
Adoption of e-filing: the US journey

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Abstract: To promote effective tax administration, the United States Congress set a goal of 80% of all tax returns filed electronically by 2007. The deadline was extended to 2012, which saw 69% accomplished. Using time series analysis from 2005 to 2016, this study analyses the advancements of electronic tax filings in the USA. Several interesting observations are reported. First, individual e-filing has reached the goal in 2012. Second, overall trends indicate continuous and steady progress both by volume and by share. Third, the total e-filing ratio shows monotonical increase over the years but is still shy of the target in 2016. Fourth, individual e-filing constitutes the majority while business and tax-exempt e-file comprises 15% of the total. Fifth, employment tax e-file, while constituting over half of business e-file, ranks the lowest due to few mandates. Finally, several strategies and recommendations are proposed to reach the composite target.

Keywords: adoption; businesses; individuals; e-filing; electronic filing; tax returns; USA.

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1 Introduction

Since the inception of electronic filing in 1986 in the USA, the pilot program has grown considerably. As a ‘green’ or environmentally friendly alternative to printing and mailing, this best practice has provided users with a variety of benefits. Some of the most cited advantages include reduction in filing cost, preparation time, errors reported and need for audits (Wang, 2003; Anderson et al., 2005; Bankman, 2008; Boynton et al., 2008). Benefits to taxpayers include:

- a no need to mail paper returns
- b faster refunds
- c greater return accuracy
- d confirmation of e-filing receipt
- e secure submission of highly personal return information (Fu et al., 2006).

In particular, the burden on taxpayers is reduced because of the lower error rate from e-file returns (Duncan and Buruss, 2005). Users can also get their tax refunds

faster (Hung et al., 2006; Hussein et al., 2011). For the Internal Revenue Service (IRS), e-file enables 100% capture of the information on returns in a digital fashion (Anderson et al., 2005). This specific capability is an excellent contributor to service improvements. Obviously, the new technology platform also substantially reduces submission processing costs and avoids other processing costs for the IRS Oversight Board (2012).

Given the many benefits to tax payers and collectors, e-filing has grown into a global innovation in many countries and researchers are studying the adoption phenomenon (Lim et al., 2011; Lymer et al., 2012; Hastuti et al., 2014; Chaouali et al., 2016; Zaidi et al., 2017). As expected, across the globe, tax-payers are provided increasingly better and newer electronic tax return filing systems to submit and pay their tax obligations (Hwang, 2000). Historically, the first electronic tax filing method required the user to call in by phone. With the use of the internet, the next two innovative methods were the two-dimensional (2D) bar codes and Telefile. Currently, in the USA, users can easily find and purchase a variety of popular, low-cost tax preparation software packages. Free Tax USA, H&R Block, Intuit TurboTax, Jackson Hewitt Tax Service, TaxAct, TaxSlayer.com and Sigma Tax Pro are some of the popular systems. Individuals whose adjusted gross income (AGI) is below \$64,000 can use a publicly available package called Free File Software.

Given these major advantages, electronic tax filing in the USA was expected to become a mainstream best practice by 2007. By 2007, 80% of the tax returns were to be received by the IRS via e-filing capabilities. The United States Congress mandated this ambitious goal in 1998. However, by 2008, this goal was not met and a new target deadline of 2012 was proposed. In 2013, the goal of a combined e-file rate of 80% for all major tax returns filed by individuals, businesses and tax-exempt organisations was still not attained. As one of the world's leaders in the area of information technology and a developed nation with a highly educated population in the area of information technology, this phenomenon is indeed perplexing. Because of the enormous effort invested in the e-filing system, there is a critical need to examine the reasons behind these failures. Specifically, there is a need for a trend analysis of the data at a national level and at the individual tax filing group levels.

This paper differs from previous research and thus contributes new insight to the literature. First, prior studies did not cover the periods when any entity reached the target. This manuscript, however, includes the critical time span when a category (individual e-file) finally obtained the goal (in 2012), while other categories (businesses and other organisations) did not. The inclusion of the most recent years not only extends the time frame, but more importantly, it validates that the congress mandate has been realised. Secondly, prior studies focused on individual e-filing, while the current study expands to all categories of electronic filings and provides a comprehensive view of the matter. A more noteworthy effort provided by this study is to identify areas for improvement and suggest solutions for future implementation. Thirdly, the dynamic and diverse perspectives of analysing the data and information were not undertaken in previous studies. Finally, the inclusion of the most recent decade for this study may embark upon a new baseline for the assessment of the 80% goal in electronic tax filing given the passage of the Tax Cuts and Jobs Act (TCJA) in December 2017.

2 Literature review

2.1 Historical background

Designated as the Internal Revenue Service Restructuring and Reform Act (IRS RRA), this act required that the IRS must attain an 80% electronic filing rate of all federal tax and information returns by 2007. To meet the goal mandated by the United States Congress, the IRS initiated a variety of strategies. In 2003, Free File was introduced and implemented. IRS began modernising its legacy e-filing system in 2004. After 2005, the IRS ended Telefile and tax filing by phone to boost efficiency. As a result, 68.4 million individual electronic tax filings were received in 2005. That year, the utilisation rate surpassed the 50% threshold for the first time.

Unfortunately, the goal that 80% of federal tax and information returns be received via electronic filing was not attained in 2007 (Koong et al., 2008; Lacijan, 2009). A major reason offered by the IRS Oversight Board (2012) for not meeting the targeted date is associated with some implementation problems with the IRS Business Systems Modernization Program. Wary about their information security when transmitting personal data over the internet, prospective users delayed their adoption decisions and waited for a more reliable and trustworthy system (Russell, 2008). The targeted timeline to reach the 80% goal was extended and the new deadline was 2012.

