RACE, PLACE, AND INFORMATION TECHNOLOGY

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Technology inequalities based on race and ethnicity present a paradox. African-Americans and Latinos have lower rates of access and skill, even controlling for socioeconomic factors. Yet African-Americans, and to a lesser extent, Latinos, also have *more* positive attitudes toward information technology than similarly situated whites. Because attitudes cannot explain lower rates of access and skill, we hypothesize that racial segregation and concentrated poverty have restricted opportunities to learn about and use technology. Using hierarchical linear modeling and multilevel data to control for both community-level socioeconomic and demographic characteristics and individual-level factors, we find that disparities among African-Americans are due to place effects rather than race. Ethnicity still exercises an independent influence for Latinos. These findings contribute to our understanding of the "digital divide," and to research on the effects of concentrated poverty.

Keywords: *race; concentrated poverty; digital divide; information technology; racial segregation*

More than half a century ago, T. H. Marshall conceptualized the notion of "citizenship" as endowing all members of a political community with civil, political, and social rights. For Marshall, equal social rights did not denote

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equality of outcomes, but a range from the right to a "modicum of economic welfare and security," to the right to "live the life of a civilized being according to the standards prevailing in the society" (Marshall 1949/1992, 8). Information technology has arguably assumed a secure place today in the civilized life and prevailing standards of American society, particularly in the economic realm, and increasingly in the political sphere.

The term "digital divide" has been used to describe patterns of unequal access to information technology based on factors such as income, education, race, ethnicity, gender, age, and geography (Norris 2001; U.S. Department of Commerce 1995). One of the puzzles emerging from recent research is the contradictory way in which race and ethnicity matter for understanding information technology inequalities. National survey research has revealed that African-Americans, and to some extent, Latinos, have *more* positive attitudes toward technology than similarly situated whites. These positive attitudes are prevalent across a number of topics, especially for African-Americans. Yet, African-Americans and Latinos are also *less* likely to report having computer or Internet access or the skills to use them, even after controlling for factors such as education and income (Mossberger, Tolbert, and Stansbury 2003).

How, then, can these positive attitudes be reconciled with lower technology access and skill? What explains the independent effects that race and ethnicity have on access and skill over and above education and income? Clearly, racial and ethnic differences in technology use are not due to apathy about technology or questions about its relevance for minorities, so we must turn to other possible explanations. We hypothesize that "place" matters; that because African-Americans and Latinos are more likely to live in areas characterized by segregation and concentrated poverty, that differences in access and skill reflect more limited opportunities to learn and use technology—to act on those positive attitudes.

Scholars have long contended that place matters, particularly the concurrent geography of racial segregation and concentrated poverty (Myrdal 1944; Clark 1965). More recent research shows that serious inequities persist in poor urban communities, despite decades of civil rights and fair housing legislation, and that they restrict opportunities for education, employment, health, and safety (Massey and Denton 1993; Kozol 1991; Kasarda 1990; Hill and Wolman 1997; Rosenbaum 1995; Wilson 1987 and 1996; Jargowsky 1997; Galster, Mincy, and Tobin 1997; Sampson et al. 2002). The evidence suggests that the information age has transformed existing disparities in very poor communities, particularly inner-city neighborhoods, into digital inequalities as well. We argue that this has consequences for economic and political participation, and for full citizenship in society in the broad or Marshallian sense of the word.

No previous studies of technology access have explored the impact of environmental factors such as the economic, racial, and educational composition of the area. Nor has this type of analysis been conducted with an appropriate methodology, such as multilevel modeling. Using hierarchical linear modeling (HLM), we provide a test of the demographic factors affecting access to a home computer and Internet use, while also controlling for varying aggregate contexts at the community level (zip code). We turn to Mossberger et al. (2003) for national survey data and extend their work with a more definitive test. The possible relationship between nested structures, community attributes, and individual technology access and use provides an opportunity and motivation for multilevel modeling.

We begin with a literature review on information technology disparities and their consequences. Next, we discuss research on concentrated poverty and theorize about ways in which environmental factors may matter for access and skill. The methodology section that follows describes the techniques used in this article as well as the national random-sample telephone survey on which this study is based. This survey is unique because it includes an oversample drawn from high-poverty census tracts. We present the findings from multilevel modeling analysis, which shows that geographic factors do indeed matter for technology access and use, although in varied ways. This study contributes to our understanding of both the "digital divide" and the impact of concentrated poverty on individual opportunity by examining the interactions between race, place, and the ability to use information technology.

INFORMATION TECHNOLOGY DISPARITIES

Digital "citizenship," or the capacity to use information technology, enables individuals to participate fully in society. For Sen (1993), capabilities, functioning, and well-being in society are a better measure of relative affluence or poverty than measures of income alone. More specifically, Warschauer (2003) has argued that information technology can be used in ways that promote social inclusion, and that technology capabilities and access are integral to inclusion. The growth of e-government and the explosion of political information on the Web mean that the Internet has already become an important resource for civic and political information (Norris et al. 2001; Larsen and Rainie 2002; West 2004). Previous research has found that online news may have a mobilizing potential, increasing political participation (Bimber 2003; Tolbert and McNeal 2003; Shah, Kwak, and Holbert 2001; Graf and Darr 2004), and that e-mail facilitates citizen-initiated contact of government (Thomas and Streib 2003; Bimber 1999). A 2003 Pew Internet and American Life survey found 77 percent of Internet users, or 54 percent of Americans, took advantage of e-government in 2003, going to government Web sites or e-mailing government officials (Horrigan 2004). Nearly half of American workers with only a high school degree or less use computers on the job, and in skilled, professional, and managerial occupations, computer use is even more pervasive (U.S. Department of Commerce 2002; Mossberger, Tolbert, and Stansbury 2003, 65). The diffusion of information technology in the workplace is at an early stage, according to some observers, and promises to increase throughout a range of occupations and industries (McGuckin and Van Ark 2001).

Inequality in technology use can be justified as a public policy issue if there are market failures that produce underinvestment and inhibit society's potential to capture the full benefits of the technology. Technology use in industries throughout the economy has resulted in productivity gains, according to the U.S. Conference Board (McGuckin and Van Ark 2001). A recent study conducted by the Brookings Institution, the University of California at Berkeley, and the Momentum Research Group estimated that 61 percent of U.S. businesses have used the Internet and have accumulated a cost savings of $155.2 billion (NetImpact 2002).

The ability to use technology is a positive externality, in the economic sense, insofar as it confers spillover benefits on society, beyond those that accrue to the individual. The democratic potential of technology use opens new vistas of information about political and civic life—through Web sites hosted by government, community organizations, interest groups, campaigns, and news organizations, among others. The capacity to use technology resembles education, with its ability to shape "human capital" and to foster civic knowledge and engagement. Health care information, telemedicine, distance learning, job information, and a number of social and educational services are also readily available online. In 2002, 73 million Americans used the Internet to search for information for health care decision making, with approximately 6 million online health searches on any given day (Fox and Rainie 2002). Fifty-two million Americans have used information online about jobs, and more than 4 million do so on a typical day (Boyce and Rainie 2002). Citizenship arguments for meeting individual social needs and positive externality arguments both support a public policy role in addressing information technology disparities.

While the number of Internet users steadily climbed throughout the 1990s, this growth has leveled off more recently. As of 2003, 45 percent of

Americans do not have Internet access at home (Lenhart 2003). This study uses 2001 data, but there has been little change since that time, when 46 percent of Americans were not online at home (Mossberger, Tolbert, and Stansbury 2003; U.S. Department of Commerce 2002). Rates for Internet use measured as access at either work or home are somewhat higher, but still 37 percent of Americans do not use the Internet in either location (Horrigan 2004). Whether Internet access is measured by connectivity at home or work, research has found systematic inequalities in access to computers and the Internet based on demographic and socioeconomic factors (Lenhart 2003; Mossberger, Tolbert, and Stansbury 2003, 30; Norris 2001; Bimber 2003; Warschauer 2003). National surveys that include measures of self-reported skill or frequency of use also indicate inequalities that mirror the access divide. Disparities in access and skill persist for African-Americans and Latinos, as well as for poor, less-educated, and older individuals (U.S. Department of Commerce 2002; Lenhart 2003; Mossberger, Tolbert, and Stansbury 2003, 30, 47).

