IMPROVING THE EFFECTIVENESS OF E-GOVERNMENT POLICIES: THE EXAMPLE OF FEDERAL E-FILING AND UNDERPRIVILEGED TAXPAYER GROUPS

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INTRODUCTION

The introduction of electronic tax administration including electronic tax filing (e-filing) has been one of the most important electronic government (e-government) initiatives in the United States. Starting in the 1980s as a partnership between the Internal Revenue Service (IRS) and H&R Block, the program has developed to a successful public-private partnership. In fact, the IRS has been described as one of the most efficient tax collection agencies in the world (Fletcher, 2003). The success of the program was significantly shaped by the 1998 "Internal Revenue Service Restructuring and Reform Act of 1998" (P.L. 105-206, 112 Stat. 685), which introduced a goal of 80 percent e-filing for all federal tax returns by the year 2007 (§2001(a)(2)). In light of this law, the IRS adopted a strategic plan that included ensuring that all electronically prepared returns can also be filed electronically, reducing the cost of administration to less than $2 per return, as well as increasing accuracy and integrity to 99 percent and taxpayer and distributor satisfaction to 90 percent.

Recent announcements by the IRS indicate that, while the 80 percent e-filing goal was not reached, e-filing has increased at an impressive rate since its introduction in the late 1990s. Our statistical analysis shows that e-filing for individual taxpayers increased from an average of about 25 percent in 1999 to 58 percent in 2005. However, this increase is not uniform across the population and across U.S. regions. One purpose of our study is, therefore, to examine the determinants of e-filing by different population segments and regions. More specifically, we are addressing the question whether underprivileged taxpayer groups are falling behind in e-filing.

E-filing has been subject to recent academic studies because it provides a rich research setting for the following reasons. Most of the households in the United States have to file tax returns; thus, while individuals may not be too familiar with the tax laws and the country's tax policy, they are familiar with filing and paying taxes. Furthermore, the tax domain is different from other situations where individuals may choose electronic services over traditional services, such as electronic retail services or online banking because the domain (i.e., the tax law) is fairly complex and most taxpayers are not experts. In addition, e-filing introduces the issues of security and privacy protection and taxpayers' dislike and distrust of the IRS and the government in general. Last, but not least, e-filing research provides an intersection of various academic disciplines, namely information systems, public finance, public administration, and accounting (taxation).

We contribute to the literature by examining not only economic and demographic but also geographic determinants of e-filing within the United States using actual e-filing data from the IRS for the years 1999, 2004, and 2005. We show that while the tax administration might have improved in efficiency through considerable rise in e-filing rates throughout the nation, the rates vary significantly both between and within the individual states. Although some variation is to be expected and acceptable, significant differences both regionally and demographically can be problematic from the equity perspective of government policy. In particular, a non-uniform e-filing rate and e-filing growth rate might be an indicator of the digital gap between the technology users and those who do not have access to electronic services.

The remainder of this paper is structured as follows. The second section provides some background information and summarizes prior literature. The third section introduces the data and methodology. The fourth section discusses the results and the fifth section concludes.

BACKGROUND AND LITERATURE REVIEW

In recent years, the introduction of electronic initiatives into various levels of government has been subject to intensive academic and practitioner discussion (e.g., Justice, Melitski, and Smith, 2006; Sprecher, 2000; Moon, 2002; Yang and Rho, 2007; Gil-Garcia and Martinez-Moyano, 2007; Yildiz, 2007). Electronic government (e-government)

services have been described as tools to improve democracy, transparency, and accountability as well as possibly government performance (Leitner, 2004; Beynon-Davies, 2005). However, the perception of what e-government should be varies among expert groups from anything that involves the government and the Internet to using any type of information technology to provide government services (Justice et al., 2006). Since experts' definitions of e-government and e-government goals vary, no clear measure of e-government success has been established. One stream of e-government research examines the development of e-government and describes it in various stages (Moon, 2002; Esteves and Joseph, 2008). Other studies survey perceptions of either government managers or citizens (Wang and Liao, 2008) or evaluate the websites of government organizations (de Jong and Lentz, 2006). We choose a different approach by focusing on only one aspect of e-government—electronic tax filing (e-filing)—and examining in what regions and with which population groups adoption was most prevalent. Thus, we evaluate the possibility of a conflict between efficiency and equity of this particular e-government initiative. Alternatively stated, this research addresses the question of whether e-filing has a negative impact on underprivileged taxpayer groups. Even though electronic tax filing covers only one aspect of e-government (i.e., the transmission of tax return information and the collection of tax revenues) at the federal government level only, we believe that examining this particular program is of interest because the IRS interacts with more Americans than any other public or private organization (Fletcher, 2003). Most individuals have tax filing experience even if they do not know much about tax laws and/or tax policy. Moreover, most taxpayers are interested in an improved relationship with the tax collection agency through faster refunds, fewer audits, and lower cost of tax filing.

