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FDI and Trade – Two Way Linkages?*

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Abstract

We investigate the intertemporal linkages between foreign direct investment and disaggregated measures of international trade. We outline a model exemplifying these linkages, describe methods for investigating two-way feedbacks between various categories of trade, and apply them to recent data. We find that the strongest feedback between the sub-accounts is between FDI and manufacturing trade. Applying Geweke's (1982) decomposition method, we find that most of the linear feedback between trade and FDI can be accounted for by Granger-causality from FDI gross flows to trade openness (50%) and from trade to FDI (31%).

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1. **Introduction**

A growing literature has recognized the existence of two-way feedbacks between financial flows and trade for developing countries. Yet, it is clear that aggregate measures of both financial flows and trade openness mask important differences between the various components of both measures. It is reasonable to expect that the linkages between FDI and trade in goods will be strong (and possibly bi-directional), but it is less evident whether the impact of trade on FDI should be different for, for example, countries in different stages of development or whether inflows and outflows of FDI react differently with different types of trade flows. This paper aims to provide preliminary answers to such questions with the help of both theoretical modeling and an empirical estimation of these relationships.

Growing literature on trade and the multinational firm identified conflicting association between international trade and FDI - see Blonigen (2005) for a recent review. Trade frictions (commercial policy, distance and transportation cost, etc.) encourage foreign producers to “jump” trade barriers by replicating similar plants in different markets. Such investment patterns are referred to as horizontal FDI. In contrast, cost gaps may encourage producers to fragment the production process, putting labor intensive stages of production in low wage countries, and the more capital intensive stages of production (R&D, assembly, headquarter services, etc.) in industrialized countries. Such investment patterns are referred as Vertical FDI. An important difference between these two patterns deals with the association between trade and FDI: horizontal FDI tends to substitute trade, whereas vertical FDI tends to create trade. Economic reasoning suggests that vertical FDI are more prevalent between the industrialized and developing countries, whereas horizontal FDI are more prevalent among the industrialized

countries. In practice, one expects hybrid patterns, where multinationals opt for both vertical and horizontal mixture.

Most of the empirical literature investigating FDI patterns focuses on cross-country variation.¹ The purpose of this paper is to focus on the interaction between trade and FDI over time, investigating possible intertemporal feedback effects between international trade and FDI. Specifically, we propose a new channel explaining positive intertemporal feedbacks between trade and FDI, and show that the data is consistent with the presence of such feedbacks. We point out that a developing country experiencing rapid improvement in its productivity will attract growing inflows of vertical FDI, increasing thereby its international trade. In circumstances where the multinational employs skilled workers in the developing country, the greater volume of trade that comes with the vertical FDI ought to increase the demand for skilled workers, increasing thereby the return to human capital in the developing country. This in turn will increase the supply of skilled workers, potentially increasing future FDI. We view this channel as only one part of a hybrid of complex intertemporal links between trade and FDI. In the empirical part we focus on a reduced form approach, identifying strong two-way positive feedbacks between trade and FDI.

A number of recent papers have examined the empirically identifiable interactions between financial flows and trade (Albuquerque et al., 2005, Do and Levchenko, 2004, Lane and Milesi-Ferretti, 2004 and 2005, Rose and Spiegel, 2004, Swenson, 2004). Most prominent in this literature is the argument that larger inflows of FDI will lead to higher volume of trade as well as other benefits such as increased rates of total factor productivity growth or higher output growth rates.

¹ See Lipsey (2002) and Blonigen (2005).

Aizenman and Noy (2004) examine de-facto measures of financial and trade openness, and show that aggregate financial and commercial openness measures are closely linked. They empirically decompose causality and find strong affects in both directions. Another approach linking trade and financial openness is Portes and Rey (2005), showing that both international trades in goods and in assets are explained by similar gravity regressions. Their work highlights the role of information flows and frictions in accounting for trade in goods and assets. Aviat and Coeurdacie (2004) extend the methodology of Portes and Rey (2005), and investigate the geography of trade in goods and asset holdings. They find that the causality between bilateral asset holdings and trade in goods runs significantly in both ways and that these effects are strong.²

We investigate linkages between finance and trade with more disaggregated measures of both. Such dis-aggregation allows us to identify the salient features of the feedback effects. We describe several methods for investigating two ways feedbacks between various categories of trade, and apply them to the recent experience of developing countries. We find that the strongest feedback between the sub-accounts is between FDI and trade in goods and focus on this specific link in this work.³ Specifically, applying Geweke's (1982) decomposition method, we find that most of the linear feedback between trade and FDI (81%) can be accounted for by Granger-causality from FDI gross flows to trade openness (50%) and from trade to FDI (31%). The rest of the total linear feedback is attributable to simultaneous correlation between the two annual series. Similar results are obtained when we instead investigate causality between trade openness and net FDI flows or net inflows. We also consider other linkages between the sub-

² Other recent papers that discuss financial flows or FDI more specifically are Agénor (2003), Blonigen and Wang (2004), Chan and Gemayel (2004), Harrison et al. (2004), Lane (2004), and Razin et al. (2003).

accounts of the current and the financial accounts and generally find them significantly less important.

In Section 2 we discuss the theoretical literature and present a model on the possible links between FDI and trade. In section 3 we present the data while section 4 outlines the empirical model and our findings for disaggregated measures of FDI and trade flows. Section 5 focuses on the question of causality and section 6 concludes with further interpretive remarks and by outlining several avenues for future research.

2. Theory: Possible links between trade and FDI

We start with a brief review of the background literature explaining feedbacks between trade and finance, and close the section with a model that describes feedbacks between trade in goods and foreign direct investment by focusing on the impact of FDI on future patterns of demand for human capital and production. We conclude that one should expect to find two ways feedbacks between trade and FDI.

The observed positive association between trade and finance may be attributed to political-economy factors. Rajan and Zingales (2003), for example, propose an interest group theory of financial development whereby incumbents oppose financial development because it breeds competition. In these circumstances, the incumbents' opposition will be weaker when an economy allows both cross-border trade and capital flows. They predict that a country's domestic financial development should be positively correlated with trade openness, and identify the time varying nature of this association.

³ Besides examining the relative importance of various commercial sub-accounts, we also investigated whether commercial openness is linked to the other financial openness measures (loans, equity and trade credits) and found it was not correlated with any of these measures in multi-variate specifications similar to the ones reported below.

