Statistical Indicators of Inclusive and Sustainable Industrialization

Forecasting the progress on the SDG target 9.2 in LDCs

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Inclusive and sustainable industrial development (ISID)

- UNIDO's primary objective is to promote ISID and support it in developing countries and in economies in transition through structural changes.
- ISID implies that **all parts of society** benefit from industrial progress while helping reduce absolute poverty and inequality.
- A **sustainable manner of industrialization** addresses the need to decouple the prosperity generated from industrial activities from excessive natural resource use and negative environmental impacts.

Sustainable Development Goal 9 (SDG9)

- Build resilient infrastructure, promote **inclusive and sustainable industrialization** and foster innovation

UNIDO as a custodian agency for SDG 9 indicators

Indicators	Target of measures
9.2.1 Manufacturing value added (share in GDP, per capita)	• **Absolute and relative volume of production** • **Relative importance of manufacturing** • **Inequality among the nations**
9.2.2 Manufacturing employment, in percent to total employment	• **Contribution of manufacturing in job creation**
9.3.1 Percentage share of small-scale industries in total industry value added	• Size and contribution of small-scale industries
9.3.2 Percentage of small-scale industries in loan or line of credit	• Access of small-scale industries to financial services
9.4.1 CO_2 emission per unit of value added	• **Environment sustainability and energy efficiency**
9.b.1 Percentage share of medium and high-tech (MHT) industry value added in total value added	• **Technological development and innovation in manufacturing**

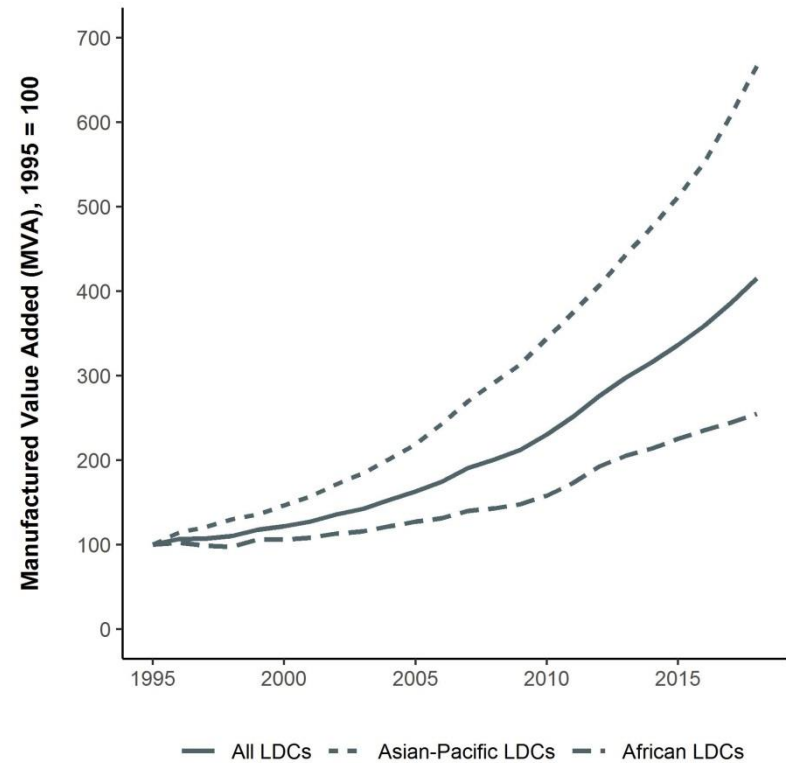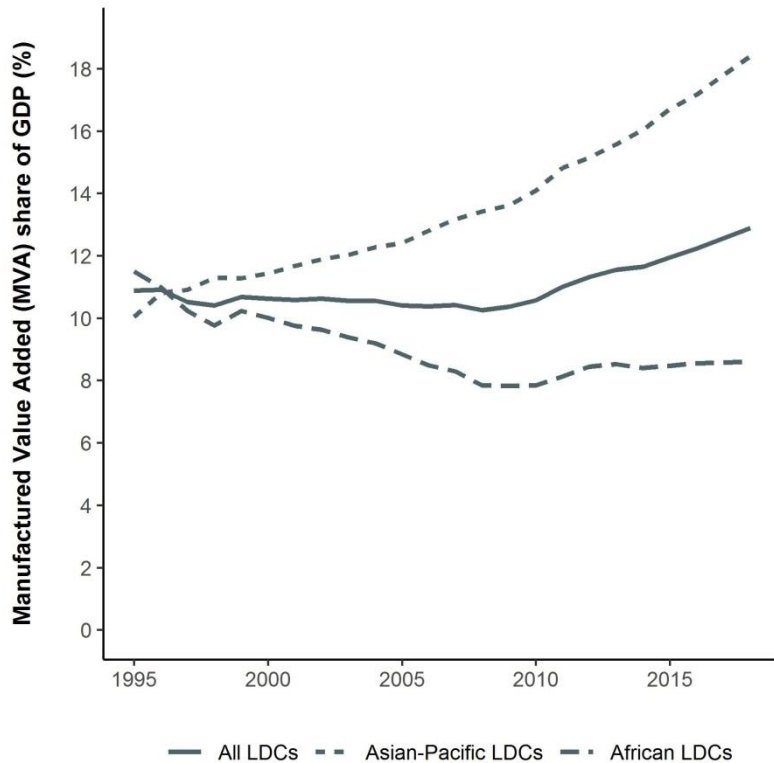| SDG Targets	Indicators
9.2 Promote inclusive and sustainable industrialization and, by 2030, significantly raise industry's share of employment and gross domestic product, in line with national circumstances, and **double its share in least developed countries**	**9.2.1** Manufacturing value added (share in GDP, per capita)
	9.2.2 Manufacturing employment, in percent to total employment

