Do multinationals deteriorate 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 (FDI) 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 robust dynamic panel data methods. The results show that FDI 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:** F23, O11

**Highlights:**

- I empirically investigate the relationship between FDI to developing countries and their terms of trade.
- FDI has a significant and important positive impact on developing countries’ terms of trade.
- The absorptive capacity of the host country matters.
1. Introduction

The effects of openness on growth and development are a traditional subject of discussion in economics. Post-war development economists were especially concerned about terms of trade of developing countries in this context, i.e. export prices relative to import prices. Based on seminal work by Prebisch (1950) and Singer (1950), they argued that deteriorating terms of trade could nullify gains from trade for developing countries because they entail a decreasing purchasing power of exports. The later would ceteris paribus directly cause the real income of an economy to decline and would increase the import price of required investment goods and therefore hamper economic growth in the longer run (cf. De Long and Summers, 1991; Levine and Renelt, 1992; Harrison and Rodriguez-Clare, 2009: 53). While some authors such as Blattman et al. (2007) have given stronger emphasis to the role of volatility of terms of trade for development, their general importance for growth is well-documented in the literature (e.g. Mendoza, 1995; Barro, 1996; Kose, 2002; Broda, 2004) and their time-series properties remain a heavily discussed issue.\(^1\) The adverse impact of declining terms of trade on growth has also shaped the industrial policy agenda in many developing countries and, for example, given rise to policies of import substituting industrialization.

More recent contributions on openness and growth have stressed the relevance of multinational corporations (MNCs) and their foreign direct investment (FDI). The potential channels for the latter to promote growth are manifold and range from linkages and positive spillover effects on the micro level to general macro benefits of capital flows (e.g. Borensztein et al., 1998; Javorcik 2004; Girma et al., 2008; Blalock and Gertler, 2008; see Herzer et al., 2008, for a critical re-view on this stand of literature). It has hence become an explicit policy goal of many governments to attract FDI (see e.g. Harding and Javorcik, 2011).

Simple cross-country OLS regressions depicted in figure 1 show preliminary support for both lines of argumentation: GDP growth in developing countries positively correlates with terms of trade developments and the magnitude of FDI inflows.\(^2\) If economic policy attempts to foster

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\(^1\)The most influential contributions include Spraos (1980), Sapsford (1985), Thirlwall and Bergevin (1985), Grilli and Yang (1988), Cuddington and Urzúa (1989), Powell (1991), and Reinhard and Wickham (1994). Kim et al. (2003), Harvey et al. (2010), and Ghoshray (2011) were among those to address the issue more recently.

\(^2\)The conditional growth rate on the vertical axis is the residual of the growth rate regressed on initial GDP. This
growth by generating favorable terms of trade and attracting FDI, it is hence necessary to understand the extent to which these two aims interfere with each other. Given the quest for growth and the relevance of the transfer problem in macroeconomics, it is surprising that this question has not yet attracted more attention.

The aim of this paper is to close this existent gap in the literature. Therefore, I first show in section 2 that previous economic work suggests a link between the operations of multinationals, their FDI, and terms of trade but has not come to precise statements about the theoretical impact of MNCs and FDI on terms of trade. After introducing the 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 dismiss concerns that MNCs and FDI would deteriorate developing countries’ export prices. 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

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3 The ‘transfer problem’ suggests an adverse impact of international transfers on relative prices, see subsection 2.2 below and Lane and Milesi-Ferretti (2004). A textbook treatment is given in Dixit and Norman (1980) and Krugman and Obstfeld (2000).

4 An exception being the concern raised by Li et al. (2007) for the case of China.
decline by about one third throughout the period of investigation. This finding highlights that the policy aims of attracting FDI and generating favorable terms of trade are in general not conflicting but can even be reinforcing. However, the study also highlights the significance of education for this relation to hold. 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. Although his seminal interpretation of this finding (Singer, 1950) has been widely cited in economics, only few have paid more attention to the title - “The Distribution of Gains between Investing and Borrowing Countries”. Thereby, Singer clearly means foreign direct investment and raised concerns that it would bring about a certain “type of foreign trade” (1950: 483) that keeps 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 on 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.

\(^5\)For the origins of the hypothesis see Toye and Toye (2003).

\(^6\)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.
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.

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 4) and will decrease in the case of horizontal FDI. Assuming that the global supply of MNCs is relevant enough to influence world market prices, 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 microeconomic 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

\(^7\)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. Also, as capital flow, FDI should shift consumption from the future to the present and may hence cause intertemporal terms-of-trade effects.
and Hijzen et al., 2013 for an overview). To the extend wages are reflected in the final good’s (export) price, this leads to more favorable terms of trade for the FDI host country (if MNCs’ wages are also higher than those of domestic exporting firms). 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 8 for the calculation of terms of trade). For example, Harding and Javorcik (2012) provide evidence that FDI increases unit values of developing countries’ exports at the four digit SITC level and interpret this finding as a quality upgrade. 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.

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 from 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:

\[ \theta^* = \frac{f'(k^0_N)}{\pi'(k^*_S)}, \]  

(1)
where \( \pi \) 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 one 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 one does not know which of the two effects will be more important.\(^8\)

In summary, economic theory suggests various channels for a relationship between FDI in developing countries and their terms of trade. But the direction and magnitude of this relationship remains unclear. The subsequent 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

In line with the literature reviewed above, 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.\(^9\) 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, \( \Psi \), depend in some functional form \( f \) on the activity of multinational corporations, denoted as \( FDI \), in the host economy:

\(^{8}\)More formally, FDI will increase both \( K \) and \( A \) in a constant-returns-to-scale Cobb-Douglas production function, leading to opposing effects in its marginal productivity of capital, \( \pi'(k_S^*) = \alpha A(L/K)^{1-\alpha} \).

