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Analysis of differences in the recognized and realized costs of stock options and the implications for studies of tax avoidance

Chelsea Rae Austin
University of Iowa

ANALYSIS OF DIFFERENCES IN THE RECOGNIZED AND REALIZED COSTS OF STOCK OPTIONS AND THE IMPLICATIONS FOR STUDIES OF TAX AVOIDANCE

by

Chelsea Rae Austin

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Thesis Supervisor: Associate Professor Cristi A. Gleason

Graduate College
The University of Iowa
Iowa City, Iowa

CERTIFICATE OF APPROVAL

PH.D. THESIS

This is to certify that the Ph.D. thesis of

Chelsea Rae Austin

has been approved by the Examining Committee
for the thesis requirement for the Doctor of Philosophy degree
in Business Administration at the August 2014 graduation.

Thesis Committee: _____
Cristi A. Gleason, Thesis Supervisor

_____
Daniel W. Collins

_____
S. Paul Hribar

_____
Jaron H. Wilde

_____
Ryan J. Wilson

This thesis is dedicated to my parents, Jeff and Anne Campbell. Without their love, endless support, and encouragement throughout my life this work would not be possible. I also lovingly dedicate this thesis to my husband, Ryan Austin, for the encouragement he gave and the sacrifices he made during this doctoral program.

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ABSTRACT

This dissertation contains two separate essays on the implications of the complex financial reporting rules for stock option compensation outlined under ASC 718. The first essay examines the effect of the tax benefit from employees' exercise of stock options on the cash effective tax rate. While not explicitly stated, many tax avoidance studies seek to investigate tax avoidance that is the result of firms' intentional choices. Although stock option exercise reduces a firm's tax burden, a firm does not control the timing of option exercise and the accompanying tax benefit. When the realized tax benefit deviates from the firm's expected cost, stock option exercise results in *unanticipated* changes in the cash taxes paid. The cash effective tax rate (*CASHETR*), a common measure of tax avoidance, reflects both the anticipated and unanticipated cash tax savings from employees' exercise of stock options. *CASHETR's* inclusion of unanticipated cash tax savings mismeasures intentional tax avoidance.

Using both parametric and non-parametric analysis I show that the unanticipated tax benefit from employees' stock option exercise can cause firms to be identified as more aggressive tax avoiders, although their intentional activities are not relatively agressive, a Type I error. I also show that, among other differences, firms with greater unanticipated tax benefits from employees' exercise of stock options are more profitable, are less levered, have more extensive R&D, and have larger market-to-book ratios. Because these firm characteristics are often used as controls in studies of tax avoidance, the relationship between these variables and *CASHETR's* mismeasurement of intentional tax avoidance creates an endogeneity problem for researchers and could lead to incorrect inferences.

I use a research simulation to inform researchers of an implication of this endogeneity concern when *CASHETR* is used to measure firms' intentional tax avoidance. I construct a hypothetical firm characteristic that is correlated to varying degrees with stock growth. This hypothetical firm characteristic represents a number of firm

characteristics that are variables of interest in studies of tax avoidance. Using a common model of tax avoidance, I test the null hypothesis that this hypothetical firm characteristic is not a determinant of tax avoidance. I show *CASHETR*'s inclusion of the unanticipated tax benefits from employees' exercise of stock options leads to inflated rejection rates of the null hypothesis (i.e. high Type I error rates) and can change inferences about determinants of intentional tax avoidance.

Researchers investigating in tax avoidance can avoid the problems caused by the unanticipated tax benefit from stock options in two ways. First, they can use the effective tax rate for financial reporting purposes (*GAAPETR)*. Because the financial reporting rules prohibit firms from including the unanticipated tax benefit from stock options in the calculation of the firm's tax expense, the unanticipated tax benefit from stock options does not affect *GAAPETR*. Second, researchers can use the excess tax benefit from the exercise of stock options disclosed by firms to adjust *CASHETR* to remove these unanticipated cash tax savings ($CASHETR_{WITHOUT}$).

The second essay in this dissertation examines the difference between firms' *recognized* and *realized* costs from stock option compensation. Under ASC 718 a firm recognizes the estimated value of stock options at their grant date as an expense for financial reporting purposes. This estimate often differs from the realized cost of the stock options, which consists of the cash proceeds forgone because the stock is issued to an option holder at a below-market exercise price. When ASC 718 was implemented, critics contended that these reporting rules allowed firms to avoid recognizing the full amount of wealth transferred from shareholders to employees.

Consistent with this concern, I find that the median difference in the realized cost and recognized cost of options is $0.99 million, or 1.46 percent of pretax book income, in each year of my sample period. This translates into a wealth transfer from shareholders to employees in each year of my sample period of three cents per share in excess of recognized. I also find that the realized cost from stock option compensation exceeds the

recognized cost by $7.8 million, or 4.96 percent of pretax book income, in each year of my sample period for twenty-five percent of firms. The shareholders of these firms are transferring to employees 11.58 cents per share in excess of the recognized cost of stock options in each year of the sample period. Overall, these results suggest that firms using stock option compensation generally avoid recognizing the full realized cost of stock options.

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CHAPTER 1: ANALYSIS OF STOCK OPTION TAX BENEFITS ON EFFECTIVE TAX RATES

1.1 Introduction

This paper uses firms' disclosures about stock options, recently available in machine-readable form, to empirically investigate the effects of the tax benefit from the exercise of stock options on the cash effective tax rate (*CASHETR*). I show *CASHETR* mismeasures intentional tax avoidance and that this measurement error is associated with firm attributes including profitability, research and development expenses, and the market-to-book ratio which creates an endogeneity concern for researchers and may lead to incorrect inferences in some research settings.

Stock option exercise can result in substantial tax savings, but a firm's actions or inactions do not determine the timing and magnitude of this deduction.[1] Once an option holder decides to exercise an option, the firm receives a tax deduction equal to the firm's realized cost of the option--the difference between the stock price on the date of exercise and the strike price of the option.[2] When a firm makes the decision to grant an option to an employee, it has an expectation as to the value of the option at its exercise, but this expectation is necessarily an estimate. Deviation of the realized cost of stock options from the firm's expected cost results in unanticipated changes in the tax liability of the firm.

Defining and estimating firms' tax avoidance plays a central role in tax avoidance research.[3] While generally not explicitly stated, many researchers imply that they want to

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[1]For example, Citizens for Tax Justice estimated that during 2012 Fortune 500 companies saved $11.2 billion in income taxes. Accessed 12/1/2013 http://www.ctj.org/ctjreports/2013/04/executive-pay_tax_break_saved_fortune_500_corporations_27_billion_over_the_past_three_years.php#.UpthMcRJOyQ

[2]This is the firm's realized cost of the option because it equals the cash proceeds forgone when the option holder receives stock at a below-market exercise price.

[3]Tax avoidance and tax aggressiveness are not synonymous. If tax avoidance is the continuum of strategies to reduce taxes where perfectly legal and fully supported positions are at one end, e.g. taking advantage of accelerated depreciation, then tax aggressiveness is at the other end of the continuum. See Hanlon and

investigate tax avoidance that is the result of *intentional* firm activities. For instance, Rego and Wilson (2012) argue that tax avoidance is a risky activity and managers must be incentivized to engage in tax avoidance. McGuire, Omer, and Wang (2012) define tax avoidance as "strategy that reduces a firm's tax liability." Cheng, Huang, Li, and Stanfield (2012) follow a similar definition of tax avoidance. They define tax avoidance as, "activities that reduce explicit taxes per dollar of pretax accounting earnings." These definitions imply two critical elements in identifying tax avoidance: 1) *intentional* action by firm management 2) affecting the tax liability of the firm. While researchers may want to investigate tax avoidance from firms' intentional choices, researchers' estimates of firms' effective tax rates do not always distinguish between tax reduction from intentional choices and tax reduction unexpected by firms.[4,5] Unanticipated changes in the firm's tax liability from employees' exercise of stock options fall into the latter category.

There are two effective tax rates that are frequently used by both academics and non-academics to identify tax avoiders: the effective tax rate for financial reporting purposes (*GAAPETR*) and the cash effective tax rate (*CASHETR).* Both of these effective tax rates compare a measure of a firm's tax liability relative to the income reported to shareholders. *GAAPETR* uses firms' recognized tax expense to measure firms' tax liability while *CASHETR* uses firms' cash taxes paid to measure firms' tax liability. The complex financial reporting rules for recognizing stock option compensation prohibit firms from

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Hetizman (2010) for a thorough discussion of the difference. Stock option exercises will also result in mismeasurement of managers' intentional tax aggressive actions.

[4]To be clear, I do not expect that distinguishing between firms' intentional tax avoidance and tax reduction from sources outside the firms' control is always appropriate. For instance, sometimes researchers want to investigate firms' total tax burden. In these studies researchers should not distinguish between tax reduction from firms' intentional activities and tax reduction from other sources.

[5]Besides employees' exercises of stock options, unexpected tax reduction could arise from unexpected changes in tax law or catastrophic natural events, such as floods and fires. I leave it to other studies to investigate these other avenues of unexpected reduction in firms' tax liability.

including the unanticipated tax benefit from employees' exercise of stock options in recognized tax expense.[6] Therefore, *GAAPETR* does not reflect the unanticipated tax benefit from employees' exercise of stock options and *GAAPETR* does not mismeasure intentional tax avoidance in this respect. Because the unanticipated tax deduction from employees' stock option exercises results in cash tax savings, *CASHETR* mismeasures intentional tax avoidance.

The effect of the financial reporting rules for stock option compensation on *GAAPETR* under Financial Reporting Standard (FAS 123) is well known and thoroughly discussed in Hanlon and Shevlin (2002).[7] Hanlon and Shevlin do not address the effect of stock options on *CASHETR* because *CASHETR* was subsequently developed in Dyreng, Hanlon, and Maydew (2008).[8] Before the current financial reporting rules for stock option compensation were enacted in 2006, Hanlon and Shevlin (2002) use hand-collected data from NASDAQ 100 firms and show adjusting *GAAPETR* for the entire tax benefit from stock option exercise results in substantial changes. For instance, the average effective tax rate in their sample falls by more than half, from 34.4% to 15.5%, after incorporating the entire tax benefit from the exercise of stock options. Despite the evidence provided by Hanlon and Shevlin (2002), subsequent research has typically acknowledged--but not explicitly controlled for--contamination from the tax benefit of stock options, due in part to data limitations. Financial reporting rules for stock option compensation changed subsequent to the publication of Hanlon and Shevlin (2002),

[6]The financial reporting rules for stock options are discussed more fully in Appendix B and Section 1.2.1.

[7]Under FAS123, firms were only required to recognize stock option compensation for financial reporting purposes if the strike price of the option was more than the stock price at grant date. If firms did not recognize stock option compensation, they were not allowed to recognize any tax benefit from option exercise in reported income.

[8] Dyreng, Hanlon, and Maydew (2008) are careful to note that *CASHETR* is a measure of tax avoidance designed to capture all reductions in firms' tax payments *regardless of the source*.

further complicating researchers' understanding of the effect of the exercise of stock options on firms' tax liability.

Beginning in 2006, Statement of Financial Accounting Standards 123R, now Accounting Standards Codification 718 (ASC 718), requires companies to expense the fair value of options on their own stock granted to their employees as those options vest.[9,10] The compensation expense recognized is the present value of the cost of the options that the firm expects to realize.[11] Because the tax deduction that is ultimately taken by the firm is equal to the realized cost of the options, the recognized cost of options is an estimate of the firm's anticipated tax deduction from option exercise that will occur once the options are exercised.