What are the prospects of LDCs to reach the SDG target 9.2?

Baseline - Manufacturing in LDCs (1)

- Despite hosting 10% of population, only 0.8% of worldwide MVA

- More than 50% of global manufacturing by developed countries

- LDCs became even less significant on global scale over last few years

- But able to increase MVA/GDP from 11.5% to 12.9% (2007-2017)

- Vast differences within group of LDCs

- Asian-Pacific LDCs' manufacturing grew 8.4% 2010-2017 (61.7% of LDC MVA)

- African LDCs' MVA share stagnated

Baseline - Manufacturing in LDCs (2)

SDG Target 9.2

"Promote inclusive and sustainable industrialization and, by 2030, significantly raise industry's share of employment and gross domestic product, in line with national circumstances, and double its share in least developed countries"

LDC Group	MVA Share 2017	Target Share 2030	Required Average Annual Growth Rate
All LDCs	12.6%	23.9%	5.1%
African LDCs	8.6%	16.9%	5.4%
Asian-Pacific LDCs	17.8%	33.4%	5.0%

Considered Variables

- Driving factors of Industrialization (mainly based on Haraguchi et al., 2019 & Newman et al., 2016)
  - Investment (gross capital formation, foreign direct investment, …)
  - State of industrial development (MVA/GDP, employment, …)
  - Economic and political stability (REER, regime change, ..)
  - Social aspects (years of education, age dependency ratio, ..)
- Selected variables for statistical model:
  - Investment (FDI per capita, gross domestic savings)
  - Macroeconomic stability (interest payments on foreign debt)

Chosen Variables

- Overall
  - Data availability
  - Problem of aggregation
  - Some variables more important in later stages of industrialization
- Foreign Direct Investments (positive impact on MVA)
  - Investment for capacity building assuming sound policy plan
  - Indicator of secure business environment
- Gross Domestic Savings (positive impact on MVA)
  - Linked to domestic investment
- Interest Payments on External Debt (negative impact on MVA)
  - Fiscal ability to strengthen industry
  - Indicator of macroeconomic stability

Forecasting the SDG target 9.2

- Univariate approach is too simplistic
- Vector autoregressive (VAR) approach suffers from over-fitting
- Solution: model including a-priori information as well as multiple variables → **Bayesian VAR model**