\(^{9}\)This is a widely used classification in the literature. Generally, one would like to use a classification from the beginning of the sample period to ensure exogeneity. However, 1987 is the first year available. The problem is mitigated by the fact that switches of categories occur quite rarely. The sceptical reader may be convinced by the robustness of the results to various subsamples, see section 4.3.
\[ \mathbb{E}(NBTT|\Psi) = f(FDI). \] (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 ratio of the export unit value indices to the import unit value indices:

\[ NBTT = \frac{UVI_x}{UVI_m}, \] (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 \( m = 1, \ldots, M \) prices, \( p_{t m}^i \), and quantities, \( q_{t m}^i \), in period \( t \) and over \( n = 1, \ldots, N \) prices, \( p_0^n \), and quantities, \( q_0^n \), in period \( 0 \), where \( m \) and \( n \) are drawn from the same set (of \( i \)) and is defined by (cf. Silver, 2010: S209):

\[ UVI_i(p^0, p^t, q^0, q^t) = \frac{\sum_{m=1}^{M} p_{t m}^i q_{t m}^i}{\sum_{m=1}^{M} q_{t m}^i} / \frac{\sum_{n=1}^{N} p_0^n q_0^n}{\sum_{n=1}^{N} q_0^n}. \] (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. Interested readers will find more detail on the construction of terms of trade and related unit value data in IMF (2009) and Silver (2010).

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 instead of relying exclusively on 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 but often - 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; Yu 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 that they are widely hence 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.

Taking into account the extensive focus on time-series properties of terms of trade data in this previous literature, it is finally important to take a look at this aspect of the used terms of trade series. More specifically, in case they are integrated of order one, \( I(1) \), this could cause spurious regression problems to inference in standard panel data models (Kao, 1999) and would also impact the choice of the econometric model. However, the evidence from panel data unit root tests suggest that one can clearly reject this hypothesis.\(^{10}\)

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 and Venables, 2004: 2; Wacker, 2013) 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 2 depicts the development of FDI stock / GDP (average weighted by GDP in constant prices) and of NBTT (unweighted average)\(^{11}\) in developing countries over the time period under

\(^{10}\)Fisher-type tests based on Phillips and Perron and augmented Dickey-Fuller tests have been applied with a time trend and with one and two lags. Results are available on request.

\(^{11}\)Since FDI stocks are more volatile and small countries with very high levels of FDI inflows may dramatically
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 the FDI stock remained fairly static at a level of approximately 20 % of GDP.

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 and identification

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 adaptation process, a dynamic model is chosen for modeling the relationship suggested in equation (2):

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

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.
where $\alpha_t$ is a country dummy variable, $\gamma_t$ is a year dummy variable and $\varepsilon_{it}$ is an error term with $\mathbb{E}(\varepsilon_{it}) = 0$ and existing second moment. This dynamic specification reflects that terms-of-trade shocks are generally persistent, i.e. realizations of the series depend on their own past realizations. Furthermore, it allows the explanatory variables to exercise their impact on terms of trade through a short-run effect (via the ‘quasi-difference’ $\ln(NBTT)_{it} - \phi \ln(NBTT)_{i,t-1}$) and a long-run relationship (given by $\beta/(1 - \phi)$ in the case of FDI). This specification also accommodates the $N/T$ dimension of the panel which is relatively large.

Note that equation (5) establishes a log-linear model that controls for unobserved heterogeneity by two-way fixed effects (FE; also called ‘least square dummy variables,’ LSDV), and hence identifies parameters by data variation over time, i.e. within countries.

Estimating (5) by OLS raises two immediate problems: First, it is well-known that it will lead to a (downward) bias in the lagged dependent variable (Nickell, 1981). And second, one may argue that the FDI stock is endogenous. For example, favorable terms-of-trade developments might attract foreign investors.

In the context of country fixed effects, the literature to my knowledge has not come up with any time-varying external instrument $Z$ for FDI on the country level that convincingly fulfills the exclusion restriction $\text{Cov}(Z_{it}\varepsilon_{it}) = 0$. Supplementary to estimating the impact of FDI on terms of trade directly, I therefore use internal instruments (i.e. lagged first differences of the FDI stock serve as instruments for current levels) and estimate (5) by general method of moments (GMM).
forcing the empirical moments $Z\hat{\varepsilon}$ towards zero. The same applies for the lagged dependent variable (LDV).

The general validity of this approach to work for lagged dependent variables (and potentially endogenous variables in general) has been demonstrated by Arellano and Bover (1995) and Blundell and Bond (1998). A key assumption of this method requires that changes in the instrumenting variables are not systematically related to the fixed effects and as the study looks at developing countries that are expected to share many common features with respect to their terms-of-trade dynamics, there is no strong reason to believe this assumption would be violated. As discussed in Roodman (2009b), another potential problem of this approach could arise from the presence of too many instruments. I therefore restrict the instrument set to the absolute minimum and show in subsection 4.3 that the obtained results also hold under different lag structures of the instruments. The obtained results are consistent with respect to statistical inference in the presence of any pattern of heteroskedasticity and autocorrelation within panels. The reported standard errors are potentially even upward biased due to the use of a small-sample correction and a (generally inefficient) one-step approach of weighting the moment conditions.

than the 'difference GMM' estimator developed by Holtz-Eakin et al. (1988) and Arellano and Bond (1991), which estimates (5) in first differences and instruments with lagged levels. To see why, take the most extreme case where $\phi \to 1$ 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.

I therefore combine collapsing the instruments with limiting the number of their included lags to one. For the LDV, this is the first lag, for the FDI stock it is the third lag since the Hansen test produces suspicious results for lower lags, suggesting that the first and second lagged differences are no valid instrument for the FDI stock. This corresponds to the standard in System GMM applications, where lag 1 (and deeper) are used for predetermined variables and deeper lags are used for endogenous variables (see Roodman, 2009a). As shown in subsection 4.3, including any deeper lags than the third one for the FDI stock (and the first one for the LDV) produces nearly identical results.

The applied framework also allows assessing the problem of autocorrelation in the residuals $\varepsilon$ with the test statistic derived by Arellano and Bond (1991).

