

# INCOME VOLATILITY: WHOM YOU TRADE WITH MATTERS

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# Income volatility: whom you trade with matters

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Example:

The Ukraine was hardly hit by the recent crisis notably via the trade channel:

➤ Exports are concentrated in the steel sector,

Sectoral  
patterns  
of  
exports

➤ The overwhelming majority of exports go to the EU and other CIS countries

Geographical  
patterns of  
exports

# Openness exposes countries to external shocks

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Trade is expected to have a positive impact on growth ...  
... notably by reducing vulnerability to domestic shocks ...  
... but it can also increase countries' exposure to external shocks, in particular to demand volatility in other countries.

In order to deal with external risk, countries can:

- increase government spending (e.g. Rodrik 1998);
- or act preventively and limit exposure to external shocks.

This paper provides insights on how to limit exposure

# Limiting exposure to external fluctuations: what do we know?

- A lot of the trade-related literature has focused on export diversification in terms of **sectoral patterns of exports**;
- It has been argued that low levels of export diversification make developing countries particularly vulnerable to external shocks (Michaely, 1958; Love, 1986);
- What countries export also matters: countries specializing in volatility sectors (e.g. agriculture, oil) tend to have more volatile economies (e.g. Koren and Tenreyro, 2007).

# Limiting exposure to external fluctuations: what do we know?

## **Correlation in the price movements of export products also matters:**

- If it takes time to reallocate production from one product to another, the **correlation** between individual external shocks matters for volatility in the exporting country ( Brainard and Cooper, 1968);
- Love (1979) showed that product diversification can indeed reduce instability of export earnings if the price movements of new export products are not strongly **correlated** with those already exported.

# So far: little attention in literature on geographical (as opposed to sectoral) patterns of exports

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- ❖ In the past, trade models implicitly assumed that exporters can easily reallocate exports from one importing country to another one.
- ❖ In Melitz (2003) reallocation is costly because of the existence of fixed costs into new markets.
- ❖ The re-direction of exports is costly as it may, for instance, require the re-adaptation of the production chain to a new standard or learning about the laws and the distribution network in the new selected destination.

**=> Geographical patterns of exports matter for income**

# Income volatility: whom you trade with matters

## Question analyzed in this paper

- We apply Markowitz-Tobin definition of portfolio's risk to international trade ...
- ... to examine whether trading partner GDP volatility affects exporters' GDP volatility.
- This approach allows us to distinguish **the role of correlation in the business cycles of trading partners**

## Related literature

- Ahmed (2003) and Calderon et al. (2005) find that trading partners' GDP volatility is positively correlated with exporters' GDP volatility.
- Saborowski et al. (2010) find that geographical diversification does not matter for exporters' GDP volatility

# This paper's contribution to the literature that takes into account geographical patterns

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- ❖ We distinguish between the risk countries face because they trade with more or less volatile partners and the risk they face because **they trade with countries whose economic cycles are more or less correlated**;
- ❖ We carefully address **endogeneity**;
- ❖ Our sample covers a significantly **larger set of countries** (163) than the related literature.



# Outline

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- ❑ Measuring External Risk (our main determinant)
- ❑ What does our variable look like
- ❑ First regressions
- ❑ Robustness checks
- ❑ Controlling for endogeneity
- ❑ Conclusions

# Measuring External Risk

- ❖ In portfolio theory, the portfolio risk that investors face is given by the volatility of their portfolio asset return (Markowitz-Tobin definition of portfolio's risk).
- ❖ We use the Markowitz-Tobin definition of portfolio's risk to measure risk levels of a countries' export portfolio;
- ❖ We assume income from exports to a country to depend on GDP in that country