While Hanlon and Shevlin (2002) investigate changes in researchers' estimates of tax burdens after including the entire tax benefit of stock options, I focus on the potential changes in researchers' inferences of firms' tax avoidance depending on the inclusion of the unanticipated tax benefit from employees' stock option exercise in the calculation of *CASHETR*. Although firms have disclosed option data since 1995, these data have only recently been made available through Compustat.[12] I use these data to estimate empirically the unanticipated tax deduction from employees' exercise of stock options for

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[9]Appendix B and Section 1.2.1 discuss the financial reporting for the recognized and realized costs of stock options and the related tax benefit.

[10]To value options, ASC 718-10-55-21 requires firms to use valuation models which, at a minimum, incorporate the following factors: the stock price at grant date, the exercise price, the expected life of the option, the expected volatility of the firm's stock (and any expected dividends) and the expected risk-free interest rate over the expected life of the option.

[11]Firms are required to recognize the fair value at grant date of stock options as those options vest. The fair value of options is the value of the option to the employee- the present value of the expected difference between the stock price upon exercise and the strike price of the option. Because the difference between the strike price of the option and the price of the underlying stock upon exercise is the realized cost of the option to the firm, the recognized expense is an estimate of the present value of the expected realized cost to the firm.

[12]Similar option data is disclosed when FAS 123 was in effect, but this data requires hand-collection.

all firms in the Compustat population with data available for every year following the required expensing of stock options, 2006-2012. To investigate the effects of the unanticipated tax benefit from employees' exercise of stock options, I modify *CASHETR* to remove the unanticipated tax benefit from employees' exercise of stock options ($CASHETR_{WITHOUT}$). The only difference between *CASHETR* and $CASHETR_{WITHOUT}$ is the unanticipated tax benefit from employees' exercise of stock options. Thus any difference between inferences when *CASHETR* is the measure of tax avoidance and inferences when $CASHETR_{WITHOUT}$ is the measure of tax avoidance is attributable to the unanticipated tax benefit from employees' exercise of stock options. Among my sample firms, I find that the median of *CASHETR* is 2.72 percent lower than the median of $CASHETR_{WITHOUT}$. *GAAPETR* does not reflect unanticipated tax savings from option exercises. I include it in my analysis as a benchmark of the effect of the unanticipated tax benefit from the employees' exercise of stock options on *CASHETR*.

I use my estimate of firms' unanticipated tax deduction scaled by pretax book income, *UNANTICIPATED*, to identify firms where *CASHETR* is most affected by the unanticipated tax benefits from employee exercise of stock options. Using both parametric and non-parametric tests, I find significant differences in *CASHETR* between firms in the highest quintile of *UNANTICIPATED* and other firms, but I do not find significant differences in $CASHETR_{WITHOUT}$ or *GAAPETR*. Because the unanticipated tax benefit from employees' option exercise is large enough to change which firms are identified as aggressive tax avoiders, including this benefit in *CASHETR* causes a material measurement error when *CASHETR* is used to measure intentional tax avoidance.[13] I also find that there are significant differences in firm characteristics that

[13] The only difference in *CASHETR* and $CASHETR_{WITHOUT}$ is the adjustment for excess cash tax savings from employees' stock option exercises. Thus, any differences in inferences made with these measures is attributable to the effect of the unanticipated tax benefit from stock option compensation.

are often used as controls in studies of tax avoidance (including profitability, leverage, the market-to-book ratio, and R&D expense) between firms in the highest quintile of *UNANTICIPATED* and other firms. Thus, the measurement error when intentional tax avoidance is measured with *CASHETR* is related to independent variables in studies of tax avoidance. These findings are problematic because in ordinary least squares analysis, common to tax avoidance research, all the coefficient estimates can be biased when measurement error in the dependent variable is related to any of the independent variables.[14] Thus, *CASHETR's* mismeasurement of intentional tax avoidance creates an endogeneity problem for researchers and may lead to incorrect inferences.

I conduct a research simulation to illustrate an implication of this endogeneity concern when *CASHETR* is used to measure firms' intentional tax avoidance. I construct a hypothetical firm characteristic that is correlated to varying degrees with stock growth.[15] This hypothetical firm characteristic represents a number of firm characteristics that could be investigated as a determinant of tax avoidance in future research. I test the null hypothesis that the hypothetical firm characteristic is not a determinant of firms' tax avoidance using a common model of tax avoidance. I find that as the correlation between stock growth and the hypothetical firm characteristic increases, the rejection rate of the null hypothesis increases rapidly when *CASHETR* is the measure of tax avoidance, but increases only slightly when *GAAPETR* or $CASHETR_{WITHOUT}$ is used as the measure of tax avoidance. These results demonstrate that the inclusion of the unanticipated tax benefit from employees' exercise of stock options in *CASHETR* causes inflated rejection

[14]Bound and Krueger (1991) state "If the measurement error in the dependent variable is correlated with any of the independent variables, however, the measurement error problem is more severe since the estimated coefficients will be biased and inconsistent."

[15]I choose to correlate the simulated variable with stock growth because stock growth is correlated with the unanticipated tax benefit of stock options and is correlated with the variable of interest in previous tax avoidance studies. See Section 1.4.5 for a more detailed explanation of this choice.

rates and can change researchers' inferences about determinants of intentional tax avoidance.

Researchers can mitigate concerns that the unanticipated tax benefit from stock options affects their inferences about intentional tax avoidance through their choice and calculation of effective tax rates. The traditional *GAAPETR* excludes the unanticipated tax benefit from the exercise of stock options and, therefore, is a good choice for researchers investigating firms' intentional tax avoidance. While *GAAPETR* does not include the unanticipated tax benefit from stock options, it has other limitations as a measure of tax avoidance (Hanlon and Heitzman, 2010). For instance, *GAAPETR* does not capture tax avoidance strategies that defer income recognition for tax purposes and it includes the effects of reserves for uncertain tax positions. When researchers want to investigate tax avoidance in settings where firms are likely to have accrued reserves for challenges by the taxing authority, *CASHETR* would be a more appropriate measure of tax avoidance than *GAAPETR.* When *CASHETR* is a more appropriate measure of tax avoidance and researchers are investigating *intentional* tax avoidance, they should adjust *CASHETR* to remove the excess tax benefit in the financing section of the statement of cash flows ($CASHETR_{WITHOUT}$).

This study adds to tax literature by explaining the effects of ASC 718 on the reporting of firms' tax benefit from employees' exercise of stock options and by describing the effects of the unanticipated tax benefit from stock options on estimates of firms' effective tax rates. The analyses show the potential problem in researchers' inferences about intentional tax avoidance when *CASHETR* is used as the measure of tax avoidance. This finding is especially important to tax researchers considering approximately 30 current working papers on SSRN use *CASHETR* as a measure of tax avoidance.[16]

[16]I define current working papers as those that have been uploaded or updated in the past three years.

The rest of the paper proceeds as follows. Section 1.2 discusses the financial reporting rules for stock options and their related tax benefit and discusses prior literature. I discuss sample selection and variable construction in Section 1.3. Section 1.4 contains the main empirical analyses. Supplemental analyses are found in Section 1.5 Section 1.6 concludes the first chapter.

1.2 Motivation

1.2.1 Background: Accounting for stock options and their tax benefit

ASC 718 (formerly FAS 123R) requires companies to recognize as an expense the estimated fair value of stock options granted to employees as those options are earned.[17] Because employee stock options are not traded on an open market, the company estimates the fair value of the stock options at the grant date using stock option valuation models. The company then recognizes this value as an expense ratably over the vesting period. The fair value of each option should be the value of the option to the employee, which is the present value of the difference between the expected stock price at the anticipated exercise date and the strike price of the option. The realized cost of the option to shareholders of the firm granting the option is the amount of cash forgone because the company must sell the stock at a discount to the employee exercising the option, i.e. the difference between the actual stock price at option exercise and the strike price of the option.

For tax purposes, firms do not deduct stock option expense until the employee exercises the option.[18] The amount of the tax deduction that a firm actually receives is the

[17]Prior to the enactment FAS 123R firms were encouraged but not required to recognize the fair value of options granted.

[18]There are two types of stock options: incentive stock options (ISOs) and nonqualified stock options (NQOs). Corporations do not receive a tax deduction for ISOs when stocks are granted, exercised, or sold. The examples in this paper illustrate NQOs. Without firm-provided information there is no way to identify whether options are ISOs or NQOs. However, the measurement issues discussed are applicable to both ISOs and NQOs.

difference between the strike price and the stock price at exercise, which is also the realized cost of the option. Under ASC 740, as firms recognize stock option compensation expense they also recognize a deferred tax benefit for the *anticipated* future tax deduction from option exercise.[19, 20] This deferred tax benefit establishes a deferred tax asset. The options' deferred tax benefit is equal to the estimated fair value of the options at grant date, which is the estimated tax deduction, multiplied by the firm's applicable tax rate. For example, consider a firm that grants 100 stock options that vest in a single year and are valued at $10 each. The federal statutory tax rate is 35%. The firm recognizes stock option compensation expense for these options in the amount of $1,000 [$10 × 100]. The firm also records a deferred tax asset of $350 [$10 × 100 × 35%], which decreases deferred (as well as total) tax expense and increases net income.

When the realized value of stock options exceeds the previously recognized value of options, the firm receives a larger tax deduction than expected and the firm's actual tax savings exceed the previously recognized tax benefit. This is referred to as a tax windfall because the firm is receiving a larger tax benefit than it anticipated. Alternatively, when the realized value of options is less than the previously recognized value of options, the

[19]The reporting of the tax benefit of stock option exercise is more complex for firms in a tax loss position or firms with an existing NOL than for firms with positive taxable income and no NOL carry forwards. For simplicity, the discussion assumes that a firm has positive taxable income without an existing NOL. Details of the impact on firms without positive taxable income or firms with an existing NOL and positive income is included in Appendix C. I exclude firms without a cumulative positive net income from my main analysis. Tax research studies commonly eliminate firms without positive net income because of the difficulty in interpreting effective tax rates when the denominator is negative.

[20]The recognized cost of options is the estimated value of the option to the employee, namely the present value of the expected value of the option at anticipated exercise. I disregard the effect of the present value discount applied to determine the fair value of options granted for two reasons. First, the average risk free rates used in firms' calculations are low during the time period studied, 2.81 percent. Second, this discount should be applied relatively evenly across firms. Because I am more interested in cross-sectional differences between firms with large differences between the anticipated and realized tax deduction the discount should not affect my analysis. Including an adjustment for the risk-free rate should not change my identification of those firms most likely to have a relatively large unanticipated tax benefit from stock options.

firm's actual tax savings is less than the deferred tax benefit previously recognized. In this circumstance firms receive a smaller deduction than expected, creating a tax shortfall. The tax windfall (shortfall) represents an unexpected benefit (expense) because the tax deduction for stock options was greater (smaller) than expected.

Continuing with the previous example, assume that five years after the grant date an employee holding 50 of the outstanding options exercises them when the stock price is $40 above the strike price. The firm's marginal tax rate is equal to the statutory rate of 35%. At the time of exercise, the firm receives a tax deduction of $2,000 [$40 × 50 options] and realizes a tax benefit of $700 [$2,000 ×35%]. ASC 718 limits the tax benefit included in current tax expense to $175, the amount originally recorded as a deferred tax asset [$10 × 50 × 35%]. Reclassifying the expense from current to deferred tax expense has no effect on total tax expense or net income. The realized tax benefit of $700 exceeds the deferred tax benefit of $175 recognized for these 50 options by $525. Thus, the firm's tax windfall is $525, the amount by which the realized benefit exceeds the recognized benefit. The excess benefit bypasses the income statement and flows directly to owners' equity. The firm’s tax windfall increases additional paid in capital (APIC- Tax Windfall) by $525. Therefore, while firms in a tax windfall position receive unanticipated cash tax savings, the savings are not recognized in tax expense or net income.

