

1. Theory-Model

- ***The Idea:***

In my PhD I investigate the impact of technical and organizational change on wages with particular emphasis on the gender wage gap. First I analyse the direct effect of the new organization of work on the demand for women relative to men. Then I will attempt to treat technical and organizational change as endogenous and driven by the relative supply of skills and female workers. Both wage inequality and pay differences between males and females workers are in the heart of the labour market oriented economic policy. There has been a great controversy with respect to the causes of the widening wage distribution both in the United States and the UK: skilled biased technological change (SBTC), associated with the computer revolution, has been offered as one of the main explanations and is said to have favoured the more skilled workers.

- ***Historical Prelevance, Related literature:***

There is a vast literature¹ that analyses the impact of technological change on the structure of the labour market. Most of the studies use individual level datasets and estimate simple wage equations, considering the increased use of personal computers at work as clear evidence of the impact of TC on the labour market. They presume that the use of advanced technologies such as computers should lead to increased productivity of the workers working with them. The critics of this approach focus on the extent to which the returns to computer use reflect real increases in productivity as opposed to the ability of the workers who use them. Controlling for ability variables such as qualification or education is a way to overcome this problem but this is not wholly convincing. In addition may researchers attempt to use family background characteristics that are expected to capture some part of otherwise unobserved ability. Test scores in school have also been used. A similar critique on the use of computers as indicators of TC is based on the causality issue. It may simply be that managers select those workers to be working with more advanced technology machines because they are those with the ability to do so. In other words workers with higher ability, which would have been paid a higher wage in any case, also have a higher chance to get such a machine or tool to work with.

¹ See Allen, S (1996), Autor, A., L. Katz and A. Krueger (1998), Bartel, A. P., and N. Sicherman (1999), Bell, B. D. (1996), Berman, E., J. Bound and S. Machin (1998), Borghans, L and B. ter Weel (2000), Bresnahan, T. F., (1999), Chennels, L., and J. Van Reenen (1999), DiNardo, J. E., and J. S. Pischke (1997), Doms, M., Dunne T., and K. R. Troske (1997), Entorf, H., and F. Kramarz (1994), Goldin, C., and L. F. Katz (1998), Haisken-DeNew, J. P., and C. M. Schmidt (1999), Juhn, C., K. Murphy and B. Pierce (1993), Krueger, A.B. (1993).

Moreover there is a recent literature² dealing with the possibility of significant organisational changes (OC) being behind the important changes in the labour market. According to that view, high skills are complements not only with technology but also with organisational change defined as decentralisation of authority, increased multi-tasking and more self-managing teams. Under this scenario, it is not only cognitive skills that are highly rewarded but also 'team' skills or the so-called 'people' skills, which include skills, required dealing with clients, subordinates, managers and colleagues. These skills seem to complement those acquired in higher education and are, at the same time, combined with technology use. It may be that the information technology is correlated with a new workplace organisation that includes broader responsibilities for line workers, more decentralised decision making and more self-managing teams. Particular personal skills such as autonomy, judgement and creativity and skills, which are necessary for dealing with clients, influencing teammates, inspiring and coaching subordinates, have received particular attention.

- **Alternative Theoretical Explanation:**

A rather new stream of the technical change literature, the endogenous technological change literature, builds upon 'endogenous growth theory' models and provides links between the degree of skill bias of technical change³ (or the type of technologies adopted) and profit incentives. It is the market size that determines the type of technology developed which implies that when there are more skilled workers the development of skill biased techniques is more profitable because the market for these techniques is larger, the number of workers that can use them is larger. The endogenous choice of technology, as a response to the increase in supply of skills, would raise the demand for skills⁴.

The predictions of the models of endogenous technological are in line with the empirical evidence on the skill premium. Furthermore these models could explain the increased female participation in the labour force and their gains at wage levels. Women are thought to have some of the characteristics highly demanded under the new organisation of work. I wonder if it can be that technological change (or the acceleration of skill biased technological change) and the accompanied organisational change have favoured females both at the employment and wage level. Are these females' characteristics particularly valuable under the new

² Bresnahan, T. F., E. Brynjolfsson and L. M. Hitt, (1999), Caroli, E., and J. Van Reenen (1999).

³ Acemoglu, D., (1998), Lloyd-Ellis, H. (1999), M. T. Kiley (1999), O. Galor and O. Moav (2000).