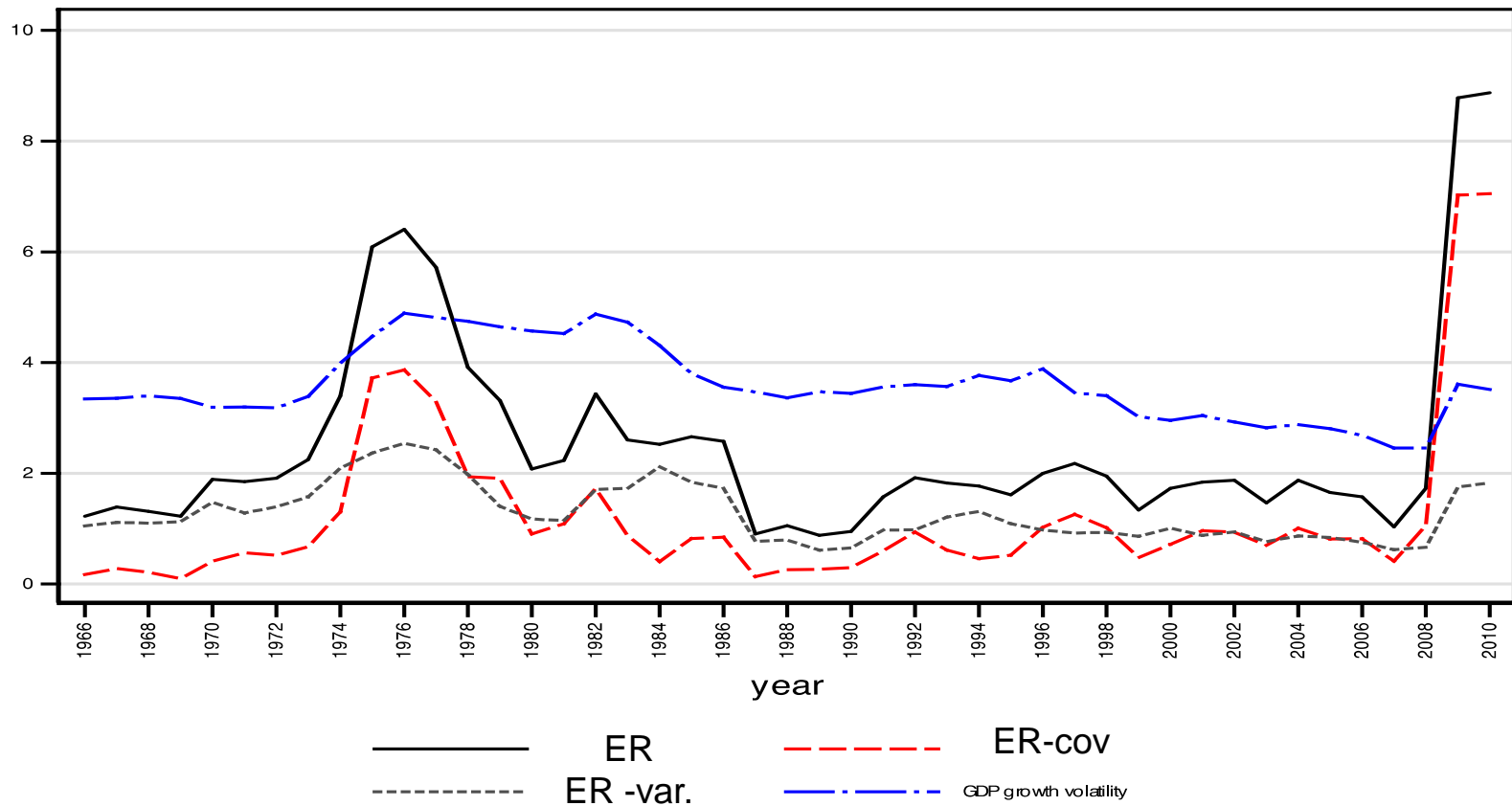
$$ExternalRisk_i = \sum_{j=1}^J \left( \frac{x_{i,j}}{X_i} \right)^2 \text{var}(g_j) + \sum_{j=1}^J \sum_{z=1}^J \frac{x_{i,j}}{X_i} \frac{x_{i,z}}{X_i} \text{cov}(g_j, g_z)$$

