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Is There a December Effect? Strategic Prepayments of Deductible State Income Tax

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ABSTRACT: Individuals' state income tax payments are deductible in the year paid for federal income tax purposes. This study investigates whether, and to what extent, individuals implement federal tax planning by prepaying state estimated income taxes before year-end, even though those payments are not due until January 15. Based on a study of 34 states' aggregate data on estimated income tax receipts from individuals, we find strong evidence of this effect. We also find that this effect is increasing with the cost of state income tax payments. The results suggest that individual taxpayers take steps to reduce taxes by shifting deductions from one year to an earlier year and/or exploit the time value of money provided by accelerating federal tax savings by one year.

Keywords: tax planning; state income tax; marginal tax rate; time value of money.

Data Availability: Data are available from public sources identified in the paper and from the authors upon request.

INTRODUCTION

In this study, we examine the propensity of individual taxpayers to strategically pay their fourth-quarter estimated state income taxes early (i.e., before the due date) to shift the related deduction on their federal tax returns from one year to the prior year. Individuals with taxable income other than wages typically pay estimated taxes on an approximate calendar-quarter basis, with the fourth payment due by January 15. Related to annual federal tax return filings, Slemrod et al. (1997, 695) find a prevalence of the "April 15 syndrome," where "people wait until the last minute to fill out their returns, and then rush to mail them at their nearest post office" by midnight of the April 15 due date. Slemrod et al. (1997) estimate that individual taxpayers in 1988 sacrificed nearly $1 billion in forgone interest by not expediting the receipt of their refunds, a practice that is inconsistent with maximization of the time value of money pursued by rational parties. Do individual taxpayers exhibit a similar April 15 syndrome when paying their state income taxes? In this study, we investigate this question in the context of estimated state income tax payments that are due January 15.

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A crucial aspect of state income tax payments is their deductibility on federal income tax returns. This federal deductibility suggests that, though taxpayers may defer state tax payments for the first three quarters to their respective due dates under an April 15-like syndrome, individuals can benefit from accelerating the fourth-quarter's payment (due on January 15) to December of the current year. To the accelerating payer, the benefit of this fourth-quarter prepayment strategy comes in two forms. First, the taxpayer may be in a higher tax bracket in year *t* than in year *t* +1, when the payment is due. Alternatively, the taxpayer may expect to be subject to alternative minimum tax (AMT) in year *t*+1 and, thus, benefit from shifting the deduction to year *t* if not in AMT position in year *t*. Second, there are benefits from the time value of money for approximately one year—the taxpayer will reap the federal tax savings from the deduction for the payment in year *t*, rather than in year *t*+1. This can provide a risk-free (annualized) return to accelerated payers of approximately 37 percent, as we detail below.

With the assistance of state government officials and public-record websites, we collect monthly state estimated income tax receipts data for 34 states from 1991 to 2009. Our main goal is to examine whether individuals exploit this fourth-quarter prepayment strategy instead of exhibiting the suboptimal April 15 syndrome. We create a prepayment ratio, *PPR*, defined as the ratio of December payments to the sum of December and January payments. Higher (lower) values of *PPR* mean a higher (lower) proportion of tax payments occur as prepayments in December.

In t-tests, we find that the mean *PPR* in the fourth quarter is significantly higher than similar *PPR*s of the first, second, and third quarters. For instance, the mean *PPR* across our states is 23.9 percent in the fourth quarter, whereas it is only 5.8 percent in the third quarter, a difference that is highly statistically significant. This suggests that a nontrivial portion of the individual taxpayer population takes advantage of the benefits of tax prepayments. In our main empirical tests, we estimate OLS regressions. Consistent with our t-test results, we find that *PPR* is highest in the fourth quarter. Moreover, we find this prepayment effect is more pronounced in states with higher state tax rates, suggesting that individual taxpayers are more likely to exploit the prepayment strategy when the marginal benefits are higher. All results remain robust to the inclusion of the one-year-ahead change in the highest marginal federal tax rate. Overall, these empirical results suggest that the fourth-quarter prepayment strategy is pervasive across years and across state lines.

Our study is the first to systematically document the existence and magnitude of state tax prepayments made by individuals. This beneficial timing of taxable activity is consistent with previous findings that timing is the most pervasive behavioral response to taxes (Slemrod 1992, 2003). Moreover, because our setting is related to a statutory requirement, we are able to avoid the joint-decision issue that is prevalent in many prior studies of "December effects." For instance, studies that examine the decision to shift the timing of marriage must disentangle the joint decision to shift the timing of the marriage from the actual decision to enter into marriage (e.g., Alm and Whittington 1995, 1997). The required nature of the estimated tax payment amount also helps us overcome the concern researchers have in determining how much of an observed behavioral response is due to a shift in timing of activities in response to tax incentives and how much is due to a more permanent change in the level of activities (Triest 1998, 766–767).

The next section provides background information on the deductibility of state income taxes. The third section presents our hypotheses. The fourth section describes our data and presents our sample and descriptive statistics. The fifth section presents our research design and empirical results. The final section concludes and discusses the implications of our findings.

STATE INCOME TAX PAYMENTS: BACKGROUND AND TIMING

Payment of State Income Taxes

All but seven states impose state income taxes (SIT). Individuals pay SIT through a process very similar to how they pay federal income taxes. SIT is primarily paid through prepayments. Upon completing the annual state tax return, the taxpayer compares the prepayments to the final determined tax. The taxpayers who have prepaid too much are entitled to a refund. Those who have not prepaid enough make a final SIT payment along with the filing of the annual return. A given year's annual return is typically due by April 15 of the following year (although extensions for several months are usually obtainable).

