GENDER DIFFERENCES IN INFORMATION TECHNOLOGY USAGE: A U.S.-JAPAN COMPARISON

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ABSTRACT: *This study examines whether there are differences in men's and women's use of computers and the Internet in the United States and Japan and, if so, how this gender gap has changed over time. We focus on these two countries because information technology is widely used in both, but there are substantial differences in institutions and social organizations. We use microdata from several surveys during 1997–2001 to examine differences and trends in computer and Internet usage in the two countries. Controlling for socioeconomic characteristics, our results indicate that there were significant gender differences in computer and Internet usage in both countries during the mid-1990s. By 2001 these gender differences had disappeared or were even reversed in the United States but persisted in Japan. People not currently working have lower levels of information technology (IT) use and skills in both countries regardless of gender, but working women in Japan have lower levels of IT use and skills than working men, a difference that generally does not occur in the United States. This suggests that employment status per se does not play a large role in the gender gap in Japan, but type of employment does. The prevalence of nonstandard employment among female workers in Japan can explain much of the gender gap in information technology use and skills in that country.*

This study examines the relationship between gender, work, and information technology (IT) use in the United States and Japan. We view digital inequality as unequal access to and use of IT across demographic groups. We argue that studying digital inequality across countries requires a nuanced understanding of the institutional context under which such inequality is generated. In this article, IT skills and usage and their interaction with labor market processes are a lens for examining the effect of institutions in a cross-country context.

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Our general hypothesis is that gender differences in IT access and use—both at work and at home—reflect gender differences in labor force participation and in types of jobs held. We focus on the United States and Japan because IT is widely used in both countries, but there are notable differences between the two countries in the structure of labor market institutions and social organizations. In particular, Japan has larger gender differences in wages, labor force participation, and occupational distribution. In addition, women in Japan are more likely to be employed in "nonstandard" positions such as part-time jobs and self-employment and to have lower human capital investments relative to men. These different social and institutional contexts in Japan and the United States may lead to cross-country gender differences in IT use. Although several studies have examined whether there is a gender gap in computer and Internet use in the United States, none have examined the role of work in any such gaps, either within the United States or in a cross-country framework. We therefore explore the institutional context that leads to gender inequality in labor market outcomes in the United States and Japan and whether such inequality carries over to gender differences in IT use and skills.

Our study is motivated by previous studies that link IT use and economic advancement. As IT has become more prevalent, computer literacy—broadly defined as the ability to use information technology—has become an important form of human capital that affects economic success (Levy and Murnane 1996; Reilly 1995). Rooted in theories of complementarity between physical capital and human capital (e.g., Griliches 1969), empirical studies have established a positive association between computer use and wages, although the causal linkage is not clear (e.g., DiNardo and Pischke 1997; Krueger 1993, 2000). The digital divide, or the separation of information have's from the have-not's, has become a serious concern because of its potential economic consequences (OECD 2001). In addition, not having computer skills can lead to social exclusion as well as economic penalties (Haisken-DeNew and D'Ambrosio 2003), making it important to identify groups that do not have access to IT. This study focuses on gender, using a cross-country analysis to explore the role of work in the digital divide across the sexes. Comparing two countries that have different attitudes toward gender roles provides an opportunity to explore whether these cultural differences in gender expectations are reflected in differential participation by men and women in the labor market and in the use of IT.

The next section briefly surveys gender differences in labor market outcomes and patterns of IT use in the United States and Japan. We then describe the data used here to analyze IT use and skills in the two countries and explain the empirical methodology. The results indicate that gender differences in IT use and skills are considerably smaller in the United States than in Japan and in many cases nonexistent in the United States. People who are not currently working tend to have lower levels of IT use and skills in both countries regardless of gender, but working women in Japan have lower levels of IT use and skills than do working men, a difference that generally does not occur in the United States. This suggests that employment status per se does not play a large role in the gender gap in Japan, but type of employment does. We find that the prevalence of nonstandard

employment among female workers in Japan can account for much of the gender gap in IT use and skills in that country.

BACKGROUND

By almost any measure, gender inequality is greater in Japan than in the United States. Statistics from the International Labour Office (ILO 2001) indicate that Japanese women are less likely to be in the labor force than U.S. women: 50 percent of women in Japan versus 60 percent in the United States. When employed, Japanese women are less likely to be in professional and technical positions than their U.S. counterparts: only 45 percent in Japan versus 54 percent in the United States. The gender wage gap is also more pronounced in Japan; the female-to-male earnings ratio is 62 percent in the United States compared to 44 percent in Japan. In addition, whereas women are currently more likely than men to go to college in the United States, the opposite is true in Japan.

Does the greater gender inequality in the Japanese labor market translate into greater gender inequality in IT access and use in Japan relative to the United States? There are several reasons why this might be the case. First, because computer use at work contributes to overall computer use rates, gender differences in labor force participation may lead to gender differences in overall computer use. In other words, people who do not work do not have the opportunity to use a computer at work, which may be reflected in overall usage statistics. Because women are less likely to work than men, their rate of overall IT use may be lower than men's. We therefore investigate the role of employment status in IT use, such as to what extent working affects the likelihood that an individual uses a computer or the Internet anywhere.

Further, differences in employment status may lead to differences in computer use at home. As people develop information literacy and familiarity with computers at work, the costs of using a computer elsewhere fall because many computer skills gained at work carry over to computer use at other locations. This may cause IT use at home to be higher among workers than among nonworkers, a possibility that we examine for both Internet use and computer use more generally. In addition, the cross-country differences in employment suggest that gender differences in computer use at home will be smaller in the United States than in Japan. We therefore examine, among other questions, whether the higher female labor force participation rate in the United States translates into a smaller gender gap in computer use at home than in Japan.

Previous studies of digital inequality have focused on computer use at home, but work is likely to be an important arena in which differences in computer use may arise, so we examine differences in computer use at work as well as elsewhere. Differences in the type of jobs held may lead to differences in computer use across genders. For example, gender differences in the fraction of workers employed in nonstandard jobs may contribute to gender differences in IT use if workers in nonstandard jobs are less likely to use computers. Cross-country gender differences in the types of positions held may lead to differences between the United States and Japan in computer use at work across sexes. These differences may carry over to computer use at home as well.

Trends in Computer Use

Until recently, the proportion of households with computers was higher in the United States than in Japan. As Table 1 indicates, the fraction of households with a computer was about 17 percentage points greater in the United States as recently as 1998. In fact, diffusion of computers in households in Japan remained lower than in most OECD countries throughout much of the 1990s (OECD 2000). Only after 2000 did computer penetration rates in Japan reach a level comparable to the United States. Internet use in Japan also lagged behind the United States during the 1990s and reached similar rates only recently.

Differences in the skills required to use computers and the costs of acquiring them may contribute to these patterns. According to the Economic Planning Agency (EPA 2000) of Japan, computer and Internet penetration rates in Japan were initially lower than in the United States in part because of higher costs of hardware, software, and telecommunication fees.

