New Technologies Create Opportunities?

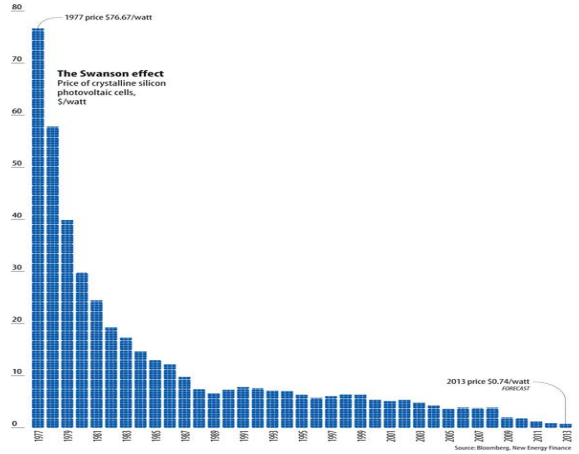
Sally Murray, UNWIDER, 19th July 2016

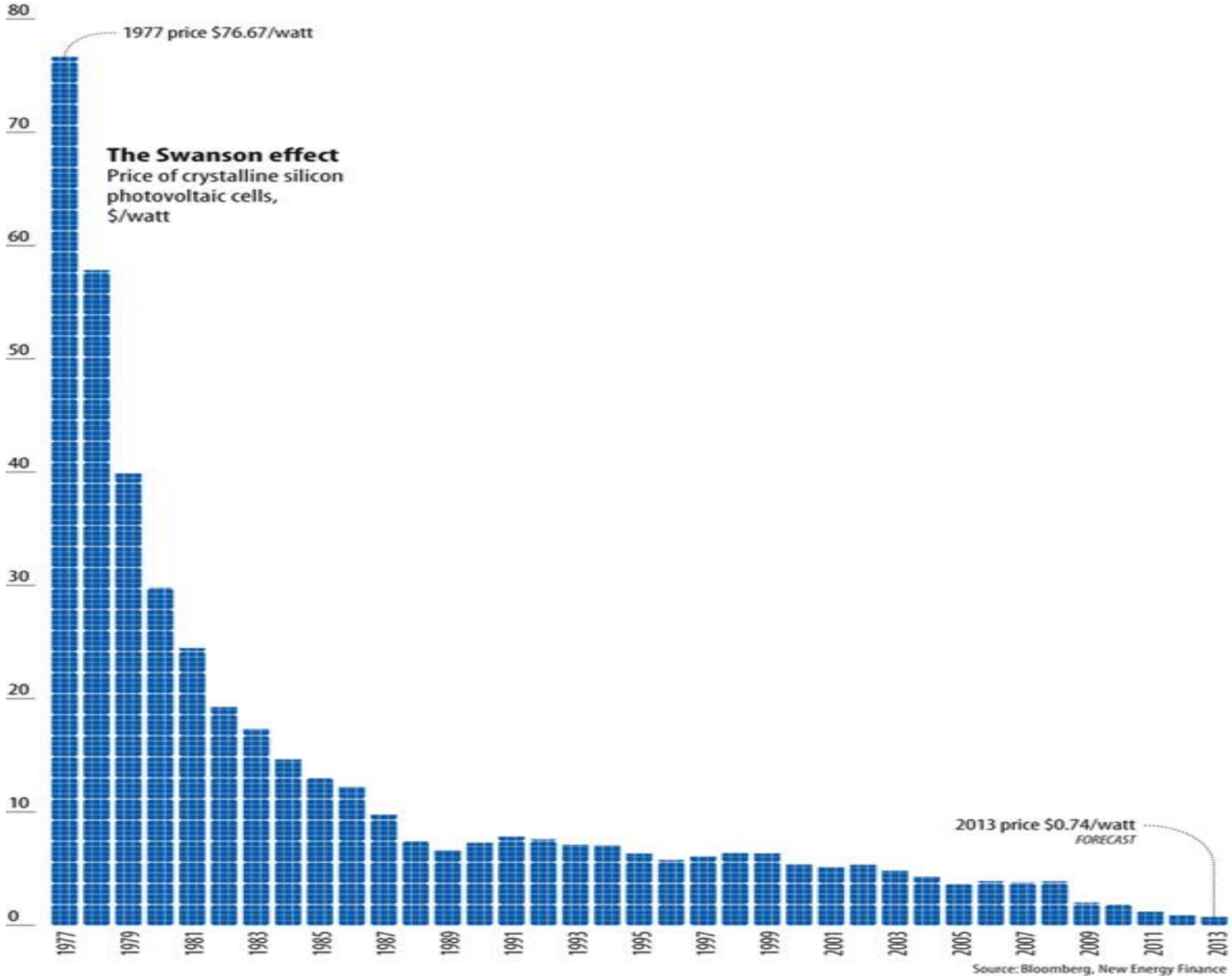
Structure of the Chapter

- New **technologies** can transform productivity in Sub-Saharan Africa
- Focus on *productivity* and *job creation*- rather than living conditions per se.
- 10 technologies with promise.
  - 'Profile': Extent, growth, and distribution of uptake; cost trends; etc
- Nuance: Does the Technology…
  - Improve SSA's *comparative advantage* for production?
  - Increase *employment,* displace it, or have a neutral impact?
  - Require a particular economic geography to realise its potential?
  - **Require investment in human capital or governance to realise its potential?**

New Technology can Transform Productivity in Sub-Saharan Africa

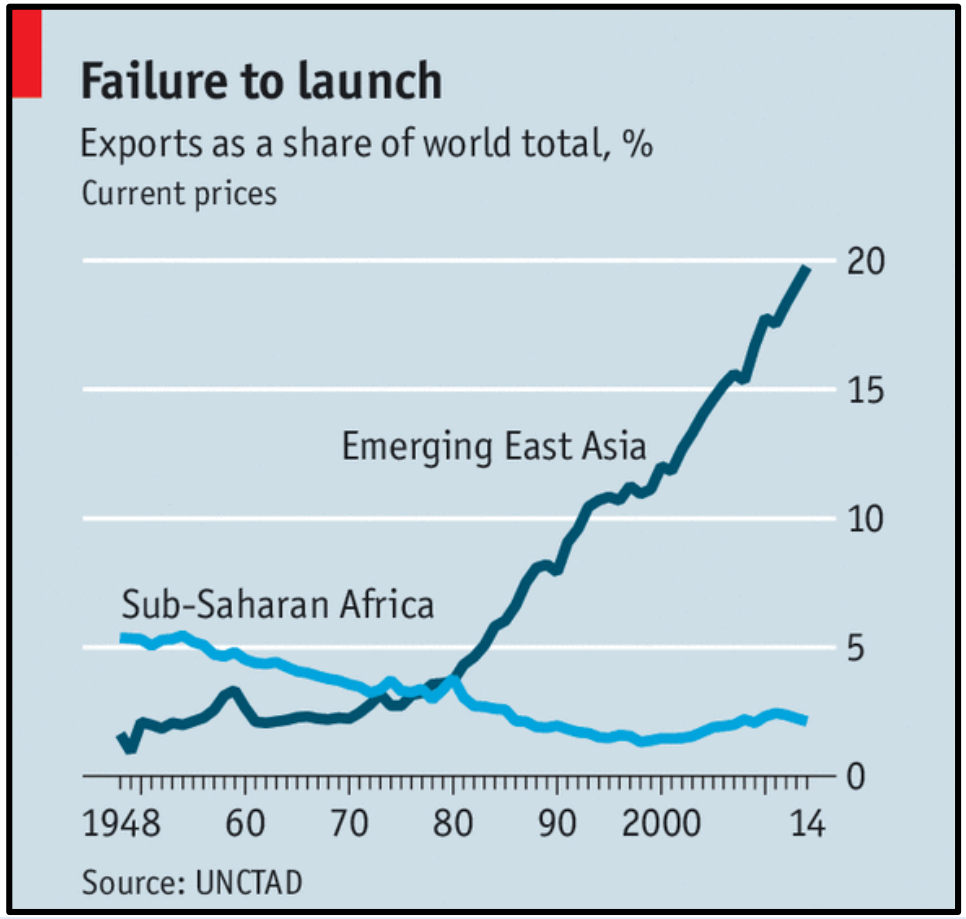
- **Tech is rapidly increasing *connectivity*, within and between countries.**
  - Rapid *equalisation* in access to data, telephone services
    - Smartphone (and normal phone) prices falling rapidly ($440 to $300 2010-2015);
    - Cheap data initiatives like Facebook's internet.org (lasers and unmanned solar aircraft), Google's Project Loon balloons in the upper atmosphere, Musk/Tesla's 700 micro-satellites;
    - Gap in data *speeds* is widening but may catch up? (Frishtak) (E.g. Undersea cables)
  - Reduced transport costs for goods (air transport; self-drive trucks; drones...).
- **Tech is raising *labour* productivity**
  - Reduced labour costs
    - Lower living costs, hence wages: Agriculture, housing, transport technology…
    - Labour-*saving* technologies like 3D-printing, mobile money…
  - Higher human capital
    - Healthcare apps and medical advances;
    - Online courses; smartphones…
- …And **cutting the costs of power** dramatically.