Conversely, when a firm experiences a tax shortfall, the expected (i.e. recognized) tax benefit is never realized. Returning to the preceding example, assume that a second employee holds the other 50 options and allows those options to expire. The firm has no realized cost for these unexercised options, nor does the firm get a tax deduction for any of these options. The firm has had no other stock option activity, so the APIC- Tax Windfall balance remains at $525. Instead of eliminating the remaining unrealizable deferred tax asset of $175 by recognizing additional tax expense, the firm removes the deferred tax asset by decreasing APIC- Tax Windfall. ASC 718 permits firms to offset a tax shortfall against prior windfalls when the balance of APIC- Tax Windfall is positive.

Otherwise, firms recognize additional tax expense. More detail on the treatment of the tax benefit from stock options is included in Appendix B and C.

1.2.2 Implications for tax avoidance measures

Two commonly used measures of tax avoidance are the GAAP effective tax rate (*GAAPETR*) and the cash effective tax rate (*CASHETR*). *GAAPETR* is calculated as the firm's tax expense, as reported on a firm's financial statement, divided by the firm's pretax book income.[21] *CASHETR* is typically calculated by dividing the cash taxes paid during the fiscal year by pretax book income adjusted for special items (Dyreng, Hanlon, and Maydew, 2008). Both of these effective tax rates capture a measure of the firm's tax liability relative to income reported to shareholders. They are relatively easy to calculate and are used by both academics and non-academics to identify tax avoiders.[22] According to general interpretation, firms with lower effective tax rates engage in more tax avoidance than other firms (Hanlon and Heitzman, 2010).

The effect of the financial reporting rules for the tax benefit from employees' exercise of stock options under FAS123 on researchers' estimates of *GAAPETR* is well known and discussed in Hanlon and Shevlin (2002). Pre-ASC 718 firms were only required to recognize stock option compensation expense if the price of the underlying stock exceeded the strike price of the options. Because this was a rare occurrence, firms rarely recognized any stock option compensation expense. The recognition of any income tax benefit from employees' exercise of stock options was limited to the amount generated by the stock option compensation recognized. Therefore, few firms recognized any income tax benefit from stock options during this period.

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[21]Depending on the research question, both *GAAPETR* and *CASHETR* are measured over one or multiple years.

[22]For instance, Citizens for Tax Justice (2011) identified firms as "tax dodgers" on the basis of their cash effective tax rates.

Using hand-collected data for NASDAQ 100 firms, Hanlon and Shevlin (2002) demonstrate the importance of considering stock options' effect on researchers' estimates of firms' GAAP effective tax rates pre-ASC718. They find that after adjusting for the tax benefit from stock option exercise, the mean (median) U.S. effective tax rate drops from 34.40% (33.44 %) to 15.50% (11.95%).[23] They suggest researchers subtract the employee stock option tax benefit reported on the shareholders' equity statement from the firm's current tax expense to provide a more accurate estimate of the tax burden for profitable firms.[24] Their suggested adjustment includes the entire tax benefit from stock options. It does not necessarily differentiate between the anticipated and unanticipated tax deduction from stock option exercise. Also, this adjustment is not readily available in machine-readable form. Subsequent research has typically acknowledged--but not explicitly controlled for--the contamination for the tax benefit of stock options, in part due to this data limitation.

Hanlon and Shevlin (2002) do not discuss the effect of stock option exercise on *CASHETR*, because Dyreng, Hanlon, and Maydew (2008) developed *CASHETR* subsequent to Hanlon and Shevlin (2002). Dyreng et al. note that a key difference in *GAAPETR* and *CASHETR* is the effect of stock options. FAS123 was still in effect during Dyreng, Hanlon, and Maydew's (2008) sample period. Therefore, as pointed out in Hanlon and Shevlin (2002), *GAAPETR* does not capture the tax benefit from stock option exercise because firms rarely recognized stock option compensation. *CASHETR*, on the other hand, captures all of the tax benefit from the exercise of stock options. The authors

[23]Hanlon and Shevlin (2002) investigate changes in researchers' estimates of marginal tax rates, effective tax rates, and taxable income for a small number, forty-two, of firms. They focus on changes in the sample mean and median of these measures. Because of the small sample size their results do not speak to differences of the change in these measures across a wide variety of firms.

[24]They do not suggest using the excess tax benefit reported on the statement of cash flows because they find fewer firms report the excess tax benefit on the statement of cash flows than on the statement of stockholders' equity. The latter disclosure is required under ASC 740.

acknowledge the importance of the tax savings from option exercise on *CASHETR* by stating, "A cluster of companies in the Business Services industry are likely on the list [of firms with a low cash effective tax rate] at least in part due to the heavy use of employee stock options during [their sample period].".

Under current financial reporting rules, outlined under ASC 718, firms recognize the *anticipated* cost and tax benefit from stock option compensation on their income statement, so these are measured by *GAAPETR*. Neither the unanticipated cost nor the unanticipated tax benefit from employees' exercise of stock options is included in firms' recognized income. Thus, *GAAPETR* is relatively unaffected by the unanticipated tax benefit from stock option exercise.[25] Like the denominator of *GAAPETR*, the denominator of *CASHETR* never reflects the unanticipated cost from stock option exercise because firms never recognize this cost. However, both the anticipated and unanticipated tax deduction from option exercise result in cash tax savings. Accordingly, the numerator of *CASHETR* reflects the unanticipated tax benefit from stock option exercise. This results in two issues. First, *CASHETR*, by construction, reflects both intentional tax avoidance and the unanticipated tax benefit from stock option exercise. Second, the numerator and denominator of *CASHETR* are incongruous, in that the numerator includes the unanticipated tax benefit of stock options but the denominator does not include the unanticipated cost of stock options. Appendix C details the impact of stock options on researchers' measures of tax avoidance.

Because *CASHETR* is reduced by both anticipated and unanticipated cash tax savings from option exercise, the use of *CASHETR* to evaluate firms' intentional tax

[25]While *GAAPETR* does not reflect a positive unanticipated tax benefit it can reflect a negative tax benefit for firms with a zero or negative balance in APIC: Tax Windfall. In this circumstance the firm will adjust the tax benefit recognized but never realized through an increase in income tax expense. A *GAAPETR* measured over multiple years will reflect this adjustment. Thus, a multi-year *GAAPETR* will reflect the realized tax benefit of stock options.

avoidance creates a mismatch between what *CASHETR* measures and what the researcher wants to measure--a construct validity issue. For instance, consider two firms that are identical in every way, including their tax strategy. These firms issue the same number of stock options at the same time with the same strike price. Accordingly, these two firms have the same anticipated cost and tax benefit of stock options. Without loss of generalization, suppose these firms are in the pharmaceutical industry and are in a race to secure a patent for the same miracle weight-loss drug. Because these firms are identical, each firm has a fifty percent chance of securing the patent and each firm knows it. Firm A beats Firm B to the patent. Accordingly, Firm A's stock price rises sharply while Firm B's stock price falls. The stock options on Firm A's stock are going to result in a much larger tax benefit than the stock options on Firm's B's stock because options on Firm A's stock are more likely to be exercised and each option exercised results in a larger tax deduction. Because *CASHETR* does not distinguish between the anticipated and unanticipated tax benefits from stock options, the larger unanticipated tax benefit from the exercise of stock options will cause Firm A's *CASHETR* to be lower than Firm B's. Firm A's lower *CASHETR* would be interpreted as Firm A engaging in more aggressive tax avoidance despite the firms' identical tax strategies. This example illustrates the importance of differentiating between tax reduction from a firm's deliberate actions and tax reduction from sources outside the firm's control when identifying aggressive tax avoiders.

1.2.3 Firm characteristics related to the unanticipated tax deduction from employees' exercise of stock options

Prior research finds that firms' characteristics, including industry membership, size, R&D expenditures, book-to-market ratios, number of employees, stock return during the year, and average return volatility within a firm's industry are associated with the level of options granted (Oyer and Shaefer, 2005, Core and Guay, 2001, Kedia and

Mozumdar, 2002, Babneko and Tzerlukevich, 2009).[26] Research on firms' characteristics associated with the exercise of stock options finds that stock price volatility, dividend yield, unexpected positive stock returns, a larger number of options that will expire within six months, a larger number of options that vested in the previous six months, and options that are more in-the-money will all increase the probability of option exercise (Bettis, Bizjack, and Lemmon, 2005, Heath, Huddart, and Lang, 1991, Core and Guay, 2001). Because firms' characteristics are related both to the number of options granted and to the number of options exercised, they are also correlated with the difference between the realized and recognized costs of options, which is equal to the unanticipated tax deduction from the exercise of stock options.

Many of the variables shown to be correlated with stock option grants or with stock option exercises are commonly used as control variables in multivariate tests of intentional tax avoidance, including: profitability, R&D expenditures, and the book-to-market ratio. This is important. If firm characteristics are related to the anticipated and/or realized tax deduction from stock option compensation, they are also likely to be related to the unanticipated tax deduction from stock option compensation, i.e. the measurement error when *CASHETR* is used to measure intentional tax avoidance.

When using ordinary least squares analysis (OLS), as is common in tax avoidance research, estimated relationships between the independent variable and the dependent variables are inefficient, but not biased if the dependent variable includes measurement error and that error is random. However, if the measurement error in the dependent variable is related to even one independent variable, then all coefficient estimates could be biased because the correlation between the measurement error and any of the

[26]Specifically, these are "new economy" firms, that is, firms that have SIC codes that indicate they manufacture computers, semiconductors, or telephone equipment, wholesale computer-related products, create software or are internet-related.

independent variables is "smeared" over all coefficient estimates.[27, 28] The sign of the bias is not predictable because it is a combination of multiple factors including the sign of the covariance between the measurement error and the independent variables and the sign of the covariance between the independent variables. Therefore, the correlation between *CASHETR's* mismeasurement of intentional tax avoidance and the variables included in multivariate tests of intentional tax avoidance causes an endogeneity issue in studies of intentional tax avoidance.

To provide evidence on the complications caused by using *CASHETR* to measure intentional tax avoidance, I begin by examining the correlation between an estimate of the unanticipated tax benefit from stock option compensation and firm characteristics.[29] I focus my analysis on firm characteristics commonly used as controls in tests of tax avoidance including profitability, net operating loss carry forwards, size, foreign income, tangible assets, growth opportunities, leverage, and research and development expenses.[30] Many of these variables are often used as controls in studies of tax avoidance because they were once determinants, i.e. variables of interest, shown to be related to tax

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[27] Bound and Krueger (1991) state "If the measurement error in the dependent variable is correlated with any of the independent variables, however, the measurement error problem is more severe since the estimated coefficients will be biased and inconsistent."