The two-step approach, which generally leads to smaller standard errors, is not feasible in the used sample because the number of instruments is still relatively large compared to the number of cross sections.
<table>
<thead>
<tr>
<th>Variable</th>
<th>Mean</th>
<th>Std. Dev.</th>
<th>Obs.</th>
<th>Source</th>
</tr>
</thead>
<tbody>
<tr>
<td>NBTT (net barter terms of trade)</td>
<td>111.626</td>
<td>45.163</td>
<td>2,116</td>
<td>World Bank (2010a)</td>
</tr>
<tr>
<td>FDI stock / GDP</td>
<td>31.814</td>
<td>89.024</td>
<td>3,098</td>
<td>UNCTAD FDIstat</td>
</tr>
<tr>
<td>Agricultural and raw materials exports (% of exports)</td>
<td>7.24</td>
<td>12.536</td>
<td>1,940</td>
<td>World Bank (2010a)</td>
</tr>
<tr>
<td>Current account balance (% of GDP)</td>
<td>-5.605</td>
<td>10.319</td>
<td>2,593</td>
<td>World Bank (2010a)</td>
</tr>
<tr>
<td>GDP per capita (constant 2000 US$)</td>
<td>1258.677</td>
<td>1289.97</td>
<td>3,024</td>
<td>World Bank (2010a)</td>
</tr>
<tr>
<td>Industry, value added (% of GDP)</td>
<td>27.436</td>
<td>11.918</td>
<td>2,837</td>
<td>World Bank (2010a)</td>
</tr>
<tr>
<td>Inflation, GDP deflator (annual %)</td>
<td>71.233</td>
<td>725.319</td>
<td>3,033</td>
<td>World Bank (2010a)</td>
</tr>
<tr>
<td>Labor participation rate (% of total population 15+)</td>
<td>65.960</td>
<td>10.802</td>
<td>3,335</td>
<td>World Bank (2010a)</td>
</tr>
<tr>
<td>Manufactures exports (% of exports)</td>
<td>34.227</td>
<td>27.719</td>
<td>1,938</td>
<td>World Bank (2010a)</td>
</tr>
<tr>
<td>Real interest rate (%)</td>
<td>6.676</td>
<td>22.156</td>
<td>2,275</td>
<td>World Bank (2010a)</td>
</tr>
<tr>
<td>Services, etc., value added (% of GDP)</td>
<td>47.513</td>
<td>12.682</td>
<td>2,836</td>
<td>World Bank (2010a)</td>
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<tr>
<td>deviation from the long run growth rate</td>
<td>-0.001</td>
<td>0.063</td>
<td>2,983</td>
<td>World Bank (2010a)</td>
</tr>
<tr>
<td>Unemployment, total (% of total labor force)</td>
<td>9.603</td>
<td>7.029</td>
<td>946</td>
<td>World Bank (2010a)</td>
</tr>
<tr>
<td>Trade (% of GDP)</td>
<td>77.045</td>
<td>40.819</td>
<td>2,964</td>
<td>World Bank (2010a)</td>
</tr>
<tr>
<td>Official Exchange Rate (LCU per $) period average</td>
<td>2,155,581</td>
<td>120,302,513</td>
<td>3,116</td>
<td>World Bank (2010a)</td>
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<td>RTA (Regional Trade Agreement)</td>
<td>0.044</td>
<td>0.205</td>
<td>3,509</td>
<td>own calculation</td>
</tr>
</tbody>
</table>

Table 1: Summary statistics
4. Empirical results

To give a short intuition and benchmark about the parametric relationship between FDI and terms of trade, I begin with estimating (5) in a ‘super-reduced’ version, i.e. without control variables Ψ and by using simple LSDV. 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 of almost 2,000 observations with an average time dimension of \( T > 20 \). Note that such a large time dimension reduces the LSDV bias in the LDV because the latter is of order \( T^{-1} \) (Wooldridge, 2002: 302) and that no instruments are used for the FDI stock either. Results are reported as model (1b) of table 2. They indicate (under weak statistical significance) that an increase in the FDI stock of 1 percentage points (relative to GDP) in developing countries is associated with a 0.08 % rise in their net barter terms of trade in the short and 0.68 % in the long run (\( = \hat{\beta}/(1 - \hat{\phi}) \)).

Model (1a) of table 2 reports such a super-reduced version of equation (5) with industrialized countries included supplementary, allowing the use of almost 3,000 observations. Separate time dummies for industrialized and developing countries are used to account for different types of ‘global shocks’ for these two groups and the relation of the FDI parameter \( \beta \) is also allowed to vary across country groups. The relation between FDI to developing countries and their terms of trade is again positive and similar to the previous estimate (0.08 % in the short run, 0.76 % in the long run), now being statistically significant at the 5 % level. But the results indicate that the relation of FDI to NBTT is different in industrialized countries - as one would expect from the theoretical discussion in section 2 - where it is negative but insignificant. This heterogeneity across country groups does not only support the claim of this paper to focus specifically on the relationship between FDI and terms of trade in developing countries, but might also help to convince the reader that endogeneity in the form of reversed causality is, if anything, a minor problem. The het-

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20 In this setting, the time dummies can be assumed to represent the developing countries’ control variables (cf. Spraos, 1983: 112).
21 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.”
22 Industrialized countries are those classified as “high income” or “upper middle income” in the above mentioned World Bank classification.
23 The difference of the estimated parameter for industrialized countries is significantly different from the estimated parameter for developing countries, however.
24 If one argues for reverse causality, one must explain why FDI increases with export prices in developing countries but decreases with export prices in industrial countries. Such arguments are of course possible but not necessarily credible.
erogeneity is also in line with Harding and Javorcik (2012) who find that FDI has an ambiguous impact on industrialized countries’ export unit values on the product level. Simple regression of the estimated time dummies on the corresponding years furthermore 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 and the insignificance could simply 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 (see Blattman et al., 2007).

