is two-stage. At the first stage, the growth of China’s imports from a specific country or region causes the growth of China’s inward FDI from that country or region. At the second stage, this increase in FDI increases China’s exports to the country or region where the FDI originated.

EST: the elasticities of FDI with respect to imports of goods and services are 11.6478*** (2-year lag), 13.1363*** (3-year lag) and 12.1143*** (4-year lag). In turn, the elasticities of exports of goods and services with respect to FDI are – 9.3836*** (1-year lag). 17.6944*** (2-year lag), 19.7447*** (3-year lag) and 23.618*** (4-year lag).89

**S 6 Cuadros, Orts and Alguacil (2001, 2004)**

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8 These high elasticity values are, in all likelihood, due to the fact that FDI is defined in terms of stocks and not of flows.
9 Could the negative one-year lagged elasticity value of exports with respect to FDI be explained by the fact that the one-year lagged elasticity value of FDI to imports is also negative, though the latter is not reported here because of its lack of significance?

GR: the significant estimates for the trade - FDI relationship are few and rather mixed. FDI and exports are complements in the case of Mexico, with FDI explaining exports. In the case of Brazil, FDI and exports are substitutes, the latter depressing the former. No significant relationship between FDI and exports was found for Argentina. According to the authors, the result obtained for Brazil can be explained by the fact that the increase in FDI was mainly related to the privatization and deregulation of existing enterprises. In such a case, additional FDI has little impact on the productive base, including the one for exports, at least in the short run, though, according to me, this explanation does not provide a full justification of the fact that exports depress FDI.

EST: the elasticity of exports with respect to FDI is 0.11* for Mexico, whereas the elasticity of FDI with respect to exports is – 1.291** for Brazil.

**S 7 Lee and van der Mensbrugghe (2001)**

CO: sub-set of APEC countries broken down into 5 regions: UCAN countries (US, Canada, New-Zealand), Japan, NIE countries (South Korea, Taiwan, Hong Kong, Singapore), ASEAN-4 (Indonesia, Malaysia, Philippines, Thailand), and China\(^{11}\). PE: 1992 (benchmark year). FDI: inward FDI stock broken down by sectors of destination (primary, manufacturing and services). TR: external tariff broken down by sectors\(^{12}\). DV: FDI. IV: TR. OVA: many given the fact that the model is a CGE. MO: multi-region CGE. CA: no.

Note: the coefficients relating TR to FDI are not estimates *per se* but changes with respect to the benchmark year, which result from the simulation of the CGE model. The flow of inward FDI is itself, in the model, a function of the share of foreign capital in capital supply by region and sector. The simulation shock on TR is the removal of trade barriers on a Most-Favored Nation basis by the 5 APEC regions\(^{13}\).

GR: trade liberalization leads to an increase in the inward FDI stocks of the manufacturing sector in every APEC region. This is consistent with the a priori expectation according to which horizontal FDI is the most prevalent in the manufacturing sector, where trade and FDI linkages are extensive. The impact of trade liberalization is, however, ambiguous in the case of the primary sector and the sector of services, leading, in some instances, to a decrease in FDI. In the case of the primary sector, it can be

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\(^{10}\) All data are quarterly data.

\(^{11}\) The other APEC countries (Australia, Brunei Darussalam, Chile, Mexico, Papua New Guinea, Peru, Russia, Vietnam) are not included in the above five regions but are aggregated with non APEC countries in a group called Rest of the world.

\(^{12}\) It is not clear from the text whether the authors took also into account non tariff trade barriers.

\(^{13}\) Other simulations were made: FDI liberalization and a combination of trade and FDI liberalization.
explained, according to the authors, by motives of FDI that might include securing energy and/or natural resources for the home country. This type of FDI is expected to be less sensitive to changes in the height of trade barriers in the host country. In the case of services, a change of trade regime is unlikely to affect the level of FDI extensively because FDI is often the only means to provide services to local consumers.

