

# Discussion of "Innovation Union: Costs and Benefits of Innovation Policy Coordination" by Teodora Borota, Fabrice Defever and Giammario Impulliti

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# This paper

- Economic context:
  - Integration of Eastern Europe with the West;
  - Catch-up growth in the East notably thanks to FDI;
  - EU launched the “Innovation Union” initiative to create a common innovation market / unify policy.
- Economics context:
  - We know (ACR) that static gains from trade are not very large, what are the dynamic gains?
  - What are the gains from coordinating (dynamic) policies in an open economy?
- Paper addresses the two questions in the context of EU integration.

# General comments

- Rich framework which highlights the dynamic gains from innovation and FDI.
  - Tons of “economics”: dynamic effects, strategic interactions between countries, etc...
- Most results are obtained through a calibration to EU comparing steady-states.

# Roadmap

- 1 **Summary**
- 2 East-West convergence
- 3 Policy and transitional dynamics
- 4 Calibration

# Model (1)

- 2 country: East and West.
  - Free trade.
- Final good is a CES aggregate of intermediates

$$u(t) = \left( \left( \int_0^1 \lambda^{j_{\max}(\omega, t)} d(j_{\max}, \omega, t) \right)^{\frac{\sigma-1}{\sigma}} \right)^{\frac{\sigma}{\sigma-1}}$$

- Each good  $\omega$  comes with different quality levels  $j$ .
  - Only the latest vintage is produced.
  - Good is produced with labor.
- 3 types of firms:
  - Western producers, marginal cost is  $a^W w^W$
  - Multinationals, produce in the East, marginal cost is  $a^M w^E$
  - Eastern firms, marginal cost is  $a^E w^E$ .

## Model (2)

- Innovation uses labor in a linear technology with free-entry.
  - An innovation increases the quality of the good by a factor  $\lambda$ .
- FDI requires labor as well (“adaptive R&D”) in a linear technology.
  - FDI undertaken by a Western incumbent who is just indifferent between doing it or not.
  - FDI does not change the quality but allows to produce in the East.
- Western innovation can be targeted at all lines.
- Key assumption: Eastern innovation can only be targeted at lines produced in the East.
  - Product cycle: a line needs to move to the East through FDI before being potentially innovated upon in the East.
- Solve for a BGP where there may be subsidies to the different forms of R&D.

## Effect of a Western subsidy on Western welfare (1)

- Denote  $W^W$  the welfare of the West,  $c^W$  expenditures,  $s^W$  a subsidy to western innovation,  $\tilde{P}$  the price index and  $g$  the growth rate ( $w^W$  is the numeraire). One can write

$$\frac{\partial W^W}{\partial s^W} = \frac{\partial W^W}{\partial c^W} \frac{\partial c^W}{\partial s^W} + \frac{\partial W^W}{\partial \tilde{P}} \frac{\partial \tilde{P}}{\partial s^W} + \frac{\partial W^W}{\partial g} \frac{\partial g}{\partial s^W}$$

- $\frac{\partial W^W}{\partial \tilde{P}} \frac{\partial \tilde{P}}{\partial s^W} > 0$ : a consumer surplus effect, an innovation allows to get a new, better product.
- $\frac{\partial W^W}{\partial g} \frac{\partial g}{\partial s^W} > 0$ : growth effect (building on the shoulders of giants).
- $\frac{\partial W^W}{\partial c^W} \frac{\partial c^W}{\partial s^W} ? 0$ : (domestic + international) business stealing effects:
  - Creative destruction of Western firms:  $< 0$ .
  - Creative destruction of Eastern firms:  $> 0$ , “strategic motive” for subsidies.
  - Role of multinationals.
- Missing an explicit mention of the cost of the subsidy: moving labor out of production.

## Effect of a Western subsidy on Western welfare (2)

- Role of multinationals: taming strategic motives.
  - Higher subsidy  $\Rightarrow$  less eastern innovations (more creative destruction)
  - $\Rightarrow$  more FDI (less of a risk of creative destruction).
  - More multinationals shifts profits to the east, hence  $a < 0$ .

# Effect of an Eastern subsidy on Eastern welfare

- Similarly one gets:

$$\frac{\partial W^E}{\partial s^E} = \frac{\partial W^E}{\partial c^E} \frac{\partial c^E}{\partial s^E} + \frac{\partial W^E}{\partial \tilde{P}} \frac{\partial \tilde{P}}{\partial s^E} + \frac{\partial W^E}{\partial g} \frac{\partial g}{\partial s^E}$$

- $\frac{\partial W^E}{\partial \tilde{P}} \frac{\partial \tilde{P}}{\partial s^E} > 0$ : same consumer surplus effect,
- $\frac{\partial W^E}{\partial c^E} \frac{\partial c^E}{\partial s^E} ? 0$ : similar business stealing effects:
  - Creative destruction of Western firms:  $< 0$ .
  - Creative destruction of Eastern firms:  $> 0$ .
- Here same subsidy applies to innovation and adaptive R&D. This has an effect on FDI
- Subsidy reduces the cost of FDI  $\Rightarrow$  more multinationals;
- Subsidy increases eastern innovation  $\Rightarrow$  less multinationals, which reduces welfare in the East.
- Less multinationals could mean fewer sectors on which the East innovates:  $\frac{\partial W^E}{\partial g} \frac{\partial g}{\partial s^E}$  ambiguous!

