Discussion "Work, wages and technology: Past, present and future" at European Central Bank conference on Challenges in the digital age

Rachel Ngai

LSE

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Overview of the session

- Four interesting papers on technology and work, covering different angles using historical data at industry level, LinkedIn data at firm level, micro data at individual level and role of policies.
- One common message is the importance of retraining in the process of reallocation across firms/industries: technology tends to displace workers that are associated with the label "old" – in the sense of "longer tenure in the firm" or in a "mature industry" – they have too much of the "old skills" and cannot (or slow to) adjust to the demand of new skills.
- This message is similar to the literature on structural change:

> *A high rate of modern economic growth is attainable only if the required marked shifts in industrial structure are not too impeded by resistence – of labour and capital, of people and their resource in the old and accustomed grooves. (Kuzents, 1966 p157).*

Overview of papers presented by James Bessen

- Bessen, "Automation and jobs: when technology boosts employment":
  - uses historical data for US textile, steel and auto industries to study effects at industrial level going back to century ago.
- Bessen and Righi, "Shocking Technology: what happens when firms make large IT investments":
  - uses LinkedIn data to construct an interesting measure on the share of IT to study effects at firm level.
  - focus on an important component of IT investment – "custom software" and its role as investment in innovation.
- Both papers emphasize
  - the role of elasticity of demand being different across different stages of an industry life cycle. Technology initially spurs job growth because demand was highly elastic but can lead to job loss for mature industry.
  - *importance of retraining*

Overview of paper presented by Anna Salomons

- Bessen, Goos, Salomons and Van den Berge, "Automatic Reaction – what happens to workers at firms that automate"
- Dutch micro-data (firm level) on automation expenditure, study effects on individual workers. *For incumbent workers:*
  - increases probability of job separation and decreases days worked, leading to a 5-year cumulative wage income loss of about 11 percent of one year's earnings.
  - no evidence that displacement effect falls more on the "low-skilled" workers within firm.
  - older workers (age 50+) enter early retirement.
- No displacement effects from investment on computer technology (ignoring software).
- No income loss for recent hire – perhaps they have more updated skills? Consistent with the other three papers on role of retraining.

Overview of the paper presented by Manuel Trajtenberg

- Trajtenberg, "Economic policy towards digitization: could we enhance the "goodies" and abate the "baddies"?
- Compare the policy concerns of recent digital general purpose technology with the past experiences, some old issues and some new
- Emphasize winners and losers as before but this time "democratization of expectations": harder for losers to accept fate, "losers cannot live to see the benefit" – but perhaps their future generation?
- Some important aspects for policies
  - retraining
  - education
  - how to deal with super firms like amazon
  - how to deal with fake news

Structural transformation within market sectors (I)

- The role of technology on jobs is the subject of interest in the structural change literature on the reallocation from agriculture into manufacturing and services.
- One strand starting with Baumol (1967 AER) emphasize the role of different productivity growth across sectors.
  - Ngai and Pissarides (2007 AER) show that when consumption goods are complement, labour reallocates from the faster to the slower productivity growth consumption sectors.
  - At any point in time, employment in a sector decreases if its productivity growth is below the average of all consumption sectors.
  - Since the average is falling, this generates an *industry cycle*, sector first expands then declines – the hump-shape in James's paper using historical data.
  - The key difference is that this generates the cycle with constant price elasticity while James' paper focuses on changing elasticity of demand.

Structural transformation within market sectors (II)

- Another strand goes back to the Engel's curve focusing on the role of income elasticity. As income rise, expenditure (thus employment) falls in sectors with lower income elasticity and rise in sectors with higher income elasticity.
  - Foellmi and Zweimuler (2008 JME) build a model to show goods are sequentially introduced starting out as luxury goods and ending up as a necessity, this gives rise to an industry cycle.
  - This mechanism is similar to James' paper through changing elasticity of demand. This can generate industry cycle even if productivity growth are the same across all sectors.
- The bottom line going back to Kuznets is that the reallocation process most likely involve retraining either informal or formal as emphasized by the paper of James and Manuel.
  - One example is the importance of lowering education cost in facilitating the transition from agriculture to non-agriculture and regional convergence in the U.S. during the 20th century (see Caselli and Coleman 2001).

Allocation of time: market, home and leisure (I)

- During the last century, hours per employed person declined by about 16 hours per week (*possibly because of better technology in existing industries*) but hours per working-age population has only declined by about 5-6 hours per week (Ramey 2009 AEJ-macro).
- This is mainly due to the rise in female market hours offsetting the fall in market hours of men.
  - reallocation again – the workers in the "old sectors" are usually men who did not all make the transition into the "new sectors" while women who used to be outside labour force make the transition into these "new sectors", *perhaps because women have the "comparative advantage" in these sectors* (e.g. expansion of services, Ngai and Petrongolo 2017 AEJ-macro.).

