

# Exchange rate misalignments, growth and institutions.



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# Introduction

It's being acknowledged that the real exchange rate matters for economic growth.

However, the consensus which type of misalignments do matter and why, is yet to be established.

“Washington consensus” misalignments => imbalances => harmful for growth.

Rodrik (BPEA, 2008) and Berg and Miao (IMF WP 10/58): Undervaluations (relative to PPP) are good for growth, while overvaluations are harmful.

# Introduction (Cont.)

D. Rodrik: Undervaluation works via the so called *institutional channel*:

Weak institutional quality => additional tax on tradables => undervaluation as a compensation => higher profits in tradables => higher growth and profits in the overall economy.

➔ The positive impact of undervaluation on growth shall be more pronounced in developing countries (confirmed by Rodrik, 2008, formal model offered).

Assumption of the Rodrik's model: The allocation of capital corresponds to the relative demand for goods and the relative profitability in the tradable and non-tradable sector. However, if institutions are weak, this assumption might not hold and the positive impact of undervaluation might not materialize.

# Our Paper

Attempt to provide an empirical test of the Institutional channel hypothesis in the undervaluation - growth nexus.

1. Recent evidence: Good institutions might matter even for undervaluation-growth relationship.
2. Methodology: Clusters of countries according to their institutional quality (follows Krištoufek and Paulus, Physica A, 2015) => estimate the relationship between undervaluation and growth on clusters.
3. Results.

# Undervaluation, Growth and Institutions: Recent evidence

Fidora, Giordano and Schmitz (ECB WP 2108/2017); Christiansen et al. (NBER 2009):

- Better institutions => less likely certain groups are favoured persistently => misalignments less frequent and policy more active to correct for them.
- Importance of regulatory framework: higher flexibility => adjustment to shocks faster.

Guzman, Ocampo and Stiglitz (NBER WP 23868, 2017):

- For growth, multiple real exchange rates might be optimal, which could be achieved via targeted fiscal policy measures or active industrial policy.
- In their framework (as in Rodrik!) persistence of misalignment isn't problematic.

# Methodology I: Clustering

Follows Paulus and Krištoufek, 2015:

Institutional quality approximated by time series of the Freedom from corruption index by the Heritage Foundation (0-100, higher values => lower corruption)

Common level and common development matters.

Euclidean distance  $d_{xy}$  then measures the distance between time series in different countries:

$$d_{xy} = \sqrt{\sum_{t=1}^T (x_t - y_t)^2}$$

Hierarchical structure derived in using the average linkage clustering approach.

# Methodology I: Clustering

Results: 4 clusters with different levels and dynamics of corruption

Figure 1 from Paulus and Křišťoufek (2015)

