

Discussion of 'A Tale of Two Workers: The Macroeconomics of Automation'

by Nir Jaimovich, Itay Saporta-Eksten, Henry Siu and Yaniv Yedid-Levi

Zsófia L. Bárány

Sciences Po and CEPR

2019 November, London
CEPR MG meeting

Summary

Automation and ICT has lead to a drop in routine occupations.

Main questions:

- 1 What are the distributional consequences of automation?
- 2 Which policies can distribute its impact more evenly?

1. Empirics:

- Identify types of individuals likely to work in routine occupations pre-automation.
- Observe what these types do post-automation.

2. Model:

- GE, heterogeneous agent model with LF participation and occ choice.

Empirics

- use CPS data 1984-2017
- occupations: non-routine cognitive, routine (cognitive and manual), non-routine manual
- use observed occupations in pre-automation (1984-1989) period to identify 'types' based on age, education, gender, race
- ⇒ main predictor of *NRC* type: education (3+ yrs of college)
- use algorithm to
 - ▶ assign likely occ to non-participants in pre-automation
 - ▶ assign likely occ to everyone post-automation and compare to actual outcome
- ⇒ reduction in routine for men: 1/3 to manual, 2/3 non-participant
- ⇒ for women a bit less clear, difficult to separate from trend increase in participation

Model – Production

output produced:

$$Z_t K_t^\gamma \left((1 - \eta) \left[(1 - \alpha) Y_{NRC,t}^{EOS1} + \alpha [X_{A,t}^\nu + Y_{R,t}^\nu]^{\frac{EOS1}{\nu}} \right]^{\frac{EOS2}{EOS1}} + \eta Y_{NRM,t}^{EOS2} \right)^{\frac{1-\gamma}{EOS2}}$$

analyze the impact of:

- a fall in the price of computer capital (X_A)
- when $\nu > 0$, i.e. routine output and comp capital good substitutes

mechanism:

reduction in cost of $X_A \Rightarrow$
 \Rightarrow reduction in demand for Y_R and in its price, P_R

Model – Workers and firms

- two types of workers: high-skilled and low-skilled
- high-skilled: frictionless labor market, produce Y_{NRC}
hours and savings decision
- low-skilled: heterogeneous ability in R and in NRM
LF participation and occ decision
- Diamond-Mortensen-Pissarides framework for low-skilled
segmented by occupation-and-ability
- wages determined by Nash-bargaining

solution:

Roy-type selection of low-sk workers into non-participation, R and NRM

mechanism:

P_R falls $\Rightarrow R$ employment less attractive \Rightarrow
 \Rightarrow more workers choose NRM or non-participation

Model – Calibration

- model solved in steady state
- most parameters calibrated to match pre-automation moments
→ in partial equilibrium (?)
- two elasticities calibrated to match changes between 1989 and 2017 given the fall in ICT capital price :
 - ▶ shift from R to non-participation and NRM employment
 - ▶ change in ICT capital per R worker
- question: does the model match the initial employment shares, relative average wages, etc?

Policy experiments

demonstrate the importance of GE model

- retraining: improve the *NRM* work ability of the low-skilled
aggregate output \uparrow , displacement of some *NRM* workers
- lump-sum UI increase
small effects, participation and unemp \uparrow
- universal basic income & increased transfers to non-participants
aggregate output, welfare of *NRC* \downarrow , welfare of low-earners \uparrow
- more progressive labor taxes
welfare of low-earners \uparrow

while keeping the budget balanced, financed by increased labor taxes on *NRC* workers

Comments – Empirics

- good to bring more data to characterize occupational selection
- BUT the main findings are somewhat underwhelming
- data only allows to differentiate *NRC* vs non-*NRC* types
- strongest predictor of type is education
- second strongest predictor is age
 - over 40 those with 1-2 years of college are likely *NRC* workers
- suggests that for some workers experience can make up for the lack of education
- classification far from perfect
 - ▶ 30-35% of *NRC* workers classified as non-*NRC*
 - ▶ 30-40% of classified *NRC* workers are actually non-*NRC*
- suggests that those who tend to get education tend to work in *NRC* jobs

Comments – Empirics

What did we learn?

1. people with education tend to work in abstract jobs
not really surprising
2. a large fraction of low-skilled individuals became non-participants
well known at least following the Great Recession

Nothing very new, but provides support for modeling choices and targets for calibration:

- connection between education and *NRC* work
- explicit non-participation margin

Comments – Education

Key assumptions:

- education is exogenous
- education fully determines which labor markets individuals can participate in

Policies are likely to also impact these margins of adjustment.

- it would be good to model endogenous education decision
- education should not fully determine *NRC* employment opportunity given classification errors

Comments – Simplifying assumptions

- a set of assumptions make the model solution & comparative statics relatively simple
 - ▶ infinite lives and no human capital accumulation
 - ▶ unemployment benefit depends on where individual searches, not on last employment/wage !
 - ▶ vacancy cost depends on ability, productivity and price of output produced
- last two assumptions together imply **constant market tightness** in each occupation, independent of ability, of productivity and of prices
- in the policy experiments this does not hold

→ solve the baseline model without these restrictive assumptions

Comments – Technological change

- the baseline model does not match the fall in routine employment, in the labor income share, the GDP growth, the change in relative wages
 - why not consider other types of technological changes?
 - ▶ Aum, Lee, Shin (2018) show that there is routinization beyond computerisation
 - ▶ Bárány and Siegel (2019) distinct role of labor-augmenting tech change and ICT/non-ICT capital accumulation
- with evolving labor-augmenting technologies (f_{NMR}, f_R, f_{NRC}) could match perhaps the data better 1989-2017
- would impact the policy conclusions as well

Summary

- interesting paper on very important and timely topic
- good to bring more data and GE model to this question
- main suggestions to strengthen policy evaluation:
 1. make education endogenous
& relax tight link between education and occupation
 2. more consistent modeling of unemployment benefit
 3. consider wider set of technological changes to match data better