Stages of Development of Payments Systems: Leapfrogging across Countries and MENA’s Place in the World

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Outline of the presentation

• Context – where this research is coming from

• Technology adoption and leapfrogging

• Innovation stages in the case of payment systems

• Empirical framework

• Findings

• Discussion
Before we start
Context of the paper

• Research program led by the WB Office of the Chief Economist in MENA
  
  • How is digital technology adoption in the MENA region?

  • Are there conditions or bottlenecks that may thwart the upside of digital?

  • How is MENA’s performance compared to the rest of the world?

• This working paper with Daniel Lederman was one of the background papers
  
  • Key question is to identify MENA’s adoption of digital financial services, relative to levels of development → are there opportunities of leapfrogging?
Overview of digital technology pillars and impact

- Digital technologies as general-purpose technologies (Cusolito et al 2021)
  - Usable across sectors and diffuse widely in the economy
  - Enables new modes of production and consumption
  - Thrive on economies of scale and network externalities

- Countries tend to adopt digital technologies at different speeds
  - In MENA, slow technology adoption has been associated with lower economic growth relative to other regions (Arezki et al 2019)

- Countries’ digital transformation require core foundational elements for the digital economy (World Bank 2020)
  - Skilled workforce; quality connectivity; digital financial services; regulatory framework
Empirical definition of leapfrogging

• Leapfrog as an alternative to the “catch-up” theory

• Concept used many times, but lacks a consistent approach in research
  • “Leapfrogging occurs when a nation bypasses traditional stages of development to either jump directly to the latest technologies (stage-skipping) or explore an alternative path of technological development involving emerging technologies with new benefits and new opportunities (path-creating). “ (CSIS 2020)

• We attempt an empirical definition. Assuming two paradigms, we propose the definitions:

STAGE 1 (legacy): \( Y_{c,t}^1 = C + \beta_1 \times \log(GDPpc_{c,t}) + \nu_t + \varepsilon \)

STAGE 2 (new): \( Y_{c,t}^2 = C + \beta_2 \times \log(GDPpc_{c,t}) + \nu_t + \varepsilon \)

\( \hat{Y}_{c,t}^2 > \hat{Y}_{c,t}^1 \Rightarrow \text{relative leapfrogging} \)

\( \beta_2 < 0 \Rightarrow \text{absolute leapfrogging} \)
Let’s apply this framework to digital payment

- We assume simple stages of innovation in payment systems:

<table>
<thead>
<tr>
<th>STAGE 1</th>
<th>Traditional bank-based payment systems, measured by incidence of access to bank accounts</th>
</tr>
</thead>
<tbody>
<tr>
<td>STAGE 2</td>
<td>Digitalization of banking systems, measured by the use of debit/credit cards and online banking</td>
</tr>
<tr>
<td>STAGE 3</td>
<td>Prepaid mobile money accounts, measured by incidence of access to mobile money accounts</td>
</tr>
<tr>
<td>STAGE 4</td>
<td>Decentralized payments native to specific devices but linked to prepaid accounts (ex: Apple pay or Alipay)</td>
</tr>
<tr>
<td>STAGE 5</td>
<td>Decentralized digital currencies native to specific private or local applications or systems (ex: cryptocurrencies)</td>
</tr>
</tbody>
</table>
Data and empirical framework

• Three dependent variables $Y^1, Y^2, Y^3$ from World Bank Findex 2017:
  • $Y^1$: Having an account in a financial institution (bank; % of adult population)
  • $Y^2$: Using digital payments (debit/credit cards, online banking, internet payment, also mobile money...; % of adult population)
  • $Y^3$: Having an account with a mobile money provider (% of adult population)

• Some precisions about the data:
  • Comprehensive dataset but relatively old, pre-COVID
  • Pooled cross-section with two years (2014 and 2017)
  • Less data on Stage 3 (mobile money) -> reduced sample to make comparisons

• Simple but effective empirical strategy:

$$Y_{c,t}^i = C + \beta_i \ast \log(GDPP_{pc_{c,t}}) + v_t + \varepsilon$$
Regression results