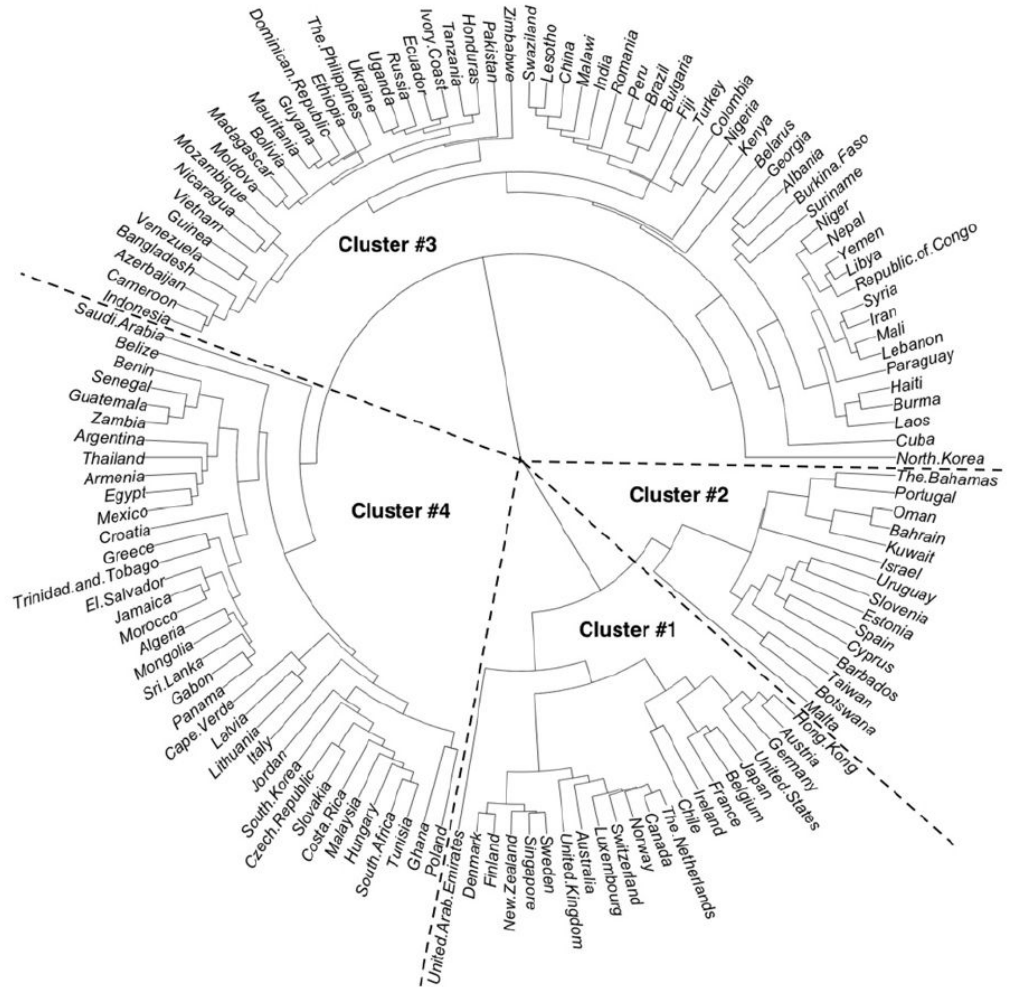


Table 1: Clusters and Basic Statistics

Cluster	Average CPI (1996-2014)	No. of countries
1	82.9	22
2	59.2	13
3	41.3	34
4	24.2	38

# Methodology II: Undervaluation

We follow Rodrik(2008) to obtain an index of undervaluation based on PPP.

Idea - the Penn effect (richer countries = higher price level)

$$\ln(RER_{it}) = \ln\left(\frac{XR_{it}}{PPP_{it}}\right)$$

$$\ln(RER_{it}) = \alpha + \beta_1 \ln(GDPPC_{it}) + \gamma f_t + u_{it}$$

$$\ln(UNDerval_{it}) = \ln(RER_{it}) - \ln(\widehat{RER}_{it})$$

Data: Penn World Tables 9.0, 1980-2014, countries encompassing 95% of the world trade included, dummy variables for the main trading blocks (EU, East Asia and NAFTA);

Variable codes: XR, PL\_GDPO (for the PPP) and RGDP (expenditure side real GDP at chained PPPs).



# Methodology III: Growth Regression

Once we obtained the index of undervaluation, we estimate the cross-country growth regression.

$$\begin{aligned} growth_{it} = & \alpha + \beta_1 \ln(GDPPC_{i,t-1}) + \beta_2 C_{1i} \ln(UNDerval_{it}) + \beta_3 C_{2i} \ln(UNDerval_{it}) \\ & + \beta_4 C_{3i} \ln(UNDerval_{it}) + \beta_5 C_{4i} \ln(UNDerval_{it}) + \phi f_i + \gamma t + u_{it} \end{aligned}$$

$C_{1i} UNDerval_{it}$ ,  $C_{2i} UNDerval_{it}$ ,  $C_{3i} UNDerval_{it}$ ,  $C_{4i} UNDerval_{it}$  are our undervaluation indices multiplied by dummies indicating to which cluster determined by the institutional quality the country belongs.

