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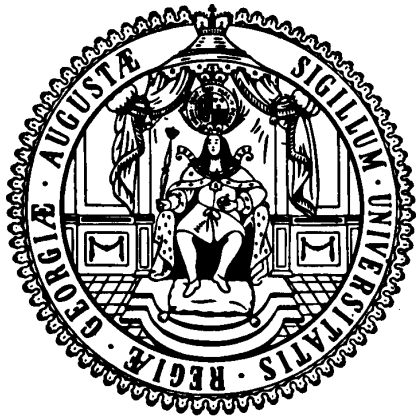

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The impact of FDI on net barter terms of trade

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Do multinationals beat down developing countries' export prices? The impact of FDI on net barter terms of trade

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Abstract

This paper explores the economic relationship between foreign direct investment to developing countries and the export prices of the latter, measured by terms of trade. It is first shown that economic theory suggests such a relationship for various reasons but is inconclusive about the direction of the effect.

To address this open issue empirically, I analyze data on more than 50 developing countries throughout the period 1980 - 2008 using dynamic panel data methods. The results show that multinational corporations, measured by data on foreign direct investment, had an economically relevant and statistically significant positive impact on developing countries' net barter terms of trade. A higher level of education in the developing country fosters this effect.

Keywords: Multinationals, FDI, Terms of Trade, Prebisch-Singer hypothesis

JEL classification: C23, F23, O11

1. Introduction

While there is widespread consensus in economics about positive micro-level effects of multinational corporations (MNCs) and their foreign investment (FDI) in developing countries[1], the evidence is less clear from a macro-perspective.[2] Despite an impressive growth-performance combined with considerable capital inflows, Li et al. (2007) raised concerns that large FDI inflows were responsible for China's terms of trade to deteriorate (Li et al., 2007).

Due to the surge in capital flows, especially FDI, to developing countries in the last years - and especially the aftermath of the financial crisis - it is necessary to understand in how far this concern is generally justified and to shed light on the relationship between FDI and terms of trade because the latter directly influence the welfare of a country. Since they reflect a country's export prices relative to its import prices, their decline implies a decreasing purchasing power of a country's exports and would ceteris paribus cause the real income of an economy to decline. Based on the seminal contributions of Prebisch (1950) and Singer (1950), terms of trade are thus seen as a central indicator how the fruits of technical progress and trade-induced wealth are shared between the industrialized Northern center and the under-developed Southern periphery and a large literature investigating the existence and correct estimation of the corresponding negative terms-of-trade trend for developing countries' export goods has emerged throughout the 1980s[3] and continues until the recent past (cf., inter alia, Kim et al., 2003; Harvey et al., 2010; Ghoshray, 2011). Probably even more important than countering a long-run decline in terms of trade is to battle their volatility: Blattman et al. (2007) have shown that the latter has a more important impact on developing countries growth prospects than has their long-run trend, and Bird (2007) concludes that terms-of-trade shocks significantly increase a developing country's probability to suffer balance of payment problems to an extent that it has to accept assistance of the International Monetary Fund as the lender of last ressort. Other recent contributions such as UNCTAD (2005), Baxter and Kouparitsas (2006), and Santos-Paulino (2010) have also addressed the issue of developing countries terms-of-trade volatility. The aim to stabilize terms of trade and the interpretation of Cuddington and Urzúa (1989: 438ff) that terms of trade follow a stochastic trend model and thus respond to exogenous shocks raise the question about structural factors causing these shocks.

Previous economic work that is discussed in section 2 established a link between the operations of multinationals and terms of trade but has not come to precise statements about the theoretical impact of MNCs on terms of trade. After introducing data and methodology in section 3, the issue is thus addressed empirically by investigating data of more than 50 developing countries between 1980 and 2008. The results show that concerns about MNCs,

[1] Lipsey (2002) provides a survey on wages and employment.

[2] Cf. Herzer et al., 2008, for the case of growth.

[3] Cf. especially Spraos (1980), Sapsford (1985), Thirlwall and Bergevin (1985), Grilli and Yang (1988), Cuddington and Urzúa (1989), Powell (1991), and Reinhard and Wickham (1994).

measured by FDI, beating down developing countries' export prices are generally not justified from an empirical perspective. On the contrary, FDI had a statistically significant positive impact on developing countries' net barter terms of trade (NBTT) and actually countered their long-run deterioration by about 50 % throughout the period of investigation. Section 5 concludes.

2. Multinationals and Terms of Trade - a theoretically unclear link

2.1. Prebisch and Singer on multinationals and terms of trade

In 1949, Hans Singer published a series for the United Nations showing the price of primary commodities to deteriorate relative to manufactured goods over the period 1876 to 1938 which initiated the Singer-Prebisch hypothesis.[4] Although his seminal interpretation of this finding (Singer, 1950) has been widely cited in economics,[5] only few have payed more attention to the title - "The Distribution of Gains between Investing and Borrowing Countries". Thereby, Singer clearly meant foreign direct investment and raised concerns that it would bring along a certain "type of foreign trade" (1950: 483) that kept the FDI-importing developing country in an export-specialization poverty-trap through falling terms of trade (1950: 477).

Prebisch's (1950, 1959) interpretation of labor market asymmetries between a highly organized North and a Lewis-type South has found more attention in the literature but it has barely been noticed that Prebisch (1950: 13-14) himself thought of these asymmetries as merely bringing into force an underlying mechanism of profit transfer (in the form of FDI and other capital flows) that operates through the business cycle. From a modern perspective towards the multinational firm one could also re-interpret a part of Prebisch' (1950) ideas as a firm's "hold-up problem" (cf. Wacker, 2011: 9f): vertical FDI[6] in the South is motivated by imperfect competition in the upstream market that leads to an output level under the perfect-market equilibrium. The multinational firm enters the market to increase production which would ceteris paribus lead to a price decline and thus a fall in the Southern terms of trade.

Both main initiators of the terms-of-trade debate, Singer and Prebisch, have thus at least implicitly linked the issue to the activities of multinational corporations.

[4]For the origins of the hypothesis see Toye and Toye (2003).