To meet the new deadline, the IRS implemented a number of additional initiatives. In 2009, private industry leaders began offering free federal e-file capabilities in retail tax preparation software. In 2010, the first phase of Form 1040 modernised e-file (MeF) was available for use. In addition, in 2011, the IRS also initiated an e-file mandate for preparers with 100 or more returns. In 2012, this e-file mandate and Form 1040 MeF requirement was expanded to include preparers with 11 or more returns. All of these mandates and new electronic filing capabilities helped to boost the 80% e-file target in 2012.

Four years have passed since the second deadline. Effective 2018, electronic tax and information return filing in the USA is expected to enter into another phase. The TCJA was signed into law in December 2017. The number of non-itemised tax filers is predicted to increase significantly because (Drucker and Rappeport, 2017; Goheen et al., 2017):

- a The standard deduction allowances for the individual as well as the family have been doubled.
- b The elimination or limitations placed on popular deductions such as moving expenses, medical expenses, archer medical savings accounts (MSA), state, local, sales and property tax deductions (SALT), adoption assistance programs, dependent care assistance programs, mortgage interest, educational, alimony and casualty loss deductions.
- c The re-characterisation of Roth conversions.
- d The elimination of tax preparation expenses (accountants and software) as a deduction.

Obviously, experts at the IRS have been continuously monitoring and reporting annual advancement trends and adoption outcomes to the United States Congress (IRS Oversight Board, 2012). Of particular interests to academicians and researchers is that since 1995, annual data about the adoption of electronic filing and information returns were available to the public. Some researchers (Hussain, 2006; Koong et al., 2008; Collins, 2010) have used the data and conducted additional analysis to predict this phenomenon from a time series perspective.

2.2 Usage factors identified and theories examined

From the body of knowledge, it can be said that taxpayers who use electronic tax filing systems are pragmatic in their attitudes and intentions toward the use of online filing practices. Usage factors identified are mostly associated with benefits attained as well as risk or harm the innovation may cause. Affecting their usage are three dominant factors, namely:

- a perceived usefulness of the tax filing method
- b trust
- c associated risks.

In all countries where research about intentions have been conducted, these factors are always present (Fu et al., 2006; Hung et al., 2006; Ojha et al., 2007; Schaupp et al., 2010; Schaupp and Carter, 2010; Warkentin et al., 2010; Carter et al., 2011a, 2011b, 2012; Hussein et al., 2011; Lim et al., 2011; Stafford and Turan, 2011; Chapuis, 2012; Tan and Foo, 2012; Hastuti et al., 2014; Chen et al., 2015; Chaouli et al., 2016; Hammouri and Abu-Shanab, 2017; Zaidi et al., 2017).

Certain antecedents were found to have an effect on usage behaviour (initial as well as continuation). For examples, Ojha et al. (2007) used regression analysis and found six antecedents that affect usage. They are compatibility, perceived ease of use, performance of e-filing service, personal innovativeness in information technology and relative advantage. Chen (2010) identified information system and service qualities as antecedents of user satisfaction using path analysis. Carter et al. (2011b) found that computer anxiety, optimism bias, performance expectancy, social influence and trust of the government are antecedents that have significant impacts on usage.

Other common or important factors identified in the literature are external influences, facilitating conditions, incentives, interpersonal or social influence, IT background or skills, national culture, perceived credibility, perceived organisational support, performance expectancy, prior experience, self-efficacy, self-sufficiency and subjective norms (Wang, 2003; Fu et al., 2006; Hung et al., 2006; Schaupp et al., 2010; Schaupp and Carter, 2010; Carter et al., 2011a, 2012, 2016; Hussein et al., 2011; Tan and Foo, 2012; Hastuti et al., 2014; Chen et al., 2015; Chaouli et al., 2016; Hammouri and Abu-Shanab, 2017; Zaidi et al., 2017). It should be noted here that some of the factors affecting behavioural intentions can be different among user groups (Hwang, 2000; Fu et al., 2006; Ilias et al., 2009; Stafford and Turan, 2011; Liu et al., 2016).

From the information technology literature, the three theories normally used in the investigation of initial use and continuance are technology acceptance model (TAM), unified theory of acceptance and use of technology (UTAUT) and theory of planned

behaviour (TPB) (Rana et al., 2012). In the studies about the adoption of electronic filing, these theories were also the most heavily applied approaches. For example, Wang (2003) and Fu et al. (2006) used TAM in their studies that were conducted in Taiwan. Schaupp et al. (2010), Carter et al. (2011a) and Chaouali et al. (2016) utilised UTAUT for the various tests in their respective studies. Fu et al. (2006) and Hastuti et al. (2014) used TPB in their studies. In the case of the Fu et al. (2006), the decomposed model was applied. Finally, Carter et al. (2012) and Chen (2010) used the OCB, the IS success and IS quality models in their studies, respectively.

Several articles examined isolated issues. Holden and Fletcher (2005) indicated a need for clarity when partnerships are formed with the private sector. A conceptual framework for a virtual value chain for handling non-monetary agreements in the USA was proposed as a solution. Kopczuk and Pop-Eleches (2007) found that electronic filing has a significant effect on earned income tax credit (EITC). It was found that smaller firms in the UK are more likely to embrace e-filing because larger firms are concerned about security issues that may compromise to their internal systems, ICT integrity and control of complex tax cases (Lymer et al., 2012). In Australia, it was found that in the case of the work-related expense deduction, the claims behaviour of e-tax self-preparers were found to be significantly higher. Given this puzzling trend, there is a call for a study from a compliance risk perspective and the appropriateness of the deduction policy (Warren, 2016). Actually, this risk and compliance assessment may already have a solution because open-source XML and object-oriented programming technologies have made it possible for the IRS and other tax administrations in the USA to assess tax compliance risk in business context beside the tax return filed (Boynton et al., 2008).

