Robots For Economic Development

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Contributions

- Expand literature on employment effects of robotization to developing countries, with a case study of Indonesia.
- In contrast to the available micro evidence in other countries, the analysis documents a positive manufacturing employment effect of robot adoption across Indonesian local labor markets.
- This is explained as diminishing returns from automation and modeled in a task-based framework building on Acemoglu and Restrepo (2018): large productivity effect might be offsetting the labor displacement effect in Indonesia.

Identification Strategy

Local labor markets (2SLS):

- Bartik-style measure: interacting baseline industry shares in a local labor market with industry-specific robot imports (as Acemoglu and Restrepo, 2020).
- Instrument for robot imports: *automation possibilities* using industry-specific robot penetration in countries ahead of Indonesia in terms of robot adoption (as Dauth et al., 2019).

Plant-level:

- plant-level exposure to robots based on Graetz and Michaels' (2018) *replaceability*: interacting yearly imports of robots by 2-digit industry with plants' share of secondary education workers in base year.

Results

- Positive manufacturing employment effect of robot adoption across Indonesian local labor markets.
- Within Indonesia most plants benefited from large productivity and employment effects of automation. Only the top decile of the base-year distribution of robots deviates.
- Present suggestive evidence for negative correlation between robot penetration and employment for OECD countries (higher robot penetration) and positive for non-OECD countries. $\rightarrow$ **diminishing returns to automation.**

Strengths and challenges

- excellently written
- new empirical findings
- combines analysis on local labor market level **and** plant-level
- extensive robustness checks (e.g. reduced form, two-way clustering and bootstrapping, testing exogeneity of the shift-share instrument and the potential impact of non-robot technologies)
- very transparent data treatment
- challenge: no direct measure of robot use
- potential extension: alternative explanations for the positive results?

Remarks and Questions

Plant-level exposure measure

- Robot adoption on plant-level is very rare, even in industrialized economies (in Germany in 2018 less than 2% of all establishments). Similar in France etc.
- Also robots are highly concentrated among few plants, e.g. in Germany the top 5% own 50% of the robot stock in 2018 (Deng et al., 2021).
  If this would also be the case in Indonesia, would your average results be biased?
- High correlation of the specific education level with investments in machinery could also be investments in other high-tech machines, not necessarily robots. **Possibly the constructed plant level measure is a bit noisy?**

Remarks and Questions

Interpretation of results

- Alternative explanations to diminishing returns to robotization? Competition and market structures?
  e.g. positive employment effects for robot adopters at the expense of competitors as in France? spill-overs?
- Are there country specific characteristics that could explain the positive employment effects? e.g. large informal sector, geographic feature (islands limiting mobility across local labor markets)
- is robot adoption among a select set of plants a mere reflection of broader industrialization that formalizes the large informal sector in a developing country?