80
70
60
50
40
30
20
10
0
1977 price $76.67/watt
The Swanson effect
Price of crystalline silicon photovoltaic cells, $/watt
2013 price $0.74/watt
FORECAST
1977
1979
1981
1983
1985
1987
1989
1991
1993
1995
1997
1999
2001
2003
2005
2007
2009
2011
2013
Source: Bloomberg, New Energy Finance

Not All Technologies Bring a Comparative Advantage for SSA Countries

- But earlier technological progress often reduced Africa's *comparative advantage*
  - Shipping technologies brought low-cost manufactured goods to Africa from Asia; local manufacturing struggled to compete (Rodrik's deindustrialization story)
  - Now, ICT firms and technologies have mostly located in already 'prosperous' global cities (need for significant wells of skilled labour, ICT infrastructure, etc)
- Does the technology deliver a **comparative advantage** to Africa, or at least **level the playing field**?



Some Productivity-Enhancing Technologies Don't Raise Employment

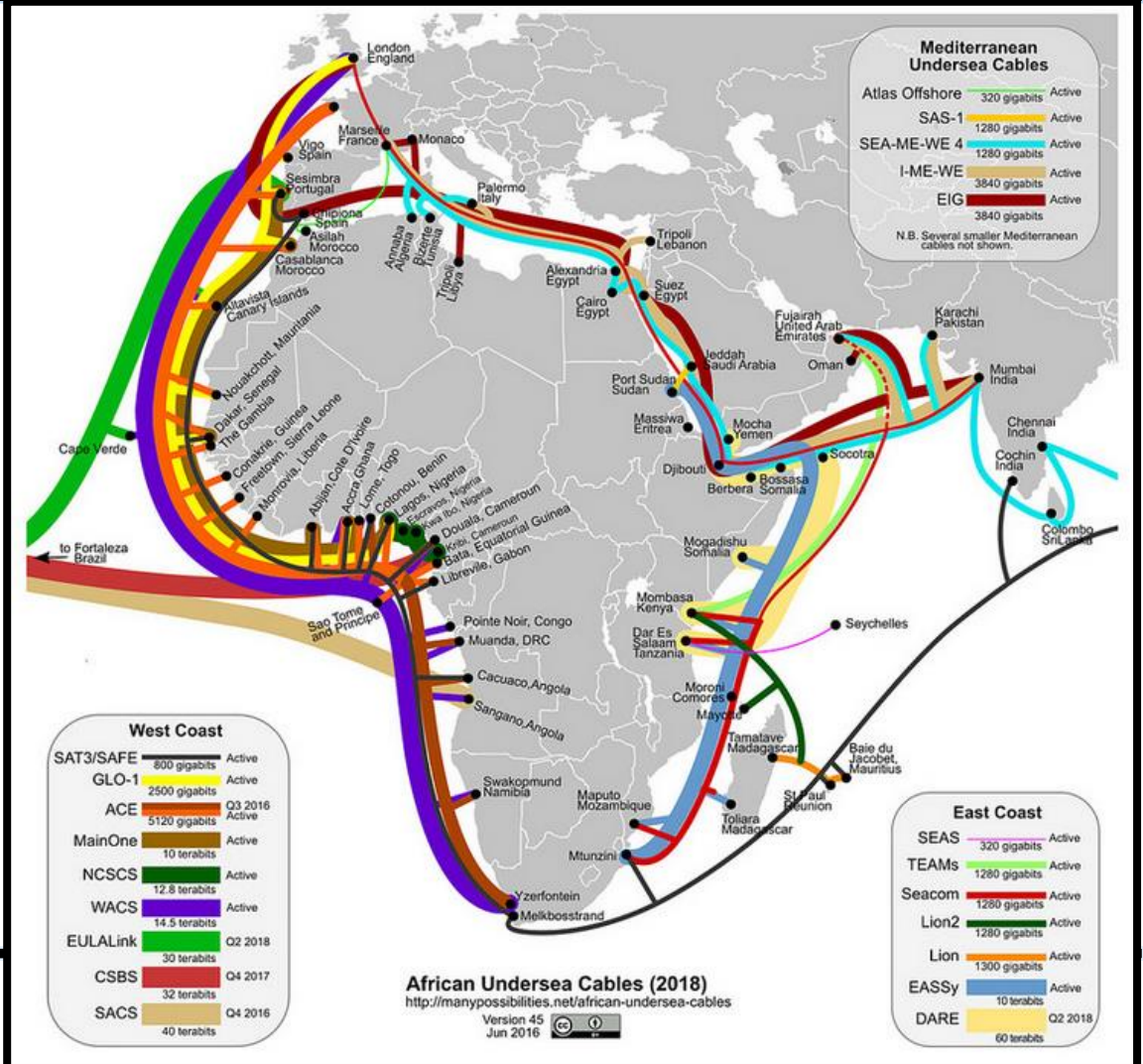
- Labour productivity is a key constraint in SSA.
  - Weak education, poor health;
  - High wages relative to GDP (Oxford/LSE study).
- Some technologies increase SSA's comparative advantage by- at least directly- cutting jobs.
  - 3D printed houses (and others).
  - Self-drive trucks? Drones? Apps that replace service providers (healthcare, governance, education…)?
- How far does the technology displace, and create, employment?
- Does the technology increase productivity by increasing the *quality* of labour?