RACIAL AND ETHNIC DIMENSIONS OF THE DIVIDE

There is a general consensus that inequities are based in part on race and ethnicity, as well as income, education, and age. Major surveys published by the National Telecommunications and Information Administration (NTIA) and the Pew Internet and American Life project present descriptive data that show that African-Americans and Latinos have lower rates of home access to computers and the Internet (see for example, U.S. Department of Commerce 2002). Research employing multivariate statistical analysis confirms the importance of race and ethnicity even when controlling for other socioeconomic factors (Fairlie 2004; Lenhart 2003; Mossberger, Tolbert, and Stansbury 2003; Bimber 2003; Neu, Anderson, and Bikson 1999). A few academic studies or market surveys have produced different results, but these studies lack statistical controls or suffer from other methodological flaws.[1]

Little research has addressed the causes for racial disparities (Kretchmer and Carveth 2001; Fairlie 2004). In a recent study using 2000 Current Population Survey data, Fairlie (2004) found that while income, education, and occupation accounted for some portion of the racial and ethnic divides in Internet access, they did not entirely explain lower rates of access for African-Americans and Latinos. Urban residence was not a significant factor. Some social scientists have hypothesized that lower rates of access and skill among African-Americans and Latinos are due to differences in motivation or cultural perceptions (including perceptions of relevance of content on the

Internet) (Kretchmer and Carveth 2001). And many African-American commentators have bemoaned a lack of interest in technology among African-Americans (Hoffman, Novak, and Schlosser 2000; Kretchmer and Carveth 2001).[2]

Survey research reported in Mossberger, Tolbert, and Stansbury (2003) contradicts this portrait of apathy toward technology. While over two-thirds of Americans view the Internet and computers as important for "keeping up with the times," or as important for economic opportunity, African-Americans and Latinos are statistically more likely to agree with these statements than similarly situated Whites. Using multivariate statistical analysis to hold other demographic factors constant, the authors found that 80 percent of Latinos and 78 percent of African-Americans agreed that the Internet was important for "keeping up" compared to 65 percent of Whites. Similarly, 76 percent of African-Americans agreed that "you need computer skills to get ahead" compared to only 66 percent of Whites, all else equal (Mossberger, Tolbert, and Stansbury 2003, 68–71). African-Americans are also more likely than Whites to be willing to learn new computer skills in a variety of formats (group instruction, online instruction, printed manuals), and are more willing to use public access sites for computers and the Internet, controlling for other demographic factors. In terms of actual behavior, African-Americans are more likely than Whites to have used computers for job search or to have taken an online course (Mossberger, Tolbert, and Stansbury 2003, 47, 51–53, 74). These results are supported by other survey research on Internet job search (Pew 2000; U.S. Department of Commerce 2002), but Mossberger et al. find that racial differences in both behavior and attitudes are statistically significant even after controlling for differences in income, education, age, and gender, and that this behavior is consistent with broader beliefs about the importance of technology for economic advancement. Other studies have also shown that African-Americans are among the Internet nonusers who are most likely to say they will use the Internet someday (Lenhart 2003).

Attitudinal differences based on ethnicity are less pronounced, but Latinos are more likely than non-Hispanic Whites to say that the Internet is necessary to keep up with the times, and are more willing than White respondents to take computer classes to learn new skills. Otherwise, Latino attitudes differ little from those of White (non-Hispanic) respondents in the sample (Mossberger, Tolbert, and Stansbury 2003).

Why have racial and ethnic disparities endured, even as the gender gap has disappeared over time? The Bush administration and some economists contend that all technology disparities, including those based on income and education, are being erased by the rapid diffusion of the Internet and computers throughout society (Compaine 2001; U.S. Department of Commerce 2002). To understand why this is not likely requires a closer examination of what digital inequalities entail, at least among some disadvantaged groups.

Policy debate and research have often shared an overly narrow definition of the divide as an issue of access alone. Access, however, is insufficient if individuals lack the skills needed to use technology. Technical skill, or the ability to use computer hardware and software, is only one dimension of the skills needed to use computers. With the advent of the Internet, technology use requires reading comprehension and the ability to search for, use, and evaluate information. Segments of the population that have limited basic literacy and little education will not likely develop the more sophisticated skills required for effective use of the Internet. According to the National Adult Literacy Survey conducted in 1992, between 21 and 23 percent of the population operates at the lowest level of literacy, unable to perform more than the most rudimentary tasks (Kaestle et al. 2001). Internet use may have peaked due to the literacy and education requirements of the medium. Measures such as individual educational attainment may not capture differences in the quality of education. Some digital inequalities may be a new reflection of fundamental educational divides that follow the geography of race, ethnicity, and class in the United States.

The case for examining environmental effects is suggested by some of the research on race and the digital divide, as well as the literature on concentrated poverty. An analysis of survey data over time by Hoffman, Novak, and Schlosser (2001) found that gaps in computer ownership and use between African-Americans and Whites were especially pronounced for lower-income individuals, and could not be explained by differences in education or income. African-Americans are most likely to live in neighborhoods characterized by concentrated poverty because of higher levels of segregation and urban residence, although Latinos living in central cities also experience concentrated poverty (Massey and Denton 1993, 12). While urban residence is no longer a significant factor contributing to technology inequality (Fairlie 2004), environmental effects must be examined at the neighborhood level because of great variation within urban areas.

HOW ENVIRONMENT MAY MATTER

Research on racial segregation and concentrated poverty suggests structural conditions in poor urban neighborhoods may account for racial and ethnic differences in technology access and skill. Neighborhoods with 40 percent or more of the population living at or below the official poverty level are often defined as areas of concentrated poverty, and 94 percent of such neighborhoods are located in central cities (Jargowsky 1998).[3] Concentrated poverty is especially prevalent in the Northeast and Midwest, where economic restructuring has been most severe (Jargowsky 1997, 46–48; Massey and Denton 1993, 12; Wilson 1987 and 1996; Galster, Mincy, and Tobin 1997). The 2000 census marked a slight reversal in the rapid growth of concentrated poverty that has occurred over the past several decades (Pettit and Kingsley 2003). Still, it remains a significant problem in central cities. Concentrated poverty has not decreased in the Northeast and is increasing in the West. Nationally, more than 8 million Americans continue to live in very poor neighborhoods (Jargowsky 2003).

The consequence of this spatial concentration of the poor is the accumulation of disadvantage: inferior schools and neighborhood services; elevated rates for school drop-out and teenage pregnancy; chronic unemployment and isolation from the labor market; high incidence of crime and drug use; deteriorated housing and neighborhood infrastructure; loss of neighborhood businesses; and estrangement from the larger society (Wilson 1987 and 1996; Quane and Rankin 1998; Massey and Denton 1993, 2, 12–13; Holzer 1987; Kasarda 1993; Orfield and Lee 2005).

Exactly how and why environment matters is subject to some theoretical debate. Lewis' (1968) concept of the "culture of poverty" has been followed by more complex "underclass" theories (Wilson 1987, 1996) that view social isolation produced by economic and demographic change as responsible for dysfunctional norms and behaviors. Other accounts stress institutional causes and the dearth of opportunities, such as a lack of access to jobs or quality schools (Kain 1968; Kasarda 1993; Massey and Denton 1993; Jargowsky 1997, 187–195). Because of the positive attitudes expressed by African-Americans and Latinos, the causes of lower technology use are likely located within the institutions and opportunity structure of poor communities, rather than a culture of poverty. We identify three ways in which location could influence technology access and skill: public and nonprofit institutions (particularly schools, but also libraries and community centers); social networks for information and informal learning; and employment.

INSTITUTIONS

The potential effect of public institutions is clearest in regard to the quality of education, something that measures such as individual educational attainment fail to capture. There are marked disparities between central city and suburban school districts (Bahl et al. 1992; Bahl 1994, Kain 1968, 1992).

These district-wide inequalities are often exacerbated, however, within the poorest neighborhoods (Kozol 1991; Orfield and Lee 2005). Investment in technology hardware through the federal E-rate program has not closed the technology gap in poor urban schools, despite an increase in the number of computers in poor districts. Students in low-income schools may use technology less frequently because of insufficient teacher training or the time required to familiarize students with basic technical skills that more affluent students have acquired at home. More fundamentally, however, lower levels of student achievement in basic skills such as reading comprehension affect the development of Internet literacy and technical skills (Bushweller 2001; Manzo 2001; Trotter 2001).

Poor communities may also lack adequate institutional supports for technology use at libraries or community centers. Federal grants and nonprofit agencies have provided funding for community technology centers in poor neighborhoods, but such centers are not universally available, and their operations often rely upon volunteers or unstable funding sources. One study of Los Angeles conducted by the Tomas Rivera Institute concluded that in many neighborhoods, the only available resource for public access was the neighborhood library (Trotter 2001). While at least 95 percent of libraries now offer public access on at least one computer (Trotter 2001), a recent evaluation of libraries in poor communities found that as few as 25 percent of them offered technical training courses or even informal assistance (http://www.gatesfoundation.org/nr/downloads/libraries/eval_docs/pdf/researchsummary.pdf).

Both schools and libraries are heavily dependent on local revenues. The needs/resource dichotomy means that central cities have less fiscal capacity to provide public services, despite the need to serve residents who are often unable to purchase equivalent services in the private sector (Rusk 1995, 47). Moreover, central cities have a higher fiscal burden for police, fire, and courts, limiting their ability to invest in other services, such as libraries (Pack 1998). Poor neighborhoods within central cities may fare worst of all, because some studies have indicated that lower rates of satisfaction with urban services in minority neighborhoods may reflect actual differences in the quality of services (Van Ryzin et al. 2004; DeHoog, Lowery, and Lyons 1990).

SOCIAL NETWORKS

Social networks facilitate technology use. According to the Mossberger, Tolbert, and Stansbury (2003) survey, computers and the Internet are used far more frequently at the homes of friends or relatives than at public access sites. Of all respondents 20 percent reported using computers and the Internet at the homes of others, and 24 percent of respondents without home computers relied on friends and relatives. This is about ten percentage points higher than rates of usage of public access computers at libraries (Mossberger, Tolbert, and Stansbury 2003). Informal processes of learning about computers may be as significant as public access and formal training. Much has been written about the lack of resources and information in social networks in areas of racial segregation and concentrated poverty (Coleman 1988; Wilson 1987 and 1996; Holzer 1987; Ihlanfeldt 1997; Ainsworth 2002; Sampson et al. 2002). Individuals living in high-poverty neighborhoods are more likely to have friends who are out of the job market and less educated (Rankin and Quane 2000), and may therefore have less exposure to technology through personal networks. A recent survey shows that 31 percent of those who are "truly unconnected," or who have never used the Internet, say that very few or none of the people they know go online, whereas only four percent of Internet users report such social networks (Lenhart 2003).