Another channel, operating in the same direction from finance to trade, might be due to reliance of international trade on trade credits. Greater openness to trade credit flows, leads to a decrease in the cost of this credit and thereby increases international trade.⁴

Alternative channels explaining the feedback between FDI and trade deal with the endogenous determination of patterns of production and investment in human capital. Below we describe a model of production by multinationals that fragment their production optimally, and benefit from the cost advantage associated with locating labor-intensive production stages in labor abundant countries.⁵ A by-product of this fragmentation is the growth of two-way trade: higher imports of primary and intermediate products, followed by higher exports of the improved/final products. Multinationals will opt to locate the production in the developing countries that offer the highest productivity/wage ratio.⁶ A developing country experiencing rapid improvement in its productivity, due to accumulation of human capital, learning by doing, or better institutions will attract growing inflows of vertical FDI, increasing thereby its international trade. In circumstances where the multinational employs skilled workers in the developing country, the greater volume of trade that comes with the vertical FDI ought to increase the demand for skilled workers, increasing thereby the return to human capital in the developing country. This in turn will increase the supply of skilled workers, further increasing future FDI.

We consider a global economy composed of 2 blocks of countries, H and F, each consuming two types of final goods -- a homogeneous one, Z , and n heterogeneous goods, denoted by $Y_{t,i}$, $i = 1, \dots, n$. The F block is composed of developing countries, differing in labor

⁴ See Helpman and Razin (1978) for an integrated theory of trade in goods and securities. For a similar argument on the impact of services liberalization on goods trade see Blyde and Sinyavskaya (2004).

⁵ Hanson et. al. (2001) shows that vertical FDI from the OECD to developing countries has increased substantially in the last twenty years.

productivity. Asterisks signify F variables. The utility of the H consumers at time t is a semi-additive function of the two goods

$$(1) \quad u_t = Z_t + \frac{A}{\delta} \sum_{i=1}^n [Y_{t,i}]^\delta, \quad 0 < \delta < 1.$$

The intertemporal utility is the conventional net present value of the temporal utilities, discounted applying the subjective rate of time preferences. Similar preferences characterize consumers in country F. The supply of labor in each block is inelastic and Good Z is produced using a simple Ricardian technology. In H, this technology is

$$(2) \quad Z = L_z.$$

where L_z denotes the labor employed in the production of the homogenous sector. We normalize the price of good Z to one, so the real wage is one in the competitive equilibrium.

For concreteness, we focus on a developing country, where the technology in the homogenous sector is:

$$(3) \quad Z^* = a^* L_z^*,$$

where the parameter a^* is the productivity of foreign labor and the real wage is $w^* = a^*$. The homogenous good, Z , is a composite good, characterized by stable and mature technology, with limited prospects for future productivity improvements. In contrast, Y goods are relatively high tech goods, the outcome of multinationals' R&D. Unlike good Z , producing intermediate Y inputs in country F is likely to increase F's productivity over time. Due to the reasons elaborated in the literature dealing with vertical FDI, multinationals producing Y goods frequently fragment vertically their production line.⁷ Specifically, we assume that goods Y are produced in a vertical mode, where production is fragmented geographically. The final production stage is done at H,

⁶ A recent thorough survey on the locational choices of multinationals' FDI is Blonigen (2005).

⁷ See Feenstra (2003) for a useful overview.

using intermediate inputs produced in F at an earlier stage, in the developing country that offers the most cost effective production line. The intermediate input, M_i , can be produced in the foreign country at time t using a Cobb-Douglas production technology

$$(4) \quad M_{t,i} = \sqrt{b_t^* L_{t,i}^*}$$

where $L_{t,i}^*$ is the labor employed, $b_{t,i}^*$ is labor productivity in the foreign intermediate-good sector. The final production stage combines the intermediate input $M_{t,i}$ and H value added using a Leontief technology to supply the final output, $Y_{t,i}^s$:⁸

$$(5) \quad Y_{t,i}^s = \text{Min} \left[M_{t,i}; \sqrt{b_t L_{t,i}} \right]$$

The fragmented production process requires the multinational to invest in two plants, resulting in a periodic set-up cost of C_i at each country. This cost may be viewed as the periodic investment needed to sustain the production capacity. We assume that goods Y_i are ordered such that a higher index i is associated with higher periodic set-up cost. We consider the case where, due to learning by doing and accumulation of human capital, the developing country's labor employed in activities Y_i becomes more productive -- $b_t^* < b_{t+1}^*$. To simplify, we take first the productivity improvement as an exogenous process. Each period, the multinational allocates the production of the intermediate output $M_{t,i}$ to the developing country that is the most cost effective. To simplify notation, we henceforth suppress the time subscript.

Applying (1), the demand for good Y in each country is

$$(6) \quad Y_i^d = (A / P_{y,i})^\eta; \quad \eta = \frac{1}{1-\delta} > 1.$$

The total demand facing the multinational is qY_i^d , where q stands for a scale measure of the number of countries composing the global economy.

Assuming that good i is produced, it follows from (4) and (5) that employment levels in the final and the intermediate production stages of good i are:

$$(7) \quad L_{y,i} = \frac{(Y_i^s)^2}{b}; \quad L_i^* = \frac{(Y_i^s)^2}{b^*} .$$

The monopoly profits are

$$(8) \quad \Pi_i = qY_i^d P_{y,i} - L_{y,i} - w^* L_i^* - 2C_i .$$

Substituting (6)-(7) into (8), we find that

$$(9) \quad \Pi_i = \bar{A}(Y_i^s)^\delta - \frac{(Y_i^s)^2}{b} - w^* \frac{(Y_i^s)^2}{b^*} - 2C_i \quad \text{where} \quad \bar{A} = A(q)^{1/\eta}$$

The first-order condition characterizing optimal output (\tilde{Y}) and the resultant profits are

$$(10) \quad \tilde{Y}_i = \left[\frac{0.5\bar{A}\delta}{(b)^{-1} + w^*(b^*)^{-1}} \right]^{\frac{1}{2-\delta}} \quad ; \quad \Pi_i = k_i - 2C_i \quad \text{where}$$

$$(11) \quad k_i = (1 - 0.5\delta)\bar{A} \left[\frac{0.5\bar{A}\delta}{(b)^{-1} + w^*(b^*)^{-1}} \right]^{\frac{\delta}{2-\delta}} .$$

Hence, k_i is determined by the real wages and by the efficiency of the labor in H and F, where

$$(12) \quad \frac{\partial \Pi_i}{\partial b^*} > 0; \quad \frac{\partial Y_i}{\partial b^*} > 0$$

The multinational allocates the production of the intermediate product i to the developing country characterized by the highest normalized productivity/wage ratio (i.e., the highest

⁸ The analysis can be extended to a general CES function. Of course, the Leontief technology simplifies the math. It may be also a reasonable assumption in manufacturing industries where, by design, there are fixed proportions (like auto body produced in Mexico, engine in the US, etc.).

b^* / a^*). Hence, a developing country that gains productivity in activity i at a rate that exceeds its competitors will attract more FDI. The exports of such a country would increase both due to the higher production level of the infra marginal goods, and the introduction of new, relatively high C_i goods.