[5]More than 1,000 cites on "google scholar", 40 within JSTOR.

[6] A vertical multinational organizes the value chain globally within one firm: goods produced in one (upstream) country serve as input in another (downstream). In contrast, horizontal investment is undertaken to gain advantage in supplying local markets, e.g. by overcoming trade costs.

2.2. Expanding the macro transfer problem

Macroeconomic theory establishes a completely different relation between FDI and terms of trade that dates back to the discussion between Ohlin (1929) and Keynes (1929) about the German transfer problem: As an income transfer, FDI will lead to a higher purchasing power of the host country.[7] If the marginal propensity to spend in the host country is in favor of the imported and against the domestic good, the relative demand for the domestic good will decrease, resulting in a decrease in terms of trade.

Although other studies reflected the transfer problem of monetary flows (cf., inter alia, Bhagwati et al., 1983; Martinez-Zarzoso et al., 2009; Darity Jr. et al., 2010), it should be stressed that the problem assumes the recipient's demand to be large enough to influence world-market prices and it is thus more than questionable whether the developing countries' excess-income generated by FDI is relevant enough to significantly influence global goods' prices. Probably more important than the demand effect of FDI is its supply response: Assuming that FDI does not simply replace domestic production, the relative supply of the developing country's export good will increase if the FDI is vertical in nature (cf. footnote 6 on page 3) and will decrease in the case of horizontal FDI. Given that global supply of MNCs is relevant in size, the relative price of the developing country's export good, i.e. the country's terms of trade, will decrease in the first case but increase in the latter.

2.3. Impacts on the micro-level

Most micro-economic considerations suggest a positive relationship between FDI and terms of trade: It is well-known that MNCs pay higher wages than domestic firms (cf. e.g. Lipsey, 2002, for an overview) and to the extent they are reflected in the final good's (export) price, this leads to more favorable terms of trade for the FDI host country. Since MNCs usually also produce more sophisticated goods than domestic producers and also demand more sophisticated inputs, their presence may lead to upgrading-effects in the host economy. If this upgrading-effect is not taking place between product groups but *within* a product group, this violates the assumption of homogeneous goods that is necessary to construct consistent price indices and the upgrade will thus show up as a terms of trade increase (cf. equation (4) on page 6 for the calculation of NBTT). Finally, structuralist reasoning about terms of trade (cf. Emmanuel, 1972; Raffer, 1987) highlighted the multinational's market-power for terms of trade formation: According to this viewpoint, Northern producer's pricing-power enables them to beat down developing countries' prices leading to a terms-of-trade decrease for the latter. Following this rationale, we would expect FDI to have a positive impact on developing countries' terms of trade since by establishing an affiliate in a host country, the firm also "exports" its proprietary asset (and thus the pricing-power) to the developing country.

[7] From a balance of payments approach, FDI is obviously not a transfer. However, insofar as FDI generates supplementary income via spill-over effects and higher wages in the host economy, it will have similar impacts as a transfer.

2.4. Terms of trade in the long period

Since most of these arguments only concerned the short run, Findlay (1980) set up a long-run equilibrium model (where growth is the same in the North and the South) to explain terms-of-trade movements and interestingly finds that they are independent of the North's mark-up. However, in his framework saving equals investment for both regions separately so that there is no international capital transfer, which he considers as one of the major limitations of the model.

In an attempt to overcome this problem, Darity Jr. (1990) derives a "long-period" model where capital moves (from North to South) and profit-equalization among all industries is the equilibrium condition. The equilibrium terms of trade are then equal to the ratio of the respective marginal products of capital:

$$\theta^* = \frac{f'(k_N^0)}{\pi'(k_S^*)}, \tag{1}$$

where π is the intensive form of the South's aggregate production function, k is the capital-to-labor ratio and hence $\pi'(k_S^*)$ is the marginal product of capital in the South. Equation (1) is remarkable for two reasons: First of all, Darity Jr. shows that it has a representation that includes the Northern mark-up but that the direction of the effect is theoretically unclear because it depends on other parameters of the model that are not predetermined. Secondly, the impact of FDI on $\pi'(k_S^*)$ is also unclear: As long as FDI does not simply crowd out domestic investment, the capital-intensity of the South will rise and under $\pi'(k_S) > 0,\ \pi''(k_S) < 0$ this leads to a decrease in the denominator, whereas we would expect FDI to also bring along more sophisticated techniques of production that lead to an increase in the marginal product of capital and a priori we do not know which of the two effects will be more important.

In summary, economic theory suggests that there exists a relationship between FDI in developing countries and their terms of trade. But the direction and magnitude of this relationship remains unclear. The consequent part of the paper therefore explores this relationship empirically and also tries to shed light on possible economic channels that can be explored in more detail in future research, both empirically and theoretically.

3. Data and Methodology

The focus of this paper is on developing countries which in this context means countries classified as "low income" or "lower middle income" by the World Bank classification 1987, the first year available. The list of countries included can be found in the appendix. Data generally ranges from 1980 to 2008, though missing values for many control variables restrict the sample size.

The main exercise is to investigate whether net barter terms of trade, $NBTT$, given a set of control variables, Ψ, depend in some functional form f on the activity-level of multinational corporations, denoted as FDI, in the host economy:

$$\mathbb{E}(NBTT|\Psi) = f(FDI) \tag{2}$$

3.1. Terms of trade data

I take a country's net barter terms of trade (NBTT) index, as reported by World Bank (2010a) WDI, as a measure for export prices to import prices. More precisely, NBTT are defined as the percentage ratio of the export unit value indices to the import unit value indices

