

Power Sector Reforms and Technological Change: Evidence from Arab League Members¹

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¹ The views expressed in these slides are our own and do not necessarily reflect the views of Banque de France.

- Introduction
- Related Literature & Contribution
- Data
- Empirical Strategy
- Results
- Conclusion

- Frequent power outages, poor power distribution , and higher loads on power generation networks \Rightarrow Adopting power sector reforms in the Arab countries \Rightarrow higher generation capacity, technical efficiency and inducing economic growth.
 \Rightarrow Have such reforms led to stimulate the technological development in the Arab countries?
- Main Objective \Rightarrow Examining the effect of hybrid power sector reforms on high-tech exports, using macroeconomic data for 18 Arab League member states during the period 1982-2013.

- Nagayama (2009) \Rightarrow The liberalization of the power sector increases electricity prices in developing countries. On the contrary, in developed countries, it decreases the electricity prices.
- Zhang, Parker, and Kirkpatrick (2005) \Rightarrow establishing an independent regulatory authority has led to higher generation capacity and capital utilization.
- Anaya (2010) \Rightarrow the Government and producers benefited the most due to the regulation and consumers the least due to price increases.

- The first paper to study the effect of power sector reforms on high-tech exports.
- Applying a new methodology (IV-2SLS) on the new research question
- Introducing new empirical evidence using the Arab Countries

- High-tech exports : the World Development Indicators (WDI)
- Hybrid power sector reforms : Dataset constructed by Urpelainen and Yang (2019).
- Gross capital formation, Gross tertiary school enrollment, FDI inflows, GDP : the World Development Indicators (WDI)
- Imports of goods and services, R&D expenditure, ICT imports : the World Development Indicators (WDI)
- The rule of law, economic freedom (financial, investment ..) : the Heritage Index of Economic Freedom dataset
- Polity IV dataset : the Center for Systematic Peace.

- The benchmark OLS equation is

$$Exp_{i,t} = \alpha_0 + \alpha_1 \mathbf{Reform}_{i,t-3} + \beta_1 \mathbf{X}'_{i,t} + \gamma_i + \varphi_t + \varepsilon_{i,t} \quad (1)$$

- $Exp_{i,t} \Rightarrow$ High-tech exports
- $\mathbf{Reform}_{i,t-3} \Rightarrow$ power sector reforms lagged by three years
- $\mathbf{X}'_{i,t} \Rightarrow$ a set of covariates
- $\gamma_i \Rightarrow$ country fixed effect
- $\varphi_t \Rightarrow$ year fixed effect

Threats to identification strategy \Rightarrow (reverse causality & Omitted variable bias).

IV Approach

- The benchmark equation is

$$Exp_{i,t} = \alpha_0 + \alpha_1 \widehat{Reform}_{i,t-3} + \beta_1 \mathbf{X}'_{i,t} + \gamma_i + \varphi_t + \varepsilon_{i,t} \quad (2)$$

$$Reform_{i,t-3} = \lambda_0 + \lambda_1 Neighbour's\ Reform_{i,t-3} + \mu_{i,t} \quad (3)$$

- Neighbour's $Reform_{i,t-3} \Rightarrow$ power sector reforms of neighboring countries (Instrumental Variable)
- $\gamma_i \Rightarrow$ country fixed effect
- $\varphi_t \Rightarrow$ year fixed effect

Relevance \Rightarrow the theory of regulatory competition

Exogeneity \Rightarrow Neighbors exogenous shocks

Baseline OLS estimates

Dependent Variable: High-Tech Exports (% of manufacture exports)				
	(1)	(2)	(3)	(4)
Power Sector Reform _{t-3}	0.430** (0.198)	0.430 (0.265)	0.295* (0.169)	0.295 (0.248)
Capital Formation	-0.070* (0.039)	-0.070 (0.076)	-0.094*** (0.035)	-0.094 (0.062)
Land per inhab.	74.89*** (19.07)	74.89** (25.05)	58.14*** (17.77)	58.14** (22.39)
ln(Real GDP)	2.636 (1.718)	2.636 (2.075)	1.691 (1.398)	1.691 (1.702)
Polity IV	0.097 (0.095)	0.097 (0.101)	0.057 (0.084)	0.057 (0.087)
School Enrollment	0.029 (0.035)	0.029 (0.078)		
Openness			0.071*** (0.022)	0.071* (0.039)
Observations	196	196	255	255
Fixed Effects	c, y	c, y	c, y	c, y
Clustered SE	No	Yes	No	Yes
R ²	0.28	0.28	0.22	0.22

P-value in parenthesis. * Significant at the 10 percent level, ** Significant at the 5 percent level, *** Significant at the 1 percent level.

IV estimates

Second stage: Dependent variable is High-Tech Exports				
	(1)	(2)	(3)	(4)
Power Sector Reform _{t-3}	2.986** (1.495)	2.986** (1.422)	2.377** (1.156)	2.377** (1.070)
Capital Formation	-0.089* (0.052)	-0.089 (0.073)	-0.135*** (0.049)	-0.135* (0.081)
Land per inhab.	126.8*** (38.95)	126.8*** (33.66)	100.4*** (31.67)	100.4*** (30.61)
ln(Real GDP)	6.716** (3.252)	6.716** (3.204)	5.716** (2.782)	5.716* (3.180)
Polity IV	0.007 (0.135)	0.007 (0.302)	-0.048 (0.117)	-0.048 (0.254)
School Enrollment	-0.028 (0.056)	-0.028 (0.101)		
Openness			0.095*** (0.030)	0.095* (0.051)
First stage: Dependent variable is Power Sector Reform _{t-3}				
Power Sector Reform in neighbouring countries _{t-3}	0.054** (0.025)	0.054*** (0.016)	0.063** (0.024)	0.063*** (0.020)
Observations	196	196	254	254
Fixed Effects	c, y	c, y	c, y	c, y
DW Hausman Test	0.012	0.261	0.016	0.278
Kleibergen-Paap F-Stat	-	11.02	-	10.27
Clustered SE	No	Yes	No	Yes

P-value in parenthesis. * Significant at the 10 percent level, ** Significant at the 5 percent level, *** Significant at the 1 percent level.

- The OLS and an IV approach \Rightarrow a positive and significant impact of power sector reforms on high-tech exports
- Robust results \Rightarrow no confounding effects leading to falsely attributing the effect of hybrid power sector reforms on high-tech exports
- Power sector reforms \Rightarrow inducing technological development and, ultimately, increasing competitiveness in foreign markets.