EMPLOYMENT

Finally, the workplace provides formal and informal training in computer and Internet use. Many individuals introduced to computers on the job eventually acquire them at home, so jobs can represent an important step in technology adoption (U.S. Department of Commerce 2002). Tolbert and Mossberger (2004) found that frequency of Internet use at work is an important predictor of home technology access, controlling for other factors. Low-skill jobs requiring less education are less likely to demand information technology use, but 45 percent of Americans who have a high school education or less used computers at work, and 25 percent used the Internet on the job in 2001 (Mossberger, Tolbert, and Stansbury 2003; see also Holzer 1996, 49; Kruse and Blasi 2000, 72; Moss and Tilly 2001, 83).

To the extent that place of residence affects employment, it may also diminish technology use and skill development. Shifts from manufacturing to the service sector coupled with the movement of many employers to the suburbs may create a "spatial mismatch" between the occupational skills of inner-city residents and the requirements of the knowledge-intensive professional jobs experiencing growth in nearby downtowns (Kain 1968; Kasarda 1990; Hill and Wolman 1997; Galster, Mincy, and Tobin 1997). The spatial mismatch thesis suggests that there are few chances for low-skill central city residents to secure jobs in knowledge-intensive (or computer-intensive) occupations. High levels of unemployment in areas of concentrated poverty may be perpetuated by social networks lacking in information and contacts that could lead to employment or better jobs (Granovetter 1973; Hill and

Wolman 1997; Ihlanfeldt 1999). As might be expected, individuals living in low-income zip codes are less likely to report use of computers or the Internet at work (Mossberger and Tolbert 2005).

Fully testing the causal mechanisms within poor communities goes beyond the data available for this study. Instead, we take the initial step of establishing whether or not concentrated poverty and racial segregation account for the incongruity between African-American and Latino attitudes and technology use.

RESEARCH HYPOTHESES

Based on the literature, we expect individuals residing in poor socioeconomic environments to be less likely to have access to or to use technology. Three primary hypotheses structure this research. *1) We expect that concentrated poverty, measured by the median income of the respondent's community, should reduce technology access and use.* Median income provides more continuous variation than poverty rates, and communities one standard deviation below the mean in our sample have an average poverty rate of 38 percent, almost exactly the same as the 40-percent-poverty threshold for areas defined as having concentrated poverty. *2) We also hypothesize that individuals residing in communities with low educational attainment will have reduced technology access and use*. We use the educational attainment of the respondent's zip code as a proxy for quality of educational opportunities as well as a general measure of socioeconomic context, which might include occupations in the community and a supportive climate for educational achievement. Oliver and Mendelberg (2000) have argued that educational attainment of an area is a more complete measure of socioeconomic context than income. *3) Most importantly, as the title of this article suggests, we hypothesize that race and place (poverty) interact to reduce technology access and use.* We measure the impact of race and place by creating interaction terms of the race/ethnicity of the respondent and the median income of the community in which they live. This final interaction serves not only as a measure of race and poverty, but of racial segregation, as the literature and our data show most African-Americans and Latinos who are in poverty reside in highly segregated communities.

LOW-INCOME SURVEY DATA

This research extends the findings from a unique 2001 survey reported in Mossberger, Tolbert, and Stansbury (2003) by merging the survey data with zip code–level data from the 2000 U.S. Census. Zip codes are commonly used to measure neighborhood-level phenomena in cities (Oliver and Mendelberg 2000; Bondonio and Engberg 2000). For each respondent in the survey we recorded information about the zip code in which they reside, using reverse telephone number searches. Environmental data are used to measure socioeconomic context, concentrated poverty, and racial diversity. We focus on two questions (or dependent variables): whether the respondent has a home computer (access), and frequency of home Internet use. Internet use can serve as an indicator for skills, as individuals who use technology frequently develop improved technical competency skills.

The national random-digital-dialed telephone survey included an oversample of respondents drawn from all high-poverty census tracts in the forty-eight states, excluding Alaska and Hawaii. High poverty tracts were defined as those with 50 percent or more of the households living at or below 150 percent of the official federal poverty level. The average response rate for the survey was 42 percent, which is typical of response rates for telephone surveys.[4] Federal data show that telephone service now reaches 94 percent of the population (U.S. Department of Commerce 1995), so telephone surveys are a reasonable methodology for obtaining sample data even in low-income communities.

Because the survey targeted high-poverty areas, the sample included a relatively large proportion of racial and ethnic minorities compared to standard surveys. Of the 1,837 respondents,[5] 70 percent were White non-Hispanic, 19 percent were African-American, 9 percent Latino, and 1.5 percent Asian-American.[6] Thus, Latinos and African-Americans composed 28 percent of the sample population, compared to 25 percent of the U.S. population in the 2000 census. Of the respondents in our sample 71 percent reside in urbanized areas, in comparison with the 2000 census figures of 68 percent of the U.S. population.[7] Of the sample 38 percent had household incomes below $30,000, allowing accurate inferences to minority and low-income Americans as a whole. The survey generated data on Internet access that were comparable to large-sample studies. Of all respondents 61 percent reported having access to a home computer, and 54 percent reported having home Internet access. This closely tracks the figures in the U.S. Census Current Population Survey conducted in September of 2001—57 percent for home computer and 51 percent for home Internet access, and 66 percent and 54 percent for computer and Internet use in any location (U.S. Department of Commerce 2002).

Two different dependent variables are analyzed. In the first model, the dependent variable is binary—"Do you personally have a home computer?"—coded 1 for yes, and 0 for no. We estimate a binary (logit) hierarchical linear regression (HLM) with a binomial distribution. Next, we measure frequency of Internet use with the following survey question: "In the last month, how often did you access the Internet from home" with responses ranging from 1 (zero times) to 5 (more than 100 times).[8] For this model, we estimate an ordinary least squares HLM model.

Explanatory variables measure individual-level demographic and attitudinal factors, as well as geographical characteristics of the respondent's community (See Table 1 for variable descriptions). Concentration of poverty is measured by median household income of the respondent's zip code. We measure racial diversity by the percentage of African-American, Latino, or Asian population in the respondent's zip code. Socioeconomic context is measured by the percentage of the population with a high school diploma or more. The environmental data drawn from the U.S. Census (2000) provide a more complete picture of influences on individual technology use, significantly reducing the random error in our models.

Control variables measure individual-level attributes of the respondents and were included to measure income, education, race, ethnicity, gender, age, and partisanship. Binary variables measure gender, race, ethnicity, partisanship, and income, with female, African-American, Latino, Asian, Democrat, Republican, and those with an annual income less than $30,000 coded 1, and 0 otherwise. For race/ethnicity, White non-Hispanics are the reference group. For partisanship, those without strong partisan identification—independents—were the reference group. Education was measured on a 5-point scale with responses ranging from 1 = less than a high school degree to 5 = postgraduate work. Age was recorded in years.

The explanatory variable of highest interest is the interaction of respondents' race and place of residence. "Race and place" interactions are created by multiplying an African-American respondent by the median income of his/her community (zip code). This term measures an African-American residing in an area of concentrated poverty versus an African-American residing in an economically well-off area. Similar interactions are created for Latino respondents. These interactions also serve as a proxy for racial segregation, as our data show that poor African-Americans have an increased probability of residing in highly segregated communities (zip codes).

The data indicate that concentrated poverty and racial segregation tend to go together—as zip codes become poorer, they also become more racially segregated (see Table 1). This is particularly true for African-Americans.[9] Frequencies indicate that 56 percent of the African-American respondents in the sample reside in zip codes where the majority (51 percent or higher) of the population are Black. When we repeat this calculation for only the zip codes with median income at the mean ($34,000 per year) or less (the lower half of

TABLE 1: Concentrated Poverty and Racial Segregation Go Together: Percentage of African-Americans Residing in Majority-African-American Zip Codes Varying Median Income

	All Zip Codes	*Zip Codes w/ Median Income Less Than $34,000*	*Zip Codes w/ Median Income Less Than $20,000*
African-American's chance of residing in a majority-African-American zip code	55.9%	64.9%	75.8%

the sample), the probability of an African-American residing in a primarily Black zip code increases to 65 percent, a 10 percent increase. When analyzing only high-poverty zip codes (median income less than $20,000 per year, one standard deviation below the mean), the probability of an African-American residing in a majority-Black area jumps to 76 percent. Thus three out of every four African-Americans residing in poverty areas also reside in highly segregated communities. These findings are consistent with the literature on the interaction between racial segregation and concentrated poverty based on earlier census data (Massey and Denton 1993). We hypothesize that the combined impact of race and concentrated poverty further reduces access to information technology for racial minorities and the poor.

MULTILEVEL MODELS

We use hierarchical linear modeling (HLM) to analyze access to a home computer and home Internet use.[10] Such multilevel models are appropriate to estimate the influences of both individual and community (zip code–level) factors on technology access and use. Multilevel models control for random effects (variation) across geographic levels, allowing for valid estimates of contextual effects. In this case individual-level phenomena are not fixed, but vary across space. The dependent variable fluctuates as well, instead of being a fixed value, and is a function of multilevel influences. Standard modeling approaches fail to account for the true contextual effects that can occur when the dependent variable is a result of multilevel structures. By allowing the dependent and independent factors to vary across context, we may derive more accurate statistical estimates than standard analyses restrained at one level of analysis.

