THE WAGE EFFECT OF ENGAGEMENT WITH COMPUTERS AT HOME AND AT WORK: DOES GENDER MAKE A DIFFERENCE?

Malcolm Brynin

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Institute for Social and Economic Research
University of Essex
Wivenhoe Park
Colchester
Essex
CO4 3SQ UK
Telephone: +44 (0) 1206 872957
Fax: +44 (0) 1206 873151
E-mail: iser@essex.ac.uk
Website: http://www.iser.essex.ac.uk

ABSTRACT

Men are often considered to be more technologically minded than women, and to gain advantage in the labour market from this. However, with the growth of computer technology, which at work is spread equally across gender, this advantage might be declining. It is likely, moreover, that this computer experience has direct effects on attitudes to computers, thus reducing the attitudinal differential. A British panel dataset is used to demonstrate first, the subservience of attitudes to experience with computers both cross-sectionally and over time and, second, that the wage advantage of computer experience is at least equal for women, though some relative advantage from domestic PC experience might still accrue to men.

Introduction

For most people their welfare over the lifetime depends on their income from work. This in turn derives from the occupational status of their work and their productivity within that status level. A wide range of evidence suggests a strong relationship between technical innovations in manufacturing or services and productive potential (Gallie 1994; Machin 1996; Nickell and Bell 1995). More specifically, there is evidence of a possible association between individual usage of technologies at work - especially of computers – and both productivity and wages (Krueger 1993). While this relationship has been disputed (diNardo and Pischke 1997; Entorf and Kramarz 1997), there can be no doubt that inability or unwillingness to use computers, or ineffectiveness in their operation, might reduce an individual's scope for employment or for fully effective employment.

Is this effect gendered? It is widely acknowledged that men tend to be the first to use new technologies, to use them more both at work and home, and to gain significant benefits from doing so. But explanation of this difference is not straightforward. Is it the result of a cultural response to technology which continues to be positive for men and negative for women? A particular strand of thought sees girls, generally held to be close to mothers while boys are faced with separation, as favouring caring and interconnectedness over competition and aggression[1], which might ultimately feed into different responses to technology (Turkle 1998). Girls and women tend not to undertake technical subjects in school and higher education, which has direct implications for the nature of their subsequent employment (Gaskell 1992)[2]. This might be reinforced by differential access to domestic leisure technologies, in particular the home computer[3]. This might in turn have direct welfare implications (women might gain less from the use of the potential of the internet), though experience of a home PC might also have an impact on access to or efficacy with work-based technologies.

Alternatively, the attitudinal differences between men and women might simply reflect traditional employment demarcations rather than cause them, and

thus be of limited long-term significance. The long-standing male predominance in the use of technologies at work is associated with extensive job segregation by gender (Jacobs and Lim 1995). Men have in the past had almost exclusive access to skilled manual work. In general, women's work tends to be associated with lesser skills demands than that of men (Elias 1994)[4]. Vocational training, which often has a strong technologist emphasis, this has traditionally been highly skewed towards men (Cockburn 1987; Shavit and Müller 1998). Men protect their technological advantage in employment in ways which make it difficult for women to break into male technology strongholds (Cockburn 1983).

These two very different approaches do not contradict each other. Traditional demarcations lead to differential experience and thence in both capability with and attitudes to technology. Recognition of this problem is apparent even where views of the solution vary considerably. Haraway's solution might be a cultural fiction but she still expresses the core problem in practical terms: "What about all the ignorance of women, all the exclusions and failures of knowledge and skill? What about men's access to daily competence, to knowing how to build things, to take them apart, to play" (Haraway 1991: 181). Cockburn, concerned with the history and nature of employment practices, is similarly straightforward:

> "We cannot continue to be the passive objects of some technologies (at the receiving end of medical and military technologies, for instance, that we should be questioning or resisting), and the manipulated and exploited operators of others (type-writers, washing machines). We have to learn technical skills" (Cockburn [1985] 1999a: 131).

It is precisely the interaction between the practical, everyday circumstances of men and women in relation to technology at work, and the attitudinal and motivational aspects of this, which gives grounds for believing that these inter-relationships are more ephemeral than the above quotations suggest. The male hold over skilled manual work is declining in importance and women predominate in a

number of service occupations. Many of these require no computer application, and where women use technology at work they are likely to be paid less for this than men are. Nevertheless, the ubiquity of the work computer provides a platform for female extension into skilled non-manual work. Past socialisation into a particular response to technology might therefore be of limited long-term importance. Women's use of work technologies is increasing, and it seems extremely likely that once a woman uses a particular technology at work she is as attitudinally engaged with this as a man might be. It is the immediacy of the experience which counts.

The research discussed below uses data which has information on use of computers at home and work by both men and women, pay received at work, and attitudes to computer technology, to test the relationships between these. Moreover, as the data come from a panel survey with measures taken on the same individuals on three separate occasions, causal links can be tested explicitly.