$$NBTT = UVI_x/UVI_m, \tag{3}$$

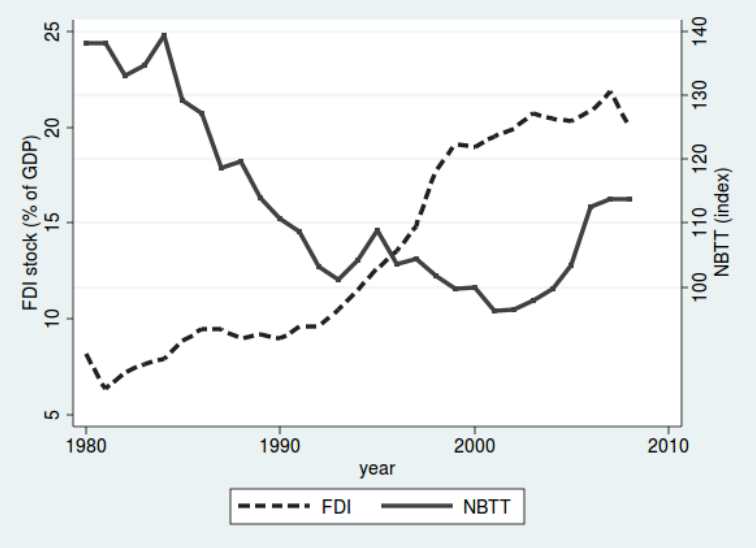
where a unit value index UVI for product group i in period t, relative to a reference period 0 is given for comparison over $m = 1, ..., M$ prices, p_m^t, and quantities, q_m^t, in period t and over $n = 1, ..., N$ prices, p_n^0, and quantities, q_n^0, in period 0, where m and n are drawn from the same set (of i) and is defined by (cf. Silver, 2010: S209):

$$UVI^i(p^0, p^t, q^0, q^t) = \frac{\sum_m^M p_m^t q_m^t}{\sum_m^M q_m^t} \Big/ \frac{\sum_n^N p_n^0 q_n^0}{\sum_n^N q_n^0}. \tag{4}$$

Export and import values are current values of exports (free on board) and imports (cost, insurance, freight), converted to US-Dollars, and quantities represent the most recent trade structure available. Unit values are then indexed with 2000=100.

Two important things should be highlighted. First of all, this measure is different from the commodity terms of trade that Prebisch and Singer originally had in mind and that tried to capture the price-relation of different types of *products*. Starting with Singer (1975), however, the debate shifted towards structural differences in export prices between different types of *countries* which found empirical support by studies such as Grilli and Yang (1988), Powell (1991), Sarkar and Singer (1991, 1993), Lutz (1999b), and Ziesemer (2010). The measure has the advantage of capturing the whole export structure of the respective countries and not relying on single primary commodities. Secondly, unit values will only be a correct price measure as long as goods within all categories of n (and m) are homogeneous. Country statistical offices take unit values from customs data, available to them up to the 10-digit Harmonized Commodity Description and Coding System - especially in developing countries at a more aggregated level. There is an extensive literature on the bias in unit values as price indicators resulting from the fact that due to this aggregation they capture price *and* compositional quantity changes (IMF, 2009: 71ff; cf., inter alia, Lipsey, 1994; Xu and Abler, 2009; Silver, 2010; McKelvey, 2011). The bottom line of this literature, however, does emphasize that national authorities can collect unit values at relatively low costs and hence

Figure 1: Development of FDI and NBTT over time



that they are widely available, especially for developing countries (e.g. Silver, 2010: S211) so that their use in this study is justified, especially since the previous literature on terms of trade has also relied on these indices.

3.2. Data on multinational activity (FDI)

For measuring the importance of MNCs' activity in a host economy I also follow conventional rules (cf. Barba Navaretti/Venables, 2004: 2) by taking foreign direct investment data from UNCTAD FDIstat, based on its World Investment Report 2009. More precisely, I take stock data as percentage of GDP since this captures the actual value of capital and reserves (including retained profits) attributable to the multinational's parent enterprise (plus the net indebtedness of affiliates to the parent enterprises) relative to the size of the host economy and thus provides a good measure of the MNCs' relative importance in the host economy.

Figure 1 depicts the development of FDI stock / GDP (average weighted by GDP in constant prices) and of NBTT (unweighted average)[8] in developing countries over the time period under investigation. Indeed, this simple picture might suggest a negative relationship between NBTT and FDI: While the latter rose until the early 2000s, NBTT suffered a steady decline. When developing countries' NBTT stabilized and started to increase after 2000, this happened at a time when FDI stock remained fairly static at a level of about 20 % of GDP.

[8]Since FDI stocks are more volatile and small countries with very high levels of FDI inflows may dramatically change the picture, a weighted average is taken. The problem does not exist for NBTT, where a weighted average might cause discontinuity in the series when large countries exit or enter the sample.

3.3. Other controls

Other control variables, their sources and descriptive statistics are reported in table 1. The economic rationale for their inclusion is discussed together with their estimated impact in section 4.

3.4. Model specification

Since NBTT is a price index, thus a persistent series, and the impact of FDI is not expected to occur all at once but to rather entail an adaption process, a dynamic model is a manifest estimable model for the relationship suggested in equation (2):

$$ln(NBTT)_{it} = \phi ln(NBTT)_{i,t-1} + FDI_{i,t-1}\beta + \Psi\theta + \alpha_i + \gamma_t + \varepsilon_{it}. \quad (5)$$

Note that this is a log-linear[9] fixed-effects (FE) model with time dummies and that the main covariate is lagged by one period to weaken endogeneity problems and to allow NBTT to respond by a delay of one period. It is well-known that OLS estimation of a lagged dependent variable (LDV) model such as (5) is biased (Nickell, 1981), so I use the System GMM estimator developed by Arellano and Bover (1995) and Blundell and Bond (1998) as implemented by Roodman (2009a) and compare it to FE and pooled OLS estimation to assess the reliability of the former estimate. This framework allows to address potential endogeneity of FDI and to assess autocorrelation in the residuals due to the test statistic derived by Arellano and Bond (1991).

Because the bias of FE OLS estimation in the presence of simultaneity is equivalent to T^{-1} under mild assumptions (Wooldridge, 2002: 302), I also estimate a super-reduced model where the control variables Ψ are represented by a simple time trend. Since NBTT and FDI data are available for a large set of countries and years while most controls are not, this leads to an extensive sample.

[9]The log-linear model allows relatively easy interpretation and prevents the response from (potentially) taking on negative values, which would not make sense in the case of a price index.