- Variables: MVA share in GDP, FDI per capita, GDS and interest payments on external debt
- Data availability: 45 countries over the time frame from 1995 to 2017
- Some data points were imputed through exponential moving average imputation

The Bayesian VAR model

- It is based on the VAR model

$$y_t = c + A_1 y_{t-1} + A_2 y_{t-2} + \cdots + A_p y_{t-p} + \epsilon_t, \quad t = 1, \ldots, T$$

- Treats parameters as random variables

- Generally better predictive performance than classic VAR model

- Updates probability distribution of unobserved parameters

- Posterior = Prior x Likelihood

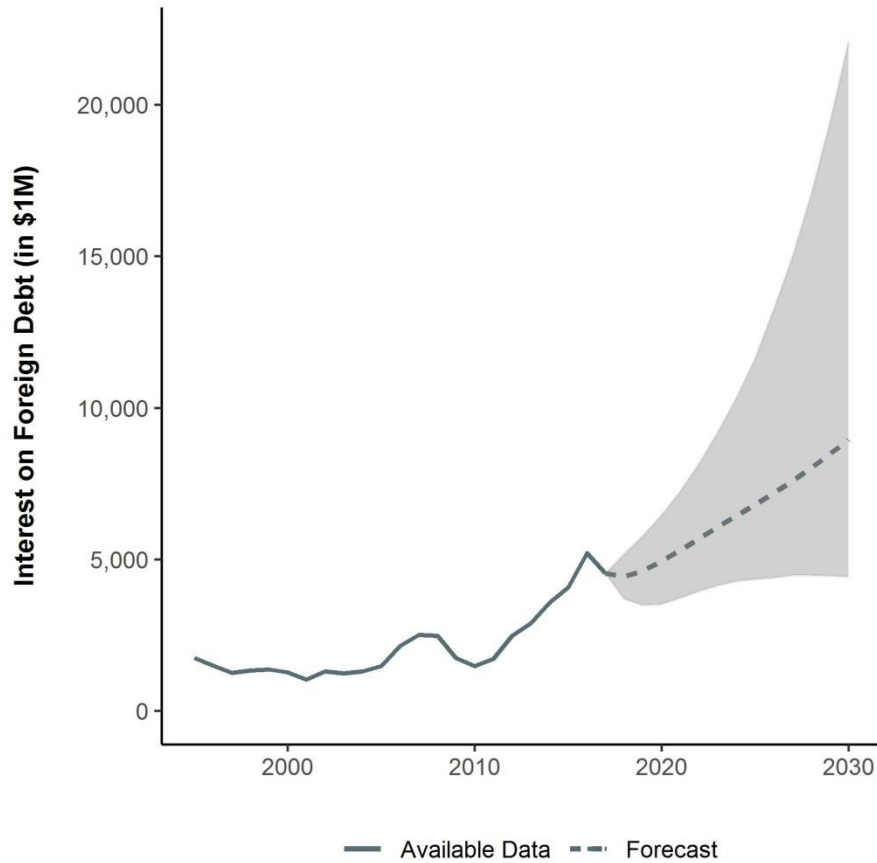$$p(\beta, \Sigma | y) = \frac{p(\beta, \Sigma) L(y | \beta, \Sigma)}{p(y)} \propto p(\beta, \Sigma) L(y | \beta, \Sigma),$$

