



# Estimating the Constraints to Developing Countries Trade: A Taxonomy

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# The Taxonomy: what are we trying to do

The third report on binding constraints to trade.

The questions:

- *How severe are the various constraints to trade expansion?*
  - ✓ Rank the various constraints.
- *What is the impact of the constraints on trade but also on growth?*
  - ✓ *Aid for trade aims at using trade as an engine for growth.*
  - ✓ *Not trade for itself.*
- *Do constraints to export differ from constraints to imports?*
  - ✓ *Imports and exports are both contributing to economic growth.*
- *How specific are the constraints?*
  - ✓ *Trade-related needs are largely country-specific (2<sup>nd</sup> Global Review).*
  - ✓ *But some countries share important specificities.*

How do we answer them?

- *A cross-country analysis for*
  - ✓ *All types of partner countries*
  - ✓ *Landlocked countries*
  - ✓ *Small and Vulnerable Economies (SVEs)*
  - ✓ *Commodity-exporters*
- *Supplemented by 2 case studies (Azerbaijan and Uganda).*

# Methodology 1/2

- The objective is to identify and quantify the effect of the countries constraints to trade and on economic growth.
- Two step process given constraints can have direct impact on growth and indirect impact through trade on growth.
- First identify and quantify the impact of the constraints on a country's trade.
- Second identify and quantify the impact of the constraints on a country's growth rate.

# Methodology 2/2

- In the paper we apply the Two Stage Least Squares Estimator (TSLS).
- The estimator isolates the explained variation in trade due to the supply-side constraints.
- Uses the explained variation in trade to identify the variation in growth from the supply-side constraints through trade.
- Allows us to calculate the impact of the supply-side constraints.

# Empirical Strategy

- The model's specification of the impact of trade on growth is the following:

- $\Delta\text{GDP}_{it} = f(\text{GDP}_{it-1}, \text{Trade}_{it}, \text{Investment}_{it}, \text{AfT}_{it}, \text{Z}; \beta, \varepsilon) \dots (1)$

where  $\Delta\text{GDP}_{it}$  is the change in real GDP,  $\text{GDP}_{it_0}$  represents initial GDP,  $\text{Trade}_{it}$  is the trade indicator (exports, imports, or openness),  $\text{Investment}_{it}$  is the amount of investment in the country as a share of GDP,  $\text{AfT}_{it}$  is a vector of the Aid for Trade variables affecting GDP growth,  $\text{Z}$  is a vector of other variables possibly affecting GDP growth including a constant;  $\beta$  represents the parameters to be estimated, and  $\varepsilon$  represents the regression error term.

- The first stage is specified as follows:

- $\text{Trade}_{it} = f(\text{GDP}_{it-1}, \text{AfT}_{it}, \text{W}; \delta, \xi) \dots (2)$

where  $\text{Trade}_{it}$  is defined as above;  $\text{AfT}_{it}$  is a vector of the Aid for Trade variables affecting the level of the country's trade;  $\text{W}$  is a vector of variables including all other variables in the model which determine the country's level of trade and a constant;  $\text{GDP}_{it-1}$  represents initial GDP,  $\delta$  are the parameters to be estimated, and  $\xi$  represents the regression error term.

# Details on the estimation

- The motivation for using the TSLS estimator is the presence of an endogenously determined variable in the growth regression, the level of trade.
- Equation (2) explains the trade indicator as a function of the aid-for-trade variables. The purpose is to test explicitly the impact of each binding constraint on trade.
- Always keep the focus on inference and the lessons which can be extracted from this work.
- The final specification of the models was empirical with guidance from past studies.
- Many alternative specifications and variables were tested as robustness checks.

# The Results: the economic growth impact of trade

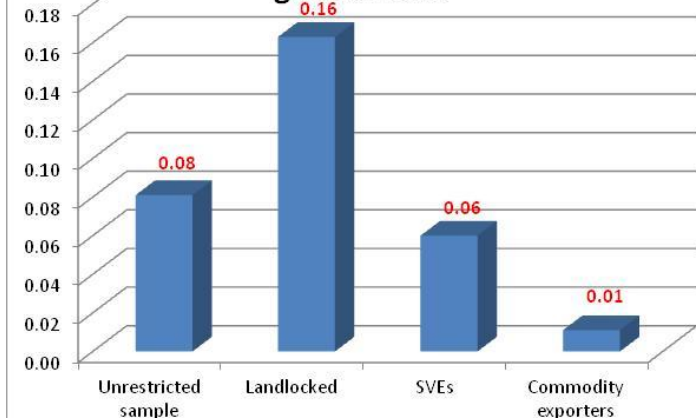
## Trade expansion boosts economic growth

- Not evenly...
- ... But in all country groupings.
- This vindicates the rationale of Aid for Trade.