Multilevel models appropriately consider the error structures at both the individual and community (zip code) level. Our multilevel models consist of an individual-level equation (level 1) and a zip code–level equation (level 2). Table 2 presents the descriptive information for each of the variables considered in these analyses, while the appendix provides a correlation matrix for the level 1 and level 2 variables. Of the 1,837 respondents, 1,345 had identifiable zip codes and were included in level 1. At level 2, there were 1,035 unique zip codes. The intercept of the level 1 equation is modeled as a function of level 2 properties and a zip code–level error term. The level 1 and level 2 equations are:

$$Y = \gamma_0 + \beta_1(Median\,Income) + \beta_2(Educational\,Attainment) + \beta_3(Percent\,Black) + \beta_4(Percent\,Latino) + \beta_6(Percent\,Asian) + \varepsilon$$

$$\gamma_0 = \gamma_{00} + \beta_{01}(Income) + \beta_{02}(Education) + \beta_{03}(Age) + \beta_{04}(Male) + \beta_{05}(African\,American) + \beta_{06}(Latino) + \beta_{07}(Asian\,American) + \beta_{08}(Democrat) + \beta_{09}(Republican) + \beta_{010}(African\,American * Median\,Income) + \beta_{011}(Latino * Median\,Income) + \varepsilon$$

Before we estimate a full model with both level 1 and level 2 predictors included, we examine a random coefficients model to determine if: 1) the level 1 predictors are associated with the dependent variable; and 2) each of the level 1 predictors varies significantly across zip codes. Thus, all the level 1 predictors are allowed to randomly vary across districts, while no level 2 variables are included in the equation. The first model in the left-hand column includes the level 1 demographic variables as predictors of having a home computer (Table 3) and frequency of Internet use at home (Table 4). Consistent with previous research on digital inequality (Mossberger, Tolbert, and Stansbury 2003; U.S. Department of Commerce 2002; Lenhart 2003) we find the wealthy, educated, young, and White are statistically more likely to have a home computer and use the Internet at home than respondents who are poor, less-educated, older, African-American, and Latino.[11] Also, males have higher home-Internet-use rates than females, but consistent with previous research, we found no gender differences for access to a home computer (U.S. Department of Commerce 2002). In sum, a number of individual (level 1) predictors are statistically associated with the dependent variables of home computer access and frequency of Internet use at home.

HOW PLACE MATTERS: ACCESS TO A HOME COMPUTER

Table 3 presents the hierarchical linear modeling (HLM) analysis of home computer access that contains the individual and the zip code–level

(continued on p. 604)

TABLE 2: Descriptive Statistics for Individual and Zip Code Variables

	Mean	*Standard Deviation*	*Minimum*	*Maximum*	*Definition*
Individual-level					
Poor	.369	.483	0	1	Dummy-coded measure of income (0=income above $30,000; 1=income at or below $30,000)
Education	3.00	1.158	1	5	Index of individual educational attainment (1=No high school; 2=high school graduate; 3=some college; 4=college graduate; 5=post graduate work or degree)
Age	45.886	16.829	21	103	Measured in years
Male	.381	.486	0	1	Dummy-coded measure of gender (0=female, 1=male)
African-American	.196	.397	0	1	Dummy-coded measure of race (0=non-African-American; 1=African-American)
Latino	.075	.263	0	1	Dummy-coded measure of ethnicity (0=non-Latino, 1=Latino)
Asian	.015	.120	0	1	Dummy-coded measure of race (0=non-Asian-American, 1=Asian-American)
Republican	.293	.455	0	1	Dummy-coded measure of partisanship (0=Democrat or Independent, 1= Republican)
Democrat	.478	.500	0	1	Dummy-coded measure of partisanship (0=Republican or Independent, 1= Democrat)

Zip code-level variables					
Concentrated poverty	33,716	13,881	10,714	116,941	Median household income
Educational attainment	73.998	12.595	32.26	99.59	Percentage of individuals with a high school diploma or higher
African-American population	21.826	26.475	0	98.14	Percentage of population African-American
Latino population	10.752	19.335	0	97.49	Percentage of population Latino
Asian-American population	1.770	3.429	0	48.98	Percentage population Asian-American
Interaction variables					
Concentrated poverty and racial segregation	5,279	11,433	0	103,614	African-American * median income in the zip code
Concentrated poverty and ethnic segregation	2,347	8,958	0	96,118	Latino * median income in the zip code

NOTE: N = 1,345 individuals; N = 1,035 zip codes.

TABLE 3: Do You Have a Home Computer?

	Individual Baseline		*Baseline 1 No Interaction Terms*		*Baseline 2 No Interaction Terms*		*Interaction 1 Median Income*		*Interaction 2 Median Income and Educational Attainment*	
	β *(se)*	*p*>|*z*|	β *(se)*	*p*>|*z*|	β *(se)*	*p*>|*z*|	β *(se)*	*p*>|*z*|	β *(se)*	*p*>|*z*|
Zip Code Level										
Median income			$.02^{-3}$ ($.008^{-3}$)	.006	$.001^{-2}$ ($.009^{-3}$)	.224	$.003^{-2}$ ($.009^{-3}$)	.002	$.002^{-2}$ ($.001^{-2}$)	.104
% High school diploma or higher					.021 (.011)	.046			.022 (.011)	.038
% African-American			–.003 (.004)	.478	–.0004 (.004)	.924	–.004 (.004)	.329	–.002 (.004)	.725
% Latino			.004 (.005)	.414	.010 (.006)	.083	.002 (.005)	.638	.009 (.006)	.144
% Asian-American			.001 (.023)	.967	–.003 (.023)	.886	.004 (.023)	.876	–.0007 (.024)	.975
Individual Level										
Poor/Income	–1.00 (.162)	.000	–.982 (.176)	.000	–1.02 (.179)	.000	–.992 (.176)	.000	–1.04 (.179)	.000
Nonpoor	—		—		—		—			
Education	.398 (.069)	.000	.336 (.076)	.000	.309 (.077)	.000	.333 (.076)	.000	.305 (.077)	.000
Age	–.028 (.004)	.000	–.033 (.005)	.000	–.032 (.005)	.000	–.033 (.005)	.000	–.033 (.005)	.000
Male	–.013 (.154)	.932	–.059 (.168)	.724	–.067 (.168)	.689	–.070 (.168)	.676	–.078 (.169)	.645
Female	—		—		—		—			
African-American	–.402 (.199)	.043	–.195 (.272)	.473	–.191 (.274)	.484	1.21 (.785)	.124	1.28 (.786)	.104
Latino	–.823 (.280)	.003	–.785 (.355)	.027	–.775 (.356)	.030	.032 (.839)	.970	.025 (.833)	.976
Asian-American	.381 (1.12)	.733	.612 (1.15)	.594	.505 (1.16)	.663	.687 (1.16)	.553	.569 (1.17)	.626
White	—		—		—		—			
Democrat	–.190 (.195)	.331	–.106 (.213)	.618	–.093 (.213)	.663	–.123 (.214)	.565	–.111 (.214)	.604
Republican	.433 (.214)	.043	.434 (.233)	.062	.459 (.234)	.049	.433 (.236)	.064	.461 (.235)	.050
Independent	—		—		—		—			

Interaction							
African-American * median income of zip code				$-.006^{-2}$ ($.003^{-2}$)	.059	$-.006^{-2}$ ($.003^{-2}$)	.048
Latino * median income of zip code				$-.002^{-2}$ ($.002^{-2}$)	.290	–.002–2 ($.002^{-2}$)	.296
Log Ratio Chi^2	216.48	185.92	189.94	190.14		194.49	
Pseudo R^2	.1669	.1718	.1755	.1757		.1797	

NOTE: Unstandardized regression coefficients, standard errors in parentheses. Parameters in bold are significant at .10 or better based on a two-tailed test. A dash in place of the coefficients denotes the variable's reference category. Analysis based on two-level hierarchical linear modeling (HLM). Listwise deletion of cases with missing scores results in a final *N* of 820 cases.

TABLE 4: How Frequently Do You Use the Internet at Home?

	Individual Baseline		*Baseline 1 No Interaction*		*Baseline 2 No Interaction*		*Interaction 1 Median Income*		*Interaction 2 Median Income and Educational Attainment*	
	β (*se*)	*p*>|*z*|	β (*se*)	*p*>|*z*|	β (*se*)	*p*>|*z*|	β (*se*)	*p*>|*z*|	β (*se*)	*p*>|*z*|
Zip Code Level										
Median income			$.008^{-3}$ ($.003^{-3}$)	.014	$.004^{-3}$ ($.004^{-3}$)	.319	$.008^{-3}$ ($.003^{-3}$)	.019	$.004^{-3}$ ($.004^{-3}$)	.330
% High school diploma or higher					.010 (.005)	.059			.010 (.005)	.060
% African-American			–.003 (.002)	.194	–.001 (.002)	.497	–.003 (.002)	.221	–.001 (.002)	.521
% Latino			–.002 (.002)	.508	.001 (.003)	.688	–.002 (.002)	.522	.001 (.003)	.699
% Asian-American			.025 (.011)	.031	.022(.012)	.053	.025 (.012)	.033	.023 (.012)	.054
Individual Level										
Poor/Income	–.220 (.055)	.000	–.322 (.092)	.000	–.339 (.092)	.000	–.321 (.092)	.000	–.339 (.092)	.000
Nonpoor	—		—		—		—			
Education	.112 (.021)	.000	.184 (.037)	.000	.171 (.038)	.000	.184 (.037)	.000	.171 (.038)	.000
Age	–.008 (.001)	.000	–.017 (.002)	.000	–.017 (.002)	.000	–.017 (.002)	.000	–.017 (.002)	.000
Male	.112 (.046)	.016	.138 (.081)	.090	.135 (.081)	.097	.138 (.081)	.090	.135 (.081)	.097
Female	—		—		—		—			
African-American	–.200 (.069)	.004	–.189 (.138)	.172	–.185 (.138)	.180	–.292 (.401)	.466	–.249 (.400)	.535
Latino	–.270 (.097)	.005	–.442 (.178)	.013	–.437 (.178)	.014	–.422 (.423)	.319	–.405 (.423)	.337
Asian-American	.098 (.247)	.693	.276 (.471)	.557	.237 (.470)	.614	.273 (.471)	.562	.235 (.470)	.617
White	—		—		—		—			
Democrat	–.065 (.060)	.283	–.102 (.105)	.331	–.096 (.105)	.360	–.102 (.105)	.333	–.096 (.105)	.359
Republican	.022 (.061)	.719	.058 (.111)	.599	.067 (.110)	.538	.059 (.111)	.596	.068 (.111)	.537
Independent	—		—		—		—			