The chosen prior is the Minnesota prior based on the normal distribution.
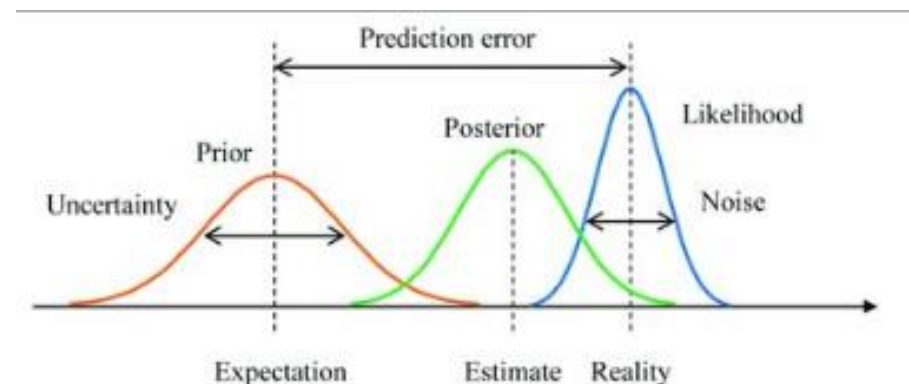
Forecasting the SDG target 9.2 in LDCs
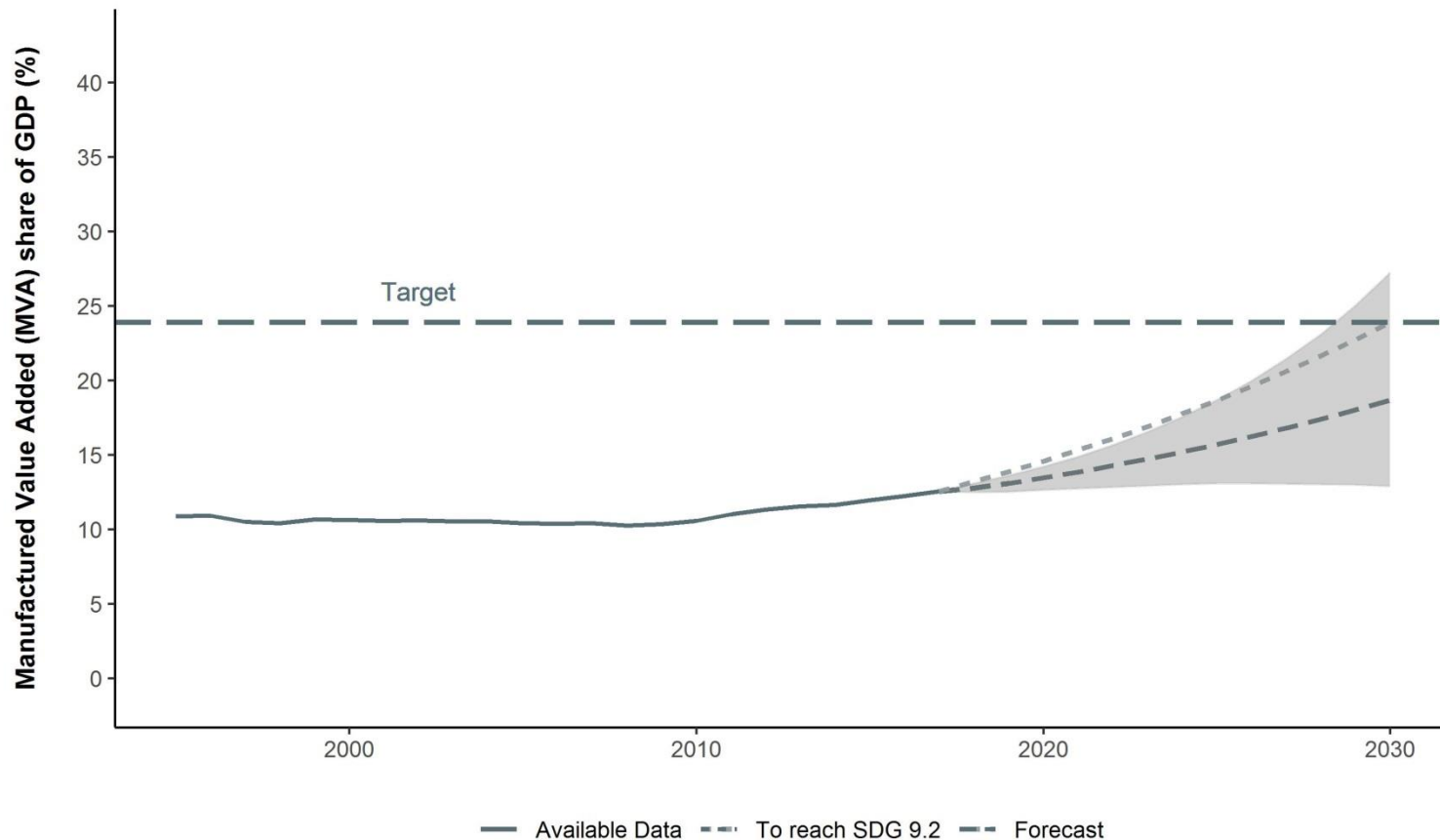