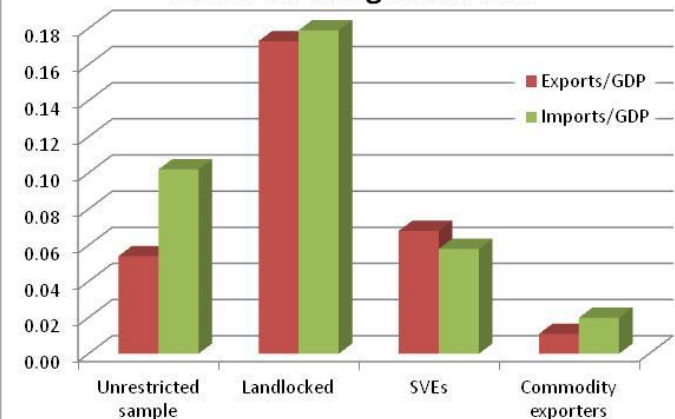
## Both imports and exports have a growth impact

- Do not overlook the role of imports
- Hong Kong declaration versus the Task Force on Aid for Trade:
  - the objective of the Aid for Trade initiative is to help developing countries “expand their trade.” (Hong Kong declaration).
  - “Aid for Trade is about assisting developing countries to increase exports of goods and services” (Task force).

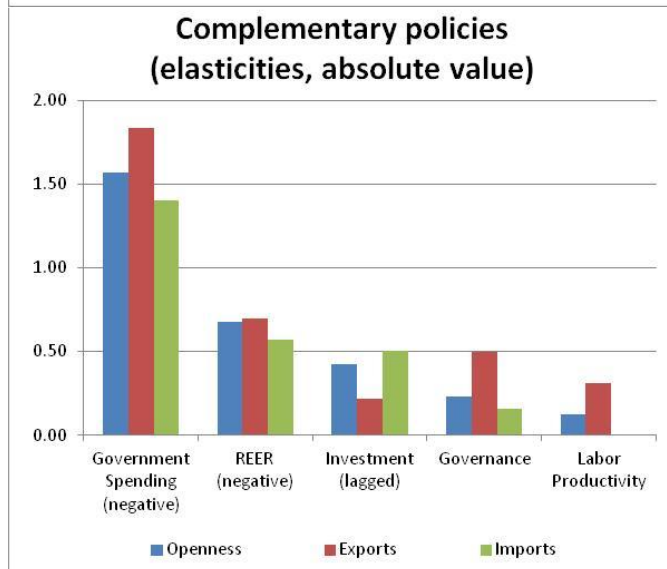
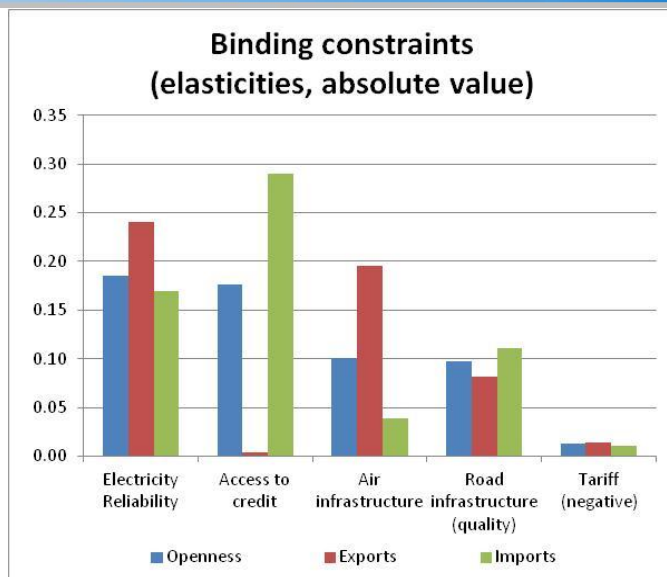
The impact of 1 percentage point increase in the openness ratio on the growth rate



