The Fourth Industrial Revolution (4IR): Overview and Policy Implications

Portfolio Committee on Higher Education, Science and Technology

Colloquium on the Fourth Industrial Revolution

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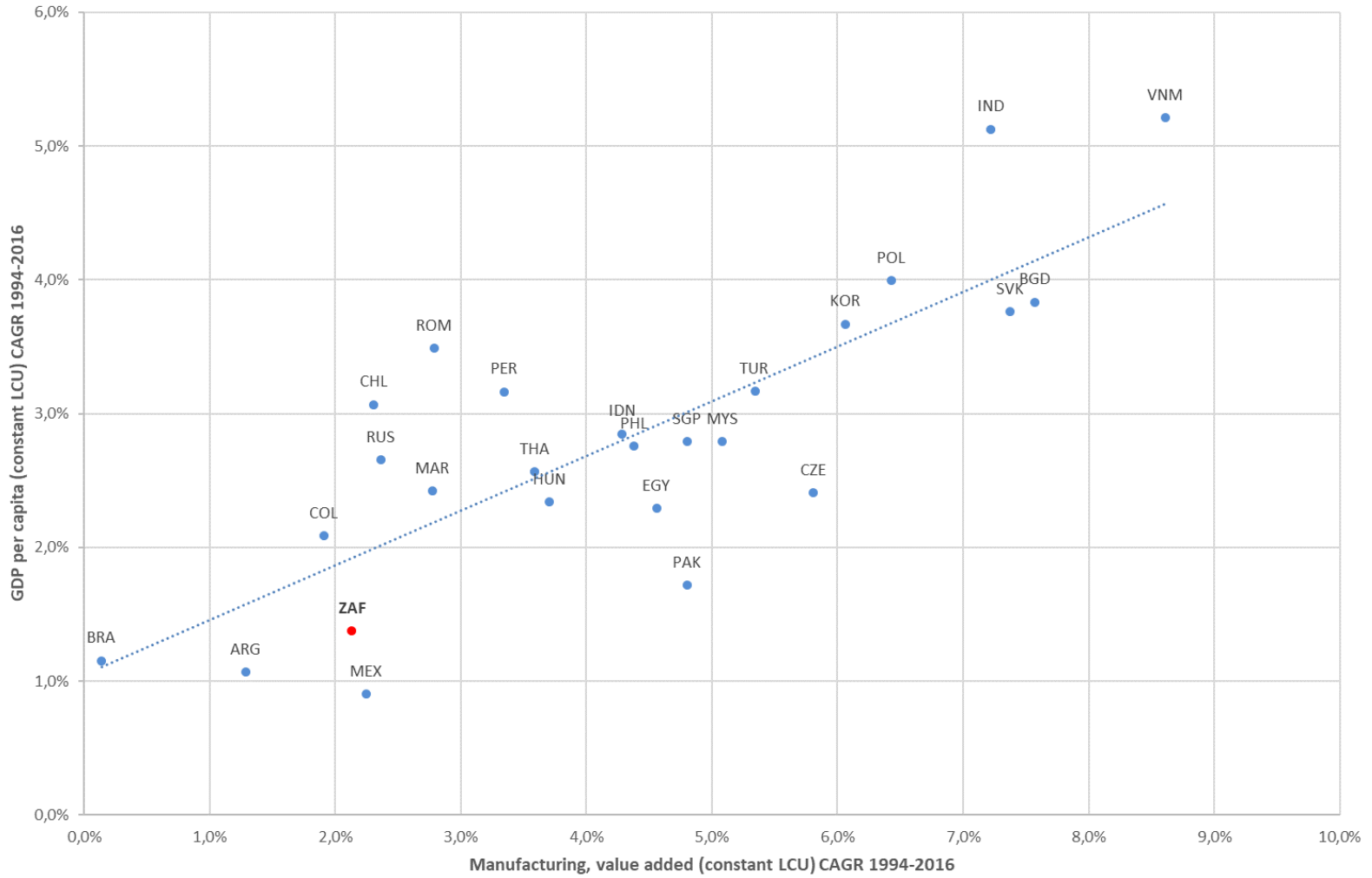
Structural transformation: industrialisation, technology and skills

- Structural transformation and catch-up: shift of people from low to higher-value adding activities → industrialisation.
- Industrialisation has become more challenging over the last few decades …
- … but no country has caught up by "leapfrogging" the industrialisation stage:
  - Main site of technological and skills acquisition; and
  - Linkages to and multipliers with to rest of economy.
- No case of successful industrialisation without industrial and related policies: technology and skills acquisition.