[28]Dr. William Greene http://people.stern.nyu.edu/wgreene/Econometrics/Econometrics-I-13.pptx

[29]The amount of unanticipated tax benefit is a function of the firm's marginal tax rate and the unanticipated tax deduction. A firm's marginal tax rate is not disclosed and is difficult to estimate. Incorporating an estimate of the marginal tax rate may add noise to the identification of those firms most likely to receive a large unanticipated tax benefit. While the recognized and realized costs of stock options might not inform about the unanticipated tax benefit directly, they do provide an indication of a firm's relative unanticipated tax benefit because the difference between these costs measures the magnitude of the tax deduction which gives rise to the underlying tax benefit.

[30]Among others McGuire, Wang, and Wilson (2014) use these same control variables in their studies of firms' tax avoidance. Cheng, Huang, Li, and Stanfield (2012), Gallemore, Thornock, and Maydew (2014) Hoopes, Mescall, and Pitman (2012), and Robinson, Sikes, and Weaver (2010) use these same base variables in their studies of firms' tax avoidance, but include additional control variables appropriate to their variable of interest. Chen, Chen, Cheng, and Shevlin (2010) and Higgins, Omer, and Phillips (2014) use almost all of these variables as their controls of tax avoidance.

avoidance. Profitability (*ROA*) and net operating loss carry forwards (*NOL* and *ΔNOL*) are used as controls because prior research has shown that income tax avoidance needs vary across firms based on their profitability (Chen et al., 2010). Investigations of tax avoidance control for foreign income (*FORINC*); property, plant, and equipment (*CAPINT*); and total assets (*AT*) because prior research has shown that economies of scale and firm complexity are associated with additional tax planning opportunities (Mills et al., 1988; Rego, 2003). Firms' growth opportunities, represented by the market-to-book ratio (*MTB*), are controlled for because Chen et al. (2010) note that rapidly growing firms invest more in tax-favored assets. Studies of tax avoidance include leverage as a control because Graham and Tucker (2006) show that tax shelter firms--a proxy for aggressive tax avoiders--have lower leverage ratios. Also, finance theory posits that firms will issue debt to the extent that they can take advantage of the tax deduction and then issue equity capital. This practice would make the leverage ratio a potential indicator of tax rates (e.g., DeAngelo and Masulis, 1980 and Graham, 1996). Research and development expense (*R&D*) is often included as a control variable because research and development expenditures generate tax credits that are negatively related to effective tax rates (Gupta and Newberry, 1997).

In addition to these firm characteristics common to tax avoidance studies, I also examine the following firm characteristics that are likely related to firms' unanticipated tax deduction from stock options: growth in stock price over the previous three years (*STCKGRWTH3*), return volatility (*RETURNVOL*), and whether firms operate in new economy industries (*NEWECON*). [31] Prior literature has consistently found that these variables are related to firms' option-granting behavior and/or employees' exercising behavior (see previous discussion).

[31] *MTB* controls for growth *opportunities*. Growth opportunities and past stock growth are distinct concepts.

After providing evidence on the correlation between my estimate of the unanticipated tax benefit from option exercise and these firm characteristics I conduct tests of differences in firm characteristics between those firms whose *CASHETR* is affected the most by the unanticipated tax benefit from stock option exercise and other firms. After establishing that the measurement error caused by the unanticipated tax benefit from employee stock option exercise is non-random and correlated with independent variables in tax avoidance studies, I show that researchers' identification of aggressive tax avoiders can change depending on the treatment of the unanticipated tax benefit from stock option exercise. Finally, I illustrate an implication of using *CASHETR* to measure firms' intentional tax avoidance by demonstrating researchers' inferences change when *CASHETR* is the measure of tax avoidance as opposed to effective tax rates which exclude the unanticipated tax benefit from employees' exercise of stock options.

1.3 Sample Selection and Variable Construction

1.3.1 Sample Selection

Table 1 summarizes the sample selection process. I begin with all firms for which Compustat data are available for earnings and total assets in each year, 2006-2012, which results in 3,430 firms (24,010 firm-years). I begin in 2006 because firms' disclosed stock option data is included in Compustat beginning with the 2006 fiscal year. I delete 674 firms whose cumulative pretax book income over the sample period is less than zero. This criterion is imposed because the treatment of the tax benefit from stock option deduction is dependent upon a firm having positive taxable income.[32] Comparing the realized and recognized tax deduction from stock options suffers from a timing mismatch. The timing mismatch arises because stock options are only exercised in the

[32]I eliminate firms with a cumulative negative pretax book income instead of measuring taxable income directly. If a firm is reporting losses for book purposes they are also likely to be reporting losses for tax purposes. This adjustment in tax research is common because a negative pretax book income leads to an estimate of effective tax rates that are negative and difficult to interpret.

year they are granted if the option vests in under a year, a rare occurrence.[33, 34] Requiring firms to have data available in all years of the sample period allows for an averaging of variables over all years of the sample period to mitigate the timing mismatch between option grant and option exercise. Therefore, I also delete 1,003 firms that are missing either data necessary to estimate the fair value of options granted or data necessary to estimate the realized cost of stock options in one or more years of the sample period.[35] This requirement does not eliminate firms that do not use stock option compensation.[36] The main sample includes 31 firms that have neither stock option grants nor stock option exercises during the sample period.[37] The final data sample includes 1,752 (12,264) firms (firm-years).

One of the features of my study is that it uses stock option disclosures for a wide variety of firms. Table 2 shows the industry membership of sample firms and all Compustat firms with cumulative pretax book income greater than zero during the sample

[33]Carpenter, Stanton, and Wallace (2009) use proprietary data and find that the average option is exercised about four years after grant.

[34]Stock option disclosures do not allow financial statement users to identify grant year of options exercised or canceled.

[35]The requirement for firms to be in the sample in all years creates a survivorship bias. Because studies of tax avoidance often require firms to have data for several years, the sample effects are similar. In untabulated supplemental analysis I find that requiring firms to have information available for three consecutive years, rather than seven, does not qualitatively change my results.

[36]I examined the 10-Ks of 10 randomly selected firms that were eliminated because of missing stock option information. I identified several reasons that the information was not present in Compustat: 1) all or part of the data is disclosed in paragraph form instead of being tabled (including the statement that the firm does not use stock option compensation), 2) option data is presented in aggregate with other stock compensation (i.e. stock appreciation rights), and 3) there is no explicit information about stock option compensation.

[37] I find 7.35% of firm-years have zero options granted and zero options exercised among the Compustat population of firms that have data available all seven years of the sample and have pretax book income greater than one during the sample. I find another 13.44% of these firm-years have either the number of options granted or the number of options exercised missing from the Compustat data.

period (Compustat firms).[38] I use the ten sectors categorized by Fama and French: durables, energy, high technology, health, manufacturing, nondurables, retail, telecommunications, utilities and other.[39] I analyze differences in the proportion of firms in each sector between the sample firms and the Compustat firms using a Chi-Square test. I find the option sample is significantly more heavily concentrated in the high technology and health sectors and significantly less concentrated in the telecommunications and "other" sectors than Compustat firms.

Imposing the final selection criteria that firms have non-missing option data in all seven years of the sample period may raise the concern that my subsample over-represents the effect of stock option compensation on measures of firms' tax avoidance. To allay this concern, I compare the number of stock options granted between my sample and all firms that would have been included in my sample if I had not imposed this requirement (Compustat firms).[40] To control for the influence of firm size, I scale the number of stock options granted by a firm by the number of its employees, *OPTGRPEREMP*. Because this analysis includes firms in Compustat with missing option data, instead of averaging these variables across the seven years of the sample period, I average these variables across years where these variables are non-missing. Table 3 presents the distribution of *OPTGRPEREMP* for my sample of firms compared to Compustat firms.

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[38]I compare my sample to Compustat firms that meet all sample requirements except for the data necessary to estimate the recognized and/or realized cost of options.

[39]Available on Professor Kenneth French's website: http://mba.tuck.dartmouth.edu/pages/faculty/ken.french/Data_Library/changes_ind.html

[40]I use the *number* of options granted instead of the *value* of options granted because the number of options granted is more populated than the fair value of options granted (the other piece of data necessary to calculate the value of options granted).

I find no statistical difference in the average or median number of stock options granted per employee between my sample and Compustat firms. I conclude that requiring all firms to have non-missing option data does not create a sample of firms that differs from the Compustat population in terms of stock option usage. Any difference in the effect of stock options on firms' cash effective tax rate between my firms and Compustat firms is not the result of stock option usage.

1.3.2 Estimation of the unanticipated tax deduction

While firms do not disclose the unanticipated tax benefit from stock options specifically, they do disclose the gross tax windfall for the year. A gross tax windfall is an unanticipated tax benefit from stock option exercises in the firm's favor. Firms are required to split the cash tax savings from stock option exercise into two pieces: one reported in the operating section of the statement of cash flows and the other in the financing section. The tax savings from options attributed to the recognized stock compensation expense--that is, the anticipated tax benefit--is reported in the operating section. The remaining tax savings--the unanticipated tax benefit from stock option exercises resulting in a windfall--is reported in the financing section as "excess tax benefit." [41] The disclosure of firms' excess tax benefit (*EXCESS TAX BENEFIT*) does not capture the unanticipated tax effect of a tax shortfall, but it can provide initial evidence on the impact of the unanticipated tax benefit from stock option compensation on measures of tax avoidance.

The sample distribution of *EXCESS TAX BENEFIT* is presented in Table 4. I find that the average *EXCESS TAX BENEFIT* from the exercise of stock options resulting in a tax windfall among my sample firms is $4.9 million each year of the sample period, or

[41]ASC 230-10-45-14-e: While tax shortfalls are netted against tax windfalls in determining the effect on additional paid in capital, netting is not allowed on the statement of cash flows. Expiring options do not result in a tax deduction so there is no cash tax benefit from expiring options. By definition, there is not an excess tax benefit from options that result in a tax shortfall. This disclosure can only capture tax windfalls.

2.71 percent of pretax book income. In comparison, the median yearly *EXCESS TAX BENEFIT* is $400 thousand (or 0.84 percent of pretax book income) and the firm in the 75th percentile discloses a yearly *EXCESS TAX BENEFIT* of $3.36 million (or 2.75 percent of pretax book income). The difference in the mean and median excess tax benefit indicates that the distribution of *EXCESS TAX BENEFIT* is left-skewed. The skewness of this distribution provides evidence that a subset of firms benefits the most from financial reporting rules. *EXCESS TAX BENEFIT* disclosed by firms is concentrated in a subset of firms and is not spread evenly across firms.

Firms' disclosed excess tax benefit only includes the tax effect of option exercises where the deduction for stock options is larger than expected. Firms do not disclose the tax effect of stock option deductions that are smaller than expected. Because I am interested in the effect of the unanticipated tax benefit from employees' exercise of stock options in the cross-section, I need to identify those firms with the largest unanticipated tax benefit from stock options after including all stock option exercises, including those which result in a tax shortfall. I use footnote data on stock option grants and exercises to estimate the recognized and realized costs of stock options. A firm's total unanticipated tax benefit from employees' exercise of stock options is the difference between the recognized and realized costs of stock options. This calculation overcomes the shortcoming of the excess tax benefit disclosure because it includes the effect of all options, not just those options whose exercise results in a tax windfall.

To estimate the recognized cost of options granted in each year, I multiply the average fair value of options granted by the number of options granted and by one minus the expected forfeiture rate. Firms disclose the average fair value of options granted and

the number of options granted. Firms do not disclose an expected forfeiture rate, so I follow Marquardt (2002) and assume a forfeiture rate of four percent.[42]

RECOGNIZED_COST = Average Fair Value of Options Granted ×
Number of Options Granted × (1-4% Forfeiture Rate)

The realized cost of all options exercised in a year is equal to the number of options exercised multiplied by the difference in the average strike price of those options and the average market price of the underlying stock when those options were exercised. The number of options exercised and the average strike price of those options are disclosed by firms, while the average market price of the underlying stock is not. Therefore, to estimate the realized cost of options, I must estimate the average market price of the underlying stock for option exercises during the year.