In that context, the main benefits of electronic filing to the customer (taxpayer) are faster preparation of the returns, better accuracy of the returns, and faster refunds. The main benefits to the Internal Revenue Service (IRS) are fewer unintentional (i.e., computational) errors, lower processing cost, and lower storage cost of the tax return information. Lowering the overall cost of tax administration should be considered good policy because low administration cost is considered a characteristic of a good tax policy (e.g., Brunori, 2001, pp. 22-24). In fact the IRS's cost of collecting $100 has recently decreased from almost $0.48 to $0.44 (U.S. Department of Treasury). Similarly, improving accuracy and increasing the processing speed are consistent with e-government goals and objectives. However, if e-filing rates and e-filing growth are not uniform across population groups and regions, the program might have distributional consequences. This paper therefore addresses how e-filing rates and e-filing growth differ for underprivileged groups such as minorities, elderly, and the poor.

Although an e-filing pilot program has existed since the mid-1980s, the actual promotion of this initiative started with the introduction of the 1998 "Internal Revenue Service Restructuring and Reform Act of 1998" (RRA; P.L. 105-206). The purpose of this law was to improve public perception of the IRS, which had suffered from various corruption scandals, as well as increase its overall efficiency. With regard to the latter, §2001(a)(2) of RRA stated a specific goal of 80 percent electronic tax filing by the year 2007. While 80 percent electronic filing is an impressive number, it also implies that, even with the great effort of promoting e-filing, some returns will be filed using a method other than electronic data transmission (generally regular mail). Further, despite a significant increase of e-filing over the past 10 years, e-filing rates and e-filing growth rates are not uniform. In fact average e-filing varies quite significantly by state and within states as illustrated in the appendix (Tables A.1 through A.3). Table A.1 shows the average county e-file rate for each state.[1] E-filing averages range from 16 percent (Vermont) to 42 percent (South Carolina) in 1999 and 45 percent (Maine) to 74 percent (Minnesota) in 2005. Table A.2 provides information about the county averages within states, and Table A.3 lists the top and bottom 10 counties for the three sample years (i.e., the tax years 1999, 2004, and 2005). In 2005 e-filing rates varied within states between under 5 (Hawaii) to over 60 (South Dakota) percentage points. Top e-filing rates in 1999 were over 50 percent and in 2005 they have increased to almost 90 percent. Bottom e-filing rates range from under 5 percent in 1999 to around 22 percent in 2005 again indicating a large variation across regions. If e-filing provides significant advantages to both the taxpayer and the tax collection agency, it is important to know which taxpayer and which regions are less likely to e-file.

Several papers have examined individual adoption of tax preparation software and/or electronic tax filing.[2] For example, Goolsbee, 2002 examines the impact of technology—specifically tax preparation software—on reducing tax compliance cost. He concludes that tax planning programs are concentrated on a small group of taxpayers and that the use of these programs is unlikely to increase. In addition to that, he finds that individuals' adoption of tax preparation is not related to the complexity of their returns but rather to their tech savvyness. Further, he argues that the individuals who would most benefit from reducing cost of compliance—namely low income taxpayers and/or people whose native language is not English—are least likely to adopt and use tax preparation programs. Since only electronically prepared tax returns can be electronically filed, Goolsbee's finding indicates that the IRS e-filing initiative could have distributional consequences because of the digital gap. Kopczuk and Pop-Eleches (2005), on the other hand, find that the availability of tax preparation software through professional preparers or volunteer sites has a positive impact on participation in the earned income tax credit (EITC). That is, more people who are eligible for this particular credit will be able to receive it because the availability of electronic tax preparation programs significantly decreased their cost of filing the required forms.

The fact that the IRS, in conjunction with promoting the e-filing initiative, partners with communities to provide tax preparation assistance for the elderly and the poor indicates that officials are concerned about the digital gap. More broadly speaking, one goal of the e-filing program in the United States can be described as reaching out to low income taxpayers to provide them with a low-cost opportunity and a quick return (Fletcher, 2003; Holden and Fletcher, 2005). Because the IRS's private partners want to make a profit, this goal constitutes a conflict in the public-private partnership. To resolve this conflict the IRS also provides free e-filing through various partners[3]—aside from providing tax preparation assistance. It seems that the aggressive promotion of e-filing through the IRS combined with the local assistance programs and the free-filing program are key factors of the overall e-filing success.

Another stream of the e-filing literature—mostly in the information systems discipline—focuses on individual characteristics and perceptions using survey methodology. For example, Wang, 2003, Chang, Li, Hung, and Hwang, 2005, and Fu, Farn, and Chao, 2006 examined e-filing in Taiwan using modified versions of the technology acceptance model (Davis, 1989) and survey methodology. They find that in addition to the traditional technology acceptance constructs—perceived ease of use, perceived usefulness, social environment, and demographics—security and privacy, timeliness, relevance and accuracy, system reliability, response time, and ease of navigation, as well as compatibility with the taxpayers needs and experience are important determinants of individuals' intention to e-file.

