Open assessment of the paper
"Labor market opportunities for women in the digital age"
by Christiane Krieger-Boden and Alina Sorgner,
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Preamble:

I have read the paper **DP2018-18** with considerable interest and delight. It is a very timely issue dealt with reasonable empathy but also necessary technical prowess. In fact, it motivated me to create a very simple model depicting the situation the authors describe, which I present below.

A back of the envelope model for the paper

Population consists of equal number of male and female, so w.l.g. assume that we have 1 male and 1 female in the population.

There are two sectors, Skilled (S) and Unskilled (U). θ fraction of male labour work in the U sector. Assume that access to each sector is less for the female than the male; λ fraction for the U sector (manual work) and $(\lambda + \epsilon)$ for the S sector (technical / non-manual work), hence female disadvantage is less in the S sector.

Sector	Wage rate	male wage	female wage
U	u	θ	$\lambda\theta$
S	s	$(1-\theta)$	$(\lambda+\epsilon)(1-\theta)$

Here $s > u$ and $0 < \lambda < \lambda + \epsilon \leq 1$.

So total male earning $y_M = \theta u + (1-\theta)s$ and total female earning $y_F = \lambda\theta u + (\lambda+\epsilon)(1-\theta)s$.

After **digitisation**, assume that the unskilled sector vanishes and the skilled sector stays as before (ceteris paribus). So now $y'_M = (1-\theta)s$ and $y'_F = (\lambda+\epsilon)(1-\theta)s$. It is easy to see that the wage disparity will be reduced:

$$\frac{y_F}{y_M} < \frac{y'_F}{y'_M} = (\lambda + \epsilon)$$

In fact, the situation can be even better if we consider that digitisation will empower females more (with access to online education etc.), implying an increase in ϵ.

Now consider the situation where there is a **entrepreneurial opportunity** created through digitisation, but the access is partial. $0 < \rho < 1$ fraction of unskilled workers get access to entrepreneurial opportunities and earn e ($< s$ but $> u$). We consider two possibilities.

Case (i): We again assume that access for the female is in the same λ fraction of the male (due to networks existing and / or chauvinism). So now $y''_M = (1-\theta)s + \rho\theta e$ and $y''_F = (\lambda+\epsilon)(1-\theta)s + \lambda\rho\theta e$

It is easy to check that:

$$\frac{y_F}{y_M} > \frac{y''_F}{y''_M} \Leftrightarrow u < \rho e$$

So creation of sufficient entrepreneurial opportunities through digitisation may actually increase the wage gap!

Case (ii): But this disadvantage may vanish if access to female is better than λ (in fact, the situation will necessarily improve if access fraction is $\geq (\lambda + \epsilon)$. In general, suppose this access fraction is $(\lambda + h)$ ($h = 0$ in case (i)). Then

$$\frac{y_F}{y_M} > \frac{y''_F}{y''_M} \Leftrightarrow s(1-\theta)[\epsilon u + (h-\epsilon)\rho e] + h\rho\theta e u < 0$$

Again, suppose $u < \rho e$. It is now possible to have an increase in wage gap even with a strictly positive h (but $< \epsilon$) if θ is small enough. That is, if the U sector was small to begin with, then the gain for females through better access will not be large enough to mitigate the disadvantage.

Concluding comments:

The model above can generate parametrically testable implications in line with the policy recommendations 1 - 4. The first one may be formulated as the question whether $h = 0$ or ϵ. The second one is related to testing whether ϵ can be increased? Recommendation 3 is linked with an increase of h. And finally the fourth one is a combination of 2 and 3. Where is the fifth one as mentioned? I could not locate it.

The model may also be generalised to a three sector model where there are two U sectors (one manual repetitive type, so replaceable and another interactive type, hence non-replaceable).

I hope that the authors find the above discussion useful for empirical testing in their future work on the topic.

Minor comment: In figures 2 and 3, the gap may be clarified as wage ratio.