The impact of 1 percentage point increase in the exports and imports ratios on the growth rate



# The Results: Unrestricted sample

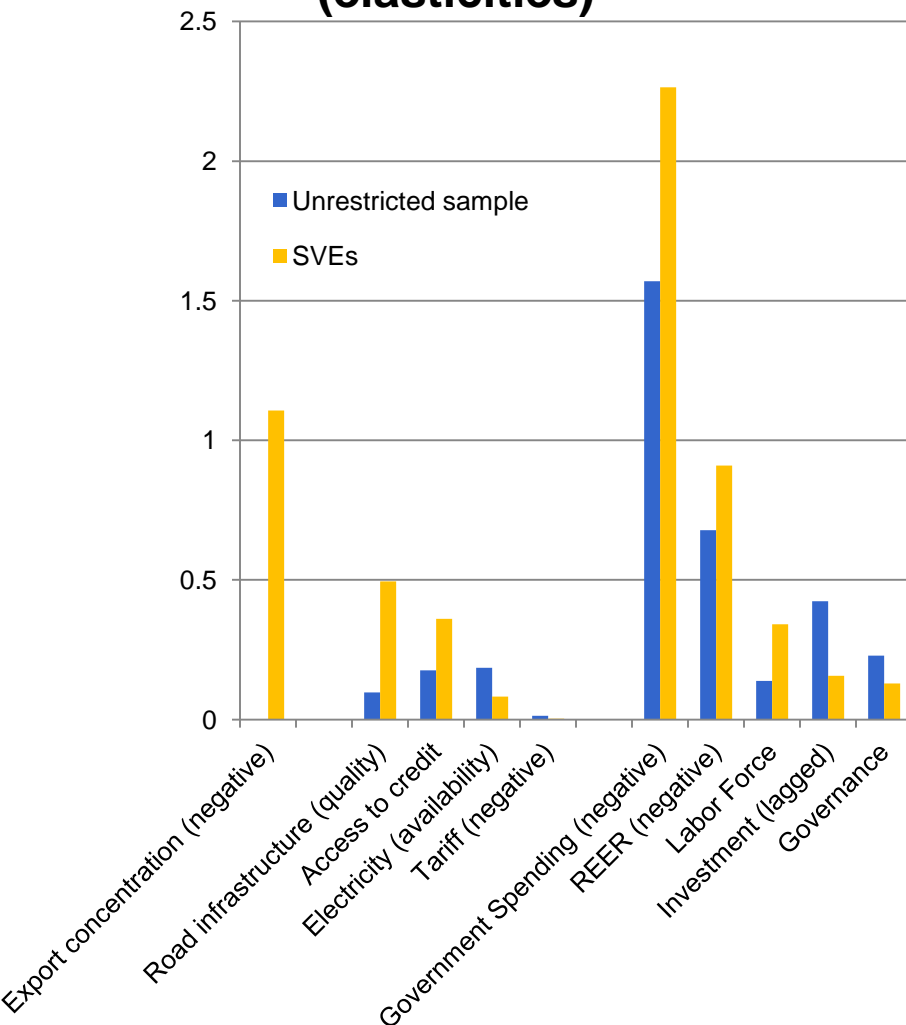


- For all countries for which there are data.
- Constraints differs for imports and exports.
- The most binding constraints to **trade openness** are
  - Electricity
    - Reliability more than availability.
    - Affects both exports and imports.
    - But is the most binding constraints for exports.
  - Access to credit
    - Affects only for imports.
    - The most binding for imports.
- Less binding are
  - Transport infrastructure.
    - Differences air and road.
  - Tariff
    - Negative (but small) impact on trade performance.
    - On both imports and on exports (Lerner).
- Macroeconomic environment is crucial (very large impact).
- Complementary policies are crucial
  - To boost investment (for imports).
  - To increase productivity per worker (for exports).
  - Proxies for quality of institutions and governance (for exports).
- More details in the paper and in appendix.