Our study will incorporate the hypotheses related to demographics and technology acceptance—to the extent possible—but will not focus on individual perceptions and intentions. Instead we focus on other factors that have been discussed in the e-government literature. We use actual e-filing information by county for three years (namely 1999, 2004, and 2005) and combine these data with demographic and geographic information.[4]

Digital technology use has been shown to vary among different demographic groups, socioeconomic classes, and between different types of regions, such as cities versus rural areas (de Blasio, 2008). Specifically, prior research finds that in general, white urban young males with higher incomes are more likely to use electronic technology (Reddick, 2005). However, our situation is confounded by the IRS's effort to bring e-filing to the poor, non-white, and non-English speaking population. If poor, non-white, female taxpayers are less likely to electronically file their tax returns but the IRS is specifically reaching out to them via community service programs, e-filing might actually be higher in areas with a larger low-income non-white female population. Another confounded variable is the fact that some paid tax preparers heavily advertise their services—including the availability of refund anticipation loans (RALs)—to low-income and non-English speaking individuals. A study by the Children's Defense Fund (2008) shows that nationwide over 25 percent of the returns with EITC also had RALs. To the extent possible, we will try to take these confounding factors into account when discussing our results.

The next section introduces and describes the dataset and the empirical methodology.

DATA AND METHODOLOGY

We use e-filing data from the IRS Statistics of Income ("SOI") Division and additional demo-

graphic and geographic information from the U.S. Department of Commerce, Bureau of Economic Analysis (BEA) and the U.S. Census Bureau. The IRS e-filing information is available for three years (1999, 2004, and 2005) for each zip code. We aggregated the zip code information to county data.[5] After eliminating missing information, 9,394 observations for the three years remained.

For our analysis we use the following OLS regression models and control for year and individual state effects:

Model 1

$$EFILE_{it} = \beta_0 + \beta_1 LOGPOP_{it} + \beta_2 MINORITY_{it} + \beta_3 GENDER_{it} + \beta_4 POP65OLDER_{it} + \beta_5 POP20YOUNGER_{it} + \beta_6 INC_{it} + \beta_7 UNEMP_{it} + \beta_8 RURAL_{i2000} + \beta_9 EDUC_{i2000} + \varepsilon$$

Model 2

$$EFILEGROWTH_i = \beta_0 + \beta_1 EFILE_{i99} + \beta_2 LOGPOP_{i99} + \beta_3 MINORITY_{i99} + \beta_4 GENDER_{i99} + \beta_5 POP65OLDER_{i99} + \beta_6 POP20YOUNGER_{i99} + \beta_7 INC_{i99} + \beta_8 UNEMP_{i99} + \beta_9 RURAL_{i2000} + \beta_{10} EDUC_{i2000} + \varepsilon.$$

Our dependent variables are the e-filing percentage in year *t* (1999, 2004, or 2005) and county *i* (Model 1) and the e-filing growth rate in county *i* (Model 2). For the e-filing growth variable, we calculated the growth rate between 1999 and 2005 for each county *i* and included the 1999 e-filing rates as the independent variable. The other independent variables in the growth regression (Model (2)) are from the 1999 tax year.

We test for the impact of minority populations with two separate *MINORITY* variables: the percentage of non-white population and the Hispanic population. For gender we test the impact of the percentage of female population in each county and year. Older (younger) population refers to population 65 and older (20 and younger) as percentage of total population. Income is the per county average personal income per capita, and unemployment is the number of unemployed individuals as percentage of the total labor force. The rural measure is the percentage of population living in rural versus urban areas for each county. We use the percentage of population older than 25 with at least a 4-year college degree as a measure of education attainment. Unfortunately, the rural population and the education measures are only available for the year 2000.[6] Summary statistics for the data set are provided in Table 1.

Empirical Results

The results of regression Models (1) and (2) are listed in Table 2, which illustrates the impact of the demographic, socioeconomic, and geographic variables on the level of e-filing in each county and how the 1999 variables determined e-filing growth between 1999 and 2005.

The results show that e-filing is more prevalent in urban counties with a larger population, a larger non-white population but a smaller Hispanic population, as well as a younger and a less college-educated population. Additionally, the share of females in the population and the number of unemployed individuals are also positively related to the e-filing rate. Of these results, several are quite surprising. For example, we find it puzzling that on the one hand the share of non-whites positively impacts e-filing, while the share of Hispanics has a negative impact. Similarly, one would expect the female percentage in the population to be either not significant because of relatively low variability across counties or negatively correlated with the adoption of e-filing because women tend to be more hesitant in accepting new technology. The most remarkable results—in our opinion—are the negative relationship between education attainment and e-filing and the positive correlation of unemployment rate and e-filing. Possible explanations for this phenomenon are discussed below.