That computers and the Internet predominantly rely on the English language also played a role in Japan's slower adoption of IT. Over 90 percent of online content is in English (OECD 2001), but relatively few Japanese speak English.[1] For example, a survey conducted by the Recruit Works Institute in 2000 found that 77 percent of workers in the Tokyo metropolitan area can barely speak English (Recruit Works Institute 2001). That English is still a distant foreign language in Japan is a significant handicap in the adoption of computers and the Internet.[2] The same is true for the supply side of IT. Developers must make additional investments in hardware and software in order to make their products compatible with the non-Roman-alphabet languages of Asia. This is believed to be one of the key reasons why Internet applications and e-commerce in Asia continue to lag behind the West (Teicher 2001).[3]

Furthermore, although the typewriter was a common fixture in offices and homes in the precomputer era in the United States, no comparable counterpart to the typewriter existed in Japan, and therefore most people in Japan do not know

TABLE 1

Computer Ownership and Internet Use in the United States and Japan

	United States		*Japan*	
Year	*Computer Ownership*	*Internet Use*	*Computer Ownership*	*Internet Use*
1997	36.6	22.2	22.1	9.2
1998	42.1	32.7	25.2	13.4
1999	—	—	29.5	21.4
2000	51.0	44.4	38.6	37.1
2001	56.5	53.9	50.1	44.0
2002	—	59.1	57.2	54.5

Source: U.S.: National Telecommunications and Information Administration (NTIA); Japan: Economic and Social Research Institute (ESRI).

Note: Computer ownership is the percentage of households that own a computer. Internet use is the percentage of individuals who use the Internet (from any location).

how to type. Also, because Japanese is still the dominant language used on computers in Japan, all users must first master the craft of transforming the English alphabet into Japanese characters (or *kanji*) using their keyboards. Thus the introduction of computers was (and continues to be) a major adjustment for users in Japan.

Computers, Work, and Gender

Today the majority of workers in the United States use computers (NTIA 2002). Women are considerably more likely than men to use computers at work; in 2001 almost 63 percent of women used a computer at work compared to about 51 percent of men (NTIA 2002). The higher proportion of female workers using computers is in large part due to changes in job skill requirements that have favored women. Weinberg (2000) explains that the number of physically demanding jobs—positions in which men have a comparative advantage—has been falling since the 1970s, while the number of positions that require using computers has risen. These trends have increased the relative demand for female workers; Weinberg finds that gender-biased technological change can explain over half of the growth in the demand for female workers during the period 1975–93. Interestingly, women without college degrees are more likely than similarly educated men to use computers at work, whereas the opposite holds among college graduates (Losh 2003).

U.S. women's higher overall rate of computer use at work does not carry over to all aspects of IT access and use. Women are slightly less likely to live in a household with a computer (Bureau of the Census 2001; Losh 2003), and men dominate household decisions about computer purchases (Papadakis 2001). Some studies conclude that women are less likely to use the Internet at all (e.g., Bimber 2000; UCLA 2001) and use the Internet less frequently given any Internet (Ono and Zavodny 2003a). However, many of these conclusions are based on cross-tabulations or regressions that do not control for employment and therefore may reflect gender differences in employment status, the focus of this analysis.

No official estimates of the proportion of computer users at work or at home by gender are available for Japan, but the available data point to large gender gaps. Proprietary data from the Nomura Research Institute indicate that 32 percent of female workers used computers at work in 1999, compared to 45 percent of male workers. In 2001 about 32 percent of all women ages fifteen through fifty-seven reported using a computer at home versus 52 percent of men.

Considering that by 2000 Japan had caught up with the United States in terms of overall computer and Internet penetration, why do vast gender gaps still exist within Japan and between the two nations, and what are the core factors in explaining these within and between gaps? We argue that the gender gap in computer use in Japan reflects patterns of differential investment in and accumulation of human capital between men and women that in turn reflect cultural expectations of gender roles.

Although perceptions of traditional gender roles are declining in Japan, social norms and expectations governing the gender division of labor do remain and

lead to greater gender differences in human capital accumulation than in the United States (Brinton 1988). International surveys have consistently reported that Japanese women are more likely to support specialization between the sexes than do women in the United States and Europe.[4] Normative expectations to fulfill commitments at home constrain the labor force participation of Japanese women. Compared to women in the United States and Europe, Japanese women are more likely to quit their jobs following marriage or childbirth (Noma 1998; Tokyo Metropolitan Government 1994). If they reenter the labor market later, many do so in nonstandard employment such as part-time or temporary work because there are very few midcareer ports of entry back into career-track positions (Nagase 2003).

Further, the Japanese employment system is gender biased by design. The so-called lifetime employment system characterized by employment security, extensive training, and internal promotion is only available to workers who are able to make long-term commitments to a firm. Employers seek workers who will remain with their firms over a long period so that they can recoup the cost of their investments. Consequently, the long-term employment relationship disfavors women, who are expected to make commitments to their families instead of working continuously for the same firm. And because women are more likely to be employed in the secondary labor market or in nonstandard positions, they receive little training and few prospects for promotion.[5] Women may enter the labor force in equal proportions to men, but only a very small proportion of the women even enter career-track positions. As Ono and Rebick (2003:242) explain, "It is not that there has been a 'glass ceiling' in Japan, it is that there has not even been a ladder." This exclusion from internal labor markets is the main reason that women do not benefit from human capital investment by employers.

Unfavorable conditions and limited opportunities for women in the Japanese labor market result in downgrading of women's educational aspirations and less investment in their human capital. Women are less likely than men to be enrolled in higher education in Japan. Ono (2004) argues that parents are significantly more likely to support university education for their sons than for their daughters, and family resources are accordingly allocated in favor of sons over daughters. Parental preference to invest more in the human capital of their sons is a major factor in the gender gap in university advancement rates in Japan.

Such gender differences in human capital investment and accumulation in Japan may carry over to IT skills. Given that the cost of acquiring computer skills is not negligible in Japan, women may invest less in computer skills and subsequently have less access to computers than men. The 2000 survey by Recruit Works Institute found that computer literacy was significantly lower among working women than among working men in the Tokyo metropolitan area (Recruit Works Institute 2001). Women were less likely than men to use computer applications such as email, Internet, word processing, and databases and more likely to respond that they can barely use computers. The survey also found that 42 percent of women work in positions that do not require computers versus 26 percent of men.[6] We investigate these differences and their causes below.

Standard versus Nonstandard Jobs

A critical dimension in the study of labor markets and social organizations is the distinction between standard and nonstandard employment. Kalleberg, Reskin, and Hudson (2000) label this distinction "good" versus "bad" jobs. Good jobs (or standard work arrangements) are characterized by "the exchange of a worker's labor for monetary compensation from an employer, with work done on a fixed schedule—usually full-time—at the employer's place of business, under the employer's control, and with the mutual expectation of continued employment" (p. 258). Bad jobs are characterized by low earnings, lack of health insurance, and lack of pension benefits, all of which are more prevalent in temporary, contingent, and part-time jobs (or nonstandard work arrangements) in the United States.

In the United States a majority of part-time workers are employed in administrative and service jobs, and a majority of temporary workers are employed in industrial (or blue-collar) occupations, followed by professional-managerial and office-clerical positions (Carre 2003; Polivka 1996a). Interestingly, Mangum, Mayall, and Nelson (1985) explain that the "Kelly Girl" image of the temporary help services industry as primarily a clerical phenomenon is no longer accurate. During the period 1983–93, the proportion of temporary workers in blue-collar occupations rose from 18 percent to 36 percent, while the proportion traditional "pink-collar" occupations fell from 46 percent to 39 percent (Segal and Sullivan 1997). In 2001 the share of temporary and contract employees in industrial occupations was 35 percent, followed by 21 percent in professional-managerial and 20 percent in office-clerical (Berchem 2004). In Japan service and clerical jobs account for a substantial proportion of nonstandard employment (Ministry of Health, Labour, and Welfare 1999).