Explanatory variables
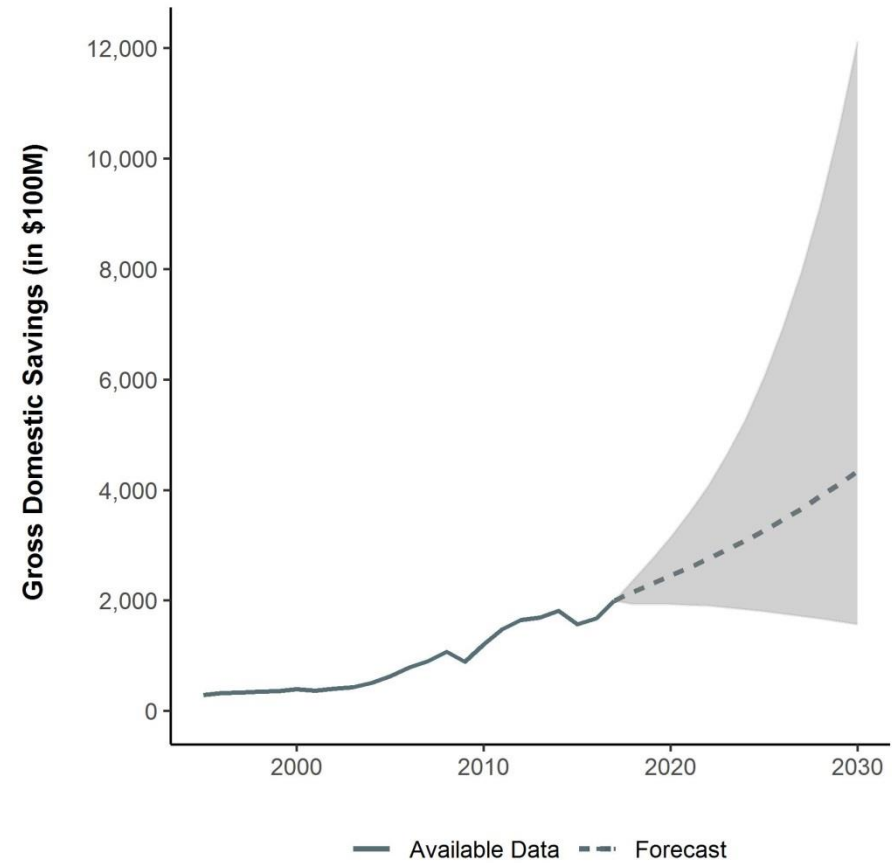
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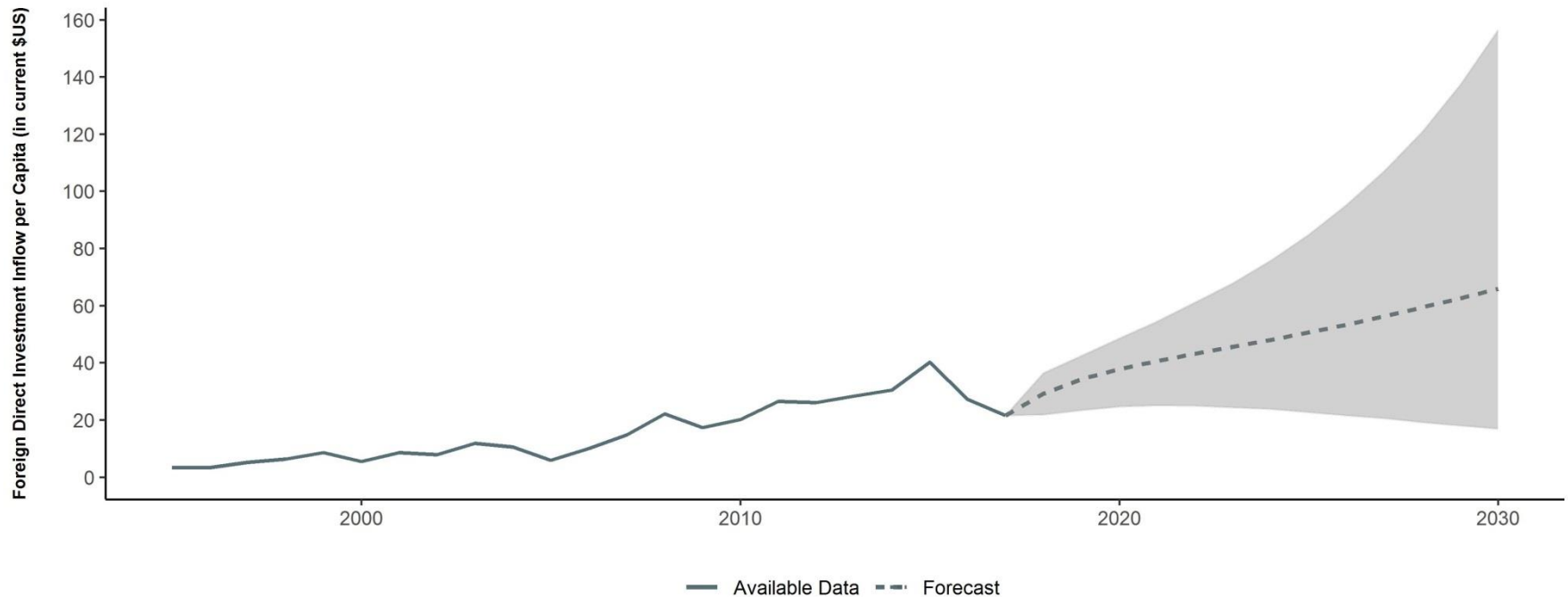
Impulse Response Functions