Prepayments of SIT are made in three ways. The most common prepayment method is withholding of taxes at the source (e.g., taxes withheld during year *t* from the employee's gross salary received during year *t*). Second, taxpayers who do not file their annual state tax return for year *t* by its due date (April 15, year *t*+1) and do not expect a refund typically make a tentative payment along with their request for an extension of time to file the year *t* tax return. The third type of prepayment, which is the subject of our study, is the four installments of estimated SIT. States usually require these payments from those with taxable income other than wages (e.g., investments, self-employment). Estimated SIT payments on year *t* income are due by the 15th day of each of April year *t*, June year *t*, September year *t*, and January year *t*+1.[1]

States typically penalize taxpayers who do not pay sufficient estimated SIT by the appropriate due dates. Unless the taxpayer shows otherwise, the income is considered earned evenly throughout the year and, thus, estimated SIT payments are due throughout the year. For example, if a taxpayer owes $40,000 SIT for the entire year *t* (i.e., $10,000 per quarter), an estimated SIT payment of $40,000 on January 15 of year *t*+1 will likely incur penalties on the $30,000 that should have been paid earlier.[2] The penalty is typically calculated on a daily basis with reference to a stated annual rate, which is usually tied to the federal short-term rate of interest or prevailing bank prime or discount rates. Even though the penalty is, in essence, a charge for the time value of money and thus is a form of interest, it is not deductible as other types of interest might be. Thus, many taxpayers strive to avoid this penalty.

Federal Tax Benefit of Deducting State Income Taxes

In computing the U.S. federal taxable income of individuals, I.R.C. Section 164(a)(3) permits an itemized deduction on Schedule A for state income taxes as such taxes are paid. A payment is deemed made on the day the check was properly mailed.[3] A check for estimated SIT mailed in an envelope that is postmarked by December 31 is considered paid in December, even if received by the state in January. Thus, an estimated SIT payment mailed in December year *t* is deductible for

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[1] Note that these periods are not exactly "quarterly," however, for ease of discussion, we shall use the term "quarterly" in this paper. Also, the vast majority of states that impose SIT follow this schedule, which also matches the due dates for payments of estimated federal income tax. The exceptions are Hawaii (and Iowa), for which the due date is the 20th (30th) of the indicated month, not the 15th. Also, Delaware's first installment is due April 30. Due dates of the 15th for estimated tax payments (and filing of final annual tax returns) are typically shifted forward to the next business day if the 15th falls on a weekend or legal holiday. Finally, there is one other way that taxpayers make prepayments of estimated tax: When filing in year *t*+1 their annual tax return for year *t*, there may be a refund due; however, the taxpayer may decide to apply the refund to year *t*+1's estimated tax payments. As a result, it is possible that taxpayers make up to *five* estimated tax payments: the payments due in April, June, September, and January, as well as the application of the refund from the recent final tax return.

[2] Two common exceptions to the penalty occur if (1) the tax paid in for year *t*+1 is higher than 100 percent (or in some cases a slightly higher percentage) of the tax for year *t*; or (2) the taxpayer pays at least 90 percent of the year *t*+1's tax by April 15. Other less common exceptions or adjustments apply in cases such as not having filed a tax return in the prior year or for farmers and fishermen.

[3] Or in the increasing number of states that accept online payment, the day such online payment occurred.

federal income tax purposes for year *t* even though not due until January 15 year *t*+1 and even if not received by the state government until January year *t*+1.

Because SIT payments are deductible, the federal government is in effect subsidizing SIT and, thus, the after-tax cost of SIT is typically something less than the SIT rate.[4] For example, if a taxpayer is in a 35 percent federal income tax bracket, a $10,000 payment of SIT in 2008 can save the taxpayer $3,500 in federal income taxes when completing the federal tax return for 2008.[5] There are two settings in which SIT payments provide no benefit. First, if taxpayers do not itemize (i.e., instead use the standard deduction), they do not obtain a federal tax benefit from paying SIT. Second, SIT is not deductible for purposes of determining the separate calculation of AMT. Thus, for those in an AMT position regardless of the level of SIT payments, SIT payments save them no taxes; for those in an AMT position because of their SIT deductions, the payment of SIT provides only a partial benefit.[6]

HYPOTHESIS DEVELOPMENT

Slemrod (2003) summarizes individuals' behavioral responses to tax incentives and provides a ranking of those responses; at the top of the hierarchy of behavioral responses is the effect of taxes on the timing of taxable activity. Consistent with this finding, many studies examine various "December effects," in which the taxpayer may shift transactions between January and December (and *vice versa*) to save taxes. For instance, Chan (1986) and Chen and Singal (2003) document the timing of capital market transactions, known as the December tax loss selling effect, in which individual investors may unwind investment positions to realize losses in the current year to help offset the tax implications of realized gains.[7]

The timing of taxable activity is not limited to capital market-related activities. Alm and Whittington (1995, 1997) find evidence that couples delay marriages from late in one year to early in the subsequent year to delay the "marriage tax penalty" (similarly, Sjoquist and Walker 1995). Dickert-Conlin and Chandra (1999) find evidence that couples accelerate birthing children to late December as opposed to early January to accelerate usage of the dependency exemption. Randolph (1995) finds taxpayers shift their levels of charitable giving for years in which tax rates change. In general, these findings buttress Slemrod's (2003) findings that tax laws can have a material effect on individuals' decisions regarding the timing of taxable activities.[8]

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[4] This paper is concerned with the impact of SIT on the taxpayer. Many papers address much of the same data we study but instead related to the impact of deductibility on the federal or state governments (e.g., cbo.gov 2008; Feldstein and Metcalf 1987; Metcalf 1993; Scott and Triest 1993).

[5] As a taxpayer's adjusted gross income (AGI) increases, certain "stealth tax" elements of the tax law reduce tax benefits otherwise allowable. One example is the phase-out of many itemized deductions as AGI, for example, surpasses $166,800 in 2009 for a married couple filing jointly. In this case, a portion of SIT (and certain other itemized deductions) is phased out. We ignore this aspect in our stylized example. Also, we ignore the feedback effect in the very small number of states that permit a deduction for federal income taxes for purposes of determining state taxable income. We are not aware of any state that permits a deduction of SIT in determining *state* taxable income.

