The Impact of Foreign Direct Investment on the Developing Countries' Terms of Trade

Konstantin M. Wacker

PhD Candidate, University of Göttingen
Center for Statistics / Chair Stephan Klasen

Vienna; December 10, 2010

GEORG-AUGUST-UNIVERSITÄT
GÖTTINGEN

UNITED NATIONS
UNIVERSITY

UNU-WIDER
World Institute for Development
Economics Research

FDI & ToT

Konstantin M.
Wacker

- Prebisch (1950) and Singer (1950) find falling terms of trade for primary commodity exports
- initially focused on different prices for commodities and manufacturing products
- shift towards country focus (Singer, 1975; Sarkar/Singer, 1991; Baxter/Kouparitsas, 2006; Ziesemer, 2010)

$\Rightarrow$ present study uses net barter terms of trade (NBTT):

$$NBTT = UVI_x/UVI_m,$$

$$\text{where } UVI = \frac{\sum p^t q^t}{\sum q^t} / \frac{\sum p^0 q^0}{\sum q^0}.$$

Three main strands in the literature:

1. **Time Series Econometrics** (Spraos, 1980; Sapsford, 1985; Thirlwall/Bergevin, 1985; Grilli/Yang, 1988; Cuddington/Urzúa, 1989; Kim et al., 2003; Harvey et al., 2010)

2. **Structural Models** (less popular, Bloch/Sapsford, 1998)

3. recently: terms-of-trade **volatility** (UNCTAD, 2005; Blattmann et al., 2007; Santos-Paulino, 2010)

MNCs & PST

Economic arguments in favor of the Prebisch-Singer hypothesis
implicitly rely on a negative impact of multinational
corporations (MNCs) on terms of trade.

- Singer (1950): "The Distribution of Gains between
  Investing and Borrowing Countries"
- Prebisch (1950): cyclical effect operates through profit
  transfer
- Emmanuel (1972 [1969]): "Unequal Exchange"
- Furtado (1976): more diverse impacts
- Global Value Chain Approach: role of upgrading

Prebisch (1950: 13-14): A Modern Interpretation

- Downstream Firm D in the industrialized country
- uses input q from upstream firm U to produce Q
- in an imperfect market.

Profit functions:

$$\Pi^D = PQ - CQ - P^D q - FC^D \tag{1}$$

$$\Pi^U = P^D q - cq - FC^U \tag{2}$$

Note: $P^D(q)$ with $\frac{\delta P^D(q)}{\delta q} < 0$ is the inverse demand function of the downstream firm D!

$\Pi^U > 0$ can only hold for $P^D q > cq$
under imperfect competition: $P^D \uparrow \leftrightarrow q \downarrow$

$\Rightarrow$ hold-up problem for the downstream firm
$\Rightarrow$ incentive for the downstream firm to enter the upstream market

Effect?

$q \uparrow$, $P^D \downarrow$

$\Rightarrow$ **terms of trade will** fall for the developing country!

Do a country i's net barter terms of trade ($NBTT$) at time t depend on the level of multinationals' activities (FDI) in the country (conditional on a set of control variables Ψ)?