# Calibration and policy effects

- Model calibrated to the EU since 2005 (in steady-states).
- An increase in  $s^W$ :
  - increases growth, increases adaptive R&D and welfare in both countries (mostly because of the growth effect).
- An increase in  $s^E$ :
  - Innovation in the East (which only affects a few sectors) increases.
  - Effect of the threat of creative destruction in the East reduces the benefit from FDI.
  - Innovation in the West (which affects all sectors!) declines (higher production in the West limits R&D labor).
  - Decreases growth, hurts the West and only benefits the East up to a point.
  - $\Rightarrow$  Separating subsidies to innovation and adaptive R&D seems a good idea.

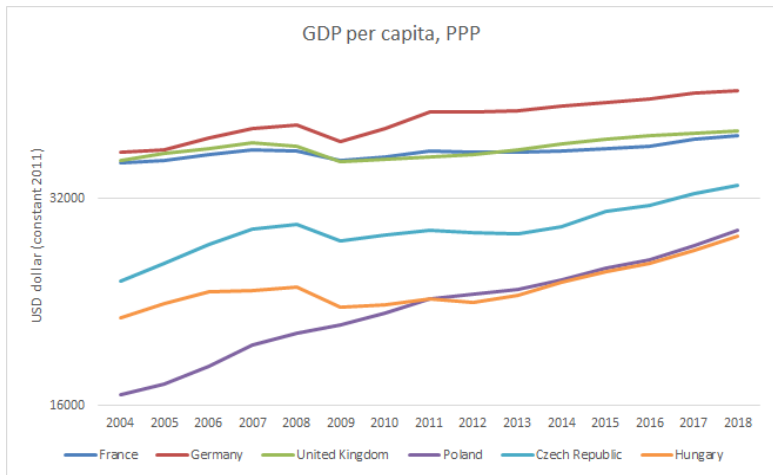
# Optimal policies

- Overall growth effects dominate:
  - Current policies are lower than Nash.
  - Nash is lower than optimal (uniform) policies.
- Separating adaptive R&D and innovation subsidies increases the gains.
- My guess: using 3 instruments would increase the gains further.
  - Eastern innovation is intrinsically less good than Western innovation because it cannot target all sectors.

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# European convergence



## Link between the model and the context

- Paper focuses on steady-states where the relative output is constant.
  - while the East is catching up.
- The paper focuses on innovation (+FDI).
  - The East is imitating and probably not solely through FDI.
- Could you calibrate to the transitional dynamics?
- What are the goods where the East leads technologically?
  - Not nothing: skype, LG for instance, but probably not too many.
- Would the model be more appropriate to think about Germany vs France?
  - (not the product cycle part).

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# Policy changes and transitional dynamics

- The paper maintains a specific wealth allocation:
  - Western innovation is financed solely by western consumers;
  - FDI and eastern innovation by eastern consumers;
  - Hence Western assets = value of purely western firms + “domestic share” of multinationals.
  - Generally asset allocation should depend on initial endowments.
- Paper compares steady-states for different policies with this steady-state wealth allocation:
  - The policy change is not only that, it is also a wealth transfer.
- Transitional dynamics may matter a lot for welfare.
  - A policy may increase initial consumption at the detriment of growth...  
Not clear whether that is a benefit or not.

# Roadmap

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- ③ Policy and transitional dynamics
- ④ **Calibration**

# Calibration

- The value-added in the paper is not in the exact numbers but in the theoretical insights.
  - Most results are derived numerically though.
- Key aspect is the asymmetry between East and West.
  - Could there be analytical results for instance when the East is arbitrarily bad at innovating?
- The current calibration of the shares of sectors with eastern and western leadership does not work though:
  - It uses FDI stock as a share of EU GDP (a flow) to measure the share of sectors with western leadership.
- Akcigit, Ates and Impulliti (2019) uses leading firms in IPC 4 categories in patent data.
  - This can be done here (and multinationals can be identified).

# Conclusion

- Very nice paper to think about the dynamic gains of FDI and the strategic interaction of R&D policy.
- Suggestions:
  - Solve for transitional dynamics;
  - Derive some analytical results in special cases;
  - Change the calibration.

## Other comments

- Figure 1: use bars not lines since the lines are meaningless.
- Regression analysis, I did not get why you did that at the yearly frequency when you have data about the last 3 years.
- A bit weird to say that there is 0 growth in steady-state, there is 0 nominal growth but there is positive real growth.
- It only became clear to me late that FDI is done by the incumbent and not an outsider.
  - page 17 was very confusing without that information.
- Do not report utility measures only welfare equivalents.
- What about the first best allocation?