- IRF show how the MVA share in GDP reacts to the exogenous impulses, also called shocks

- The most significant impact on the share of MVA in GDP is caused by a shock in GDS. A onetime increase of one standard deviation has not only a positive impact on the MVA share but more remarkably this impact also increases over time. This may hint towards a positive multiplier effect of domestic savings i.e. domestic investment.
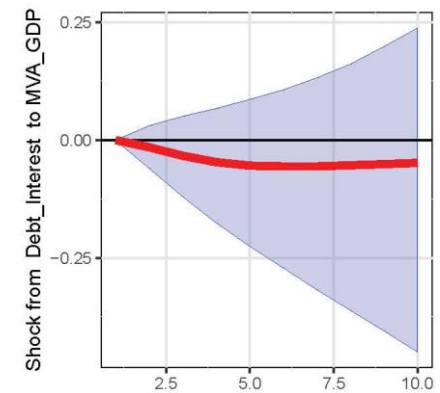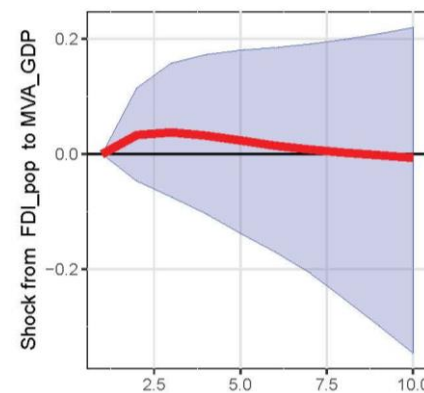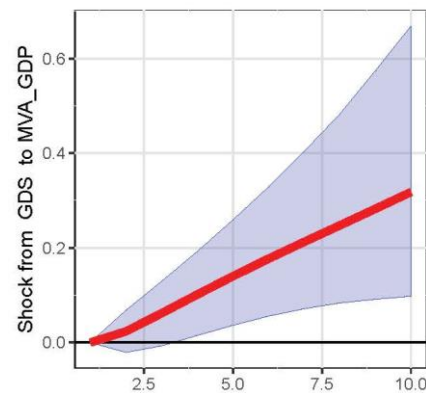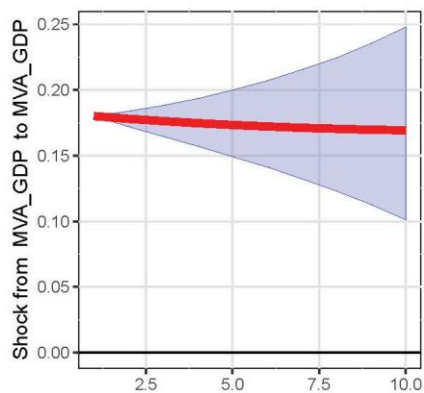
Impulse Response Functions

