

Factors Influencing Use Tax Payment in Illinois

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I. Introduction

Like most U.S. states, Illinois' primary sources of state tax revenue are the personal income tax and the general sales tax. Illinois' general sales tax of 6.25 percent on most items is actually an "occupation" tax imposed on sellers. The legal occupation-tax liability of sellers is based on the amount of tangible personal property purchased from them for use in Illinois.² Sellers reimburse themselves for this liability by charging buyers a sales tax.

Well-known constitutional restrictions prevent Illinois from requiring out-of-state sellers with no legal nexus (roughly physical presence) in Illinois to remit occupation taxes to the state even when it is known that buyers will use the purchased goods in Illinois. Any person or business that uses goods in Illinois that were purchased outside of Illinois at a lower tax rate or tax free is liable for the difference as a "use" tax. The use tax applies to items purchased through the mail, by phone, online from other states, or in-person via a cross-border sale for use in Illinois. The use tax is intended to create a level playing field between out-of-state sellers who do not collect sales tax on purchases by Illinois residents and Illinois brick-and-mortar retailers who are required to collect the Sales tax when a transaction occurs.³

Illinois' use tax has been in place since 1955. Purchases made over the Internet, through toll-free numbers, from mail-order catalogs and from out-of-state locations are examples of purchases subject to use tax. Illinois use tax rates are 6.25 percent of the purchase price of general merchandise and 1 percent of the purchase price of qualifying food, drugs, and medical appliances.⁴ If the use tax amount is \$600 or less, the tax is due by April 15 of the following year. If the use tax due is more than \$600, it must be paid by the last day of the month following the month when the purchase was made. Illinois collected over \$1.2 billion of state use tax in Calendar Year 2012. This was about 13 percent of the total revenue from the statewide sales and use taxes.

Retailers that have a physical presence in Illinois and make retail sales from out-of-state locations to customers in Illinois remit about half of the total use tax payments, which they collect from their customers in Illinois. The remaining share of state use tax that is collected consists mostly of either payments from individuals and businesses related to motor-vehicle purchases or payments from businesses that make a taxable purchase from a supplier who does not collect Illinois tax.⁵

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² Tangible personal property excludes real estate, stocks, bonds, and other "paper" assets representing an interest in some asset.

³ Remote sales have been federally regulated by the 1998 Internet Tax Freedom Act and two Supreme Court rulings. Under current law, online and catalog sellers (viz., remote sellers) are required to collect sales tax only in states where they have nexus. Otherwise, consumers who shop online and do not pay a sales tax at the time of purchase are required to pay the tax to their resident state. On May 6, 2013, the U.S. Senate passed the Marketplace Fairness Act bill, and an identical bill is referred to the House Subcommittee on Regulatory Reform, Commercial and Antitrust Law. This legislation would allow states that currently charge sales taxes to require large remote retailers to collect sales and use taxes on purchases made by their residents regardless of their physical presence in that state. Were this legislation to take effect, we expect that use tax compliance by remote sellers would increase significantly.

⁴ Illinois Department of Revenue, Use tax Questions and Answers; available at <http://tax.illinois.gov/Individuals/FAQs-Use-tax.htm>.

⁵ Use tax is reported on Form ST-1 for registered retailers and on Form ST-44 for nonretailers. For motor-vehicle purchases, RUT-25, RUT-50, and RUT-75 are used.

Illinois can easily monitor use tax payments due on automobiles by tracking automobile registrations. Similarly, business purchases that incur a use tax obligation are relatively easy to monitor compared with purchases by individuals because the business purchases tend to be large, recurring, and may be documented in public records. In this paper we are concerned with the use tax obligations of individuals whose purchase activities may not be easily monitored.⁶

In 2010 and 2011, Illinois offered a use tax amnesty, which allowed individual taxpayers to pay use tax without penalty and interest for purchases during the period from July 1, 2004, through December 31, 2010.⁷ Taxpayers were encouraged to file and pay use tax from January 1, 2011, through October 15, 2011. This initiative did not receive much attention and the Illinois Department of Revenue (IDOR) attributes less than 4 million dollars of additional collections in 2011 to it.

In an effort to increase awareness of and compliance with the use tax, the Illinois General Assembly followed the lead of more than 20 other states and passed a law putting a use tax line on the personal income-tax form (IL-1040) beginning in Tax Year 2010. This change gives individuals a simpler alternative compared to the previously available Form ST-44 to pay their Illinois use tax liability.⁸ Since 2010, the instructions for the IL-1040 have included a “lookup” table that guides tax filers to estimate their use tax liability based solely on their federal adjusted gross income (FAGI) in the event the filer does not have records of out-of-state purchases.

A small minority of Illinois tax filers make any use tax payments under either the ST-44 or the IL-1040. While it is difficult to attribute use tax liability to any particular tax filer, aggregate studies make clear that many tax filers have a use tax liability with which they are not complying. Prior to 2010, it was plausible to think of the noncompliance as inadvertent and resulting from ignorance of the legal mandate since most Illinois tax filers were probably unaware of the use tax and of procedures required to file Form ST-44. Since 2010, it is probably more plausible to think of widespread use tax evasion by Illinois tax filers who justifiably believe that there is a very small possibility that failure to comply with use tax requirements will result in any penalty.

Because we have no information about the use tax liability of individual taxpayers, we cannot directly measure tax compliance or avoidance. However, various studies discussed in Section 2 have estimated aggregate Illinois use tax liability. By comparing these estimates with our data on use tax payments, we infer that there is widespread noncompliance.

To better understand use tax payments in Illinois, we obtained IDOR’s “warehouse” data on ST-44 tax returns covering the years 2005 through 2012. Also, we obtained access to the universe of almost 6 million of Illinois’ individual income tax returns in Calendar Years 2010 and 2011 for this research. Illinois has a very simple tax form (see <http://www.revenue.state.il.us/taxforms/IncmCurrentYear/Individual/IL-1040.pdf>) that requires little information beyond the filer’s FAGI, number of deductions, withholding amount, and tax-exempt retirement income. We use these data to relate tax-filer characteristics to the probability that they will make Illinois use tax payments on the IL-1040 in 2011.

II. Previous Literature

The general topic of compliance with tax laws has been a major area of study for tax scholars—particularly economists. Slemrod (2007) and Slemrod and Bakija (2008) discuss recent evidence on this topic. Much of the research in this area has focused on federal taxes, particularly the federal income tax. Compliance with state and local taxes, with the exception of tobacco taxes, has gotten less attention.⁹ Recently, there have been a number of serious attempts to measure and understand sales and use tax compliance, particularly as it relates to Internet commerce.