Our analysis assumed so far that the productivity improvements are exogenous, as will be the case if productivity is only impacted by exogenous accumulation of human capital. One can extend our model to account for endogenous accumulation of human capital, allowing for heterogenous labor force. Specifically, suppose that there are two labor types, skilled and unskilled. Unskilled labor is employable only in sector Z , whereas skilled workers have the option of employment at sector Y . The economy starts with relative scarcity of skilled labor. Unskilled workers may become skilled workers following the accumulation of human capital, a process that is associated with time and resource costs. In such an economy, higher trade implies also higher demand for skilled workers, inducing more unskilled workers to acquire human capital. Consequently, greater abundance of skilled workers would increase the economy's attractiveness to multinationals. Higher trade would tend to increase the demand for skilled workers, increasing over time the supply of skilled workers, increasing thereby the future attractiveness of the country for multinational FDI. Appendix A outlines a specific example of a model where such feedbacks are at work. We consider the case where mobility of workers from sector Z to Y is limited and costly. Specifically, we assume that workers in the developing country can move from to the Y sector only after paying a switching cost, the sum of investment in human capital and other reallocation costs. These costs are worker specific, and are assumed to be known to each agent. In these circumstances, the supply of labor in activity Y is segmented in the short run from the supply of labor in activity Z , and wages are sector specific, a^* ; $w_{t,y}^*$.

Workers would switch from sector Z to Y when the net present value of the future wage gap, $w_{t,y}^* - a^*$ exceeds the switching costs. In an economy where the wage gap is anticipated to grow in favor of sector Y, agents with lower switching costs will move earlier. The supply of labor in sector Y is composed of workers that have switched already. Consequently, higher productivity in sector Y (induced by higher investment in that sector Y, learning by doing, etc.) would increase wages in sector Y. This in turn would induce more agents to switch to sector Y, encouraging further investment in sector Y.

India's recent trade history exemplifies the possible links between trade, FDI flows and investment in human capital. The education system in India has been known for producing highly qualified engineers. In the 1970s-1980s, the options available to these engineers in India were rather limited, implying that relatively low domestic demand imposed a constraint on the effective supply of engineers.⁹ The recent advances of telecommunication and the Internet reduced drastically the cost of trade in information services. The direct outcome has been a sizable increase in trade in services, putting in motion a two way feedback process. The greater export of services from India increased the return for education in India, increasing the supply of human capital, and the attractiveness of India for future FDI.

3. Data

A priori, we see no reason to restrict our sample and therefore attempted to include all 205 countries and territories for which data are available in the 2001 edition of the World Bank's *World Development Indicators (WDI)*. Our control variables, though, are available for only a subset of this group. Most importantly, most of the data on FDI flows are typically available only

from the 1980s and only for a much smaller set of countries while the political data is available only up to 1998. Our data set is therefore an annual panel of 81 countries for the years 1982-1998.

Blonigen and Wang (2004) argue that pooling developed and developing countries in empirical studies of this type is inappropriate and likely to lead to misleading results. We also hypothesize that results for industrialized/developed countries might be different from those for developing countries as the nature of FDI in these groups might be different; for example vertical vs. horizontal FDI. We thus conduct our empirical investigation for developed economies – which we define as those economies that were members of the OECD in 1990 – and developing countries separately.¹⁰ For a summary of the information described in this section including detailed data sources and sample sizes, see Appendices B & C.

We measure *de facto* financial openness using the sum of total capital inflows and outflows (in absolute values) measured as a percent of gross domestic product. Capital flows are the sum of FDI, portfolio flows, trade credits and loans. We construct an openness index for each one of these four components and briefly describe them below. We then focus on FDI openness in our estimations. The data on financial flows is taken from the IMF's *Balance of Payments Statistics* dataset. These measures of financial openness are exactly analogous to the standard measure of commercial openness (sum of exports and imports as percent of GDP), which we investigate as well.

We sub-divide the standard measure of commercial openness into openness for trade in goods, trade in services and trade in incomes. We further divide trade in goods into openness

⁹ This situation also led to significant brain drain from India to OECD countries. The recent surge in demand for qualified workers in India has possibly reversed the brain drain, inducing some workers that left India in the 1980s-90s to return.

measures for trade in foodstuffs, in fuel, in manufacturing and in metals/ores. This data is from the World Bank's *World Development Indicators*. We provide descriptive statistics and then incorporate them in our estimations.

In tables 1-2 we describe our data for financial and commercial openness. Specifically, table 1 presents averages for financial openness disaggregated by type (FDI, loans, trade credits and equity flows) for the 1980s and 1990s.¹¹ We divide our country sample into industrialized and developing countries. A number of observations merit discussion at this point. First, one can observe a dramatic increase (doubling) of FDI in the 1990s as compared to the previous decade. This trend is more pronounced for the developing countries whose inflows of FDI went up from an average of about 1% of GDP to almost 3% (most of this increase appears to have come from a large increase in FDI outflows from the industrial countries). Portfolio flows have also seen a dramatic increase (more pronounced for the industrialized countries) while trade credits and the amount of loan flows have not changed that much in the last two decades (as % of GDP).

Table 2 records descriptive statistics for trade flows (disaggregated by type, countries' income levels and decades). Apparent is the relative stability of most measures of trade openness in both developing and developed countries. Exception are a large increase in the volume of trade in manufactures for developing countries and a large decrease in trade in fuels for both samples.¹² Interestingly, on average, developing countries appear to be more open to trade in both goods (across all types) and services than our sample of industrialized countries.

Table 3 presents correlation coefficients between our financial openness measures and the commercial/trade openness measures disaggregated by types of flows. The only notable

¹⁰ Developing countries are defined by excluding OECD countries and island economies (as these are often used as off-shore banking centers and their level of *de facto* openness to financial flows is often dramatically different from other countries with the same income level).

correlations are a significant correlation of FDI flow measures with goods and services trade (especially trade in manufactures and fuels) for developing countries and a much weaker association between FDI flows and trade in industrialized countries. Other significant and noteworthy correlations are between trade in goods and trade in services (for both samples) and a high correlation between equity flows and FDI flows for the industrialized countries sample.