<table>
<thead>
<tr>
<th>Dependent Variable: ln(NBTT)</th>
</tr>
</thead>
<tbody>
<tr>
<td>model (1a) (1b)</td>
</tr>
<tr>
<td>countries</td>
</tr>
<tr>
<td>ln(NBTT)</td>
</tr>
<tr>
<td>(-1)</td>
</tr>
<tr>
<td>FDI stock</td>
</tr>
<tr>
<td>(0.00038)</td>
</tr>
<tr>
<td>time dummies</td>
</tr>
<tr>
<td>time dummies’ trend</td>
</tr>
<tr>
<td>(0.00014)</td>
</tr>
<tr>
<td>observations</td>
</tr>
<tr>
<td>(N × avg.T)</td>
</tr>
</tbody>
</table>

***, **, and * denotes statistical significance at the 1 %, 5 % and 10 % level, respectively.

Table 2: Super-reduced form model

4.1. Main results

The main results of this study are reported as models (2), (3) and (6) in table 3. Models (2) and (3) include the full set of control variables. While the first of them only instruments the LDV with lagged first differences (while all other variables, including FDI, act as their own instrument), model (3) also instruments the FDI stock with lagged differences. The impact of FDI on terms of trade in developing countries is statistically significant on the 5 and 10 % level and of magnitude

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25The long-run trend of -0.54 % is in line with other results in the literature.
0.30 and 0.56 %, respectively. This means, an increase in the FDI stock / GDP ratio of 1 percentage point would lead to a 0.56 % increase in NBTT in the latter case, a considerable magnitude as discussed below. The fact that instrumenting the FDI stock increases the estimated parameter suggests that a potential reverse relationship running from NBTT to FDI is negative, i.e. FDI is rather low when terms of trade are unfavorable.  

Since an F-test for industry value added, labor participation rate, trade/GDP and the exchange rate does not allow to reject the null hypothesis of joint insignificance, these variables are excluded in model (6), which again instruments the LDV and FDI stock with lagged differences. The estimated FDI parameter stays fairly stable, now indicating a statistically significant long-run impact of 0.50 % on NBTT. It is also remarkable that these estimates are not too far from the ones obtained from the super-reduced model reported in table 2.

Considering the conventional test statistics of GMM models supports the reported specification: The Hansen statistic clearly does not allow rejecting the null hypothesis that the whole set of instruments is valid. Since the model is overidentified, this statistic allows to test the hypothesis that the vector of empirical moments $\hat{Z}\epsilon$ is indeed randomly distributed around 0 and the test results do neither provide evidence against this assumption nor raise suspicion of overfitting the model. The Arellano-Bond (1991) test for serial correlation of the residuals does not allow to reject the null hypothesis of no second order autocorrelation.

Models (4) and (5) in table 3 allow for a comparison of the System GMM results to LSDV and random effect estimation. Under these estimates, the long-run relationship between FDI and NBTT is statistically significant in both cases and of order 0.54 and 0.38 %, respectively. The

---

26 This makes sense economically as unfavorable NBTT could also drive down asset prices which may attract FDI flows.

27 A perfect Hansen statistic of 1.00 or the number of instruments exceeding by far the number of cross sections in the panel would be a telltale sign of such overfitting. The Hansen statistic is reported instead of the Sargan test as the latter one is potentially inconsistent in robust one-step estimation. See Roodman (2009a) for these issues.

28 The Arellano-Bond test allows to reject the null hypothesis of no autocorrelation of order one. This is trivial since $\Delta \varepsilon_i, t-1$ in equation (5) is mathematically related to $\Delta \varepsilon_i, t-1$ via the common $\varepsilon_i, t-1$ term and negative autocorrelation is hence expected. Thus, the relevant test statistic is for second-order autocorrelation.

29 In both cases Huber (1967) - White (1980) cluster and heteroskedasticity robust standard errors are reported, consistent with the estimation procedure for the GMM results.
LSDV/FE estimate is hence nearly identical to the System GMM impact and it should be noted that the FDI-coefficient of the random effect model (5) is positive as well. 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 contrasts with the above-cited view of Singer (1950) that countries with higher FDI levels suffer a worse terms-of-trade development.30

The reported estimates might look economically small on a first view. But considering a developing countries’ terms of trade deterioration of about 0.5 % p.a.31 the findings indicate that a one percentage point increase in the FDI stock / GDP ratio could more or less offset the developing countries’ structural tendency of deteriorating terms of trade. In fact, between 1980 and 2008, the FDI stock/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 $\frac{16.24 \times 0.5}{-0.239} = 34\%$, where 0.239 is the decrease in the logarithm of NBTT and a long-run FDI parameter of 0.5 % as in model (6) is assumed. 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 economically highly relevant.

4.2. Control variables

Considering the other control variables, data on the industry structure, such as the share of agricultural and other raw material exports,32 industry value added, manufacturing exports and services value added, have been included because these characteristics may influence a country’s 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.

30Comparison to FE and RE also allows to assess the reliability of the GMM results with respect to the LDV. Parameter estimates of the latter are expected to be downward biased under FE and to be upward biased under pooled OLS, which is nearly identical to RE in the estimation above (cf. Bond, 2002: 4/5). The “true” LDV is hence expected to lie between these two estimates and/or not to differ much from the FE result which is generally consistent as $T \to \infty$. Indeed, the estimated LDV is very close to the FE estimate, with a standard error clearly ranging into the interval between FE and RE estimate.

31Ziesemer (2010:7) finds a -0.42 % p.a. long-run decrease of NBTT for low income countries. Estimating a simple time trend for the used sample between 1980 and 2008 leads to a -0.63 % NBTT deterioration p.a. This is consistent with previous findings in the literature which are usually in a range near 0.6 % p.a.