⁶ Some of these obligations could theoretically be disposed of by filing Form ST-44 but very few individuals file this form. Illinois Department of Revenue, Illinois Use tax; available at <http://tax.illinois.gov/individuals/illinois-use-tax.htm>.

⁷ Illinois Department of Revenue, Use Tax Amnesty Questions and Answers; available at <http://www.revenue.state.il.us/Amnesty/Amnesty-FAQs-Use-tax.htm>.

⁸ Tax filers who owe a use tax of more than \$600 per person are required to use Form ST-44.

⁹ See Chernick and Merriman (2013) and Merriman (2010) and sources cited therein for a small sample of the literature on tobacco-tax compliance.

Einav, et al. (2012) investigate the sensitivity of Internet retail purchases to sales taxes using data from the eBay marketplace.¹⁰ They use several approaches that all indicate online purchases are sensitive to sales-tax rates. In their most novel investigation, Einav, et al. note that because seller locations are revealed only after buyers have expressed interest in an eBay item by clicking on its listing, the required sales-tax payment can be treated as an exogenous “surprise” that affects the price of the item. The authors exploit this insight by comparing buyers who arrive at the same item page, some of whom are located in the same state as the seller (and therefore would be compelled to pay sales tax if they purchase the item) and some of whom are located in different states and therefore would accrue only a (potential) use tax liability that they might, or might not, later discharge by making a payment to their state of residence. Einav, et al. (2012) find a tax-price elasticity of about -2 for buyers who click on a listing; each 1 percent increase in the sales-tax rate causes the probability of a sale to fall by about 2 percent.

Alm and Melnik (2012) also used eBay data to study use taxes. They collected information on 21,000 eBay listings generated by roughly 7,000 sellers and over 9,000 buyers on a typical day to measure the extent of cross-border shopping and estimate its potential for generating state use tax revenue. They find that 94 percent of eBay purchases are made by out-of-state buyers. Alm and Melnik present state-specific estimates of use tax liability attributable to eBay sales under a number of assumptions about how their “typical day” data on a subset of sales categories can be generalized to all eBay sales during 2010. In Table 8 (p.28), Alm and Melnik estimate that Illinois use tax liabilities as a result of eBay purchases in 2010 were nearly \$41 million. They conservatively estimate that 2007 eBay U.S. e-commerce sales of about \$23 billion represented roughly 17 percent of the total U.S. e-commerce sales of \$137 billion. If Illinois were typical of the nation and if eBay sales were representative of all e-commerce sales, this would suggest a 2007 Illinois use tax liability of about \$246 million ($= 137/23 \times 41$ million).¹¹

Using a different methodology, Chupick and Davila (2009) estimate unpaid use tax from online sales to Illinois households and businesses for Calendar Years 2005 through 2010. They start with actual¹² U.S. online sales, estimate Illinois’ share, subtract out sales that either are not taxable or where enforcement of the use tax is strong, and estimate the tax due. Chupick and Davila estimate use tax liabilities ranging from \$103 million in 2005 to \$169 million in 2010. Their 2009 estimate of \$169 million appears to suggest less potential additional revenue than Alm and Melnik.

While there have been a number of attempts to measure theoretical use tax liabilities, only recently have there been significant attempts to study and encourage compliance. One major compliance initiative has been the effort by a large number of states to incorporate payment of use tax liabilities into the personal income-tax filing process. Manzi (updated 2012) provides a very useful description of these efforts.

Manzi reports that 25 states have a line on the income-tax return that allows payment of use taxes. An additional seven states provide information about how to discharge use tax liabilities in the booklet that explains procedures for complying with the state income tax. Manzi also provides data showing that, in states that allow payment of use tax on the personal income-tax form, the percent of returns with a nonzero use tax payment varies from 0.3 in California to 9.8 in Maine. Some states employ a “lookup table” that provides an estimate of use tax liability as a function of taxpayer income. Manzi reports that the participation rate—i.e., rate of tax returns with a nonzero use tax payment is 3.1 percent on average in states with a lookup table but only 0.6 percent in states without a lookup table. She notes that Indiana and Rhode Island have tried to increase collections by sending information about the use tax to a random sample of taxpayers. Kentucky, Massachusetts, and Maine have also introduced individual compliance programs.

Gunter (2011) has done an in-depth analysis of factors influencing use tax payments on Maine’s personal income-tax returns over the years 2003 to 2009. According to Manzi, Maine has the highest rate of income-

¹⁰ Einav et al. (2012) also provide a review of related literature beyond that discussed here.

¹¹ Alm and Melnik note that their calculations assume that “all of the observed transactions are subject to use tax, when in fact some transactions are not legally taxable. As a result, these calculations are an upper bound on potential use tax under-collection.” (p.27) On the other hand, Alm and Melnik’s work covers only online transactions. Catalog purchases and purchases through physical cross-borders are not studied. As a result, in our view, the estimate that we derive using Alm and Melnik’s figures should not be viewed as an upper bound for the potential use tax liability in 2007.

¹² Projected sales were used in 2008, 2009, and 2010 since data were not yet available for those years at the time they did their research.

tax returns with use tax payments of any state in the country. Gunter is the first paper in the literature to our knowledge to use information on use tax payments from income-tax returns to study factors that influence compliance. He reports that between 11 and 13 percent of income-tax returns in Maine have use tax payments during his sample period. His paper provides an important model, inspiration, and basis of comparison for the analyses of Illinois' personal income-tax returns that we discuss in sections 3 and 4.

Gunter uses a balanced panel of Maine taxpayers and estimates a linear probability model with use tax payment (=1 if some use tax payment and zero otherwise) as the dependent variable. He finds that taxpayers who used a paid preparer are roughly 8 percent less likely to pay use tax than similar taxpayers who did not use a paid preparer. In order to quell concern that taxpayers who use paid preparers are self-selected individuals with an especially strong desire to minimize their tax burden, Gunter runs a specification that controls for the use of a tax preparer in the previous year. He finds that a taxpayer who switches to using a preparer is less likely to pay use tax compared with a taxpayer who does not use a preparer in the current or previous year.

Conventional wisdom holds that small business owners are especially likely to evade and avoid taxation. Gunter tests and rejects this hypothesis. He finds that small business owners are slightly *more* likely to pay use taxes on their income taxes in Maine.

Gunter also finds that taxpayers who make charitable contributions are more likely to pay use taxes. In particular, the 1 percent of taxpayers who take an option to check a box and make a voluntary charitable or political contribution are 23 percent more likely to pay use taxes than taxpayers who do not.

Gunter notes that previous research on tax avoidance has found that noncompliance increases with the amount of tax due. He finds that the probability that a Maine income-tax return will have a positive use tax payment increases with the refund due.