Manufacturing drives growth …

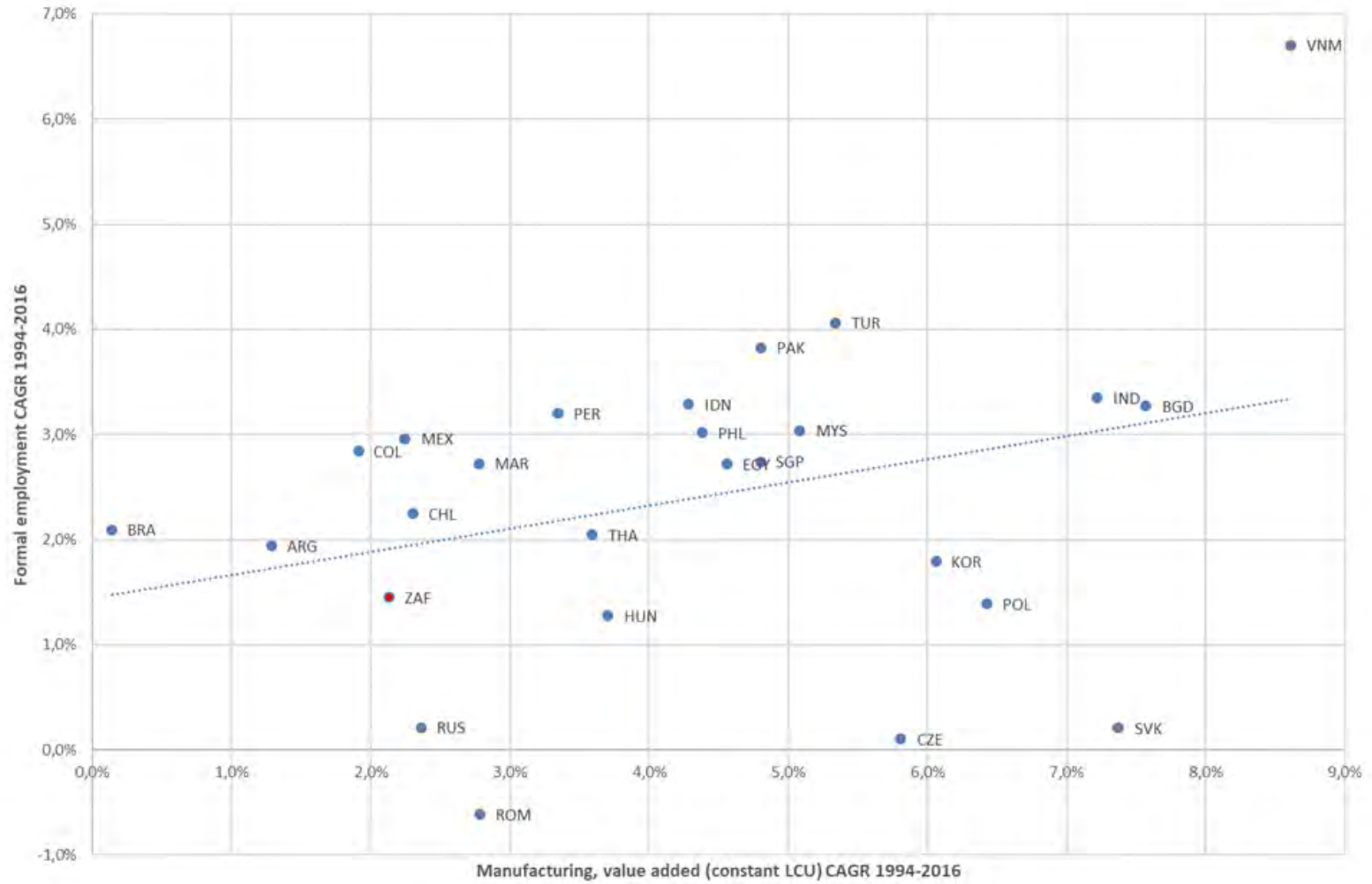
Compound annual Manufacturing growth vs GDP per capita growth, 1994-2016



