REVIEW: ADULT TRAINING IN THE DIGITAL AGE

This paper picks up an interesting and relevant question for academics and practitioners alike: The need for redirection for policy in times of increasing digitization. In times of dynamically changing environments, workers must engage in lifelong learning to develop skills complementing new technologies and changes in the nature of work. As workers across industries are affected and potentially endangered by automation, this is a relevant question for policy attention - in particular in times of rising populism. The authors argue that firms alone cannot take over the task of (re)training, as access to training on the job is selective. As work-based training focuses on high-skilled workers, it excludes workers most vulnerable to automation and with skills less transferable to new jobs. As these workers lack access to private training, policy support is essential and in the interest of society.

While the paper has a very good aim and goes in the right direction, I still have the following main concerns regarding its current version that I elaborate on below.

DEPTH AND CLARITY
I am concerned that the current paper lacks theoretical depth and elaboration for solid policy advice. While the authors pick up relevant and interesting topics (e.g. polarization, low chances of reemployment of substituted workers, barriers to training), their analyses and guidelines require more theoretical grounding and precision.

- There is a lack of citations in many parts of the paper. I elaborate on an example of main concern:
    o The paper makes the strong argument that workers hit hardest by digitization are unable to pay for necessary retraining (p.2). The authors should provide more evidence that this is the case (e.g. empirics, figures). The Economics of Digitization literature has highlighted how in particular mid-skilled workers are affected by digitization, because their work is vulnerable to automation (routine task-intensive). Often low-skilled workers have a high non-routine (manual) part of tasks (e.g. in nursing) keeping them invulnerable to automation. On this note, I would like to see more persuasion that in particular mid-skilled workers are not willing to invest into retraining on their own. Is there a lack of general, affordable training courses provided by the government(s)? Do workers most vulnerable to automation lack financial means and/or awareness for training? How should policy measures best be designed to combat the issue at hand - Is it a question of providing funding, opportunities or education? While the authors touch upon possible, general participation barriers (p. 5), more specificity is needed.

- Lacking elaboration of arguments
    o It is a dominant view in the literature that non-routine skills complement automation (see e.g. Autor, Levy & Murnane (2003), Bresnahan (1999)). The authors build on a different classification of skills ("theoretical, non-cognitive and digital") that I personally find a bit confusing. Theoretical skills are often cognitive in nature and seem to conflict with the term non-cognitive (soft) skills. Using their "mixed" classification, the authors should make clearer if workers need to have all three skill sets (theoretical, non-cognitive and digital) combined or to which extent single skill sets are useful.
        ▪ In midst of the fast pace of technical change of digital technologies, I worry whether simply being able to handle given technologies is protection enough. Such skills may help hinder substitution in the short term, yet not for developing the complementary skills the authors emphasize that provide long term protection. Training in particular in new, non-routine task areas that benefit from input by automation (see

e.g. Bessen 2015's example of bank tellers) is crucial and deserves more emphasis in the paper.

- In parts of the authors' definition of non-cognitive skills (e.g. patterns of values, behaviors and attitudes), it is further unclear whether these skills can be affected by training at all. More evidence would be helpful.

o The authors provide an elaborate overview on suggestions for administration and control for the programs (p.6). However, this specification is lacking with regard to the content of general training programs. More "hands-on" advice concerning many questions related to the program is needed. Examples:
- How will new programs differ from existing (general) programs? I am missing a feeling for expected costs for the program (e.g. how much is the mentioned "lion's share", p. 6?).
- How will the programs consider differential needs across affected occupations? How will the programs create room for differentiation of skills, crucial for workers to be competitive?
- How to meet the psychological challenges workers face in participating in retraining? The argumentation that non-cognitive training is the solution to the problem (p. 5) is not persuading enough (e.g. how does this change views on being externally controlled or motivation problems?)

o Overall, while the authors provide appealing arguments for why firms alone should not train workers for the digital age, I miss discussions on (and solutions to) the challenges governments face. Scholars in the literature have criticized that institutions such as universities are too rigid and formal to adapt trainings programs to the pace of technical change. (Often also educated workers lack the skills needed on the job!) Why and how will governments perform better?
- I wonder to which extent cooperation with firms is essential in designing training programs. How will governments gain the relevant knowledge to train employees for the digital age? This discussion is missing in the paper and I find it very relevant.

Good luck!

References

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