With regard to the e-filing growth rate between 1999 and 2005, we find evidence of "catching up." Specifically, we find that the 1999 e-filing rate is negatively related with e-filing growth indicating that counties with low e-filing rates in 1999 have higher e-filing growth between 1999 and 2005. Also, population size is negatively related and share of elderly is positively related to the e-filing growth rate. On the other hand, rural population, college education attainment, unemployment, and income are not significantly related to e-filing growth. Finally, the sign for the minority variables is the same as for the level regression (i.e., positive for share of non-whites and negative for share of Hispanics). These results imply that the IRS's effort to reach out and improve e-filing has been, to a certain

Table 1
Summary Statistics for Independent Variables

Years 1999, 2004, and 2005 combined

Variable	*Mean*	*Median*	*Std*	*Minimum*	*Maximum*
Log of population	10.2400	10.1301	1.4330	4.0943	16.1129
Non-white percentage	0.1315	0.0606	0.1607	0.0000	0.9514
Hispanic percentage	0.0685	0.0220	0.1238	0.0008	0.9744
Female percentage	0.5032	0.5064	0.0202	0.3277	0.5740
Older percentage	0.1488	0.1450	0.0412	0.0180	0.3494
Young (< 20) percentage	0.2702	0.2678	0.0352	0.1148	0.4987
Income per capita	27,963	25,065	65,904	860	3,985,074
Unemployment rate	0.0491	0.0462	0.0180	0.0134	0.2086
Rural percentage in 2000	0.5995	0.6041	0.3093	0.0000	1.0000
Education attainment in 2000	16.5211	14.5000	7.7678	4.9000	63.7000

Year 1999

Variable	*Mean*	*Median*	*Std*	*Minimum*	*Maximum*
Log of population	10.2247	10.1112	1.4107	4.1744	16.0718
Non-white percentage	0.1284	0.0560	0.1611	0.0000	0.9514
Hispanic percentage	0.0623	0.0180	0.1204	0.0008	0.9744
Female percentage	0.5042	0.5073	0.0198	0.3277	0.5740
Older percentage	0.1474	0.1439	0.0417	0.0180	0.3464
Young (< 20) percentage	0.2838	0.2813	0.0338	0.1636	0.4987
Income per capita	23,990	22,176	49,248	932	2,714,620
Unemployment rate	0.0436	0.0406	0.0169	0.0134	0.1743

Year 2004

Variable	*Mean*	*Median*	*Std*	*Minimum*	*Maximum*
Percent e-filing	0.5333	0.5322	0.0984	0.0000	0.8550
Log of population	10.2451	10.1365	1.4408	4.1109	16.1122
Non-white percentage	0.1326	0.0628	0.1604	0.0000	0.9506
Hispanic percentage	0.0708	0.0237	0.1249	0.0013	0.9742
Female percentage	0.5028	0.5060	0.0203	0.3283	0.5719
Older percentage	0.1492	0.1453	0.0409	0.0276	0.3494
Young (< 20) percentage	0.2650	0.2627	0.0337	0.1148	0.4704
Income per capita	29,119	26,017	69,336	870	3,701,550
Unemployment rate	0.0543	0.0510	0.0182	0.0189	0.2086

Year 2005

Variable	*Mean*	*Median*	*Std*	*Minimum*	*Maximum*
Log of population	10.2501	10.1380	1.4477	4.0943	16.1129
Non-white percentage	0.1336	0.0636	0.1605	0.0000	0.9470
Hispanic percentage	0.0725	0.0247	0.1259	0.0014	0.9743
Female percentage	0.5026	0.5059	0.0205	0.3301	0.5733
Older percentage	0.1499	0.1460	0.0408	0.0258	0.3454
Young (<20) percentage	0.2619	0.2596	0.0341	0.1167	0.4637
Income per capita	30,763	27,081	75,936	860	3,985,074
Unemployment rate	0.0493	0.0466	0.0173	0.0159	0.2055

Variable explanation:

Log of population:	Natural log of population in county *i*
Non-white percentage:	Non-white population as a percentage of total population in county *i*
Hispanic percentage:	Hispanic population as a percentage of total population in county *i*
Female percentage:	Female population as a percentage of total population in county *i*
Older percentage:	Population 65 and older as a percentage of total population in county *i*
Young (<20) percentage:	Population younger than 20 as a percentage of total population in county *i*
Income per capita:	Average personal income per capita for county *i*
Unemployment rate:	Number of unemployed as a percentage of the total labor force in county *i*
Rural percentage in 2000:	Population living in rural areas as a percentage of total population in the year 2000 in county *i*
Education attainment:	Population with at least a 4-year college degree as a percentage of total population in the year 2000 in county *i*

extent, successful. Note that, despite this effort, cross-county variability of e-filing rates remains high (Appendix Tables A.2 – A.3).