Previous research indicates that women disproportionately occupy nonstandard jobs in both the United States and Japan (Houseman and Osawa 2003; Kalleberg, Reskin, and Hudson 2000). In the United States about one-third of female workers are in nonstandard jobs, compared to less than one-fourth of male workers (Hudson 1999), and women compose slightly over one-half of workers in nonstandard jobs (Wenger 2003). As the use of nonstandard workers in blue-collar jobs increased in the United States during the 1990s, the number of men in nonstandard jobs also rose (Segal and Sullivan 1997). In Japan women are more likely than their U.S. counterparts to be employed in nonstandard jobs, with over one-half of female workers in nonstandard jobs (Nagase 2003).

There are clear gender differences in the occupational distribution of nonstandard workers in both countries. Data for the Tokyo metropolitan area in 2000 (Recruit Works Institute 2001) indicate that about 87 percent of nonstandard clerical jobs are filled by women. Among workers in nonstandard jobs, men disproportionately occupy services and manual labor positions, while women disproportionately occupy clerical jobs. There is a similar gender division by occupation among nonstandard workers in the United States (Cohany 1996).

The proportion of women in part-time employment expanded during the 1990s in Japan but remained stable in the United States (Houseman and Osawa 2003). The increase in Japan is believed to be a consequence of the high cost of maintaining the Japanese system of lifetime employment.[7] The economic downturn of the 1990s resulted in a decrease in the number of core employees (or regular full-time

workers) and an increase in the number of part-time workers (Ministry of Health, Labour, and Welfare 2001). Because it is generally more difficult to dismiss full-time, regular workers in Japan than in the United States, Japanese employers are more likely to maintain a secondary workforce in part-time or temporary positions who can be more easily dismissed. This "buffer" workforce allows firms to respond to business cycle fluctuations.[8] Women comprise the majority of the buffer workforce, which results in their bearing a disproportionate amount of the adjustment to changes in labor demand (Houseman and Abraham 1993). In addition, Japan's tax code provides strong financial incentives for married women to work part-time to keep their earnings below a certain threshold (Houseman and Osawa 2003; Ono and Rebick 2003).

Nonstandard work arrangements have several implications for human capital development. The temporary or part-time nature of the employment relationship may disrupt the accumulation of human capital; nonstandard workers not only may accumulate human capital more slowly than other workers but also may experience faster skill depreciation. Further, employers may have little interest to invest in the human capital of nonstandard workers. Because workers in such positions typically have shorter employment durations with a firm, employers, because they are less likely to recoup their investments, may invest less in training these workers.[9] Brinton (1989) notes that Japanese employers report not giving the same training to women as to men because of concerns that women will get married and quit, the same reason they disproportionately hire women for nonstandard jobs.

This disadvantage in human capital accumulation may thrust temporary workers into a self-perpetuating cycle. If individuals who have held nonstandard jobs have less human capital, then employers are likely to instead prefer to hire candidates with previous experience in regular, full-time jobs. Nonstandard workers thus may get caught in an iterative cycle of accumulating less experience and fewer skills than other workers. On the other hand, such fears may be overblown.[10] Many workers in nonstandard employment acquire a wide range of hands-on general skills that are transferable across firms and work settings. Their work experience and acquisition of skills over a variety of jobs may potentially improve their chances of reemployment.

Working in a nonstandard job may lead to less IT access and use. First, lower levels of training of nonstandard workers may extend to IT training, causing nonstandard employees to have lower rates of computer use at work and potentially creating the self-perpetuating cycle discussed above. One study indicates that 65 percent of temporary help firms surveyed in the United States in 1994 provided training in computer skills, but the majority of temporary workers received ten or fewer hours of total training, including in IT skills; IT training was largely limited to word processing (Autor 2001). Another survey found that only 18 percent of temporary workers received some computer skills training, with industrial and blue-collar workers rarely receiving any IT training (Autor, Levy, and Murnane 1999). In addition, nonstandard workers may not have regular workspaces; for example, temporary or part-time clerical workers may share computers with other workers or continually use different software, resulting in the development of shallow computer skills.

Little is known about differences in the use of IT in the workplace between workers in standard versus nonstandard jobs. Data from the U.S. Current Population Survey indicate that men working in nonstandard jobs are about 11 percentage points less likely to use a computer at work than men in standard jobs; the gap is 23 percentage points among women. In Japan the differences are 29 and 41 percentage points for men and women, respectively, according to data from the Nomura Research Institute. Differences in educational attainment and other socioeconomic characteristics may underlie these gaps, a possibility examined below.

The differences between the United States and Japan in women's and men's labor market outcomes and human capital accumulation may give rise to differences between the two countries in women's and men's IT access and use both at work and at home. We next investigate whether the patterns in IT usage discussed above are observed in the data.

DATA AND METHODS

Data

We use two data sets to examine the role of work in gender differences in IT use during the period 1997–2001. Although this is a relatively short time period, it is the only one for which data for Japan are available, as discussed below. This period covers the time when the number of Internet users increased dramatically in both countries, so we examine patterns in Internet as well as computer use. The data sets are from the Current Population Survey (CPS) and the Nomura Research Institute Cyber Life Observations (CLO) Survey. Our sample from each survey includes all adult respondents with complete answers to the IT and demographic questions analyzed here.

Current Population Survey

The CPS is a monthly survey of labor force behavior conducted in more than fifty thousand U.S. households. In October 1997, December 1998, August 2000, and September 2001, the CPS had a supplement on computer ownership and use that included questions about Internet use. This analysis focuses on the CPS when discussing IT use in the United States for several reasons. The CPS is the largest U.S. survey that includes questions on computer use and therefore yields the most precise estimates of the determinants of Internet use. The questions about IT use included in the CPS changed across some of the surveys, so not all years are included in all regressions that use CPS data. All results using the CPS data are weighted using the final CPS weights.

Nomura Research Institute Cyber Life Observations Survey

The Nomura Research Institute conducted its CLO surveys of technology use in Japan during the years 1997–2001 and in the United States in 1997 and 2000. All surveys were conducted in October using a two-stage stratified random sampling method. The Resident Basic Register of Japan (published by the Ministry of

Internal Affairs and Communications) was used to ensure the representativeness of the selected sample. The CLO surveys were designed to monitor the activity of various information and communication technologies and are proprietary data. The surveys asked respondents about ownership and use of a personal computer, Internet use, and mobile phone use as well as about their demographic characteristics. As in the CPS, some of the questions are not included in all years in the Japanese surveys, so not all regressions using the CLO data for Japan include all years. Results using the CLO are not weighted because the data do not include sampling weights.

We use the CLO data here for all questions regarding Japan and for some questions regarding the United States. Specifically, we use the U.S. CLO data on the length of time individuals have been using computers and on typing speed, questions not covered in the CPS.[11]

Methods

We use logit and ordered logit regressions to estimate the determinants of a wide variety of aspects of IT use. We examine personal computer (PC) use at home and at work, Internet use, computer skills, and experience with using computers. The outcome variables are detailed below as we discuss our findings. We focus on the role of gender, examining whether there are differences between the sexes in IT use, whether any such differences have changed over time, and whether employment plays a role in any gender differences. We compare results for the United States and Japan throughout, but separate regressions are estimated for each country because all coefficients are likely to differ between the two nations.

For most outcomes, we estimate four sets of regressions. The base specification includes an indicator variable for whether an individual is female (as well as other control variables discussed below). In the second set of regressions, the female dummy variable is interacted with indicator variables for each survey year to measure changes in gender differences over time. The third set of regressions includes an indicator variable equal to 1 for respondents who were employed at the time of the survey; these regressions examine how the estimated coefficient of the female indicator variable changes when controlling for employment status. We also include a full set of interactions between gender and employment status in some regressions in order to investigate further the role of work in any gender differential in IT use. In this last set of regressions, working men are the omitted group, so the coefficients for other groups are relative to employed men.