Recently Anderson (2013) reported the results of a field experiment conducted in cooperation with the Nebraska Department of Revenue in which a thousand randomly chosen taxpayers received a postcard encouraging them to report their use tax liability when they filed their state income taxes. Anderson finds that this nudge more than doubled the likelihood of use tax reporting and increased the amount of revenue collected.

III. Descriptive Statistics About Illinois Use Tax Payments

Table 1 shows the number of ST-44 and IL-1040 returns, the number of IL-1040 returns with use tax payments in 2010 and 2011 and the use tax paid on each type of return. Both businesses and households may incur use tax liability in Illinois and both may discharge their liability using the ST-44.¹³ Of course, households can also pay their use tax using the IL-1040. In many cases, nonincorporated businesses can also pay their use tax using the IL-1040. With our data, there is no unambiguous method to determine whether a particular use tax payment was made for a household or a business activity. In most years, roughly one-third of ST-44 returns list a Federal Employer Identification Number (FEIN) and two-thirds list a Social Security (SS) number. ST-44 use tax payments associated with a FEIN almost certainly resulted from business activity. ST-44 use tax payments associated with an SS number may come from either a household or a business activity. Roughly half of ST-44 use tax payments are associated with returns using an FEIN, while the other half of payments are coming from returns listing an SS number.¹⁴

¹³ Registered retailers discharge their use tax liability using form ST-1.

¹⁴ Our discussion of ST-44 filers and payments is based on our aggregation of data on individual filings. We also obtained data about ST-44 filers compiled within IDOR from accounting reports. While the accounting report data should, in principle, be based on the disaggregated data, our totals do not match accounting totals. In general, we find slightly less revenue and slightly fewer returns than accounting reports. We suspect that the discrepancies in these figures are due to the fact that we attribute an ST-44 return to the year in which it was filed while the accounting reports may attribute a return to the year in which the liability occurred. We have not been able to verify this explanation.

TABLE 1. Illinois Use Tax Payments Before and After a Use Tax Payment Option Was Added to Personal Income Tax Return Form

Calendar year	Number of ST-44 returns	Total use tax on ST-44 returns (million dollars)	Number of IL1040 returns	Number of IL1040 returns with non-zero use tax payment	Total use tax payment on IL1040 returns (million dollars)
2005	1,857	2.58	na	np	np
2006	4,520	4.00	na	np	np
2007	6,366	5.26	na	np	np
2008	9,801	4.86	na	np	np
2009	8,055	5.34	na	np	np
2010	6,415	6.09	4,747,133	242,412	10.22
2011	27,618	8.12	5,124,947	239,900	10.92
2012	4,256	5.94	na	na	na

NOTE: na=not available, np=not possible. Analysis of IL-1040 is restricted to 5,124,947 matched returns in 2010 and 2011. Dependents, returns with over \$1mm FAGI, returns with zero or negative FAGI, and returns of nonresidents are dropped from the analysis. Prior to 2010 it was not possible to make a use tax payment on the IL1040 form. The large number of ST-44 returns in 2011 is the result of a use tax amnesty in that year. Details are discussed in <http://tax.illinois.gov/Amnesty/Amnesty-FAQs-Use-Tax.htm>.

As shown in Table 1, Illinois' nearly 13 million residents filed fewer than 10,000 ST-44 returns each year except in 2011, when there was a tax amnesty that resulted in a temporary surge in returns. The introduction of an alternative use tax filing mechanism—a line on the IL-1040—after 2010 appears to have had little impact on ST-44 tax payments. In 2011, there were more than eight times as many IL-1040 returns with a positive use tax payment than ST-44 returns. While the average IL-1040 use tax payment was small, total revenue collected on this form exceeded that collected using the ST-44 by a large margin.

Despite the addition of a use tax payment option on the IL-1040, total Illinois use tax payments in 2010 of \$16.3 million are less than half of the \$41 million legal liability Alm and Melnik (2012) estimate is due on eBay purchases alone and less than one-fourth the amount that Chupick and Davila (2009) estimate is due on all online transactions. Neither Alm and Melnik nor Chupick and Davila provide an estimate of the use tax liability due on offline cross-border transactions, so these estimates should be viewed as quite conservative estimates of the use tax that is legally due to Illinois.

We obtained an alternative estimate of legal Illinois resident use tax liabilities by calculating the liability that would be incurred if all tax filers used the Illinois' use tax lookup table which is shown in Figure 1.

Illinois' use tax lookup table assesses a use tax of 0.06 percent of a filer's FAGI in the center of each lookup category¹⁵ and the 2010, 2011, and 2012 use tax lookup tables charge identical rates. If these rates are applied to 2011 IL-1040 returns, tax filers would hypothetically generate use tax payments of \$214 million from Illinois residents who were not claimed as dependents on someone else's tax return. This is more than 20 times as much as the amount of use tax actually paid on the 2011 IL-1040.

While we cannot determine the precise amount of use tax noncompliance, various estimates suggest that it is large. However, a significant minority (about 4 percent) of IL-1040 tax filers pay use taxes despite the fact that, like other U.S. states, Illinois makes almost no effort to audit personal income tax filers' use tax payments.

We create a "panel" of tax returns by attempting to match the primary SS number on all 2010 returns with a 2011 return with the same primary SS number. We create Table 2 using this full panel of returns. Persistence is one of the most dependable regularities in the study of human behavior. Table 2 shows that use tax payment behavior is, perhaps unsurprisingly, quite persistent among Illinois taxpayers.

¹⁵ The rate used in Illinois use tax lookup table was apparently justified on the basis of unpublished research by IDOR employees who estimated that uncollected use taxes on nonauto e-commerce sales in 2008 were about 0.06 percent of Illinois' FAGI. Apparently, IDOR did not estimate use tax liabilities stemming from other (non-e-commerce) transactions, nor did IDOR estimate whether average use tax liability varied with a tax filer's FAGI.

FIGURE 1. Illinois Use Tax Liability Schedule

Use Tax (UT) Table	
If you had no major purchases and you do not have receipts to figure your purchases, use this table to estimate your annual Illinois Use Tax liability.	
<u>AGI (from IL-1040, Line 1)</u>	<u>Use Tax</u>
\$0 - \$10,000	\$3
\$10,001 - \$20,000	\$9
\$20,001 - \$30,000	\$15
\$30,001 - \$40,000	\$21
\$40,001 - \$50,000	\$27
\$50,001 - \$75,000	\$38
\$75,001 - \$100,000	\$52
Above \$100,000	Multiply AGI by 0.06% (0.0006)

(Source: <http://www.revenue.state.il.us/taxforms/IncmCurrentYear/Individual/IL-1040-Instr.pdf>.)