Variable	Mean	Std. Dev.	Obs.	Source
NBTT (net barter terms of trade)	111.626	45.163	2,116	World Bank (2010a)
FDI stock / GDP	31.814	89.024	3,098	UNCTAD FDIstat
Agricultural and raw materials exports (% of exports)	7.24	12.536	1,940	World Bank (2010a)
Current account balance (% of GDP)	-5.605	10.319	2,593	World Bank (2010a)
GDP per capita (constant 2000 US$)	1258.677	1289.97	3,024	World Bank (2010a)
Industry, value added (% of GDP)	27.436	11.918	2,837	World Bank (2010a)
Inflation, GDP deflator (annual %)	71.233	725.319	3,033	World Bank (2010a)
Labor participation rate (% of total population 15+)	65.960	10.802	3,335	World Bank (2010a)
Manufactures exports (% of exports)	34.227	27.719	1,938	World Bank (2010a)
Real interest rate (%)	6.676	22.156	2,275	World Bank (2010a)
Services, etc., value added (% of GDP)	47.513	12.682	2,836	World Bank (2010a)
deviation from the long run growth rate	-0.001	0.063	2,983	World Bank (2010a)
Unemployment, total (% of total labor force)	9.603	7.029	946	World Bank (2010a)
Trade (% of GDP)	77.045	40.819	2,964	World Bank (2010a))
Official Exchange Rate (LCU per $) period average	2,155,581	120,302,513	3,116	World Bank (2010a)
RTA (Regional Trade Agreement)	0.044	0.205	3,509	own calculation

Table 1: Summary statistics

4. Empirical results

Table 2 shows a super-reduced version of equation (5) where separate time dummies for industrialized and developing countries are assumed to represent their respective control variables Ψ (cf. Spraos, 1983: 112). This allows the inclusion of 2,977 observations, thereof almost 2,000 from developing countries, with the time dimension being also relatively large ($T \approx 20$). The estimated effect of FDI on terms of trade is negative (but not statistically significant) in industrialized countries but positive and statistically significant[10] in developing countries: There, an increase in the FDI stock / GDP ratio of one percentage point leads to a 0.76 % increase in the net barter terms of trade.[11] Simple regression of the estimated time dummies on the corresponding years reveals that industrialized countries experienced a statistically significant increase in NBTT (conditional on FDI). The trend is not statistically significant for developing countries which does not necessarily mean good news: On the one hand the estimated parameter is negative[12] and the insignificance could just reflect higher volatility in time-dependent shocks. Statistically this would entail a high noise-to-signal ratio (thus insignificant results), economically it would mean unpredictable shocks with potentially severe impacts on producers and growth perspectives.

Dependent Variable: ln(NBTT)

model	(1)	
countries	industrialized	developing
ln(NBTT)	0.89024***	
(-1)	(0.01739)	
FDI stock	-0.00024	0.00083**
(-1)	(0.00038)	(0.00041)
time dummies	yes	
time dummies' trend	0.00097***	-0.00059
	(0.00014)	(0.00048)
observations	1,015	1,962
(N × avg.T)	51 × 20	90 × 22

FE OLS estimation with Huber (1967)-White (1980) cluster robust standard errors in parentheses. ***, **, and * denotes statistical significance at the 1 %, 5 % and 10 % level, respectively.

Table 2: Reduced Form Model

The results for models (2) - (4) in table 3 and 4 include the full set of control variables. Due to the absence of convincing time-varying instruments for FDI that will be uncorrelated

[10] Unless stated otherwise, I consider statistical significance at the 5 % level and refer to the 10 % level as "weak significance" and to the 1 % level as "strong significance".

[11] This is the long-run coefficient, calculated by dividing the respective coefficient by (1 minus the coefficient of the lagged dependent variable).

[12] The long-run trend of -0.54 % is in line with other results in the literature.

with ε in equation (5), I use lagged first differences as instruments for FDI and the LDV in GMM models (2) and (5)-(7) (cf. Arellano/Bover, 1995).[13] Since the time dimension of the panel is relatively large, I collapse the FDI instrument set in order to prevent overfitting problems for the (potentially) endogenous variable as proposed by Roodman (2009b: 148f). For the lagged dependent variable I combine collapsing the instruments with limiting the lag depth to lags 1-4 (ibid.). Since the instrument set is still large relative to the number of cross sections, a one-step approach had to be used which is generally not efficient, i.e. will result in more conservative inference. Estimated standard errors are consistent in the presence of any pattern of heteroskedasticity and autocorrelation within panels and a small-sample correction was applied.

In model (2), the estimated coefficient for the long-run impact of FDI on NBTT is 0.82 % and weakly statistically significant despite the non-efficient one-step procedure. The result supports the view that the activity of multinational corporations has a positive impact on developing countries' terms of trade. It is remarkable that the inclusion of a wide set of control variables and the considerably reduced sample size lead to an estimated coefficient close to one of the reduced model (1) in table 2. The estimated parameter of the LDV of model (2) lies in between those of the OLS FE estimator (3) and the pooled OLS estimate which in this case is identical to the random effects model (4), though standard errors differ.[14] Since the first one is generally expected to be downward biased while the second one is generally upward biased, this fact supports the reliability of the model (cf. Bond, 2002: 4/5). The Arellano-Bond (1991) test for serial correlation of the residuals and the Sargan test provide further support for the model specification, however, the Hansen statistic is worrisome (but only in this specification). It should also be noted that the FDI-coefficient of the random effect model (4) is positive - since random effects is a matrix-weighted average of fixed and between effects estimation (cf. Maddala, 1971) and thus also takes into account cross-country variation, this is in contrast to the above-cited view of Singer (1950) that countries with higher FDI levels suffer a worse terms-of-trade development.

Considering the other control variables, data on the industry structure, such as the share of agricultural and other raw material exports[15], industry value added, manufacturing exports and services value added, have been included because these characteristics may influence a country's potential to influence terms of trade. None of them turn out to be statistically significant and though standard errors are of reasonable size in some cases, the economic relevance is negligible.