All regressions control for age, marital status, household income, education level, and survey year. The impact of these variables on IT use is undoubtedly crucial in understanding the sources of digital inequality. However, because our primary focus concerns gender differences, we do not report the estimated coefficients for these socioeconomic and demographic variables here.[12] The age variable is linear, with the midpoint of the survey interval used for the CLO data and the exact age used for the CPS data. Indicator variables are used to measure marital status (married or single), income, and education. Household income includes

fourteen dummy variables in the CPS and four dummy variables in the CLO, with missing income as the omitted category for both data sets. Education includes dummy variables for three of four categories (less than high school, high school, some college, and college graduates). Regressions using CPS data also control for race and ethnicity (black, Asian, other, and Hispanic, with whites as the omitted group).

RESULTS

We begin by discussing gender differences in computer use and Internet use. We then investigate gender differences in computer skills and the role of nonstandard work.

We present our main findings first in Figure 1, which shows the percentage of men and women using a computer anywhere, using a computer at home given computer ownership, using the Internet anywhere, and using the Internet at home given computer ownership. There is virtually no evidence of a gender gap in computer and Internet use in the United States. The gender differences that existed in 1997 eventually converged or even reversed by 2001. In Japan, in contrast, there is a sizable gender gap in computer and Internet use during the period 1997–2001. Although usage rates increased considerably for both sexes, a large gap between the sexes persisted at the end of the sample period. As discussed below, these differences remain after controlling for socioeconomic and demographic characteristics. In both countries, employment status affects patterns of computer and Internet use, but the effect is not the same across countries.

Computer Use

We examine four binary measures of PC use: computer ownership at home; computer use at home among computer owners only; computer use at work among workers only; and computer use anywhere, including home, work, and school. All regressions are logits. Table 2 reports the results for the gender variables and other variables of particular interest; as noted above, all regressions include controls for socioeconomic and demographic characteristics. In each column, the table shows the results for four separate regressions, with each set of regression results reported in a different panel (A–D). The sample size reported at the bottom of each column corresponds to the sample size for all regressions reported in that column.

In the United States women are more likely than men to live in a household that owns a computer and also more likely to use a computer given ownership (columns 1 and 2, panel A). These differentials have changed over the 1997–2001 period, with women and men initially equally likely to own computers but women less likely to use them; by 2001 women were more likely both to live in a household that owns a computer and to actually use a computer at home (panel B). These higher relative likelihoods of computer ownership and use among women increase slightly (albeit insignificantly) when controlling for employment status, and employed individuals are more likely to have and use a computer at home (panel

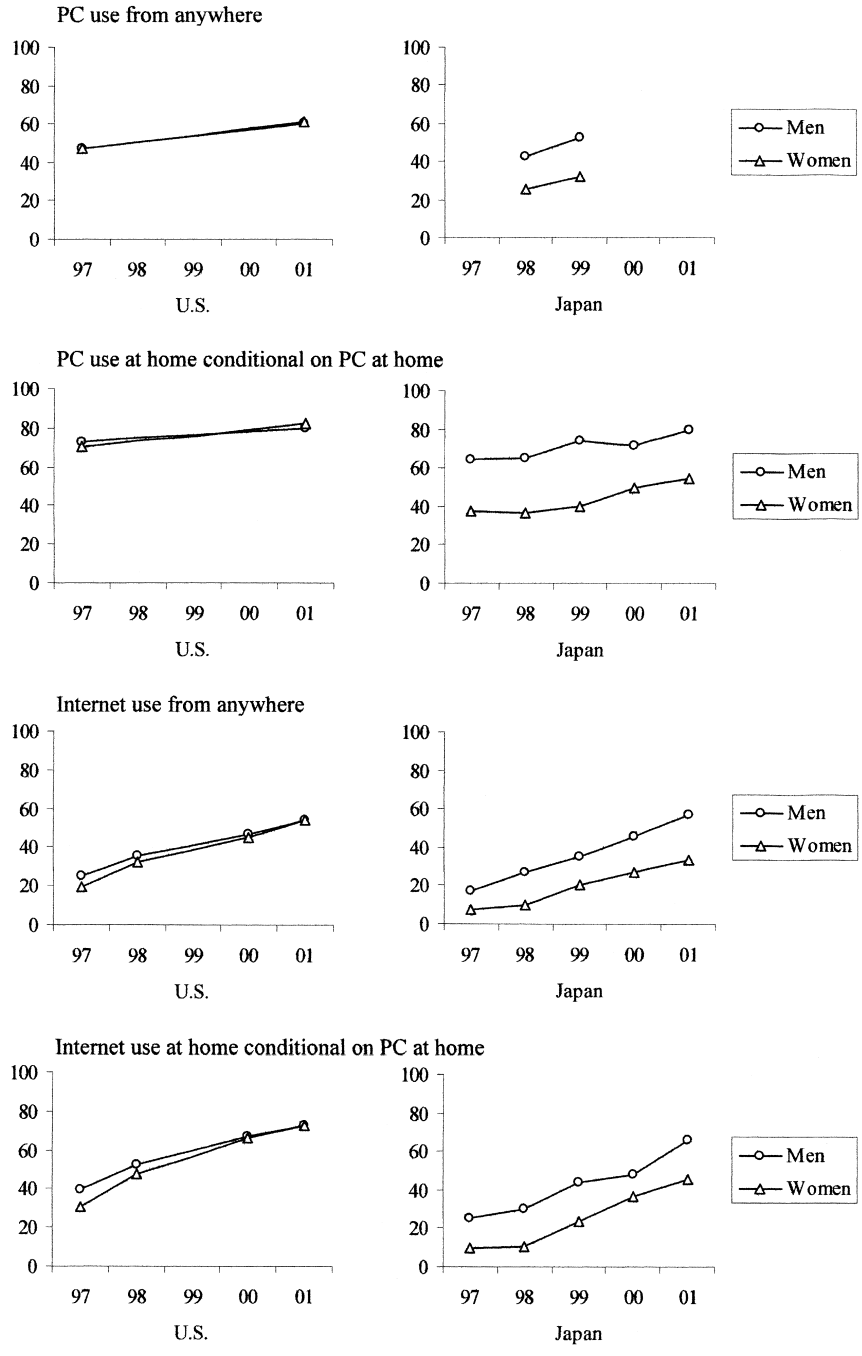

Figure 1

Percentage of Men and Women Using a Computer and the Internet in the United States and Japan

TABLE 2

Regression Results for Role of Gender in Computer Ownership and Use in the United States and Japan