Women and technology

Work extends general competence in life and has positive psychological effects such that the intrinsic benefits might be at least as important as the material benefits (Lane 1991). The ability to adapt to technological change might well be one part of this. "As work changes, so do we" (Dougherty 1998: 268). Yet the direct wage effects of this have a significance in their own right because the distribution of material welfare, including across gender, is partially related to the ability to adapt.

Feminist approaches to the impact of technological change on the welfare of women might be either pessimistic or, alternatively, so optimistic as to be almost utopian. Haraway rejects female isolation from technology. "At an extremely deep level, nature for us has been reconstructed in the belly of a heavily militarized, communications-system-based technoscience in its late capitalist and imperialist forms. How can one imagine contesting for nature from that position?" (Penley and Ross 1991: 6; my italics). In her famous "Cyborg Manifesto"

Haraway argues that new technologies will themselves directly erode or at least substantially alter gender differences (Haraway 1991). As the cyborg, partly human, partly technology, is "a creature in a post-gender world" (1991: 150), there is ultimately a loss of gender through technology. At a more prosaic level, it might therefore be assumed that gendered employment differences would eventually become insignificant.

Distinct from this idea, but perhaps equally utopian, “cyberfeminism” (Plant 2000) predicts the undermining of patriarchy through the creation of an alternative technological network in cyberspace - an “insurrection on the part of the goods and materials of the patriarchal world, a dispersed, distributed emergence composed of links between women, women and computers, computers and communications links, connections and connectionist nets" (Plant 2000: 274). The virtue of such an account is that it speaks of a freeing of space for women, unrestricted by social location, for instance in work (Graham 2001; Green 2001). However, such utopian views of the capacity of cyberspace to transcend the world through new means of expression has been criticised as having little to tell us about the position of most women or about the real effects of most technologies (Adam 1998). Material welfare still depends crucially on activity and on work.

For Cockburn the outlook is at the pessimistic end of the scale. Male social advantage derives not from economic but from material, and ultimately, technological power. "Identifying the gendered character of technology enables us to overcome our feelings of inferiority about technical matters and realize that our disqualification is the result not of our own inadequacy, nor of chance, but of power-play" (Cockburn 1985/1999: 194-5). However, as Cockburn (1983) herself acknowledges, there is no inevitable reason why technological change should have a male bias. While men have successfully adapted in some instances to loss of job control through technological change, often this is not possible because of the extent of the innovation; adaptation to deskilling, where this occurs, is even less possible.

Computerisation is a very important aspect of technological change at work. Whether or not it requires more or less skills than related work undertaken without computers, computers have a built-in "user-friendliness" which should in principle cut across gender. The measure of the extent of gender differentials in engagement with work technologies has therefore to include analysis of the distribution of computer technologies by gender, plus the sorts of tasks undertaken on these, and the wage returns to this effort. The question is whether changes in employment practices are such that women's technological subordination is diminishing, or whether the structure of women's willingness to engage with new technologies, presumably deriving in large measure through socialisation, is such that women will always be at a disadvantage. The reality might be between these two extremes of optimism and pessimism and would therefore suggest the possibility of at least incremental diminution of the technological differential between men and women.

This might also be apparent in the case of domestic usage of computers. Male advantage in information and communication technologies (ICT) access across a range of leisure technologies is well attested, (Gallagher 1987; Stewart Millar 1998; Morley 1995; Wacjman 1991). The same applies to domestic work usage of ICTs (Sullivan and Lewis 2001). Men are more likely than are women to be in the types of occupation where teleworking occurs (Haddon and Silverstone 1994). However, the domestic differential might also be subject to decline. Looking at the home PC there are several reasons why women should use them more than men. One is time spent at home, which gives them greater opportunity to use a domestic PC. Many aspects of consumption are managed by women (Glennie 1995; Pahl 1989) and this in combination with increasingly independent finances means that women might have a considerable interest in internet purchases. Finally, teleworking in principle gives workers a more complex set of options on how to relate work to home.

Certainly, in practice both in work and the home change might be less beneficial for women. The loss of male skilled work and its replacement through

largely female and routine white-collar work might transfer little in the way of advantage. While it is possible to distinguish between the growth in the service sector and the growth of the information society, both comprise a mix of highly skilled work and work which is routine and low-skilled (Aronowitz and DiFazio 1994; Esping-Anderson 1993; Rowe and Thompson 1996). Webster (1996) locates the growth of IT in work specifically in a context of degradation of skills, security and control. In addition, while there are some gains for women, they are more vulnerable than men to job displacement through technological change because of their generally less secure position in the labour market. This ambiguity also applies to consumption. The car is a convenience yet sometimes also a chore (Spender 1995). Women watch a lot of television but are also more likely to manage the disruption caused by television in domestic routines (Morley 1995). The proliferation of ICTs in the home will intensify current trends towards individualisation in the home (TVs or PCs in every room, the use of mobile phones). In Gallagher's view (1987) "the isolation presently experienced by women within the privatised sphere of the home is likely to increase". Early use of the telephone expanded women's contacts but by reducing outside visits probably tied women more to the home (Martin 1998).