As shown in Table 2, about 4.9 million filers submitted tax returns in both 2010 and 2011 and had no use tax payment in either year. Also, about 685 thousand additional returns with no use tax payment were filed in 2010 but could not be matched to a 2011 return, and about 658 thousand returns with no use tax payment in 2011 could not be matched to a 2010 return.¹⁶ About 4.6 percent of all 2010 IL-1040 returns and about 4.4 percent of all 2011 IL-1040 returns included a use tax payment.¹⁷

Payment behavior is quite persistent. Roughly half (82,489) of the 165,198 filers who made a use tax payment of \$1 to \$50 in 2010 also made a use tax payment of \$1 to \$50 in 2011. Most of the other half (72,200) made no use tax payment in 2011, but a small minority of filers (around 10,000) made a larger use tax payment in 2011. The same general pattern holds for other use tax payment categories so that the numbers in the main diagonal of Table 2 (where the use tax payment category is the same in 2010 and 2011) are larger than off-diagonal elements. Put another way, a filer who paid use tax in 2010 had a more than 50-percent probability of paying use tax in 2011, while all IL-1040 tax filers had only a 4.4-percent probability of paying use tax in 2011.¹⁸

Illinois collected \$11.5 million of use tax revenue in 2010 and \$12.1 million in 2011 from approximately 260,000 to 270,000 tax filers, which represents a 4.5-percent payment rate. This compares with an average 2009 payment rate of 3.1 percent among states that have both a use tax reporting line on their income-tax return and a lookup table.¹⁹ While Illinois' IL-1040 payment rate is above the national average, it is only about half of the payment rate in Vermont and Maine.

¹⁶ We matched 2010 and 2011 returns based on the "primary" SS number on the 2010 return. If the holder of this SS number did not file a 2011 IL-1040 or if she or he filed a 2011 IL-1040 but was not listed as the "primary" SS number, our computer algorithm will fail to find a match.

¹⁷ We do not know what share of tax filers actually incurred a use tax liability. However, Madden and Rainie (2003) report that in December of 2002, on any given day, 5 percent of Internet users (3 to 6 million individuals) made an online purchase and 61 percent of Internet users (about 67 million people) made an online purchase at some point. By 2010, these percentages surely must have been higher.

¹⁸ Some readers might erroneously expect that persistence of payment among those who paid in a previous year could eventually lead to widespread payment of the use tax. The Appendix demonstrates that this expectation is misplaced.

¹⁹ Manzi, Nina, updated 2012.

TABLE 2. Cross-Tabulation of 2010 and 2011 Use Tax Payments by Illinois Tax Filers

Category		Amount of Use Tax Payment on 2010 Income Tax Return						TOTAL 2010 returns		
		No matching 2010 return	No use tax payment	\$1 to \$50	\$51 to \$100	\$101 to \$300	\$301 to \$600		Over \$600	
Amount of Use Tax Payment on 2011 Income Tax Return	No matching 2011 return		685,031	13,757	1,355	464	56	14	700,677	
	No use tax payment	657,910	4,896,250	85,483	19,107	5,472	687	151	5,007,150	
	\$1 to \$50	11,559	72,200	82,489	8,525	1,824	152	8	165,198	
	\$51 to \$100	1,014	20,471	10,523	24,753	2,538	164	22	58,471	
	\$101 to \$300	349	6,531	2,114	3,359	8,179	477	28	20,688	
	\$301 to \$600	33	804	161	165	672	725	33	2,560	
	over \$600	12	219	35	28	76	111	79	548	
	TOTAL 2010 returns									5,955,292
	TOTAL 2011 returns	670,877	4,996,475	180,805	55,937	18,761	2,316	321		5,925,492

Notes: Each cell shows the number of Illinois tax returns with characteristics in column and row headings. The greyed cells inside the black box represent returns of taxpayers present in both 2010 and 2011. The first row of numbers and the left-most column of numbers show the number of tax returns that were present in only one of the years. For example there were 685,031 returns with no use tax payment in 2010 and no matching return in 2011. Similarly there were 657,910 tax returns with no use tax payment in 2011 and no matching return in 2010.

IV. Cross-Tabular Evidence About Taxpayer Characteristics That Influence the Probability of Illinois Use Tax Payment

In this section, we examine potential factors that may influence tax filers' propensity to pay use taxes when sellers without Illinois nexus cannot be required to remit the tax. We begin by examining some simple cross-tabulations and similar statistics to examine individual factors that influence the probability of payment. In the next section, we report the results of regression analyses that control for a variety of factors simultaneously.

We study data about Illinois use tax payments to learn about use tax policy specifically and also to gain broader lessons about factors that may affect tax compliance more generally. Tax filers may be less prone to fulfill their obligation to pay use tax than to pay other taxes because: (a) it is difficult for tax authorities to audit use tax liability and therefore to compel compliance; (b) there could be a high compliance burden since use tax liability may result from multiple small transactions (in the absence of the use tax, a typical tax filer would have little reason to track transactions that create a use tax liability); and (c) the use tax is generally small and obscure and, at least until 2010, many Illinois tax filers may not have been aware of their potential use tax liability at the time they filed their personal income-tax form.

Tax authorities could seek to increase use tax compliance by supporting federal legislation or an amendment of the U.S. Constitution that would place responsibility for remitting the use tax on out-of-state sellers.²⁰ Doing this would make it much easier for tax authorities to audit and compel use tax compliance.

The option to pay use taxes as part of the filing of a personal income-tax return combined with the use tax lookup table is a key administrative procedure designed to minimize the compliance burden. The huge increase in the number of use tax payers—from about 8,000 (who filed the ST-44) in 2009 to more than 240,000 (ST-44 filers plus those who paid some use tax when filing their IL-1040 return) in 2010 and 2011—suggests the procedure is effective.

As shown in Table 3 below, almost three out of five Illinois tax filers who paid any use taxes for 2010 and 2011 paid the exact amount indicated by the use tax lookup table.²¹ This suggests that many tax filers do not

²⁰ As discussed above, legislation that would place responsibility for remitting the use tax on out-of-state sellers is under review in the U.S. Congress in 2013.

²¹ In Tables 3, 4, 6, and 7, we restrict the sample of returns as noted. These tables are not strictly comparable to Tables 2 and 5 which use a broader sample.

track individual purchases and may find the lookup table a convenient way of reducing compliance costs.²² Because it decreases perceived compliance costs, the addition of a use tax payment line to the IL-1040 and the addition of a use tax lookup table in the IL-1040 instruction booklet can be responsible for the dramatic increase in the number of use tax filers since 2010.