Estimated on 3-year and 5-year averages.

# Results I

Table 2: Estimation of the real exchange rate adjusted for the Balassa-Samuelson effect

$\ln(GDPPC_{it})$	-0.2355*** (0.0056)
<i>constant</i>	2.9962*** (0.0596)
Observations	6,077
R-squared	0.3869
Country FE	NO
Year FE	YES

Notes: Robust standard errors in parentheses. \*\*\*  $p < 0.01$ , \*\*  $p < 0.05$ , \*  $p < 0.1$ . Results for country and time period dummies are not presented.

# Results II

Table 3: Benchmark results

$\ln(GDPPC_{i,t-1})$	-0.0911*** (0.0051)
$C_{1i} \ln(UNDerval_{it})$	0.0216 (0.0200)
$C_{2i} \ln(UNDerval_{it})$	0.0540*** (0.0184)
$C_{3i} \ln(UNDerval_{it})$	0.0145 (0.0118)
$C_{4i} \ln(UNDerval_{it})$	0.0431*** (0.0076)
<i>constant</i>	0.681*** (0.0399)
Observations	1,488
R-squared	0.338
Country FE	YES
Year FE	YES

Notes: Standard errors in parentheses. \*\*\* p<0.01, \*\* p<0.05, \* p<0.1. Results for country and time period dummies are not presented.

# Robustness checks

1. Include other growth determinants: savings rate approximated via investment ratio ( $SR_{it}$ ), share of government expenditures on output ( $G_{it}$ ), index of human capital ( $HC_{it}$ ), population growth ( $gpop_{it}$ ), openness ( $OPEN_{it}$ ), terms of trade ( $TOT_{it}$ ), and the exchange rate volatility ( $RERvolat_{it}$ ).
2. Estimation on individual clusters.
3. System GMM to tackle potential endogeneity (not in the paper, yet)

# Robustness Checks

	3-year interval						5-year interval	
	Benchmark	Robustness Check					Robustness Check	
Dependent variable	GDP growth							
Independent Variables	I	II	III.a	III.b	III.c	III.d	IV	V
$\ln(GDPPC_{i,t+1})$	-0.0911*** (0.0051)	-0.0815*** (0.0049)	-0.077*** (0.011)	-0.128*** (0.023)	-0.080*** (0.010)	-0.103*** (0.008)	-0.0866*** (0.0048)	-0.0855*** (0.0048)
$C_1 \ln(UNDerval_{it})$	0.0216 (0.0200)	0.0329* (0.0187)	0.047*** (0.015)				0.0233 (0.0203)	0.0299 (0.0201)
$C_2 \ln(UNDerval_{it})$	0.0540*** (0.0184)	0.0635*** (0.0191)		0.056** (0.024)			0.0526*** (0.0186)	0.0643*** (0.0205)
$C_3 \ln(UNDerval_{it})$	0.0145 (0.0118)	0.0403*** (0.0116)			0.033*** (0.012)		0.0282** (0.0123)	0.0421*** (0.0126)
$C_4 \ln(UNDerval_{it})$	0.0431*** (0.0076)	0.0712*** (0.0081)				0.092*** (0.011)	0.0336*** (0.0075)	0.0639*** (0.0083)
Observations	1,488	1,287	256	133	360	538	859	757
R-squared	0.3380	0.3970	0.606	0.611	0.426	0.472	0.4761	0.5291
Country FE	YES	YES	YES	YES	YES	YES	YES	YES
Year FE	YES	YES	YES	YES	YES	YES	YES	YES
Growth determinants	NO	YES	YES	YES	YES	YES	NO	YES

Notes: Standard errors in parentheses. \*\*\* p<0.01, \*\* p<0.05, \* p<0.1. Constant, and coefficients of country and time period dummies are skipped. Growth determinants include savings rate, gov. expenditures, human capital, population growth, openness, terms of trade and RER volatility, all in logs.