Since results from all the estimation procedures described below will be biased if the FDI series has a unit root, we first establish stationarity. We conduct the common Phillips-Perron test for unit root for the FDI time-series as well as for our other main variables of interest (the other financial openness variables as well as the various trade openness measures). Results are presented in table 4 – fortunately, we reject the existent of unit root in almost all cases.¹³

In our multivariate estimations, we include several control variables that are described below. This list is based on our previous research on financial openness (Aizenman and Noy, 2004) and recent empirical work on FDI (especially Albuquerque et al., 2005 and Blonigen and Wang, 2004). In order to ensure our results are not driven by a ‘missing variables’ bias, we include a host of macroeconomic control variables. In all regressions we use per capita gross domestic product (measured in PPP dollars), a domestic interest rate spread (from a world rate of interest), and a weighted average of G3 growth rates. In an initial specification, we also included the government’s budget surplus (as % of GDP), the inflation rate (CPI), a world interest rate (U.S 1-year T-bill rate), the government’s budget surplus, gross domestic product (in \$1995), and government consumption (as % of GDP). None of these were significant and all were

¹¹ The 1990s include data up to and including 1998. Because we limit our data to 1998, our data does not completely reflect the slowdown in capital flows following the Asian crisis.

¹² At the very least, part of the reason for this decline is average lower oil prices during the 1990s.

¹³ We fail to reject a unit root in the case of the openness measure for trades in goods and incomes in the industrial countries sample.

dropped from the specifications we report. All the macroeconomic data are taken from the World Bank's *World Development Indicators* and the IMF's *International Finance Statistics*.

For the political-economy determinants of financial openness, we concentrate our empirical investigation on two political-institutional measures. We first include a variable that measures the degree of democratic rule. Our democracy index is taken from the *Polity IV* project and ranges from -10 (fully autocratic) to +10 (fully democratic).¹⁴

In addition, for our second political-economic control, following the work of Wei (2000) and Dreher and Siemers (2003), we examine whether corruption matters for the degree of financial openness. To that end, we use a measure of corruption that is taken from the *International Country Risk Guide (ICRG)*. The data are available in monthly observations. We obtain annual observations from 1982 onward by averaging the monthly data points for each year. This index ranges from -6 (low probability/risk of encountering corruption) to 0 (high risk of corruption). Two other political variables that were initially included but later dropped due to their insignificance were a measure of political risk (from the *ICRG* data) and a measure of government unity (taken from the World Bank's *Dataset on Political Institutions 2000*).

In order to examine whether the occurrence of financial crises contaminates our result, as they might systematically change the relationship between financial openness and our control variables, we also include crises measures in a number of regressions.¹⁵

¹⁴ The "Polity IV database includes annual measures for both institutionalized democracy (DEMOC) and autocracy (AUTOC)...A third indicator, POLITY, is derived simply by subtracting the AUTOC value from the DEMOC value; this procedure provides a single regime score that ranges from +10 (full democracy) to -10 (full autocracy)." (Marshall and Jaggers, 2000, p. 12). We use the POLITY variable in our regressions.

¹⁵ We utilized a number of variants of these binary indicators (currency crisis and banking crisis, their onset year only, and these separately or together in the same specification) and we never reject the null (no effect). For currency crises, our indicator is identified by periods in which a monthly index, composed of a weighted average of the real exchange rate and foreign reserves, changes by more than 2 standard deviations (data is taken from the *IFS*). The banking crisis binary indicator is taken from Caprio and Klingebiel (1999) and is analyzed in Arteta and Eichengreen (2002) and Hutchison and Noy (2005). See Hutchison and Noy (2004) for more on the identification of various types of financial crisis episodes.

As the theoretical discussion in Aizenman and Noy (2004) suggests, one of the determinants of *de facto* financial openness should be the legal impediments to financial flows (*de jure* financial openness). Accordingly, we also include in our multivariate analysis a binary measure for restrictions on the capital account taken from the IMF's *Annual Report on Exchange Arrangements and Exchange Restrictions*. This binary measure is the only internationally comparable measure of *de jure* financial openness available for a large sample of countries and over the time period.

4. Multivariate Estimation - Methodology and Results

4.1 Causality from Trade to Finance

In order to investigate whether past trade openness Granger-causes FDI gross flows openness, we start by positing a linear structure for the determination of the level of financial openness whereby:¹⁶

$$(13) \quad FDI_{it}^o = \alpha_i + \beta_1 X_{it} + \beta_2 \overline{CO_{it-1}^T} + \varepsilon_{it}$$

The dependent variable ($FDI_{it}[Q]$), FDI openness for country i at time t and type Q (gross, net, inflow, or outflow), is assumed to be dependent on separate country intercepts, a vector X_{it} of macroeconomic and political-institutional control variables, a vector of average lagged trade openness measure ($\overline{CO_{it-1}^T}$) for country i , time t and type T (goods, services, etc.) and an error term.

While in Aizenman and Noy (2004), we found strong evidence of autocorrelation in the aggregate financial openness measure; this is not the case for estimations of the FDI component of financial openness as is evident in the estimated autocorrelations included in the tables below.

¹⁶ See Granger (1969) and Sims (1972) for a definition of G-causality.

We estimate the model with time-invariant country effects. In order to examine the suitability of fixed vs. random assumption for the country-specific effects we examine the standard Hausman χ^2 statistic for the benchmark regression of table 5, column 1. The statistic, at 12.35, strongly indicates (at below 1%) that fixed-effects are preferable.¹⁷ We therefore conduct all estimations with a fixed-effects specification.

Table 5 and 6 include results for our basic regressions. The adjusted R^2 is between 0.47 and 0.71; these depend on the macroeconomic controls that are included in the estimation, the specific LHS trade variable used and the sample (developed or developing countries). In table 5, we report results of regressions that exclude the macroeconomic and political control variables. Only GDP per capita and a dummy for the 1990s are included besides the trade variables of interest to us in this paper. We find that the coefficient for per-capita GDP is always positive and statistically significant – i.e., an increase in domestic per capita GDP of PPP\$1000 will facilitate 0.2-0.4 percentage points increase in the volume of FDI flows (as percent of GDP). A dummy variable for the 1990s is consistently positive and significant for the developing countries and negative but only occasionally significant for the industrial countries sample.

The association between FDI gross flows and trade is positive and significant at the 1% level for the developing countries sample and is apparently positive but insignificant for the developed countries (columns 1-2 in table 5).¹⁸ A decomposition of our measure of trade openness into trade in goods, in services, and in incomes however, yields very similar statistically significant results for the two samples; with trade in goods dominating the association between trade and FDI flows (columns 3-4 in table 5). Services trade is never statistically significant for either sample nor in the different specifications for tables 5 and 6.

¹⁷ Put differently, we reject the null of uncorrelated errors necessary for un-biased random-effects estimation.

¹⁸ Using exports/GDP ratio instead of the trade/GDP measure does not change this result.

Interestingly, in table 6 columns 3-4, the association between goods trade and FDI openness and trade in incomes and FDI openness is twice as strong and statistically significant while that is no longer the case for the industrial economies.