3 Data and methodology

Data for this study were obtained from the IRS data book, a free and secure online database of all tax return filings available to the public. The database contains total returns, individual returns, business returns, and the corresponding returns filed electronically by total number, preparation method and return types each year. The business and tax-exempt returns include major returns types (corporate income taxes, partnership tax returns, employment tax returns, other business and tax-exempt returns, etc.). The extracted data covered the annual tax returns and returns that were filed electronically in the USA from 2005 to 2016 (12 years).

The methodology used for analysing the dataset is fairly simple because the goal is to provide a descriptive and graph heavy report that is easy for the reader to follow. To make sure the trends are meaningful to the evaluation of the 80% goal mandated by congress, this report will focus on electronically filed tax returns. The time period used for generating tables and graphs in this report is 2005 through 2016. The year 2005 is the ending year from an earlier report by Koong et al. (2008) and 2016 is the year where the data is officially stable. Data from 2017 and 2018 are subject to revisions. From the data, the e-filing rates for the total, individual and business are computed and compared. The corresponding annual growth rate, the proportion of each in the total e-file and the corresponding trend analysis are also presented in the findings section.

The composite number of business e-filers is obtained by adding together the actual number of corporate and partnership e-filing returns and the number for other business and tax-exempt organisations, which comprises estate and trust tax returns, estate tax returns, gift tax returns, excise tax returns and tax-exempt organisations. The composite information is also a helpful means to understand and view the occurrences from a national perspective. The growth rate or the trend for the national data is computed by dividing the number of e-filing returns in 2016 by the number in 2005, the base year. This measure was used to study the rate of change over the 12-year period. The national results are presented in Tables 1 through 4 and Figures 1 to 10.

4 Results and discussion

In this report, total tax returns are defined to include individual, business and other categories' tax returns. In 2016, 244 million tax returns were filed. Calendar year of 2008 has the highest number of tax returns filed. Nearly 250 million returns were filed in 2008 due to the Economic Stimulus Act of 2008 that increased about 14.4 million returns above baseline projections. With the exception of three years (2009, 2010 and 2014), the total returns have been increasing. The primary cause of the continuing decrease in total returns in 2009 and 2010 is the spillover effects of the 2008 stimulus coupled with the economic recession (Collins, 2010), as the latter affected the tax return decline in 2014 as well as a sharp drop in oil prices. Historically, recession correlates with increases in unemployment and subsequent decreases in taxable income and tax return filings. By far, the largest category is individual income tax returns with 151 million filed, constituting 62% of the total returns in 2016. On the other hand, business and tax-exempt returns are comprised of 47.5 million. This is 20% of the total over the sample period.

Table 1 depicts the number of the total, individual and business and tax-exempt returns filed electronically as well as their corresponding electronic filing rate. Table 1 trends from 2005 to 2016. The information is quite enlightening as noted below.

For the congress goal of 80% of tax returns filed electronically for all major individual and business returns by 2007, the total e-filing rate is still below the target, at 69% in 2016 (column 3). However, it has been monotonically increasing over the sample period. While the business and tax-exempt e-filing also falls far short of reaching the goal (less than 50% in 2016), it has grown at a faster rate, increasing from 17% in 2005 to 49% in 2016 (column 8). It has been steadily increasing each year except for 2006 when the US IRS introduced several filing forms (such as Form 944 to reduce taxpayer burden on small businesses) and brought about downward adjustments when tax payers were switching to new and simpler forms (Hussain, 2006). Only the individual income tax return e-file rate finally achieved the strategically important goal of 80% e-file rate in 2012 – a goal originally set to be reached by 2007 in the *IRS Restructuring and Reform Act of 1998* (RRA98) but extended until 2012. This major milestone reflects a culmination of years of effort as mentioned in the introduction. The e-file rate has been monotonically growing year after year from 52% in 2005 to an impressive 87% in 2016 (column 5).

Table 1 Number and percentage of electronically filed return: total, individual, and business

Year	Total returns (1)	Total e-file (2)	Total e-file pct. (3)	Individual e-file (4)	Ind. e-file pct. (5)	Ind. total e-file (6)	Bus. and tax-exempt e-file (7)	Bus and tax-exempt e-file pct. (8)	Bus and tax-exempt/total e-file (9)
2005	226,676,936	76,199,637	0.336	68,476,328	0.515	0.899	7,723,308	0.169	0.101
2006	228,145,029	80,504,813	0.353	72,769,506	0.543	0.904	7,735,307	0.168	0.096
2007	235,438,192	87,305,241	0.371	78,728,542	0.567	0.902	8,576,699	0.185	0.098
2008	250,378,521	101,502,861	0.405	89,527,883	0.580	0.882	9,008,439	0.195	0.089
2009	236,503,362	109,702,686	0.464	95,130,626	0.660	0.867	10,602,093	0.230	0.097
2010	230,408,678	116,061,187	0.504	98,209,764	0.696	0.846	11,814,110	0.259	0.102
2011	234,566,998	133,457,468	0.569	111,004,358	0.773	0.832	14,563,852	0.323	0.109
2012	237,345,350	144,619,628	0.609	118,401,243	0.810	0.819	16,890,847	0.368	0.117
2013	240,075,782	151,114,490	0.629	120,983,966	0.829	0.801	18,706,937	0.403	0.124
2014	239,874,741	157,187,971	0.655	124,585,594	0.845	0.793	19,629,237	0.420	0.125
2015	243,249,108	163,483,978	0.672	127,778,934	0.858	0.782	21,433,835	0.455	0.131
2016	244,246,247	168,816,411	0.691	131,043,815	0.870	0.776	23,128,235	0.487	0.137
Avg.	237,242,412	124,163,031	0.522	103,053,380	0.712	0.842	14,151,075	0.305	0.110

Source: Authors computation from <http://www.irs.gov> data book in various years

Figures 1 and 2 illustrate the number and the percentage of electronically filed returns by total, individual and business and tax-exempt organisations. Overall, trends indicate steady and continuous progress for both the volume and the percentage of e-filing returns for all major tax returns.

