

Trade liberalisation and import margins

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Idea and contents

Assess the impact of recent CEEC institutional trade liberalisation on imports.

In particular, decompose the impact along *import margins*:

- the set of imported goods (import variety, *extensive import margin*)
- volumes per imported good (import intensity, *intensive import margin*)

across different categories of (intermediate, capital and consumer) goods

- within a gravity framework using highly disaggregated trade data

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Trade liberalisation and trade

Trade policy has well documented effects on trade volumes:

- Rose (2000 and 2005) demonstrates substantial pro-trade effects of being a member of the OECD or of the euro zone.
- Baier and Bergstrand (2007) find that free trade agreements may double bilateral trade after 10 years.

Work with gravity equations traditionally concentrates on trade volumes but ignores the two *margins of trade*

Why should trade margin effects of trade liberalisation be interesting?

There are potential links to two quite different strands of the literature

- (1) Reform and growth in transition
- (2) Recent theories of firm heterogeneity and trade

Both of these links rest on the notion of margin effects of liberalisation across different categories of goods.



Links to the literature (1): Reform and growth in transition

Transition literature: a growth enhancing role for reforms

(Endogeneous) growth literature links input variety to growth

- Amiti and Konings (2007) suggest a link from higher import variety of intermediate inputs to productivity gains at the firm level.
- More capital goods variety may change an economy's state of technology (proposed in Romer, 1990) with consequent growth effects.

Successfully tested in Frensch and Gaucaite Wittich (2009): a trade-based measure of the variety of available capital goods relative to consumer goods behaves 'as if' it represented technology

according to 'conditional technological convergence' hypothesis when change of technology is assumed to be subject to a learning process.

Higher institutional trade liberalisation effects on the variety of imported inputs (intermediate goods, capital goods) versus consumer goods indicate a channel for the link between reforms and growth.



Data issues: Measuring import margins

Import data from 36 reporters (European emerging economies and OECD), 1992–2004, cover reporters' imports from 54 selected partners.

- Aggregation: lowest level of SITC, Rev. 3 in UN COMTRADE: 3,114 items
some 75 mn data points
- Margin measurement follows Frensch and Gaucaite Wittich (2009) over an expanded product set, differentiating items by country of origin:

$EM_{c,t}$: number of imported SITC items times the respective number of source countries (maximum count of 168,156)

$IM_{c,t}$: average value per imported variety, $IM_{c,t} = IMPORTS_{c,t} / EM_{c,t}$

- UN *Classification by Broad Economic Categories* allows for SITC items to be grouped into primary, intermediate, capital, and consumer goods.



Data issues: Institutional trade liberalisation

EBRD foreign trade and payments liberalisation index

- Info on trade and payments liberalisation that applies equally to all goods categories

This index equals 4.33 for OECD economies, in line with construction.

- Progress on the EBRD index results in lowering the fixed “beachhead” costs for ROW exporters, rather than variable costs

Simple correlation coefficient between the EBRD measure and the ten-scale IMF trade restrictiveness index (tariff and non-tariff restrictions): -0.13 .

- EBRD index is ordered qualitative: consider *full* liberalisation, i.e., define *TradeLib* as 1 if the index equals 4.33, and 0 otherwise

Half of 1992–2004 *TradeLib* observations for ex-transition countries take the value of one.

A gravity framework

$$\log \text{IMPORTS}_{j,t} = \beta_{0,1} + \beta_{1,1} \log \text{GDP_Im}_{j,t} + \beta_{2,1} \text{TradeLib}_{j,t} + c_{j,1} + k_{t,1} + \varepsilon_{j,t,1}, \quad (1)$$

for total imports,

$$\log \text{EM}_{c,t} = \beta_{0,2} + \beta_{1,2} \log \text{GDP_Im}_{c,t} + \beta_{2,2} \text{TradeLib}_{c,t} + c_{j,2} + k_{t,2} + \varepsilon_{c,t,2}, \quad (2)$$

for extensive import margins, and

$$\log \text{IM}_{c,t} = \beta_{0,3} + \beta_{1,3} \log \text{GDP_Im}_{c,t} + \beta_{2,3} \text{TradeLib}_{c,t} + c_{j,3} + k_{t,3} + \varepsilon_{c,t,3}, \quad (3)$$

for intensive import margins.

Estimations include country (c_j) and period (k_t) fixed effects

- to control for time-invariant country-specific as well as country-invariant time-specific omitted variables (including trade barriers, multilateral trade resistance).

I.e., specification of trade costs is by fixed costs plus country heterogeneity

- to control for each year's data using a different numéraire since GDP and trade values are in current dollars (Baldwin and Taglioni, 2006)
- with the implication that no time-invariant parameters can be estimated.