[6] We do not control for AMT in our study primarily because our study uses aggregate data and thus we do not know which individual taxpayers are in AMT position. In untabulated results from IRS SOI data from 2004 to 2007, the average percentage of all federal tax returns filed in our sample of 34 states that had AMT is only 3.03 percent.

[7] There are also time-value-of-money benefits from selling losing stocks in December instead of January (e.g., Chance et al. 2003; Lange 2003); however, we are unaware of any empirical studies that test that component of the December effect in the stock selling context.

[8] We study taxpayer behavior that is, in some sense, similar to the behavior studied in the research stream related to "secondary tax evasion." Secondary tax evasion refers to the tendency of taxpayers who determine their taxes through the tax tables to cluster their reported taxable incomes at the high end of a table bracket. In those settings, a dollar of added deduction could lead to a marginal tax savings of far more than one dollar due to the squeezing into the next lower table bracket. As noted by Christian and Gupta (1993, 93), "taxpayers are sensitive to, and respond to, even the small tax effects of the table brackets." Recent papers include Schmidt and Werner (2005) and Buchheit et al. (2005). In our setting, the SIT payments are far larger than trivial amounts that might allow the taxpayer to enter the next lower

In the context of the current study, we examine the existence and magnitude of a particular type of tax timing. Specifically, we ask the question: Do individual taxpayers accelerate the final quarter's estimated state income tax (SIT) payment to December instead of paying on January 15 of the following year? This setting enables us to disentangle a significant caveat of prior studies that examine time-shifting behavior. Specifically, prior studies that examine tax-related time shifting behavior involve a joint decision. For instance, the decision to delay a marriage date to a future year is a joint decision to marry and to shift the date of the marriage. Similarly, the timing of a stock sale is a joint decision to sell a particular stock and to time that sale. In contrast, SIT payments are not a joint decision—because the amount of the SIT payment is a statutory requirement, no decision to pay or not pay is made; it *must* be paid by fiat. This nondiscretionary nature therefore purges our study of the joint-decision issue. The only decision for our studied taxpayer is whether to pay by January 15—the due date of the estimated SIT—or to pay by December 31—to accelerate the tax deduction.

The economic concept of time value of money and the natural process of tax-related filings around prescribed due dates suggest that taxpayers should normally wait until the final due date, January 15, before paying an estimated tax bill. Thus, it is desirable to defer paying taxes, including interim payments such as estimated SIT payments, as long as possible, assuming interest is not being charged on the tax liability (Scholes et al. 2009, 23; Ayers et al. 1999, 55). Extant tax research on violations of this basic financial principle has asked, "Why do taxpayers 'give interest-free loans to the government'"? For example, Ayers et al. (1999) study why taxpayers prepay federal estimated income taxes instead of paying in April. Similarly, from the point of view of tax refunds, Slemrod et al. (1997) analyze taxpayers who file their annual returns close to April 15, even though they are entitled to a refund. The authors estimate that taxpayers in 1988 sacrificed nearly $1 billion in forgone interest by not expediting the receipt of their refunds.[9] Consistent with this characterization, Slemrod (1997, 695) coins the phrase, the *April 15 syndrome*: "The popular characterization of completing and mailing individual tax forms is that people wait until the last minute to fill out their returns, and then rush to mail them at their nearest post office [by] midnight."

Ex ante, because individuals pay estimated SIT through a process very similar to how they pay federal income taxes, we would expect similar time-shifting behavior for all SIT payments; i.e., individuals should defer paying SIT until the due date. This time-shifting behavior would especially be the case for the final estimated SIT payment, due January 15, because as compared to the prior three estimated quarterly SIT installments, which are more likely to be based on estimated taxable income projections, many taxpayers may prefer to wait until early January to calculate actual realizations for the year ended in December. Moreover, there exists the incremental financial burden (i.e., opportunity costs of lost investment opportunities) to the taxpayer who pays the bill sooner rather than later. Overall, this discussion suggests the deferral of estimated SIT payments until the very last day they are due.

An alternative argument suggests that there are potentially significant economic reasons for a

table. However, the secondary tax evasion papers and our findings both document the extent to which individual taxpayers carefully factor taxes into their decisions, although there is nothing illegal about prepaying SIT two weeks early.

[9] Slemrod et al. (1997) also cites the "less comprehensible fact" that some taxpayers remit their taxes before the filing deadline (sacrificing $46 million in forgone interest); this behavior is concentrated among the elderly, a group which they argue has on average a lower value of time and possibly are averse to being in debt, fear forgetting or losing their tax return materials, or perhaps derive utility from fulfilling their half of their contract with the government. We note that another reason, which has basis in financial rational decision making, for paying before April 15 could be that it is possible that some taxpayers paid quickly because they had failed to pay sufficient estimated income taxes during the year and thus sought to cease accruing of penalties on such delayed payments.

given taxpayer to *accelerate* or prepay the fourth-quarter tax payment from the typical January 15 due date to a period a few weeks earlier—before December 31. This concept of prepaying SIT is offered in various taxation textbooks (e.g., Willis et al. 2009, 10–33), as well as the popular press (e.g., Wiener 1998; Rattiner 2002; Franklin 2006).[10] The reason is twofold. First, there exists the possibility of benefiting from a tax rate differential by intertemporal shifting. Scholes et al. (2009, 23) summarize the basic idea: If tax rates are increasing (decreasing) over time, taxpayers prefer to accelerate (delay) recognizing income to the period when it can be taxed at as low a rate as possible. Similarly, if rates are increasing (decreasing), this intertemporal shifting can be accomplished by shifting deductions to the future (current) year (Triest 1998, 767). Alternatively, the taxpayer may expect to be subject to AMT in the year the January SIT payment is due but not expect to be in AMT position in the prior year. By prepaying in December, the taxpayer avoids losing the tax benefit of deducting the fourth-quarter SIT payment.

