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Renewable electrification and local capability formation: Linkages and Interactive learning

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Energy Policy 117 (2018) 326–339

Published IREK journal paper. Presentation at IREK project workshop in Copenhagen, April 2018

Starting point

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- Focused on the ‘learning opportunities’ that clean energy provision may provide in the context of renewable electrification.
- Learning is understood as the accumulation of relevant capabilities: local production and innovation capabilities for effective low carbon development
- We pay attention to ‘where’ and ‘how’ such capabilities arise in local economies, particularly the role of *interactive learning* (in associated linkages) as a means to building these production and innovation capabilities.

We address three closely related issues:

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- The opportunities for ‘further’ capability formation arising in and from RE investments.
- Inbound flows of ‘technology’: learning opportunities that may potentially arise in and around the linkages that facilitate these flows
- (The lack of progress in shedding light on SS-TT: framing it and connecting it to the first two issues).

Technology collaboration and local capability formation: the theoretical starting points

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- The importance of local capabilities and shaping of technology
  - International technology transfer (Bell, 2012; Ockwell and Mallett, 2013)
  - From hardware to software (Ockwell and Mallet (2013, p. 120)
  - Below the radar innovation (Clark and Chataway, 2009; Kaplinsky, 2011).
- Appropriate technology
  - Southern-origin equipment demonstrably appropriate to operating conditions in SSA (Hanlin and Kaplinsky, 2016: 361).
  - How about energy sectors/services?

Renewable electrification: linkages and interactive learning

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Our value added – connecting and bringing in:

- User–producer interaction and learning (Lundvall, 1985)
- Global value chains (Gereffi, 2014; Humphrey and Schmitz, 2002).
- Learning from importing (Haakonsson, 2009): ‘reverse value chains’
- *Trade-centred* and *investment-centred* (reverse) global value chains