EST\textsuperscript{14}:

\textit{Impact of trade liberalization on inward FDI stock (\% changes with respect of the removal of APEC tariff barriers on a Most-Favored Nation basis)}

<table>
<thead>
<tr>
<th></th>
<th>NIE</th>
<th>ASEAN-4</th>
<th>CHINA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Primary</td>
<td>- 12.4</td>
<td>- 9.1</td>
<td>51.7</td>
</tr>
<tr>
<td>Manufacturing</td>
<td>15.6</td>
<td>15.5</td>
<td>8.4</td>
</tr>
<tr>
<td>Services</td>
<td>1.8</td>
<td>- 5.0</td>
<td>- 5.7</td>
</tr>
<tr>
<td>Overall</td>
<td>4.5</td>
<td>4.0</td>
<td>22.1</td>
</tr>
</tbody>
</table>

\textit{S 8 Asiedu (2002)}

CO: 71 countries divided into 32 Sub-Saharan African countries (SSA) and 39 non-SSA emerging countries (NSSA). PE: 1988-97. FDI: net FDI inflows / GDP (\%). TR: total of exports and imports of goods and services / GDP (\%). DV: FDI. IV: TR. OVA: infrastructure as log (phones per 1 000 inhabitants); return on investment in the host country as log (1 / real GDP per capita); Government consumption / GDP (\%); inflation rate as M2 / GDP (\%); real GDP growth rate; political risk as the number of assassinations and revolutions. MO: linear. CA: no.

GR: FDI and trade are complements. Openness to trade (TR) promotes FDI to SSA and NSSA countries. However, the marginal benefit from increased openness is less for the SSA countries.

EST: the elasticity of FDI with respect to TR is 0.030*** for the 71 countries, 0.028*** for the 32 SSA countries and 0.033*** for the 39 NSSA countries.

\textit{S 9 Bende-Nabende (2002)}

CO: 19 sub-Saharan countries. PE: 1970 – 2000. FDI: inward FDI flows in millions US \$. TR: total exports and imports of goods and services in billions US \$ at international prices; exports of goods and services in billions US \$ at international prices. DV: FDI. IV: TR. OVA: hourly wage rate in US \$; real effective exchange rate; FDI liberalization dummy (0 from 1970 to 1985 and 1 from 1986 to 2000); GDP in billions US \$ at international prices; real GDP growth rate; mean years of education. MO: linear. CA: yes.

\textsuperscript{14} The results for the APEC regions are only given here for the emerging ones (NIE, ASEAN-4, China).
GR: TR affects FDI in the long run though the impact varies widely across countries.

EST: i. If TR is defined as total exports and imports, a one billion increase in TR increases FDI by 19.6 million in Botswana, 1.3 in Congo\textsuperscript{15}, 4.4 in Ivory Coast, 0.8 in Kenya, 10.7 in Niger, 0.02 in Swaziland and 23.9 in Zimbabwe.

ii. If TR is defined as exports, a one billion increase in TR increases FDI by 0.06 million in Cameroon, 8.8 in Central Africa, 4.4 in Congo, 3.7 in Gabon, 2.2 in Kenya, 0.9 in Malawi and Madagascar, 0.2 in Nigeria, 4.4 in Rwanda, 4.5 in Sierra Leone, 4.0 in South Africa and 0.3 in Zambia.\textsuperscript{16}

S 10 Kandiero and Chitiga (2003, 2006)


GR: FDI responds well in general to increased openness in the whole set of countries and in the services sector in particular.

EST: the overall elasticities of FDI with respect to TR, as measured by total exports and imports / GDP are 0.0363*** (OLS), 0.0354 (when country fixed effects are accounted for) and 0.0520*** (one-step GMM estimate). The corresponding sector elasticities are - 0.0586*** (primary sector) and 0.1161*** (services), the elasticity not being significant for the manufacturing sector. The overall elasticity of FDI with respect to TR, as measured by taxes on external trade, is – 0.1142***.

S 11 Addison and Heshmati (2003)

CO: 110 developed and emerging countries, the latter being aggregated into East Asia-Pacific, Europe (former socialist countries) and Central Asia, Latin America, Middle East and North Africa, South Asia, and sub-Saharan Africa. PE: 1970 – 99. FDI: net FDI / GDP (%). TR: total of exports and exports of goods and services / GDP (%). DV: FDI. IV: TR. OVA: real GDP growth rate; real GDP; Government consumption / GDP (%); inflation rate and its variance; net return on investment (lending – deposit rates); wages

\textsuperscript{15} The author does not say if he refers to the Republic of Congo (Brazzaville) or to the Democratic Republic of Congo (Kinshasa).