Interaction										
African-American * Median income zip code							.003-*3*(.001-*2*)	.783	.002-*3* (.001-*2*)	.864
Latino * Median Income zip code							$–.007^{-4}$ $(.001^{-2})$	.953	$–.001^{-3}$ $(.111^{-4)}$	.931
F	161.92	.000	15.70	.000	14.87	.000	13.58	.000	12.99	.000
Adjusted R^2	0.0512		.189		.192		0.1873		0.1897	

NOTE: Unstandardized regression coefficients, standard errors in parentheses. Parameters in bold are significant at .10 or better based on a two-tailed test. A dash in place of the coefficients denotes the variable's reference category. Analysis based on two-level hierarchical linear modeling (HLM). Listwise deletion of cases with missing scores results in a final *N* of 820 cases.

predictors. The data are presented using different baselines. Baseline 1 (column 2) includes only one of the two socioeconomic contextual factors—zip code median income without zip code educational attainment due to a moderate correlation between the variables (Pearson's r=.66, see appendix). Baseline 2 (column 3) includes both zip code median income and educational attainment.

One clear difference between the HLM models (baselines 1 and 2) and the analysis including only the individual-level predictor is that African-Americans are no longer statistically less likely to have a home computer. Once we control for concentrated poverty and low-socioeconomic-status environments, African-Americans, Whites, and Asians have comparable access rates to a home computer. This suggests there are important interactions occurring between racial minorities and the communities in which they live, shaping access to technology. Both baseline models 1 and 2 continue to show that the poor, less-educated, older individuals and Latinos (as compared to non-Latinos) are significantly less likely to have access to a home computer. Controlling for concentrated poverty and educational environments does not diminish the effects of ethnicity on access, as Latinos continue to have reduced access rates compared to non-Hispanic Whites.

Not only is race no longer statistically significant, we also find that place matters. As shown in baseline 1, concentrated poverty is important. Respondents residing in zip codes with lower median household income are statistically less likely to have access to a home computer, controlling for other contextual and individual-level factors. While previous research has focused on the individual-level predictors of access to information technology, no previous research we are aware of has shown the importance of concentrated poverty and the environment on access to technology.

The educational attainment of the community is also important as shown in baseline model 2 (Table 3). Respondents residing in zip codes with lower educational attainment (measured by percent of the population with a high school diploma or higher) are statistically less likely to have a home computer than those residing in geographic areas with higher educational attainment. This suggests that socioeconomic context (and possibly educational opportunities) measured by the educational attainment of a community are important in understanding digital inequalities.

In both baseline models, Latinos had lower access rates than other racial and ethnic groups, but in baseline model 2, residents of zip codes with higher Latino populations had statistically higher access rates. How can this be? These data indicate that other cultural or regional characteristics of geographic areas with large Latino populations are associated with increased computer use. Latino populations are concentrated in the Southwest, a region with the highest percentage of high-technology industries. The percentage of African-Americans or Asians in the respondent's zip code had no measurable impact on home computer access.

The question driving this research, however, is the interaction of race and place on technology access. What is the effect of being a racial or ethnic minority and living in a poor community on the probability of access to a home computer? Hierarchical linear models presented in columns 4 and 5 (Table 3) are identical to those presented in columns 2 and 3, but also include two interaction terms modeling the effect of an African-American residing in an area of concentrated poverty (Black * median income of the zip code of residence) and the effect of a Latino residing in an area of concentrated poverty (Latino * median income of the zip code of residence) on digital access. Column 4 includes the primary predictor for only median income and column 5 for median income and educational attainment in the zip code, paralleling columns 2 and 3, analyzed earlier. We consider the model in column 5 to be the fully specified model, but include column 4 as a reference.

As hypothesized, the interaction term for African-Americans is statistically significant and negatively related to home computer access. African-Americans residing in areas of concentrated poverty (race * place) have significantly lower access than African-Americans residing in wealthier communities. Thus race and place (concentrated poverty) interact to further decrease access rates to technology, beyond individual or environmental factors alone.

The model in column 5 indicates that when we control for the fact that many African-Americans reside in very poor areas, the primary coefficient for African-American becomes positive and statistically significant. African-Americans residing in nonpoverty areas are somewhat more likely than Whites or Asians to have a home computer, once we control for concentrated poverty and racial segregation. This is consistent with previous research showing African-Americans are more interested in technology for economic opportunity, education, and technology-skill acquisition (Mossberger, Tolbert, and Stansbury 2003). Thus apathy or motivation is not the problem in reported low-access rates for African-Americans, but concentrated poverty is. The interaction term for Latinos residing in areas of concentrated poverty is not statistically significant.

The fully specified model in column 5 indicates not only that race and place interact, but that concentrated poverty (measured by zip code median income) and low-socioeconomic-status environments (measured by educational attainment) continue to matter and shape access to a home computer. Individuals (of all racial and ethnic backgrounds) residing in poorer zip codes with a smaller percent of the population with a high school diploma are significantly less likely to have a home computer, regardless of individual demographic factors.

HOW MUCH DOES PLACE MATTER FOR ACCESS?

Probability simulations are used to understand the substantive magnitude of the effect of geographic factors on home computer access, while holding other explanatory variables constant at their mean or modal values. The probabilities shown in Tables 5 and 6 below are reported as percentages, but are based on the logit coefficients reported in our fully specified model (column 5, Table 3). Tables 5 and 6 present simulations for a hypothetical respondent who is female, Black, with independent partisanship, and average education, age, and income. The respondent is assumed to reside in a zip code with average African-American, Latino, and Asian populations, and average median household income and educational attainment. The interaction term for Black * zip code median income is also set at the mean. As a comparison we present simulations with identical settings but for a White respondent. For these simulations, the interaction terms are set at 0. Table 5 varies median household income in the respondent's zip code, while Table 6 varies the percentage of high school graduates in the zip codes, holding other factors constant.

Two main findings are striking. First, concentrated poverty and the socioeconomic status of the community, measured by educational attainment, result in large disparities in technology access, holding individual demographic factors constant. Second, concentrated poverty has a larger impact in reducing technology access for African-Americans than for Whites, while poor educational environments appear to have a larger effect in decreasing access rates for Whites than Blacks.

Holding other factors constant, White respondents residing in areas of concentrated poverty (median income one standard deviation below the mean) were 56 percent less likely to have a home computer than the same respondent living in an upper middle-class community (median income one standard deviation above the mean). Communities one standard deviation below the mean in income ($19,835) also have poverty rates of about 38 percent on average. This places them around the 40 percent threshold that researchers have used to define geographic concentration of poverty. Holding other factors constant, Black respondents residing in areas of concentrated poverty (income one standard deviation below the mean) were 83 percent less likely to have a home computer than the same respondent residing in a middle-class community (one standard deviation above the mean). This suggests wealth of the community is more important for technology access for African-Americans than for similarly situated Whites, but that place

TABLE 5: Impact of Place on the Probability of Home Computer Access

	Median Household Income Zip Code	*BLACK Probability of Access*	*Difference from the Mean*	*WHITE Probability of Access*	*Difference from the Mean*
Very high (+2 *SD*)	$61,481	113%	+83	125%	+55
High (+1 *SD*)	$47,599	71%	+41	98%	+ 28
Mean	$33,716	30%	0	70%	0
Low (–1 *SD*)	$19,835	–12%	–42	42%	–28
Very low (–2 *SD*)	$5,953	–54%	–84	15%	– 55

NOTE: Probabilities are based on the unstandardized coefficients reported in Table 4, column 5 and calculated with a "do" file in STATA. To simulate different levels of community wealth, zip code median income was set at its mean and one and two standard deviations above and below the mean. Values for other explanatory variables held constant at their means. Gender was set at female, and partisanship at independent. Race of the respondent was varied from Black to White. For the Black simulations the interaction term was set at the mean. For the White simulations, the interaction term was set at 0. *SD* = standard deviation.

TABLE 6: Impact of Place on the Probability of Home Computer Access

	% HS Diploma or More in the Zip Code	*BLACK Probability of Access*	*Difference from the Mean*	*WHITE Probability of Access*	*Difference from the Mean*
Very high (+2 *SD*)	99.18	85%	+35	125%	+55
High (+1 *SD*)	86.59	57%	+27	98%	+28
Mean	73.99	30%	0	70%	0
Low (–1 *SD*)	61.41	2%	–28	43%	–27
Very low (–2 *SD*)	48.82	–26%	–56	15%	–55

NOTE: Probabilities are based on the unstandardized coefficients reported in Table 4, column 5 and calculated with STATA. To simulate different levels of community educational attainment, zip code percentage of high school graduates was set at its mean and one and two standard deviations above and below the mean. Values for other explanatory variables are held constant at their means. Gender was set at female, and partisanship at independent. Race of the respondent was varied from Black to White. For the Black simulations the interaction term was set at the mean. For the White simulations, the interaction term was set at 0. *SD* = standard deviation.

factors matter considerably for both Blacks and Whites. Perhaps the importance of community wealth for African-Americans reflects the impact of the *concentration* of poverty in the communities in which African-Americans reside, as African-Americans are more likely than Whites of similar income to live in communities with concentrated poverty.