32The measure comprises SITC section 2 (crude materials except fuels) excluding divisions 22, 27, and 28.
## Table 3: Main Results

<table>
<thead>
<tr>
<th>Dependent Variable: ln(NBTT)</th>
<th>(2)</th>
<th>(3)</th>
<th>(4)</th>
<th>(5)</th>
<th>(6)</th>
<th>(7)</th>
</tr>
</thead>
<tbody>
<tr>
<td>ln(NBTT)</td>
<td>0.7311***</td>
<td>0.7322***</td>
<td>0.7583***</td>
<td>0.8423***</td>
<td>0.7173***</td>
<td>0.7076***</td>
</tr>
<tr>
<td>(-1)</td>
<td>(0.1810)</td>
<td>(0.1853)</td>
<td>(0.0405)</td>
<td>(0.0334)</td>
<td>(0.2106)</td>
<td>(0.2084)</td>
</tr>
<tr>
<td>FDI stock / GDP</td>
<td>0.0008**</td>
<td>0.0015*</td>
<td>0.0013**</td>
<td>0.0006***</td>
<td>0.0014**</td>
<td>0.0009**</td>
</tr>
<tr>
<td>(-1)</td>
<td>(0.0003)</td>
<td>(0.0009)</td>
<td>(0.0006)</td>
<td>(0.0002)</td>
<td>(0.0007)</td>
<td>(0.0003)</td>
</tr>
<tr>
<td>FDI stock / GDP</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>-0.0060***</td>
</tr>
<tr>
<td>South Asia (-1)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>(0.0200)</td>
</tr>
<tr>
<td>agricultural and raw</td>
<td>0.0020</td>
<td>0.0021</td>
<td>-0.0011</td>
<td>0.0011</td>
<td>0.0018</td>
<td>0.0020</td>
</tr>
<tr>
<td>material exports (%)</td>
<td>(0.0019)</td>
<td>(0.0019)</td>
<td>(0.0018)</td>
<td>(0.0018)</td>
<td>(0.0015)</td>
<td>(0.0016)</td>
</tr>
<tr>
<td>current account balance (%)</td>
<td>0.0056***</td>
<td>0.0059***</td>
<td>0.0030</td>
<td>0.0058***</td>
<td>0.0062***</td>
<td>0.0058***</td>
</tr>
<tr>
<td>(of GDP)</td>
<td>(0.0016)</td>
<td>(0.0017)</td>
<td>(0.0019)</td>
<td>(0.0017)</td>
<td>(0.0015)</td>
<td>(0.0015)</td>
</tr>
<tr>
<td>current account balance (%)</td>
<td>-0.0030**</td>
<td>-0.0029*</td>
<td>-0.0034**</td>
<td>-0.0034**</td>
<td>-0.0029**</td>
<td>-0.0028*</td>
</tr>
<tr>
<td>(of GDP) (-1)</td>
<td>(0.0014)</td>
<td>(0.0014)</td>
<td>(0.0016)</td>
<td>(0.0014)</td>
<td>(0.0014)</td>
<td>(0.0014)</td>
</tr>
<tr>
<td>real GDP p.c.</td>
<td>-0.0000</td>
<td>-0.0000</td>
<td>-0.0000</td>
<td>-0.0000</td>
<td>0.0000</td>
<td>0.0000</td>
</tr>
<tr>
<td></td>
<td>(0.0000)</td>
<td>(0.0000)</td>
<td>(0.0000)</td>
<td>(0.0000)</td>
<td>(0.0000)</td>
<td>(0.0000)</td>
</tr>
<tr>
<td>industry value added (%)</td>
<td>0.0018</td>
<td>0.0015</td>
<td>0.0022</td>
<td>0.0010</td>
<td></td>
<td></td>
</tr>
<tr>
<td>manufacturing exports (%)</td>
<td>(0.0022)</td>
<td>(0.0025)</td>
<td>(0.0036)</td>
<td>(0.0014)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>inflation (annual %)</td>
<td>0.0000</td>
<td>0.0000*</td>
<td>0.0000*</td>
<td>0.0000**</td>
<td>0.0000</td>
<td>0.0000</td>
</tr>
<tr>
<td></td>
<td>(0.0000)</td>
<td>(0.0000)</td>
<td>(0.0000)</td>
<td>(0.0000)</td>
<td>(0.0000)</td>
<td>(0.0000)</td>
</tr>
<tr>
<td>labor participation rate</td>
<td>0.0006</td>
<td>0.0007</td>
<td>0.0077**</td>
<td>0.0003</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>(0.0010)</td>
<td>(0.0009)</td>
<td>(0.0031)</td>
<td>(0.0007)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>real interest rate (%)</td>
<td>-0.0001</td>
<td>-0.0000</td>
<td>-0.0000</td>
<td>-0.0000</td>
<td>-0.0000</td>
<td>-0.0000</td>
</tr>
<tr>
<td></td>
<td>(0.0005)</td>
<td>(0.0006)</td>
<td>(0.0004)</td>
<td>(0.0004)</td>
<td>(0.0006)</td>
<td>(0.0006)</td>
</tr>
<tr>
<td>services value added (%)</td>
<td>0.0016</td>
<td>0.0018</td>
<td>-0.0018</td>
<td>0.0008</td>
<td>0.0004</td>
<td>0.0004</td>
</tr>
<tr>
<td></td>
<td>(0.0018)</td>
<td>(0.0018)</td>
<td>(0.0022)</td>
<td>(0.0010)</td>
<td>(0.0008)</td>
<td>(0.0008)</td>
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<tr>
<td>growth deviation</td>
<td>0.4446**</td>
<td>0.4247**</td>
<td>0.2684**</td>
<td>0.3868***</td>
<td>0.4407**</td>
<td>0.4356**</td>
</tr>
<tr>
<td></td>
<td>(0.1668)</td>
<td>(0.1907)</td>
<td>(0.1212)</td>
<td>(0.1289)</td>
<td>(0.1779)</td>
<td>(0.1682)</td>
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<tr>
<td>unemployment rate (%)</td>
<td>0.0143</td>
<td>0.0246</td>
<td>-0.0565</td>
<td>-0.0500</td>
<td>0.0417</td>
<td>0.0258</td>
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<tr>
<td></td>
<td>(0.1940)</td>
<td>(0.1927)</td>
<td>(0.1668)</td>
<td>(0.1509)</td>
<td>(0.2090)</td>
<td>(0.2118)</td>
</tr>
<tr>
<td>trade/GDP</td>
<td>0.0001</td>
<td>-0.0000</td>
<td>0.0002</td>
<td>0.0002</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>(0.0001)</td>
<td>(0.0002)</td>
<td>(0.0007)</td>
<td>(0.0001)</td>
<td></td>
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<tr>
<td>exchange rate</td>
<td>0.0000</td>
<td>-0.0000</td>
<td>-0.0000</td>
<td>0.0000</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>(0.0000)</td>
<td>(0.0000)</td>
<td>(0.0000)</td>
<td>(0.0000)</td>
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<td></td>
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<tr>
<td>RTA</td>
<td>-0.0381**</td>
<td>-0.0367*</td>
<td>-0.0508**</td>
<td>-0.0387**</td>
<td>-0.0322</td>
<td>-0.0351**</td>
</tr>
<tr>
<td></td>
<td>(0.0187)</td>
<td>(0.0193)</td>
<td>(0.0229)</td>
<td>(0.0165)</td>
<td>(0.0195)</td>
<td>(0.0172)</td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>estimation</th>
<th>SysGMM</th>
<th>SysGMM</th>
<th>FE</th>
<th>RE</th>
<th>SysGMM</th>
<th>SysGMM</th>
</tr>
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<tr>
<td>time dummies</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
<td>yes</td>
</tr>
<tr>
<td>observations(N)</td>
<td>480(50)</td>
<td>480(50)</td>
<td>480(50)</td>
<td>480(50)</td>
<td>490(52)</td>
<td>490(52)</td>
</tr>
<tr>
<td># instruments</td>
<td>47</td>
<td>48</td>
<td>44</td>
<td>44</td>
<td>44</td>
<td>44</td>
</tr>
<tr>
<td>Arellano-Bond AR(1)</td>
<td>2.59</td>
<td>2.61</td>
<td>2.45</td>
<td>2.39</td>
<td>2.45</td>
<td>2.39</td>
</tr>
<tr>
<td>Arellano-Bond AR(2)</td>
<td>1.17</td>
<td>1.19</td>
<td>1.16</td>
<td>1.14</td>
<td>1.16</td>
<td>1.14</td>
</tr>
<tr>
<td>Hansen χ² (p-val)</td>
<td>0.924</td>
<td>0.713</td>
<td>0.917</td>
<td>0.994</td>
<td>0.917</td>
<td>0.994</td>
</tr>
</tbody>
</table>
Labor market control variables (labor participation rate and unemployment rate) are 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 and 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 result in higher wages and thus have no impact on terms of trade.\(^{33}\) However, there is clearly no support for the neoclassical view that the increase in the abundant factor worsens terms of trade. If anything, the estimates (especially in model (4)) point to a rather positive relationship.