A gravity framework

Each equation estimated separately for all goods, intermediate, capital, and consumer goods categories

- The seemingly unrelated regression (SUR) method estimates (1), (2), or (3) each as a system across goods categories, accounting for hetero-skedasticity and contemporaneous correlation in errors across categories.

Unobservables could simultaneously affect both intermediate and capital goods trade. However, the same regressors show up in each equation, in which case SUR estimates become equivalent to OLS.

Perform SUR in order to obtain the covariances between the estimates from different equations to properly perform Wald tests.

- OLS is a linear operator: estimated coefficients from (1) and (2) sum up to respective estimated coefficient from equation (3).

Results

Table 1: Gravity regressions for import volumes
 OLS with country and period fixed effects

	(1)	(2)	(3)	(4)
	Dependent variable is the log of total import flows of:			
	All goods	Intermediate goods	Capital goods	Consumer goods
Explanatory variables:				
$\log GDP_{Im}$	0.84 ^{***} (15.26)	0.74 ^{***} (11.18)	0.96 ^{***} (13.15)	0.89 ^{***} (15.00)
<i>TradeLib</i>	0.15 ^{***} (5.46)	0.22 ^{***} (6.67)	0.12 ^{***} (3.46)	0.048 [*] (1.65)
Wald test [p-value]		[0.0000] ^{***}	[0.0211] ^{**}	
Observations (cross sections; time)	442 (36; 1992–2004)			
Adj. <i>R</i> -squared	0.99	0.99	0.99	0.99

Notes: Fixed effects not reported, *t*-statistics in parentheses; * (**, ***): significance at 10 (5, 1) per cent. By the semi-elasticity nature of the trade liberalisation coefficient, full liberalisation increases imports by $(e^{\beta^2} - 1)$. The null hypothesis in the SUR-based Wald tests for trade liberalisation effects is that coefficients are identical between a respective goods category equation and the consumer goods equation.

Results

Table 2: Gravity regressions for extensive import margins
 OLS with country and period fixed effects

	(5)	(6)	(7)	(8)
	Dependent variable is the log of the <i>extensive</i> import margin of:			
	All goods	Intermediate goods	Capital goods	Consumer goods
Explanatory variables:				
$\log GDP_{Im}$	0.35*** (11.12)	0.30*** (10.21)	0.40*** (10.58)	0.42*** (11.40)
<i>TradeLib</i>	0.10*** (6.54)	0.13*** (8.15)	0.11*** (6.12)	0.048*** (2.63)
Wald test [p-value]		[0.0000]***	[0.0001]***	
Observations (cross sections; time)	442 (36; 1992–2004)			
Adj. R-squared	0.98	0.98	0.98	0.98

Results

Table 3: Gravity regressions for intensive import margins
 OLS with country and period fixed effects

	(9)	(10)	(11)	(12)
	Dependent variable is the log of the <i>intensive</i> import margin of:			
	All goods	Intermediate goods	Capital goods	Consumer goods
Explanatory variables:				
$\log GDP_{Im}$	0.49 ^{***} (10.92)	0.44 ^{***} (6.88)	0.56 ^{***} (9.36)	0.47 ^{***} (9.29)
<i>TradeLib</i>	0.046 ^{**} (2.08)	0.085 ^{***} (3.29)	0.011 (0.36)	0.00066 (0.03)
Observations (cross sections; time)	442 (36; 1992–2004)			
Adj. <i>R</i> -squared	0.99	0.99	0.99	0.99

Results

- (1) The extensive import margin effect of institutional trade liberalisation is significantly higher for inputs than for consumer goods.

This identifies a channel for the link between reforms and growth.

- (2) The import volume effect of institutional trade liberalisation is predominantly realised along the extensive margin.

When testing for separate goods categories, this is strictly true for capital and for consumer goods.

Links to the literature (2): Heterogeneous firms and trade

My setup:

- A country's institutional trade liberalisation reflects declining fixed costs for ROW exporters => exploring effects of a country's institutional trade liberalisation on imports from ROW is equivalent to analysing the impact of declining fixed export costs on ROW exports.
- Differentiate goods categories by use (intermediate, capital and consumer goods): goods used in production are more complementary than consumer goods.

Accordingly, results (1) and (2) imply:

- (1) extensive margin effects of lowering fixed costs for ROW exporters are higher for low substitutability goods than for high substitutability goods.
- (2) the volume effect of lowering fixed costs for ROW exporters is predominantly realised along the extensive margin.

This is what models of heterogeneous firms and trade predict; see especially Chaney (2008).



Links to the literature (2): Heterogeneous firms and trade

Generalisation of Krugman (1980): combine firm heterogeneity in productivity with fixed costs of exports (Melitz, 2003; Chaney, 2008).