TABLE 3. Actual Use Tax Payment Compared to Amount Suggested by Use Tax Lookup Table

Tax Year	Use tax taxpayers total	Paid same as Lookup Table	Paid more than Lookup	Paid less than Lookup
2010	242,412	57%	6%	37%
2011	239,900	58%	6%	36%

NOTE: Dependents, returns with over \$1mm FAGI, returns with zero or negative FAGI, and returns of nonresidents are dropped from the analysis.

Another factor that may be responsible for the increase in the number of use tax filers is the increase in knowledge about the use tax after 2010. In the absence of survey data about the use tax, the surest way to know that a tax filer is aware of the use tax is that the filer either paid the use tax in a previous year or employed a paid preparer. We know from Table 2 that taxpayers who paid the use tax in 2010 were much more likely to pay the use tax in 2011 than those who did not. This fact might be explained by the hypotheses that people who paid the use tax in 2010 are: (a) more likely to have a use tax liability in 2011; (b) more likely to voluntarily comply with a liability when they have it and hence more likely to pay in 2011; or (c) more knowledgeable about the use tax and thus more likely to comply.

Table 4 provides some additional insight about the relationship between knowledge of the use tax and the probability of payment. We know that paid preparers have been exposed to training about the use tax and are knowledgeable about Illinois tax law. Consistent with Gunter's findings in Maine, we find, as shown in Table 4, that Illinois returns prepared by paid preparers are less likely to have use tax payments than returns that are self-prepared. In 2010, 6.2 percent of self-prepared returns had use tax payments compared with only 4.5 percent of paid preparer returns. Similarly, in 2011, 5.8 percent of self-prepared returns had a use tax payment but only 3.6 percent of paid preparer returns had such a payment.

TABLE 4. Paid Preparers and Use Tax Payments

Return prepared by	Tax Year 2010			Tax Year 2011	
	All tax filers	Use tax filers	Percent that paid use tax	All tax filers	Use tax filers
Self	37.7%	45.6%	6.2%	38.2%	5.8%
Paid preparer	62.3%	54.4%	4.5%	61.8%	3.6%

NOTE: Dependents, returns with over \$1mm FAGI, returns with zero or negative FAGI, and returns of nonresidents are dropped from the analysis.

Of course, tax filers who prepare their own returns are likely to be systematically different from tax filers who use paid preparers in a number of ways, so the higher rate of use tax payment among this group is not definitive evidence that use of paid preparers causes reduced use tax payment. To better understand the relationship between the use of a paid preparer and payment of the use tax, we confined our analysis to tax filers who filed in both 2010 and 2011 and who switched between using a self-prepared and paid-preparer return (or vice-versa) in these years.²³ Our results are displayed in Table 5.

²² Technically, using the use tax lookup table does not relieve tax filers of the obligation to track their use tax obligations. Instructions for Form IL-1040 say: To determine the Illinois Use tax you owe, check your records to see if you were charged tax on internet, mail order, or other out-of-state purchases and use the Use tax (UT) Worksheet to calculate your tax ... use the UT Table [i.e., the use tax "lookup table"] to help you estimate the use tax you owe. Enter the Illinois Use tax from the UT Worksheet or UT Table on Form IL-1040, Line 23 If we find that you owe additional tax, we may assess the additional tax plus applicable penalties and interest. We conduct routine audits based on information received from third parties, including the U.S. Customs Service and other states. (words in [] added).

We speculate that many tax filers believe that using the use tax lookup table is in practice a quasi-guarantee that they will not be charged penalties and interest.

²³ This idea was suggested by Gunter, who found that "a taxpayer who switches to using a preparer is less likely to pay use tax compared to a taxpayer who does not use a preparer in the current or previous year." (p. 9)

TABLE 5. Probability of Use Tax Payment in 2011 Conditional on Whether Use Tax Was Paid in 2010

(Among those who switched from self prepared to paid preparer returns and vice-versa)

2010 use tax payment	2010 return prepared by	2011 return prepared by	Probability use tax was paid in 2011
No	Self	Paid preparer	2.3%
	Paid preparer	Self	1.7%
Yes	Self	Paid preparer	18.0%
	Paid preparer	Self	25.0%

NOTE: Data include all returns matched in 2010 and 2011.

Those tax filers who did not pay a use tax in 2010 and switched from a self-prepared 2010 return to a paid-preparer return in 2011 were *more* likely to pay use tax than those who switched from a paid-preparer return to a self-prepared return (2.3 percent versus 1.7 percent). Contrary to Gunter (2011), this suggests that paid preparers might encourage use tax payments.

However, the story may not be so simple. As we show in the bottom panel of Table 5, among those who both paid use tax in 2010 and switched from self-prepared to paid-preparer returns, the 2011 payment rate of 18 percent is low compared with the 25 percent payment rate of those who paid use tax in 2010 and switched from paid-preparer returns to a self-prepared return. Thus the bottom panel of the Table 5 is consistent with Gunter's finding that paid preparers *reduce* the use tax payment rate but apparently inconsistent with the top panel of Table 5.

The analysis of Table 5 is limited because it does not control for other factors that may affect use tax payment. In the next section, we control for other influences on use tax payment using regression analysis.

V. Regression Evidence About Taxpayer Characteristics That Influence the Probability of Illinois Use Tax Payment

The discussions in the previous two sections were quite informal and designed primarily to provide descriptive information about which Illinois tax filers pay the use tax. In this section, we attempt to be more rigorous by controlling for a number of variables simultaneously that might influence use tax payment. We caution that we do not observe use tax liability and have both a short time series (only 2 years) and a very limited set of information about tax filers—we have only the data reported on Illinois' very simple personal income-tax form—and can make limited causal inferences about use tax payments.

Table 6 shows descriptive statistics about key variables included in our analyses.

Our dependent variable (UT_11) is a dichotomous (1/0) variable that equals one if a tax filer made a use tax payment and zero otherwise. About 4.7 percent of tax filers in our data set made a use tax payment in 2011. Various factors such as a tax filer's attitude toward honesty, risk, government, and their financial situation probably play a role in the decision about whether or not to make a use tax payment in 2010. In all of our regressions, we control for whether the filer made a payment in 2010 (UT_10). About 5.1 percent of filers in our sample made such a payment. Since we use matched 2010 and 2011 tax returns and control for whether the tax filer made a use tax payment in 2010, our regressions should be interpreted as explaining changes in taxpayers' behavior between 2010 and 2011.

TABLE 6. Descriptive Statistics of Key Variables Used in the Analysis

(Based on 5,124,947 IL1040 matched returns in 2010 and 2011; dependents, returns with \$1 million or more AGI, returns with zero or negative AGI, and returns of nonresidents are dropped from the analysis.)