Prior literature has not established an estimate of the average market price of the underlying stock for option exercises. Most of the previous literature that estimates the realized cost of stock options focuses on executive stock options. Disclosures about executive stock option exercise are much more detailed than the information available on stock options exercised by nonexecutives and include the realized cost upon option exercise. Only one prior paper, Marquardt (2002), estimates the realized cost of executive and non-executive options. She estimates the average market price of the underlying stock as the annual average of daily closing stock price, given the daily closing stock price is higher than the average strike price of all options exercised during the year. If options are exercised when the stock price is below the average strike price of all options exercised during the year, Marquardt's calculation overstates the realized cost of options. Critics of the current financial reporting rules for stock options, including Congress,

[42]In untabulated analysis, I test for sensitivity to this assumption. Results are qualitatively unchanged even if I assume a 0% forfeiture rate.

assert that the realized cost of stock options is larger than the recognized cost of stock options.[43] Therefore, I choose not to use Marquardt's calculation of the average market price to avoid the criticism that my assumptions bias in favor of overstating the realized cost of options.

To estimate the average stock price for option exercises during the year I choose to use the simple average of the stock price high and low during the year. Prior research shows that option exercises are more likely to occur as the underlying stock price rises (e.g. Core and Guay, 2001). Thus, using a simple average of the stock price high and low for the year is likely to understate the true realized cost of stock options because it over-weights the influence of stock prices at the lower end of the stock price distribution. Incorporating the increase in the likelihood of option exercise as stock prices rise would require developing an algorithm that assigns weights to stock prices throughout the year. Doubt exists in prior literature about the ability of non-executives to use inside information to time their stock option exercise (Huddart and Lang 1996 and 2003). Given the limited information about non-executive stock option exercise, justifying a superior stock price-weighting algorithm that would avoid concerns of overstatement is inefficient because it is not the primary purpose of this paper. I leave the development of this algorithm to future research.

To find the realized cost of employees' exercise of stock options, I multiply the number of options exercised during the year by the difference between the average strike price and the average of the stock price high and low during the year.[44]

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[43]E.g. Rue, Volkan, Best, and Lobo 2003 and Senate Congressional Record Vol. 155 No. 111

[44]For completeness, I confirm that my inferences are robust by assuming that all options were exercised at the high or low stock price for the fiscal year.

$$REALIZED\_COST = \left(\frac{stock\_price\_low + stock\_price\_high}{2}\right) - \text{Average Option Strike Price)} \times \text{Number Options Exercised}$$

To estimate the unanticipated tax benefit from employees' exercise of stock options, I subtract *REALIZED_COST* from *RECOGNIZED_COST*, I refer to this variable as *DIFF_COST*.[45] A positive *DIFF_COST* means that the realized tax deduction exceeds the anticipated tax deduction, so the firm is getting an unanticipated tax deduction.

Table 4 presents the descriptive statistics of the distribution of *RECOGNIZED_COST*, *REALIZED_COST*, and *DIFF_COST* during the sample period. I find the average (median) *RECOGNIZED_COST* is $12.40 ($2.16) million yearly and the average (median) *REALIZED_COST* is $24.81 ($4.20) million yearly. I find that both *RECOGNIZED_COST* and *REALIZED_COST* are left-skewed as the mean values are greater than values in the 75th percentile. This distribution suggests that a subset of firms make more extensive use of stock-option compensation.

While descriptive statistics about *RECOGNIZED_COST* and *REALIZED_COST* are interesting, this paper is more concerned with the difference between these values, *DIFF_COST*. The average *DIFF_COST* is $10.34 million each year of the sample period. This estimate implies that the average anticipated tax deduction for options during the 2006-2012 time period is $72.38 million less than the average realized tax deduction from stock option compensation.[46] I find that the median yearly unanticipated tax deduction is $0.99 million, which means the majority of firms are receiving a larger tax deduction from employees' stock option exercise than they anticipated when the options

[45]Despite my efforts to mitigate the timing mismatch between the year options are granted and the year options are exercised, I acknowledge that the timing mismatch is not completely corrected. I do not include the cost that was recognized (or would have been recognized under ASC718) for options that were granted prior to 2006 but exercised during the sample period. I also do not include the realized cost of options that were granted during the sample period but have not been exercised by the end of the sample period.

[46] $10.34 million × 7 = $72.38 million

were granted. I also find that the firm in the 25th percentile anticipates a tax deduction that is $70,000 larger than the tax deduction they actually receive. Thus, while the majority of firms have unanticipated tax savings, a non-negligible minority of firms have a tax deduction from stock option exercise that is smaller than expected.

The calculation of *RECOGNIZED_COST* and *REALIZED_COST* requires several assumptions. Additionally, *DIFF_COST* suffers from a timing mismatch because it assumes that options are granted and exercised in the same year. To test the validity of my *estimation* of *DIFF_COST*, I compare this variable to the firms' *disclosed* cash tax savings from stock option exercises that result in a tax windfall, *EXCESS TAX BENEFIT*. Because these validity checks focus on the relation between *DIFF_COST* and *EXCESS TAX BENEFIT*, these tests are a joint test of the reasonableness of my estimates of both the recognized cost and realized cost of stock options. In Table 5, I analyze firms with positive *DIFF_COST* and negative *DIFF_COST* separately because *EXCESS TAX BENEFIT* is only generated from tax windfalls. Therefore, *EXCESS TAX BENEFIT* as reported by firms in an overall tax windfall position is a better benchmark for the validity of *DIFF_COST* than *EXCESS TAX BENEFIT* as reported by all firms.

While *DIFF_COST* is an estimate of the unanticipated tax *deduction* from employees' exercise of stock options, *EXCESS TAX BENEFIT* is firms' disclosed unanticipated tax *savings* from employees' exercise of stock options. To directly compare *DIFF_COST* and *EXCESS TAX BENEFIT*, *DIFF_COST* would have to be multiplied by the firm's tax rate. For firms with a positive *DIFF_COST*, I find that the average *DIFF_COST* is $19.23 million. Assuming firms are using a statutory tax rate of 35%, then this average *DIFF_COST* implies an average *EXCESS TAX BENEFIT* of $6.73 million.[47] This estimate is comparable to the average disclosed *EXCESS TAX BENEFIT*

[47] $19.23 × 35% = $6.73 million

of $6.22 million. Among firms where *DIFF_COST* is negative, the average *DIFF_COST*, which indicates a net tax shortfall, reports a tax windfall of $1.56 million.[48] The expected pattern provides support that my estimate of *DIFF_COST* is reasonable.

I also calculate the correlation between firm's *DIFF_COST* and *EXCESS TAX BENEFIT*. I restrict this analysis to firms with positive *DIFF_COST* because *EXCESS TAX BENEFIT* is generated from stock option exercises that result in a tax windfall. The correlation results are presented in Table 6. I find that the Pearson correlation between *EXCESS TAX BENEFIT* and *DIFF_COST* is 0.86 and both the Pearson and Spearman correlations are significant at the one percent level. This positive and significant correlation provides further confidence that my estimate of *DIFF_COST* is a reasonable, albeit imperfect, estimate of the unanticipated costs of options.

To allow readers to assess the importance of the tax deduction from stock options, I scale *RECOGNIZED_COST*, *REALIZED_COST*, and *DIFF_COST* by pretax book income. I refer to these scaled figures as *ANTICIP_DEDUCT*, *REAL_DEDUCT*, and *UNANTICIPATED*. I use pretax book income as a scalar for two reasons: (1) scaling by pretax book income allows a better comparison of the effect of stock options on effective tax rate measures, and (2) scaling by pretax book income mitigates the effect of differences in firm size.[49] I present the descriptive statistics for *ANTICIP_DEDUCT*, *REAL_DEDUCT*, and *UNANTICIPATED* in Table 7.

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[48]The *EXCESS TAX BENEFIT* disclosed by firms is the gross unanticipated tax benefit from option exercises that result in a tax windfall. Therefore, it is reasonable that at least some firm-years with negative *DIFF_COST* will have positive *EXCESS TAX BENEFIT* because, as discussed previously, firms are not supposed to net the effect of option exercises which result in a tax windfall and option exercises which result in a tax shortfall in determining *EXCESS TAX BENEFIT*.

[49]Two things can cause a large difference in the recognized and realized costs of stock options: (1) a large difference between the strike price and the average stock price upon option exercise, or (2) a large number of option exercises. A larger firm is likely to grant a larger number of options. The relationship between firm size and various other firm attributes has been well documented by prior studies [for example, Zimmerman (1983)]. Scaling by firm size, measured as total pretax book income, limits concerns that differences between firms are a result of differences in firm size. Results are qualitatively unchanged when total revenue or total assets is used as the scaling variable.

I find that the anticipated average (median) deduction from stock option compensation is 9.3 percent (2.4 percent) of pretax book income, while the average (median) realized tax deduction is 11.7 percent (5.0 percent) of pretax book income. The impact of the unanticipated tax benefit from stock option exercise is of more concern to tax avoidance researchers because it is an estimate of the measurement error when *CASHETR* is used to measure of intentional tax avoidance. I find that the average (median) unanticipated tax benefit is 2.2 percent (1.6 percent) of pretax book income. This analysis shows that both the average and median realized tax deduction is larger than what was anticipated, consistent with the concerns of Congress that the financial reporting rules for stock option compensation allow firms to report a smaller income to the taxing authorities than what is reported to stock holders.[50] Even after scaling by pretax book income, the distribution of the anticipated, realized, and unanticipated tax deductions from employees' exercise of stock options are left-skewed. Accordingly, I focus the remainder of my discussions on median values instead of average values.

Table 8 presents the correlations between *ANTICIP_DEDUCT*, *REAL_DEDUCT*, and *UNANTICIPATED*. Because *UNANTICIPATED* is the difference between *ANTICIP_DEDUCT* and *REAL_DEDUCT*, I expect and find that *ANTICIP_DEDUCT* and *UNANTICIPATED* are significantly and negatively correlated and *REAL_DEDUCT* and *UNANTICIPATED* are significantly and positively correlated. Because realized tax deductions should be larger for firms that anticipate larger tax deductions, I expect and find that *ANTICIP_DEDUCT* and *REAL_DEDUCT* are positively correlated. The high correlation between *ANTICIP_DEDUCT* and *REAL_DEDUCT* provides tension for my assertion that the unanticipated tax benefit from stock option exercise causes certain firms to be identified as aggressive tax avoiders when *CASHETR* is the variable of interest. If

[50]See Chapter 2 for a more complete analysis.

unanticipated tax deductions do not create a lot of disagreement between *ANTICIP_DEDUCT* and *REAL_DEDUCT*, then their impact on *CASHETR* may be immaterial. The empirical analysis in Section 1.4 addresses this possibility using both parametric and nonparametric tests.