Figure 1 Number of electronically filed tax returns: total, individual and business and tax-exempt (see online version for colours)

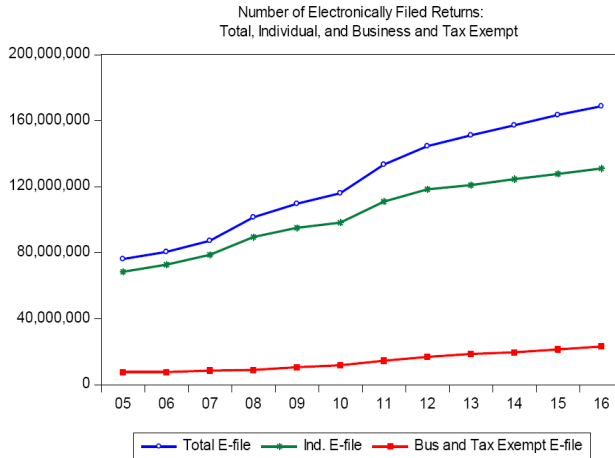
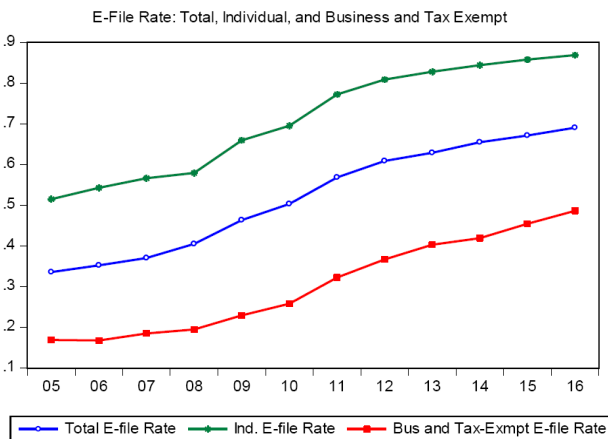


Figure 2 Percentage of electronically filed returns: total, individual and business and tax-exempt (see online version for colours)



The individual e-filing accounts for the dominating majority of the total e-filing accounts at an average of 84% annually (column 6) while business and tax-exempt e-filing accounts make up 11% over the sample period (column 9) as depicted in Figure 4. Figure 4 polarises the scenario by showing that the proportion of individual income tax returns using e-file has been monotonically decreasing from 90% in 2005 to 78% in 2016 (column 6), while business and tax-exempt e-files have grown four percentage points, constituting 14% of all electronic returns in 2016 (column 9).

Figure 3 Trend of e-file: total, individual and business (see online version for colours)

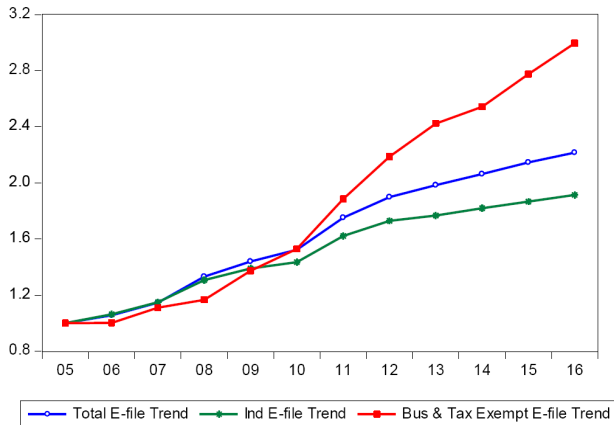


Figure 4 Proportion of e-file by individual vs. business (see online version for colours)

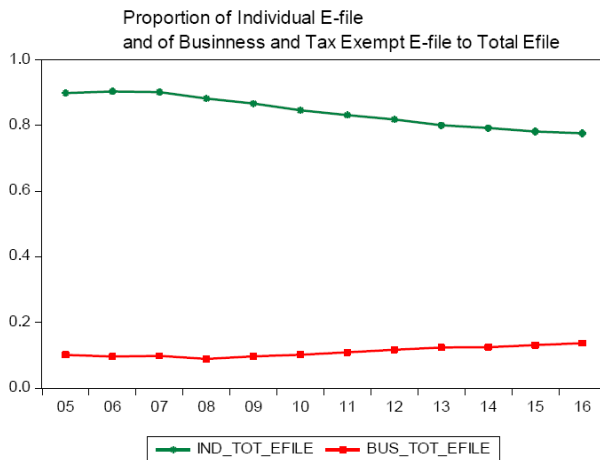


Table 2 Trends and growth of electronic filing: total, individual and business and tax-exempt