Results for other macroeconomic and political control variables are reported in table 6. The coefficient for the interest rate spread is negative for developing countries and positive for industrial ones but is rarely statistically significant. Foreign growth rates are positive and significant for developing countries but negative and insignificant for developed ones. The political-economy determinants of international financial flows, corruption levels and the democracy measure are never statistically distinguishable from zero in our regression specifications. The democratic regime variable is consistently negative, in line with our previous findings on aggregate measures of financial openness. Since we use a fixed-effects specification these results are not surprising, as these measures tend to be fairly constant over time.¹⁹

In table 7, we re-estimate our benchmark specifications with different left-hand-side FDI variables. In columns 1 and 3 we examine FDI inflows while in columns 2 and 4, outflows. For the trade openness measures, the only variable that is consistently significant, as before, is goods trade for the inflows specifications (columns 1 and 3). Trade does not appear to explain FDI net outflows.

In addition to the specifications discussed above, we tested a number of alternative specifications of our empirical model in order to verify the robustness of our results. Because of space considerations we do not include the full specifications in our tables but all these results are available upon request. We started by decomposing the measure for goods trade into trade in foodstuffs, fuel, manufacturing and metals/ores. For the developing countries sample, we

¹⁹ In Aizenman and Noy (2004), we present significant results for these measures when fixed effects are not included.

consistently find that FDI is positively correlated with trade in foodstuffs and manufacturing but negatively correlated with trade in fuels. Qualitatively similar but somewhat weaker results are obtained for the developed countries sample.²⁰

We first tested whether cross-sectional dependence might be biasing our coefficients and creating a spurious correlation. That will be the case if cross-sectional shocks that affect a number of countries will increase both FDI gross flows and gross trade flows at the same time. To account for cross-sectional dependence, we implement the ‘principal components’ procedure suggested by Coakley et al. (2002).²¹ We implement this procedure for the baseline specification in table 5 column 1. Results for the variable of interest (i.e., trade openness) are very similar if slightly weaker – the coefficient is 25% smaller but is positive and significant at the 1% level.

Geweke et al. (1983) describe a number of alternative causality tests. Specifically, they suggest that a Wald test using the Granger or Sims specifications is superior to other alternatives they examine. We implement a variant of this test for the two data series (FDI and goods trade openness measures) and always reject the null of no causality with more than 1% statistical significance in both directions.²²

As we already noted in the previous section, we also tested the significance of a number of other control variables and found none to have any explanatory power. We also hypothesized that financial crises (either banking or currency crises) might significantly affect the level of financial openness in general and more specifically the use of financial repression for generating government revenues. Interestingly, in all iterations of the model we attempted, none of the

²⁰ These results are presented in the working paper version of this paper, Aizenman and Noy (2005).

²¹ The algorithm involves estimating a fixed effect model, obtaining the principal component of the cross-sectional error terms and then augmenting the original specification with these principal components. Coakley et al. (2002) show that coefficient estimates are then unbiased and consistent. Through simulations, they conclude that this algorithm leads to a substantial bias reduction if the panel does have cross sectional dependence.

²² This result does not depend on the number of lags included for the RHS variable.

coefficients for the crises variables comes out significant for the developing countries sample (nor for the other samples).

4.2 Causality from Finance to Trade

In the estimations described above, we have established that past trade openness Granger-causes FDI gross flows openness. As we already suggested that causality might also run from past financial openness to present trade openness we also estimate the opposite specification:

$$(14) \quad CO_{it}[goods] = \gamma + \delta_1 X_{it} + \delta_2 \overline{FO}_{it-1} + \eta_{it}$$

Where the LHS variable is now the openness to goods trade while on the RHS we include a set of control variables (chosen incrementally with the Akaike Information Criterion) and various measures of financial openness (FDI, loans, equity and trade credits). The measures for trade credits and portfolio flows are not reported for many countries so we subsequently drop them in the specifications reported in columns 3-4 and thus increase the sample size significantly. We use the same assumptions, methodology, definition of variables and samples as before. Results are reported in table 8. The FDI openness measure appears to have a statistically significant, positive, and large effect on trade in goods while for the developing-countries sample the measure of gross loans appears to have the opposite effect (reducing goods trade).

5. Decomposition of Causality Between Trade and Finance

In Granger (1969), the possibility of simultaneous causality between the two time series is assumed away by arguing that, at least in principle, it should be feasible to obtain higher frequency observations and thus identify accurately the exact chronology of effects and do away with the correlations in the contemporaneous data series. As we only have annual data, and since

financial flows respond quickly to exogenous shocks, it is reasonable to expect that our data will also contain what appears to be instantaneous causality between trade and financial openness. Furthermore, Granger's (1969) approach does not allow us to estimate and compare the relative magnitudes of causality between the two time series.

Geweke (1982) suggests a methodology to distinguish between (temporal) causality from x to y , from y to x and simultaneous causality between the two. We briefly describe the methodology and provide results.²³

First we estimate the following equations using a panel fixed-effects least squares estimation.

$$(15) \quad FDI_{it} = \alpha_i^1 + \sum_{s=1}^p \beta_{1s}^1 FDI_{it-s} + \sum_{s=0}^p \beta_{2s}^1 CO_{it-s} + \varepsilon_{it}^1$$

$$(16) \quad FDI_{it} = \alpha_i^2 + \sum_{s=1}^p \beta_{1s}^2 FDI_{it-s} + \sum_{s=1}^p \beta_{2s}^2 CO_{it-s} + \varepsilon_{it}^2$$

$$(17) \quad FDI_{it} = \alpha_i^3 + \sum_{s=1}^p \beta_{1s}^3 FDI_{it-s} + \varepsilon_{it}^3$$

$$(18) \quad CO_{it} = \alpha_i^4 + \sum_{s=1}^p \beta_{1s}^4 CO_{it-s} + \sum_{s=1}^p \beta_{2s}^4 FDI_{it-s} + \varepsilon_{it}^4$$

$$(19) \quad CO_{it} = \alpha_i^5 + \sum_{s=1}^p \beta_{1s}^5 CO_{it-s} + \varepsilon_{it}^5$$

Next, following Geweke's (1982) notation we define $F_{CO \rightarrow FDI}$ as the linear feedback (i.e. G-causality) from trade openness to FDI, $F_{FDI \rightarrow CO}$ as the G-causality from FDI openness to trade openness, and $F_{FDI \bullet CO}$ as the instantaneous linear feedback between the two series. $F_{FDI, CO}$, defined as the total measure of linear dependence between the two series is therefore given by:

²³ Readers may also consult Geweke (1984) and Granger (1988). The only applications we are aware of which apply this methodology to macro-economic data series are Chong and Calderón (2000), Calderón and Liu (2003) and Aizenman and Noy (2004). Other approaches to identifying causality in macroeconomics will typically rely on an

$$(20) \quad F_{FDI,CO} = F_{FDI \rightarrow CO} + F_{CO \rightarrow FDI} + F_{FDI \bullet CO}.$$

Given these definitions, Geweke (1982) concludes the following:

$$(21) \quad F_{FDI \rightarrow CO} = \log[\text{var}(\varepsilon_{it}^5) / \text{var}(\varepsilon_{it}^4)]$$

$$(22) \quad F_{CO \rightarrow FDI} = \log[\text{var}(\varepsilon_{it}^3) / \text{var}(\varepsilon_{it}^2)]$$

$$(23) \quad F_{FDI \bullet CO} = \log[\text{var}(\varepsilon_{it}^2) / \text{var}(\varepsilon_{it}^1)]$$

Geweke (1982) shows that the null hypothesis ($H_0: F=0$) can be statistically examined using the χ^2 distribution. In estimating (15)-(19), we started with three lags ($p=3$) of the independent variables in each regression and reduced step-wise the number of lags using the Akaike Information criterion. In all cases, it turned out that a single lag ($p=1$) contained all the information required to estimate the model. Consequently, we set $p=1$ throughout. Table 9 provides our results for this decomposition of causality between the two series for the complete sample. Most of the linear feedback between trade and FDI (81%) can be accounted for by Granger-causality from FDI gross flows to trade openness (50%) and from trade to FDI (31%). Simultaneous correlation between the two only accounts for 19% of the total linear feedback between the two series.²⁴ Similar results are obtained when we instead investigate causality between trade openness and net FDI flows or net inflows.

6. Concluding remarks

The empirical results presented in this paper are consistent with the notion that the feedback effects between trade and FDI are stronger in developing than in industrialized

instrumental variable methodology. An excellent book length treatment of the issue of causality in macroeconomics is Hoover (2001).

²⁴ The apparent simultaneous correlation is interesting in and of itself, even though it accounts for less of the linear feedback than the temporal measures. In order to identify the mechanisms at work for the simultaneous correlation,

countries. This result is in line with the conjecture that the bulk of the FDI to developing countries has been vertical. This result also provides a partial motivation for the deep trade and financial liberalizations undertaken by developing countries in recent years –the positive feedbacks between trade and FDI frequently hinge on low trade and financial barriers, and may intensify with further lowering of these barriers. Our analysis also suggests that in an era of rapidly growing trade integration countries cannot choose their capital account policies independently of their degree of openness to trade.

We close the paper by noting that our model and empirical work can be extended to account for more complex aspects of the association between FDI and trade. For example, we ignore the potential importance of private and public infrastructure investment as an input into the production process, and the role of financial intermediation in facilitating domestic investment. These considerations are left for future research.

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Appendix A: Heterogeneous Supply Of Labor And Switching Costs

This appendix outlines a model where the supply of labor in each sector is determined by the anticipated wage path. We consider the case where workers in the emerging markets are drawn from the unity interval, $j \in [0, 1]$. Agent j can switch to the heterogenous sector, Y, only after spending switching cost θ_j ; $0 \leq j \leq 1$. This cost represents investment in human capital and other costs associated with moving from Z to Y. Workers are ordered according to the switching costs from sector Z to sector Y. Hence, for $1 \geq l > h \geq 0$, $\theta_l > \theta_h$. We simplify by assuming that the switching cost is known to each agent, and that it takes one period to make the switch. We assume that the productivity in sector Y increases over time due to learning by doing and technological improvements, while labor productivity in the homogenous sector remains constant at a^* . Recalling that the production function in sector Z is Ricardian, wages there are determined by productivity, $w_{Z,t}^* = a^*$. In contrast, productivity improvements in sector Y imply $w_{y,t}^* \leq w_{y,t+1}^* \leq w_{y,t+2}^* \dots$. In a rational expectation equilibrium where the anticipated path of wages in sector Y is $w_{y,t}^*$; $w_{y,t+1}^*$; $w_{y,t+2}^* \dots$, agent j will switch at a time t where

$$(A1) \quad \theta_j - a^* = NPV[w_{y,t+1}^* - a^*; w_{y,t+2}^* - a^*, \dots].$$

We denote by $j(t)$ the marginal agent that is indifferent between switching at time t and time $t+1$. The anticipation of further increases in the wage offered in sector Y implies $j(t) \leq j(t+1) \leq j(t+2) \dots$. In a discrete time model, the mass of workers reallocating to sector Y at t is $j(t) - j(t-1)$, and the supply of labor in the two sectors is

$$(A2) \quad L_{y,t}^* = j(t-1); \quad L_{z,t}^* = 1 - j(t).$$

Let the aggregate demand for labor in sector Y at time t be $D_{L_y,t}^*$. It can be verified that

$$(A3) \quad D_{L_y,t}^* = D_{L_y,t}^*(w_{y,t}^*; b_t^*; n)$$

where n denotes the number of Y activities located in the emerging market at time t , and the signs above the variables correspond to the sign of the partial derivatives. Hence, $w_{y,t}^*$ is determined by the condition

$$(A4) \quad D_{L_y,t}^* = j(t-1).$$

Learning by doing and technological improvement in sector Y would induce higher wages, attracting more workers to switch to sector Y. These trends will also increase the multinationals investment in the economy, increasing n .

Appendix B: Data Samples and Definitions

Samples (1982-1998)^a

IND	Industrialized countries (21 countries): Australia, Austria, Canada, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Japan, Netherlands, New Zealand, Norway, Portugal, Spain, Sweden, Switzerland, UK, USA
DEV	Developing countries (60 countries): Algeria, Argentina, Bangladesh, Belize, Bolivia, Botswana, Brazil, Cambodia, Cameroon, Chile, China, Colombia, Costa Rica, Ivory Coast, Ecuador, Egypt, El Salvador, Gabon, Gambia, Ghana, Guatemala, Guyana, Honduras, India, Indonesia, Israel, Jamaica, Jordan, Kenya, Korea, Malaysia, Mauritius, Mexico, Morocco, Mozambique, Nepal, Nicaragua, Nigeria, Pakistan, Panama, Papua New Guinea, Paraguay, Peru, Philippines, Senegal, Sierra Leone, South Africa, Sri Lanka, Swaziland, Syria, Tanzania, Thailand, Togo, Tunisia, Turkey, Uganda, Uruguay, Venezuela, Zambia, Zimbabwe.
ALL	Both samples above (81 countries)

FDI Data Definitions

FDI net inflows	Inflows of direct investment from foreigners minus direct investment from foreigners that was repatriated to the country of origin.
FDI Net outflows	Outflows of direct investment from domestic residents minus direct investment by residents to foreign countries that was repatriated to the domestic country.
FDI Gross flows	FDI net inflows + FDI net outflows

^a Data availability further constrained our samples. Thus, the numbers reflect countries for which data were available for the aggregate financial flows but not necessarily for the whole 1982-1998 time period.