\textsuperscript{16} The author does not provide any explanation for the fact that the impact of exports on FDI is greater than the impact of total exports and imports in the case of Congo and Kenya.

\textsuperscript{17} Assumed to be a percentage with respect to the relevant tax base.
and salaries / GDP (%); gross secondary school enrolment ratio (%); manufacturing value added / GDP (%); number of phones per 1,000 inhabitants; weighted infrastructure index incorporating various factors such as transportation, communication, information, education and health investment; ICT variable as total spending on information technology plus communications equipment and services / GDP (%); dummy variables for the presence of fuel resources, the exportation of ores and metals, and resource depletion; indicators of competition and democratization as computed by Vanhanen (2001). MO: linear. CA: yes.

GR: TR has a positive impact on FDI, but the effect is relatively small and varies by region. It is the strongest in Latin America and the weakest in sub-Saharan Africa.

EST: the significant elasticities of FDI with respect to TR are 0.0472*** (Latin America) and 0.0333*** (sub-Saharan Africa). The corresponding elasticities are not significant for the other regions.

S 12 Onyeiwu and Shrestha (2004)

CO: 29 sub-Saharan and North African countries. PE: 1975-99. FDI: net inward FDI flow / GDP (%). TR: total exports and imports of goods and services / GDP (%). DV: FDI. IV: TR. OVA: real GDP growth rate; inflation rate; real interest rate; international reserves / GDP (%); external debt / GDP (%); corporate profit tax rate; political rights index as given by the Freedom House’s Annual Survey (Washington, D.C.); number of telephones per 1,000 inhabitants; fuel exports / total exports (%). MO: linear. CA: no.

GR: TR has an impact on FDI.

EST: the elasticity of FDI with respect to TR is 0.0382*** (fixed-effects model) and 0.040*** (random-effects model).

S 13 Nonnemberg and Cardoso de Mendonça (2004)

CO: 38 emerging countries (Africa, Asia, Middle East, North Africa and former socialist economies). PE: 1975-2000. FDI: log (inward FDI flow). TR: total exports and imports of goods and services / GDP (%). IV: FDI. DV: TR. OVA: log (GDP); average GDP real growth rate in the 5 previous years; inflation rate; risk rating by Euromoney; per capita energy consumption; DOWJONES Index (reflecting “investment euphoria”); OECD GDP real growth rate; secondary school enrolment ratio (%). MO: linear. CA: yes, but causality only tested between FDI and GDP, the result being that GDP leads FDI.

GR: TR affects FDI.

EST: the elasticities of FDI with respect to TR are 0.0113 (pooling OLS), 0.0143 (random effects) and 0.0160 (fixed effects) for the 1975-2000 period. The corresponding elasticities are 0.0115, 0.0127 and 0.0146 for the 1985-2000 period. In all cases, the p-value is zero.
**S 14 Faini (2004)**

CO: 92 emerging countries. PE: 1981-2000. FDI: inward FDI stock / GDP (assumed to be a %, but not defined by the author). TR: log of external tariff rate. DV: FDI; IV: TR. OVA: potential index of inward FDI as computed by UNCTAD (Note: given the way the index is defined, a high value for the index means that the country is unattractive to foreign investors)\(^{18}\). MO: linear. CA: no.

GR: the higher is the external tariff, the lower is FDI, which invalidates the tariff-jumping argument and suggests that FDI and trade are complements. According to the author, this is consistent with the observation that FDI in emerging countries is largely backward vertical. In other words, after FDI is made and has increased the corresponding stock (as FDI is here defined), foreign affiliates generate a steady demand for imports of capital and intermediate goods from their parent firm. In the medium run therefore, following the FDI, trade flows may grow rather than contract.

EST: the impact coefficients of the external tariff on FDI are -1.23 and -1.03 according to the estimation procedure, these results being considered as significant by the author.