	United States				*Japan*			
	(1) *PC at Home*	*(2)* *Use PC at Home Cond'l on PC at Home*	*(3)* *Use PC at Work (workers only)*	*(4)* *PC Use Anywhere*	*(5)* *PC at Home*	*(6)* *Use PC at Home Cond'l on PC at Home*	*(7)* *Use PC at Work (workers only)*	*(8)* *PC Use Anywhere*
(A) Base specification								
Female	0.035**	0.049**	0.602**	0.259**	0.006	−1.033**	−0.308**	−0.659**
	(0.009)	(0.019)	(0.015)	(0.013)	(0.055)	(0.086)	(0.118)	(0.095)
Log-likelihood	−194,214	−47,203	−72,090	−92,467	−4,216	−1,829	−1,063	−1,529
(B) Base specification with gender interacted with each survey year								
Female × Year 1997	0.020	−0.090**	0.609**	0.242**	−0.062	−0.996**		
	(0.018)	(0.028)	(0.021)	(0.019)	(0.124)	(0.213)		
Female × Year 1998	0.017				−0.056	−1.158**	−0.378*	−0.642**
	(0.018)				(0.118)	(0.195)	(0.156)	(0.128)
Female × Year 1999					0.144	−1.358**	−0.294	−0.674**
					(0.119)	(0.196)	(0.163)	(0.130)
Female × Year 2000	0.044*				0.135	−0.738**		
	(0.018)				(0.115)	(0.163)		
Female × Year 2001	0.059**	0.166**	0.595**	0.278**	−0.137	−1.034**		
	(0.017)	(0.025)	(0.020)	(0.018)	(0.117)	(0.163)		
Log-likelihood	−194,212	−47,172	−72,090	−92,466	−4,214	−1,826	−1,063	−1,529
(C) Base specification plus employment status								
Female	0.053**	0.061**		0.392**	−0.017	−0.883**		−0.442**
	(0.009)	(0.019)		(0.014)	(0.058)	(0.090)		(0.098)
Working	0.158**	0.092**		1.006**	−0.081	0.589**		0.983**
	(0.010)	(0.022)		(0.015)	(0.064)	(0.101)		(0.117)
Log-likelihood	−194,072	−47,192		−89,636	−4,216	−1,812		−1,494

(continued)

TABLE 2 (*Continued*)

	United States				*Japan*			
	(1) *PC at Home*	*(2)* *Use PC at Home Cond'l on PC at Home*	*(3)* *Use PC at Work (workers only)*	*(4)* *PC Use Anywhere*	*(5)* *PC at Home*	*(6)* *Use PC at Home Cond'l on PC at Home*	*(7)* *Use PC at Work (workers only)*	*(8)* *PC Use Anywhere*
(D) Base specification with gender interacted with employment status								
Female working	0.067**	0.124**		0.624**	0.078	−1.004**		−0.450**
	(0.011)	(0.022)		(0.017)	(0.066)	(0.103)		(0.112)
Female not working	−0.110**	−0.063*		−0.704**	0.036	−1.453**		−1.006**
	(0.013)	(0.027)		(0.019)	(0.073)	(0.116)		(0.194)
Male not working	−0.132**	0.046		−0.567**	0.367**	−0.938**		−1.420**
	(0.015)	(0.035)		(0.023)	(0.113)	(0.181)		(0.135)
Log-likelihood	−194,069	−47,172		−89,208	−4,211	−1,809		−1,494
N	368,545	99,995	125,396	191,887	6,800	3,116	1,785	2,704

Notes: For each panel A–D, each column represents a separate regression with the dependent variable as indicated. The sample size *(N)* reported at the bottom of each column corresponds to the sample size for all regressions reported in that column. Standard errors are reported in parentheses and are White-corrected for individual-specific heteroscedasticity. All regressions also include controls for age, marital status, household income, education level, and survey year; the U.S. regressions also include controls for race and ethnicity (see text for details).

* $p < 0.05$; ** $p < 0.01$.

C). Nonemployed women are less likely than either working women or working men to live in a household that owns a computer or, given ownership, to use a computer at home (panel D).

In Japan women and men are equally likely to live in a household that owns a computer, but women are significantly less likely to use a computer at home (columns 5 and 6, panel A). This gender gap in use has remained constant over time (panel B). Working increases the likelihood of computer use at home for both men and women, as in the United States, but a sizable gender gap in home computer use remains in Japan after controlling for employment status (panel C). Women who do not work are the least likely to use a computer at home given ownership, but working women are less likely to use a computer at home than are employed men (panel D). These results highlight the distinction between access and use: women in Japan have equal access to computers in the home, but they are not using them. In the United States, in contrast, women have greater access to computers at home and are more likely to use them.

There are large gender differences between the United States and Japan in computer use at work and computer use anywhere. In the United States women are more likely than men to use a computer at work or anywhere, whereas women in Japan are less likely than men to use a computer at work or anywhere (columns 3 and 4 and 7 and 8, respectively, of panel A). These differences hold in all the years for which data are available (panel B). In the United States nonworking women are the least likely group to use a computer anywhere, whereas nonworking men are the least likely group in Japan (panel D). These results highlight the fact that gender differences in computer use in Japan are not simply because of lower labor force participation among women but also because women in Japan are less likely than men to use computers both at home and at work.

Internet Use

We examine Internet use at different locations, including use anywhere, use at home (both unconditional and conditional on computer ownership), and use at work among workers. All of these Internet use measures are indicator variables, so we again estimate logit regressions. The coefficients of interest are reported in Table 3.

In the United States Internet use at various locations increased over time among women relative to men. In 1997 and 1998 women were less likely than men to use the Internet anywhere or at home, but they were more likely to do so by 2001 (columns 1–3, panel B). Among those who work, women remained less likely than men to use the Internet at work throughout our sample period, but the gender gap narrowed over time (column 4, panel B). People who are employed are more likely than the nonemployed to use the Internet at home or anywhere, with nonworking women the least likely to use the Internet (columns 1–3, panels C and D). This is consistent with our finding that nonworking women are the least likely to use a computer at home or anywhere.

Women in Japan are much less likely to use the Internet than men regardless of location, and this difference has not narrowed significantly over time (columns

TABLE 3

Regression Results for Role of Gender in Internet Use in the United States and Japan

	United States				*Japan*			
	(1) *Anywhere*	*(2)* *At Home*	*(3)* *At Home (PC at home)*	*(4)* *At Work (workers only)*	*(5)* *Anywhere*	*(6)* *At Home*	*(7)* *At Home (PC at home)*	*(8)* *At Work (workers only)*
(A) Base specification								
Female	0.004	−0.064**	−0.104**	−0.199**	−0.799**	−0.530**	−0.698**	−0.598**
	(0.009)	(0.010)	(0.012)	(0.018)	(0.078)	(0.077)	(0.089)	(0.105)
Log-likelihood	−175,404	−167,615	−111,706	−49,963	−2,464	−2,568	−1,761	−1,579
(B) Base specification with gender interacted with each survey year								
Female × Year 1997	−0.252**	−0.313**	−0.369**	−0.383**	−0.759**	−0.943**	−0.977**	−0.319
	(0.021)	(0.023)	(0.026)	(0.030)	(0.188)	(0.265)	(0.286)	(0.239)
Female × Year 1998	−0.074**	−0.148**	−0.188**	−0.119*	−1.058**	−1.100**	−1.197**	−0.879**
	(0.019)	(0.020)	(0.023)	(0.048)	(0.162)	(0.236)	(0.253)	(0.222)
Female × Year 1999					−0.585**	−0.494**	−0.753**	−0.420*
					(0.140)	(0.172)	(0.195)	(0.197)
Female × Year 2000	0.109**	0.014	0.002	0.077		−0.132	−0.297	
	(0.018)	(0.018)	(0.022)	(0.048)		(0.140)	(0.159)	
Female × Year 2001	0.169**	0.066**	0.068**	−0.149**	−0.833**	−0.601**	−0.770**	−0.681**
	(0.017)	(0.017)	(0.021)	(0.029)	(0.124)	(0.126)	(0.153)	(0.166)
Log-likelihood	−175,221	−167,484	−111,577	−49,912	−2,461	−2,559	−1,755	−1,578
(C) Base specification plus employment status								
Female	0.056**	−0.051**	−0.099**		−0.656**	−0.449**	−0.575**	
	(0.010)	(0.010)	(0.012)		(0.081)	(0.081)	(0.092)	
Working	0.441**	0.112**	0.042**		0.604**	0.320**	0.516**	
	(0.012)	(0.012)	(0.014)		(0.090)	(0.090)	(0.106)	
Log-likelihood	−174,366	−167,558	−111,701		−2,443	−2,562	−1,749	