The ‘local content’ of renewable energy products and services

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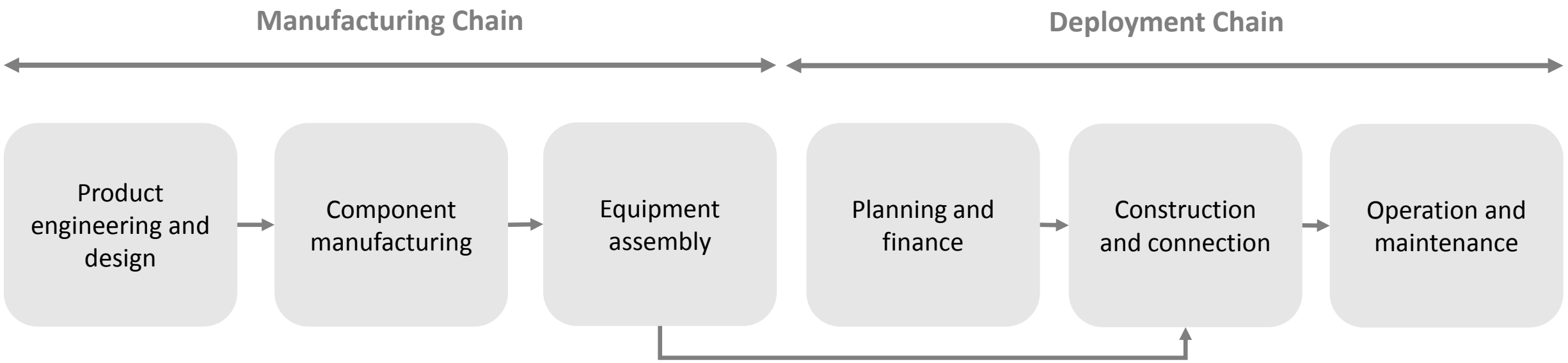
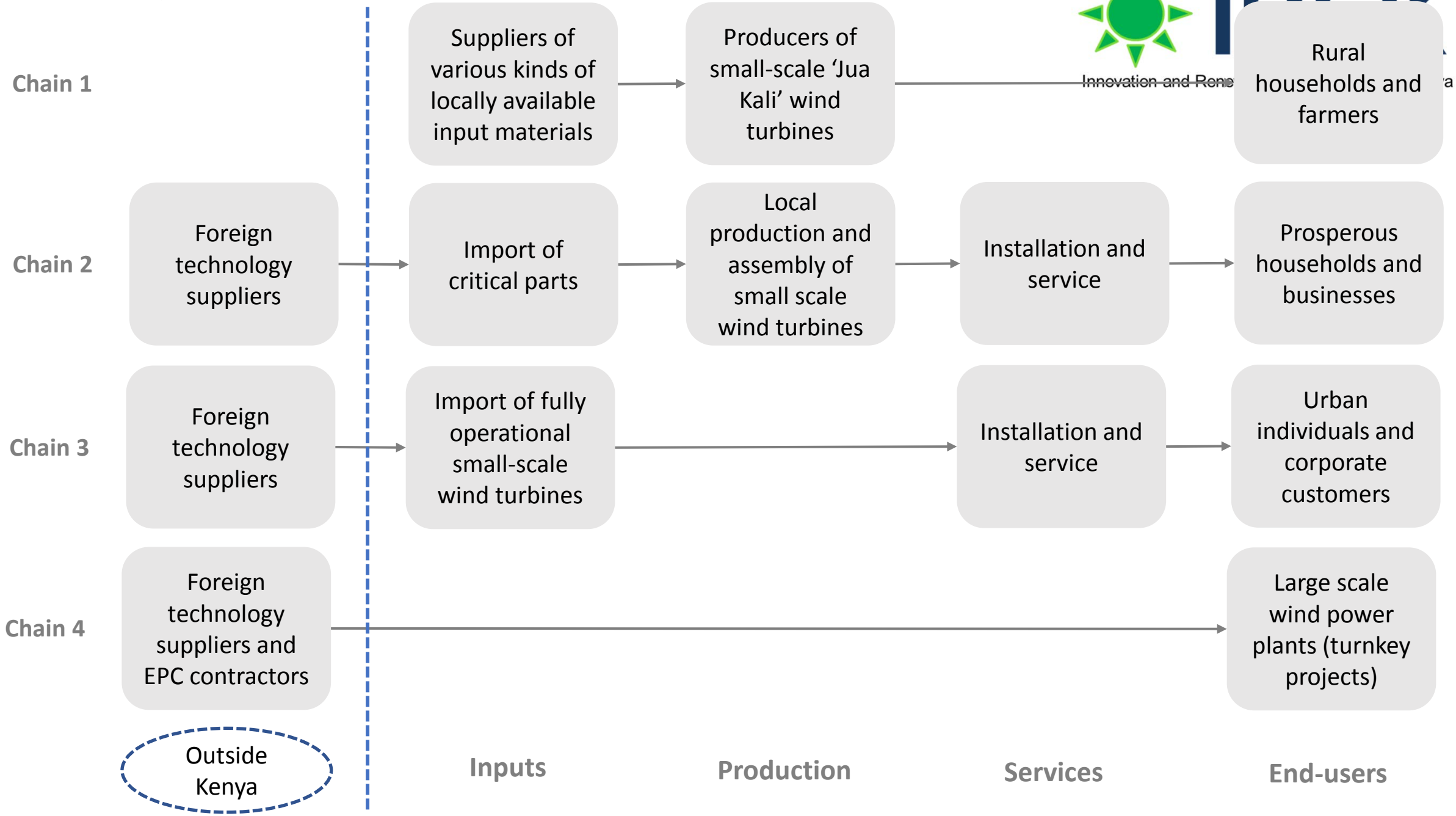
- Core technology manufacturing steps: production of energy-generating equipment. Organised by producers.
- Deployment steps related to their installation and use. Organised by services companies / ‘professional users’