However, such interpretations, while partly correct, are over-negative. Technology might enhance the exploitation of labour, yet there is considerable evidence that there is an association between skills, use of technology and wages, even if the causal interconnections are disputed. Engagement with new technologies through employment might be associated with a welfare premium, but so might any familiarity with computers, whether at home or work, if it enhances employability or effectiveness in employment. Women use computers at work equally with men, and this implies some technological equality – though whether for good or ill in the long term remains to be seen.

Technological change and the response to innovation

There is no contradiction between the idea that women lose out in access to work technologies through a continuing gender bias in the distribution of employment chances, and that they lose out technologically because they have a different response to technology. These two interact and feed off each other. The question is, which is primary?

It seems necessary first to make a distinction between two aspects of the response to technology: everyday engagement with technologies and the response to innovations. The former is determined in part by the location of an individual within employment, as this dictates which technologies that person will use, the level of skill required for this, and the productivity effect of that work. The social ramifications of change in the distribution of technology usage in employment might be substantial and there are several reasons, based on changes in the structure of employment, for suspecting that the gendered technological differential should fade away in the course of time. In many of the more industrialised societies manual work is in decline, while both white-collar and service jobs are in the ascendant (at least numerically). Some of these are increasingly female dominated (Desai, Gregg and Wadsworth 1999; Esping-Anderson 1993; Gallie et al 1998) and in many such occupations computers are an important tool. It might be expected, therefore, that women might now be increasingly able to use new technologies to their advantage. As a corollary, the male bias in use of technology and the associated differentials in rewards could be expected to diminish. Indeed, there has been some closing of the male-female wage gap for some years (Chevalier and Walker 2001; Desai, Gregg and Wadsworth 1999; Spain and Bianchi 1996), though with a variety of causes. In particular, traditional industries have declined, and with them the advantage men have had through domination of traditional craft skills. Within remaining occupational groups, the gain in the ratio of women's to men's pay has been in white-collar work (Rubery, Smith and Fagan 1999). The skill level of women's full-time work is often not dissimilar to that of men (Blossfeld and Rohwer 1997; Burchell, Dale and Joshi 1997; Horrell, Rubery and

Burchell 1994). While considerable job segregation remains, in the now highly expanded white collar sector computer technology is spread evenly across the genders (Wagner, Pischner and Haisken-deNew 2002), so that the link between segregation and technology might be weaker now than 20 years or so ago. Whether this is so in practice is an empirical question which cannot be assessed a priori. However, at least the patterns if not the levels of job segregation will change with new technologies (Jonung 1998). The expansion of the service sector favours women, but there is change even within traditional occupations. While across the world there has been an increase in feminisation of already feminised (non-technological) jobs, and no change in many working-class "male" jobs, some professional occupational groups such as "architects, engineers and related technicians" have become somewhat more feminised (Anker 1998: 374). This conforms with assertions that job segregation does not explain inequality as strongly as it used to (Blackburn, Jarman and Brooks 2000; Hakim 1998), and that inequality is primarily in the most highly segregated less skilled sectors (Rubery, Smith and Fagan 1999).

Alternatively, the response to innovations might reflect a more general attitude to technology over and above immediate experience. Cockburn (1983) views the male technological advantage as in part an adaptation to cycles of technological innovation. Men might in general be the first to be asked to use new work technologies. However, it would be difficult to know if this association was always the result of employer bias rather than of the available distribution of individual proclivities and skills in the workplace. The response to innovation might therefore be best measured at the household level as domestically the selection effect does not arise. Indeed, new domestic and leisure technologies diffuse through the population on the basis of by now quite well-known patterns (Rogers 1995). Although there has been a tendency for diffusion analysis to be undertaken at the household level, the evidence suggests that men are generally more likely to be technological innovators than are women (Norris 2000).

The thesis here is that men do not use technology *more* than women but simply *sooner*. They are, in diffusion terms, early adopters, but women always catch up. All domestic leisure technologies reach saturation point in the population, by which time gender is insignificant. In 1995 7% of European internet users were female, 17% in the USA. By 1998 these figures had become 16% and 41% respectively – even if intensity of usage is stronger amongst men (Scott, Semmens and Willoughby 2001: 6). Other data suggest that female usage of the internet was 55% of the population in 2001 in the UK and 60% in the USA, up from 21% and 40% respectively in 1999 (Wellman and Haythornthwaite 2002: 14). In Germany, 39% of men in a large sample aged 45-59 in 2000 used a PC for leisure compared to 25% of similarly aged women. The figures for men and women aged 16-29 were 56% and 45% respectively (Wagner, Pischner and Haisken-deNew (2002: 170-1)[5].