More surprising is the fact that there is some evidence that an increase in unemployment is positively related to terms of trade.\(^{34}\) 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).

The ratio of trade (imports + exports) to GDP is included because, inter alia, Lutz and Singer (1994) argue that for developing countries an increased export intensity might worsen their terms of trade and find empirical support for this statement. For similar purposes, 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 in general, regional trade agreements seem to increase pressures on developing countries export prices. I also control for the exchange rate, the

\(^{33}\)Note that the impact is positive and weakly statistically significant when models (2) and (6) are estimated for industrialized countries. Results are available upon request.

\(^{34}\)Though not statistically significant for the GMM-models, the estimated coefficient is always positive and standard errors are of reasonable size.
real interest rate and inflation since they all might influence terms of trade and, more importantly, may be correlated with FDI as well. Controlling for GDP should capture different other country characteristics and is also important since many other variables are measured as a percentage of GDP.

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.

4.3. Robustness checks

4.3.1. Instrument robustness

As mentioned above, System GMM estimates are often suspicious of instrument proliferation, i.e. results might depend on the instrumens’ lag structure chosen and too many instrumens may generate too small standard errors. While the results reported above used the minimum number of instruments available, figure 3 demonstrates that the obtained results do not depend on the chosen lag structure of instruments. The figure depicts the point estimate of the (long-run) impact of FDI on NBTT in dependence of the lag depth, together with the doubled respective robust standard errors. Remember that ±2 standard errors approximate a 95 % confidence interval.\textsuperscript{35} In both panels, the very left end of the solid line shows the same long-run estimate as obtained from model (6), i.e. instrumenting the LDV with the first lagged difference and instrumenting the FDI stock with the difference lagged by three years. From there, the left panel sequentially adds another lagged difference of the FDI stock to the instrument set so that at the end the FDI stock is instrumented with differences lagged by three up to twenty years (generating a total number of 61

\textsuperscript{35}More precisely, the pointwise 95 % confidence band is given by \( \hat{\beta} \pm 1.96 \times \hat{SE}(\hat{\beta}) \).
instruments). In the right panel the instrument set for the FDI stock is restricted to the difference lagged by three years but the lag length for the LDV is sequentially expanded by one additional lag. The results for both exercises clearly show that the estimated impact of FDI on NBTT is very stable and does not depend on the lag length chosen. As expected, the statistical significance of the parameter estimates increases with the lag depth and hence the instrument set but it can clearly be seen that the results reported above are fairly conservative ones.\textsuperscript{36}

4.3.2. Parameter heterogeneity over time

As a second 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 outward FDI increased dramatically. Therefore, the model in equation (5) is re-estimated in the form:

\textsuperscript{36}By expanding the instrument set of the FDI stock up to lags of 20 years (i.e. increasing the overall instrument set from 44 to 61), the t-statistic of the FDI stock parameter increases from 2.05 to 3.07.
\[ \ln(NBTT)_{i,t} = \phi\ln(NBTT)_{i,t-1} + \mathbb{1}_{(t<1995)}\beta_1 FDI_{i,t-1} + \]
\[ + \mathbb{1}_{(t\geq1995)}\beta_2 FDI_{i,t-1} + \psi + \alpha_i + \gamma_t + \epsilon_{it}, \] (6)

where \( \mathbb{1} \) is the indicator function, i.e. the impact of FDI on terms of trade, \( \beta \), 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 should generally provide estimators with smaller variance than one-step System GMM and hence tests for equality of parameters will have more power. Still, an F-test cannot reject \( H_0 : \beta_1 = \beta_2 \) in equation (6), as is depicted in table 4: 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.\(^{37}\)

4.3.3. Parameter heterogeneity across country groups

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, \( \beta \) is allowed to vary between the two subsamples. Results are again presented in table 4. 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 may gain more from FDI in terms

\(^{37}\)Other breakpoints than 1995 have been investigated as well and lead to the same conclusion. Results are available upon request.
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. table 4). However, the difference 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 (5) does not provide support for the hypothesis that FDI has a negative impact through commodity exports.\(^{38}\)

<table>
<thead>
<tr>
<th></th>
<th>(\hat{\beta})</th>
<th>SE ((\hat{\beta}))</th>
<th>F-stat (d.f.) (p-val)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>time</strong></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>year &lt; 1995</td>
<td>0.00124</td>
<td>0.00089</td>
<td>0.03 (1,49)</td>
</tr>
<tr>
<td>year (\geq) 1995</td>
<td>0.00136</td>
<td>0.00089</td>
<td>0.8650</td>
</tr>
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<td><strong>trade intensity</strong></td>
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<td></td>
<td></td>
</tr>
<tr>
<td>&lt; sample median</td>
<td>0.00172</td>
<td>0.00061</td>
<td>1.06 (1, 49)</td>
</tr>
<tr>
<td>&gt; sample median</td>
<td>0.00074</td>
<td>0.00101</td>
<td>(0.3082)</td>
</tr>
<tr>
<td><strong>Primary Exports</strong></td>
<td></td>
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</tr>
<tr>
<td>&lt; sample median</td>
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<td>0.00067</td>
<td>1.55 (1, 49)</td>
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<td>&gt; sample median</td>
<td>0.00071</td>
<td>0.00090</td>
<td>(0.2185)</td>
</tr>
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</tr>
<tr>
<td>&lt; sample median</td>
<td>-0.00072</td>
<td>0.00097</td>
<td>6.78 (1, 43)</td>
</tr>
<tr>
<td>&gt; sample median</td>
<td>0.00165</td>
<td>0.00059</td>
<td>(0.0126)</td>
</tr>
</tbody>
</table>

Note: All estimates using model (4), \(\hat{\beta}\) is the short-run coefficient; F-test is a test for equality of estimated parameters.

Table 4: Different coefficients for FDI impact for different sub-samples

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

\(^{38}\)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. Adding an interaction with the manufacturing sector size suggests that the impact of FDI operates via this sector but this finding is not statistically significant.
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 4, the estimated parameter for the impact of FDI on terms of trade is higher for developing countries with more years of schooling. Statistically, the hypothesis that FDI has the same impact in countries with few years of schooling as in countries with more years of schooling can be rejected on the 5% level of significance. The negative and statistically insignificant FDI parameter for developing countries below the median level of school years highlights that the positive impact of FDI on NBTT found in this study does not release developing countries from the obligation of building human capital but that the latter is required for generating positive impacts of FDI.

Finally, I allow the impact of FDI on terms of trade to vary by six different regions. An 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 one 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 (4) in table 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. Furthermore, the model selection criteria AIC and BIC prefer the saturated over the reduced model. Accordingly, specification (6) of table 3 was re-estimated in the same setting.

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39I 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 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%. Results are available upon request.

40These follow the World Bank classification and consist of East Asia & Pacific, Europe & Central Asia, Latin America & Caribbean, Middle East & North Africa, South Asia, and Sub-Saharan Africa, according to the World Bank classification.

41A likelihood-ratio 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).
but allowing for a different FDI-impact on terms of trade in South Asia (and letting both FDI variables act as their instrument in levels, similar to specification (2)). Results are presented as specification (7) in table 3 and show a negative (and highly significant) impact of FDI on terms of trade for South Asia of -2.05 % and a positive (and significant) impact of 0.31 % for the rest of the developing world (both long-run parameters). We investigate this finding in more detail elsewhere (Wacker et al., 2013) but in essence the South Asian exception can be attributed to the fact that (late-coming) South Asian economies integrated into global industries via price competitiveness in relatively low-quality segments with poor human capital. In these sectors, FDI is more vertically oriented and the respective economies barely managed to gain considerable market share and corresponding pricing power. As discussed in section 2, both has rather adverse impacts on terms of trade and a low level of educational attainment adds to this picture.

4.3.4. Cross-country correlation

The fact that one country’s export price is another country’s import price raises the suspicion of cross-country dependence in terms-of-trade data and in the residuals of equation (5). The latter could impact the efficiency of moment estimation, their statistical inference, and raise specific efficiency issues in the dynamic panel setting (Phillips and Sul, 2003). Exploring this issue is also relevant for other reasons as understanding the pattern of cross-sectional dependence in terms-of-trade data could provide economic insights and the finding of cross-sectional independence in the residuals of equation (5) could be interpreted as evidence that the model is well specified (as no systematic pattern is left in the residuals) and/or that developing countries face very similar shocks among each other in their trade with industrialized countries. In fact, using a Pesaran (2004) test for cross-sectional dependence does not provide clear-cut evidence of cross-sectional dependence.

42It 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.

43In this case, there would be time-specific shocks that are captured by the year-dummies because the used sample exclusively consists of developing countries.