- A positive increase in FDI per capita showed the predicted increase for the importance of manufacturing converging back to the steady state after some periods.

- A positive shock in cost of foreign debt results in some decline in the MVA share which is only slowly reverting back to the initial value over the time.
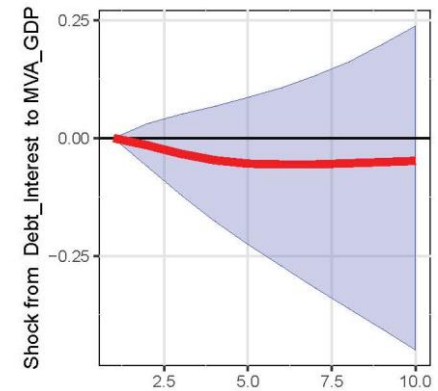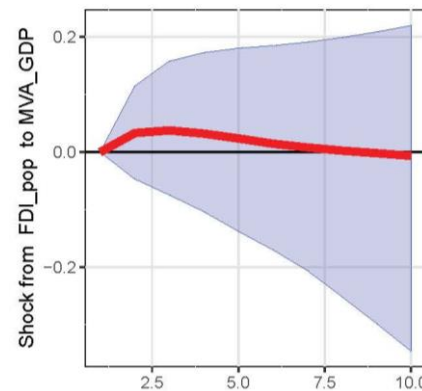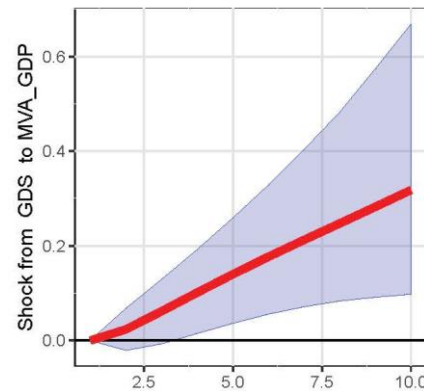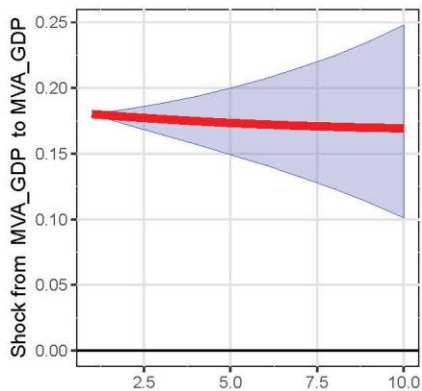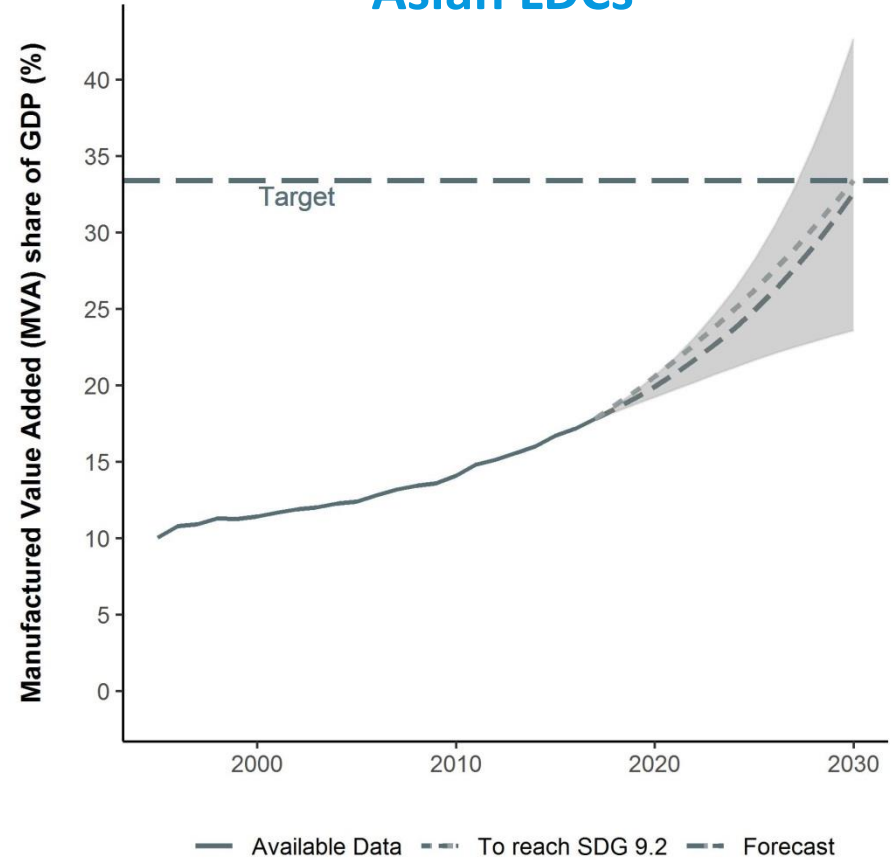
Forecasting the SDG target 9.2