# The Results: SVEs

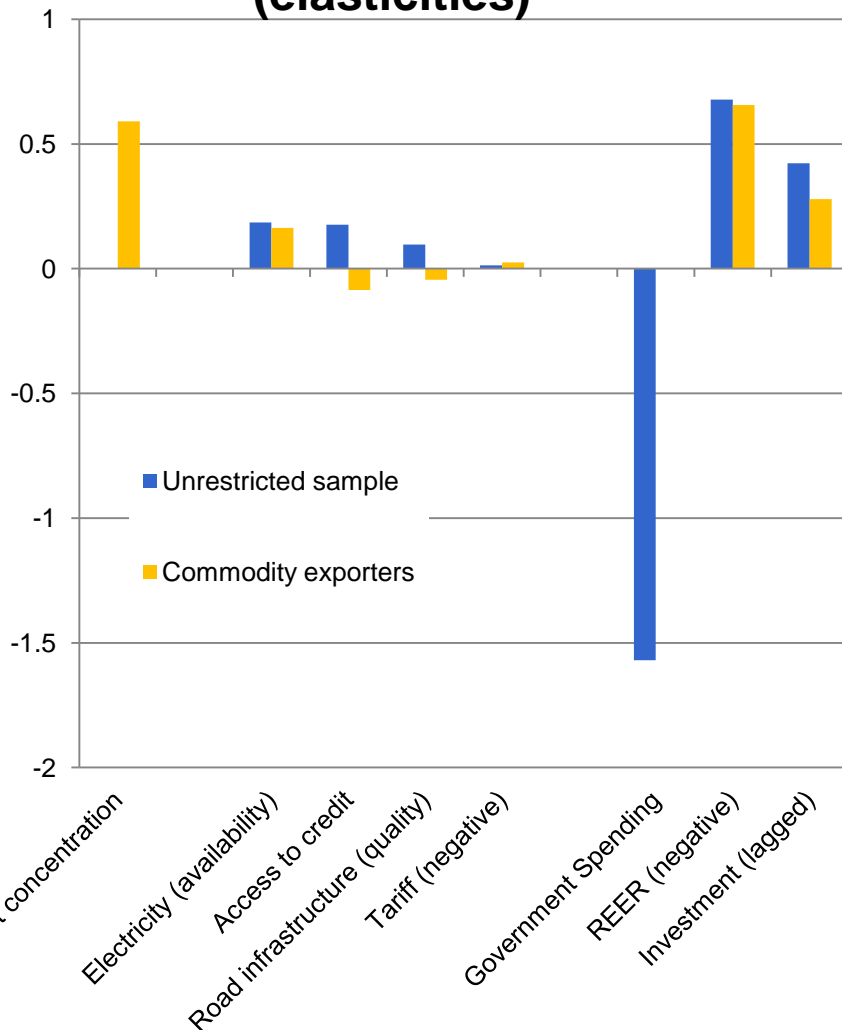
## Impact on the Openness Ratio (elasticities)



- Trade is a :
  - Necessity
    - Small market and production base
    - Export concentration
  - And an engine for growth
- Central to trade performance are
  - Access to credit
    - Both for exports and imports
    - Unrestricted sample: only for imports
  - Infrastructure
    - More transport infrastructure
    - Than Electricity
    - Telecommunication
      - ✓ Significant
      - ✓ But small (0.02).
  - Better policies
    - Fiscal policy
    - Governance (for exports)
- Not binding are:
  - Tariff (insignificant and close to zero)
  - Exchange rate policy
    - Large impact
    - But insignificant.