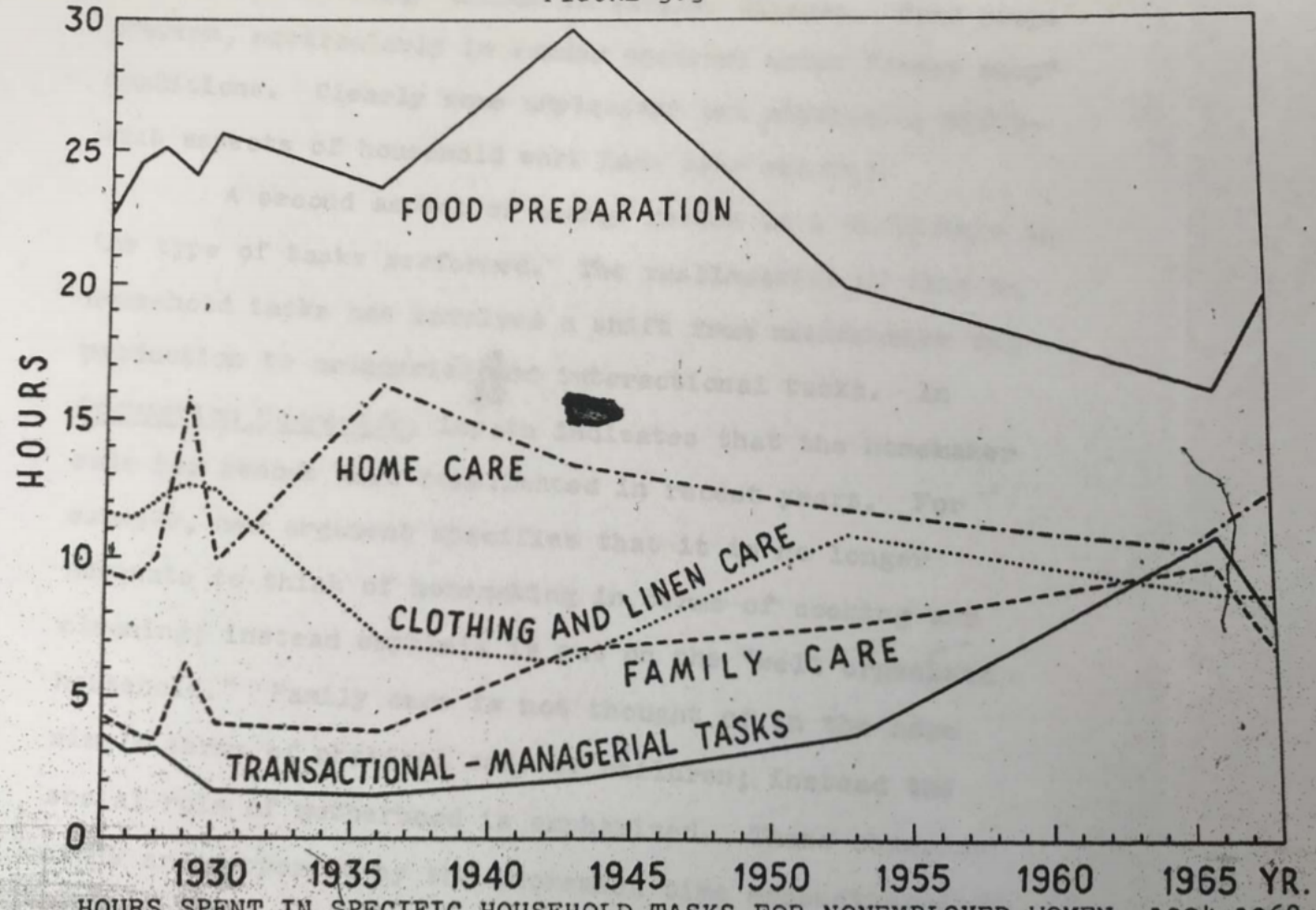
Allocation of time: market, home and leisure (II)

- So where do those additional market hours of women come from?
- Women substantially reduced their time spent in home production (especially after 1965) while there is rise in home production by men.
- Home production time averaged over the population ages 14+ decreased by very little for the last century (Ramey 2009 AEJ-macro).
- The decline in aggregate market hours was mainly reflected in the rise in leisure of about four hours over (about 10 percent increase).
  - This is far from what John Maynard case said in his 1930 essay "Economic Possibilities for Our Grandchildren" that rise in productivity would result in a large increase in leisure time during the next 100 years.
- But these aggregate trends might mask the effects at individual level as showed by Anna's paper.

Final remark: automation at home

- Vanek (1973), time use data from 1925 to 1970 shows that the reduction in total home production is mostly due to reduction in hours by domestic assistants. Consistent with BEA data, "private households" sector shrinks from 5% in 1929 to less than 3% in 1948 and to less than 1% by 1975. — *effects differ across "workers".*
- Historians asked despite the availability of household durables, "Why more work for mother?" (Cowan problem, increase in homework from 1870 to 1960s). Mokyr (2000 JEH) writes that there was an increased demand for cleaner homes and better-prepared food, which requires more home production time (sanitary and hygienic movement, germ theory of disease and nutritional science) – *more demand of the same tasks and new tasks are created!*
- Vanek (1973) finds that "there has been a reallocation of tasks of household work... a shift from maintenance and production to managerial and interactional tasks", and there is more "caring work" — *these shifts are similar to what we see in the labour market!*

FIGURE 3.3



HOURS SPENT IN SPECIFIC HOUSEHOLD TASKS FOR NONEMPLOYED WOMEN: 1924-1968

Source: Table 3.5.