Robustness Analysis

In order to test if some of our results relate to specific variables, multi-collinearity, and other biases, we re-estimated our models as follows. First, we ran regression Model (1) without the rural and the education attainment variables (not tabulated). We also repeated Model (1) for each of the three years separately (see endnote 7). Qualitatively, the results remain similar. Next, we excluded the county population size variable in Model (1) and in Model (2) because population is also the denominator of the dependent and several independent variables (not tabulated). Again, qualitatively the results are similar. Note that in the growth regression (Model (2)), removing the population size variable results in a significantly negative coefficient for FEMALE and a significantly positive coefficient for RURAL. When county population size is included in Model (2), the FEMALE and the RURAL variable are not significantly correlated with e-filing growth.

Since the e-filing initiative was not strongly promoted until the passage of the RRA in 1998, we removed the 1999 tax year from the sample for Model (1) with qualitatively similar results (not tabulated). Note that the female and the unemployment variable are not significant in this case. We also re-estimated Model (2) using the e-filing growth from 2004 to 2005 as dependent variable. Untabulated results show that the 2004 to 2005 growth rate is negatively impacted by the 2004 e-filing rate, by population size, and education attainment of the county. The remaining independent variables are not significant.

Since professional preparers are more likely to use e-filing services, we include a variable to control for the percentage of returns filed by professional services. Note that this variable includes the returns filed through local volunteer programs, such as the volunteer income tax assistance (VITA) program and the assistance for the elderly programs. The results (not tabulated) show that preparer variable is positive and significant for both regression models. Yet including a preparer variable does not significantly change the overall results. Interestingly, the variable for the share of

Table 2
Determinants of Electronic Tax Filing and E-filing Growth: Regression Results

	Dependent Variable: E-filing Percentage		*Dependent Variable: E-filing Growth 99–05*	
Adjusted R-square	0.8497	0.8478	0.6882	0.6883
Intercept	0.1208***	0.1241***	0.3077***	0.3093***
	(0.0219)	(0.0221)	(0.0245)	(0.0245)
E-filing percentage in 1999	NA	NA	-0.6237***	-0.6177***
	NA	NA	(0.0136)	(0.01324)
Log of population	0.0053***	0.0048***	-0.0035***	-0.0036***
	(0.0010)	(0.0010)	(0.0011)	(0.0011)
Nonwhite percentage	0.0801***		0.0144**	
	(0.0068)		(0.0074)	
Hispanic percentage		-0.0406***		-0.0207**
		(0.0086)		(0.0092)
Female percentage	0.2514***	0.1879***	-0.0512	-0.0733
	(0.0475)	(0.0482)	(0.0555)	(0.0557)
Older percentage	-0.5220***	-0.5062***	0.0941**	0.1075***
	(0.0340)	(0.0345)	(0.0403)	(0.0404)
Young (<20) percentage	0.0322	0.1835***	0.1520***	0.1931***
	(0.0375)	(0.0386)	(0.0431)	(0.0434)
Income per capita	0.0000	0.0000	0.0000	0.0000
	(0.0000)	(0.0000)	(0.0000)	(0.0000)
Unemployment rate	0.2083***	0.4520***	-0.0591	-0.0025
	(0.0572)	(0.0538)	(0.0661)	(0.0635)
Rural percentage in 2000	-0.0217***	-0.0279***	0.0045	0.0021
	(0.0040)	(0.0041)	(0.0044)	(0.0045)
Education attainment in 2000	-0.0038***	-0.0036***	0.0000	0.0001
	(0.0001)	(0.0001)	(0.0002)	(0.0002)

Notes:

Standard errors in parentheses. * = significant at .1; ** = significant at .05; *** = significant at .01;

Variable explanation:

Log of population:	Natural log of population in county *i*
Nonwhite percentage:	Nonwhite population as a percentage of total population in county *i*
Hispanic percentage:	Hispanic population as a percentage of total population in county *i*
Female percentage:	Female population as a percentage of total population in county *i*
Older percentage:	Population 65 and older as a percentage of total population in county *i*
Young (<20) percentage:	Population younger than 20 as a percentage of total population in county *i*
Income per capita:	Average personal income per capita for county *i*
Unemployment rate:	Number of unemployed as a percentage of the total labor force in county *i*
Rural percentage in 2000:	Population living in rural areas as a percentage of total population in the year 2000 in county *i*
Education attainment:	Population with at least a 4-year college degree as percentage of total population in the year 2000 in county *i*

elderly is not significant in the growth regression when the preparer variable is included.

In summary, our robustness checks show that the results hold in various situations. The next section discusses some of these findings in more detail and concludes.

DISCUSSION AND CONCLUSION

Our results indicate that e-filing varies significantly across and within states. Specifically, we show that e-filing rates are lower in rural counties, counties with low population size, counties with a lower share of females, counties with a higher share of Hispanics, and counties with a higher share of the elderly population. E-filing rates grew dramatically between 1999 and 2005; however, the cross-county variability remains. The e-filing growth regressions show evidence of convergence in e-filing across counties. Yet, we also find that counties with a high share of younger people have higher e-filing rates as well as higher e-filing growth rates. Similarly, and more problematically, counties with a high share of Hispanics have lower e-filing rates and lower e-filing growth rates. This could be evidence for the presence of the digital gap and needs to be addressed if the e-filing program should be equitable.