The Potential of Technologies Varies by Location

- ‘World is Flattening’? … Economic Geography Still Very Important
  - Will New Tech Drive Productivity in Rural Areas?
    - Lack scale economies, so slow to receive tech with high fixed vs marginal costs. E.g. Internet cables, 3D printers, even power lines and strong mobile signal.
    - Tech requiring cheap land (e.g. solar fields, agricultural tech/science);
    - Benefit from tech that decreases transport costs.
      - For information- health/ag/governance text services, rural internet initiatives, e-commerce;
      - For power- decentralised solar, including battery advances;
      - For goods- drones?
      - For financial transactions- mobile banking/transfers.
      - More consumption, ‘import’? Stats on new ‘off farm’ jobs.
    - **Migration to cities**, plus remittance technology…

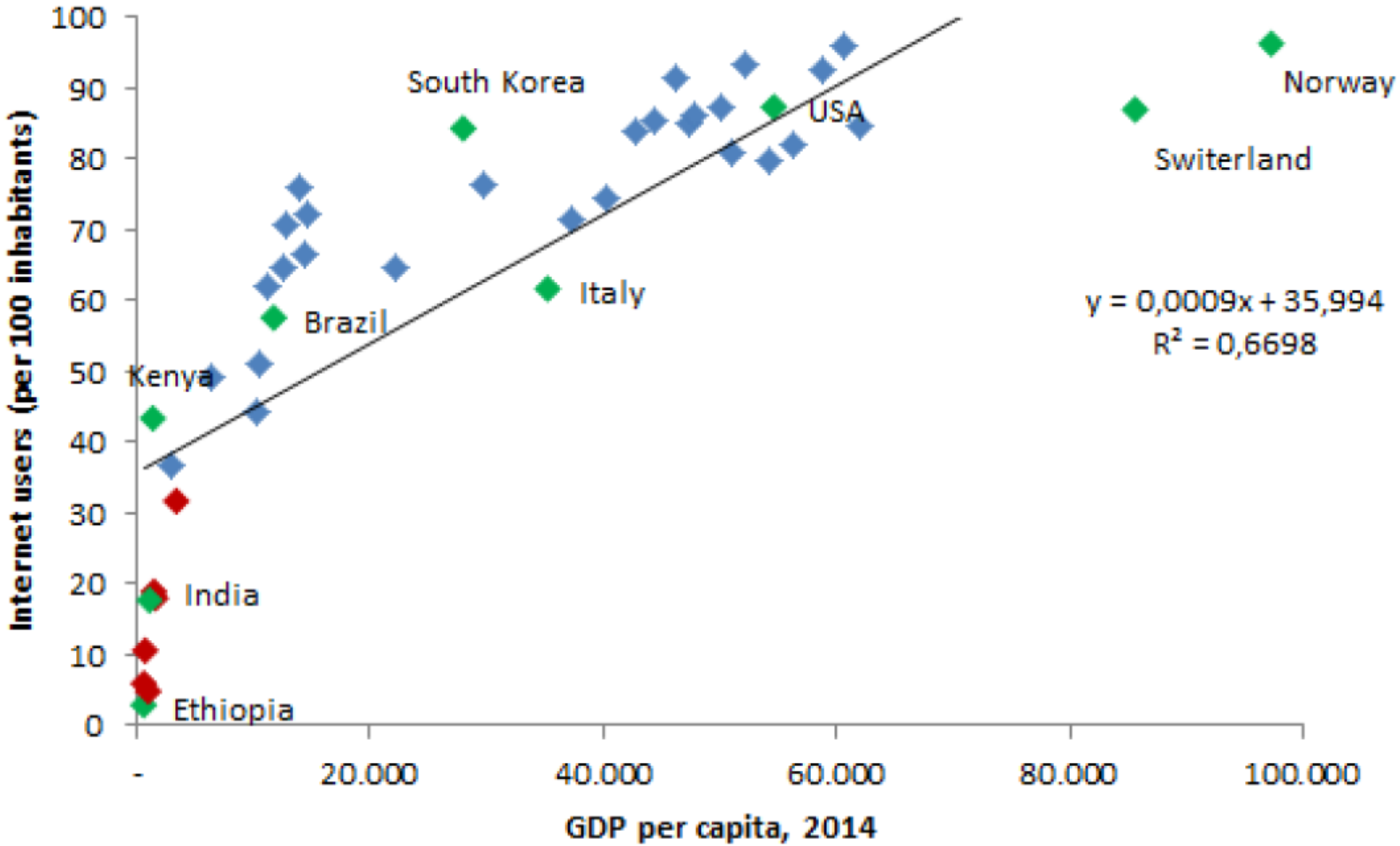
The Potential of Technologies Varies by Location

- Economic Geography Continued.
  - Major coastal cities:
    - First access to high-speed fibre optic internet.
    - Port access facilitates production for export….
    - Agglomeration economies, such as pool of higher skilled labour to use ICT
- Governance is also still crucial
  - Internet users and speed don't closely track GDP, or geography, at low end
    - 25% Rw vs 4% Burundi; 70% Ken vs 4% Eth



Graph 5: Internet users per 100 inhabitants and GDP per capita

Selected countries[7].