**S 15 Razafimahefa and Hamori (2005)**

CO: Sub-Saharan African, Latin American and Asian countries\(^{19}\). PE: 1980-2001. FDI: inward FDI flow. TR: total exports and imports of goods and services / GDP (%). IV: FDI. DV: TR. OVA: total factor productivity measured as the Solow residual; exchange rate (seemingly the nominal rate, but not defined by the authors): consumer price index and its variance; capital return as 1/ real GDP per capita; dummy variables for Asia and Africa. MO: linear. CA: no.

GR: TR weakly determines FDI.

EST: the impact coefficient of TR on FDI is 0.003* when regional dummy variables are not taken into account. It is insignificant when dummies are included.

**S 16 Aizenman and Noy (2005)**

CO: 21 developed and 60 emerging economies. Developed countries are those that were members of the OECD in 1990. Emerging countries are defined by excluding OECD countries and island economies, as the latter are often used as off-shore banking centres and their level of *de facto* openness to financial flows is often dramatically different from other countries with the same income level. PE: 1982-98. FDI: total FDI net inflows and outflows / GDP (%); FDI net inflows / GDP (%)\(^{20}\). TR: total exports and imports of goods and services / GDP (%); total exports and imports of goods / GDP (%) broken

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\(^{18}\) The author makes separate regressions taking into account other determinants of FDI, such as schooling

\(^{19}\) The number and the list of countries are not provided by the authors.

\(^{20}\) FDI net outflows / GDP (%) was also considered.

\(^{21}\) Other international financial flows were separately introduced (equities, trade credits and loan flows)
down by foodstuffs, fuel, metals and ores, and manufactured products; total exports and imports of services / GDP (%)\(^{22}\). DV: FDI. IV: TR. OVA: current per capita GDP at PPP; real GDP growth rate of the developed world\(^{24}\); interest spread rate with respect to the US 1-year Treasury-bill rate; index of democracy as computed by the POLITY IV Project (Center for International Development and Conflict Management, University of Maryland, College Park, MD); index of political corruption as given in the International Country Risk Guide (PRSG, Syracuse, NY); restrictions on the external capital account as a binary variable computed on the basis of the information available in the IMF annual report on *Exchange Arrangements and Exchange Restrictions* (Washington, D.C.); dummy variable for the nineties\(^{25}\). MO: linear. CA: yes.

GR: FDI and TR are on the whole complements, though there are some exceptions when the trade breakdown is taken into account. The overall association between FDI and TR is positive and significant at the 1% level for the emerging countries, but not significant for the developed countries. There is, however, a two-way relationship between FDI and TR. Applying Geweke’s decomposition method (Geweke, 1984) to the whole sample of countries, the authors find that most of the linear feedback between TR and FDI (81%) can be accounted for by Granger-causality from FDI to TR (50%) and from TR to FDI (31%).

EST: i. When FDI is FDI total net inflows and outflows /GDP (%) and capital account restrictions are ignored, its elasticities are 0.02*** with respect to overall trade openness and 0.03** with respect to trade openness for goods\(^{26}\).

ii. When FDI is defined as in i and when the interest rate spread, the developed world growth rate, the level of democracy, the level of political corruption and restrictions on the capital account are ignored, its elasticities with respect to trade openness are 0.28*** for foodstuffs, - 0.06*** for fuel, 0.02* for manufactured goods, and - 0.12*** for services.

iii. When FDI is defined as in i and ii, but only the restrictions on the capital account being ignored, its elasticities with respect to trade openness are 0.21*** for foodstuffs and -0.12*** for fuel.

iv. When FDI is defined as in i, ii and iii and all OVA are considered, including restrictions on the capital account, its elasticities, with respect to trade openness, are 0.20*** for foodstuffs, - 0.12*** for fuel, and - 0.08* for services.

\(^{22}\) Factor income flows were also considered.
\(^{23}\) These trade openness indicators are averaged, in each case, over the 4 previous years.
\(^{24}\) The authors refer to the “G-3” growth rate. We believe that it means Japan, the EU and the US.
\(^{25}\) Other OVA variables, such as the Government’s budget surplus, were initially considered, but were later dropped because of lack of significance.
\(^{26}\) In all cases, the overall elasticity was estimated without taking into account the trade breakdown into goods and services, whereas the sector elasticities were estimated without taking into account the overall trade openness indicator.
v. When FDI is defined as FDI net inflows /GDP (%) and the OVA are included, except capital account restrictions, its only significant elasticity, with respect to trade openness, applies to all goods and is equal to 0.06***, the corresponding elasticities not having been estimated at the goods’ sector level.