In addition, this research provides several rather puzzling results. First, e-filing rates and e-filing growth are higher in counties with a larger share of non-whites, yet these correlations are negative if the minority in question is the Hispanic population. This could be an indicator that certain minorities are more likely to use community outreach programs for tax return preparation assistance than others. Without more information about the presence of VITA and TCE programs in each county, it is difficult to prove this hypothesis. Alternatively, this phenomenon could also be related to language barriers assuming that non-whites other than Hispanics are mostly African-American and Asian. If this is the case, the e-filing program should focus (even more) on Spanish translations.

The most surprising result in our opinion is the negative relationship between education attainment and e-filing rates and e-filing growth. This indicates that taxpayers in counties with more college educated people are less likely to use e-filing. One possibility for this could be the presence of tax preparation services in conjunction with the offer of refund anticipation loans. We suspect that more educated people are less likely to use these services. (Most of these services use e-filing and the data available to us does not distinguish between e-filing from home, from a community outreach program, or from a paid tax preparer.)

We think that our findings will be useful for officials who are concerned with e-filing at the federal level. Some of these findings can also be generalized to other government levels and therefore improve policymakers' understanding of e-filing of various other taxes at the state and local levels. Furthermore, findings regarding e-filing may also apply to the adoption of other e-government initiatives. For future work, we plan to do a micro analysis of e-filing in certain states, particularly the ones that have high degree of within-county variation in e-filing rates and/or growth in e-filing. We will also complement our analysis by examining the community outreach programs on tax preparation as data about these problems become available. One possibility for this may the utilization of community surveys.

Notes

[1] Note that this rate is not necessarily the same as the average *individual* e-filing rate by state.

[2] It is important to point out that using tax preparation software and e-filing are two distinct yet often overlapping concepts. In particular, in order to electronically file a return, it must be entered into some software program. Yet, using a software program does not necessarily imply that the return will be e-filed. Further, it is possible for individuals to fill out their forms by hand and have a tax filing company—such as H&R Block—enter the data electronically.

[3] As of October 2008, 19 companies provide free-filing services through the IRS Web site.

[4] The best possible information about the impact on demographics, socioeconomics, and geography on e-filing would come from individual micro-data for a representative sample of taxpayers. However, for reasons of privacy protection, this information is not available. County data represents data from the smallest possible unit and is therefore a reasonable alternative to micro-data.

[5] Some tax return information is not available for all zip codes because the IRS blocks information when a cell has 10 or fewer data points for privacy protection reasons. We used a gross-up approach based on county population to arrive at e-file percentages for each county. We are aware that this gross-up approach could be biasing our results. We believe that, if there is a bias, e-file percentage for counties with many blocked zip code cells will be overstated when using the gross-up method.

[6] This includes variables for which only one year of data is available when using panel data for the other variables can bias the results. We therefore first ran regression Model (1) for the 1999 tax year (2000 filing year) only. Then, we estimated the models for all three sample years excluding the rural and education attainment variable. Including rural and education attainment variables in the overall sample leads to qualitatively similar results.

References

Beynon-Davies, Paul. Constructing Electronic Government: The Case of the UK Inland Revenue. *International Journal of Information Management* 25 (February 2005): 3-20.

de Blasio, Guido. Urban-Rural Differences in Internet Usage, e-Commerce, and e-Banking: Evidence from Italy. *Growth and Change* 39 (June 2008): 341-367.

Brunori, David. *State Tax Policy*. Washington, D.C.: The Urban Institute Press, 2001.

Chang, I-Chiu., Yi-Chang Li, Won-Fu Hung, and Hisn-Ginn Hwang. An Empirical Study on the Impact of Quality Antecedents on Tax payers' Acceptance of Internet Tax-filing Systems. *Government Information Quarterly* 22 (2005): 389-410.

Children's Defense Fund. Halting the Loss of Billions of Dollars in Earned Income Tax Credit Benefits. Washington, D.C.: Children's Defense Fund, 2008. Policy Report.

Davis, Fred D. Perceived Usefulness, Perceived Ease of Use, and User Acceptance of Information Technology. *MIS Quarterly* 13 (September 1989): 319-340.

Esteves, José and Rhoda C. Joseph. A Comprehensive Framework for the Assessment of eGovernment Projects. *Government Information Quarterly* 25 (January 2008): 118-132.

Fletcher, Patricia D. New Models of Collaboration: A Guide for Managers. IRS E-File: Electronic Tax Administration in the United States. Albany, Center for Technology in Government, University at Albany, SUNY, 2003

Fu, Jen-Ruei, Cheng-Kiang Farn, and Wen-Pin Chao. Acceptance of Electronic Tax Filing: A Study of TaxpayerI. *Information & Management* 43 (January 2006): 109-126.

Gil-Garcia, J. Ramon and Ignacio J. Martinez-Moyano. Understanding the Evolution of E-Government: The Influence of Systems of Rules on Public Sector Dynamics. *Government Information Quarterly* 24 (April 2007): 266-290.