Such processes of change have been similarly apparent in other cases such as driving (men drove cars before women) and the telephone. The phone was originally often an extension of the office only for men; female usage for leisure purposes was frowned upon[6]. Yet Martin (1998) suggests that it is the latter which in the end helped turn the phone into a tool of mass communication. More generally, every new domestic technology becomes part of a household's "moral economy" (Green 2001), which helps shape its usage, location and even meaning. If PCs are placed on kitchen tables rather than in studies, "technophobia can be transformed into technofamiliarity" (Green 2001: 182).

While the male advantage in innovation might be consistent, it is short-term.

Measuring technological engagement at any point in time appears to give men the advantage, measuring it longitudinally renders the advantage nugatory. Perhaps the sum of the differences across technological cycles is important in its social effect, but this still means there is no *fundamental* difference in the technological engagement of men and women. Women's lesser engagement with computer technology is the result not of different technology attitudes but of differential

experience with technology in employment. Experience, whether derived from home or work, drives attitudes. Describing the various routes through which this might operate is far from easy, as ICTS are "a routine part of the mundane everyday" (Green 2001: 177). The analysis discussed below has little direct bearing on such processes. The argument is, rather, that we might assume from observation of the effects of these processes that the new technologies are slowly helping to erode work-based gender differentials.

This discussion produces the following directly testable hypotheses:

1. There is unlikely to be any strong or persistent differential between men and women in their attitudes to computer technology. Other factors associated with gender, such as work experience, determine gender differentials in attitudes to computers.
2. The male advantage in technology behaviour is always a short-run phenomenon. This implies the same possibilities in employment where appropriate technologies arise.
3. Experience with the home PC is an important contributor to general experience with computers and contributes to any premium derived from use of a computer at work. This is increasingly likely to be of advantage to women.

The data

The analysis is based on the three waves of the BT-funded 1000-household Home-OnLine (HoL) survey, which started in 1998[7]. Interviews were sought with every member in the household aged 16 or above. Attempts were made to trace all people who moved home between waves and all new household members became eligible for interview. Interviews were face to face in wave 1 and by telephone thereafter. The dataset is complicated by a deliberate choice to oversample homes with computers in wave one. In addition, homes eliminated from the survey in wave two were substituted by replacement households in order to maintain 1000 households in wave two. The household response rate was 57% in wave 1. Taking this as the baseline, plus the replacement households introduced in wave 2,

produces a pool of individuals eligible for interview for at least one wave of 2500, of which 33% were interviewed three times, 30% twice, 35% once and 2% never. (Eligibility for interview of course varied. For instance, new sample members in wave three would only be eligible once.)

The above complexities of the sample required a weighting design to compensate for the oversampling, to produce weights for the replacement households, and to adjust for household and within-household non-response. Separate weights were also produced to deal with non-response to the diary once an interview had been obtained. The analysis presented below uses different weights as appropriate.

The data used in the main results table are summarised at Annex A. In addition, in some other parts of the analysis time-use data were used. These were derived from a week-long self-completion diary. This shows activities for each day with 35 categories, including ICT usage, divided into quarter-hour slots.

The gender differential in computer behaviour

This section reviews three aspects of gender differentials in engagement with computer technology: home PC usage, attitudes to computers, and usage of computers at work. Whether we look at frequency, intensity (time spent on an ICT activity), and change in these over time, women use home computers much less than men. In wave 1, 36% of men and 25% of women used a home PC. In wave 3, these figures were 53% and 41% respectively[8]. This suggests a continuing (in fact slightly widening) differential during a period of major take-up of home computers (and the statistical significance of the difference is greater in wave 3). The differential is therefore even stronger longitudinally and this seems to negate the hypothesis of converging rates of take-up.

The data also seem to contradict any notion of a "feminisation" of computer technology, although the measures used here are the weakest of echoes of the "cyberfeminism" thesis. It is well known that female interest in and usage of computers is very different from that of men. In this case it might be expected that

differential take-up masks different needs, with women perhaps using PCs more than men for certain "female" activities. In wave 1 there in fact appears to be a typical gendering of PC usage, with men using home PCs mostly for games, but then also for work and for surfing the web, while women exceed the time men spend on computers for education and on email[9]. But by wave 3 men reduce time spent on games and increase time on some other functions, with the overall result that men in wave 3 use computers for each function more than women do, roughly doubling female time spent in each case. Total male time in wave 1 is 6.0 hours while for women it is 3.9; by wave 3 these figures are 7.1 and 3.3 hours respectively.

However, the figures on overall usage mask a surprising amount of fluctuation. The question asked in HoL is about current usage. Some people use a PC at one time, and then not[10]. This "churn" means that the cross-sectional picture is a net result of these changes in both directions. Take-up over the two-year period wave 1-3 was very high, in fact roughly equal for both men and women, at around 22%. However, 11% of men stopped using a home PC over the period, compared to 20% of women. Thus net adoption by women was about zero. The willingness to adopt the home PC does not vary by gender; only its persistence varies.