44Although the test is applicable for unbalanced panels like the one used in this study, it is infeasible with highly unbalanced data. In this application, it requires a minimum of 11 residuals/observations per country (leaving 20 countries in the sample), in which case the test allows rejecting the null hypothesis of cross-section independence on the 5 % level of statistical significance. Limiting to those 19 countries that have at least 12 observations, one can reject the null on the 10 % level, but not when requiring a minimum of 13-16 observations.
Considering the absence of standard methods to fully satisfactorily handle potential cross-section dependence in the given framework of short-T panels with data gaps that would not induce other drawbacks compared to the applied econometric framework, I apply the Driscoll and Kraay (1998) estimator to model (4) of table 3 which corrects standard errors of fixed effect models for potential cross-section dependence patterns. The estimated t-statistic of the FDI stock parameter decreases from 2.21 (under FE estimation) to 2.00. If one estimates model (6) of table 3 with the Driscoll and Kraay (1998) instead of the FE estimator, the t-statistic even increases from 2.49 to 2.59. It is thus reasonable to assume that the main results in this paper are not plagued by significant patterns of cross-country dependence within the sample, but it would still be interesting if future work would shed more light on global cross-country patterns in terms of trade and their potential economic implications.

4.3.5. Alternative FDI stock measure

In a final 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 5 shows the estimated coefficients using the same covariates as in specification (3) with depreciation rates \( \delta = 0.05, 0.1, 0.15 \). The results support the previous findings: the new measure meets statistical significance at the 10 % level and, more importantly, the estimated long-run parameters are not too far from the 0.56 % estimated in model (3).

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

\[ \text{The case of } \delta = 0.1 \text{ is most appropriate for comparison with previous results since then the overall FDI growth comes closest to the value observed in the actual stock data.} \]
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 one third at conventional levels of statistical significance. Results are robust to the inclusion of differing sets of control variables, to different estimators (GMM, FE and RE) and subsamples and to an alternative measure of the FDI stock. It was also shown that the identification strategy via lagged differences in System GMM is not sensitive to the lag depth and instrument set in this case.

The results show that a growth strategy that focuses on generating favorable terms of trade does not generally conflict with FDI attraction. Furthermore, they go beyond recent findings of Harding and Javorcik (2012) who find positive impacts of FDI on developing countries export unit values because the study highlights that not only ‘enclave’-type product segments under foreign control experience positive price developments but that the relevant terms of trade of the whole country can be improved via FDI.

The positive impact of FDI is stronger for countries with more years of schooling, supporting the findings of Borensztein et al. (1998) that the absorptive capacity of the host economy matters for the effects of FDI. The results in table 4 also suggest that the net barter terms of trade of primary exporters do not benefit as much from FDI as those of developing countries with a higher share of manufacturing exports.46 There is no support, however, for the widespread belief that the impact of FDI positively depends on a country’s international trade intensity. If anything, the

46The difference in the estimated parameters, while considerable in economic magnitude, is not statistically significant. However, note that the split of the sample at the median is somewhat artificial.
data suggest that developing countries with larger trade-to-GDP ratios experience a lower positive impact of FDI than “less open” economies.

A possible explanation for these findings is the relationship between the extent of the market and the social division of labor as explored by Adam Smith and revisited by Rodríguez-Clare (1996). Increased access to international markets will rise the possibility of people to transform their potential capacities of performing meaningful tasks into outcomes - here: to work in occupations that produce goods with high export prices. As highlighted by Diamond (1982: 893), “the ease in finding a trading partner depends on the number of potential partners available” and FDI increases this number of potential “partners” by both generating employment in new sectors or occupations and providing access to export markets. Since the manufacturing sector provides more space for diversification and hence to perform tasks that match with individual capacities, one would expect more benefits from extending its market than from a larger market of primary goods that generally copies existing activities. A well-educated people will find much more opportunities and benefits from an increased extent of the market (and from other possibilities provided by MNCs) than a less-educated one because the former possess a larger portfolio of performing tasks.47 Finally, since trade and (horizontal) FDI act as substitutes, the supplementary benefits of FDI in extending the market will be smaller in a more trade-open economy than in a relatively closed one.

Other channels to explore in future research involve the role of upgrading effects induced by MNCs (cf., inter alia, Javorcik, 2004, and the extensive literature on global value chains) that show up as a “price” increase due to inappropriate measurement by unit values (cf. sections 2.3 and 3.1) and the plausibility that multinationals possess higher market power and more appropriate information about global market conditions which allow them to realize higher (export) prices. Therefore, studies on the product level (similar to Harding and Javorcik, 2012) will be helpful. Further research should also pay more attention to the role of vertical vs. horizontal FDI for terms of trade and could address the impact of FDI on terms of trade volatility (cf. Al-Abri, 2013).

47Conversely, a larger extent of the market of course increases the incentives to invest in education.
The above considerations highlight the complexity how FDI might influence development outcomes such as terms of trade. It may increase the possibility of people to make use of their capacities, hence generating incentives to invest in productive capacities, it may itself provide training to its employees and vertical suppliers (cf. Görg and Strobl, 2005) but also directly influence outcomes by paying higher wages or possessing pricing power. The results of this investigation, however, do not imply that policy makers should blindly attract FDI in order to boost trade revenues, as the cautionary exception of South Asia shows. Firstly, improving and - possibly more important - stabilizing NBTT should only be 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, a 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*: Bangladesh, Belize, Bolivia, Botswana, Chile, China, Cameroon, Colombia, Costa Rica, Dominican Republic, Ecuador Egypt (Arab Rep.), Ethiopia, Fiji, Guatemala, Guyana, Honduras, Indonesia, India, Jamaica Jordan, Kenya, Cambodia, Lebanon, St. Lucia,
Sri Lanka, Morocco, Madagascar, Mexico, Mongolia, Mauritania, 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, Zimbabwe

*Developing countries supplementary included in specifications (1a) and (1b):* 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.)
Bibliography


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