The second reason for accelerated fourth-quarter payments is the benefit the taxpayer derives from the time value of money in accelerating the deduction to the earlier year (Kushel 1987, 11,446). *Prima facie*, this time-value-of-money argument is similar to that made by Scholes et al. (2009) and Ayers et al. (1999) to *defer* a tax payment, not *accelerate* it. Here, however, the taxpayer balances the marginal time value cost of paying SIT 15 days earlier (on December 31 year t instead of January 15 year t+1) against the marginal time-value benefit of realizing the federal tax savings of the SIT deduction approximately one year earlier (in April year t+1 instead of year t+2). For instance, assuming a 5 percent after-tax interest rate, a typical taxpayer in a 35 percent tax bracket will realize an approximate 1.55 percent time-value savings (where $365/365 * 0.05 * 0.35$ marginal benefit $- 15/365 * 0.05$ marginal cost $= 0.0155$ net savings). This results in an annualized yield of 37 percent ($0.0155 * 365/15$). In comparison, a vast literature in empirical asset pricing finds that abnormal returns from various anomaly/trading rules, in which the investor exposes himself to nontrivial risk, typically earns the individual investor less than this 1.55 percent in abnormal returns on a monthly basis (e.g., Sloan 1996). In contrast, the taxpayer can earn this 1.55 percent in just two weeks, risk free, from simply accelerating payment by slightly more than two weeks.[11]

The above discussion suggests a tension between the deferring of payments until their due dates versus the accelerating of payments due to federal tax planning and time-value optimization purposes. We state our first hypothesis in alternative form:

H1a: Individual taxpayers are more likely to accelerate fourth-quarter estimated state income tax payments from the due date of January 15 to December of the prior year.

Similarly, because no such benefit is derived from a shift in timing of payments in other quarters:

H1b: For the first, second, and third quarters, individual taxpayers are more likely to defer estimated state income tax payments to their respective due dates.

Next, we make an empirical prediction regarding the cross-sectional and time-series variation in this fourth-quarter prepayment effect. Because the benefit derived from an accelerated shift in

[10] However, it is not always clear whether the advice in these cited sources is premised on the two separate benefits we describe next in the text—the time-value-of-money benefit or the tax-bracket-differential benefit/AMT planning, or both.

[11] As noted in Kushel (1987, 11,447), there is an additional time-value benefit resulting from the fact that taxpayers are permitted to base their year t+1 federal estimated tax payments on year t's tax. In other words, besides reducing year t's tax, they are also able to reduce year t+1's federal estimated tax payments, thereby accomplishing further deferral until year t+2. Kushel calls this a "hidden bonus deferral." See also Kushel (1991) for a theoretical analysis of various types of taxpayers and the degree to which prepayment may benefit them (e.g., taxpayers who use the 90 percent of current year penalty exception versus those who use the 100 percent of prior year tax penalty exception).

timing of SIT payments is directly dependent on the magnitude of the SIT payment, a prepayment effect is predicted to be more pronounced for state-month observations with higher SIT rates. This suggests the following prediction:

H2: The fourth-quarter accelerated prepayment effect is more prevalent in states where the marginal state income tax rate is higher.

DATA, SAMPLE, AND DESCRIPTIVE STATISTICS

Data

We collect 3,173 state-month observations, culled from 34 states with available estimated state income tax (SIT) data.[12] Table 1 summarizes our data collection process. Of the 50 states, eleven states do not have applicable tax data. Specifically, seven states do not impose SIT (Alaska, Florida, Nevada, South Dakota, Texas, Washington, and Wyoming). An additional four states do not have an estimated SIT process (Idaho and Utah), or only impose SIT on dividends and interest

TABLE 1
Sample Selection

Total states	50
Less:	
States without income tax	−7
States that only tax dividend and interest	−2
States without estimated income tax process	−2
	39
Less:	
States that do not segregate estimated tax from other non-withholding taxes (3) or do not segregate withholding from other income taxes	−4
States that did not provide information	−1
Total states in sample	34

This table shows the sample selection process, starting from 50 states to our final sample of 34 states.

[12] Our total of 34 states matches the number of states included in Boyd and Dadayan's (2009a) report on macroeconomic state trends. However, our sample includes (excludes) Arizona, Minnesota, and Montana (New Jersey, Pennsylvania, and Virginia). We also note that there are some localities (e.g., cities) that impose their own income tax; however, this is beyond the scope of our current study.

(New Hampshire and Tennessee).[13] Of the remaining 39 states, we lose five states due to incomplete data: (1) one state was unable to provide a breakdown between its non-withholding SIT and its withholding SIT receipts (Mississippi); (2) three states were not able to segregate estimated SIT receipts from all other non-withholding receipts such as balance due payments made with the annual tax returns filed by April (New Mexico, Pennsylvania, and Virginia);[14] and (3) one state would not supply the data unless we made a formal request under the state's Open Public Records Act (New Jersey).

We collect monthly estimated SIT receipts data from each state's public-record websites. When not available on its website, we directly contact the state's tax or comptroller officials, or staff economists, to obtain the information. Because there is no uniform law that requires a certain minimum number of years of data to be provided, some states provide us with data starting in 1991, while other states provide data from only 2007. Regardless of the starting period, almost all states provide monthly data through May 2009. Because of delays in mail arriving at the tax agencies and time to process, recorded *monthly receipts* data overstates how much was actually *paid* by taxpayers in latter months (e.g., January) and understates how much was paid in prior months (e.g., December). This biases against our finding results.[15]

Table 2 summarizes the population of data collected. Panel A of Table 2 presents the distribution of observations across states, the number of observations per state, and the beginning and ending period we collect for each state. On average, each state provides 93.3 monthly observations (i.e., about eight years of data). Delaware, Illinois, Maine, and North Carolina provide the most observations, with observations that start in 1991–1992. Iowa and Rhode Island provide the fewest observations, with observations that begin in July 2007. Almost all states provide very recent information (up to approximately May of 2009). Panel B shows that observations are clustered in more recent years. Panel C shows that the observations are not clustered by month (i.e., evenly spread through the 12 months).