Wind


Chain 1
Suppliers of various kinds of locally available input materials
Producers of small-scale 'Jua Kali' wind turbines
Rural households and farmers
Chain 2
Foreign technology suppliers
Import of critical parts
Local production and assembly of small scale wind turbines
Installation and service
Prosperous households and businesses
Chain 3
Foreign technology suppliers
Import of fully operational small-scale wind turbines
Installation and service
Urban individuals and corporate customers
Chain 4
Foreign technology suppliers and EPC contractors
Large scale wind power plants (turnkey projects)
Outside Kenya
Inputs
Production
Services
End-users

Solar PV

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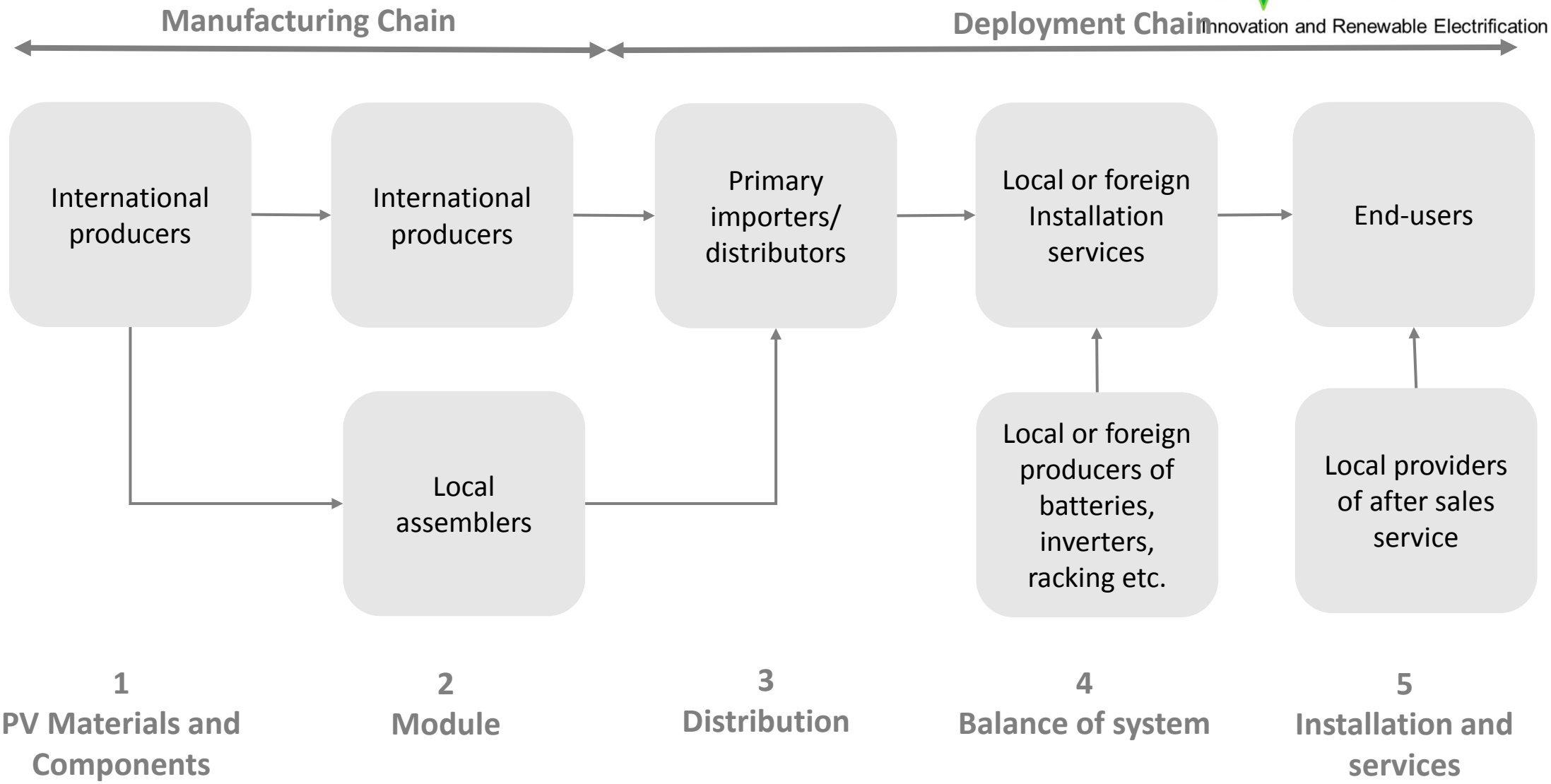