**S 17 Botrić and Škuflić (2006)**


GR: TR leads FDI in a very significant manner.

EST: When the first set of OVA is used, the impact coefficient of TR on FDI is 5.43***. When the second set of OVA variables is used, the corresponding coefficient is 9.20***.

**S 18 Ghosh (2007)**


GR: There is a two-way linkage between trade and FDI..

EST: The impact coefficient of TR on FDI is 0.53 (i.e. a 1% increase in trade openness increases FDI intensity by 0.53%). The impact coefficient of FDI on TR is 0.07 (i.e. a 1% increase in FDI intensity increases trade openness by 0.07%)29.

**S 19 Greenaway, Sapsford and Pfaffenzeller (2007)**


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27 Several of the OVA are not defined with precision by the authors.

28 To test for causality, several instrument variables were used (tariff rates, non tariff barriers, black market exchange rates, existence of export state monopolies, existence of a socialist economic system).

29 These results allow for serial correlation in the errors of order AR (1). The results are, however, robust to a higher correlation AR specification.

30 Considered as an indicator of the trade regime.
OVA: GDP per capita; GDP per capita growth rate; foreign aid inflows per capita; inflation rate; unit labor cost in the manufacturing sector. MO: log-log linear. CA: no.

GR: TR has a significant impact on FDI, the impact being larger for low-income countries as opposed to middle-income countries, though the authors do not provide a clear explanation for such a difference.

EST: the elasticities of FDI with respect to TR are 0.018 (t = 2.121) for all countries, 0.033 (t = 1.414) for low-income countries and 0.017 (t = 1.836) for middle-income countries.

**Empirical evidence from single-country studies**

**S 20 Erdal and Tatoğlu (2002)**


GR: TR has a significant impact on FDI.

EST: the elasticity of FDI with respect to TR is 1.724, which is considered as significant by the authors on the basis of LR significance tests.

**S 21 Hakro and Ghumro (2007)**


GR: TR has a significant impact on FDI.

EST: The elasticity of FDI with respect to TR is 2.0 ***.

\(^{31}\) It is not clear whether these infrastructure expenditures are both current and capital expenditures and whether they refer only to public expenditures or to public and private expenditures.

\(^{32}\) Other OVA, such as political risk and employment rate in the manufacturing sector, were initially considered, but eventually dropped.
Concluding remarks and suggestions for CGE modeling

There is enough evidence from the 21 surveyed studies to believe that, in emerging economies, trade and FDI are mainly complements and not substitutes, which, among other things, weakens the tariff-jumping argument for FDI going to these countries. The only cases of substitution were found in one study on OECD FDI to Africa (Grünfeld and Svindal, 2000), in the case of Brazil (Cuadros, Orts and Alguacil, 2001, 2004), and for certain products in the case of a panel study on a large number of emerging countries (Aizenman and Noy, 2005).

The complementarity between trade and FDI can be explained by the fact that some of the assumptions of the Heckscher-Ohlin model of international trade are not satisfied in the real world and by the fact that most of the FDI going to emerging countries is vertical, the parent firm either supplying inputs to its foreign affiliate or exporting its output. When trade and FDI are complements, our survey not only shows that, in some countries, FDI is explained by trade openness, whereas, in other countries, the reverse holds, but also that, for a last set of countries, there is bi-directional causality. But, in general, it is trade which leads to FDI instead the other way around, though not all our studies include testing for causality.

On the basis of the above, what suggestions can be offered to CGE modelers?

1. To retain a relationship where FDI is the dependant variable and trade the independent one.

2. Since, in CGE models, the net capital import variable does not usually pertain to only net FDI but is an aggregate of net FDI and the other net capital inflows (aid, portfolio investment, sales of equities, etc.), to attempt to isolate FDI from the other capital flows. If this is not done, the elasticities provided by existing studies on the trade-FDI relationship run the risk of becoming rather meaningless.