Labor market control variables (labor participation rate and unemployment rate) are

[13]Since both, FDI and NBTT are persistent series, System GMM provides stronger instruments than the difference-GMM estimator developed by Holtz-Eakin et al. (1988) and Arellano and Bond (1991). To see this, take the most extreme case where $\phi = 1$ in (5). Then, excluding other explanatory variables, $\Delta ln(NBTT) = \varepsilon$, i.e. the differences of the series do not depend on actual (or lagged) levels.

[14]In both cases (3) and (4), Huber (1967) - White (1980) cluster robust standard errors are reported.

[15]The measure comprises SITC section 2 (crude materials except fuels) excluding divisions 22, 27, and 28.

included since especially Prebisch argued that the decline of developing countries' terms of trade operates through differences in labor markets between industrialized and developing countries; but an increase in the abundant factor (labor for developing countries) might also worsen terms of trade in neoclassical trade models (cf. Grilli/Yang, 1988: 29). The finding that increased labor market participation in developing countries has no clear impact on terms of trade supports Prebisch' viewpoint to some extent: It is a conclusion from a Lewis-type labor market model, that increases in the labor force participation would not reflect in higher wages and thus have no impact on terms of trade.[16] However, there is clearly no support for the neoclassical view that the increase in the abundant factor worsens terms of trade. More surprising is the fact that there is some evidence that an increase in unemployment is positively related to terms of trade.[17] This contrasts with Prebisch' viewpoint that during a downswing, i.e. when unemployment rises, wage-pressure drives down the South's terms of trade. However, the finding that the actual deviation from the long-run growth rate is strongly statistically significant highlights that there is clearly a relationship between business-cycle fluctuations and terms of trade that is beyond the scope of this paper but worth future investigation (cf. also Thirlwall and Bergevin, 1985, on the issue).

I also control for the exchange rate, the real interest rate and inflation since they all might influence terms of trade and, more importantly, may be correlated with FDI also. Controlling for GDP should capture different other country characteristics and is also important since many other variables are measured as a percentage of GDP.

The ratio of trade (imports + exports) to GDP is included because, inter alia, Lutz and Singer (1994) argue that for developing countries increased export intensity might worsen their terms of trade and find empirical support for this statement. For similar purposes, also a dummy variable was added which equals one if a country belongs to one of the regional trade agreements (RTA) of the Central American Free Trade Agreement (CAFTA), the Mercosur, or the ASEAN Free Trade Area (AFTA) at a specific year. While there is absolutely no support for the concern that high trade intensity negatively correlates with terms of trade, regional trade agreements seem to increase pressures on developing countries export prices.

[16]Note that the impact is positive and weakly statistically significant when models (2) and (3) are estimated for industrialized countries.

[17]Though not statistically significant for the GMM-models, the estimated coefficient is always positive and standard errors are of reasonable size.

Dependent Variable: ln(NBTT)

model	(2)	(3)	(4)	(5)	(6)	(7)
ln(NBTT)	0.8278***	0.7583***	0.8423***	0.8181***	0.7849***	0.8327475***
(-1)	(0.0764)	(0.0405)	(0.0334)	(0.0951)	(0.0962)	(0.093972)
FDI stock / GDP	0.0014*	0.0013**	0.0006***	0.0014**	0.0013**	0.0013052*
(-1)	(0.0008)	(0.0006)	(0.0002)	(0.0007)	(0.0006)	(0.0006614)
FDI stock / GDP						-0.0052241***
South Asia (-1)						(0.0017042)
time dummies	yes	yes	yes	yes	yes	yes
estimation	SysGMM	FE	RE	SysGMM	SysGMM	SysGMM
observations	480	480	480	490	499	490
(N × avg.T)	(50 × 9.6)	(50 × 9.6)	(50 × 9.6)	(52 × 9.4)	(53 × 9.4)	(52 × 9.4)
# instruments	73	-	-	69	65	70
Arellano-Bond AR(1)	-3.07			-3.01	-3.03	-3.00
Arellano-Bond AR(2)	-1.30			-1.35	-1.18	-1.35
Sargan χ^2 (p-val)	0.48			0.40	0.47	0.40
Hansen χ^2 (p-val)	0.00			0.98	0.98	0.99
Other control variables:						
agricultural and raw	0.0013	-0.0011	0.0011	0.0012	0.0017	0.0013
material exports (%)	(0.0013)	(0.0018)	(0.0010)	(0.0012)	(0.0014)	(0.0012)
current account balance	0.0062***	0.0030	0.0058***	0.0064***		0.0062***
(% of GDP)	(0.0018)	(0.0019)	(0.0017)	(0.0016)		(0.0016)
current account balance	-0.0032*	-0.0034**	-0.0034**	-0.0032**		-0.0032**
(% of GDP) (-1)	(0.0016)	(0.0016)	(0.0014)	(0.0015)		(0.0016)
real GDP p.c.	-0.0000	-0.0000	-0.0000	-0.0000	0.0000	-0.0000
	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)

(continued on next page)

Table 3: Full Model (Main Results)