# The Results: Commodity Exporters

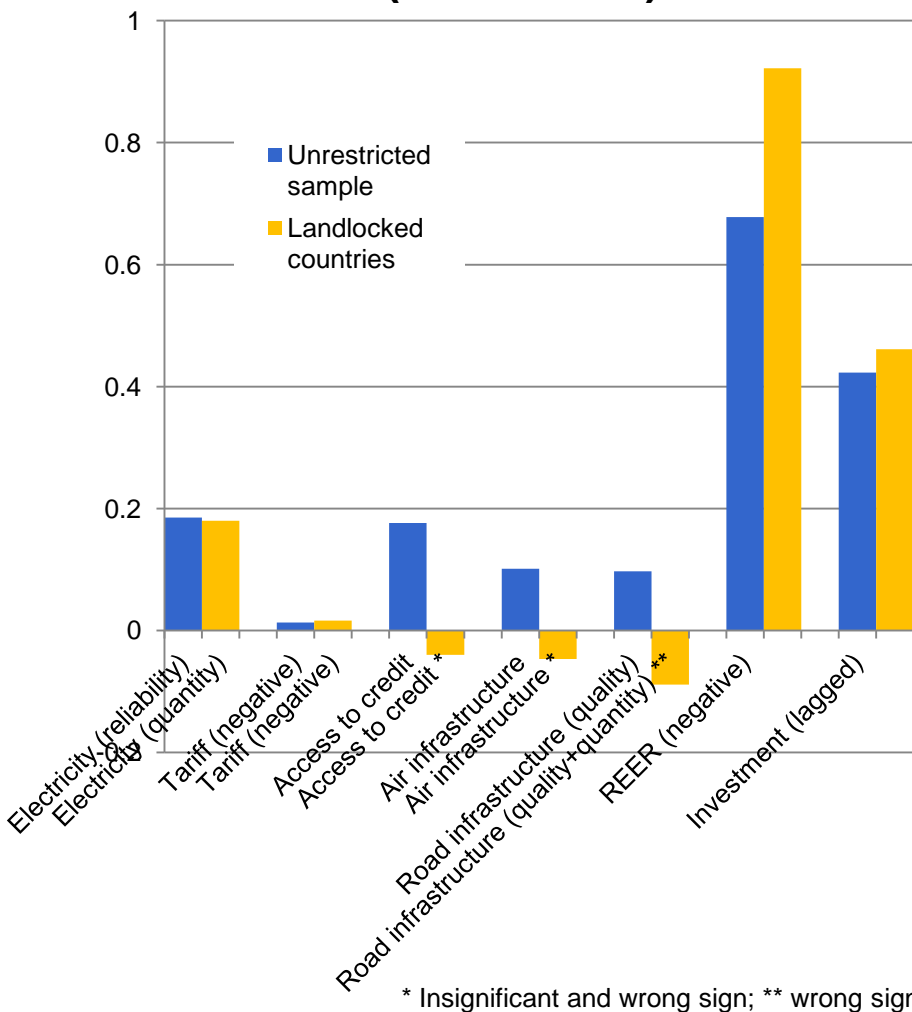
## Impact on the Openness ratio (elasticities)



- Export concentration:
    - Captures a specificity
    - Unlike SVEs affects only exports and is positive
  - Literature on the “natural resource curse” highlights
    - Dutch disease
      - REER has a negative impact
      - But smaller than for unrestrictive sample.
    - Political economy of resource rents
      - Governance
      - Public spending
        - Contrasts with other country grouping
          - ✓ On openness close to zero
          - ✓ Positive and significant for exports
          - ✓ Negative and significant for imports
        - Does it reflect policy to invest in order to smooth the impact of the Dutch disease on exports...
          - ✓ Role of policies that foster investment
          - ✓ Investment significant only for imports
        - ... Or a reversed causality?
- Infrastructure:
  - Electricity (only for exports)
  - Not transport (insignificant and wrong sign)
- Tariff impact
  - Remains small
  - But larger than for other groupings.

# The Results: landlocked countries

## Impact on the Openness Ratio (elasticities)



- The dummies: landlocked are much less open than average developing countries

- Highly significant
- Openness ratio lower by 0.5% of GDP
- Driven by lower export ratio by 0.7% of GDP

- Central to trade performance are

- Electricity (the most binding constraint)
  - More availability than reliability
  - Unrestricted sample: impact on both import and exports
  - Landlocked: significant and large (0.4) only for exports
- Better policies
  - Tariff
  - Macroeconomic policies (exchange rate policy)
  - Policies fostering investment

- Not binding are:

- Access to credit (insignificant and wrong sign)
- Transport infrastructure (either quality or quantity)
  - Wrong sign
  - Very robust
  - More important than infrastructure are
    - ✓ Existence of functioning corridors
    - ✓ Transit countries infrastructure
    - ✓ Regulation
    - ✓ Time...
- These aspects are discussed in the Uganda case study...
- ... and we will discuss the issue later in the workshop.