In Table 2, Panel D, we present descriptive statistics. First, we note the mean (median) number of annual individual federal tax return filers for our state observations is 3.16 million (2.37 million) per year. (The number of individuals filing annual state tax returns or estimated SIT is not available.) The mean (median) aggregate amount of monthly estimated state income tax receipts, SIT, is $114.3 million ($18.0 million), with the median being dramatically lower than the mean because the calculations of the mean and median include February, July, October, and November, which are each two or three months before the due date of payment, and for which we would expect very small prepayment. The mean (median) state tax rate is 0.0665 (0.0675), with an 80 percent range of 0.0340 to 0.0924, suggesting nontrivial cross-sectional variation in such rates.

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[13] Idaho and Utah collect prepayments of SIT through withholding and, if necessary, one prepayment, which is made by a taxpayer paying an expected balance due before April 15 when the tax return will not be completed in time. We also omit New Hampshire and Tennessee from our sample due to the limited amount of income at issue. Interest and dividends are two types of income that are likely far less than other types of income that are also not subject to withholding, such as rental gains, self-employment income, and capital gains.

[14] This would have added significant noise from receipts on final annual tax returns, especially in the first half of the year. Boyd and Dadayan (2009a) likely do not exclude two of these states because their focus is on macroeconomic trends in the states, whether paid as a balance due on the April 15-due tax return or paid as estimated taxes.

[15] Note also that we were unable, in every state, to confirm whether extension payments were included in the estimated tax receipts, as well as whether any refunds that were applied to the next year's estimated tax were included in the estimated tax receipts. This might present noise in the months in which there are large amounts of extension payments and final tax returns being filed (e.g., starting in February, and peaking in March and April, as well as in May to the extent mail is slow in April and/or states are slow to record the mass volume of filings and payments received in April).

TABLE 2
Summary of Data

Panel A: Distribution of Observations across States

State	n	Begin Period	End Period
NC	215	1991.07	2009.05
DE	208	1992.02	2009.05
IL	208	1992.02	2009.05
ME	203	1992.07	2009.05
MA	172	1995.02	2009.05
NY	169	1995.04	2009.04
IN	161	1996.01	2009.05
HI	154	1996.07	2009.04
CA	119	1999.07	2009.05
VT	104	1999.07	2008.02
KS	113	2000.01	2009.05
NE	101	2001.01	2009.05
MT	95	2001.07	2009.05
GA	82	2002.07	2009.04
KY	83	2002.07	2009.05
OH	83	2002.07	2009.05
AZ	75	2003.01	2009.03
CO	71	2003.07	2009.05
CT	71	2003.07	2009.05
MI	65	2004.01	2009.05
OR	65	2004.01	2009.05
WI	65	2004.01	2009.05
WV	65	2004.01	2009.05
AR	59	2004.07	2009.05
MN	59	2004.07	2009.05
MO	48	2004.07	2008.06
OK	59	2004.07	2009.05
LA	36	2006.06	2009.05

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Panel A: Distribution of Observations across States

State	n	Begin Period	End Period
AL	32	2006.10	2009.05
MD	29	2007.01	2009.05
ND	29	2007.01	2009.05
SC	29	2007.01	2009.05
IA	23	2007.07	2009.05
RI	23	2007.07	2009.05
	3,173		

Panel B: Annual Distribution

Year	n	Percent
1991	6	0.2%
1992	40	1.3%
1993	48	1.5%
1994	48	1.5%
1995	68	2.1%
1996	90	2.8%
1997	96	3.0%
1998	96	3.0%
1999	108	3.4%
2000	132	4.2%
2001	150	4.7%
2002	174	5.5%
2003	216	6.8%
2004	300	9.5%
2005	324	10.2%
2006	334	10.5%

(continued on next page)

Panel B: Annual Distribution

Year	n	Percent
2007	396	12.5%
2008	392	12.4%
2009	155	4.9%
	3,173	

Panel C: Monthly Distribution

Month	n	Percent
Jan	272	8.6%
Feb	275	8.7%
Mar	274	8.6%
Apr	274	8.6%
May	271	8.5%
Jun	244	7.7%
Jul	260	8.2%
Aug	260	8.2%
Sep	260	8.2%
Oct	261	8.2%
Nov	261	8.2%
Dec	261	8.2%
	3,173	

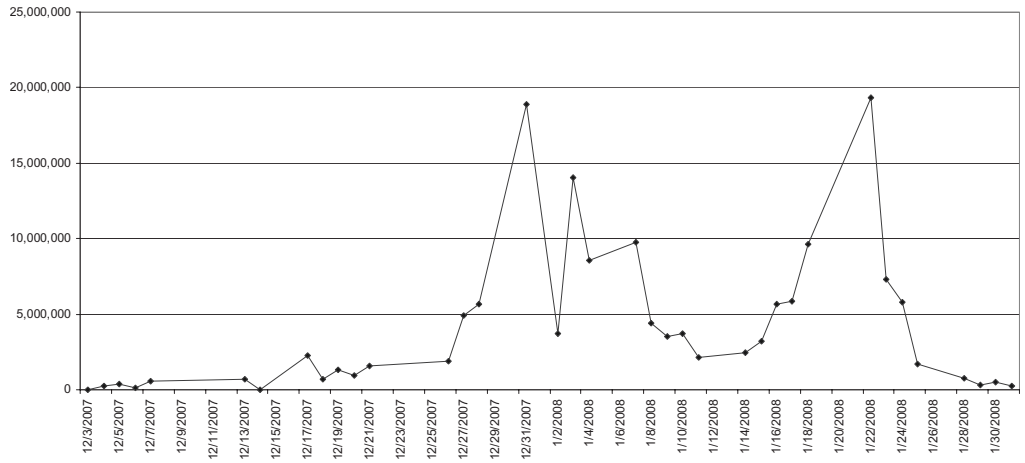
(continued on next page)