Dependent Variable: ln(NBTT)						
model	(2)	(3)	(4)	(5)	(6)	(7)
Other control variables *(continued):*						
industry value added (% of GDP)	0.0008	0.0022	0.0010			
	(0.0016)	(0.0036)	(0.0014)			
inflation (annual %)	0.0000**	0.0000*	0.0000**	0.0000**	0.0000**	0.0000
	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)
labor participation rate	0.0005	0.0077**	0.0003			
	(0.0008)	(0.0031)	(0.0007)			
manufacturing exports (%)	0.0001	0.0007	-0.0001	0.0001	0.0003	0.0001
	(0.0003)	(0.0007)	(0.0002)	(0.0003)	(0.0003)	(0.0004)
real interest rate	0.0001	0.0000	0.0000	0.0001	0.0002	0.0001
	(0.0004)	(0.0004)	(0.0004)	(0.0004)	(0.0004)	(0.0004)
services value added (% of GDP)	0.0011	-0.0018	0.0008	0.0003	-0.0005	0.0004
	(0.0011)	(0.0022)	(0.0010)	(0.0008)	(0.0007)	(0.0009)
growth deviation	0.3723***	0.2684**	0.3886***	0.3873***		0.3660**
	(0.1354)	(0.1212)	(0.1289)	(0.1360)		(0.1530)
growth deviation	-0.0283	-0.0565	-0.0500	-0.0147		-0.0402
(-1)	(0.1535)	(0.1668)	(0.1509)	(0.1708)		(0.1782)
unemployment rate	0.0010	0.0045**	0.0013	0.0009	0.0012	0.0009
	(0.0009)	(0.0019)	(0.0009)	(0.0009)	(0.0008)	(0.0009)
trade/GDP	0.0000	0.0002	0.0002			
	(0.0002)	(0.0007)	(0.0001)			
exchange rate	-0.0000	-0.0000	0.0000			
	(0.0000)	(0.0000)	(0.0000)			
RTA	-0.0368**	-0.0508**	-0.0387**	-0.0336**	-0.0283*	-0.0366**
	(0.0178)	(0.0229)	(0.0165)	(0.0163)	(0.0156)	(0.0176)
constant	0.6525**	0.5704	0.5792***	0.7968*	0.9524**	0.7288*
	(0.3111)	(0.3670)	(0.2126)	(0.4198)	(0.4242)	(0.4160)

Standard errors in parentheses; see text for further details. ***, **, and * denotes statistical significance at the 1 %, 5 % and 10 % level, respectively.

Table 4: Full Model (Control Variables)

Finally, since Santos-Paulino (2010: Table 2) finds a statistically highly significant impact of the (lagged) current account on terms of trade in 14 small island developing countries in a similar time period as the present study, the actual and the lagged current account balance are added among the control variables. This distributed lag specification was chosen because Santos-Paulino (2010: 864) finds a "J-curve response" caused by a shock in terms of trade onto the current account balance. The results, while hardly being comparable to the intentionally and methodically different study of Santos-Paulino (2010), still support a dynamic response of terms of trade to the current account and thus highlight the potential for further research on this relationship.

Since an F-test does not allow to reject the hypothesis that the parameters for industry value added, labor participation rate, the trade to GDP ratio and the exchange rate are jointly different from 0 (F-statistic 0.19 with 4 and 49 degrees of freedom), model (5) is estimated without these covariates. The estimate of the impact of FDI on terms of trade becomes statistically significant also at the 5 % level and slightly reduces in size (0.74 % in the long run). In specification (6), the covariates covering the current account and the cyclical effects are omitted too, though this is statistically not justified (F-statistic of 7.00 with 4 and 51 degrees of freedom) but may give an intuition about the variability of the FDI coefficient. In fact, this has some impact on the relationship between FDI and terms of trade: At the same level of statistical significance, the long-run coefficient decreases to 0.59 %.

4.1. Robustness checks

As a first robustness check, I investigate whether the relationship between FDI and terms of trade has changed over time. This might be the case, inter alia, when the nature of FDI varied. For example, throughout the 1990s and 2000s, the share of Southern FDI increased dramatically. Therefore, the model in equation (5) is re-estimated in the form:

$$\begin{aligned} ln(NBTT)_{it} &= \phi ln(NBTT)_{i,t-1} + \mathbb{1}_{(t<1995)} FDI_{i,t-1}\beta_1 + \\ &+ \mathbb{1}_{(t\geq 1995)} FDI_{i,t-1}\beta_2 + \Psi\theta + \alpha_i + \gamma_t + \varepsilon_{it}, \end{aligned} \tag{6}$$

where $\mathbb{1}$ is the indicator function, i.e. the impact of FDI on terms of trade, β, is allowed to differ between the period prior to 1995 and the period thereafter. The model is estimated using OLS FE because the resulting bias is not expected to differ between the two parameters of interest and OLS will generally provide estimators with smaller variance than System GMM and hence tests for equality of parameters will have more power. A F-test for $H_0 : \beta_1 = \beta_2$ in equation (6) cannot be rejected, as is depicted in table 5: The estimated parameters are almost equal in size (F-statistic 0.03 with 1 and 49 degrees of freedom), suggesting that there is no reason to believe the relationship between FDI and terms of trade to have changed during the period of observation.

In another check that may also shed light on the potential channel of FDI influencing terms of trade, I investigate whether the impact of FDI depends on the trade policy regime of the developing host country, motivated by findings based on Bhagwati (1973: 50ff; cf. also Brecher and Diaz-Alejandro, 1977; Brecher and Findlay, 1983). I follow the rationale of Greenaway et al. (2007: 206) by dividing the sample according to whether the country-specific trade/GDP ratio exceeds or falls short of the whole sample median value and apply a procedure comparable to the one outlined for equation (6), that is, β is allowed to vary between the two subsamples. Results are again presented in table 5. Interestingly, the impact of FDI seems to be higher for closed economies (0.0017) than for open ones (0.0007) but the difference is not statistically significant. Accordingly, there is no evidence that the impact of FDI on terms of trade is more favorable for open (export promoting) economies than for more closed (import substituting) ones. On the contrary, there is even some evidence that countries with a low trade/GDP ratio gained more from FDI in terms of their export price development.

Another concern, related to the original contributions of Prebisch and Singer, is the different impact of FDI in commodity exporting countries and manufacturing exporters. Splitting the sample according to the share of agricultural and raw material exports shows that countries with a higher share of primary exports indeed experience a weaker (but still positive) impact of FDI on terms of trade (cf. also table 5). However, the difference in the impact to those developing countries with a lower share of primary exports is not statistically significant. Adding an interaction term of (lagged) FDI with the share of primary exports to the regression equation does not provide support for the hypothesis that FDI has a negative impact through commodity exports.[18]

To test whether the absorptive capacity of the local labor force matters for the impact of FDI on terms of trade, I apply a similar procedure as above using the Barro-Lee (2010) dataset on education. This is motivated by the fact that Borensztein et al. (1998) find for FDI flows to 69 developing countries after 1970 that they have a positive impact on productivity only when the host county has reached a minimum level of human capital. This finding is supported by the present investigation: As highlighted in table 5, the estimated parameter for the impact of FDI on terms of trade is higher for developing countries with a higher completion rate of primary education and with more years of schooling. While we could not reject equality of parameters in the first case, we can reject the hypothesis that FDI has the same impact in countries with low years of schooling as in countries with high years of schooling (on the 5 % level of statistical significance). This supports the view that the positive impact of FDI on terms of trade is fostered by or requires a certain threshold level of education.