(D) Base specification with gender interacted with employment status								
Female working	0.120**	−0.037**	−0.091**		−0.682**	−0.464**	−0.706**	
	(0.011)	(0.011)	(0.013)		(0.093)	(0.093)	(0.107)	
Female not working	−0.426**	−0.171**	−0.147**		−1.245**	−0.762**	−0.823**	
	(0.014)	(0.014)	(0.017)		(0.107)	(0.105)	(0.169)	
Male not working	−0.289**	−0.080**	−0.019		−0.668**	−0.356*	−1.044**	
	(0.017)	(0.018)	(0.022)		(0.143)	(0.143)	(0.121)	
Log-likelihood	−111,706	−167,555	−111,700		−2,442	−2,562	−1,746	
N	368,545	368,545	191,396	96,987	5,409	6,800	3,108	3,549

Notes: For each panel A–D, each column represents a separate regression with the dependent variable as indicated. The sample size *(N)* reported at the bottom of each column corresponds to the sample size for all regressions reported in that column. Standard errors are reported in parentheses and are White-corrected for individual-specific heteroscedasticity. The regressions also include controls for age, marital status, household income, education level, and survey year; the U.S. regressions also include controls for race and ethnicity (see text for details).

*$p < 0.05$; **$p < 0.01$.

5–8, panels A and B). This is similar to our finding that women are less likely than men to use computers at home or at work, gender gaps that also did not narrow between 1997 and 2001. Workers are more likely than nonworkers to use the Internet at any location or at home, but working women are less likely to use the Internet at home or at work than are working men (columns 5–7, panels C and D). These differences across employment/gender groups in Internet use are also consistent with the differences in computer use shown in Table 2: working women in Japan are less likely than working men to use computers or the Internet, and nonworking women even less so compared with working men. The similarity in the computer and Internet results suggests that computer use translates into Internet use or that the same factors underlie differences in both computer use and Internet use.

Computer Skills

We next examine gender differences in several measures of computer skills, including experience with computers and ability to type, a crucial skill when using a computer. We focus on four specific outcome variables: the number of years of experience with computers (in categories); an indicator variable for whether an individual has no experience at all with computers; self-reported typing speed (in categories); and an indicator variable for whether an individual can barely type or cannot type at all. The categorical measures of computer experience and typing speed are increasing in experience or speed. We use logit regressions to estimate the binary outcomes and ordered logit regressions to estimate the categorical outcomes. Again, all regressions control for socioeconomic and demographic characteristics, but we focus here on the results for the gender and work variables.

Women and men in the United States have similar experience with computers, and women have an advantage in typing. As the results in panel A of Table 4 report, there is no significant gender difference in computer experience, measured either categorically (column 1) or as a binary variable for no experience (column 2). Workers have more experience with computers than nonworkers, and, in particular, working women have been using computers for more years than have working men (column 1, panels C and D). Nonworking women have less experience with computers than working men, a difference that does not occur between nonworking and working men (column 1, panel D). Compared to men, women, including those not currently working, report being significantly faster typists (columns 3 and 4, panels A–D).

In contrast to the United States, our results for Japan show that women have less experience with computers. As panel A reports, women have been using computers for significantly less time (column 5) and are less likely to have ever used a computer (column 6). These differences have not changed over the period 1997–2001 and hold even after controlling for employment status (columns 5 and 6, panels B and C). Working is positively associated with computer experience, but the effect is stronger for men than for women (column 5, panel D). Further, gender differences in experience are greater among workers than among nonworkers.[13]

Unlike in the United States, Japanese women's self-reported typing skills fall

TABLE 4

Regression Results for Role of Gender in Computer Skills in the United States and Japan

	United States				*Japan*			
	(1) *PC Experience*	*(2)* *No Prior PC Experience*	*(3)* *Typing Speed*	*(4)* *Can Barely Type*	*(5)* *PC Experience*	*(6)* *No Prior PC Experience*	*(7)* *Typing Speed*	*(8)* *Can Barely Type*
(A) Base specification								
Female	0.122	−0.089	1.139**	−1.137**	−0.564**	0.539**	−0.149**	0.317**
	(0.094)	(0.149)	(0.103)	(0.122)	(0.048)	(0.060)	(0.049)	(0.062)
Log-likelihood	−2,724	−586	−1,741	−855	−11,244	−3,757	−7,661	−3,486
(B) Base specification with gender interacted with each survey year								
Female × Year 1997	−0.042	0.084	0.556**	−0.622**	−0.520**	0.526**	−0.062	0.180
	(0.170)	(0.247)	(0.169)	(0.200)	(0.108)	(0.126)	(0.105)	(0.127)
Female × Year 1998					−0.508**	0.410**	−0.242*	0.418**
					(0.109)	(0.123)	(0.104)	(0.126)
Female × Year 1999					−0.556**	0.550**	−0.062	0.236
					(0.107)	(0.125)	(0.105)	(0.130)
Female × Year 2000	0.200	−0.186	1.440**	−1.398**	−0.565**	0.603**	−0.153	0.456**
	(0.113)	(0.186)	(0.129)	(0.151)	(0.098)	(0.129)	(0.106)	(0.141)
Female × Year 2001					−0.654**	0.627**	−0.220*	0.300*
					(0.094)	(0.137)	(0.104)	(0.144)
Log-likelihood	−2,723	−586	−1,733	−851	−11,243	−3,756	−7,660	−3,484
(C) Base specification plus employment status								
Female	0.181	−0.150	1.176**	−1.148**	−0.396**	0.390**	0.032	0.207**
	(0.095)	(0.152)	(0.105)	(0.123)	(0.049)	(0.063)	(0.052)	(0.066)
Working	0.478**	−0.377*	0.280*	−0.091	0.704**	−0.516**	0.655**	−0.365**
	(0.119)	(0.179)	(0.136)	(0.155)	(0.053)	(0.071)	(0.059)	(0.074)
Log-likelihood	−2,716	−584	−1,739	−855	−11,168	−3,731	−7,597	−3,474

(continued)

TABLE 4 (*Continued*)

	United States				*Japan*			
	(1) *PC Experience*	*(2)* *No Prior PC Experience*	*(3)* *Typing Speed*	*(4)* *Can Barely Type*	*(5)* *PC Experience*	*(6)* *No Prior PC Experience*	*(7)* *Typing Speed*	*(8)* *Can Barely Type*
(D) Base specification with gender interacted with employment status								
Female working	0.333**	−0.315	1.423**	−1.386**	−0.507**	0.413**	−0.051	0.257**
	(0.111)	(0.181)	(0.119)	(0.140)	(0.060)	(0.071)	(0.061)	(0.073)
Female not working	−0.405**	0.305	0.701**	−0.873**	−1.065**	0.900**	−0.597**	0.558**
	(0.144)	(0.204)	(0.164)	(0.185)	(0.065)	(0.079)	(0.065)	(0.081)
Male not working	−0.020	−0.067	0.456*	−0.649**	−0.977**	0.600**	−0.892**	0.568**
	(0.176)	(0.296)	(0.198)	(0.233)	(0.081)	(0.140)	(0.098)	(0.152)
Log-likelihood	−2,712	−582	−1,728	−848	−11,161	−3,731	−7,593	−3,473
N	1,445	1,445	1,445	1,445	6,800	6,800	6,800	6,800

Notes: For each panel A–D, each column represents a separate regression with the dependent variable as indicated. The sample size *(N)* reported at the bottom of each column corresponds to the sample size for all regressions reported in that column. Standard errors are reported in parentheses and are White-corrected for individual-specific heteroscedasticity. The regressions also include controls for age, marital status, household income, education level, and survey year (see text for details).
*$p < 0.05$; **$p < 0.01$.

short of men's, and they are more likely to report that they can barely type (columns 7 and 8, panel A). The difference in typing speed is largely due to the fact that women in Japan are less likely to work; there is no difference in typing speed between men and women who work (column 7, panel D). However, working women are more likely than working men to report that they can barely type (column 8, panel D).