with  $j \neq z$

Volatility in  
partner country

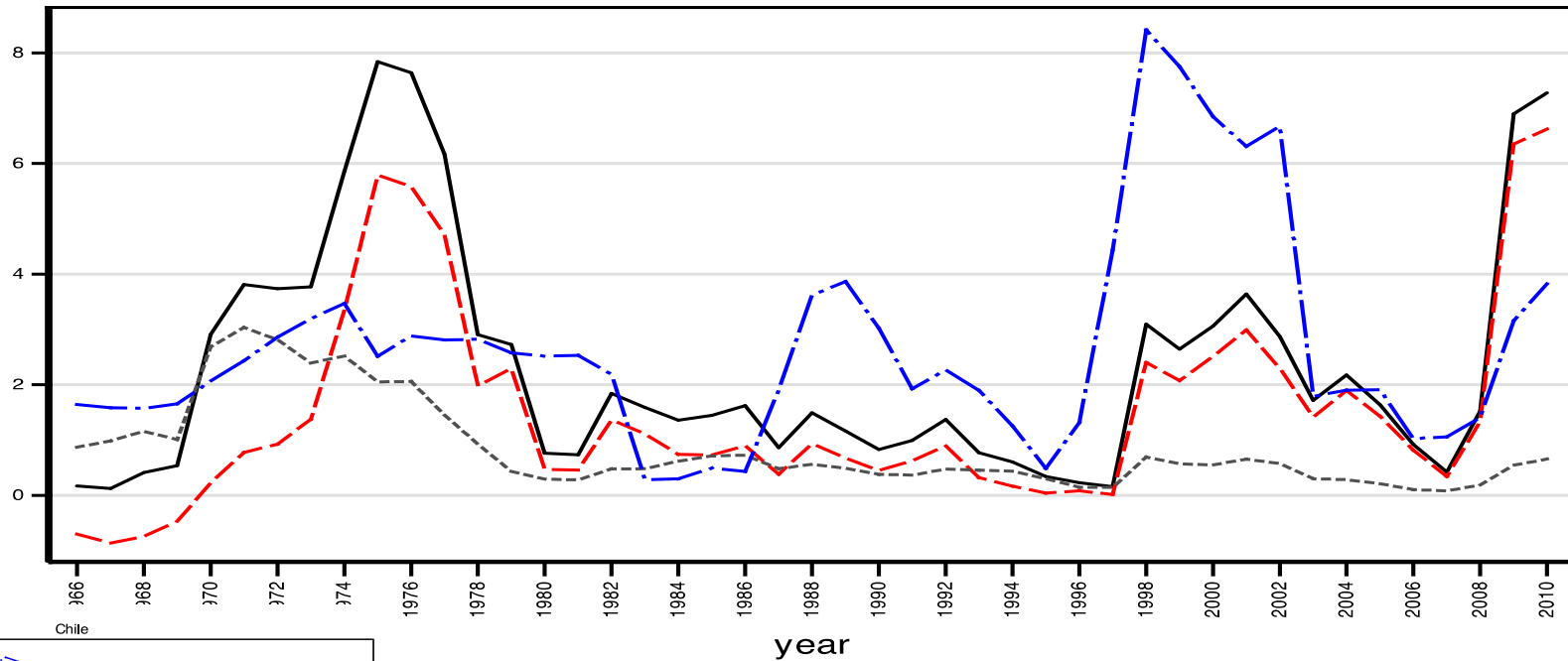
Correlation among  
business cycles in  
partner country

# What does our main variable (External Risk) look like?

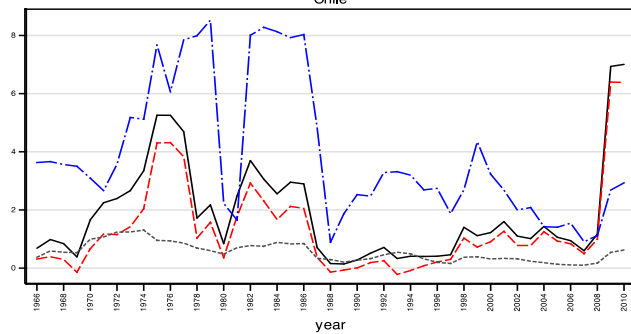


# What does our main variable (External Risk) look like?

Thailand



Chile



— ER  
 - - - ER-var.  
 - - - ER-cov  
 - · - GDP volatility

— ER  
 - - - ER-var.  
 - - - ER-cov  
 - · - GDP volatility

# Econometric specification

$$(i) \text{ GDPvol}_{it} = \beta_0 + \beta_1 \text{ExternalRisk}_{i,t} + \beta_2 X_{it} + \mu_i + \eta_t + u_{it}$$

Control variables:

- Geographical patterns of exports (Hirschman index); (+)
- Population (-)
- GDP per capita (-)
- Government expenditure (-)
- Trade openness (+)
- Financial openness (+)
- Real exchange rate volatility (+)
- Civil wars (+)
- Military intervention (+)
- ToT volatility (+)
- «Interaction term with openness» (+)

# Econometric specifications

$$(i) \quad GDPvol_{it} = \beta_0 + \beta_1 \text{ExternalRisk}_{i,t} + \beta_2 X_{it} + \mu_i + \eta_t + u_{it}$$

$$(ii) \quad GDPvol_{it} = \beta_0 + \beta_1 VAR_{i,t} + \beta_2 COV_{i,t} + \gamma X_{it} + \mu_i + \eta_t + u_{it}$$

Does correlation among  
partner countries'  
business cycles matter?

# First regressions: impact of external risk on income volatility (in exporting countries)

	Pooled, 10 year non-overlapping				
	1	2	3	4	5
External risk	0.323*** [0.0537]	0.460*** [0.0873]	0.587*** [0.184]	0.484*** [0.107]	0.223*** [0.0668]
Hirschmann (products)	3.222*** [0.694]	2.593*** [0.776]	2.538*** [0.779]	2.110*** [0.792]	
GDP per capita	-3.74e-05** [1.47e-05]	-4.57e-05*** [1.34e-05]	-4.51e-05*** [1.32e-05]	-9.08e-05*** [1.92e-05]	-8.50E-06 [1.59e-05]
Population	-7.74e-10** [3.78e-10]	-7.25e-10** [3.20e-10]	-7.82e-10** [3.31e-10]	-8.17e-10* [4.82e-10]	-1.21e-09*** [3.42e-10]
Openness	0.00283 [0.00206]	0.00252 [0.00217]	0.00674 [0.00518]	0.00196 [0.00222]	0.00364* [0.00194]
Government expenditure	0.0167 [0.0199]	-0.00959 [0.0210]	-0.00873 [0.0210]	0.0128 [0.0218]	-0.033 [0.0241]
Financial openness	0.0439 [0.0957]	0.0914 [0.105]	0.084 [0.103]	0.138 [0.138]	-0.0422 [0.131]
Real exchange rate volatility		9.34e-07*** [3.22e-07]	9.60e-07*** [3.24e-07]	2.25E-07 [6.30e-07]	9.97e-07** [4.25e-07]
Openness*ECSS			-0.0014 [0.00167]		
Civil war				0.441 [0.729]	
Military intervention				-0.0119 [0.317]	
ToT volatility					0.0133 [0.0127]
Constant	1.911*** [0.479]	1.332** [0.562]	0.949 [0.712]	1.454** [0.698]	2.238*** [0.633]
Observations	522	275	275	188	150
R-squared	0.268	0.43	0.432	0.522	0.169
First year	1980	1980	1980	1980	1990
Last year	2010	2010	2010	2000	2010
year_ FE	YES	YES	YES	YES	YES

# Robustness checks

	10 years non overlapping			
	Fixed effects	Regional-time dummies	Small countries	Lowincome
ECSS	0.207*** [0.0702]	0.174** [0.0689]	0.201*** [0.0696]	0.197*** [0.0699]
GDP per capita	0.000129*** [4.73e-05]	0.000158*** [5.88e-05]	0.000141** [5.66e-05]	0.000605# [0.000366]
Constant	2.181** [0.953]	1.376 [1.139]	2.304** [1.045]	-0.128 [1.282]
Observations	522	522	483	370
R-squared	0.203	0.24	0.207	0.2
Number of id_reporter	165	165	155	121
First year	1980	1980	1980	1980
Last year	2010	2010	2010	2010
Country FE	YES	YES	YES	YES
year_* FE	YES		YES	YES
year_* region_year_* FE		YES		