Year	Total e-file	Total e-file trend	Total e-file growth rate	Individual e-file	Ind. e-file trend	Ind. e-file growth rate	Bus. and tax-exempt e-file	Bus. and tax-exempt e-file trend	Bus. and tax-exempt e-file growth
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
2005	76,199,637	1.000		68,476,328	1.000		7,723,308	1.000	
2006	80,504,813	1.056	0.056	72,769,506	1.063	0.063	7,735,307	1.002	0.002
2007	87,305,241	1.146	0.084	78,728,542	1.150	0.082	8,576,699	1.110	0.109
2008	101,502,861	1.332	0.163	89,527,883	1.307	0.137	9,008,439	1.166	0.050
2009	109,702,686	1.440	0.081	95,130,626	1.389	0.063	10,602,093	1.373	0.177
2010	116,061,187	1.523	0.058	98,209,764	1.434	0.032	11,814,110	1.530	0.114
2011	133,457,468	1.751	0.150	111,004,358	1.621	0.130	14,563,852	1.886	0.233
2012	144,619,628	1.898	0.084	118,401,243	1.729	0.067	16,890,847	2.187	0.160
2013	151,114,490	1.983	0.045	120,983,966	1.767	0.022	18,706,937	2.422	0.108
2014	157,187,971	2.063	0.040	124,585,594	1.819	0.030	19,629,237	2.542	0.049
2015	163,483,978	2.145	0.040	127,778,934	1.866	0.026	21,433,835	2.775	0.092
2016	168,816,411	2.215	0.033	131,043,815	1.914	0.026	23,128,235	2.995	0.079
Avg.	124,165,031	1.629	0.076	103,053,380	1.505	0.061	14,151,075	1.832	0.107

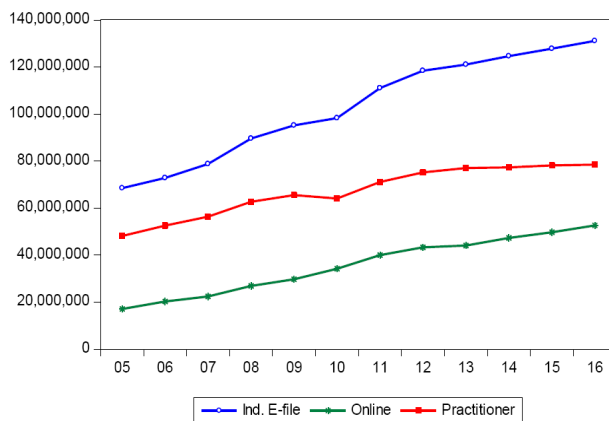
Source: Authors computation from <http://www.irs.gov> data book in various years

Table 2 presents the annual growth rate and time series trends in e-filing by total, by individual and by business, and tax-exempt organisations over the sample period. The total e-files increase at an average of 7.6% per year (column 4). It is evident that business and tax-exempt e-files exhibit a faster growing trend (an average of 10.7% in column 10) than individuals (an average of 6.1% in column 7) over the sample period due to a series of IRS initiatives and industry efforts. These measures include implementing a modernised e-filing platform for partnership tax returns, enhancing electronic federal tax payment system and adopting multiple authentication methods (IRS, 2007).

Using 2005 as the base year, the electronic filing tax returns show monotonically increasing trends overall. Over the sample period, the total e-files grew by 63%, while the e-files for business and tax-exempt organisations grew by 83% by 2016. The individual e-files grew 51% over the sample period. Overall, the latest growing trends in total, individual, business and tax-exempt e-file from 2005 to 2016 are also portrayed in Figure 3. Figure 3 also shows business and tax-exempt organisations demonstrate the strongest momentum, surpassing individual e-filing growth rate in 2009 and total e-filing growth in 2010.

Figure 5 depicts the number of individual e-filing returns by preparation method: practitioner (paid preparer) versus online (self-prepared). Total individual e-filing grows at an annual rate of 7.6% over the sample period. Self-prepared online filing has been monotonically increasing, growing at 11% per year from 25% in 2005 to 40% in 2016. Meanwhile, paid tax practitioner e-filing showed a growth 5% per year (a slower pace). They account for 60% of all e-filed individual tax returns in 2016, down from 70% in 2005.

Figure 5 Number of individual e-filing returns by preparation method (see online version for colours)



Figures 6 and 7 portray the percentage and trend of individual returns filed electronically by preparation method over the sample period. It is obvious that while practitioners still e-file the majority of all individual e-filing returns (60% in 2016), it has been decreasing its weight monotonically since 2006, when it was 72%. The percentage drop in 2012 was

the smallest for the sample period. E-filing by practitioners surprisingly increased in 2013. This is due in part to congress lowering the e-file mandate threshold to preparers filing 11 or more returns in 2012. It is vital that the IRS continues to implement a rigorous process to ensure e-file applicants' authentication. In the meantime, the e-filing rate for self-prepared online returns has been monotonically increasing from 25% in 2005 to 40% in 2016 as illustrated in Figure 6. Figure 7 depicts the opposite landscape. The self-prepared online e-filing grows at almost double the speed of the practitioners. Self-prepared online return speed also exceeded the average e-filing growth rate. This trend is narrowing the gap between the two preparation methods.