These results are not surprising in light of our previous findings for Japan, mainly that women are less likely to use computers and the Internet at home or at work. Because of less exposure to computers, women have lower computer skills than men. Our finding that working is more positively associated with computer skills for men than for women also suggests that men and women occupy different positions in the labor force.

Standard versus Nonstandard Employment

For our final analysis, we examine the role of nonstandard employment in gender differences in IT use. The estimation samples consist of workers only, and the regressions include interactions of gender with standard or nonstandard employment status, with men working in standard jobs as the omitted group. The regressions also control for the socioeconomic and demographic variables included in the earlier models. Following Kalleberg, Reskin, and Hudson (2001), we define standard employment as regular full-time workers and nonstandard employment as part-time workers and the self-employed.[14] Table 5 shows the regression results for the variables interacting gender with nonstandard job status; we do not present results for the logit models of no experience with computers and poor typing skills because they are similar to the results using the ordinal measures of computer experience and typing speed.[15]

In the United States the relationship between working in a nonstandard job and IT access and use differs somewhat between the sexes. Women in standard jobs are the most likely to use a computer at work, men in nonstandard jobs the least likely to do so (column 1). For Internet use at work, in contrast, women in nonstandard jobs have the lowest usage rate, followed by men in nonstandard jobs (column 2). Women in standard jobs have been using computers the longest, with men in standard jobs and both men and women in nonstandard positions having less but similar experience with computers (column 3). These results do not clearly indicate that working in nonstandard jobs disadvantages women relative to men; for some measures of IT use, women in nonstandard jobs are actually more likely to use IT than men in nonstandard jobs. This accords somewhat with the gender difference in occupational distributions among nonstandard workers, with women more likely than men to be in clerical positions that require use of a computer and typing skills.

In the United States workers in nonstandard jobs are significantly less likely to use a computer or the Internet at work and have not been using computers as long as workers in standard positions. In results not shown here, workers in nonstandard jobs are about 16 percent less likely than workers in standard jobs to use a computer at work, for example, controlling for other factors. Nonstandard

TABLE 5

Regression Results for Role of Gender Interacted with Type of Employment in Computer Use, Internet Use, and Computer Skills in the United States and Japan

	United States				*Japan*			
	(1) *PC Use at Work*	*(2)* *Internet Use at Work*	*(3)* *PC Experience*	*(4)* *Typing Speed*	*(5)* *PC Use at Work*	*(6)* *Internet Use at Work*	*(7)* *PC Experience*	*(8)* *Typing Speed*
Female * Standard	0.819**	−0.123**	0.313**	1.462**	0.547**	−0.080	0.032	0.488**
	(0.018)	(0.020)	(0.118)	(0.133)	(0.165)	(0.137)	(0.083)	(0.093)
Female * Nonstandard	−0.246**	−0.685**	0.037	1.450**	−1.498**	−1.452**	−1.052**	−0.670**
	(0.023)	(0.032)	(0.238)	(0.244)	(0.170)	(0.152)	(0.076)	(0.078)
Male * Nonstandard	−0.548**	−0.212**	−0.226	0.025	−1.252**	−0.947**	−0.629**	−0.761**
	(0.025)	(0.037)	(0.183)	(0.175)	(0.195)	(0.156)	(0.090)	(0.088)
Log-likelihood	−70,464	−49,730	−2,104	−1,312	−983	−1,526	−7,448	−5,070
N	125,396	96,987	1,122	1,122	1,785	3,549	4,566	4,566

Notes: Each column represents a separate regression with the dependent variable as indicated. Standard errors are reported in parentheses and are White-corrected for individual-specific heteroscedasticity. The regressions also include controls for age, marital status, household income, education level, and survey year; the U.S. regressions for PC and Internet use at work also include controls for race and ethnicity (see text for details).

*$p < 0.05$; **$p < 0.01$.

workers thus appear to be at a disadvantage in accumulating IT skills relative to full-time, permanent workers. Given that female workers are more likely than male workers to occupy nonstandard jobs (30 percent vs. 21 percent in the CPS data), this suggests that gender differentials in nonstandard employment may contribute to gender differences in computer use. We investigate this possibility further after discussing gender differences in the impact of nonstandard employment in Japan.

In Japan workers in nonstandard jobs are considerably less likely to use IT and have lower computer skills than workers in standard jobs. However, the results in columns 5–8 of Table 5 suggest that women in such jobs are more disadvantaged than men. Women in nonstandard jobs are less likely to use a computer or the Internet at work and have less experience with PCs than men in standard jobs and *also* relative to men in nonstandard jobs. Women in standard jobs, in contrast, are not significantly different from comparable men in standard jobs in terms of IT use and skills. These results are in striking contrast to the results pooling all workers, which indicated that women had lower IT use and skills. This gender difference is driven by women in nonstandard jobs. The finding is also interesting given that many Japanese women with nonstandard jobs likely have clerical positions. Our results suggest that these positions do not require (or confer) high levels of IT skills.

The substantial gender difference in the fraction of workers in nonstandard employment suggests that the gender inequality in IT use and skills in Japan may be due inpart to women's higher propensity to occupy nonstandard jobs. About 61 percent of female workers in Japan are in nonstandard jobs, compared to 22 percent of male workers. This is about double the proportion of women in the United States but comparable for men.

There are two ways that nonstandard employment might contribute to the gender gap in IT use: more women may be in nonstandard jobs, and the relationship between being in a nonstandard job and IT use may be more adverse for women. To illustrate these two effects, we report three sets of predicted probabilities of computer and Internet use at work in Table 6. The first set is simply the proportion of women who use computers and the Internet at work predicted using the coefficients in Table 5. The second set is the predicted proportion of women using IT at work if the proportion of women in nonstandard jobs was the same as among

TABLE 6

Impact of Nonstandard Work on Women's Predicted Likelihood of IT Use

	United States	*Japan*
Predicted % use computer at work	58.6	30.2
Predicted % if same % in nonstandard employment as men	60.5	43.2
Predicted % if effect of nonstandard employment same as for men	61.6	37.1
Predicted % use Internet at work	59.2	14.2
Predicted % if same % in nonstandard employment as men	59.6	18.5
Predicted % if effect of nonstandard employment same as for men	60.4	16.2

men. The third set is the predicted proportion of women using IT at work if the effect of nonstandard employment on IT use was the same for women and men.[16]

The results indicate that both factors act to lower women's IT use in both countries, but the magnitude of the two estimates differs across countries. In the United States the larger number of women in nonstandard employment and the more adverse effect of nonstandard employment are each associated with lower rates of computer and Internet use at work (i.e., the counterfactuals are larger than predictions using the actual fraction of women in nonstandard employment and women's return to nonstandard employment), but the estimates are small in magnitude. The impacts are considerably larger in Japan. In particular, the disproportionate employment of Japanese women in nonstandard jobs is associated with a 13 percentage point decline in the fraction of women who use computers and a 4 percentage point decline for Internet use at work. These results suggest that the prevalence of women in nonstandard employment in Japan plays a large role in the gender gaps in IT use and access in that country.