To further analyze the impact of firms' stock option compensation on their tax burden, I compare *ANTICIP_DEDUCT*, *REAL_DEDUCT*, and *UNANTICIPATED* among firms that issue stock options more heavily than other firms in the sample, and firms with the most stock option exercises to other firms in the sample. I also compare *GAAPETR* and *CASHETR* among these subsets of firms. I limit these analyses to firms in my sample that use stock option compensation. I do not compare the effective tax rates of those firms in my sample that use stock option compensation to those firms that do not use stock option compensation because there are only thirty-one firms in my sample that do not use stock option compensation. A sample size this small is not a reliable representation of all firms that do not use stock option compensation. For instance, the *ROA* of these thirty-one firms is significantly higher than both the *ROA* of all Compustat firms with positive income during the 2006-2012 time period and the *ROA* of the other 1,721 firms in my sample that use stock option compensation.[51]

To identify firms that issue stock options more heavily than other firms (*LARGEGRANTER*) I rank firms by the number of stock options the firm grants in a year scaled by the market value of equity at the end of that year, averaged over the sample period. I use the market value of equity as a scalar to control for firm size. A firm that falls into the highest quintile of this distribution is identified as a *LARGEGRANTER*. Firms that have more stock option exercises than other firms (*LARGEEXERCISER*) are

[51]I find that the median *ROA* of the 31 firms not using options is 7.4 percent, the median *ROA* of the 1,721 firms in my sample using stock options 5.9 percent, and the median *ROA* of all firms in the Compustat population with positive income during the 2006-2012 time period is 5.6 percent.

firms that fall into the top quintile of the distribution of the number of stock options exercised by the firms' employees during the year scaled by the market value of equity at the end of that, averaged over the sample period.

Table 9 presents the univariate statistics of *ANTICIP_DEDUCT*, *REAL_DEDUCT*, and *UNANTICIPATED* for *LARGEGRANTER* firms compared to other firms. Because stock option usage drives the anticipated tax deduction from stock options, firms that are the heaviest users of stock option compensation should have the largest anticipated tax deduction from stock option compensation. The median anticipated stock option tax deduction is 4.8 percent of pretax book income among *LARGEGRATNER* firms while the median anticipated stock option tax deduction is only 0.6 percent of pretax book income among firms in the rest of the sample. Marquardt (2002) finds that her calculation of the fair value of stock options granted, which is an estimate of what firms would have recognized if ASC 718 was in effect during her sample period, fairly represents firms' realized cost from employees' exercise of stock options. Because they anticipate a larger tax deduction that other firms, the largest granters of stock options should have significantly larger *REAL_DEDUCT* than firms in the rest of the sample. Consistent with this expectation, the median realized tax deduction among *LARGEGRANTER* firms is significantly larger than the median realized tax deduction among firms in the rest of the sample, 4.5 percent of pretax book income compared to 1.5 percent of pretax book income. The unanticipated tax deduction from employees' stock option exercise is not the result of firms' intentional choices, including the use and size of stock option compensation chosen by firms. Accordingly, I have no prediction about differences in the unanticipated tax deduction between *LARGEGRANTER* firms and other firms. I find that the median unanticipated tax deduction among firms in the *LARGERGRANTER* subsample is significantly smaller than the median unanticipated tax deduction from stock options among other firms. The median anticipated tax deduction among *LARGEGRANTER* firms is 0.06 percent of

pretax income more than the tax deduction realized. The median unanticipated tax deduction among the firms in the rest of the sample is 0.65 percent of pretax book income. Therefore, the largest granters of stock options are not the firms that are getting the most unanticipated tax deductions from employees' exercise of stock options.

I do not make a prediction about differences in the effective tax rates of firms in the *LARGEGRANTER* subsample and other firms. The tax exhaustion theory would predict no differences in the effective tax rates of *LARGEGRANTER* and other firms (e.g. MacKie-Mason, 1990 and Trezevant, 1992) because it posits that firms choose among a variety of tax shields to reduce their tax burden. Firms that do not use stock options heavily may use other tax shields, such as debt (Graham, Lang, and Shackelford, 2004) to reduce their effective tax rates to levels similar to firms with the most option grants. Alternatively, firms that use stock option compensation heavily may have different effective tax rates than other firms because their tax planning opportunities differ from other firms. For instance, prior literature shows that firms' research and development expenditures are positively associated with the level of options granted (Core and Guay, 2001) and research and development expenditures generate tax credits, which reduce effective tax rates more than expenses that generate tax deductions. Table 9 compares *GAAPETR* and *CASHETR* among *LARGEGRANTER* firms and other firms. Both the median *GAAPETR* among firms in the *LARGEGRANTER* subsample and the median *GAAPETR* among firms in the rest of the sample is about 29%. However, the median *CASHETR* among the *LARGEGRANTER* subsample is 21.03%, which is significantly lower than the median *CASHETR*, among firms in the rest of the sample, 24.35%. It is possible that these mixed results are caused because *GAAPETR* excludes the unanticipated tax benefit from employees' exercise of stock options while *CASHETR*

includes it.[52] However, this result is not conclusive because the inclusion of the unanticipated tax benefit from stock options is only one of many differences between *GAAPETR* and *CASHETR*.[53]

Table 10 presents the univariate statistics of *ANTICIP_DEDUCT, REAL_DEDUCT*, and *UNANTICIPATED* for *LARGEEXERCISER* firms compared to other firms. Because the number of stock options exercised is a component of firms' realized tax deduction, mechanically *REAL_DEDUCT* should be larger for *LARGEEXERCISER* firms than other firms. *ANTICIP_DEDUCT* and *UNANTICIP_DEDUCT* should also be larger for *LARGEEXERCISER* firms. As stock price appreciates, employees are more likely to exercise stock options. *LARGEXERCISER* firms are those firms with the most stock option exercises so they should have larger stock price appreciation than other firms. Anticipated stock price appreciation is a component in the calculation of the anticipated tax deduction from stock option compensation, so *ANTICIP_DEDUCT* should be larger for *LARGEEXERCISER* firms than other firms. Unanticipated stock price appreciation increases the likelihood that employees exercise more stock options than anticipated and increases the unanticipated tax deduction from each option exercised. Thus, *UNANTICIP_DEDUCT* should also be larger for *LARGEEXERCISER* firms than other firms.

Therefore, it is unsurprising that *ANTICIP_DEDUCT, REAL_DEDUCT*, and *UNANTICIPATED* are significantly larger for firms with more stock option exercises (*LARGEEXERCISER*) than other firms. The median anticipated tax deduction among

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[52]Even though the median unanticipated tax deduction from employees' exercise of stock options is significantly smaller among *LARGEGRANTER* firms than the median unanticipated tax deduction from employees' exercise of stock options in the rest of the sample, *CASHETR* may be significantly lower for these firms because only positive unanticipated tax savings from stock option exercise are included in *CASHETR*.

[53]For example, *GAAPETR* includes valuation allowances and uncertain tax benefits and does not reflect temporary tax planning strategies. See Hanlon and Hetizman, 2010 for a more thorough discussion.

LARGEEXERCISER firms is 2.9 percent of pretax book income, but the median realized tax deduction is 4.7 percent of pretax book income. The median unanticipated tax deduction among *LARGEEXERCISER* firms is 1.9 percent of pretax book income. The median anticipated tax deduction among firms in the rest of the sample is 0.7 percent of pretax book income, but the median realized tax deduction is 1.4 percent of pretax book income. The median unanticipated tax deduction among firms that are not a *LARGEEXCISER* is 0.4 percent of pretax book income.

Because *CASHETR* includes the unanticipated tax benefit from employees' stock option behavior and *LARGEEXERCISERs* have significantly larger unanticipated tax benefits than other firms, I expect *CASHETR* will be significantly lower for *LARGEEXERCISER* firms than other firms. Because the unanticipated tax benefit from employees' exercise of stock options is not included in *GAAPETR*, I do not make a prediction about the sign or significance of the difference in these effective tax rates between *LARGEXERCISERs* and other firms. The comparison of *GAAPETR* and *CASHETR* among *LARGEEXERCISER* firms and other firms is presented in Table 10. I find that the median *GAAPETR* among *LARGEEXERCISER* firms is insignificantly lower than the *GAAPETR* of other firms, 28.21% and 29.05% respectively, but that the median *CASHETR* among *LARGEEXERCISER* firms is significantly lower than the *CASHETR* of other firms, 20.81% and 24.24% respectively. Again, while not conclusive, these results provide initial support for the assertion that the unanticipated tax benefit from employees' exercise of stock options causes firms to be identified as more aggressive tax avoiders regardless of their intentional choices.

For the remainder of my analysis I focus on the relationship between firm characteristics and effective tax rates with *UNANTICIPATED*, the unanticipated tax deduction scaled by pretax book income. This variable identifies those firms whose *CASHETR* is most affected by their unanticipated tax benefit.

1.4 Empirical Analysis

1.4.1 Correlations between the unanticipated tax benefit and firm characteristics

Significant correlation between firms' unanticipated tax benefit from employees' exercise of stock options and any variables in regression analyses used to estimate tax avoidance activities of firms can lead to incorrect inferences about tax avoidance activity. To provide evidence on this possibility, I investigate the correlation of *UNANTICIPATED* and the firm characteristics previously discussed. .[54] Table 11 shows the correlation between *UNANTICIPATED* and the following firm characteristics: total assets (*AT*), return on assets (*ROA*), market to book (*MTB*), leverage (*LEV*), capital intensity (*CAPINT*), foreign income (*FORINC*), stock growth over the previous three years (*STOCKGROWTH*), research and development expense (*R&D*), return volatility (*RETURNVOL*), the existence of a net operating loss (*NOL*), and the change in net operating losses (*ΔNOL*).

UNANTICIPATED is positively and significantly correlated with *ROA*, *MTB*, *FORINC*, *STOCKGROWTH*, and the existence of an outstanding *NOL*. It is negatively and significantly correlated with *RETURNVOL*. *UNANTICIPATED* is not correlated with *AT*, *LEV*, *CAPINT*, *R&D*, or *ΔNOL*. The significant correlation between *UNANTICIPATED* and a number of the firm characteristics included in this investigation underscores the possibility that the use of *CASHETR* can create an endogeneity issue in studies of the relation between intentional tax avoidance and firm characteristics associated with stock price appreciation.

Table 12 shows the correlation between *UNANTICIPATED* and the two effective tax rate measures, *GAAPETR* and *CASHETR*. A naive expectation is that, because

[54]Inferences are qualitatively unchanged when the correlation between firm attributes and the unscaled difference between recognized and realized costs of stock options is tested instead of *UNANTICIPATED.*

UNANTICIPATED generates cash tax savings but does not affect recognized tax expense, *UNANTICIPATED* should be negatively related to *CASHETR* and unrelated to *GAAPETR*. The naive expectation may not be descriptive of the actual relation due to the impact of firm characteristics related to both *UNANTICIPATED* and the effective tax rates, including profitability, growth, and R&D expenditures. Contrary to my naive expectation, I find *UNANTICIPATED* is positively and significantly correlated with *GAAPETR*. I find no statistically significant correlation between *UNANTICIPATED* and *CASHETR*. Below I consider one explanation for the observed positive correlation between *GAAPETR* and *UNANTICIPATED*.

Although I compute the univariate correlations using a continuous measure of *UNANTICIPATED,* firms with negative values of *UNANTICIPATED* (which have lower than expected stock prices) differ in a number of respects from firms with positive values of *UNANTICIPATED* (which have higher than expected stock prices), including performance, income, and tax planning incentives. I split the full sample on the sign of *UNANTICIPATED. UNANTICIPATED* is non-positive for 28.3 percent of firms in the sample. I find that the sign and significance of the correlations between *UNANTICIPATED* and both *CASHETR* and *GAAPETR* depends upon the sign of *UNANTICIPATED*. The split sample correlations are also presented in Table 12.