Type of variable	Minimum	Maximum	Mean	Std. Deviation	Description
Dependent Variable					
UT_11	0	1	0.05	0.21	1=paid use tax in 2011, 0=not paid
Independent Variables					
UT_10	0	1	0.05	0.22	1=paid use tax in 2010, 0=not paid
agi_2011	1	999,823	62,574	76,695	Federal adjusted gross income
TAXPREP2011	0	1	0.62	0.49	1=used paid tax preparer; 0=self prepared
ESTIMATED PAYMENT	0	1	0.03	0.16	1=made estimated tax payment of more that \$500 and under 65 yrs old, 0=not paid
DONATION_DUM_2011	0	1	.004	.067	1=paid check-off donation, 0=not paid
TAX_PMT_DUE_2011	-173,372	621,421	0.67	1,384	positive=refund due; negative=tax pmt due to the state
COUNTY2011	0	1	0.66	0.47	1=border county, 0=nonborder county

Valid Filing Statuses, 2011		
	Frequency	Percent
JOINT	2,103,322	41.0
DEATH	16,104	0.3
MARRIED FILING SEPARATE	63,263	1.2
SINGLE	2,932,581	57.2
WIDOW	9,677	0.2
Total	5,124,947	100.0

We start with a very simple regression specification that includes only a constant and a dummy variable indicating whether a use tax payment was made in 2010 (UT_10) and gradually enter additional variables to better understand the determinants of use tax payments in 2011 (UT_11). It is clear from Gunter's (2011) analyses and from cross-tabulations of our data (not shown) that the probability of paying use tax varies with tax-filer income as measured by FAGI. This correlation is probably due to several factors, including the fact that as tax filers' income rises they become less cash constrained and therefore have less incentive to avoid the use tax. The higher payment rate among higher income tax filers also may be because these tax filers have more complex returns and perceive themselves to have a higher probability of facing an audit.

We have dropped tax filers with negative or zero FAGI and those with FAGI of \$1 million or more from our sample: these tax returns may use sophisticated accounting techniques, and the returns may get extra scrutiny and the payment of use taxes may be determined by special considerations. The mean income of tax filers in our sample is more than \$62,574 (median is \$40,647). In our regression analysis, we enter the natural log of FAGI as an independent variable under the (maintained) hypothesis that the probability of use tax payment increases roughly proportionately with FAGI. We also allow for the possibility that the slope of this relationship changes at high income levels by including a zero/one dummy variable that interacts with FAGI over \$250,000.

We also include controls for use of a paid tax preparer for reasons discussed above. As discussed in Gunter (2011), conventional wisdom suggests that small business owners may be particularly savvy about ways to reduce their tax burden and therefore may be less likely to pay the use tax. Unfortunately, the data available from the IL-1040 do not allow us to directly observe whether the filer is a business owner. In lieu of direct evidence, we reasoned that small business owners are more likely to pay quarterly estimated income taxes since they may not have withholding of business income. We create a dummy variable equal to one if the tax filer had estimated tax payments of more than \$500 (indicating taxable income of at least \$10,000) in 2011 and did not claim an exemption for age 65 or older (which might indicate that filer is a retiree). We suspect that many, but perhaps not all, of the returns that met these two conditions were filed by small business owners.²⁴ Thus, the estimated coefficient on this variable gives some indication about whether small business owners were more likely to pay use taxes.

We also include a dummy variable equal to one if the filer elected to make a voluntary donation to a number of designated Illinois charities in conjunction with the filing of their tax return. Only about 0.4 percent of tax filers make such a donation. This select group is probably either extremely generous or may feel unusually economically secure, so it would not be surprising if this group also was likely to pay the use tax.

We include a set of variables measuring filing type (single, married filing jointly, and so forth) because we speculate that tax filers may take the views of their partner into account when making ambiguous tax choices. We speculate that holding FAGI constant, couples filing jointly may be more likely to pay the use tax because they want to avoid putting a partner at risk of a negative outcome. Of course, couples with different filing types may be very different in a variety of ways for which we cannot fully control, so that our analyses should be taken as suggestive rather than definitive.

We include a dummy variable equal to one in Illinois' border counties (where 66 percent of filers live) and zero elsewhere. The idea here is that those who live in border counties may have less incentive to shop via the Internet because the retail stores in their home jurisdiction face more intense interstate competition.²⁵ We hypothesize that because those in border counties might be less likely to shop via the Internet, they might be less likely to pay the use tax.

Since tax filers may be loss averse, they may be less likely to pay a use tax if they owe taxes than if they have a refund due. Because of this, we include a variable measuring the refund or tax payment due on the return and allow it to enter the regression equation asymmetrically.²⁶

Table 7 shows our regression results. Because we have a very large sample size, almost all of the t-statistics on the regression coefficients are quite large. The column I regression has a simple interpretation. It shows that the probability of a filer paying the use tax in 2011 is just 2 percent if they did not pay use tax in 2010. A filer who did pay use tax has a nearly 58-percent probability ($= 0.021 + 0.556$) of paying the use tax. All of the other coefficients in the regression table are quite small relative to the coefficient of UT_10.

²⁴ We acknowledge that this variable does not identify small business owners since the number of returns that met these conditions is far lower than the number of federal returns in Illinois that report schedule C (business) income.

²⁵ Agrawal 2011 provides evidence that proximity to state borders results in increased sales-tax competition.

²⁶ In 2011 there was an unusually small number of Illinois tax filers with a refund due. The reason for this is that when Illinois increased its (flat) personal income-tax rate in January 2011, many Illinois employers did not increase withholding in a timely fashion. As a result, many tax filers found that they had to make a payment or got a smaller refund when they filed their 2011 taxes in the first quarter of 2012. We see no reason why this decrease in refunds due should affect the interpretation of coefficients that measure the relationship between the refund due and the probability of a use tax payment.