Panel D: Descriptive Statistics

Variable	n	Mean	10%	25%	Median	75%	90%
Number of federal tax return filers	3,173	3.16	0.43	0.64	2.37	3.78	7.92
State estimated income tax receipts	3,173	$114.3	$2.0	$4.8	$18.0	$76.0	$215.4
State income tax rate	3,173	0.0665	0.0340	0.0560	0.0675	0.0825	0.0924

All amounts in millions, except for state income tax rate. Number of federal tax return filers is based on IRS SOI data reported by state. This table shows the distribution of observations for the population of observations across the 34 states with available data (January through December). (Our sample of March, May, August, and December prepayments is drawn from this population.) Panel A presents the beginning and ending periods for each state. Panel B (Panel C) presents the distribution of observations across years (months). Panel D presents descriptive statistics.

FIGURE 1
Timeline of Oklahoma's Daily State Estimated Income Tax Cash Receipts from December 2007 to January 2008



This figure shows daily state estimated income tax cash receipts for Oklahoma from December 2007 to January 2008.

Case Study: Oklahoma's Daily Tax Receipts

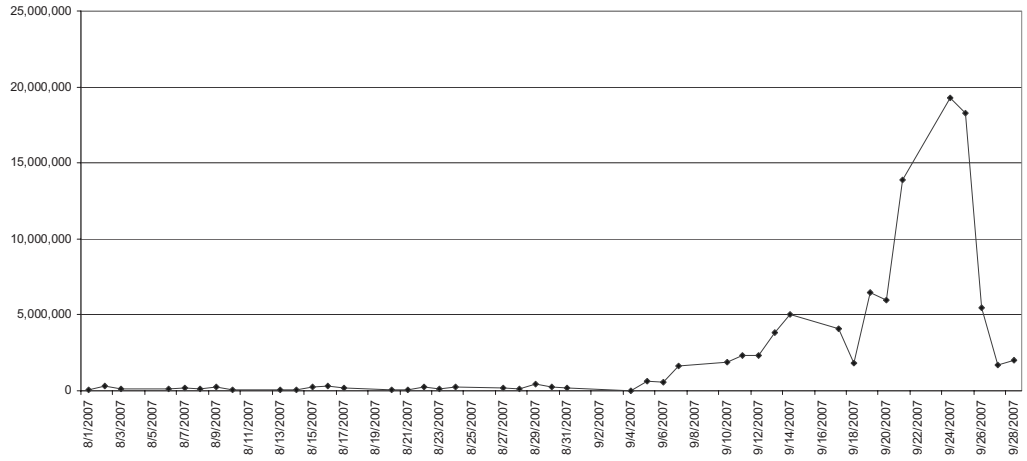
To illustrate the potential acceleration of estimated SIT payments, we first examine Oklahoma, the only state that provides details on its website of *daily* cash flows from estimated SIT receipts (our sample and tests are performed on monthly data). In Figure 1, we present a timeline of Oklahoma's daily estimated SIT cash receipts from individuals during the months of December 2007 and January 2008, where the tax due date is January 15. Figure 2 is a similar timeline for August and September of 2007, where the tax due date is September 17 (September 15 is a Saturday in 2007, thereby pushing the due date to Monday, September 17).

Visual inspection of Figure 1 shows the increase in payments in late December and early January. Specifically, there are essentially two peaks in the graph: on December 31 and January 22. The first peak on December 31 is consistent with a shift in tax payment behavior. Moreover, as noted above, because these data points are tax *receipts*—and considering the typical 1–3 day delay of regular USPS mail delivery (as well as additional days to process the received vouchers and checks)—it is likely that each data point is biased to a later date, such that the peaks of the graph should be shifted several days to the left, where an even larger frequency of prepayments would be observed. In contrast, Figure 2 shows no similar increase in late August, but rather, a peak shortly after the September 17 due date. This pattern of increased prepayment in December is consistent with H1a, while the absence of the pattern in August is consistent with H1b.

Sample and Descriptive Statistics

Our final sample comprises 1,038 state-month observations. The four quarters' relevant months for studying prepayment behavior are March, May, August, and December. The main variable of interest is our prepayment ratio (*PPR*) variable, which represents the ratio of payments

FIGURE 2
Timeline of Oklahoma's Daily State Estimated Income Tax Cash Receipts from August 2007 to September 2007



This figure shows daily state estimated income tax cash receipts for Oklahoma from August 2007 to September 2007.

that occur in the month prior to due date versus the total payments that occur in that month plus the due-date month. In Table 3, we present the distribution statistics for our sample, the four prepayment months: March, May, August, and December.