When *UNANTICIPATED* is positive firms are in a tax windfall position. These firms are receiving unanticipated tax savings from employees' exercise of stock options. I find results consistent with the naive expectation, a negative and significant relation between *CASHETR* and *UNANTICIPATED* and no relation between *GAAPETR* and *UNANTICIPATED*.

When *UNANTICIPATED* is non-positive firms are in a tax shortfall position, which means employees' exercise of stock options did not generate all of the anticipated tax savings from stock option compensation. For these firms, I find *UNANTICIPATED* is positively and significantly associated with both *CASHETR* and *GAAPETR*. Reading the

results of the split sample analysis together, firms in a tax shortfall position are apparently driving the positive correlation in the full sample. I continue to use the full sample of firms in subsequent analyses, but in untabulated robustness tests I find that the results of all subsequent inferences are qualitatively unchanged if firms with negative *UNANTICIPATED* are excluded from the sample.

1.4.2 Adjustment to CASHETR to eliminate the unanticipated tax benefit from employees' exercise of stock options

While the evidence presented above indicates that firms' characteristics are related to the unanticipated tax benefit from employees' exercise of stock options, the impact of the unanticipated tax deduction on measures of tax avoidance is of greater concern to researchers. As discussed in Section 1.2.2, *CASHETR* incorporates both the anticipated and unanticipated cash tax savings from option exercise. To investigate the effect of the unanticipated tax benefit from employees' stock option exercise on the identification of aggressive tax avoiders using the cash effective tax rate, I adjust the cash effective tax rate to remove the excess tax benefit from the exercise of stock options resulting in a tax windfall ($CASHETR_{WITHOUT}$). After this adjustment $CASHETR_{WITHOUT}$ is analogous to *GAAPETR* in that it excludes the unanticipated tax savings from option exercise from the calculation of the effective tax rate. $CASHETR_{WITHOUT}$ is calculated by adding back the excess tax benefit--the unanticipated cash tax savings from stock option exercise resulting in a tax windfall--to the numerator of *CASHETR*, $\left[\frac{TXPD+\ EXCESS\ TAX\ BENEFIT}{PI-SPI}\right]$. The denominator of $CASHETR_{WITHOUT}$ is the same as the denominator for *CASHETR*, pretax book income adjusted for special items.The only difference in *CASHETR* and $CASHETR_{WITHOUT}$ is the unanticipated tax benefit from employees' exercise of stock options. Thus any difference between inferences when *CASHETR* is the measure of tax avoidance and inferences when $CASHETR_{WITHOUT}$ is the measure of tax avoidance is attributable to the unanticipated tax benefit from employees' exercise of stock options.

I use firms' disclosed *EXCESS TAX BENEFIT* to adjust *CASHETR* for two reasons. First, *EXCESS TAX BENEFIT* is directly available to researchers in machine-readable form via Compustat. Second, it is available on a yearly basis. My estimates of *DIFF_COST* and *UNANTICIPATED* are firm averages, which are noisy measures of the appropriate annual adjustment. The primary limitation of *EXCESS TAX BENEFIT* is that it excludes shortfalls.[55] I present the descriptive statistics for the effective tax rate measures in Table 13 and their correlations in Table 14.

The median unadjusted *CASHETR* is 23.64% compared to the median $CASHETR_{WITHOUT}$ of 26.36%. The 2.72 percentage point increase is statistically significant at the one percent level. Thus, the adjustment for the unanticipated tax benefit from stock options is non-trivial. While the change in *CASHETR* after removing the unanticipated cash tax savings from employees' exercise of stock options is significant, the greater concern for inferences of tax avoidance is a non-random distribution of the effect of the unanticipated tax benefit from employees' stock option exercise on measures of tax avoidance. For instance, if the difference in $CASHETR_{WITHOUT}$ and *CASHETR* is the same for all firms then the measurement error caused by the unanticipated tax benefit from stock options is not correlated with any variable and will not create an endogeneity concern in studies of firms' intentional tax avoidance. However, a concentration of the difference in $CASHETR_{WITHOUT}$ and *CASHETR* in a subset of firms that are similar among specific firm characteristics raises an endogeneity concern.

I find that the correlation between *CASHETR* and $CASHETR_{WITHOUT}$ is very strong, 0.88. This is much higher than the correlation between *CASHETR* and *GAAPETR*, 0.54. Like the high correlation between the anticipated tax deduction and the realized tax deduction, the high correlation between *CASHETR* and $CASHETR_{WITHOUT}$ provides

[55]In supplemental analysis I eliminate firms with negative *UNANTICIPATED* and results are qualitatively unchanged.

tension to my assertion that the unanticipated tax benefit from stock options changes researchers' inferences about firms' intentional tax avoidance. However, this high correlation does *not* imply that the adjustment for unanticipated tax benefits is immaterial. If the disagreement in *CASHETR* and $CASHETR_{WITHOUT}$ is correlated with other variables, then it can still bias researchers' inferences of intentional tax avoidance. In the next section I investigate this possibility.

1.4.3 Cross-sectional differences in firm operating characteristics

Inclusion of the unanticipated tax benefit from employees' stock option exercise in *CASHETR* creates measurement error when *CASHETR* is a measure of intentional tax avoidance. An endogeneity problem arises if this measurement error increases the likelihood that certain firms are identified as intentional tax avoiders *and* that this measurement error is related to any independent variables in the ordinary least squares analysis including firm characteristics that are control variables.[56] To provide further evidence that the unanticipated tax benefit from stock option exercise can cause an endogeneity problem in studies of intentional tax avoidance, I test for significant differences in firms' characteristics and measures of firms' tax avoidance between those firms with the largest unanticipated tax benefit from employees' exercise of stock options and other firms in the sample.[57] Finding significant differences in firms' characteristics among these subsamples strengthens the previous evidence that inclusion of the unanticipated tax benefit from employees' exercise of stock options in *CASHETR* has the potential to cause endogeneity in studies of intentional tax avoidance.

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[56]Random measurement error in a dependent variable raises an efficiency, but not endogeneity, concern. However, when the error in a dependent variable is correlated with any of the independent variables, then estimated relationships may be biased and inconsistent. See Section 1.2.3 for a more detailed discussion.

[57]Section 1.3.1 discusses each of these firm characteristics in more detail.

I identify those firms where the unanticipated tax benefit from employees' option exercise is likely to exert the most influence on *CASHETR* by sorting firms into quintiles using my estimate of the difference between the realized and recognized costs of stock options, scaled by the firm's total pretax income (*UNANTICIPATED*).[58,59] After sorting firms into the highest quintile of *UNANTICIPATED*, I test for differences in firms' characteristics between firms in the highest quintile of *UNANTICIPATED* and other firms. I test for differences in both the mean and median values of firms' characteristics between these two groups, but discuss differences in median values because previous analysis shows *UNANTICIPATED* is left-skewed.

Table 15 presents the univariate statistics for firms in the highest quintile of *UNANTICIPATED* compared to other firms. To confirm that *UNANTICIPATED* identifies those firms with the largest unanticipated tax benefit from stock option exercise, I compare the *EXCESS TAX BENEFIT* of firms in the highest quintile of *UNANTICIPATED* and firms in the other quintiles.[60] The median yearly excess tax benefit among firms in the highest quintile of *UNANTICIPATED* is $2.06 million, while the median yearly excess tax benefit of other firms is $0.22 million. This difference is significant at the one percent level.

I find differences in the median value of almost every firm attribute tested between firms in the highest quintile of *UNANTICIPATED* and other firms. Firms in the

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[58]I use the unanticipated tax deduction as the partitioning variable, but the partitioning is not different if I use the unanticipated tax benefit, which is a function of the unanticipated tax deduction and the firm's statutory tax rate.

[59]Results are qualitatively similar when testing differences between the 100 (250) firms with the smallest absolute value of *UNANTICIPATED* and the 100 (250) firms with the most positive or most negative *UNANTICIPATED*.

[60]To reiterate, *EXCESS TAX BENEFITS* consists of firms' disclosed unanticipated tax savings from employees' exercise of stock options that result in a tax windfall. *UNANTICIPATED* is my estimate of firms' unanticipated tax deduction from all option exercises by scaled pretax book income.

highest quintile of *UNANTICIPATED* have significantly larger measures of market-to-book (*MTB*), profitability *(ROA),* foreign income (*FORINC*), research and development expenses (*R&D*), annualized daily return volatility (*RETURNVOL*), and stock growth than firms in the other four quintiles. Firms not in the highest quintile of *UNANTICIPATED* are significantly larger (*AT*) and have significantly higher leverage (*LEV*) than firms in the highest quintile.[61] I find firms in the highest quintile of *UNANTICIPATED* are significantly more likely to have outstanding net operating loss carry forwards, but do not use (or add to) these net operating losses differently than other firms. The significant differences in firms' characteristics between firms in the highest quintile of *UNANTICIPATED* and other firms indicates that the unanticipated tax benefit from stock option exercise is significantly related to a number of firm characteristics, including those characteristics that are commonly used as controls in tax avoidance research. These results reinforce the concern that the mismeasurement of intentional tax avoidance caused by including the unanticipated tax benefit from employees' exercise of stock options creates an endogeneity problem.

Table 15 also shows the univariate statistics for the effective tax rates of firms in the highest quintile compared to other firms. Both academics and non-academics generally interpret firms with significantly lower effective tax rates as being engaged in more aggressive tax avoidance. I find that firms in the highest quintile are identified as more aggressive tax avoiders *only* when *CASHETR* is the variable of interest. There is no difference in the tax avoidance of firms in the highest quintile of *UNANTICIPATED* and other firms when $CASHETR_{WITHOUT}$ or *GAAPETR*, which exclude the unanticipated tax

[61]The finding of significantly higher annualized daily stock return volatility for firms in the highest quintile of *UNANTICIPATED* aligns with standard option theory. Standard option theory suggests that as the volatility of the stock price increases, risk-averse employees will exercise options earlier and be more likely to exercise options Huddart (1994) and Hemmer et al. (1994) find early exercises by executives are an increasing function of the volatility of the stock price underlying the option.

benefit of stock options, is the measure of tax avoidance. These results add support for the concern that the use of *CASHETR* can bias researchers' inferences in investigations of intentional tax avoidance.

1.4.4 Nonparametric tests

Prior research has sometimes compared the effective tax rates of firms within the researchers' sample to identify aggressive tax avoiders. Firms are ranked by their effective tax rate. Those falling into a certain percentage of observations are considered aggressive tax avoiders (e.g. Blaylock, Shevlin, and Wilson, 2012). In these studies, the ordinal ranking of firms matters more than cardinal differences in the underlying effective tax rate. Removing the effects of *UNANTICIPATED* mechanically lowers the ranks of firms in the highest quintile of *UNANTICIPATED* when $CASHETR_{WITHOUT}$ is the ranking variable relative to when *CASHETR* is the ranking variable. However, it is unclear whether the magnitude of the adjustment alters the relative ranking enough to impact whether a firm is classified as a tax avoider. I next use nonparametric tests to examine the impact of *UNANTICIPATED* on relative ranks and the classification of tax avoiders.