‘smiling curve’ vs ‘sloping curve

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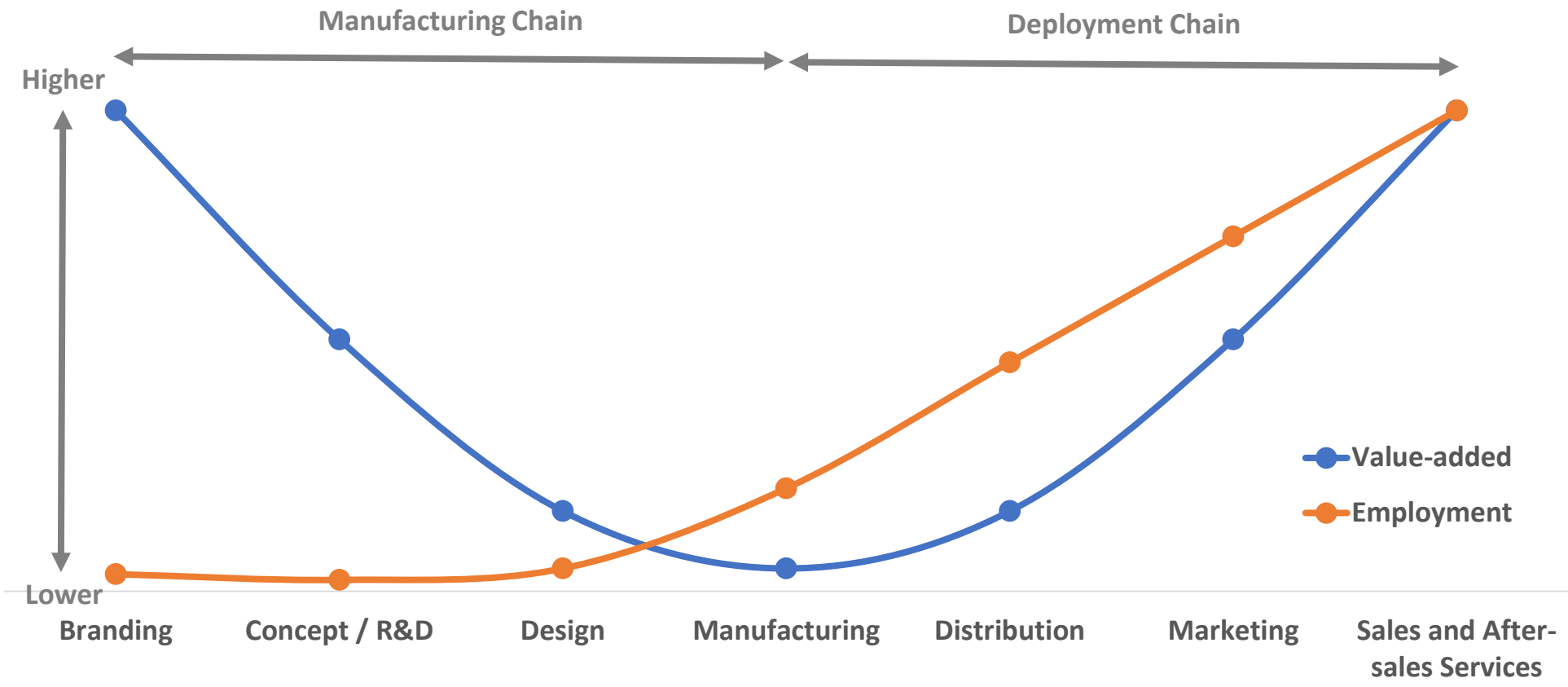

Conclusions (1)

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- Projects for renewable electrification differ in balance between trade- and investment-centred value chains.
- Investment-centred value chains, even if they are part of more complex sets of technology transfer, tend to ‘bundle’ requisite tasks that are organised by the (foreign) investor.
- Trade-centred (market-based) value chains, or the elements of transfers/projects that are traded, may allow for more local substitution of products and services, local participation and local shaping.