# Case Study-Uganda: A landlocked country

The experience of Uganda highlights :

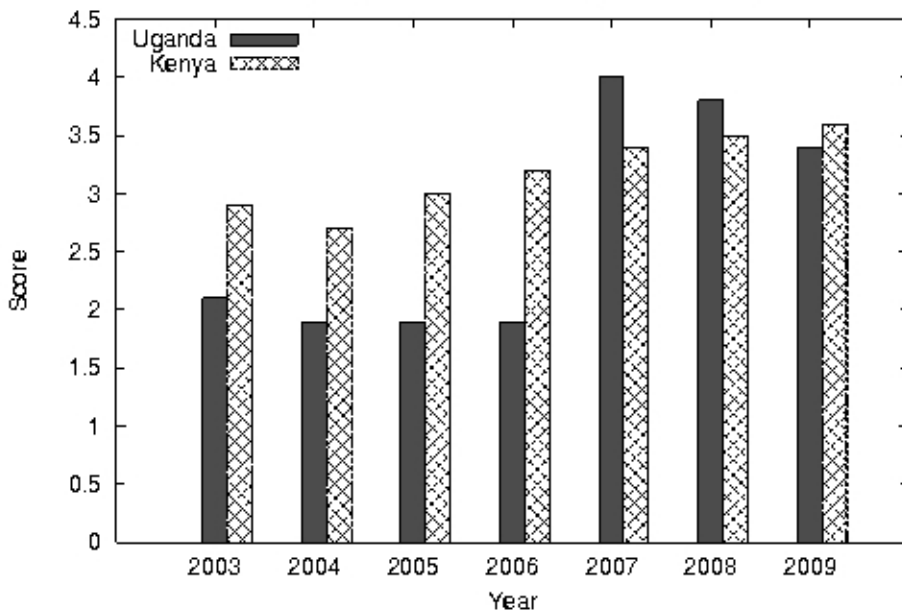
- Importance of identifying the most binding constraint to trade
- Trade reforms of the 1990s did not result in trade expansion and economic growth:
  - The most binding constraints were related to high transport cost, time cost and unpredictability in the delays.
  - But the reforms focused on tariff reforms → the wrong binding constraint.
- Importance of complementary policies
- Broader reforms conducted in the 2000s led to sharp increase in trade and significant export diversification:
  - Regional integration (EAC) played a pivotal role in diversifying exports and
  - Reducing transport costs and time to trade.

# Case Study-Uganda: A landlocked country

## What are the sources of success?

- Export diversification (both in terms of markets and products).
- Improvement of the Northern Corridor.
- Better market regulation of transport sector.
- Reduction of time costs and uncertainty arising from transport time.

Quality of port infrastructure in Uganda and Kenya



➤ Improvements in infrastructure and customs procedures.

➤ Better port quality in Kenya gave easier access to port for Uganda (importance of infrastructure in transit countries).

# Case Study-Azerbaijan: A commodity exporter

## The study of Azerbaijan highlights:

- Importance of export diversification
  - Oil sector represented 95% of total exports in 2008 but employs 1.1% of total workforce.
  - Oil reserves are expected to be exhausted in 20-25 years.
  
- Importance of complementary policies
  - Export diversification can be achieved tackling binding constraints related to:
    - Tax regulations
    - Competition and corruption
    - Access to finance
    - Non-tariff barriers (incl. customs clearances)
    - Dutch disease

# OECD Trade and Agriculture



[www.oecd.org/trade](http://www.oecd.org/trade)

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# Appendix: Unrestricted sample

	Openness	Exports	Imports
Loggdp1	-0.287*** (0.0906)	-0.413*** (0.106)	-0.192** (0.0814)
_l_air_trans_carr_dep	0.101*** (0.0388)	0.195*** (0.0574)	0.039 (0.0343)
_l_roadkm2	0.097*** (0.0280)	0.082** (0.0405)	0.111*** (0.0238)
_l_electric_power_losses_p_out	-0.185*** (0.0666)	-0.240** (0.0984)	-0.170*** (0.0546)
_l_dom_credit	0.176** (0.0866)	0.004 (0.117)	0.290*** (0.0733)
Simple_average3_mfn	-0.013** (0.00561)	-0.014** (0.00670)	-0.011** (0.00506)
_l_gfcf1	0.423* (0.254)	0.218 (0.294)	0.507** (0.228)
_l_property_rights	0.229 (0.167)	0.496** (0.219)	0.159 (0.149)
_l_force	0.138** (0.0674)	0.263*** (0.0857)	0.055 (0.0594)
_l_productivity_per_worker	0.122* (0.0736)	0.309*** (0.0942)	-0.027 (0.0664)
_l_reer	-0.678* (0.367)	-0.696 (0.440)	-0.572* (0.332)
_l_government_spending	-1.570*** (0.510)	-1.840*** (0.571)	-1.404*** (0.479)
Landlocked	-0.501*** (0.126)	-0.709*** (0.179)	-0.359*** (0.113)
Island	0.005 (0.137)	0.019 (0.163)	-0.033 (0.129)
Constant	-2.972 (3.778)	-3.994 (4.230)	-4.095 (3.493)
Observations	175	176	176
R-squared	0.454	0.411	0.503
Trade variable in growth estimate	0.081 (0.0885)	0.054 (0.0607)	0.102 (0.127)