TABLE 7. Illinois Use Tax Regression Results

Dependent Variable 2011 Use Tax Dummy:
 Data: 2010 and 2011 Illinois individual income tax returns excluding those of dependents and nonresidents as well as those with zero or negative AGI or with AGI over \$1 million.
 Number of Records 5,124,947

VARIABLE	VARIABLE	MODEL							
		I	II	III	IV	V	VI	VII	VIII
	Intercept	0.021	-0.088	-0.081	-0.076	-0.076	-0.059	-0.059	-0.059
2010 USE TAX PMT	2010 use tax dummy; 0=no; 1=use tax paid	0.556	0.550	0.549	0.548	0.548	0.547	0.547	0.547
2011 ASYM_LOGAGI	LOG_AGI		0.010	0.010	0.010	0.010	0.008	0.008	0.008
	ASYM_LOG=0 if FAGI<\$250K; LN(FAGI) if FAGI>\$250K		0.001	0.001	0.001	0.001	0.001	0.001	0.001
2011 TAX PREPARER	Paid preparer dummy; 0=self, 1=paid preparer			-0.011	-0.011	-0.011	-0.011	-0.011	-0.011
2011 ESTIMATED PAYMENT	0=no pmt, 1=Pmt over \$500 under age 65				0.031	0.031	0.030	0.030	0.030
2011 DONATION-CHECK-OFF	Donation dummy; 0=no 1=yes					0.037	0.037	0.037	0.037
2011 FILING TYPE	Single						Omitted	Omitted	Omitted
	Head of household						-0.010	-0.010	-0.010
	Joint filing						0.004	0.004	0.004
	Separate filing						-0.002	-0.002	-0.002
	Widow						0.007	0.006	0.006
	Deceased						-0.005	-0.005	-0.005
Border County	Border county dummy; 0=no; 1=border county							-0.001	-0.001
FINAL_REFUND_2011	Refund_due: positive=refund due, neg=tax pmt								-0.00000007
PMT_ASYM_2011	FINAL_REFUND_2011 * PMT_ASYM_DUM_2011; 1 = Refund_Due > 0, 0 = Refund Due <0								0.00000033

*T statistics for all coefficients are greater than or equal to three except for Final_refund_2011 which has a t stat of 0.7 in column 8 and PMT_ASYM_2011 which has a t stat of 2.5 in column 8. Adjusted R-squareds are about .32 for all regressions.

The coefficients in column II show that the probability of paying the use tax increases with FAGI but not at a very fast pace. According to our regression results, a tax filer with the mean FAGI of \$62,574 who did not pay the use tax in 2010 would have a probability of paying the use tax of about 2.5 percent. A tax filer with twice as much income would have a probability of paying the use tax of only about 3.2 percent.²⁷

The coefficient of ASYM_LOG allows the slope of the relationship between the probability of a use tax payment and FAGI to change for incomes above \$250,000. The coefficient on ASYM_LOG suggests that the probability of use tax payment rises quite rapidly with FAGI above \$250,000. According to the regression coefficients in column II, a tax filer with FAGI of \$125,000 would have a probability of paying use tax of about 3.2 percent. Doubling FAGI to \$250,000 increases the probability to only about 3.9 percent; however, doubling FAGI again (to \$500,000) increases the probability of a use tax payment to about 6.1 percent.

²⁷ Simulated probabilities are calculated by multiplying coefficients by appropriate values of independent variables. For example $2.5\% = -0.888 + 0.010 \times \ln(62574)$. Other simulated values are calculated analogously.

After we control for income and payment of the use tax in the previous year, filing a self-prepared return (rather than having a return submitted by a paid preparer) has essentially the same impact on the probability of making a use tax payment as doubling the tax filer's FAGI. This coefficient is essentially unaffected by the addition of more independent variables in columns IV to VIII.

In column IV, we add a dummy variable equal to one if an estimated payment was made and zero otherwise. The coefficient of this variable is quite large, indicating that making an estimated payment is associated with a 3-percent increase in the probability of paying the use tax. This is perhaps counter-intuitive since it suggests those who make estimated payments, who we speculate are likely to be business owners, are much more likely to pay the use tax than a randomly selected filer.

As we noted above, about 0.4 percent of tax filers make a voluntary donation to one of the Illinois charities indicated on the IL-1040. As shown by the estimated coefficients in columns V to VIII, this group of donors is much more likely to pay use tax than others. A tax filer who did not pay use tax in 2010 but made a check-off donation has a 6.2-percent probability of making a use tax payment compared with a 2.5-percent probability for a tax filer who did not make a check-off donation. This is consistent with the hypothesis that use tax payment is, in effect, similar to a charitable donation. This is consistent with Gunter's (2011) finding using Maine data.

In column VI, we added various dummy variables measuring filing type to the regression. The estimated coefficients measure the impact of filing type relative to the omitted category of a single filer. A head of household (nonmarried person with one or more dependents) is about 1 percent less likely to pay use tax while widows or widowers and those filing jointly are more likely to pay the use tax. Since the baseline probabilities of paying the use tax are low (about 2 percent for a filer who did not pay use tax in 2010), the impact of filing type is relatively large. The baseline probability of a use tax payment by a formerly single person who became a single parent in 2011 (and therefore switched filing status from single to head of household) would fall from about 2 percent to only about 1 percent. If instead she married in 2011, her baseline probability of paying the use tax would be almost 2.5 percent.

Living in a border county reduces the probability of paying the use tax as hypothesized and shown in columns VII and VIII. The locational impact is quite small, however, living in one of these counties reducing the probability of payment by only about 0.1 percent.

Finally, in column VII we added a variable measuring the refund that is due²⁸ and allow for asymmetry around zero so that having a refund due is allowed to have a different effect than having to make a tax payment. We included these variables to investigate the role of "loss aversion," which might make tax filers less willing to pay the use tax if paying it requires them to write a larger end-of-tax-year check.

The coefficient for FINAL_REFUND_2011 is not significantly different from zero despite the very large sample size in our analysis. The coefficient on PMT_ASYM_2011 (FINAL_REFUND_2011 * PMT_ASYM_2011) is statistically significant but very small. The coefficients are easiest to interpret using numerical examples. The coefficient on FINAL_REFUND_2011 is negative, implying that *the larger the tax payment due, the higher the probability a tax filer will pay a use tax*. In practice, the estimated coefficient suggests that there is essentially no relationship between the amount of tax payment due and the probability a tax filer pays the use tax.

Similarly, according to the regression results, the estimated coefficient suggests essentially no relationship between the amount of refund due and the probability of a tax filer paying the use tax.

VI. Discussion

Authors of economics textbooks recommend that we evaluate systems of government finance based on equity, efficiency, and administrative ease (Hyman 2002). By these criteria, the use tax has both virtues and flaws. The use tax is a modification intended to make the sales tax more equitable and efficient by reducing or eliminating

²⁸ This value is negative if a tax payment is due.

behavioral distortions that would arise if out-of-state purchases for in-state use were taxed at a different rate than in-state purchases. A universally imposed use tax would remove the incentive for buyers to purchase equally priced identical goods over the Internet or from cross-border shopping. This could reduce wasteful travel and shipping and increase the efficiency of the tax system. A universally imposed use tax also would increase horizontal equity as those who live near a low-tax border and those with easy access to Internet purchases (e.g., those with credit cards) would no longer pay a lower after-tax price than other citizens.