# The Way Forward

Sensitivity analysis:

- Alternative indicators of institutional quality
- Account for nonlinearities (as in Geung, Chinn and Nong, *International Finance*, 2017) and exclude outliers (Gonclaves and Rodriguez, 2017)
- Treat potential endogeneity between the institutional quality and growth

# Conclusions

We have investigated the relationship between undervaluation and economic growth.

Unlike the previous literature, we focused on nonlinearities caused by different institutional quality across countries, thus we put the hypothesis of an institutional channel into a test.

We have found that while the relationship between undervaluation and growth remains positive but it differs based on the level of institutional development. Undervaluation is found as the most beneficial for countries with the lowest, and above average level of institutional quality.

Implication: Our results point to the importance of strong institutions not only for growth but for the relationship between undervaluation and growth as well.

**This is the End.**

**Thank you for your attention.**



Table 4: Robustness Checks

	3-year interval						5-year interval	
	Benchmark	Robustness Check					Robustness Check	
Dependent variable	GDP growth							
Independent Variables	I	II	III.a	III.b	III.c	III.d	IV	V
Constant	0.6722*** (0.0399)	0.7631*** (0.0740)	0.675*** (0.115)	1.168*** (0.217)	0.633*** (0.084)	0.760*** (0.066)	0.6416*** (0.0370)	0.7240*** (0.0641)
$\ln(GDPPC_{t,t-1})$	-0.0911*** (0.0051)	-0.0815*** (0.0049)	-0.077*** (0.011)	-0.128*** (0.023)	-0.080*** (0.010)	-0.103*** (0.008)	-0.0866*** (0.0048)	-0.0855*** (0.0048)
$C_1 \ln(UNDerval_{it})$	0.0216 (0.0200)	0.0329* (0.0187)	0.047*** (0.015)				0.0233 (0.0203)	0.0299 (0.0201)
$C_2 \ln(UNDerval_{it})$	0.0540*** (0.0184)	0.0635*** (0.0191)		0.056** (0.024)			0.0526*** (0.0186)	0.0643*** (0.0205)
$C_3 \ln(UNDerval_{it})$	0.0145 (0.0118)	0.0403*** (0.0116)			0.033*** (0.012)		0.0282** (0.0123)	0.0421*** (0.0126)
$C_4 \ln(UNDerval_{it})$	0.0431*** (0.0076)	0.0712*** (0.0081)				0.092*** (0.011)	0.0336*** (0.0075)	0.0639*** (0.0083)
Savings rate		0.0062 (0.0044)	0.011 (0.013)	-0.017 (0.015)	0.008 (0.008)	0.001 (0.007)		0.0084* (0.0046)
Government expenditures		0.0084* (0.0047)	-0.044*** (0.011)	-0.055*** (0.017)	-0.011 (0.009)	0.028*** (0.007)		0.0085* (0.0050)
Human capital		0.0719*** (0.0265)	0.018 (0.032)	0.148 (0.105)	-0.034 (0.054)	0.128** (0.051)		0.0695** (0.0278)
Population growth		-0.0009 (0.0023)	-0.000 (0.002)	0.013** (0.006)	-0.009** (0.004)	-0.006 (0.006)		-0.0031 (0.0025)
Openness		0.0189*** (0.0042)	-0.021** (0.010)	0.052** (0.021)	0.010 (0.007)	0.026*** (0.007)		0.0198*** (0.0045)
Terms of trade		-0.0311 (0.0193)	0.046 (0.047)	0.040 (0.081)	-0.024 (0.035)	-0.068** (0.030)		-0.0782*** (0.0223)
RER volatility		-0.0033* (0.0018)	0.003 (0.003)	0.002 (0.006)	-0.000 (0.003)	-0.009*** (0.003)		-0.0040* (0.0024)

# Robustness Checks