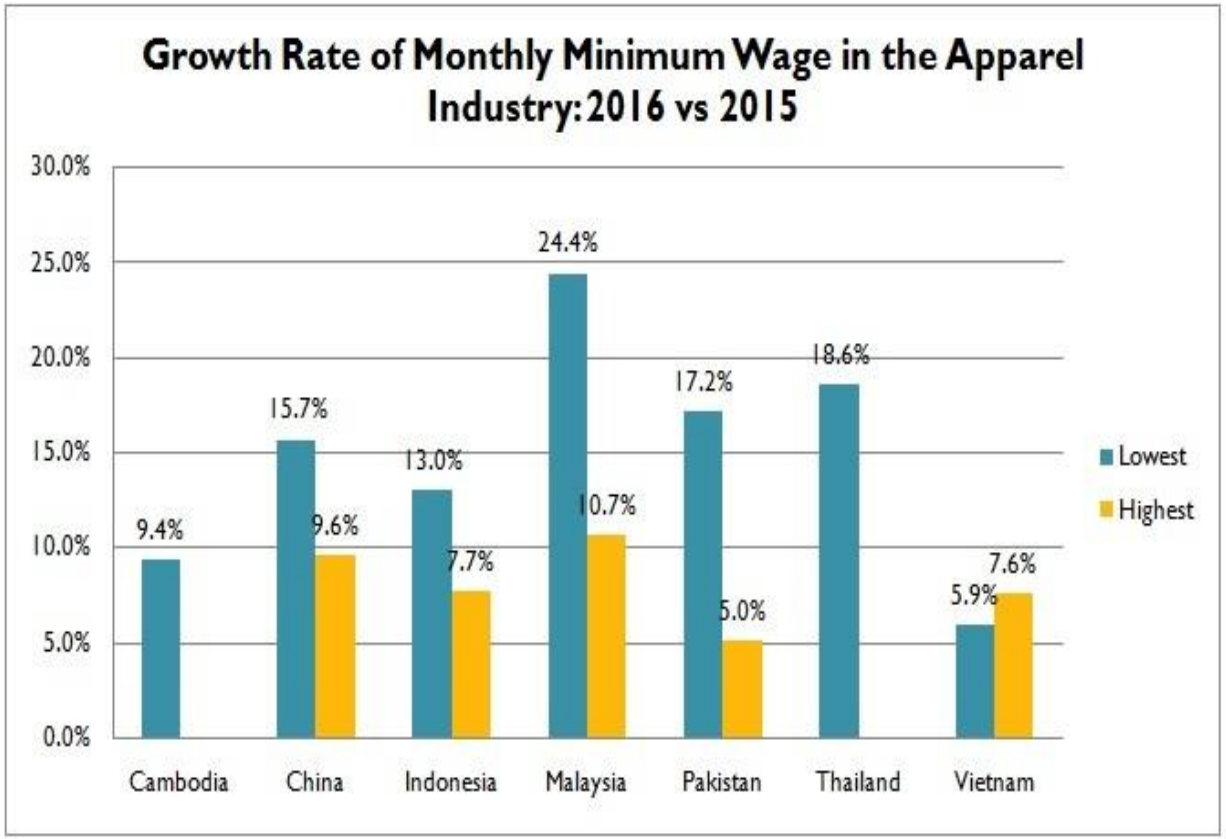
Realising the Promise of Many Technologies Requires Much Stronger **Education**

- Call centre staff in India typically have a degree or more; 3D printing requires special skills to operate, or to generate models for export…
- *But* some skills can be learnt without completing formal school
  - Software engineers, app developers…
  - E-learning opportunities.
  - Languages for call centers.
- **Language fluency critical** to take full advantage of new ICT
- Is intervention required to **encourage** people to produce, not just consume, tech?

A Lot of New Tech *Is* Particularly Well Suited to SSA Production

- Example 1: Solar power (and battery advances, which facilitate)
  - Particularly well-suited to Africa: lots of intense sun, cheap land, dispersed locations.
  - Can facilitate growth of even 'industries *with* smokestacks'. Energy prices a major constraint.
- Example 2: Smartphone, Computer, and Internet Access for App development
  - Lower wages in SSA, while access (ability to produce) is equalising. Kenya showing opportunities.
  - Doesn't require complete formal education, often particularly lacking in Africa.
- Example 3: Transport technologies
  - Wages in landlocked African countries becoming cheaper than many Asian (next slide).
  - Transport is key barrier, e.g. textile factory in Rwanda can't produce for high street

Annex: Garment Factory Wages By Country



Starting to Gather for SSA.

Ethiopia and Rwanda: $40-80

Kenya: $120-160

Some New Tech May Weaken SSA Comparative Advantages?

- Example 1: 3D Printing
  - Designing product to be printed requires high skill. More likely designs will be imported?
  - 3D printing replaces labour.
  - But will printed inputs facilitate production? E.g. Rare/Quick spare parts, cheaper living costs (urban housing…)
- Example 2: E-Commerce
  - Less skill needed to buy vs sell. Producers/ vendors in developed country more skilled in ICT and banking, to sell online. Will e-commerce imports to SSA exceed exports?
  - But, African producers particularly struggle to market and sell to consumers. E-commerce could be transformative *if* mastered.

Technologies to Be Included

- Solar and Batteries
- Internet Access Initiatives
  - E-Learning
  - E-Commerce
  - App development
  - Online task outsourcing
  - Crowdsourcing (finance, data processing)?
- Mobile Banking and Transfers
- Transport: Drones, self-drive trucks, port/border/visa tech, others?
- Tech for Agriculture
- Medical Technologies
- 3D Printing