Appendix C: Data Sources and Samples

Code	Source	Description
KTOTAL	<i>IMF-BOP statistics</i> ^a	Sum of capital inflows and outflows (% of GDP)
FDITOT	<i>IMF-BOP statistics</i>	Sum of FDI inflows and outflows (% of GDP)
TRADTOT	<i>IMF-BOP statistics</i>	Sum of trade credit inflows and outflows (% of GDP)
LOANTOT	<i>IMF-BOP statistics</i>	Sum of loan inflows and outflows (% of GDP)
EQTOT	<i>IMF-BOP statistics</i>	Sum of portfolio inflows and outflows (% of GDP)
TRADG	<i>WB-WDI</i> ^b	Sum of exports and imports (% of GDP)
SERVG	<i>WB-WDI</i>	Sum of service exports and imports (% of GDP)
GOODG	<i>WB-WDI</i>	Sum of goods exports and imports (% of GDP)
INCOMG	<i>WB-WDI</i>	Sum of trade in incomes (% of GDP)
FUELG	<i>WB-WDI</i>	Sum of trade in fuels (% of GDP)
MANUG	<i>WB-WDI</i>	Sum of trade in manufacturing (% of GDP)
FOODG	<i>WB-WDI</i>	Sum of trade in foodstuffs (% of GDP)
METALG	<i>WB-WDI</i>	Sum of trade in metals and ores (% of GDP)
GDPPCPP	<i>WB-WDI</i>	GDP per capita, PPP (current int'l \$)
DLCPI	<i>WB-WDI</i>	Inflation, consumer prices (annual %)
BDGTG	<i>WB-WDI</i>	Overall budget deficit (% of GDP)
USTBILL	<i>IMF-IFS</i> ^c	Interest rate on U.S. Treasury bill
CORRUPT	<i>PRS: International Country Risk Guide</i>	Level of Corruption ^d
POLITY2	<i>POLITY IV</i> project	Political regime type ^e
KKCCAR	<i>IMF- EAER</i> ^f	Binary measure for current and/or capital account restrictions

^a The IMF's *Balance-of-Payments Statistics*.

^b The World Bank's *World Development Indicators*.

^c The IMF's *International Finance Statistics*.

^d This index runs from -6 (low probability/risk of encountering corruption) to 0 (highly corrupt).

^e The index runs between -10 (fully autocratic) to +10 (fully democratic).

^f The IMF's Annual Report on *Exchange Arrangements and Exchange Restrictions*; extended to 1998 by Glick and Hutchison (2005).

Table 1. Financial Openness By Type – Descriptive Statistics

	Developing countries		Industrialized countries	
	1980s	1990s	1980s	1990s
FDI	1.71	3.44	1.97	3.76
FDI inflows	1.07	2.85	1.03	1.87
FDI outflows	0.29	0.40	1.13	1.92
FDI net-flows	0.92	2.60	0.13	0.06
Trade Credits	1.49	1.68	0.67	0.51
Portfolio Flows	1.18	2.20	2.90	6.41
Loans	5.97	5.44	3.26	3.18

The table presents averages of sum of financial inflows and outflows (divided by types) as percent of GDP. Data from the *Balance of Payments Statistics*.

Table 2. Trade Openness By Type – Descriptive Statistics

	Developing countries		Industrialized countries	
	1980s	1990s	1980s	1990s
Trade in Incomes	9.14	9.07	9.19	12.51
Trade in Services	20.79	22.76	15.36	17.36
Trade in Goods	66.31	61.69	52.25	51.80
Trade in manufacturing	28.84	37.78	34.85	38.95
Trade in foodstuffs	13.42	11.19	7.73	6.95
Trade in fuels	24.09	9.82	6.94	3.37
Trade in metals/ores	2.98	2.46	2.09	1.79

The table presents averages of sum of commercial inflows and outflows (divided by types) as percent of GDP. Data from the *World Development Indicators*.

Table 3. Correlations For Trade And Financial Flows

Developing Countries												
	Equity flows	Trade credits	Loan flows	FDI flows	Trade in goods	Trade in services	Trade in incomes	Trade in manufactures	Trade in foodstuffs	Trade in fuel	Trade in metals	
Equity flows	1	0.06	0.40	0.23	0.21	0.23	0.26	0.13	-0.04	0.13	-0.02	
Trade credits		1	0.02	0.18	0.07	0.07	0.02	0.07	0.12	0.07	-0.03	
Loan flows			1	0.15	0.13	0.21	0.72	-0.05	0.03	0.01	-0.07	
FDI flows				1	0.60	0.55	0.22	0.60	0.23	0.46	0.22	

Industrialized Countries												
	Equity flows	Trade credits	Loan flows	FDI flows	Trade in goods	Trade in services	Trade in incomes	Trade in manufactures	Trade in foodstuffs	Trade in fuel	Trade in metals	
Equity flows	1	0.03	0.26	0.63	0.13	0.09	0.30	0.34	0.03	-0.20	0.01	
Trade credits		1	0.13	0.04	0.15	0.15	-0.16	0.20	0.03	0.23	0.07	
Loan flows			1	0.30	0.17	0.17	0.44	0.28	0.04	-0.07	-0.01	
FDI flows				1	0.20	0.05	0.33	0.36	0.17	-0.01	0.15	

Table 4. Phillips-Perron Test for Unit Root

	(1)	(2)
	DEV	IND
Financial openness index...		
...FDI	-123.8***	-47.7***
...loans	-863.8***	-162.1***
...equity	-500.3***	-68.7***
...trade credits	-2.93.5***	-160.7***
Trade openness index...		
...for services	-123.7***	13.1**
...for incomes	-181.4***	-4.26
...for goods	-331.6***	1.82

The table lists the z-statistic for ρ with the asterixes denoting statistical rejection of the unit-root hypothesis. We denote significance levels at the 10%, 5% and 1% with *, ** and *** respectively. The two columns denote the developing countries and industrialized countries samples.