Exporting *versus* non-exporting firms => extensive margin adjustment

The impact of goods substitutability on trade adjustment to costs

	Variable cost impact	Fixed cost impact
On intensive margin	+ (Krugman, 1980)	0
On extensive margin	–	–
On total trade	0	–

Caveat: I deal with disaggregated macro data, not micro data. Consequently, my margin measurement is not exactly according to Chaney, and may overstate the extensive margin. But on the plus side: reliable discrimination between goods of different substitutability.

Links to the literature (2): Heterogeneous firms and trade

Generalisation of Krugman (1980): combine firm heterogeneity in productivity with fixed costs of exports (Melitz, 2003; Chaney, 2008).

Exporting *versus* non-exporting firms => extensive margin adjustment

- This is still essentially a Dixit-Stiglitz world:
- With low product differentiation (high substitutability): there are few large firms
- With high product differentiation (low substitutability): there are many small firms
- Increase variable export costs: export prices go up, sales suffer, most so for high substitutability goods, i.e., the impact of variable costs on the intensive margin of exports increases with elasticity of substitution (as in Krugman, 1980).
- No effect of increasing fixed costs on prices and thus on sales of traded goods.
- Increase variable or fixed export costs: *cet. par.*: exit of low productivity firms and of small firms, i.e., the impact of (variable and fixed) costs on the extensive margin of exports decreases with elasticity of substitution
 - Amplification of substitutability on variable cost impact on intensive margin is cancelled by dampening effect on variable cost impact on extensive margin.
 - What remains: dampening effect of substitutability on fixed cost impact on the extensive margin of trade

Sensitivity

'Time-span-variant' Country Dummies

- I can go in the direction of Baier and Bergstrand's (2007) time-variant country dummies by adding 'time-span-variant' country dummies to period fixed effects. Specifically, I select dummies for sub-periods 1992–6, 1997–2000, and 2001–4.
- This results in cutting Table 1–3 point estimates of liberalisation effects: the advantage of the time-span-variant country dummies' taking better account of country heterogeneity comes at the cost of an increased collinearity between the liberalisation dummy and time-span-variant country dummies.
- The qualitative benchmark results remain intact.

Measurement of Trade Liberalisation

- Campos and Horvath (2006) present alternative measures of liberalisation for transition economies. I use their cardinal measure of external liberalisation, defined between 0 and 1.
- Result (1) comparable to benchmark results. Result (2) valid only for capital goods.



Conclusions

What can we learn from assessing the impact of institutional trade liberalisation on import margins across goods categories within a gravity framework?

Results:

- (1) Robust evidence of strong extensive import margin effects of institutional trade liberalisation for intermediate and capital goods; stronger than for consumer goods
- (2) Evidence that the import volume effect of institutional trade liberalisation is primarily realised along the extensive margin
Robust for capital goods imports

Effect

- The first result identifies a channel for the link between reforms and growth in transition.

Cause

- The first and second results taken together support models of heterogeneous firms and trade.



Additional slides



Multilateral trade and gravity: complete specialisation

Why analyse import flows along margins within a gravity framework? In which one?

- Quick answer to the first question: why not; others also do so, in particular Hummels and Klenow (2005), Crozet and Koenig (2007), Bernard et al. (2007), Felbermayr and Kohler (2007).
- Better answers:
 - Studying extensive *versus* intensive trade margins presupposes a model with product differentiation (see below), reflected in appropriate data.
 - Product differentiation implies complete specialisation, so the question becomes: which gravity approach is appropriate for studying multilateral imports of various goods categories when specialisation is complete?
 - Under fairly general assumptions: for frictionless trade in final goods complete specialisation implies a log-linear relationship between a country's multilateral imports and country size (Havemann and Hummels, 2004). Can be extended to also account for trade in intermediates (Frensch, 2009).
 - This in turn, is necessary (but not sufficient) for applying the same specification to margins of imports; sufficient conditions must be identified in specific trade models.



A gravity framework

Drawback of using panel data: potential non-stationarity of trade and income data, implying likely biased estimates with fixed effects models.

Using cross-sectionally augmented panel unit root testing, Fidrmuc (2009) confirms that trade and income variables used in gravity regressions are integrated of order one.

However, Fidrmuc (2009, p. 436) also finds that fixed effects estimators

- are asymptotically normal and consistent with large panels
- perform “relatively well in comparison to panel cointegration techniques (FMOLS and DOLS)” in finite samples, i.e., the potential bias of fixed-effects gravity estimators is rather small.

This is of specific concern with our data, which span only over a period of 13 years, too short a period for proper panel unit root testing.