Figure 6 Percent of individual e-file by preparation method (see online version for colours)

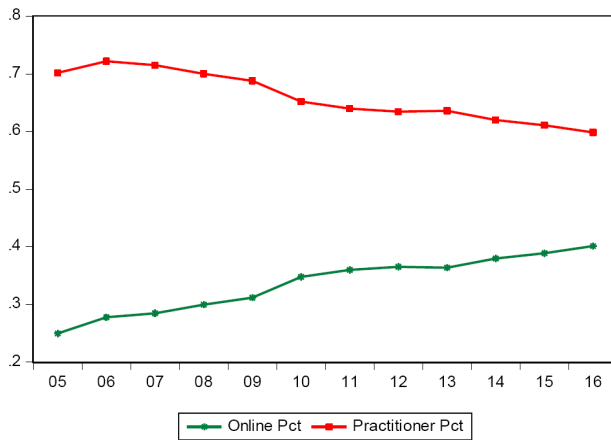


Figure 7 Trend of individual e-file by method (see online version for colours)

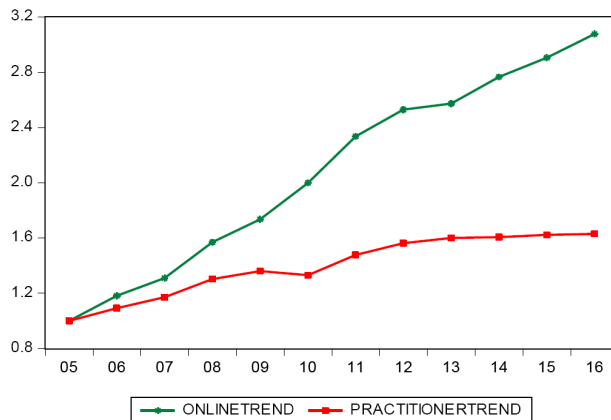


Table 3 Number, percentage and trends of individual e-file by preparation method

Year	Individual efile	Online	Practitioner	Ind. e-file pct.	Online pct.	Prac. Pct.	Online growth	Prac. growth	Online trend	Prac. trend
2005	68,476,328	17,100,353	48,081,640	0.515	0.250	0.702			1.000	1.000
2006	72,769,506	20,227,240	52,542,266	0.543	0.278	0.722	0.183	0.093	1.183	1.093
2007	78,728,542	22,413,421	56,315,121	0.567	0.285	0.715	0.108	0.072	1.311	1.171
2008	89,527,883	26,847,390	62,680,493	0.580	0.300	0.700	0.198	0.113	1.570	1.304
2009	95,130,626	29,672,655	65,457,971	0.660	0.312	0.688	0.105	0.044	1.735	1.361
2010	98,209,764	34,184,279	64,025,485	0.696	0.348	0.652	0.152	-0.022	1.999	1.332
2011	111,004,358	39,957,992	71,046,366	0.773	0.360	0.640	0.169	0.110	2.337	1.478
2012	118,401,243	43,261,754	75,139,489	0.870	0.365	0.635	0.083	0.058	2.530	1.563
2013	120,983,966	44,011,726	76,972,240	0.829	0.364	0.636	0.017	0.024	2.574	1.601
2014	124,585,594	47,309,667	77,275,927	0.845	0.380	0.620	0.075	0.004	2.767	1.607
2015	127,778,934	49,704,605	78,074,329	0.858	0.389	0.611	0.051	0.010	2.907	1.624
2016	131,043,815	52,619,856	78,423,959	0.870	0.402	0.598	0.059	0.004	3.077	1.631
Avg.	103,053,380	35,609,245	67,169,607	0.712	0.336	0.66	0.109	0.046		

Source: Authors computation from <http://www.irs.gov> data book in various years

Table 4 Number, percentage, and growth of business tax returns electronically filed by type

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
	Bis. and tax-exempt e-file	Corp-prnr. e-file	Empl. tax e-file	Other tax-exempt e-file	Bis. and tax-exempt e-file pct.	Corp-prnr. e-file pct.	Empl. tax e-file pct.	Other and tax-exempt. e-file pct	Bis. and tax-exempt. e-file grow	Corp-prnr. e-file grow
2005	7,723,309	371,499	5,998,396	5,905,585	0.169	0.042	0.194	0.229		
2006	7,735,307	800,165	5,563,151	5,786,210	0.168	0.088	0.178	0.237	0.002	1.154
2007	8,576,699	1,278,517	5,889,239	5,828,060	0.185	0.132	0.192	0.242	0.109	0.598
2008	9,008,439	1,896,103	6,296,103	5,139,461	0.195	0.184	0.205	0.159	0.050	0.483
2009	10,602,093	2,832,394	6,636,410	5,376,545	0.230	0.220	0.220	0.211	0.177	0.494
2010	11,814,110	3,483,480	6,924,099	5,512,146	0.259	0.336	0.232	0.255	0.114	0.230
2011	14,563,852	4,832,881	7,397,952	5,231,865	0.323	0.463	0.251	0.446	0.233	0.387
2012	16,890,847	6,086,202	8,052,997	5,901,562	0.368	0.581	0.272	0.466	0.160	0.259
2013	18,706,937	6,786,077	8,841,374	5,909,794	0.403	0.646	0.295	0.521	0.108	0.115
2014	19,629,237	7,426,252	9,615,578	6,029,008	0.420	0.696	0.320	0.429	0.049	0.094
2015	21,453,835	8,094,542	10,544,640	6,082,078	0.455	0.748	0.349	0.459	0.092	0.090
2016	23,128,235	8,596,343	11,593,826	6,007,480	0.487	0.778	0.381	0.489	0.079	0.062
Avg.	14,151,075	4,373,705	7,779,480	5,725,816	0.305	0.414	0.257	0.345	0.107	0.361
	(11)	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	
	Empl. tax grow	Other bus. and tax-exempt e-file growth	Bis. and tax-exempt. e-file trend	Corp-prnr. e-file trend	Empl. tax e-file trend	Other bus. and tax-exempt e-file trend	Corp-prnr./TotBus e-file	Empl-tax/TotBus e-file	Other tax-exempt./TotBus e-file	
2005			1.000	1.000	1.000	1.000	0.048	0.777	0.175	
2006	-0.073	0.014	1.002	2.154	0.927	1.014	0.103	0.719	0.177	
2007	0.059	0.027	1.110	3.442	0.982	1.041	0.149	0.687	0.164	
2008	0.069	-0.421	1.166	5.104	1.050	0.603	0.210	0.699	0.091	
2009	0.054	0.388	1.373	7.624	1.106	0.837	0.267	0.626	0.107	
2010	0.043	0.241	1.530	9.377	1.154	1.039	0.295	0.586	0.119	
2011	0.068	0.659	1.886	13.009	1.233	1.724	0.332	0.508	0.160	
2012	0.089	0.179	2.187	16.383	1.343	2.033	0.360	0.477	0.163	
2013	0.098	0.119	2.422	18.267	1.474	2.275	0.363	0.473	0.165	
2014	0.088	-0.160	2.542	19.990	1.603	1.912	0.378	0.490	0.132	
2015	0.097	0.080	2.775	21.789	1.758	2.065	0.378	0.492	0.130	
2016	0.099	0.051	2.995	23.140	1.933	2.171	0.372	0.501	0.127	
Avg.	0.063	0.107	1.832				0.271	0.586	0.143	