⁴ This story is in line with the empirical evidence on the behaviour of the skill premium during the last few decades. Initially, the increased supply of skills reduces the skill premium, because the economy uses the same constant technology. Afterwards, the technology must be adjusted and becomes more skill biased. Thus the premium paid to skill workers starts rising to reach a point possibly higher than the starting one).

organisation of work in association with the technical changes part of the explanation of the growing participation of women in the labour force? Has the growing numbers of females in the labour force played a role in the changes in the organisational structure of work?

I believe that the answer is positive. If the direction of technological change as well as changes in the organisation of work have been influenced by the increased participation of women in the labour market, this would have important implications for the economic policy. The education policy should be designed in such a way to develop further the highly demanded and rewarded skills. This would help to reduce the pay gap between men and women but also improve the position of the low skilled – low paid in Europe.

2. Empirical Analysis – Research Design

- **The Sample:**

The empirical analysis crucially depends on the availability of the data. At the moment I focus on the UK because of the number of rich datasets at individual and industry level. The data I use for the first part of my come from the NCDS (National Child Development Study)⁵. For the second part of my research, in order to investigate the relative demand for women, I will need a combination of different datasets. I am already using the New Earnings Survey Panel Data-set (NESPD)⁶. This will be combined with information on skills used and tasks performed in work, from two Skills Survey (1997 and/or 1999) conducted by the DfEE and also industry level data on output, labour, capital and investment in new technologies and R&D. The period covered depends on the particular dataset used but ideally it should cover the last two decades.

- **The Research Design:**

First Part: The methodology used is a multivariate analysis, mainly Least Squares and in some cases Logit/Probit, ordered Porbit and Instrumental Variables techniques. I follow

⁵ This is a continuing longitudinal study that seeks to follow the lives of all those living in Great Britain who were born between the 3rd and the 9th March 1958. To date there have been six attempts to collect information on the cohort members and five different sweeps have been created. The final sweep is that of 1991, at age 33 and it contains information on education and training, employment history, partnership and family formation, income and wealth, health. In 1978 there has been a contact with the schools attended by the cohort members at the time of the third sweep (1974) in order to obtain details on public examination entry. I mainly use the two final sweeps, which contain information on wages and labour income, but also several family and background characteristics are taken from the first three sweeps.

⁶This is a survey of the earnings of employees in Great Britain, carried out in April of each year by the Office of National Statistics. It starts in 1975 and continues until today, with the last wave being that of 1999

several specification procedures to capture any skill and computer premia and ensure that these do not reflect unobserved ability. In addition I pay particular attention to the differences in the returns to different skills and the use of computers between men and women. Furthermore I investigate the determinants of computer use and how they differ between males and females. The main difficulty with the analysis of returns to new technologies and/or new work practices lies in the identification of pure returns, compared to increases in wages due to higher skills that may be correlated with the use of new equipment. This is closely linked to the way new technologies are allocated in the workplace, or in other words how workers are selected to work with a new technological equipment, computer etc. We believe that this must be related to the nature of the tasks performed by the worker and the increase in its productivity that will follow the introduction of the new technology. We argue that highly skilled/educated workers are first chosen to work with the new technologies because this is more profitable. The main results suggest that there are significant returns to organizational and supervising skills, especially for female workers⁷. In addition I find computer premia, which become quite small in the panel regressions and are close to zero for women.

Second Part: I plan to analyse the growing demand for women and investigate its main causes. I expect the new structure of work to be among the most important explanations. For that purpose the first step would be to check the female intensity of certain skills (mainly the so called social skills) across time and then determine their industry intensity. In that way one can get rankings of the skills used by each sector and also determine whether those skills are mostly a female characteristic and how these have changed in the last decades. The second stage consists of investigating the growth rates of the industries that require those attributes and test the hypothesis that those are the sectors where women’s position relative to men has significantly improved. The econometric analysis consists of ordinary probit and ordered probit to construct the skill rankings. The regressors include the qualifications held by individuals, other personal characteristics and work characteristics.

⁷ The returns to organizational skills range between 7-10% for men and 7-13% for women. Returns to supervision skills are of the order of 9-13% for female workers. I find a computer premium of 10-15% for males but the 15% premium for women in the cross sectional analysis disappears when the panel is used.