The diary adds information on intensity of usage. In wave 1, men who used a home PC did so for an average of 6.4 hours a week compared to 4.1 for women. In wave 3 these figures were 6.7 for men and 3.4 for women. This suggests a much weaker longitudinal commitment to home PC usage amongst women, whose intensity of usage actually falls (though the change in the differential over time, given the small numbers in this subsample, is statistically insignificant).

This differential diffusion is also apparent from gender differences in the number of years experience with a home PC. 32% of male home-PC users have been using a home PC for ten or more years compared to 17% of women. However, it is necessary to take age into account. When we look at the under-30s in HoL, the figures for home PC usage are 47% for men and 38% for women in

wave 1 but 70% and 68%, respectively, in wave 3. In other words, over a very short period of time young women's PC usage has become equal to that of young men.

Men have a more positive attitude to computers than do women, though HoL data show that the difference is slight (if highly significant statistically in both waves 1 and 3). In wave 1 the mean score is 11.1 for men and 11.9 for women (with the range 1-25, and where a high score represents high "phobia"). In wave 3 the figures are 10.8 and 11.7 respectively. This suggests that even over this short period of time on average men's attitudes adapted to computer technology more than did women's attitudes. However, attitudes are not a given but are in part a function of experience. Table 1 shows the mean "technophobia" scores for men and women who either have no PC in the home (row 1), or do have one but in some cases use this (row 2) and in others not (row 3). Attitudes to computer technology are associated with experience of computers far more than with gender, both in wave 1 and wave 3.

TABLE 1 ABOUT HERE

To try to get closer to the causal nature of this relationship, Table 2 shows change in usage against change in attitudes. Attitudes become less technophobic if people become new users, and this is the same for men and women.

TABLE 2 ABOUT HERE

It is possible to test the causal direction of this association more directly by comparing change in usage across the three waves to change in attitudes across pairs of waves. New users, whether male or female, show a slight decrease in technophobia (averaging –0.2) before adoption and a somewhat bigger change (averaging –0.8) after adoption. Attitudes depend on experience and gender makes no difference to this. Of course, women's more negative attitudes might impede adoption of the home PC or any other computer experience, but gender is overall a less powerful predictor of PC attitudes than is experience itself.

Men and women use computers at work about equally, that is as a proportion of those in work. HoL data show that about 59% of male and 61% of female workers use a computer at work in wave 1.[11] However, more men than women work, more men than women work full-time, and their work experience is on average longer. This might mean that work will have a longer, greater and potentially more rewarding association with PC usage for men than for women. Yet this holds only weakly. While men in work aged 45 or over have been using a computer at work for an average of 10.1 years, compared to between 7.7 for women of the same age, these figures become 6.5 and 6.1 respectively, therefore showing only a negligible gender difference, at ages younger than this. Finally, in respect of attitudes to computers, and comparing both home and work PC usage (but looking only at people in work), women who do not use a PC have a high "phobia" score, whether this non-usage is at work (12.2) or at home (11.6). For men the equivalent figures are 12.1 and 11.9 respectively. Where a PC is used at work women's "phobia" score falls to 9.8, and is 9.5 where a home-PC is used. For men the figures are 9.3 and 9.2 respectively.

In summary, while women tend to have less positive attitudes to computers and to use computers less at home than do men, they are equally willing to start using a home computer but less willing to persist (and where there is only once home PC this might be the result of the man or children claiming this for themselves). Young women's take up varies little from that of young men. Women also use them about equally with men at work. Moreover, not only is the

functional use of computers by men and women becoming increasingly similar, but the structure of the relationship between computer experience and attitudes is the same for men and women. Attitudes to computers are in both cases highly pliable and follow rather than lead experience with computers.

The similarities both between men and women is encapsulated in Table 3. This produces results from a logistic regression analysis of the factors associated with home and work PC usage, for men and women separately. The data are pooled across all three waves. The models include some lifestyle indicators represented by frequency of leisure activities such as attendance at outside sports events or eating out, as computer usage itself might be considered an aspect of lifestyle, though the effects of these are not shown. Some of the other measures are of work needs which might encourage home PC usage, in particular frequency of working at home. Responses to three questions on this relating to work at home in the day, in the evening, or at weekends, are summed into a simple scale.

The results show that both for men and for women, but also for both home and work PC usage, education, positive attitudes to computers, high work autonomy, and frequency of working at home are associated with the probability of using a PC. While there are some differences across the columns, the overall picture is clearly one of similarity. The same factors which help explain the likelihood of using a computer at home help explain work computer usage to the same extent, and they do so roughly equally for men and women. It would appear that computer usage is computer usage, wherever it is undertaken and whoever undertakes it. Women are in no way exceptional in this. All these outcomes give strong support to hypothesis one.