Source: Authors computation from <http://www.irs.gov> data book in various years

Table 3 summarises the information in Figures 5–7.

Table 4 illustrates the number, percentage and trend of business tax returns filed electronically by return type and the proportion of each return type to the total business e-filings. Total business and tax-exempt tax returns are comprised of three major business tax return categories. These categories represent the bulk of forms processed by IRS submissions processing operations. They are corporate and partnership returns, employment tax returns and other business and tax-exempt returns. Employment taxes include federal and state payroll tax withholdings, social security tax, medicare tax, federal income tax, federal unemployment tax and self-employment tax. Accurate preparation and timely filing and payment of employment tax returns are essential. Accurate and timely compliance is the key to avoiding payroll tax penalties. Other business and tax-exempt e-files consist primarily of estate and trust returns, excise tax returns, gift returns and the tax-exempt organisation returns. Of the three categories, employment tax e-files generate 59% of the total business e-filings while corporation-partnerships constitute 27% of the total business e-filings and other business and tax-exempt e-filings contribute 14% to the total business e-filing, as also illustrated in Figure 9. Table 4 also presents the growth rates of major business tax return types and the average annual growth rate over the sample period.

Figure 8 Number of business and tax-exempt electronic filling returns by return type (see online version for colours)

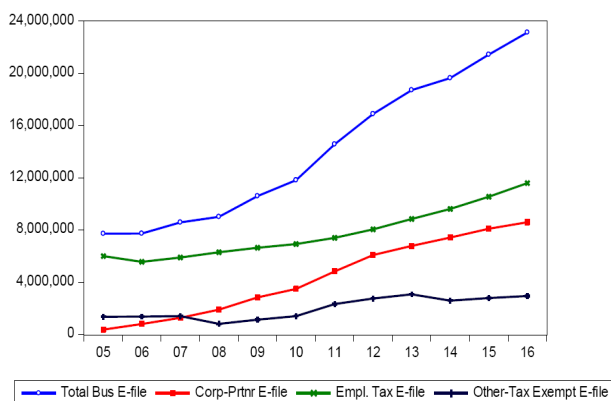
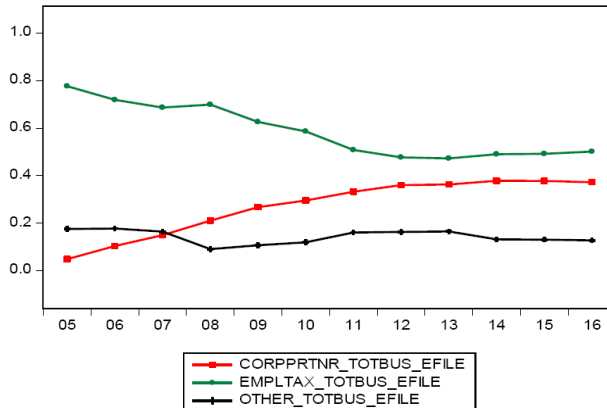


Table 4 and Figure 8 illustrate the number of total business and tax-exempt electronically filed returns by return type. Total business and tax-exempt electronic filing grew at an annual average of 11% (column 9) with high growth rates in 2011 and 2012. This growth was driven particularly by the average high growth rate of corporate and partnerships of 36% (column 10) and other business and tax-exempt filings of 11% (column 11). This e-file mandate for paid practitioners of individual returns lowered to 11 or more returns, also applies to preparers of estate and trust returns. This mandate has contributed to a noticeable increase in total business and tax-exempt e-filings in 2011 and 2012 (IRS Oversight Board, 2012). Meanwhile, the growth in employment tax e-filings over the

sample period is a moderate 6.3% (column 11). This area has been unfavourably impacting the e-file rate for the total business and tax-exempt.

Table 4 and Figure 9 portray the proportion of business returns filed electronically by return type for the sample period. It is clear that the percent of corporate and partnership e-files has been increasing monotonically from 5% in 2005 to 37% in 2016 (column 17). There was a high double-digit growth rate from 2006 to 2012. This was due to congress' mandate to reduce the asset threshold applicable to corporate mandates from \$50 million to \$10 million. The growth rate has levelled off to a single digit for the past three years. Mandated corporate e-filers started with less than 5% of all corporate returns in 2005. The majority of e-filed corporate returns were corporate taxpayers who voluntarily e-filed. The IRS infrastructure (MeF platform) and congress' series of e-file mandates helped the e-filing growth rate to reach 37% for all business returns in 2016. Nevertheless, the growth process bodes for increased congress mandates in order to improve the corporate electronic filing. The IRS has also made progress in other areas by implementing MeF for partnership returns, lowering the e-filing threshold from 100 partners to ten partners and enhancing the electronic federal tax payment system. In addition, the IRS implemented a free and secure government electronic tax collection system where individuals, businesses and federal agencies can pay their taxes electronically.