3. To retain for the trade variable an indicator measured in terms of trade flows and not in terms of the external tariff height or another nominal protection rate.

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33 The tariff-jumping FDI is bound to become even less relevant as various emerging countries are in the process of liberalizing their import regime (Nunnenkamp, 2002).
34 There are even cases when forward vertical FDI leads to the creation of “export hubs” in certain emerging countries, as in the case of Japanese FDI going to the Philippines from where the output of the resulting multinational corporation is exported to other South-East Asian countries (Kumar, 2001).
35 In a study focusing only on trade-FDI causality without any attempt to provide elasticity estimates, it was found that, in the case of Latin American countries, FDI lead to trade, whereas, in the case of Southeast Asia, trade lead to FDI, with, however, for the latter group a fair amount of bi-directional causality (de Mello Jr and Fukasaku, 2000).
36 An additional problem is that we may be left, after such a disaggregation, with net FDI but not with the FDI variable which is often retained in the elasticity measurement, i.e. only inward FDI. This may not be a problem for the poorest countries which mainly experience inward FDI and where outward FDI is small and “disinvestment” of FDI is rare, except in the case of sudden political turmoils. It may, however, raise a problem in the case of middle-income countries, such as Brazil and Chile, which invest abroad on a rather large scale.
including subsidies to trade and various non tariff barriers. Indeed, in a CGE model, such trade instruments affect already the difference between domestic and international prices, which, in turn, affects, when the CGE is simulated, the magnitude of the trade flows on the basis of transformation and substitution commercial elasticities between what is sold locally and what is exported and between local products and imports.

4. Given 1 to 3, to express trade and FDI in % terms, i.e. in terms of “intensities”, using, for instance, GDP as the denominator, these percentages changing, of course, in an endogenous manner with the different CGE simulations. This should permit to introduce with little difficulty, in the CGE, the already existing trade-FDI relationship estimates available in the empirical literature in the form of elasticities, elasticity being, in my view, the least ambiguous way to measure the said relationship.

5. One would also wish, considering the available empirical results, to introduce as well a breakdown between export and import intensities both at the overall level and at the sector level, though this is not necessarily required in a first step.

6. If one looks at the values which were found for the elasticity of FDI with respect to trade, one could retain:

i. 0.010 as the minimum value and 2.000 as the maximum one\(^{37}\);

ii. A range of 0.020 – 0.060 for the African countries\(^{38}\);

iii. A range of 0.040 – 0.065 for the Latin American countries;

iv. A range of 0.600 – 1.700 for the Asian countries.

In conclusion, this relationship could be portrayed by the following equation:

\[
CAB_t = \frac{CAB^0}{GDP^0} \cdot \left[ \frac{(IM_t + EX_t) / XS_t}{(IM^0 + EX^0) / XS^0} \right]^\sigma \frac{GDP_t}{GDP_t}
\]

where CAB is the current account deficit (which is equal to net foreign savings), GDP is gross domestic product, IM is the volume of imports, EX is the volume of exports, \(\sigma\) is the elasticity of FDI relative to the openness indicator (expression in square brackets) and all variables with the superscript 0 are base year values. Alternatively,

\(^{37}\) The high elasticity value of 2.000 was found for Pakistan where, it should be remembered, FDI was restricted to FDI going to manufacturing (Hakro and Ghumro, 2007)

\(^{38}\) On the basis of the surveyed studies, it is not possible to provide a separate range for the North African countries since the latter, when included, were aggregated with the other African countries.
the current account deficit in the expression above can be replaced by FDI and the rest of the current account deficit being modeled as a fixed share of GDP:

\[
F DI_i = \frac{F DI^0}{G DP^0} \left[ \frac{(I M_i + E X_i)}{(I M^0 + E X^0)} / X S_i \right]^{\sigma_{F DI}} G DP_i
\]

\[
(C A B_i - F DI_i) = \frac{(C A B^0 - F DI^0)}{G DP^0} \cdot G DP_i
\]


References


Nonnemberg, M.B. and M.J. Cardoso de Mendoça (2004): *The Determinants of Foreign Direct Investment in Developing Countries*, Instituto de Pesquisa Econômica Aplicada (IPEA), Rio de Janeiro