DISCUSSION AND CONCLUSION

Information technology skills are becoming increasingly vital to individuals' economic success. Monitoring gaps in IT access and use is important because groups that have less access risk being excluded from job and educational opportunities as well as losing political influence as computers and the Internet become increasingly signficant in daily life and in the workplace (Norris 2001).

This article examines how the gender gap in IT use in the United States and Japan evolves from gender inequality at a broader societal level. In general, we find that gender inequality in labor markets and human capital development carries over to gender differences in IT use. The contrasting patterns of IT access and use in the United States and Japan reflect differences in the structure of social organizations and labor market institutions in the two cultures.

Our results indicate that there are few gender differences in IT use and skills in the United States, and any such gaps have diminished in recent years. In addition, female workers are not at a disadvantage relative to male workers with regard to most measures of computer use or skills; the same is true of nonworking women relative to nonworking men, although both groups of women are generally less likely to use the Internet than their male counterparts. Further, women in nonstandard jobs—part-time positions or self-employment—do not have systematically lower levels of IT use and skills than comparable men.

The results for Japan are considerably different. In general, our findings indicate that gender differences in human capital investment in Japan carry over to gender differences in IT use and skills. Women in Japan are less likely to use computers or the Internet and have lower computer-related skills than men. These differences have not narrowed significantly in recent years. Working women in Japan have lower levels of IT use and skills than working men, whereas comparisons between female and male nonworkers yield mixed results.

Our results suggest that the disproportionate employment of women in nonstandard employment in Japan accounts for much of that country's gender gap in

IT use and skills. This suggests that larger social and economic factors have led to the gender gap in IT use and skills. Specialization between the sexes, which presupposes labor force withdrawal on marriage and childbirth, leads to the systematic exclusion of women from internal labor markets. Women are unable to return to career-track jobs under an employment system that presupposes long-term commitment and consequently end up in nonstandard jobs. These factors reduce the incentive to invest in women's human capital—by parents, by firms, and by the women themselves—and also lead to a gender gap in IT use and skills. This gap may in turn lead to or reinforce other aspects of gender inequality. As earnings and employment prospects as well as civic engagement become more dependent on computer skills, women in Japan risk being left further behind if the digital divide does not begin to narrow or if they remain disproportionately in nonstandard jobs. Narrowing the gender gap in IT use in Japan is unlikely to be achieved without improvements in the fundamental institutions and social organizations that give rise to gender inequality there.

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NOTES

1. The Prime Minister's Commission on Japan's Goals in the 21st Century issued a report in 2000 warning of Japan's lack of global literacy. The report argues that English skills plus mastery of computers and the Internet are the key to survival on the global stage. The report also cites a 1998 study that found that Japan ranked the lowest among Asian nations in English proficiency. *International Herald Tribune*, "Japan Advised to Open Up to the World," January 19, 2000.
2. Lazarus and Mora (2000) argue that in the United States non-English speakers are often left out of the benefits offered by the Internet. Fairlie (2002) reports that Mexican Americans in Spanish-speaking households are half as likely as non-Hispanic whites to own a computer or use the Internet.
3. Hargittai (1999) shows that English-language competency has little effect on Internet connectivity among eighteen OECD countries, but her sample does not include any Asian countries.
4. The International Comparative Survey Concerning Issues Confronting Women, conducted by the Tokyo Metropolitan Government in 1993, reported that the proportion of women who agreed with the statement "The husband should be the breadwinner and the wife should stay at home" was 56 percent in Japan and 24 percent in the United States (Tokyo Metropolitan Government 1994). In an international survey conducted in 2003, the proportion of women who believed that husbands should work in the labor market and wives should protect the home was reported to be 37 percent in Japan versus 18 percent in the United States (Cabinet Office 2003).

5. Edwards (1994), citing a 1987 survey of large employers in Japan, reports that a majority of female white-collar workers are not in jobs that can lead to high-level management positions. Brinton (1989) reports that 71 percent of men who started in large firms were in career-track positions, compared to 23 percent of their female counterparts. Other studies also indicate that women are primarily in clerical positions and not in managerial-track jobs (Wirth 2001).
6. The survey also finds that 73 percent of women are in positions that do not require English versus 56 percent for men (Recruit Works Institute 2001).
7. For further discussion of the influence of Japanese employment systems on female labor supply, see Brinton 1993; Ono and Rebick 2003.
8. Houseman and Abraham (1993) show that the elasticity of female employment with respect to the business cycle is significantly greater than the corresponding male elasticity throughout the 1970s and 1980s in Japan. In other words, female employment is more procyclical than male employment.
9. Davis-Blake and Uzzi (1993) show that temporary workers are less likely to be employed in jobs that require large amounts of firm-specific training.
10. In the case of temporary employment, Segal and Sullivan (1997) show that a majority of temporary workers move on to permanent jobs within a year, and explain that "the chances of a large underclass developing are slight" (p. 134). Polivka (1996b) also shows that a sizable number of temporary assignments lead to standard (i.e., permanent) employment.
11. The CLO data have a much smaller sample size than the CPS data, making the estimates using the former less precise than those using the latter. This is reflected in the larger standard errors for many of the results using the CLO data. Nonetheless, many of the results using the CLO data are statistically significant at conventional levels, as indicated in the tables. Previous research using both the CLO and CPS data has found that the two surveys give consistent results on questions that overlap (Ono and Zavodny 2003a, 2003b).
12. Results not shown here are available from the authors on request. In general, our results for the socioeconomic and demographic variables confirm previous findings, mainly that IT ownership and use in the United States and Japan has increased over time, rises with education and household income, and declines with age. We find mixed results for marital status. In the United States married persons have a higher probability of IT ownership and use than nonmarried persons, but we find few differences by marital status in Japan. Results for the variables of interest reported in the tables are robust to different specifications of the other variables, such as using dummy variables for age categories instead of a linear measure or including age squared as well as linear age. Results are also robust to controlling for household size or the presence of children.
13. In other words, the results in column 5, panel D, indicate that the difference in experience with computers is smaller between working and nonworking women than between working and nonworking men. In addition, the difference between working women and working men is larger than the difference between nonworking men and nonworking men.
14. Kalleberg, Reskin, and Hudson (2001) also include temporary and contingent workers as being in nonstandard jobs. Neither the CPS (during the survey months with questions about computer use) nor the CLO asks about temporary or contingent jobs, so we do not categorize workers based on this dimension. In addition, the 2000 U.S. CLO sur-

vey did not ask about part-time versus full-time status, so we only use self-employment status to categorize workers for that survey; the results are not sensitive to categorizing the 1997 U.S. CLO data using only self-employment status.

15. This approach implicitly assumes that working in a standard or nonstandard job is exogenous with respect to computer use and skills. However, familiarity with computers may affect the type of job a worker holds (and employment status as well). The effect of any such endogeneity bias on our estimates of the gender gap is unclear. There is no obvious exclusion restriction that would allow us to control for such endogeneity using a two-stage estimation procedure such as instrumental variables or a selection correction; this would require a variable that affects employment outcomes but not computer use and skills, and no such variable is available in the data used here.
16. These predictions are similar to a Blinder-Oaxaca decomposition, where the gender difference is decomposed into a component due to differences in observed characteristics and a component due to differences in returns (regression coefficients) and unobservable factors. Here, we focus on only one factor—nonstandard employment—and its coefficient.

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