Our first tests of H1 involve univariate analysis using standard t-tests. We compare the differences in means of prepayment ratios in December to those of March, May, and August. We find that both the means and medians for December's prepayment ratio, *PPR*, are higher than

TABLE 3
Distribution of Prepayment (*PPR*) Ratio

PPR Ratio	n	Mean	10%	25%	Median	75%	90%	t-statistic
March	274	0.073	0.026	0.044	0.060	0.091	0.128	24.98
May	243	0.149	0.033	0.042	0.069	0.196	0.385	7.80
August	260	0.058	0.034	0.039	0.047	0.061	0.095	31.21
December	261	0.239	0.131	0.187	0.238	0.297	0.361	—
Total	1,038							

This table shows the distribution of the prepayment ratio, *PPR*, for the sample. *PPR* is defined as the ratio of state estimated income tax payments that occur in the month prior to due date versus the total payments that occur in that month plus the due-date month. For instance, for December, the *PPR* = December payments/(December payments + January payments). t-statistics show the difference in means between the month's *PPR* and December's *PPR*.

those three months. A t-test for differences in means is provided in the last column of Table 3. The mean *PPR* for December is 0.239. This is higher than March's *PPR* of 0.073; the difference is statistically significant (t = 24.98). May's *PPR* is 0.149;[16] the difference with December's *PPR* is statistically significant (t = 7.80). Finally, August's *PPR* is 0.058; again, the difference with December's *PPR* is statistically significant (t = 31.21). These results are consistent with H1a, and present preliminary evidence that the ratio of prepayments in December is larger than in other potential prepayment months.

RESEARCH DESIGN AND EMPIRICAL RESULTS

We perform our main empirical tests by estimating an OLS regression of *PPR* on monthly indicator variables. Specifically, we estimate the following model:

$$PPR = \beta_0 + \beta_1 MAR + \beta_2 MAY + \beta_3 AUG + \varepsilon \quad (1)$$

where:

PPR = payments in month *t*/(payments in month *t* + payments in month *t*+1);
MAR = 1 if month is March, = 0 otherwise;
MAY = 1 if month is May, = 0 otherwise; and
AUG = 1 if month is August, = 0 otherwise.

We exclude the December indicator variable to ensure that the model is of full rank. Therefore, we interpret the intercept as the December effect. Results are qualitatively identical when the March, May, or August indicator variable is alternatively excluded instead. (All standard errors are adjusted for heteroskedasticity and clustering at the state and period levels [i.e., Rogers standard errors; Petersen 2009]).

In Table 4, we present our main results. We find that the intercept, which includes the December effect, is positive (0.239) and statistically significant (t = 45.48). This result is consistent with H1a, and confirms our univariate results presented in Table 3. Specifically, we find that the prepayment ratio in December is positive, suggesting that taxpayers accelerate large amounts of SIT payments due January 15 to December of the prior calendar year, and this tendency to prepay is more pronounced for December relative to other prepayment months. Similarly, consistent with H1b, the coefficient for *MAR* is negative and statistically significant (−0.167, t = −24.48). The coefficients for *MAY* and *AUG* are similarly negative and statistically significant. Here, the results suggest that for the first, second, and third calendar quarters, taxpayers defer their SIT payments to the month of the due date. All results are robust to including state and year fixed effects.

In Table 5, we present results for our tests of H2, for which we predict that the December prepayment effect is more prevalent in states where SIT rates are higher. To test this hypothesis, we build upon our main model in Equation (1) above, and include the SIT rate (*SRATE*), as well as interaction terms with the monthly indicator variables. Last, we also include *CH_FRATE*, which is the one-year-ahead change in the highest marginal federal tax rate (the model is also estimated

[16] As noted earlier, three states (Delaware, Hawaii, and Iowa) have their first payment due either April 20 or April 30, thus biasing against our predictions. (Also, the large backlog of filings in April of final tax returns, extension payments, and estimated SIT payments might cause some April estimated SIT payments to be recorded in May.) When these three states' May observations are deleted, the mean (median) May *PPR* is 0.126 (0.059). The difference in means relative to December *PPR* is statistically significant (t-statistic = 9.13).

TABLE 4

OLS Regression of *PPR* on Monthly Indicator Variables

	Coefficient	Std. Error	t-statistic
Intercept	0.239	0.0053	45.48
MAR	−0.167	0.0068	−24.48
MAY	−0.090	0.0128	−7.06
AUG	−0.181	0.0062	−29.36
Adj.-R^2	0.348		
n	1,038		

This table presents results from the estimation of the following OLS regression:

$$PPR = \beta_0 + \beta_1 MAR + \beta_2 MAY + \beta_3 AUG + \varepsilon$$

where *PPR* = payments in month *t*/(payments in month *t*+ payments in month *t*+1); *MAR* = 1 if month is March, = 0 otherwise; *MAY* = 1 if month is May, = 0 otherwise; and *AUG* = 1 if month is August, = 0 otherwise.

TABLE 5

OLS Regression of *PPR* on Monthly Indicator Variables, Change in Federal Rates (*CH_FRATE*), and State Rate (*SRATE*) Interactions

	Coefficient	Std. Error	t-statistic
Intercept	0.145	0.0169	8.62
MAR	−0.078	0.0227	−3.42
MAY	0.003	0.0467	0.05
AUG	−0.102	0.0206	−4.94
SRATE	1.403	0.2472	5.68
SRATE ∗ *MAR*	−1.341	0.3041	−4.41
SRATE ∗ *MAY*	−1.391	0.6633	−2.10
SRATE ∗ *AUG*	−1.187	0.2914	−4.07
CH_FRATE	−0.184	0.1622	−1.13
Adj.-R^2	0.359		
n	1,038		

This table presents results from the estimation of the following OLS regression:

$$PPR = \beta_0 + \beta_1 MAR + \beta_2 MAY + \beta_3 AUG + \beta_4 SRATE + \beta_5 SRATE * MAR + \beta_6 SRATE * MAY + \beta_7 SRATE * AUG + \beta_8 CH\_FRATE + \varepsilon$$

where *PPR* = payments in month *t*/(payments in month *t* + payments in month *t*+1); *MAR* = 1 if month is March, = 0 otherwise; *MAY* = 1 if month is May, = 0 otherwise; *AUG* = 1 if month is August, = 0 otherwise; *CH_FRATE* is the one-year-ahead change in the highest marginal federal tax rate; and *SRATE* is the highest marginal state tax rate for the given year.

without *CH_FRATE*). The model is as follows:

$$PPR = \beta_0 + \beta_1 MAR + \beta_2 MAY + \beta_3 AUG + \beta_4 SRATE + \beta_5 SRATE * MAR + \beta_6 SRATE * MAY + \beta_7 SRATE * AUG + \beta_8 CH\_FRATE + \varepsilon \quad (2)$$

where:

SRATE = highest marginal SIT rate for a given year;
CH_FRATE = one-year-ahead change in the highest marginal federal income tax rate from the federal rate that applied in the given year;[17] and
PPR, MAR, MAY, AUG are as defined above.