Another way to understand the influence of place on digital access is in terms of the distribution from the mean. Black individuals residing in wealthy communities (two standard deviations above the mean) have an 83 percent increased probability of owning a home computer compared to an individual residing in an area with mean income, all else equal. But White individuals residing in wealthy communities have only a 55 percent increased probability of access compared to those residing in an area with mean income. Black individuals residing in an upper-middle-class community (one standard deviation above the mean) have a 41 percent increased probability of having a home computer compared to an individual residing in an area of average income, all else equal. For Whites, the difference from the mean is only 28 percent. A Black individual residing in an area of highly concentrated poverty (two standard deviations below the mean) has a 84 percent decreased probability of computer access compared to the same individual living in a community of average wealth. For Whites, the difference from the mean is 54 percentage points. Communities two standard deviations below the mean have a poverty rate of about 70 percent, on average, in the sample.

Table 6 indicates that educational opportunities have a similar impact on the probability of technology access, but the disparities are smaller than when varying community wealth (above). The educational attainment of the community appears to have a greater impact in shaping technology access for Whites than for Blacks, although African-Americans have considerably lower home-access rates than Whites on average. Both Black and White respondents residing in areas with low educational attainment (zip codes with only 61 percent of the population with a high school diploma or higher) were 55 percent less likely to have a home computer than the same respondent living in a zip code where 87 percent of the population had a high school diploma—a comparison of one standard deviation above and below the mean. It is striking is that the same level of community education results in significantly lower home-access rates for Blacks than Whites, and that highly educated environments (two standard deviations above the mean) lead to higher home-access rates for Whites than for Blacks. The data suggest that concentrated poverty and educational opportunities in communities shape access to technology in America, beyond individual-level factors.

HOW PLACE MATTERS: HOME INTERNET USE

Access to a computer is important, but research suggests use of the Internet at home may be more so, both for economic and political opportunities given the migration of employment and government information online

(Horrigan 2004).[12] In this section we repeat the HLM models with and without interaction terms, when the dependent variable is frequency of Internet use at home. We measure frequency of Internet use with the following survey question: "In the last month, how often did you access the Internet from home" with responses ranging from 1 (zero times) to 5 (more than 100 times).[13] Since home Internet access leads to more frequent and convenient use this may be more conducive for skill development, and a wider range of uses, for example, searching for information on politics, health, and jobs. We expect that both our individual-level demographic predictors and zip code–level environmental predictors will be related to the frequency of Internet use at home.

Table 4 reports our two baselines modeling frequency of home Internet use. There is a noticeable difference when we compare the coefficients from the model with only individual-level predictors discussed earlier (level 1) to the two baseline models with zip code median income (baseline 1, column 2) or zip code median income and educational attainment (baseline 2, column 3), as African-Americans are no longer statistically less likely to use the Internet at home than Whites. A similar pattern emerged for home computer access. That is, when we control for place (concentrated poverty), race is no longer a statistically significant predictor of frequency of Internet use. Latinos, however, continue to have lower Internet use at home than the reference group, non-Hispanic Whites. This suggests that concentrated poverty is a more significant factor in reducing Internet use rates for African-Americans than for Latinos. Other factors beyond poverty, such as language and education, may reduce Internet use rates for Latinos (see also Fairlie 2004).

Paralleling the findings for home computer access, we find respondents residing in poorer areas, with lower household median income, are statistically less likely to use the Internet from home, above and beyond individual demographic factors (baseline 1, column 2). Similarly, individuals residing in zip codes with lower educational attainment (measured by the percent of the population with a high school degree or higher) have lower Internet use at home (baseline 2, column 3). In fact, place variables such as zip code median income and educational attainment explain more of the variation in home Internet use than in home computer access (see change in *R*-square values from baseline with only individual-level predictors). Individual-level characteristics explain relatively little of the variation in frequency of Internet use, although there are statistically significant differences at the individual level. This suggests that socioeconomic environments (and associated opportunities) are more critical for Internet use than technology access alone.

Individuals living in zip codes with higher Asian populations tend to have higher Internet use rates. Since Asians do not have measurably different use rates than Whites, this again suggests that geographic areas with high Asian populations tend to be associated with frequent Internet use. Asians reside primarily in urban areas, so this variable may serve as a proxy for urban residents who have a structural advantage in broadband access and service providers compared to rural citizens. Asian populations may also serve as a proxy for western regions with many high-technology industries.

One difference from the findings on access is the statistically higher Internet use rates for males compared to females, suggesting that while the gender divide in terms of Internet access may have closed, there remain significant differences in usage rates between women and men, with men more likely to engage in frequent Internet use at home than women. In previous research, men's self-reported technology skills were modestly higher than women's—a difference that achieved statistical significance (Mossberger, Tolbert, and Stansbury 2003; see also Bimber 2000). The persistence of the gender gap suggests that Internet use serves as an indicator of skills as well as access.

We again include our two primary interaction terms to measure the interplay of race and place in shaping technology use reported in columns 4 and 5 (Table 4). Table 4 includes models of Internet use with two interaction terms modeling the effect of being an African-American and residing in an area of concentrated poverty and the effect of being a Latino residing in an area of concentrated poverty. Departing from the previous analysis of home computer access, neither of the interaction terms for race/ethnicity and place are statistically significant. Since the interactions are not significant, we consider the fully specified models for this analysis to be baseline 1 (column 2) and baseline 2 (column 3) that include the individual demographic and environmental variables, but not the interaction terms. Baseline 1 indicates that zip code median income matters for technology use, while baseline 2 shows that educational attainment of the zip code remains an important predictor of use, but race and place do not interact. This analysis suggests that concentrated poverty and educational opportunities in communities shape access to technology and use of the Internet in America, beyond individual-level factors.[14]

RACIAL SEGREGATION AND CONCENTRATED POVERTY DESERVE ATTENTION IN TECHNOLOGY POLICY

Early descriptive studies tracked urban and rural differences in technology adoption (U.S. Department of Commerce 1995, 2002; Pew 2003), but measuring community disparities rather than simple urban/rural differences is more meaningful, and suggests that the influence of place persists at lower levels of aggregation.

The central contribution of this study is to establish evidence, for the first time, that concentrated poverty matters for computer access and Internet use. This study has employed community-level measures that distinguish the variations in the fabric of urban areas. It has utilized more rigorous methodology than previous research, using multilevel statistical modeling that allowed us to test the influence of place as well as individual characteristics in shaping digital inequalities. This has yielded a more complete and accurate model of the factors that account for systematic differences in technology access and use—recasting our conception of the "digital divide." Introducing environmental variables has also extended the research on the impact of concentrated poverty and racial segregation, and the geography of disadvantage.

As a result of this study, we have begun to unravel some of the mysteries of how race matters for inequalities in technology access and use, a topic on which there has been little evidence. Previous research based on survey data and individual demographic variables alone found that race and ethnicity (as well as income, age, and education) were statistically significant for determining access and skill (Mossberger, Tolbert, and Stansbury 2003; Lenhart 2003; Bimber 2003; U.S. Department of Commerce 2002; Neu, Anderson, and Bikson 1999; Bimber 2003). When we control for community income and educational attainment, however, race is no longer a significant factor (although Latino ethnicity is). Community educational attainment and wealth are significant determinants of technology use as well, again trumping the role of race in explaining disparities. Racial segregation and concentrated poverty therefore account for technology disparities that at first glance seemed to be due to race. When place factors are controlled for in the models, the effect of race at the individual level disappears.

This finding explains the paradox that appeared in prior research—the notably positive attitudes toward technology that African-Americans expressed, despite their lower rates of access and skill. The consistency with which African-Americans connected the issue of technology with economic opportunity across a range of survey questions indicates the motivation to overcome economic disadvantage and discrimination as a powerful reason for more positive attitudes toward using public access or learning new computer skills. Further, we found evidence that African-Americans living in more affluent communities are somewhat more likely than similarly situated Whites to have home computer access. Using an interaction term to explore the effect of being African-American and living in areas of concentrated poverty (measured by zip code median income), we were able to untangle different experiences that African-Americans have with technology, based on the local opportunities available to them. African-Americans residing in areas of concentrated poverty were statistically less likely to have access to a home computer than African-Americans residing in more affluent zip codes, all else equal. Understanding the place-based characteristics of technology inequalities does not diminish their significance, however, for even with some reversal of segregation and concentrated poverty in the 1990s, the 2000 census data reveal that African-Americans are still disproportionately likely to reside in areas that are primarily segregated and poor.

For Latinos, the results are more complex. Ethnicity is still significant when controlling for concentrated poverty. Language may also be a barrier for Latinos in access to and use of the Internet.

Comparing technology use to access, we find that the low educational attainment of poor communities is a consistently significant factor for frequency of use, as well as the wealth of a community, but that unlike technology access, race and place (zip median income) do not interact to further reduce technology use for minorities.

There may also be some correlation between educational attainment in an area and the quality of local schools. While this study focused on adults, people who have lived in poor neighborhoods may struggle with educational deficits that make it difficult to fully exploit information on the Internet or to learn technical skills. Individuals who spend their adolescence in areas of concentrated poverty are statistically more likely to suffer lifelong disadvantages in employment, even when they move outside these neighborhoods (Holloway and Mulherin 2004). The relationship between the quality of education and the digital divide is worth further investigation, particularly because of the well-known, place-based educational inequities in the United States, which are especially acute in racially segregated, poor neighborhoods (Orfield and Lee 2005).