$$\mathbb{E}(\ln(NBTT_i)|\Psi_i) = f(t_j, FDI_i) \tag{3}$$

If so - is the impact positive or negative?
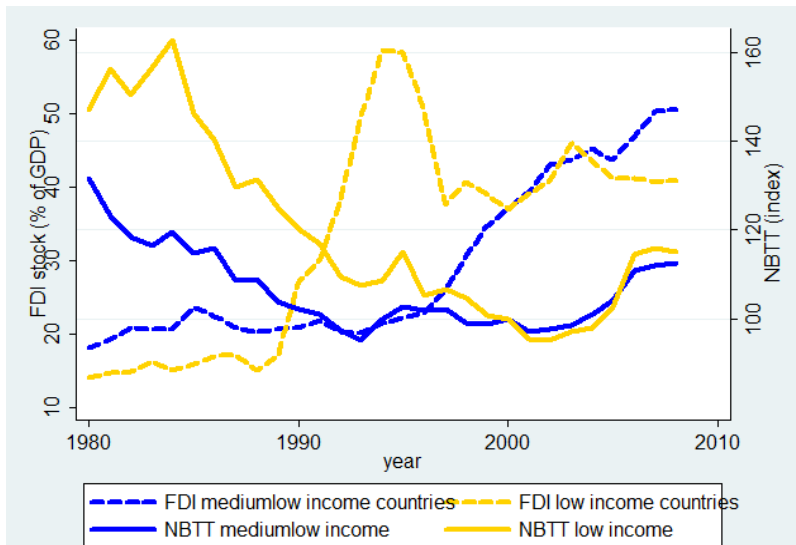
To what extent?

Data (1/2)

- generally comes from WDI
- FDI data: UNCTAD (dating back to 1970)
- 1980 - 2008
- 197 countries, thereof 52 low income, 69 medium-low income, 37 medium-high income, 39 high-income (1987 World Bank classification)
- N=197, T=28, N × T = 5,516
- ("Fisher") Unit Root Test (Maddala/Wu, 1999) ✓
- Note: Asymptotics are $N/T \rightarrow \infty$ followed by $T \rightarrow \infty$.

Descriptive Statistics: FDI and NBTT

Legend:
- FDI mediumlow income countries (blue dashed)
- FDI low income countries (yellow dashed)
- NBTT mediumlow income (blue solid)
- NBTT low income (yellow solid)

- Agricaltural Raw Material Exports +
- Current Account Balance +**
- lagged Current Account Balance -*
- Employment in Agriculture +
- Employment in Industry +
- GDP p.c. -
- Industry Value Added +
- Inflation -***
- ln(Labor Force) +***
- Labor Participation Rate -
- Manufactures Exports -

- Real Effective Exchange Rate $+$***
- Real Interest Rate $+$**
- Services Value Added -
- Trade -
- Unemployment Rate $+$*
- Deviation from Long-Run Growth $+$***
- lagged Deviation from Long-Run Growth -**
- Oil Price -***
- Industrial Production -
- World GDP $+$**

Fixed Effect Regression, robust se

FDI & ToT

Konstantin M.
Wacker

Table: dependent variable: ln(NBTT)

Variable		Model 7	Model 8	Model 9
L.ln(NBTT)		0.7714***	0.7601***	0.7492***
		(0.0553)	(0.0549)	(0.0554)
trend	lowmed	-0.1104**	-0.1128**	-0.1818**
		(0.0538)	(0.0527)	(0.0742)
	LIC	-0.1169**		
		(0.0542)		
L.FDI stock	lowmed	0.0017*	0.0019**	0.0019**
		(0.0010)	(0.0009)	(0.0009)
	LIC	0.0067***		
		(0.0020)		
# controls		21	21	16
time dummies		yes	yes	yes
Prob F-Stat		0.00	0.00	0.00
R-sq within		0.8547	0.8528	0.8521
No of Obs.		225	225	225

Robustness

- Random Effects, Pooled OLS
- Clustered Standard Errors
- Newey-West Standard Errors
- no structural change in relationship
- Alternative FDI stock using perpetual inventory method

$\Rightarrow$ **statistical significance holds at least at 10 % level.**

As depreciation rates grow, i.e. FDI stock $\rightarrow$ FDI flow, results are no more significant (for $\delta \geq 0.2$).

$\Rightarrow$ FDI has long-lasting impact.