TABLE 3 ABOUT HERE

PC usage and welfare

This still leaves the question of the welfare impact of computer usage. In Table 4 this is measured by gross monthly wages. The aim is to see if use of a computer either at home or at work is associated with higher wages, and if so whether this varies by gender. The basis of the model is therefore a wage equation with a number of controls and the above measures of computer usage. The interest here is specifically the gender difference, but the significance of this itself hinges on the interpretation of the computer effect (that is regardless of gender). The computer effect model has been both supported (Krueger 1993; Green 1998) and criticised (diNardo and Pischke 1997; Entorf and Kramarz 1997) in the economics literature. While the former finds a positive wage premium derived from usage of computers at work, which implies some sort of productivity impact, but also of course an ultimate welfare enhancement for the individual user, the critique argues that the effect is more apparent than real. It is imputed not to productivity linked either to the machine or to the skills needed to operate this but to unmeasured differences in ability, motivation and experience. The computer effect is seen as a proxy for these because people with higher levels of potential performance are more likely to use a computer at work.

The data used here are panel data, which normally allow improved models through their ability to take into account within-individual variation over time. However, with only three waves and not all variables measured in all three waves, while the critical variables such as PC usage are unlikely to change much over this time (especially PC usage at work), this route does not offer much improvement over the standard models. The household basis of the survey is much more useful. Many computer effect models are work-based and therefore contain little information on individuals which would help soak up some of the apparent association between use of a computer and wage outcomes. Apart from data on occupations and education, Home-OnLine also contains information on family, leisure, and attitudes to computers, but also on whether people bring work home and of course whether they use a computer at home. Some of these measures no

doubt tell us something about the person's motivation or ability, even if, as in the case of the leisure indices, the theoretical basis for this is not clear.

All the variables are shown in the table, and the data are again pooled. Little comment is necessary on the fairly large number of controls, though there are some elements which are of interest, in particular the gender differences in the effect of work autonomy and work at home. Of even more interest, there is no association between attitudes and wages for either men or women.

TABLE 4 ABOUT HERE

The key variables for computer usage show a computer effect for both men and women. What does this mean? The effect itself might still reflect individual and unmeasured differences in actual or potential performance at work, in line with the critiques cited above, and despite the additional controls. Indeed, it is impossible to say what precisely causes this apparent effect. However, following on from the theoretical discussion, it is arguable that this distinction is both unresolvable and ultimately perhaps not that important. Work experience is a complex process of adaptation in which learning on the job influences ability and motivation, while the latter then have an impact on learning on the job. The general thesis here is that women's attitudes to technology do not inhibit welfare outcomes because these attitudes themselves change in response to work experience. The computer effect is the result not just of unmeasured differential ability or motivation but of an undifferentiated amalgam of this and experience accumulated over time.

The gender differences in the effect are quite clear, and not as expected. It is not surprising that use of a home PC has no wage effect where this is not combined with use of a work PC, as the computer premium obviously requires the

latter (though it is also apparent that home PC usage does not itself give any indication of higher, or lower, levels of potential performance at work). Use of a work PC has a positive effect for both men and women, as does combined use of a work and a home PC. However, in the case of women this combined effect is *lower* than the single effect of usage of a work PC, which, contrary to hypothesis three suggests that the domestic PC experience has no additional welfare effect. For men this is not so. Use of a home PC where one is also used at work is associated with a higher premium than use of a work PC alone, suggesting the possible impact of the additional experience gained from using this (or possibly of differential motivation which might itself have a technological component). This gives some credence to the arguments of Cockburn (1986; 1985/99b) that the technological differential is gendered and that its gendering is pervasive. However, the wage impact of use of a computer at work is stronger for women than for men, and this powerfully supports hypothesis two - that any male advantage is at most short-term. It is work experience, not a lack of a positive response to technology, which is important.

Four adaptations to the general model shown above were tested in an attempt to cover residual problems with the basic specification. First, random effects models were run with the same specifications as above. These produced much the same results as the OLS regressions, suggesting that the within-individual variation over time which such models include, given the nature of the data at least, adds little information. Second, the same regressions were run with ten additional variables denoting the function of computer usage at work. Only use of email produced a significant outcome, and then for men only. This gives at least partial support to the idea that the computer premium reflects individual characteristics rather than the productivity derived from technology, as it is difficult to see how email can be especially productive. However, the coefficients for the computer effect itself remained much the same for women with the introduction of these variables and in fact strengthened for men (while retaining the same relative values). This gives further credence to the validity of the computer

effect, however this might be interpreted. Third, models were run with computer usage at work and at home as separate variables (despite some correlation between the two). The results shows a positive and highly significant home PC effect on wages for men which has a value of 40% of the work PC premium. The latter premium was the same for women but the home PC effect in this case was close to zero. Finally, number of years experience with a PC both at home and work were substituted for whether or not a computer was used in either location. It was expected that this would show the benefits to men of their earlier adaptation to computer technology, but none of the coefficients, whether for men or women, anywhere reached statistical significance. Number of years experience makes no difference. It is only current usage which counts. Whatever this says about the impact of differential diffusion, it is clear that no long-term advantage or disadvantage derives from this.