# Appendix: Landlocked countries

	Openness	Exports	Imports
Loggdp1	0.012 (0.0237)	-0.013 (0.0255)	0.028 (0.0311)
l_roadkm2	0.092*** (0.0281)	0.070* (0.0381)	0.152*** (0.0347)
l_roadpaved	-0.181*** (0.0431)	-0.191*** (0.0501)	-0.251*** (0.0483)
l_air_trans_carr_dep	-0.047 (0.0546)	-0.191 (0.0591)	-0.251*** (0.0483)
l_electric_cons_percap	0.180*** (0.0265)	0.397*** (0.0308)	0.058 (0.0388)
l_dom_credit	-0.040 (0.0413)	-0.054 (0.0494)	-0.026 (0.0475)
Simple_average3_mfn	-0.016*** (0.00535)	-0.011 (0.00837)	-0.018** (0.00848)
l_gfcf1	0.461*** (0.0712)	0.306*** (0.0853)	0.533*** (0.111)
l_reer	-0.922*** (0.131)	-0.860*** (0.214)	-0.843*** (0.231)
Constant	-10.77*** (0.764)	-12.43*** (1.005)	-10.66*** (1.089)
Observations	66	67	66
R-squared	0.922	0.949	0.780
Trade variable in growth estimate	0.163 (0.189)	0.173 (0.193)	0.179 (0.217)

# Appendix: SVEs

	Openness	Exports	Imports
Loggdp1	-0.163 (0.117)	-0.209 (0.160)	-0.145 (0.105)
l_roadpaved	0.495*** (0.162)	0.422** (0.0306)	0.538*** (0.151)
l_electric_cons_percap	0.082 (0.0753)	0.175* (0.0948)	0.016 (0.0767)
l_dom_credit	0.360** (0.155)	0.366* (0.202)	0.343** (0.132)
Simple_average3_mfn	-0.003 (0.0247)	-0.001 (0.0287)	-0.004 (0.0223)
l_gfcf1	0.157 (0.311)	0.067 (0.365)	0.215 (0.294)
l_property_rights	0.129 (0.168)	0.589*** (0.224)	-0.0485 (0.159)
l_l_force	0.341* (0.185)	0.600** (0.237)	0.232 (0.170)
l_reer	-0.910 (0.566)	-0.864 (0.716)	-0.784 (0.512)
l_government_spending	-2.264*** (0.803)	-2.448** (0.964)	-2.145*** (0.727)
l_herfindhal	-1.107*** (0.403)	-0.839* (0.498)	-1.328*** (0.465)
Constant	-7.676** (3.815)	-12.160** (5.274)	-7.679** (3.382)
Observations	123	123	124
R-squared	0.396	0.326	0.441
Trade variable in growth estimate	0.060* (0.0606)	0.068* (0.0715)	0.058** (0.0613)

# Appendix: Commodity Exporters

	Openness	Exports	Imports
loggdp1	-0.128*** (0.0196)	-0.116*** (0.0289)	-0.143*** (0.0243)
l_road_paved	-0.044 (0.0263)	-0.141*** (0.0375)	0.018 (0.0319)
l_electric_cons_percap	0.163*** (0.0215)	0.400*** (0.0275)	0.025 (0.0240)
l_dom_credit	-0.085** (0.0391)	-0.355*** (0.0711)	0.0431 (0.0400)
Simple_average3_mfn	-0.025*** (0.00422)	-0.023*** (0.00623)	-0.023*** (0.00476)
l_gfcf1	0.279*** (0.0631)	0.108 (0.0990)	0.464*** (0.0753)
l_reer	-0.656*** (0.162)	-0.864*** (0.297)	-0.460*** (0.170)
l_government_spending	0.002 (0.101)	0.355*** (0.123)	-0.243** (0.118)
l_herfindahl	0.590*** (0.0843)	1.203*** (0.0979)	-0.004 (0.0906)
Constant	-8.693*** (0.684)	-9.204*** (1.339)	-10.14*** (0.705)
Observations	99	100	100
R-squared	0.830	0.843	0.787
Trade variable in growth estimate	0.011 (0.102)	0.011 (0.077)	0.020 (0.148)