Figure 9 Percent of business e-file by return type (see online version for colours)

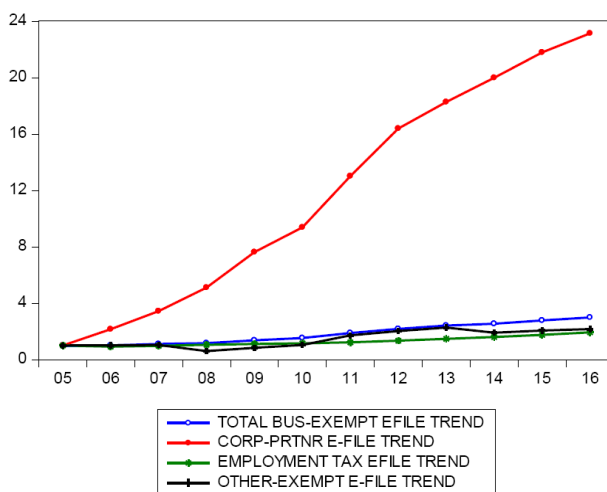


Contrarily, the proportion of employment tax e-filing returns has been monotonically decreasing every year except 2008 (boost of the Economic Stimulus Act of 2008). Employment tax e-file has a modest average annual growth rate of 6.3% over the sample period. While employment tax e-file still constitutes the larger portion of all business e-filing returns, it has been decreasing from 78% in 2005 to 50% in 2016 (column 18). There is no mandate to file employment tax returns electronically except for businesses with 250 or more wage statements to file Form W-2 electronically. Creating employment tax e-file mandates is simple since most of the information forms have already been required for e-filing.

Meanwhile, the e-filing rate for other business and tax-exempt returns accounts for 14% of the total business electronic returns (column 19) with its modest annual growth rate of 10.7%. This is slightly higher than employment tax due to related e-file mandates for estate tax returns.

Figure 10 presents contrasting features. For the sample period, the corporate-partnership e-filing has grown 23 times, while the total business e-file, employment tax e-file and other business and exempt tax e-file increased only about two to three times, lagging far behind the case of corporation and partnership. Evidently, great opportunities exist here especially for employment tax e-filing.

Figure 10 Trend of business e-file by type (see online version for colours)



5 Conclusions and implications

As can be seen in tables and graphs presented in this research report, the new goal of the IRS Strategic Plan calls for a combined e-file rate of 80% for all major tax returns filed by individuals, businesses and tax-exempt organisations (originally by 2007 and extended to 2012 was not attained). Four years later in 2016, in 2016, the total e-filing rate is still below the target at 69%. However, this is a positive trend showing that the share of major tax returns filed electronically is growing steadily. In addition, the individual income tax return e-filing rate achieved the strategically important goal of 80%, the critical milestone originally articulated in RRA98.

The corporate and partnership e-file category appears to be the next group that will reach the 80% goal, having reached 78% in 2016. A lot of work and new strategies must be identified to help the employment tax e-filing reach the

mandated goal. As of 2016, it is the lowest group at only 38%. Additionally, new and more innovative strategies must be identified to cause other business and tax-exempt categories to perform better. As of 2016, only 49% were filed electronically. Total business and tax-exempt e-filing must improve beyond the 49% electronic filing rate that was reported in 2016.

The following suggestions may be useful strategies for reaching the mandates faster:

- The IRS should decree e-filing for all employment tax returns and excise tax returns (as was done in 2012 when the e-file mandate and Form 1040 MeF requirement were instituted). This should be a feasible alternative since affected businesses are already submitting other tax information to the IRS and local tax collecting agencies.
- Address taxpayer barriers to e-filing. In addition to having software platforms that are user-friendly to businesses, the IRS should hold town hall meetings with businesses to learn about adoption barriers. The literature has pointed out that business tax-payers and tax-exempt organisations are concerned about privacy, security, the reliability of transactions and risk of audit. Working with business and tax-exempt participants and representatives, the IRS may be able to develop and implement authentication methodologies and services that are more secure and user friendly.
- Address the issue of access to businesses and tax-exempt filers who are disadvantaged because of the digital divide. While it may be true that access to technology is not a big issue in the USA, there remain many areas where a town may have only one service provider. This is especially true in the case of businesses and charities that are providing goods and services in rural communities where their electricity technology is provided by only one vendor.
- Expand this study to include an analysis of individual state or regional filing centre data. In the USA, adoption is highly dependent on state participation. One suggestion is to disseminate the data deeper and analyse the effects using panel analysis or mixed effects regression. Broadening the scope of the study this way may provide researchers with a better understanding of the trends and provide additional insight into the mandated adoption of technology usage by the government.

Finally, based on returns filed from 2005 to 2016, the average annual increase in usage and compliance is 6% per year. This means that the IRS is expected to receive about 139 million returns filed electronically for 2017. This will represent over 90% of all individual income tax returns and is three percentage points higher than the prior year. Overall, grand total tax return e-filings are projected to grow at an average annual rate of 6% and expected to reach approximately 325 million returns by 2025. The average rate of growth is derived by projected trends for the major return categories. These categories comprise grand total filings, individual income tax returns, business tax returns, corporation tax returns, partnership returns, employment tax returns and other business and tax-exempt returns. Based on the historical and projected trends, the grand total tax e-filing goal may be reached sometime in 2021 or 2022.

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