Conclusion

Because women use domestic computers less than men do, and because women have less positive attitudes to computer technology, it is tempting to assume that the response to computer technology is fundamentally gendered. Such a concept would fit in with a wide range of theoretical and empirical writings, much of it feminist, which takes this differential as a given. It has been argued that this is an indicator of a more deep-seated technology-based power differential in favour of men. The focus here is the welfare implications of this. Men have for along had a hold over technologically advanced and thus better paid work. Is this changing with the spread of computers in work processes, many of which are in fact highly "feminised"?

It seems likely that a part of the traditional male advantage in employment stems from a near monopoly over access to highly productive work technologies. This in turn leads to greater familiarity with and a more positive attitude to technology in general. Socialisation into a particular set of responses to technology therefore depends on actual work experience. In this case the apparent male

preference for technology is not fundamental. It could, for instance, be read as a speedier willingness to come to terms with innovations rather than as a reflection of a different underlying disposition towards technology. While its effects appear continuous (depending on the rate of innovation) it not long-lasting: when a new technology arises men merely get in the queue first. The above analysis relating computer usage to attitudes to computers, and change in these over time, shows that the structure of the relationship between PC attitudes and PC behaviour is the same for both men and women. For both, attitudes seem to follow experience rather than the other way round, and to much the same degree. Furthermore, the gap in attitudes between users and non-users is far greater than the gap across the gender divide, while the factors which explain use of a PC, whether at home or at work, are roughly the same for both women and men.

The gender divide in computer usage, behaviour and attitudes should in principle therefore play only a limited role in the gendered wage differential. The actual impact of computer usage and attitudes is tested in a wage regression where use of a computer both at home and at work are used as explanatory variables. The expectation that increased female use of a computer at home would, through the additional experience this represents, give women some productivity gain, is not supported. In fact, men not only use a home PC more than do women but only they appear to achieve some productivity enhancement from their domestic PC usage. This does after all give some credence to theories of the fundamental nature of male superiority in the engagement with technology. However, this is largely discounted by the fact that women's wages increase somewhat more than those of men through use of a computer at work. Given change in the technological basis of work in favour of computer technology, this might represent a real advantage.

Obviously, the actual understanding of technology required to operate a computer is limited, and mostly even unnecessary. Computer usage represents a range of engagement from relatively unskilled, routine work, though a range of craft skills, to high-level intellectual input, while for some it is merely a tool that is used to enable other high-level intellectual work. However, computer technology

itself is not necessarily associated with a more unequal wage distribution. For instance, using HoL data, the wage that marks the division between the first and second quintiles of the pay hierarchy of computer users is £850, compared to £2400 for the division between the fourth and fifth quintiles. The figures for non-PC users are £325 and £1451 respectively. The former is somewhat more equal. These figures also demonstrate the substantial pay difference between those who do and who do not use a computer. There is therefore some justification for generalising about the computer wage effect.

The computer is as far as most of us will get to technology in our working lives, and it is forming the basis of a re-ordering of the gendered basis of the advantages accruing to use of technology at work. That women are beginning to gain from this means above all that we should perhaps begin to dismantle ideas of an inevitable male technological advantage. The advantage derives from experience, not gender, and the gendered nature of this experience is now changing. However, this does not mean that across the array of technology-based work processes there is, or is even likely to be, complete gender equality. The example of computers serves, rather, to remind us that there is no indissoluble difference in attitudes to technology between men and women. At least where the technological element is subdued, as with the operation of computers, attitudes are pliable, and women gain as much as men, possible even more than men, from the use of computers at work.

Notes

1. Some early feminists conceded that science and rationality are “male” and developed anti-technology theories (critiqued in Farganis 1986: 185/94).
2. A typical example of the problems women face: "The second year I was the only girl in the class, and I felt really stupid, so I didn't want to go back" (quoted in Gaskell 1992: 48). In the UK, despite the rise of computer technology the proportion of women taking degree courses in computing fell dramatically just as the computer and then the internet began to become widespread (Adam 1998: 19; Scott, Semmens and Willoughby 2001: 14). In the case of computers the issue “is not computerphobia, needing to stay away because of fear and panic, but rather computer reticence, wanting to stay away because the computer becomes a personal and cultural symbol of what a woman is not” (Turkle 1998: 365). Referring to computer science, Turkle argues that its culture is male because success is linked to risk-taking and thrill (for the hacker in particular). The location of computer science in departments where geeks do not predominate (such as social science) raises female participation (Rasmussen and Håpnes 1998).
3. Telephonic behaviour is gendered, with women tending towards different call lengths but also more likely to use the phone not only for social contacts but for “kinkeeping, nurturing, and community support” (Moyal 1995: 303). Use of email tends to replicate the gendering of relationship patterns. For instance, in one sample, 39% of women but 22% of men used emails to “revive family ties” (Boneva and Kraut 2002: 382).
4. In part this might be because of a traditional undervaluing of female skills - secretarial work is seen as clerical while (male) keyboard-based printing was in its heydey treated as skilled (Cockburn [1985] 1999b; Gaskell 1992).
5. Time spent, however, varies by much more. While 73% of young men aged 16-17 used the internet, and 63% of young women of that age, average weekly hours usage was 12 for the men and 5 for the women (Wagner, Pischner and Haisken-deNew (2002: 170-1).