Source: World Bank Development Indicators

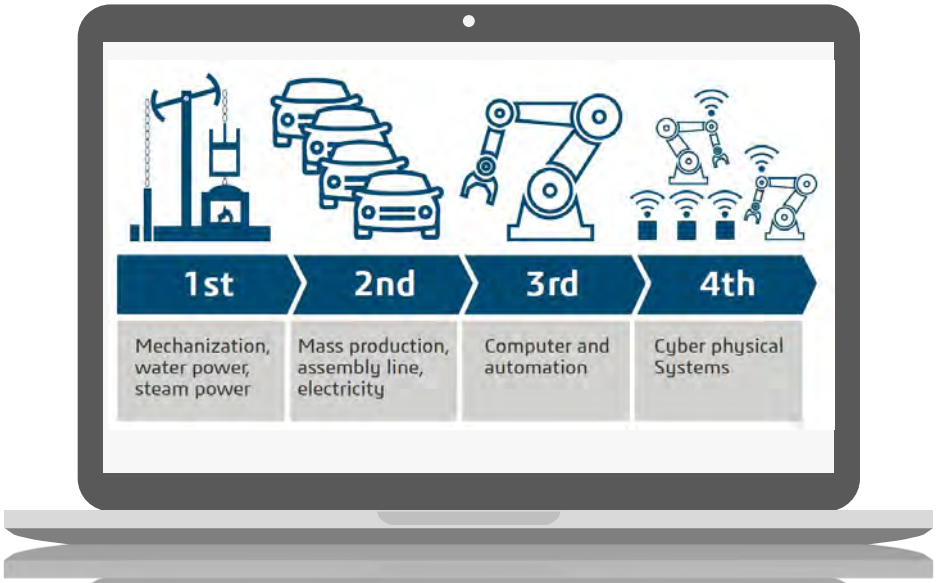
… and formal employment creation

Compound annual Manufacturing growth vs formal employment growth, 1994-2016



Source: SA Reserve Bank Quarterly Bulletin

The 4IR and increasing digitalisation



- Data: the new “primary resource”.
- Increasing digitalisation of production and distribution.
- Securing policy space and formulating appropriate policy responses.

The 4IR and increasing digitalisation

- *Digitalisation and integration of supply chains.* Digitalisation of production and supply chains is the minimum requirement for participating in the new digital economy: co-ordination efficiencies, condition monitoring and process optimisation.
- *Design, rapid prototyping and customisation.* Artificial intelligence (AI)-assisted design software, additive manufacturing and material science is significantly reducing the time to develop prototypes and produce tooling.
- *Advanced manufacturing and automation.* Integrated, collaborative manufacturing systems that respond in real time to meet changing demands in the factory and the supply network
- *E-commerce, online search and social media platforms*. Online platforms can open-up routes to consumers for small, medium enterprises. But "super" platforms dominate with accompanying power to determine rules for participation.

The 4IR and digitalisation: policy principles

- Digital industrialisation: involves both incremental changes and disruptive technological innovations.
- Digital industrialisation must create conditions for more domestic value creation and distribution.
- Systemic changes call for systemic and integrated policy frameworks: trade, regulation, competition, taxation, industrial, technology, skills and infrastructure policies.

The 4IR and digitalisation: policy considerations

- Policy space and digital sovereignty:
  - Global, regional and bi-lateral negotiations;
  - Plurilateral process on e-commerce rules;
  - Need for global rules that are developmental and enable digital sovereignty; and
  - Developing countries need to preserve policy space to respond to current and future technological change.

The 4IR and digitalisation: policy considerations

- Taxation:
  - Taxation of physical and digital goods and services;
  - Fiscal integrity; and
  - Measures to address base erosion and profit shifting (BEPS).

The 4IR and digitalisation: policy considerations

- Competition and Regulation:
  - Global “super platforms” and “winner takes most” market outcomes; and
  - Emerging responses in various domains including EU, India, Indonesia, Rwanda.

The 4IR and digitalisation: policy considerations

- Digital Infrastructure:
  - Ensure 5G network rollout is competitive and delivers affordable data.
  - Potential improvements digitalisation can bring to "traditional" infrastructure and public services, e.g. -
    - Smart grid enablement of renewable energy at scale;
    - E-government / public services; and
    - Climate change mitigation, water efficiency and agricultural modernisation.

The 4IR and digitalisation: policy considerations

- Digital Industrial Capabilities:
  - Firms increasingly need to acquire digital capabilities as part of industrial upgrading.
  - Financing instruments for acquiring digital industrial capabilities -
    - Expansion and adaptation of financing instruments;
    - Acquisition of digital supply chain tools;
    - Innovation and commercialisation; and
    - R&D.

The 4IR and digitalisation: policy considerations

- Digital Industrial Capabilities Skills Sets:
  - Software engineering, data science and related ICT skills;
  - Computer-aided design (CAD), computer-aided manufacturing (CAM), Enterprise Resource Planning (ERP), Materials Requirements Planning (MRP) and Manufacturing Execution Planning (MES);
  - Sector-specific digital skills in partnership with industry associations and Sector Education and Training Authorities (SETAs);
  - Curriculum adaptation and financing for Vocational Education and Training (VET) institutions; and
  - Big data analysis.

The 4IR and digitalisation: policy considerations

- Digital Policy Skills Sets:
  - Regulation and competition;
  - Trade negotiations;
  - Industrial, technology, innovation and skills policy;
  - Big data analysis for public policy; and
  - E-government.
- Education:
  - Numeracy;
  - Maths and Science; and
  - Science, Technology, Engineering and Maths (STEM) skills.