I also split the sample for characteristics such as the initial GDP p.c. (1979-1981 average), employment in agriculture, employment in industry, GDP p.c., the growth rate of

[18]Note that in the further case of different parameters, the impact is allowed to differ *across* countries. In the case of an interaction term in the regression, only the variation *within* countries is explored.

	$\hat{\beta}$	SE ($\hat{\beta}$)	F-stat (d.f.) (p-val)
time			
year $<$ 1995	0.00124	0.00089	0.03 (1,49)
year $\geq$ 1995	0.00136	0.00089	(0.8650)
trade intensity: trade/GDP			
$<$ sample median	0.00172	0.00061	1.06 (1, 49)
$>$ sample median	0.00074	0.00101	(0.3082)
Primary Exports: agric. raw. mat. exports (%)			
$<$ sample median	0.00207	0.00067	1.55 (1,49)
$>$ sample median	0.00071	0.00090	(0.2185)
Education I: percentage of primary complete			
$<$ sample median	0.00064	0.00070	1.74 (1, 43)
$>$ sample median	0.00176	0.00067	(0.1944)
Education II: years of schooling			
$<$ sample median	-0.00072	0.00097	6.78 (1, 43)
$>$ sample median	0.00165	0.00059	(0.0126)

Note: All estimates using model (3), $\hat{\beta}$ is the sort-run coefficient; F-test is a test for equality of estimated parameters

Table 5: Different coefficients for FDI impact for different sub-samples

GDP p.c., and the ratio of the FDI stock of GDP (all over the whole sample range) but in neither case the relationship between FDI and terms of trade was significantly different for the subsamples, even when considering a level of statistical significance such as 20 %.

Finally, I allow the impact of FDI on terms of trade to vary by six different regions.[19]. A F-test for equality of all parameters allows rejection of $H_0 : \beta_1 = \beta_2 = \beta_3 = \beta_4 = \beta_5 = \beta_6$ at the 1 % level of statistical significance (F-statistic 3.97 with 5 and 49 degrees of freedom) but we cannot reject equality of other parameters than the one for South Asia (F-statistic 1.52 with 4 and 49 degrees of freedom). This suggests the relationship between FDI and terms of trade to be different between South Asia, covering observations of Bangladesh, India, Pakistan and Sri Lanka, and the rest of the developing world which is confirmed by a likelihood ratio test, where the reduced model is the same as in specification (3) and the saturated model has an extra parameter for FDI in South Asia: The resulting $\chi^2_{(1)}$ statistic of 8.12 allows to reject the null hypothesis that the reduced model provides the same fit as the saturated model at the 1 % level of statistical significance.[20] Furthermore, the model selection criteria AIC and BIC prefer the saturated over the reduced model. Accordingly, specification (5) was re-estimated in the same setting but allowing for a different FDI-impact on terms of trade in South Asia. Results are presented as specification (7) in tables 3 and 4 and show a negative (and highly significant) impact of FDI on terms of trade for South Asia of -3.1 % and a positive (and weakly significant, t-statistic 1.97) impact of 0.78 % for the rest of the developing world (both long-run parameters).[21] The South Asian exception poses some questions for further research since it may not be explained by largely different export structures: In the mid-1990s, when FDI was on the surge, all Asian economies were large exporters of textiles and apparel and/or food manufactures. It is true that countries such as Philippines, Singapore and Thailand had considerable higher export shares of machinery than South Asian exporters, but Indonesia, Mongolia and Vietnam, on the other hand had not. The most likely explanation is the low-educated labor force in South Asian countries that may be unable to absorb the potential benefits from foreign direct investors: In the early 1990s, the (unweighted) average of South Asian population without any schooling was 45.7 %, it was barely 15 % for East Asian countries. (Unweighted) Average years of schooling were 4.2 in South Asia and 6.1 in East Asia. Thereby, South Easian data is even biased by the good educational performance of Sri Lanka (Barro and Lee, 2010). In this respect South Asia is underdeveloped, especially when compared to East Asia. The inner-Asian division of

[19]These are East Asia & Pacific, Europe & Central Asia, Latin America & Caribbean, Middle East & North Africa, South Asia, and Sub-Saharan Africa

[20]For a LR-test comparing a saturated model with six different FDI parameters (one for each region) against a reduced model with one FDI parameter for South Asia and another one for the remaining regions does not allow rejection of the hypothesis that the reduced model provides the same fit as the saturated one ($\chi^2_{(4)}$ statistic of 4.12).

[21]It is also investigated whether the different impact in South-Asia is driven by individual countries. For this purpose, one South Asian country at a time and any set of two South Asian countries at a time have been excluded from the regression. In each case a similar picture emerged, rejecting the suspicion that the effect is driven by individual countries.

labor might have thus detained South Asian economies in product segments that correspond to their factor endowment but have less favorable price perspectives. Multinational corporations might have reinforced production in this segments with comparative "advantages" at lower stages at the value chain. Given that South Asian markets were moderately intersting for horizontal investment (with the exception of India), most FDI might have had vertical motives thus leading to negative price impacts as explained towards the ends of sections 2.1 and 2.2.

In another robustness check I construct a new FDI stock series based on UNCTAD FDIstats flow data using the perpetual inventory method (PIM) since FDI stock values might suffer from problematic asset valuation (cf. IMF, 1993: §377). The method of Hall and Jones (1999: 89) is used to estimate initial values of FDI stock and missing flow data is interpolated. Table 6 shows the estimated coefficients using the same covariates as in specification (2) with depreciation rates $\delta = 0.05, 0.1, 0.15$. The results support the previous findings: Despite using the same System GMM specification as above (including the lag structure), the new measure meets significance at the 10 % level in 2 out of 3 cases (with a t-statistic of 1.67 in the third case). More importantly, for the case of $\delta = 0.1$, which is most appropriate for comparison with previous results since then the overall FDI growth comes closest to the value observed in the actual stock data, the estimated long-run parameter of 0.81 % is almost identical to the one of model (2).