Table 5. Estimation of FDI Openness Index

	(1)	(2)	(3)	(4)
	DEV	IND	DEV	IND
Per capita GDP	0.25*** (3.97)	0.17*** (6.06)	0.28*** (5.32)	0.17*** (4.72)
The 1990s	0.71*** (3.98)	-0.24 (1.05)	0.72*** (4.10)	0.38 (1.11)
Trade openness index...	0.02*** (6.98)	0.01 (1.53)		
(Average for t-1,...,t-4)				
...for services			0.00 (0.27)	0.00 (0.06)
...for incomes			0.01* (1.62)	0.07** (2.06)
...for goods			0.02*** (3.39)	0.10*** (5.37)
Akaike IC	4.70	3.25	4.78	4.30
Estimated autocorrelation	0.47	0.50	0.47	0.29
Observations	1341	318	1446	468
Adjusted R ²	0.47	0.63	0.47	0.52

t-statistics for all variables are given in parentheses. We denote significance levels at the 10%, 5% and 1% with *, ** and *** respectively. The LHS variable is the sum of FDI net inflows and outflows (as % of GDP). Estimation using least squares with country fixed effects. For definitions of variables, see Appendix B.

Table 6. Estimation of FDI Openness Index – Full Specification

	(1)	(2)	(3)	(4)
	DEV	IND	DEV	IND
Per capita GDP	0.35*** (3.30)	0.28*** (4.95)	0.40*** (3.62)	0.32*** (5.19)
Interest rate spread	-0.08 (0.76)	0.10* (1.57)	-0.09 (0.81)	0.03 (0.36)
Foreign growth rate	0.20** (1.96)	-0.12 (1.48)	0.26*** (2.53)	-0.05 (0.53)
Democratic regime	-0.04 (1.04)	0.05 (0.09)	-0.02 (0.36)	-0.19 (0.29)
Corruption	-0.37* (1.60)	-0.01 (0.05)	-0.13 (0.54)	0.03 (0.11)
The 1990s	0.61* (1.80)	-0.91*** (2.63)	0.75** (2.18)	-0.61* (1.57)
Trade openness index... (Average for t-1,...,t-4)	0.02*** (3.84)	0.02** (2.53)		
...for services			-0.06 (1.49)	0.06 (0.71)
...for incomes			0.05*** (4.48)	0.00 (0.05)
...for goods			0.03** (1.98)	0.04 (1.33)
Akaike IC	4.72	3.22	4.74	3.58
Estimated autocorrelation	0.16	0.34	0.19	0.17
Observations	533	193	541	235
Adjusted R ²	0.58	0.71	0.55	0.67

t-statistics for all variables are given in parentheses. We denote significance levels at the 10%, 5% and 1% with *, ** and *** respectively. The LHS variable is the sum of FDI net inflows and outflows (as % of GDP). Estimation using least squares with country fixed effects. For definitions of variables, see Appendix B. In an initial specification, we also included the government's budget surplus (as % of GDP), the inflation rate (CPI), a world interest rate (U.S 1-year T-bill rate), government consumption (as % of GDP).

Table 7. Estimation for the FDI Inflows/Outflows

	(1) FDI net inflows DEV	(2) FDI net outflows DEV	(3) FDI net inflows IND	(4) FDI net outflows IND
Per capita GDP	0.24*** (2.57)	-0.27*** (10.84)	0.10*** (4.32)	-0.20*** (6.05)
Interest rate spread	0.00 (1.30)	0.01 (1.20)	0.03 (1.02)	0.00 (0.07)
Foreign growth rate	0.06 (0.97)	-0.01 (0.23)	-0.01 (0.41)	0.00 (0.03)
Democratic regime	0.03 (0.85)	0.02* (1.68)	-0.15 (0.70)	-0.47 (0.77)
Corruption	0.27 (1.48)	0.18*** (2.91)	-0.04 (0.41)	-0.03 (0.24)
The 1990s	0.62** (2.09)	0.01 (0.05)	0.10 (0.55)	0.66*** (2.60)
Trade openness in... (Average for t-1,...,t-4)				
...services	-0.03 (0.91)	0.01 (0.83)	0.01 (0.18)	-0.06 (0.95)
...incomes	0.01 (0.79)	0.00 (0.00)	0.02 (1.37)	0.01 (0.48)
...goods	0.06*** (4.66)	0.00 (0.74)	0.04*** (2.73)	0.01 (0.66)
Akaike IC	4.81	1.90	2.43	2.98
Estimated autocorrelation	0.17	-0.02	0.34	0.29
Observations	635	318	283	254
Adjusted R ²	0.39	0.66	0.58	0.59

t-statistics for all variables are given in parentheses. We denote significance levels at the 10%, 5% and 1% with *, ** and *** respectively. The LHS variable is either FDI net inflows or net outflows (as % of GDP). Estimation using least squares with country fixed effects. For definitions of variables, see Appendix B.

Table 8. Reverse Specifications for Goods/Services Trade Openness Indices

	(1) Goods DEV	(2) Goods IND	(3) Goods DEV	(4) Goods IND
US Treasury bill rate	2.18*** (4.98)	0.92*** (6.65)	1.21*** (6.44)	0.94*** (8.21)
Real exchange rate appreciation index	-0.15*** (2.65)	-0.24*** (7.02)	-0.11*** (6.34)	-0.22*** (7.87)
Democratic regime	1.25*** (3.85)	1.73 (1.00)	0.38*** (3.21)	-0.11 (0.10)
The 1990s	4.00 (1.55)	1.97** (2.21)	7.24*** (6.72)	1.27* (1.84)
Financial openness in... (Average for t-1,...,t-4)				
...FDI	-0.04 (0.05)	0.39 (1.17)	0.80*** (2.62)	0.79*** (3.11)
...loans	-0.44*** (4.91)	-0.09 (0.81)	-0.30*** (5.94)	-0.04 (0.32)
...equity	0.79** (2.12)	0.30 (1.55)		
...trade credits	0.91 (0.62)	0.51 (0.67)		
Akaike IC	7.22	5.27	7.05	5.31
Observations	203	261	801	372
Adjusted R ²	0.97	0.89	0.93	0.89

t-statistics for all variables are given in parentheses. We denote significance levels at the 10%, 5% and 1% with *, ** and *** respectively. The LHS variable is the sum of imports and exports of goods or services (as % of GDP). Estimation using least squares with country fixed effects with a correction for an autocorrelation (AR1). For definitions of variables, see Appendix B. Similar estimation for trade in services does not yield any significant coefficients for the financial flows variables.

Table 9. Decomposition of Causality – Full Sample

	Percent of overall linear feedback		
	FDI gross flows	FDI net flows	FDI inflows
From FDI openness to commercial openness ($F_{FO \rightarrow CO}$)	50	58	57
From commercial openness to FDI openness ($F_{CO \rightarrow FO}$)	31	34	32
Simultaneous feedback ($F_{FO \leftrightarrow CO}$)	19	8	11

For the decomposition, we use the methodology outlined in Geweke (1982) and defined in equations (15)-(23). The overall linear feedback is defined in equation (20).