Our focus for these tests is on the interaction terms—particularly for December. Because December is represented in the intercept, econometrically, we interpret the unconditional *SRATE* variable as the interaction with December.[18] Table 5 shows that the coefficient for *SRATE* is 1.403 (t = 5.68). As predicted, this coefficient is positive and statistically significant, suggesting that the December prepayment effect is positively related to SIT rates, such that those states with higher (lower) rates exhibit a stronger (weaker) December prepayment effect. The coefficients for the interactions with March, May, and August are significantly negative, also consistent with our predictions.

Last, we note that these results include the future change in the federal tax rate, *CH_FRATE* (which is statistically insignificant); this mitigates potential concerns that our documented results arise due to a correlated omitted variables problem regarding the change in the federal rate. Nonetheless, we note that our results are qualitatively identical when *CH_FRATE* is excluded from our estimation or when interaction terms are added for *CH_FRATE*. Our results are also qualitatively identical when SIT rates are netted against the federal income tax benefit of deducting SIT. Furthermore, all results are robust to including state and year fixed effects.

Thus, overall, results in Tables 4 and 5 are consistent with our main predictions, suggesting that the tendency to prepay/accelerate SIT payments is relatively more pronounced for December, and that this effect is relatively more common in states with higher marginal SIT rates.

CONCLUSION

Based on a study of 34 states' aggregate data on estimated state income tax (SIT) receipts from individual taxpayers, we find evidence of taxpayers prepaying their January 15-due payment in December of the prior year. This is consistent with taxpayers strategically prepaying in order to shift the deduction on their federal income tax return from one year to the prior year. We also find that this effect is increasing with the cost of SIT payments (whether measured using SIT rates on a gross basis or net of federal tax benefit basis). The results are robust to several alternative specifications, inclusive of the one-year-ahead change in the highest marginal federal income tax rate, as well as state and year fixed effects.

Our findings contribute to a stream of archival research literature that does not typically study the existence and extent to which individuals factor taxes and the time value of money into their economic decision-making process. Furthermore, the results should also sensitize readers of state tax receipt trends in interpreting monthly, quarterly, or yearly state trend data. For example, many studies provide periodic tracking data and analyses of macroeconomic trends in the states (e.g., The Rockefeller Institute's periodic state tax trend data reports, such as recently released in Boyd

[17] SIT rates are provided by the Tax Foundation, available at http://www.taxfoundation.org/files/state_individualincome_rates-20090519.xls. Rates from years before 2000 were obtained by searching the state's tax website for prior year tax forms or instructions, or where not available, researching the state tax law. We used the highest marginal SIT rate that applied in a given year. With a handful of exceptions, the highest marginal SIT rate applies to income levels far lower than that at which the federal highest marginal tax rate applies. For federal income tax rates, we also used the highest marginal federal income tax rate that applied in the given year (between 31 percent and 39.6 percent in our data set, with the majority of observations at the 35 percent rate). We employ one-year-ahead federal rates because, for example, a prepayment of SIT in December is predicted to be less likely if federal income tax rates increase in the following year.

[18] Results are qualitatively identical when we choose to estimate *DEC* and its interaction term explicitly (and leave out the interaction term for, say, *AUG*).

and Dadayan [2009a, 2009b, 2009c]). Of course, to the extent December collections are compared year over year, and such pattern that we detect occurs annually, the implications of interpreting such macroeconomic reports are not so severe.

Our findings highlight a potential need to amend the tax law. As noted by Slemrod (1992, 254), "It is important to pay closer attention to—and strive to eliminate—aspects of the tax code that provide rewards to taxpayers for changing the timing of transactions." In our study, we find that average SIT-estimated payments in December are approximately $4.4 billion across all 34 states. This is significantly higher than in other quarters (e.g., August's prepayments are approximately $1 billion, or about 77 percent lower), and results in a nontrivial loss in revenues to the federal government. One potential avenue to address such leakage would be an amendment to Section 164(a) to require individual taxpayers to use a modified-accrual method of accounting for SIT, which would not permit deductions before their due date, or a full-accrual method of accounting for SIT. This would be an enhancement of Revenue Ruling 82–208 and IRS Publication 17, which only address the issue of taxpayers who pay large estimated SIT when they do not reasonably expect such amount to be ultimately due.

There are at least two caveats to our study due to limitations in our data. First, we examine SIT payments at the aggregate, state level. Because we do not have data on such payments at the individual-taxpayer level, we are unable to discern whether our findings are representative of the general population of taxpayers who make estimated tax payments, or are the result of influential observations—namely, a handful of very wealthy individuals (presumably not in AMT position in the prepayment year) that may drive our results. Because we do not observe the individuals' tax brackets and AMT positions, we cannot isolate whether they are prepaying so as to obtain a larger marginal tax-rate benefit for the deduction, to avoid losing a deduction under AMT, or to exploit the time value of money. Second, there are aspects of the data that introduce noise and/or bias into our empirical tests. Specifically, many states could not segregate the amount of their estimated taxes from extension payments, and information was not always available about how refunds that were applied to the following year's estimated tax payments were handled. Also, May observations may be biased to the extent that the very busy month of April may lead to some estimated tax payments mailed in April being processed in May. However, we expect these aspects to predominantly impact March through May data, and not our measure of December prepayments, especially when compared to August prepayments.

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