Unfortunately, imposition of the use tax is far from universal. Use tax compliance by individual consumers is essentially voluntary for many out-of-state purchases. Compliance has been limited both because narrowly self-interested consumers benefit from noncompliance and because even consumers with a broader or more risk-averse conception of self-interest previously had no low-cost method of complying with the use tax. The addition of a use tax payment line on the IL-1040 and the associated lookup table was designed to reduce compliance costs of tax filers.

The reduction in compliance costs associated with the addition of a use tax payment line on the IL-1040 and the associated lookup table appears to have increased revenue from the use tax but may have done little to increase the efficiency of the sales tax and may have reduced horizontal equity. Because a majority of Illinois use tax-paying filers use the lookup table, it functions as essentially a 0.06-percent personal income-tax surtax for many compliers. The addition of a use tax line to the IL-1040 will not diminish behavioral distortions if compliers simply use the lookup table to assess their tax liability because tax payments will not vary with the level of low-tax purchases. Thus, taxpayers will have no incentive to curtail low-tax purchases. Furthermore, the addition of a use tax payment line on the IL-1040 could reduce horizontal equity because risk-averse, naïve, or charitable tax payers may comply while others do not. Because of this, taxpayers in similar circumstances with similar incomes may pay different taxes.

VII. Conclusion

Illinois' use tax is legally mandated but difficult to monitor and collect from individual buyers. Since Tax Year 2010, the Illinois personal income-tax form has contained a line so that tax filers can remit their use taxes with minimal administrative complexity. We examined data from a panel of 2010 and 2011 Illinois personal income-tax returns. With this short time series and limited number of independent variables, we were not able to make definitive causal inferences about factors that determine filers' use tax payments.

However, our analysis does show that only a small fraction of tax filers pay any use tax. By far the most important predictor of a 2011 use tax payment is a 2010 use tax payment, suggesting that persistence is an important factor. Consistent with Gunter—so far as we are aware, the only other empirical research directly on our topic—we find that the probability that a tax filer pays the use tax increases with income and is associated with charitable contributions. Like Gunter, we find evidence consistent with the hypothesis that business owners are more likely to pay use tax than randomly selected tax filers. We also find that filing type matters, although the impact is relatively small. In contrast to Gunter, we find mixed evidence about the impact of paid preparers on use tax payment. We find only small impacts from other variables that we examined.

We find that about 60 percent of tax filers that pay the use tax pay exactly the amount suggested by the use tax lookup table. It may therefore be advisable for Illinois and other states to undertake additional research to refine the payments suggested by use tax lookup tables.

APPENDIX

How Many Use Tax Payers Will There Be in the Long Run?

Policymakers might wish to know the share of filers that will pay the use tax in the long run. Illinois has very limited experience in this area so it is difficult to make an empirical estimate. Based on our analysis of the first two years' experience, however, two facts are salient. First, only a small percentage of taxpayers pay any use tax. Second, use tax payment is persistent. Those who paid in Year 1 are much more likely to pay in Year 2 than the average. The high level of persistence of those who do pay the tax might lead to the hope that eventually such behavior will become widespread. On the other hand, our analysis suggests that even in the best-case scenario, persistent payment behavior would lead to only modest growth in the number of use taxpayers. To understand this claim, suppose that

$$(1) \quad P_t = \lambda F_t$$

Where P_t = the number of filers paying the use tax in time period t , λ = a constant, F_t = total number of IL-1040 returns in time period t , and t = the first year in which the use tax line is on the IL-1040 form. Further assume that the number of tax filers is approximately constant from year to year so that $F_{t+1} = F_t = F$.

In Illinois, tax filers who paid the use tax in 2010 had an almost 50-percent chance of paying the tax again in 2011. To capture this fact, suppose

$$(2) \quad P_{t+n} = .5P_{t+n-1} + \lambda(F - P_{t+n-1}) = (.5 - \lambda)P_{t+n-1} + \lambda F$$

Equation (2) says that half of the tax filers that pay the use tax in a given year also pay the use tax in the next year, which captures the persistent behavior that we observe thus far in Illinois. Equation (2) also says that other taxpayers who did not pay the use tax in the previous year are just as likely to pay the use tax as a randomly selected taxpayer was in the first year, and therefore the probability that they will pay is the same λ . This is probably an overly optimistic assumption since those who did not pay in Year 1 are less likely to be disposed to pay than the average in Year 2. Nonetheless, we adopt this assumption since it provides a "best case" scenario when projecting the number of future use tax payers. Equation (2) implies that

$$(3) \quad P_{t+n} = (.5 - \lambda)((.5 - \lambda)P_{t+n-2} + \lambda F) + \lambda F = (.5 - \lambda)^2 P_{t+n-2} + (.5 - \lambda)\lambda F + \lambda F$$

Generalizing this

$$(4) \quad P_{t+n} = (.5 - \lambda)^n \lambda F + (.5 - \lambda)^{n-1} \lambda F + (.5 - \lambda)^{n-2} \lambda F + \dots + (.5 - \lambda)\lambda F + \lambda F$$

rewrite as

$$(5) \quad P_{t+n} = (.5 - \lambda)^n \lambda F + \sum_1^n (.5 - \lambda)^{n-i} \lambda F$$

we can rewrite equation (5) as

$$(6) \quad \frac{P_{t+n}}{F} = \lambda \sum_0^n (.5 - \lambda)^{n-i}$$

If $0 < (.5 - \lambda) < 1$ then $\sum_0^n (.5 - \lambda)^{n-i}$ converges, and this equation can be used to predict the share of taxpayers that will pay the use tax at any point in the future.

Consider the simple example with $\lambda = 4\%$ for $N \leq 20$ displayed in the table below. With these parameters, Illinois starts out with about 4 percent of filers paying the use tax. This rises gradually to about 7 percent of filers by the third year (Year 3) since the use tax line is on the tax form but remains at 7 percent in subsequent years. Of course, the assumptions used in creating the table are very simple, but they make the general point that, even with a rate of payment-persistence of 50 percent, Illinois should expect to experience only a short-term increase in the number of use tax payers. In the long-term, the share of use tax payers will remain quite small, given the parameters we see in the first 2 years of the program.

Years since use tax payment line was put on 1040	Share of general filers paying use tax	Predicted share of filers that pay use tax if one-half of those paying in the preceding year pay in next year
t	lambda	Share paying
1	4%	4%
2	4%	6%
3	4%	7%
4	4%	7%
5	4%	7%
6	4%	7%
7	4%	7%
8	4%	7%
9	4%	7%
10	4%	7%
11	4%	7%
12	4%	7%
13	4%	7%
14	4%	7%
15	4%	7%
16	4%	7%
17	4%	7%
18	4%	7%
19	4%	7%
20	4%	7%

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