The picture that emerges from these results is that those who live in the poorest communities experience the digital divide as yet another form of social exclusion or "capability poverty" (Sen 1993). To the extent that race matters for technology access, it is because of racial segregation and concentrated poverty. Just as concentrated poverty erects structural barriers that limit educational opportunities, access to jobs, and social mobility, so too it restricts information technology access and use. This suggests that public technology access and skill development programs should be targeted to poor communities in the short term. In the long run, however, virtual inequality does not exist apart from other inequities in American society, such as unequal housing, education, and job opportunities.

It is also worthwhile to consider what implications these findings have for the way in which growth is distributed in cities and metropolitan areas—whether some neighborhoods and their residents will flourish in the new economy, while others will be increasingly left behind. Fiber-optic networks, wireless networks, and other “new economy” development strategies will likely have little impact if public policy ignores the need for a skilled labor force available to meet the needs of technology-intensive industries.

Beyond these considerations, however, is the argument that residents of poor communities deserve the same opportunities as other Americans to develop skills and capabilities, to compete in labor markets, and to go online to acquire information. Technology inclusion is less a matter of persuasion or demonstrating relevance than providing more chances to use technology and to develop necessary skills.

APPENDIX
Correlations of Individual and Zip Code Variables

Individual-Level Variables	*Poor*	*Education*	*Age*	*Male*	*African-American*	*Latino*	*Asian-American*	*Democrat*	*Republican*
Poor	1.000								
Education	–.368	1.000							
Age	.101	–.102	1.000						
Male	–.060	.085	–.041	1.000					
African-American	.204	–.141	–.041	–.054	1.000				
Latino	.018	–.042	–.101	–.001	–.143	1.000			
Asian-American	.024	.077	–.059	.046	–.039	–.022	1.000		
Democrat	.177	–.071	–.014	–.101	.362	.083	.029	1.000	
Republican	–.103	.036	.030	.056	–.274	–.074	–.022	–.629	1.000

Zip Code-Level Variables	*Median Income*	*% High School Diploma or Higher*	*% African-American*	*% Latino*	*% Asian American*
Median Income	1.000				
% High school diploma or higher	.658	1.000			
% African-American	–.424	–.403	1.000		
% Latino	–.101	–.426	–0.1684	1.000	
% Asian-American	.227	.209	–0.1052	.0736	1.000

NOTES

1. Some market research has found that Latinos have higher rates of access than Whites (Walsh 2001). This market survey has been quoted by academic sources (see Compaine 2001, chapter 14), but it was based on a mail survey for which the response rate was not disclosed. Nie and Erbring (2000) and Wilhelm (2000) dismiss the influence of race, but Nie and Erbring do not use multivariate statistical controls, and Wilhelm's findings on race and ethnicity are suspect because of data analysis that may have obscured the impact of race and ethnicity.

2. For example, Larry Irving, the former U.S. Assistant Secretary of Commerce and administrator of the National Telecommunications and Information Administration, has identified the problem as partly being the "need to refocus minority youth from 'high tops' to high tech" (Kretchmer and Carveth 2001).

3. While any threshold is somewhat arbitrary, Jargowsky's (1997, 11) fieldwork has shown real differences in neighborhood poverty when approximately 40 percent or more of the residents are living at or below the official poverty level.

4. See, for example, surveys reported by the Pew Internet and American Life Project. The response rate is calculated by dividing the number of complete and partial interviews by the number of eligible reporting units. Eligible units are calculated as the sum of complete and partial interviews plus refusals plus callbacks that did not result in an interview. Because only a small number of refusals indicated that they were in fact eligible to be interviewed, the maximum response rate based on known eligibility is 92 percent for the high-poverty sample and 88 percent for the general sample. Assuming that all refusals and incomplete callbacks involved respondents who answered a household telephone and were 21 years old or older yields a response rate of 42 percent for each sample.

5. A total of 1,190 interviews were conducted in high-poverty census tracts, and another 747 interviews were completed in the general sample. The number of complete surveys was 1,152 and 685 respectively, for 1,837 valid responses. The total sample with identifiable zip codes was 1,345 cases.

6. Respondents were coded in mutually exclusive categories as White (non-Hispanic), African-American, Latino, or Asian with Whites coded 0 as the reference group.

7. We coded zip codes with 50 percent or more of the residents living in urbanized areas as urban and those with 0–49 percent of the population in urbanized areas as nonurban.

8. While no-use responses were high, a histogram reveals a normal distribution characterized the responses that reflected some home Internet use. Limitations in the survey questionnaire prevent a more refined measure of Internet use.

9. For Latinos in our sample there is less residential variation by income. Latinos in our sample had a 70.9 percent probability of residing in a majority Latino zip code. For those in zip codes with a median income of less than $34,000 the probability of living in a majority-Latino zip code rose slightly to 72.3 percent; for those in zip codes with median incomes of less than $20,000 (concentrated poverty), the probability was 73.7 percent. Less variation for Latinos may be due to a smaller sample size for that subgroup.

10. We estimate generalized linear latent and mixed models. The hierarchical (multilevel) models are random coefficient models. Home computer access is modeled using a binominal conditional density and logit link model, whereas the frequency of home Internet use is modeled using linear regression with a Gaussian conditional density.

11. Individuals with Republican partisanship are more likely to have a home computer than Democrats or Independents, but we found no partisan differences for Internet use.

12. Online job search has become increasingly common with private companies like http://monster.com, and also the U.S. Department of Labor's America's Job Bank (http://ajb.org). The latter includes jobs at a variety of skill levels. The diffusion of e-government has been extensive as well. All federal agencies and state governments now have Web sites as a key mechanism for communicating with citizens. At least 80 percent of local governments have e-government Web sites (Norris et al. 2001).

13. Responses are coded as 1 for zero times in the past month, 2 for 1–10 times, 3 for 11–30 times, 4 for 30–100 times, and 5 for more than 100 times in the past month.

14. Due to space constraints we do not present probability simulations for Internet use at home. These simulations are available from the authors.

REFERENCES

Ainsworth, J. W. 2002. Why does it take a village? The mediation of neighborhood effects on educational achievement. *Social Forces* 81(1): 117–52.

Bahl, R. 1994. Metropolitan fiscal disparities. *Cityscape: A journal of policy development and research* 1(1): 293–306.

Bahl, R., J. Martinez-Vazquez, and D.L. Sjoquist. 1992. Central-city suburban fiscal disparities. *Public Finance Quarterly* 20(4):420–32.

Bimber, B. 1999. The Internet and citizen communication with government: Does the medium matter? *Political Communication.* 16(4): 409–428.

———. 2000. Measuring the Gender Gap on the Internet. *Social Science Quarterly.* 81(3): 868–876.

———. 2003. *Information and American democracy: Technology in the evolution of political power.* New York: Cambridge Univ. Press.

Bondonio, D., and J. Engberg. 2000. Enterprise zones and local employment: Evidence from the states' programs. *Regional Science and Urban Economics* 30(5): 519–49.

Boyce, A., and L. Rainie. 2002. *Online job hunting: A Pew Internet Memo*. Pew Internet and American Life Project. Retrieved from http://www.pewinternet.org//PPF/r/65/report_display.asp/.

Bushweller, K. 2001. Beyond machines. *Education Week on the Web.* Retrieved from http://www.edweek.org/sreports/tc01/tco/article.cfm?slug=35pittsburgh.h20.

Clark, K. B. 1965. *Dark Ghetto: Dilemmas of social power.* New York: Harper and Row.

Coleman, J. S. 1988. Social capital in the creation of human capital. *American Journal of Sociology* 94:95–120.

Compaine, B. M. 2001. *The digital divide: Facing a crisis or myth?* Cambridge, MA: MIT Press.

DeHoog, R. H., D. Lowery, and W. E. Lyons. 1990. Citizen satisfaction with local governance—A test of individual, jurisdictional, and city-specific explanations. *Journal of Politics* 52(3): 807–837.

Fairlie, R. W. 2004. Race and the digital divide. *Contributions of Economic Analysis and Policy* 3(1): 1–35. Retrieved from http://www.bepress.com/bejeap.

Fox, S., and L. Rainie. 2002. E-patients and the Online Health Care Revolution. *The Physician Executive.* November–December: 14–17.

Galster, G., M. Mincy, and G. Tobin. 1997. The disparate racial neighborhood impacts of metropolitan economic restructuring. *Urban Affairs Review* 32(6): 797–824.

Graf, J., and C. Darr. 2004. Political influentials online in the 2004 presidential election. Available from http://www.ipdi.org.

Granovetter, M. S. 1973. The strength of weak ties. *American Journal of Sociology* 78(6): 1360–80.

Hill, E. W., and H. L. Wolman. 1997. City-suburban income disparities and metropolitan areas employment: Can tightening labor markets reduce the gaps? *Urban Affairs Review* 32(4): 558–82.

Hoffman, D. L., T. P. Novak, and A. Schlosser. 2000. The evolution of the digital divide: How gaps in Internet access may impact electronic commerce. *Journal of Computer Mediated Communication* 5(3). Available from http://www.ascusc.org/jcmc/vol5/issue3.html.

Holloway, S.R., and S. Mulherin. 2004. The effect of adolescent neighborhood poverty on adult employment. *Journal of Urban Affairs* 26(4): 427–54.

Holzer, H. J. 1987. Informal job search and black youth unemployment. *American Economic Review.* 77:446–52.