Problems with OLS / fixed effects:

1. biased in presence of lagged dependent variable
2. simultaneity

$\Rightarrow \ \text{Cov}(X, \varepsilon) \neq 0 \ \Rightarrow \ \mathbb{E}(\hat{\beta}) = \beta + X'\varepsilon(X'X)^{-1} \neq \beta$

bias($\hat{\beta}_{FE}$) in panels with weak dependence: T^{-1}

$\Rightarrow$ may be small but $\exists$ alternative: GMM

FDI & ToT

Konstantin M.
Wacker

general idea ("moment condition"):

force vector of empirical moments $\mathbb{E}(z'e) = \frac{1}{N}Z'\hat{\varepsilon}$ to zero

$$\Rightarrow \underset{\hat{\beta}}{\operatorname{argmin}} \, ||Z'\hat{\varepsilon}||_A \Rightarrow \hat{\beta}_{GMM} = (X'ZAZ'X)^{-1}X'ZAZ'Y,$$

where $A = A' \in \mathbb{R}^{n \times n}$ is a weighting matrix.

Properties:

- consistent
- but not generally unbiased in finite samples
- not efficient

FDI & ToT

Konstantin M.
Wacker

GMM is efficient for

$$\hat{\beta}_{EGMM} = (X'Z(Z'\Omega Z)^{-1}Z'X)^{-1}X'Z(Z'\Omega Z)^{-1}Z'Y$$

Note: For $\Omega = \sigma^2 I$, i.e. when errors are homoskedastic, $\hat{\beta}_{EGMM}$ becomes 2SLS

Ω has to be estimated

What if there are no good instruments waiting in the wings?

general idea:

suitably lagged first differences of a series w, $\Delta w_{i,t-s}$ may be uncorrelated with α_i

$$\Delta w_{i,t-1} = w_{i,t-1} - w_{i,t-2}$$

$\rightarrow$ mathematically related to $w_{i,t-1}$ (LDV!) but not to ε_{it}
$\rightarrow$ available as instrument

Similarly, difference GMM (Holtz-Eakin et al, 1988; aka Arellano/Bond, 1991), instruments differences with levels. Problematic if series to be instrumented is close to a random walk ($\rightarrow$ FDI)!

Parameter Identification: GMM

Table: dependent variable: ln(NBTT)

Variable	Model 9	POLS	Sys GMM	Diff GMM
L.ln(NBTT)	0.7492***	0.8016***	0.8051***	0.7760***
	(0.0554)	(0.0389)	(0.0437)	(0.0834)
time	-0.1818**	-0.0807	0.0006**	0.3729
	(0.0742)	(0.0586)	(0.0003)	(0.7694)
L.FDI stock	0.0019**	0.0011***	0.0010**	0.0018
	(0.0009)	(0.0003)	(0.0004)	(0.0013)
other controls	yes	yes	yes	yes
time dummies	yes	yes	yes	yes
# obs.			217	181
# instruments			217	180
AB test AR(1)			-2.48	-2.48
			(0.013)	(0.013)
AB test AR(2)			0.62	0.39
			(0.534)	(0.694)
Hansen test			165.31	0.0
			(0.669)	(1.0)

Economic Relevance

FDI & ToT

Konstantin M. Wacker

According to the, rather conservative, system GMM estimate, an increase of FDI stock/GDP by one percentage point will result in a 0.1 % increase of NBTT.

Considering a long-run deterioration of developing countries NBTT of -0.42 to -0.62 % p.a., this is a considerable size.

As FDI stock/GDP ratio rose from 16.1 % to 46.2 % between 1980 and 2008, actual FDI countered the structural tendency of developing countries' NBTT to deteriorate by about

$$\frac{0.001 \cdot 26.5}{-0.155} = \textbf{21.3 \%}.$$

Conclusions

- Contrary to rationales in the Prebisch-Singer literature, FDI has a positive impact on the developing countries' NBTT.
- The impact is both, statistically significant and economically relevant.
- The model describes the developing countries' NBTT movement better than for industrialized countries → DCs' NBTT are more exposed to market forces
- The impact of FDI on NBTT is rather long-lasting → ownership advantages, market power