Goolsbee, Austan The Turbo Tax Revolution? Evaluating the Ability of Technology to Solve the Tax Complexity Dilemma. Chicago, IL: University of Chicago, 2002.Working Paper.

Holden, Stephen H. and Patricia D. Fletcher. The Virtual Value Chain and E-Government Partnership: Non-Monetary Agreements in the IRS E-File Program. *International Journal of Public Administration* 28 (2005): 643-664.

de Jong, Menno and Leo Lentz. Scenario Evaluation of Municipal Web Sites: Development and Use of an Expert-Focused Evaluation Tool. *Government Information Quarterly* 23 (2006): 191-206.

Justice, Johnathan B., James Melitski, and Daniel L. Smith. E-Government as an Instrument of Fiscal Accountability and Responsiveness: Do the Best Practitioners Employ the Best Practices? *The American Review of Public Administration* 36 (September 2006): 301-322.

Kopczuk, Wojciech and Cristian Pop-Eleches. Electronic Tax Filing, Tax Preparers, and Participation in the Earned Income Credit. Cambridge, MA: National Bureau of Economic Research, 2005. NBER Working Paper 11768.

Leitner, Christine. eGovernment in Europe: The State of Affairs. *European Institute of Public Administration* (2004): 36-48.

Moon, M. Joe. The Evolution of E-Government among Municipalities: Rhetoric or Reality? *Public Administration Review* 62 (July/August 2002): 424-433.

Reddick, Christopher G. Citizen Interaction with E-Government: From the Streets to the Servers? *Government Information Quarterly* 22 (2005): 38-57.

Sprecher, Milford H. Racing to E-Government: Using the Internet for Citizen Service Delivery. *Government Finance Review* 16 (October 2000): 21-22.

U.S. Department of Treasury. Internal Revenue Service. Statistics of Income Division. http://www.irs.gov/taxstats/compliancestats/article/0,,id=132165,00.html

Wang, Yi-Shun. The Adoption of Electronic Tax Filing Systems: An Empirical Study. *Government Information Quarterly* 20 (2003): 333-352.

Wang, Yi-Shun and Yi-Wen Liao. Assessing eGovernment System Success: A Validation of the DeLone and McLean Model of Information Systems Success. *Government Information Quarterly* 25 (October 2008): 717-733.

Yang, Kaifeng and Seung-Yong Rho. E-Government for Better Performance: Promises, Realities, and Challenges. *International Journal of Public Administration* 30 (2007): 1197-1217.

Yildiz, Mete. E-Government Research: Reviewing the Literature, Limitations, and Ways Forward. *Government Information Quarterly* 24 (July 2007): 646-665.

Table A.1.
Average County E-Filing Rates by State

STATE	*1999*	*2004*	*2005*
AK	0.1640	0.4407	0.4964
AL	0.3408	0.6179	0.6680
AR	0.3308	0.5858	0.6260
AZ	0.2537	0.5189	0.5701
CA	0.1907	0.5667	0.6099
CO	0.1721	0.4062	0.4531
CT	0.1896	0.4462	0.5741
DC	0.2358	0.4539	0.5040
DE	0.2592	0.5053	0.5562
FL	0.2921	0.5159	0.5655
GA	0.3730	0.6013	0.6446
HI	0.1703	0.4117	0.4625
IA	0.2805	0.6731	0.7142
ID	0.2135	0.5505	0.6066
IL	0.2482	0.5118	0.5631
IN	0.2869	0.5242	0.5712
KS	0.2243	0.5157	0.5678
KY	0.3016	0.5668	0.6172
LA	0.3207	0.5289	0.5813
MA	0.1629	0.4664	0.5693
MD	0.2180	0.4493	0.5001
ME	0.1796	0.3931	0.4472
MI	0.2114	0.6362	0.6783
MN	0.2411	0.7080	0.7433
MO	0.2741	0.5564	0.6066
MS	0.3720	0.6045	0.6569
MT	0.1898	0.4876	0.5455
NC	0.2999	0.5318	0.5726
ND	0.1708	0.5131	0.5765
NE	0.1614	0.4954	0.5609
NH	0.2213	0.4392	0.5002
NJ	0.1879	0.4565	0.5279
NM	0.2405	0.4912	0.5382
NV	0.2573	0.5223	0.5787
NY	0.2170	0.4286	0.5636
OH	0.2358	0.4797	0.5375
OK	0.2602	0.5555	0.6061
OR	0.2191	0.5244	0.5762
PA	0.1911	0.4285	0.4907
RI	0.1720	0.4229	0.4859
SC	0.4171	0.6418	0.6789
SD	0.1821	0.4689	0.5315
TN	0.3390	0.5779	0.6217
TX	0.2582	0.4743	0.5193
UT	0.2194	0.5229	0.5934
VA	0.2379	0.4751	0.5237
VT	0.1611	0.4061	0.4790
WA	0.2143	0.4794	0.5296
WI	0.2208	0.6274	0.6738
WV	0.2348	0.4481	0.5030
WY	0.2203	0.4877	0.5390