6. Functional technologies are harder to assess. The microwave oven could have more technology incorporated into it, so that it better mimics the traditional oven, but manufacturers shied away from over-technologising the product in order not to put off (predominantly) female users (Cockburn and Ormrod 1993).
7. Analysis based on this dataset also appears in Anderson and Tracey (2002).
8. The difference is also apparent across cultures. Using e-Living data, covering 1750 households in each of six European countries in 2001 (URL http://www.eurescom.de), male usage varies in the extent to which it exceeds that of women across five countries from 11.4 percentage points (Israel) to 18.5% (Italy).
9. In one US sample, women spent nearly twice as long as men using email (Boneva and Kraut 2000: 385).
10. Dropping-out from *internet* usage has been measured in the USA at around 10% of a sample of current users per year (Katz and Rice 2002: 129).
11. In Germany there is a similar equality though men are substantially more likely to use the internet at work (Wagner, Pischner and Haisken-deNew 2002: 172).

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Table 1: Mean "technophobia" scores for home pc users and non-users

	Wave 1		Wave 3	
	Male	**Female**	**Male**	**Female**
No home PC	12.2	12.7*	12.7	13.3*
PC user	9.1	9.8**	9.1	9.6*
Non-user	12.1	12.4	12.6	13.2
All	11.1	11.9***	10.8	11.7***
N	*793*	*941*	*700*	*848*

*** p <.001 ** p <.01 * p <.05*

Table 2: Change in attitudes waves 1-3 (positive score=higher phobia)

	Men	**Women (**)**	***N***
Never uses	0.03	0.36	*616*
New user	-0.71	-0.76	*129*
Stopped using	0.94	0.30	*43*
Stays user	0.02	-0.10	*397*
N	*524*	*661*	*1185*

** p <.01 (between the categories of the column)*

Table 3: Factors associated with home and work PC usage, those in work only (odds ratios from logistic regression: observations for men 1385, women 1353)

	Men		**Women**	
	Home	**Work**	**Home**	**Work**
Age	1.0	1.0	1.0	1.0
Has degree	1.6*	2.8***	2.3***	2.4*
Uses PC at home/work	3.0***	2.9***	1.9***	1.9***
Positive attitudes to PCs	1.3***	1.3***	1.3***	1.3***
High work autonomy	1.0	1.7**	1.5**	1.4*
Tends to work at home	1.2***	1.1**	1.1***	1.1***
Pseudo R^2	*.26*	*.28*	*.21*	*.19*

*** p <.001 ** p <.01 * p <.05; 6 controls for leisure frequency not shown*

Table 4: Variables associated with log of monthly gross wages (OLS coefficients)

	Men	**Women**
Age	.006***	.003
High sports leisure	.03*	.03*
Eats/drinks out frequently	.02	.04*
Partner, no children	.02	.03
Partner and children	.08	-.01
Has a degree	.11*	.23***
Higher school qualifications	.05	.09*
Higher manager	.45***	.49***
Lower manager	.17**	.35***
Intermediate	.12	.18***
Small employer	.40***	-.12
Lower supervisor	.13**	.16**
Work hours	.02***	.03***
Home-work score	.00	.02**
Work autonomy	.08*	.06
Positive computer attitudes	.00	.00
Uses work pc only	.24***	.37***
Uses home pc only	.02	.07
Uses home+work pc	.35***	.31***
Constant	6.22***	5.80***
Adjusted R squared	*.37*	*.61*
Observations	*936*	*960*

**** p <.001 ** p <.01 * p <.05*

Excluded categories: single-person families;low or no educational qualifications; routine and semi-routine professions (using the NSSEC); uses a PC neither at home nor at work.

Annex A: Means of variables used in Table 4

	Men	**Women**
Uses work PC only	.14	.21
Uses home PC only	.14	.15
Uses work and home PC	.50	.41
Log pay	£7.3 (SD: .77)	£6.6 (SD: .84)
Age	38.8 (SD: 12.2)	38.3 (SD: 11.9)
Has a degree	.23	.25
Higher school qualifications	.22	.18
Higher manager	.20	.07
Lower manager	.24	.31
Intermediate	.09	.22
Small employer	.05	.02
Lower supervisor	.16	.06
Work autonomy: yes/no	.62	.51
Home-work scale 3-13 (high=low home-work)	9.8	10.2
Work hours	42.3 (SD: 13.0)	30.7 (13.4)
PC attitudes range 1-25 (high=negative)	9.9 (SD: 3.0)	10.5 (SD: 3.0)
Watches live sport scale 1-6 (low=frequent)	4.2	4.8
Eats or drinks out scale 1-6 (low=frequent)	2.9	3.0
Couple only	.22	.22
Couple plus children	.61	.54

SD=standard deviation; see Table 4 for excluded categories