African LDCs
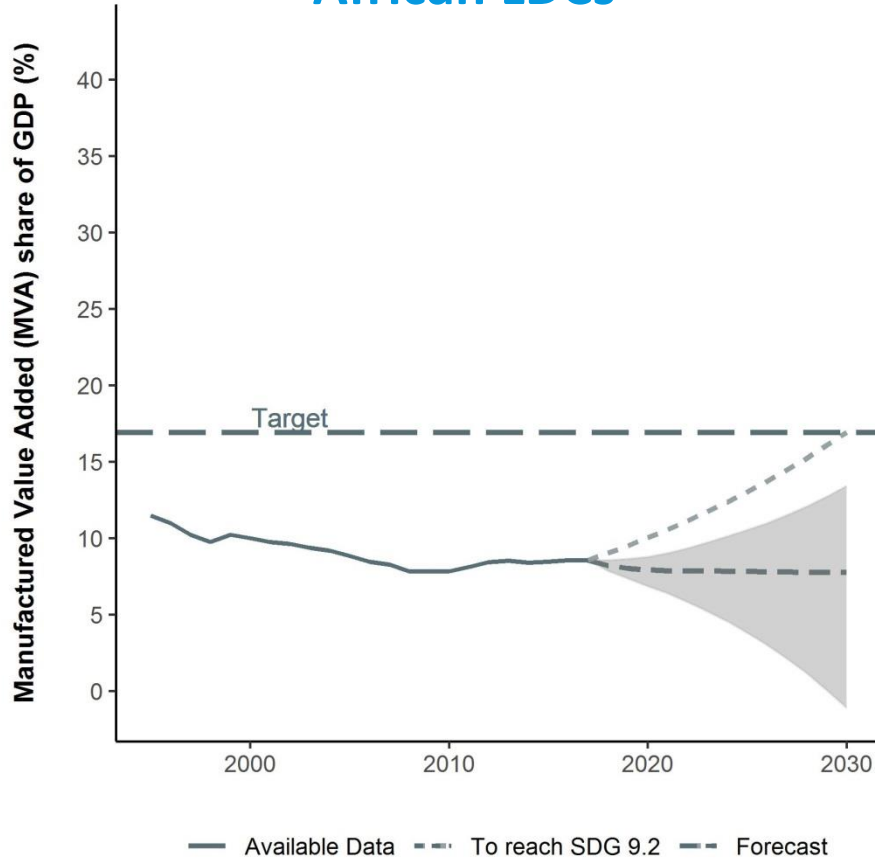
Asian LDCs

Thank you for your attention

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