As for alternative dynamic panel estimators, the original Arellano and Bond (1991) performs poorly for persistent time series, while the Blundell and Bond (1998) system GMM estimator requires strict exogeneity of regressors, which is not fulfilled when variable such as income and trade are cointegrated.

Sensitivity

'Time-span-variant' Country Dummies

- I can go in the direction of Baier and Bergstrand's (2007) time-variant country dummies by adding 'time-span-variant' country dummies to period fixed effects. Specifically, I select dummies for sub-periods 1992–6, 1997–2000, and 2001–4.
- This results in cutting Table 1–3 point estimates of liberalisation effects: the advantage of the time-span-variant country dummies' taking better account of country heterogeneity comes at the cost of an increased collinearity between the liberalisation dummy and time-span-variant country dummies.
- The qualitative benchmark results remain intact.

Measurement of Trade Liberalisation

Estimation is with fixed effects, liberalisation effects are identified using the time-series variation. Measurement error is a potential problem

- Campos and Horvath (2006) present alternative measures of liberalisation for transition economies. I use their cardinal measure of external liberalisation, defined between 0 and 1.
- Result (1) comparable to benchmark results. Result (2) valid only for capital goods.



Sensitivity: Measurement of trade liberalisation

Table 4: Gravity regressions for extensive import margins
 OLS with country and period fixed effects

	(13)	(14)	(15)	(16)
	Dependent variable is the log of the <i>extensive</i> import margin of:			
	All goods	Intermediate goods	Capital goods	Consumer goods
Explanatory variables:				
$\log GDP_{Im}$	0.29*** (8.29)	0.24*** (6.58)	0.33*** (7.89)	0.37*** (8.60)
$\log Lora_{ext}$	0.11*** (4.34)	0.16*** (5.89)	0.14*** (4.44)	0.0065 (0.20)
Wald test [p-value]		[0.0000]***	[0.0000]***	
Observations (cross sections; time)	327 (35; 1992–2001)			
Adj. <i>R</i> -squared	0.99	0.99	0.98	0.98

Note: for strictly positive values of *Lora_ext*.



Sensitivity: Measurement of trade liberalisation

Table 5: Gravity regressions for intensive import margins
 OLS with country and period fixed effects

	(17)	(18)	(19)	(20)
	Dependent variable is the log of the <i>intensive</i> import margin of:			
	All goods	Intermediate goods	Capital goods	Consumer goods
Explanatory variables:				
$\log GDP_{Im}$	0.46*** (8.88)	0.40*** (6.30)	0.49*** (6.67)	0.54*** (9.69)
$\log Lora_{ext}$	0.16*** (4.33)	0.19*** (4.03)	0.022 (0.41)	0.035 (0.85)
Wald test [p-value]				
Observations (cross sections; time)	327 (35; 1992–2001)			
Adj. <i>R</i> -squared	0.99	0.99	0.99	0.99

Sensitivity: ‘Time-span-variant’ country dummies

Table 6: Gravity regressions for extensive import margins
 OLS with period and time-varying country effects

	(21)	(22)	(33)	(24)
	Dependent variable is the log of the <i>extensive</i> import margin of:			
	All goods	Intermediate goods	Capital goods	Consumer goods
Explanatory variables:				
$\log GDP_{Im}$	0.31 ^{***} (9.26)	0.24 ^{***} (7.32)	0.38 ^{***} (9.87)	0.41 ^{***} (9.86)
<i>TradeLib</i>	0.039 ^{***} (2.84)	0.053 ^{***} (3.92)	0.042 ^{***} (2.65)	0.015 (0.89)
Wald test [p-value]		[0.0010] ^{***}	[0.0122] ^{**}	
Observations (cross sections; time)	442 (36; 1992–2004)			
Adj. <i>R</i> -squared	0.99	0.99	0.99	0.99

Note: time-varying country effects are defined for three sub-periods, 1992–6, 1997–2000, and 2001–4.

Sensitivity: ‘Time-span-variant’ country dummies

Table 7: Gravity regressions for intensive import margins
 OLS with period and time-varying country effects

	(25)	(26)	(27)	(28)
	Dependent variable is the log of the <i>intensive</i> import margin of:			
	All goods	Intermediate goods	Capital goods	Consumer goods
Explanatory variables:				
$\log GDP_{Im}$	0.48*** (11.20)	0.43*** (8.89)	0.57*** (9.36)	0.48*** (9.94)
<i>TradeLib</i>	-0.018 (-1.02)	0.0044 (0.22)	-0.059** (-2.37)	0.0032 (0.16)
Wald test [p-value]				
Observations (cross sections; time)	442 (36; 1992–2004)			
Adj. <i>R</i> -squared	0.99	0.99	0.99	0.99

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