———. 1996. *What employers want: Job prospects for less-educated workers*. New York: Russell Sage Foundation.

Horrigan, J. 2004. Broadband penetration on the upswing. Pew Internet and American Life Project. Washington, D.C. Available from http://www.pewinternet.org.

Ihlanfeldt, K. R. 1997. Information on the spatial distribution of job opportunities in metropolitan areas. *Journal of Urban Economics* 41: 218–42.

———. 1999. The geography of economic and social opportunity in metropolitan areas. In *Governance and opportunity in metropolitan America*, edited by Alan Altshuler et al., 213–52. Washington, D.C., National Academy.

Jargowsky, P. A. 1997. *Poverty and place: Ghettos, barrios and the American city.* New York: Russell Sage Foundation.

———. 1998. Urban poverty, race, and the inner city: The bitter fruit of thirty years of neglect. In *Locked in the poorhouse: Cities, race, and poverty in the United States,* edited by Fred R. Harris and Lynn A. Curtis, 79–94. New York: Rowman and Littlefield.

———. 2003. *Stunning progress, hidden problems: The dramatic decline of concentrated poverty in the 1990s.* The Living Cities Census Series. Washington, D.C.: The Brookings Institution, Center for Urban and Metropolitan Policy.

Kaestle, D. F., A. Campbell, J. D. Finn, S. T. Johnson, and L. J. Mickulecky. 2001. *Adult literacy and education in America: Four studies based on the National Adult Literacy Survey.* NCES publication number 2001534. Washington, D.C.: U.S. Department of Education, National Center for Education Statistics. Retrieved from http://nces.ed.gov/pubsearch/pubsinfo.asp?pubid=2001534.

Kain, J. 1968. Housing segregation, Negro employment and metropolitan decentralization. *Quarterly Journal of Economics* 82:175–97.

———. 1992. The spatial mismatch hypothesis: Three decades later. *Housing Policy Debate* 3:37–41.

Kasarda, J. D. 1990. City jobs and residents on a collision course: The urban underclass dilemma. *Economic Development Quarterly* 4(4):286–307.

———. 1993. Inner-city concentrated poverty and neighborhood distress, 1980–1990. *Housing Policy Debate* 4:253–302.

Kozol, J. 1991. *Savage inequalities: Children in America's schools.* New York: Crown.

Kretchmer, S. B., and R. Carveth. 2001. The color of the net: African-Americans, race, and cyberspace. *Computers and Society* 34:9–14.

Kruse, D., and J. Blasi. 2000. The new employer-employee relationship. In *A working nation: Workers, work, and government in the new economy*, D.T. Ellwood, R.M. Blank, J. Blasi, D. Kruse, W.A. Niskanen, and K. Lynn-Dyson. New York: Russell Sage Foundation.

Larsen, E., and L. Rainie. 2002. The rise of the E-citizen: How people use government agencies' web sites. Washington, D.C.: The Pew Internet and American Life Project. Retrieved from http://www.pewinternet.org/PPF/r/57/report_display.asp

Lenhart, A. 2003. The ever-shifting Internet population: A new look at Internet access and the digital divide. Pew Internet and American Life Project. Retrieved from http://www.picosearch.com/cgi-bin/ts.pl

Lewis, O. 1968. A study of slum culture: Backgrounds for La Vida. New York: Random House.

Massey, D. S., and N. A. Denton. 1993. *American apartheid: Segregation and the making of the underclass*. Cambridge, MA: Harvard Univ. Press.

Manzo, K. 2001. Academic record. *Education Week on the Web.* Retrieved from http://www.edweek.org/sreports/tc01/tc01article.cfm?slug=35academic.h20.

Marshall, T. H. 1992. The problem stated with the assistance of Alfred Marshall [originally delivered in 1949]. In *Citizenship and social class*., T. H. Marshall and T. Bottomore, 3–51. London: Pluto Perspectives.

McGuckin, R., and B. Van Ark. 2001. Making the most of the information age: Productivity and structural reform in the new economy. New York: Conference Board.

Moss, P., and C. Tilly. 2001. Stories employers tell: Race, skill, and hiring in America. New York: Russell Sage Foundation.

Mossberger, K., and C. Tolbert. 2005. Race, place and information technology. Report prepared for the U.S. Department of Housing and Urban Development, Grant H-21439RG.

Mossberger, K., C. Tolbert, and M. Stansbury. 2003. *Virtual inequality: Beyond the digital divide*. Washington, D.C.: Georgetown Univ. Press.

Myrdal, G. 1944. *An American dilemma.* New York: Harper and Brothers.

NetImpact. 2002. Study overview and key findings. Retrieved July 30, 2004 from http://www.netimpactusdy.com/nis_2002.html.

Neu, C.R., R.H. Anderson, and T.K. Bikson. 1999. *Sending your government a message: E-mail communication between citizens and government.* Santa Monica, CA: RAND.

Nie, N., and L. Erbring. 2000. *Internet and society: A preliminary report.* Stanford, CA: Stanford Institute for the Qualitative Study of Society, Stanford University.

Norris, D. F., P. D. Fletcher, and S. Holden. 2001. Is your local government plugged in? Highlights of the 2000 Electronic Government Survey. Prepared for the International City/County Management Association and Public Technology, Inc. Retrieved June 10, 2002 from http://www.umbc.edu.mipar/final_draft/PDFs/e-gover.icma.final-4-25-01.pdf.

Norris, P. 2001. *Digital divide: Civic engagement, information poverty and the Internet worldwide*. Cambridge, MA: Cambridge Univ. Press.

Oliver, J., and T. Mendelberg. 2000. Reconsidering the environmental determinants of white racial attitudes. *American Journal of Political Science* 44:574–589.

Orfield, G., and C. Lee. 2005. *Why segregation matters: Poverty and educational inequality.* Cambridge, MA: The Civil Rights Project, Harvard University. Retrieved from http://www.civilrightsproject.harvard.edu.

Pack, J. R. 1998. Poverty and urban public expenditures. *Urban Studies* 35(11): 1995–2019.

Pettit, K. L. S., and T. Kingsley. 2003. Concentrated poverty: A change. Urban Institute. May 23, 2003. Retrieved from http://www.urban.org/url.cfm?ID=310790.

Pew Internet and American Life Project. 2000. African-Americans and the Internet. Retrieved from http://www.pewinternet.org/PPF/r/25/report_display.asp.

Quane, J. M., and B. H. Rankin. 1998. Neighborhood poverty, family characteristics, and commitment to mainstream goals—The case of African American adolescents in the inner city. *Journal of Family Issues*. 19(6): 769–794.

Rankin, B. H., and J. M. Quane. 2000. Neighborhood poverty and the social isolation of inner-city African American families. *Social Forces* 79(1): 139–64.

Rosenbaum, J. E. 1995. Changing the geography of opportunity by expanding residential choice: Lessons from the Gautreaux program. *Housing Policy Debate* 6(1): 231–69.

Rusk, D. 1995. *Cities without suburbs*, 2nd ed. Baltimore, MD: Johns Hopkins Univ. Press.

Sampson, R. J., J. D. Morenoff, and T. Gannon-Rowley. 2002. Assessing "neighborhood effects": Social processes and new directions in research. *Annual Review of Sociology* 28:443–78.

Sen, A. 1993. Capability and well-being. In *The quality of life,* edited by M. Nussbaum and A. Sen. Oxford: Clarendon.

Shah, D., N. Kwak, and R. Holbert. 2001. "Connecting" and "disconnecting" with civic life: Patterns of Internet use and the production of social capital. *Political Communication* 18:141–62.

Thomas, J. C., and G. Streib. 2003. The new face of government: Citizen-initiated contacts in the era of e-government. *Journal of Public Administration Research and Theory* 13(1): 83–102.

Tolbert, C., and R. McNeal. 2003. Unraveling the effects of the Internet on political participation? *Political Research Quarterly* 56(2): 175–85.

Tolbert, C., and K. Mossberger. 2004. *Inequality in Broadband Internet Access.* Report submitted to the Economic Policy Institute. September.

Trotter, A. 2001. Closing the digital divide. *Education Week on the Web.* Retrieved from http://www.edweek.org/sreports/tc01article.cfm?slug=35solutions.h20.

U.S. Department of Commerce, National Telecommunications and Information Administration (NTIA). 1995. *Falling through the net: A survey of the "have nots" in rural and urban America.* Retrieved from http://www.ntia.doc.gov/ntiahome/fallingthru.html.

———2002. *A nation online: How Americans are expanding their use of the Internet.* Retrieved from http://www.ntia.doc.gov/ntiahome/dn/anationonline2.pdf/.

Van Ryzin, G. G., D. Muzzio, S. Immerwahr. 2004. Explaining the race gap in satisfaction with urban services. *Urban Affairs Review* 39(5): 613–632.

Walsh, E. O. 2001. The truth about the digital divide. In *The digital divide: Facing a crisis or a myth?* edited by Benjamin M. Compaine, 279–84. Cambridge, MA: MIT Press.

Warschauer, M. 2003. *Technology and social inclusion: Rethinking the digital divide.* Cambridge, MA: MIT Press.

West, D. M. 2004. E-government and the transformation of service delivery and citizen attitudes. *Public Administration Review.* 64(1): 15–27.

Wilhelm, A. 2000. *Democracy in the digital age: Challenges to political life in cyberspace.* New York: Routledge.

Wilson, W. J. 1987. *The truly disadvantaged: The inner city, the underclass and public policy.* Chicago: Univ. of Chicago Press.

———1996. *When work disappears.* New York: Alfred A. Knopf.

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