Table A.2
Lowest and Highest E-Filing Rate by State in 2005

STATE	*low*	*high*	*Standard Deviation*
AK	0.3016	0.6323	0.0854
AL	0.5609	0.7846	0.0452
AR	0.4833	0.7628	0.0604
AZ	0.4323	0.7500	0.0702
CA	0.5030	0.7060	0.0420
CO	0.3110	0.6177	0.0692
CT	0.4984	0.6067	0.0356
DC	0.5040	0.5040	NA
DE	0.5259	0.6082	0.0452
FL	0.4078	0.6668	0.0579
GA	0.4884	0.7793	0.0585
HI	0.4369	0.4823	0.0231
IA	0.5259	0.8306	0.0585
ID	0.4669	0.7056	0.0717
IL	0.4189	0.7131	0.0557
IN	0.4331	0.7063	0.0501
KS	0.3269	0.7775	0.0871
KY	0.4387	0.7854	0.0730
LA	0.4825	0.6627	0.0433
MA	0.4933	0.6167	0.0321
MD	0.3805	0.5849	0.0455
ME	0.3591	0.5147	0.0364
MI	0.5193	0.7848	0.0512
MN	0.5711	0.8332	0.0521
MO	0.4701	0.8009	0.0611
MS	0.5565	0.7841	0.0448
MT	0.2252	0.7736	0.1247
NC	0.4052	0.7443	0.0626
ND	0.3522	0.7825	0.0943
NE	0.2678	0.7983	0.0916
NH	0.4411	0.5639	0.0345
NJ	0.4320	0.6450	0.0561
NM	0.3156	0.7212	0.0978
NV	0.4672	0.6850	0.0625
NY	0.4012	0.6897	0.0636
OH	0.3759	0.6704	0.0549
OK	0.4263	0.7616	0.0631
OR	0.4744	0.6977	0.0537
PA	0.3935	0.5980	0.0494
RI	0.4395	0.5226	0.0336
SC	0.5732	0.7669	0.0461
SD	0.2361	0.8734	0.1236
TN	0.4346	0.7224	0.0524
TX	0.2734	0.6919	0.0696
UT	0.4729	0.7269	0.0494
VA	0.3191	0.6811	0.0664
VT	0.4131	0.5697	0.0383
WA	0.3672	0.6423	0.0535
WI	0.5402	0.7996	0.0517
WV	0.3985	0.6152	0.0525
WY	0.3471	0.6599	0.0731

Table A.3
Bottom 10 and Top 10 E-Filing Counties in 1999, 2004, and 2005

Bottom 10 Counties					
1999		*2004*		*2005*	
COUNTY	*E-file percent*	*COUNTY*	*E-file percent*	*COUNTY*	*E-file percent*
Burke, ND	0.0322	Liberty, MT	0.1826	Liberty, MT	0.2252
Liberty, MT	0.0333	Perkins, SD	0.1914	Perkins, SD	0.2361
Divide, ND	0.0342	Harding, NM	0.2077	Gregory, SD	0.2457
Sioux, NE	0.0377	Minder, SD	0.2106	Meagher, MT	0.2640
Hinsdale, CO	0.0385	Meagher, MT	0.2161	Brown, NE	0.2734
Douglas, SD	0.0394	Jones, SD	0.2171	Cottle, TX	0.2828
Brown, NE	0.0430	Douglas, SD	0.2213	Miner, SD	0.2918
Perkins, SD	0.0437	Brown, NE	0.2377	Glasscock, TX	0.2966
Rock, NE	0.0465	Highland, VA	0.2397	Jones, SD	0.3016
Boone, NE	0.0479	Gregory, SD	0.2410	Aleutians East, AK	0.3064
Top 10 Counties					
1999		*2004*		*2005*	
Shannon, SD	0.7280	Shannon, SD	0.8550	Shannon, SD	0.8734
Camden, GA	0.5946	Yellow Medicine, MN	0.8086	Yellow Medicine, MN	0.8332
Liberty, GA	0.5792	Pipestone, MN	0.8044	Lyon, IA	0.8306
Butler, KY	0.5742	Lac Qui Parle, MN	0.7984	Lac Qui Parle, MN	0.8274
Early, GA	0.5661	Jackson, MN	0.7972	Pipestone, MN	0.8271
Allendale, SC	0.5633	Cottonwood, MN	0.7948	Jackson, MN	0.8199
Culberson, TX	0.5630	Mahnomen, MN	0.7885	Marion, IA	0.8136
Jackson, TN	0.5571	Waseca, MN	0.7862	Monroe, IA	0.8118
Barnwell, SC	0.5522	Shelby, IA	0.7759	Waseca, MN	0.8103
Lee, SC	0.5491	Marion, IA	0.7722	Cottonwood, MN	0.8089