- Evidence of absolute leapfrogging in mobile money
- Consistent underperformance of the MENA region
- Relative leapfrogging in both digital payments and mobile money

<table>
<thead>
<tr>
<th>VARIABLES</th>
<th>STAGE 1 bankaccount (quadratic)</th>
<th>STAGE 2 digitalpayment (quadratic)</th>
<th>STAGE 3 mobilemoney (log-linear)</th>
</tr>
</thead>
<tbody>
<tr>
<td>log_gdppc</td>
<td>-0.243 (0.177)</td>
<td>-0.662*** (0.166)</td>
<td>-0.0255*** (0.00999)</td>
</tr>
<tr>
<td>log_gdppc_2</td>
<td>0.0240** (0.0101)</td>
<td>0.0436*** (0.00944)</td>
<td></td>
</tr>
<tr>
<td>MENA</td>
<td>-0.0886* (0.0466)</td>
<td>-0.0731* (0.0458)</td>
<td>-0.0265 (0.0366)</td>
</tr>
<tr>
<td>Constant</td>
<td>0.649 (0.774)</td>
<td>2.638*** (0.727)</td>
<td>0.285*** (0.0872)</td>
</tr>
<tr>
<td>Observations</td>
<td>149</td>
<td>149</td>
<td>149</td>
</tr>
<tr>
<td>R²</td>
<td>0.594</td>
<td>0.440</td>
<td>0.161</td>
</tr>
<tr>
<td>Adjusted R²</td>
<td>0.583</td>
<td>0.424</td>
<td>0.144</td>
</tr>
<tr>
<td>Min. of log_gdppc</td>
<td></td>
<td>6.70</td>
<td></td>
</tr>
<tr>
<td>Predicted value at minimum</td>
<td>0.105**</td>
<td>0.197***</td>
<td>0.157***</td>
</tr>
<tr>
<td>20th percentile of log_gdppc</td>
<td>7.64</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Predicted value at 20th perc.</td>
<td>0.200***</td>
<td>0.163***</td>
<td>0.133***</td>
</tr>
</tbody>
</table>

Standard errors in parentheses (*** p<0.01, ** p<0.05, * p<0.1)
Time fixed effects are controlled with a dummy variable
Bank accounts

- Almost all MENA countries underperform relative to their level of development
- Only Iran, Malta and Israel have high rates of banking access
Digital payments

- Same groups of countries
- Iran, Malta and Israel are the only MENA countries with high use of digital payments
Mobile money

• Smaller sample, but similar results

• Iran and the United Arab Emirates are the high performers (MLT and ISR not in the sample)

• Higher uptake at lower levels of development
MENA’s digital paradox

• One can wonder about the drivers of this underperformance, but:
  • MENA has high levels of internet usage
  • Internet users are highly connected to social networks
  • Why are they not adopting digital payments?
Drivers of leapfrogging

• Unfortunately, this WP aims to identify MENA’s performance and does not look into the drivers of technology adoption and leapfrogging

• Some considerations:
  • Digital finance may arise to compensate for the lack of a formal financial system
  • A formal financial system can also enable digital finance innovation
  • In MENA, neither of these appear to be true

• More research is needed to test additional data sources, identification strategies, adoption of digital services
Conclusion

• The paper proposes a simple empirical strategy to identify absolute and relative leapfrogging applied to digital financial services

• While there is evidence of leapfrogging to digital finance globally, the MENA region exhibits a consistent underperformance
  • This outlines the existence of a digital paradox:
    • Internet users outperform on use of social networks (non-productive use-case)
    • But they underperform on use of digital payments (productive use-case)

• In MENA, there appear to be a set of factors not related to technology adoption that prevent access to financial services in general, and thus may also slow down digital transformation
References


• Arezki, Rabah; Fan, Yuting; Nguyen, Ha Minh. 2019. Technology Adoption and the Middle-Income Trap: Lessons from the Middle East and East Asia. Policy Research working paper; no. WPS 8870


• Natarajan, Harish. 2019. Developing Payment Services in the Middle East and North Africa: A Strategic Approach. Background paper