# Effects of Trade on Growth

- The impact of trade on the economy's growth rate is captured by  $\hat{\alpha}_2$ . Since the change of the growth rate in GDP when the trade indicator changes can be expressed as:

$$\frac{\partial \Delta GDP}{\partial Trade} = \hat{\alpha}_2, \quad (3)$$

# Effects of the Constraints on Trade and Growth

- The impact of the  $k^{\text{th}}$  binding constraint on trade and on the economy's growth rate can be expressed as the following:

$$\begin{aligned}\frac{\partial \Delta GDP}{\partial W_k} &= \frac{\partial \Delta GDP}{\partial X_k} + \frac{\partial \Delta GDP}{\partial Trade} \frac{\partial Trade}{\partial W_k} \\ &= \underbrace{\hat{\beta}_k}_{\text{Direct effect}} + \underbrace{\hat{\alpha}_2 * \hat{\delta}_k}_{\text{Indirect effect}},\end{aligned}$$

# Details on the econometric methodology 1/2

- The motivation for using the TSLS estimator is the presence of an endogenously determined variable in the growth regression, the level of trade.
- Previous literature such as Frankel and Romer (1999) has documented reverse causality between trade levels and GDP growth. The TSLS estimator is used as a consequence of the presence of reverse causality between the variables included in the regression model.
- Reverse causality violates the first assumption of the classical linear regression model. That is, one of the reasons as to why the expected value of the regression error term given the data is not equal to zero.
- When the first assumption of the linear regression model is violated the parameter estimates will not be consistent and in large samples will not approach the true population values. This bias persists and must adjust the estimation technique to correct this problem.

# Details on the econometric methodology 2/2

- A solution is to use variables called "instruments" to obtain consistent parameter estimates of the unknown coefficients of the population regression function. These instruments must satisfy two conditions.
  - First, the instruments must be correlated with the endogenous variable.
  - Second, the instruments must not be correlated with the regression's error term.
- The TSLS estimator uses the instruments in the first stage to decompose the endogenous variable into two components by regressing the endogenous variable on the instruments and all other exogenous variables in the model.
- This regression isolates the variation of the endogenous variable accounted by the instruments from the residual variation which may still be correlated with the regression model's error term.
- The second stage uses the isolated variation of the endogenous variable, no longer correlated with the regression model's error term, to estimate the parameters of interest.

# Dealing with endogeneity

- Equation (2) explains the trade indicator as a function of the aid-for-trade variables. The purpose is to test explicitly the impact of each binding constraint on trade.
- Most of these variables change slowly through time. We consider them fixed in the short run (contemporaneously to the trade indicator) and thus exogenous.
- In Equation (1), predicted values coming from equation (2) for the trade indicator (exports, imports, or openness) are used. As a result, as much endogeneity as possible has been removed from the trade indicator (which is the focus variable with the ones describing the binding constraints).
- The endogeneity is purged out of GDP because lagged GDP is used (no endogeneity between variables at different periods in time).
- Some endogeneity issues could still be present regarding the shares of investment and government spending in the growth equation, but these should be minimal.



# Tackling the issues 1/2

- There is no universally accepted growth theory.
- In total, about 145 different variables have been used in past studies which “seem” to affect growth.
- The final specification of the models was empirical with guidance from past studies.
- Always keep the focus on inference and the lesson which can be extracted from this work.
- We talked about endogeneity of trade, but what about endogeneity of investment or government expenditures?
  - Cannot claim any causality only correlation.
- What about parameter heterogeneity?
  - Not only did we investigate a “full” sample but also different country groupings (landlocked, commodity exporters, SVEs).
  - Looking for differentiated impacts of the explanatory variables.

# Tackling the issues 2/2

- **What about fixed effects estimation?**
  - Trade-off between reducing bias but losing efficiency.
  - With inference in mind opted for increasing efficiency.
  - No fixed effects.
  - Did look for robustness by testing different variables measuring similar aspects of the constraints.
- **Why not use another econometric estimator?**
  - Capturing the short-run dynamics instead of long-run impact.
  - Assumptions related to instruments not appropriate since lagged levels of the variables included could still affect the variables of interest (e.g. education).
  - Possibility of weak instruments which distort the t-distributions and confound inference.