Conclusions (2)

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- Both types of chains can be subdivided into a manufacturing chain and a deployment chain.
- Much literature on technology transfer collaboration and value chains tend to focus predominantly on the former. This can be explained, in part, by the fact that this type of (embodied) transfer is visible ‘on the radar’.
- But deployment chains deserve most attention for several reasons, even if the software elements involved are difficult to detect and often highly complex. Many of these functions are labour-intensive, tied to the point of end-use, and provide a main possible entry point for local value chain participation and learning.

Conclusions (3)

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- The degree of bundling may differ in both large (centralised) and small (decentralised) sets of technology transfers, i.e. renewable energy ‘projects’ (Hansen et al., 2018).
- But decentralised diffusion projects may typically involve higher degrees of unbundling.
- Such openness in the organisation of value chains is associated with lower entry barriers and more fruitful spaces for interactive learning.

Promoting interactive learning in renewable electrification (1)

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- Interactive learning between contractors and local/global suppliers
  - Professional users with defined needs - interaction with contractors and suppliers to improve projects.
  - Reducing the 'lock-in' of dominant sourcing policies of lead firms in a project setting.
  - Need for government intervention (procurement policy)
- Local labour learning to 'use' the new installations—operating and maintaining
  - Importance of recognising less codified knowledge and experiential learning that comes through 'doing, using and interacting' (Jensen et al., 2007).
  - Educating local labour to engage in problem-solving in the context of RE projects
  - New mindset from lead firms + government support for training to ensure technicians/engineers with capabilities

Promoting interactive learning in renewable electrification (2)

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- Public authorities learning to manage major projects
  - Again: Public authorities taking more of an active role in regulating and supporting the sector through promotion of training schemes etc.
  - Governments recognising their importance as 'lead firms' in projects: commissioning, managing and/or running the projects.
  - Balancing commercial mindset with learning objectives
  - Using bargaining power and acting as convenor in shaping projects
- Public procurement policy is key as opportunity for local skills-building
- Ambitious local content policy
- *A priory* planning of learning and knowledge management/circulation at the system level

Reflections for the project

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- Based on anecdotal and scattered secondary and primary data. *Further scope for going deeper*.
- Disentangling/mapping trade-and investment-centred elements of projects.
- Using also the manufacturing/deployment elements for project mapping.
- Extending from the independent variable (organisational arrangements) to the independent variable (learning)
- Further scope for addressing the South-South issue

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Thank you

Renewable electrification

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Table 1
Access to electricity.
Source: OECD/IEA (2015).

Region	Population without electricity millions	Electrification rate %	Urban electrification rate %	Rural electrification rate %
Developed countries	1	100%	100%	100%
Developing countries	1200	78%	92%	67%
Sub-Saharan Africa	634	32%	59%	17%
Developing Asia	526	86%	96%	78%
India	237	81%	96%	74%
Latin America	22	95%	98%	85%
Middle East	17	92%	98%	79%
World	1201	83%	95%	70%

Note: Electricity access in 2013 – Regional aggregates.

Wind and Solar projections

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Table 2
Renewable energy in Africa: installed capacity and projections. (GW)
Source: AEEP Power Project Database/AEEP (2016).

	2010	2015	2020 Growth Scenario 1 (Linear)	2020 Growth Scenario 2 (25%)	2020 Growth Scenario 3 (50%)	2020 Growth Scenario 4 (75%)
Hydro	33.01	35.18	37.36	41.97	48.63	55.30
Wind	1.12	3.13	5.14	4.93	6.62	8.30
Solar	0.10	1.55	2.99	3.25	4.61	5.96
Other	0.95	1.50	2.05	2.49	2.94	2.98

Note: Other = Geothermal, biomass.