Controlling for unobserved country characteristics

Controlling for regional shocks

Controlling for reverse causality



# Correlation among trading partners' cycles matters

	Pooled					
	1	2	3	4	5	
ER-Cov	0.544*** [0.0800]	0.568*** [0.132]	0.703*** [0.219]	0.855*** [0.135]	0.993*** [0.304]	
ER-Var	0.0942# [0.0633]	0.313** [0.123]	0.416 [0.343]	0.0812 [0.151]	0.148 [0.447]	
GDP per capita	-3.70e-05** [1.47e-05]	-4.54e-05*** [1.34e-05]	-4.48e-05*** [1.34e-05]	-9.28e-05*** [2.00e-05]	-0.000107*** [2.67e-05]	
Constant	-0.354 [0.533]	1.223** [0.548]	0.851 [0.748]	0.968# [0.602]	1.227# [0.786]	
Observations		522	275	275	188	167
R-squared		0.292	0.436	0.438	0.555	0.551
Number of id_reporter						
First year		1980	1980	1980	1980	1980
Last year		2010	2010	2010	2000	2000
Country FE						
year_* FE	YES	YES	YES	YES	YES	
year_* region_year_* FE						

# Correlation among trading partners' cycles matters

	Fixed effects	Regional-time dummies	Small countries	Lowincome
	2	3	4	5
Cov	0.417*** [0.140]	0.377** [0.161]	0.406*** [0.143]	0.464*** [0.151]
Var	0.0811 [0.0949]	0.0597 [0.0942]	0.0801 [0.0951]	0.0533 [0.0879]
GDP per capita	0.000117*** [4.46e-05]	0.000156*** [5.73e-05]	0.000126** [5.29e-05]	0.000473 [0.000355]
Constant	1.728* [0.906]	2.174* [1.107]	1.802* [1.000]	-0.475 [1.310]
Observations	522	522	483	370
R-squared	0.211	0.246	0.215	0.212
Number of id_reporter	165	165	155	121
First year	1980	1980	1980	1980
Last year	2010	2010	2010	2010
Country FE	YES	YES	YES	YES
year_* FE	YES		YES	YES
year_* region_year_* FE		YES		

Controlling for unobserved country characteristics

Controlling for regional shocks

Controlling for reverse causality

# One more approach to control for endogeneity: IV-regression

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- ❖ We instrument the covariance component of the *External Risk* variable;
- ❖ As instrument we use the “average distance between the three main export partners of each exporting country”;
- ❖ The “three main partners” are selected on the basis of average trade flows in the period 1966-2010.

# Instrumental variable regression

<b>GDP volatility</b>	1	2	3	4
covariance	0.533*** (0.196)	0.843*** (0.308)	2.880° (2.102)	1.340# (0.883)
variance	0.0788 (0.109)	0.0822 (0.236)	-1.544 (1.619)	-0.376 (0.694)
GDP per capita	-4.62e-05*** (1.56e-05)	-4.71e-05*** (1.80e-05)	-0.000137*** (3.67e-05)	-0.000142*** (3.70e-05)
Constant	1.171** (0.562)	0.779 (0.813)	0.401 (2.159)	3.004*** (0.717)
<b>First stage regression:</b>				
Average distance among three main trading partners	-0.000159*** (3.70e-05)	-0.000117*** (3.51e-05)	-3.37e-05 (2.85e-05)	-6.28e-05* (3.32e-05)
Observations	511	269	184	167
R-squared first	0.290	0.302	0.526	0.492
R-squared second	0.208	0.0845	-0.455	0.392
F-test excluded instruments	18.38	11.03	1.395	3.571

Control variables: Hirschmann (products), population, openness, gvt. Expenditure, financial openness

Added: real exchange rate volatility

Added: civil war, military intervention

Added: 101 volatility; eliminated Hirschmann

## Conclusions:

### Income volatility: Whom you trade with matters

- This paper analyses the effect of demand volatility in partner countries on domestic volatility in exporting countries;
- **Why:** In the presence of fixed costs related to market entry, whom you trade with matters when it comes to adjusting to country specific shocks;
- **How:**
  - We measure exposure to foreign demand shocks by the Markowitz-Tobin measure for portfolio risk related to GDP volatility in partner economies
  - We carefully control for endogeneity
  - We use a sample with large country coverage

## Conclusions:

### Income volatility: Whom you trade with matters

- We find that '***External Risk***' matters for domestic income volatility in exporting countries.
- We find that the correlation between trading partners' cycles is more important in explaining exporters' GDP volatility than the size of cycles in individual trading partners.
- Geographical patterns of exports matter for income volatility!