δ	LDV coef.	FDI coef	long-run FDI coef.
0.05	0.7582***	0.0019*	0.78 %
	(0.0825)	(0.0011)	
0.1	0.7589***	0.0019*	0.81 %
	(0.0824)	(0.0012)	
0.15	0.7595***	0.0020	0.83 %
	(0.0822)	(0.0012)	

Table 6: Results using PIM stock data

4.2. Economic relevance

Throughout this investigation, we observed a statistically significant positive long-run impact of the FDI stock (relative to GDP) on net barter terms of trade that ranged from 0.59 % to 0.82 %, depending on the model specification. Assuming a long-run parameter of 0.74 %, as estimated in model (5) and lying between the above estimates, would mean that a one percentage point increase in the FDI stock to GDP ratio causes the NBTT to increase by 0.74 %. Considering those 32 out of 53 countries included in specification (6), where observations are available for 1980 and 2008, a simple time trend of -0.63 % is estimated

for (the logarithm of) net barter terms of trade.[22] This would mean that a one percentage point increase in the FDI stock / GDP ratio could more than offset the developing countries structural tendency of deteriorating terms of trade. In fact, between 1980 and 2008, the FDI/GDP ratio in these countries increased from 15.6 % to 31.9 %, that is an average increase of 0.58 percentage points p.a. Put differently: The actually observed increase of FDI in developing countries between 1980 and 2008 countered their terms-of-trade decrease by $\frac{16.24 \times 0.74}{-0.239} = 50.3$ %, where 0.239 is the decrease in the logarithm of NBTT. There can thus be no doubt that the positive impact of FDI on the developing countries' terms of trade is of a magnitude that is highly relevant and thus provides space for future research.

5. Discussion and Conclusion

As shown above, economic theory has been inconclusive about the impact of multinational corporations (MNCs) and their foreign direct investment (FDI) on developing countries' net barter terms of trade. Accordingly, the issue was addressed empirically for more than 50 developing countries between 1980 and 2008. The main finding is that there is no empirical support for concerns that multinationals would beat down developing countries' export prices. On the contrary, I find that the observed increase of FDI countered the structural tendency of developing countries' terms of trade to deteriorate by an economically relevant magnitude of about 50 %, depending on the model specification, at conventional levels of statistical significance. Results are robust to the inclusion of differing sets of control variables and an alternative measure of the FDI stock and it should be mentioned that FE OLS regression leads to almost identical results as the System GMM estimator, supporting the claim to compare GMM results to OLS results as a standard-procedure in applied research in order to assess the reliability of the former.

The impact is stronger for countries with higher school enrollment rates, supporting the findings of Borensztein et al. (1998) that the absorptive capacity of the host economy matters. There is no support, however, for the widespread view that the impact depends on the host country's trade regime. But future work might explore this issue in more detail, especially in the interesting case of Asia. Other channels to explore in future research involve the role of upgrading effects induced by MNCs (cf., inter alia, Javorcik, 2004; Görg and Strobl, 2005) that show up as a "price" increase due to inappropriate measurement by unit values (cf. sections 2.3 and 3.1) and the question whether FDI might help overcome the shallow division of labor in many developing countries (cf. Rodríguez-Clare, 1996). This might give rise to the production of new varieties of goods and entail positive price effects.

Considering especially the exception of South Asia, the results of this investigation do not imply that policy makers should blindly attract FDI in order to boost trade revenues.

[22] $\ln(\text{NBTT})_{it} = \beta t + \varepsilon$; Ziesemer (2010:7) finds a -0.42 % p.a. long-run decrease of NBTT for low income countries.

Firstly, improving and - possibly more important - stabilizing NBTT should be only one dimension of a coherent macro-development strategy. Secondly, the knowledge of the economic channels through which the FDI-NBTT nexus operates is still opaque and deserves further exploration. For example, the recent World Bank (2010b) study on farmland ownership-transfer to foreign investors has highlighted that their outcomes highly vary with factors such as information asymmetries, enforcement and awareness of existing ownership rights, stakeholder involvement and the potential to form linkages with the domestic producers. This emphasizes that policymakers should understand a developing country's investment policy as being only one part in the puzzle of development.

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Appendix A. Countries included

Countries included in specifications (3) - (9): Bangladesh, Belize, Bolivia, Botswana, Chile, China, Cameroon, Colombia, Costa Rica, Dominican Republic, Ecuador[23], Egypt (Arab Rep.), Ethiopia, Fiji, Guatemala, Guyana, Honduras, Indonesia, India, Jamaica[24], Jordan, Kenya, Cambodia, Lebanon, St. Lucia, Sri Lanka, Morocco, Madagascar, Mexico, Mongolia, Mauritania[25], Mauritius, Malawi, Malaysia, Namibia, Nicaragua, Pakistan, Peru, Philippines, Poland, Paraguay, Rwanda, El Salvador, Syrian Arab Republic, Thailand, Tunisia, Tanzania, Uganda, Vietnam, Samoa, South Africa, Zambia[26], Zimbabwe

Developing countries supplementary included in specifications (1) and (2): Angola, Burundi, Benin, Burkina Faso, Cote d'Ivoire, Congo (Rep.), Colombia, Comoros, Cape Verde, Cuba, Djibouti, Eritrea, Ghana, Guinea, Gambia, Equatorial Guinea, Grenada, Haiti, Lao PDR, Lesotho, Maldives, Mali, Myanmar, Mozambique, Niger, Nigeria, Nepal, Papua New Guinea, Sudan, Senegal, Solomon Islands, Swaziland, Togo, Turkey, St. Vincent and the Grenadines, Yemen, Congo (Dem. Rep.)

[23] not in specifications (3)-(5)
[24] not in specifications (3)-(5)
[25] not in specifications (3)-(6)
[26] not in specification (6)

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