The first non-parametric test I conduct is the Mann-Whitney-Wilcoxon (MWW) test. MWW ranks all members of a sample on a variable and then tests whether the sum of the ranks of subsamples differ. I test whether the sum of the ranks of each effective tax rate measure for firms in the highest quintile of *UNANTICIPATED* are significantly lower than the sum of the ranks for the rest of the sample.[62] The unanticipated tax benefit from stock option exercise arises from sources outside firms' control and increases the likelihood that firms in the highest quintile of *UNANTICIPATED* are identified as aggressive tax avoiders. I expect that the sum of the ranks of *CASHETR*, which includes

[62] Lower effective tax rates are assigned lower ranks.

the unanticipated tax benefit from employees' stock option exercises, will be lower for firms in the highest quintile of *UNANTICIPATED* than firms in the rest of the sample. Because $CASHETR_{WITHOUT}$ and *GAAPETR* do not include the unanticipated tax benefit from employees' exercise of stock options, I do not expect a difference between the sum of the ranks of firms in the highest quintile of *UNANTICIPATED* and that of other firms when either of these variables is the ranking variable.

There are two reasons why I may not find significant differences between the ranks assigned by *CASHETR* and/or I may find significant differences between the ranks assigned by $CASHETR_{WITHOUT}$ and those assigned by *GAAPETR*. One alternative to this expectation, following the tax exhaustion theory (e.g. MacKie-Mason, 1990 and Trezevant, 1992), is that firms with lower levels of *UNANTICIPATED* may use tax shields other than stock options, such as debt, to lower their effective tax rates (Graham, Lang, and Shackelford, 2004). Under this alternative, the sum of the ranks of *GAAPETR* and *CASHETR* for firms in the highest quintile of *UNANTICIPATED* should not differ from the sum of the ranks of the remaining firms, because firms in the highest quintile of *UNANTICIPATED* have used stock options to achieve their desired effective tax rates while the remaining firms have used alternative (non-stock option) tax shields. In contrast, if the tax exhaustion theory is descriptive, the sum of the ranks of $CASHETR_{WITHOUT}$ for firms in the highest quintile of *UNANTICIPATED* will be significantly higher than the rest of the sample because part of their tax benefit was excluded by the adjustment for the unanticipated tax benefit from employees' exercise of stock options. Alternatively, the magnitude of unanticipated tax savings may be too small to impact the relative rankings of firms. If this latter explanation is true, then the results of the MWW test when $CASHETR_{WITHOUT}$ is the ranking variable should be the same as the results when *CASHETR* is the ranking variable.

Initially, I use Kendall's coefficient of concordance (Kendall's W) to test the level of agreement between *CASHETR* and $CASHETR_{WITHOUT}$. . Kendall's W tests the

agreement in ranks assigned to objects by one or more rankers. I use Kendall's W to test the similarity of the rankings assigned to firms by *CASHETR* and $CASHETR_{WITHOUT}$. I find a Kendall's W of 0.89 for *CASHETR* and $CASHETR_{WITHOUT}$, which suggests a high degree of similarity in the overall ranks.[63] Because Kendall's W does not have cutoff values to indicate significance levels, I also calculate Kendall's W for *GAAPETR* and *CASHETR* as a benchmark. The Kendall's W for *GAAPETR* and *CASHETR* is 0.63. Therefore, the ranks assigned by *CASHETR* are more similar to those assigned by $CASHETR_{WITHOUT}$ than to those assigned by *GAAPETR*.

Finding overall agreement between the ranks assigned by *CASHETR* and $CASHETR_{WITHOUT}$ is a necessary, but not sufficient, condition to conclude that the adjustment for the unanticipated tax benefit from employees' exercise of stock options is immaterial. If the disagreement in *CASHETR* and $CASHETR_{WITHOUT}$ is concentrated in firms with the lowest effective tax rates, then the unanticipated tax benefit from stock option deduction can still affect researchers' inferences about tax avoidance. Kendall's coefficient of concordance does not allow for tests identifying whether the disagreement between *CASHETR* and $CASHETR_{WITHOUT}$ is concentrated in a certain region of the effective tax rate distribution. I use the MWW test as my main test because it tests the assertion that the unanticipated tax benefit from employees' exercise of stock options changes the identification of firms as aggressive tax avoiders.

The results of the MWW tests, presented in Table 16, mirror those of univariate parametric tests. I find that there are significant differences at the one percent level between the sum of the ranks of *CASHETR* for firms in the highest quintile of *UNANTICIPATED* and the sum of the ranks for other firms. Neither the sum of the ranks of $CASHETR_{WITHOUT}$ nor the sum of the ranks of *GAAPETR* is significantly

[63]Kendall's W ranges from 0 to 1. A Kendall's W of 0 indicates that there is no agreement among the rankers. A Kendall's W of 1 indicates that the rankers are in complete agreement.

different for firms in the highest quintile of *UNANTICIPATED* compared to the other firms in the sample. This is consistent with the unanticipated tax benefit from employees' exercise of stock options causing firms to be identified as more aggressive tax avoiders regardless of their intentional tax avoidance. I conduct two additional non-parametric tests to check the robustness of this conclusion.

In the first additional non-parametric test, I rerun the MWW tests using firms' tax-aggressive rank within their industry instead of their rank within the full sample. I conduct tests of within-industry ranks for two reasons. First, the proportion of *NEWECON* firms in the highest quintile of *UNANTICIPATED* is larger than the proportion of *NEWECON* firms in the rest of the sample. Second, tax researchers sometimes either identify tax avoiders as those firms with the lowest effective tax rate in their industry or conduct analysis on industry-adjusted effective tax rates, e.g., Balakrishnan, Blouin, and Guay (2012). To conduct the rank-within-industry tests, I first rank firms on the various tax avoidance measures within each Fama-French 48 industry.[64] I scale the ordinal ranking based on the number of firms in each industry. I use these scaled ordinal ranks in the MWW test. These results are presented in the last column of Table 16. Results of the MWW test using firms' scaled industry ranks are qualitatively similar to the results of the MWW test using the full sample ranks. The sum of the ranks of firms in the highest quintile of *UNANTICIPATED* is significantly different than the sum of the ranks of the other firms when *CASHETR* is the ranking variable, but not when $CASHETR_{WITHOUT}$ or *GAAPETR* is the ranking variable. Like the first MWW test, these results support the assertion that including the unanticipated tax benefit from stock options in the calculation of *CASHETR* changes the identification of firms as aggressive tax avoiders.

[64]Fama-French 48 industries are a refinement of the earlier described Fama-French ten industries. These industry definitions are common to tax-avoidance literature.

The second additional non-parametric test I conduct is a Chi-square test identifying whether the proportion of aggressive tax avoiders in the highest quintile of *UNANTICIPATED* is greater than the proportion of aggressive tax avoiders in the rest of the firms in my sample. I follow Blaylock, Shevlin, and Wilson (2010) in identifying firms as aggressive tax avoiders if their effective tax rate is in the 20th percentile of all firms in the sample. If the unanticipated tax benefit from employees' exercise of stock options is causing firms to be identified as aggressive tax avoiders, then the highest quintile of *UNANTICIPATED* should hold a disproportionate share of aggressive tax avoiders when *CASHETR* is used to assess tax avoidance because *CASHETR* includes the unanticipated tax benefit from employees' exercise of stock options. Because $CASHETR_{WITHOUT}$ and *GAAPETR* do not include the unanticipated tax benefit from employees' exercise of stock options, then the proportion of aggressive tax avoiders should not be different between firms in the highest quintile of *UNANTICIPATED* and other firms. I find results consistent with this expectation, as shown in Table 17. I find that significantly more firms in the highest quintile of *UNANTICIPATED* are identified as aggressive tax avoiders when *CASHETR* is the ranking variable, but not when $CASHETR_{WITHOUT}$ or *GAAPETR* is the ranking variable. These results are consistent with the MWW tests. Overall, the results of the non-parametric tests provide further support for my assertion that the unanticipated tax benefit from stock options changes the classification of firms as aggressive tax avoiders.

In summary, the results presented thus far indicate two things: (1) the magnitude of the unanticipated tax benefit from stock option exercise is correlated with firm characteristics, and (2) the identification of tax avoiders is sensitive to the treatment of the unanticipated tax benefit from employees' exercise of stock options. In the following section, I conduct a simulation to inform researchers of an implication of this endogeneity concern when *CASHETR* is used to measure firms' intentional tax avoidance.

1.4.5 Effect of the unanticipated tax benefit from stock options on null rejection rates

When using ordinary least squares estimation techniques, a common practice in tax-avoidance studies, correlation between any of the independent variables and measurement error in the dependent variable can bias estimates of all coefficients, including the coefficient on the variable(s) of interest.[65] This is the classic problem of endogeneity. To illustrate an implication of this endogeneity concern, I use a common tax-avoidance model and study the rejection rate of the null hypothesis that there is no relationship between a hypothetical firm characteristic and tax avoidance, as measured by effective tax rates.

To conduct this simulation analysis, I first construct a hypothetical firm characteristic, PART.[66] This hypothetical firm characteristic represents a firm characteristic hypothesized as related to tax avoidance. I create PART so that it is correlated to varying degrees with stock growth. I choose stock growth as a base variable because it is related both to the magnitude of the unanticipated tax benefit from employees' exercise of stock options, as shown in previous analyses, and because it is related to many variables previously hypothesized to be determinants of tax avoidance. Prior tax-avoidance researchers have found many determinants of tax avoidance that are related to stock growth including: executive compensation (e.g., Armstrong, Blouin, and Larcker, 2012), corporate governance (e.g., Desai, Dyck, and Zingales, 2007 and Desai and Dharmapala, 2006) and firm ownership structure (e.g., Chen, Chen, Cheng and

[65] See Section 1.2.3 for a thorough discussion of this problem.

[66] I use the term *PART* to be consistent with prior research using simulation analysis to study implications of endogeneity concerns on rejection rates of null hypotheses, such as Hribar and Nichols (2007), and Dechow, Sloan, Sweeney (1995). While in some simulations *PART* is an indicator variable, I follow Hribar and Nichols (2007) and implement *PART* as a continuous variable.

Shevlin, 2010 and McGuire, Wang, and Wilson, 2014).[67] Another benefit of using stock growth as the base variable for the simulated firm characteristic is that it is available to researchers in a variety of settings.[68] Researchers can use the results of this research simulation together with the correlation between stock growth and their variable of interest to estimate how much their rejection rate frequency may be overstated (i.e. the Type I error rate) when they use *CASHETR* to measure intentional tax avoidance.

PART is constructed so that its correlation with stock growth ranges from 0.0 to 1.0, increasing by tenths. To conduct the simulation, I calculate *PART* for all firms in the sample and then estimate equation 1, discussed below. I then compute the t-statistic for *PART* from the regression. I repeat this process 1,000 times for each correlation. Also for each correlation, I use the t-statistics to calculate the rejection rates at the ten, five, and one percent levels in a two-tailed test. Figure 1 illustrates the rejection rates as the correlation between *PART* and stock growth increases.

I use equation 1, a common model of tax avoidance, to estimate the likelihood that the hypothetical partitioning variable, *PART*, is related to tax avoidance. [69]

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[67]Gompers, Ishii, and Metric (2003) show that the stock returns of firms with stronger shareholder rights, a form of corporate governance, outperform the stock returns of firms with weak shareholder rights. Anderson and Reeb (2003) show that family firms have better stock performance than their nonfamily counterparts. Dimitrov and Jain (2006) show dual class recapitalization (when a firm with one class of common stock creates a second class) leads to an abnormal stock return of about 23.11% above other firms over a four-year period following the recapitalization.

[68] While the variables necessary to calculate *UNANTICIPATED* are available through Compustat for a wide variety of firms starting in 2006, they are not available through all data sources. They are also not available in machine-readable form prior to 2006. For this reason, I do not use *UNANTICIPATED* as the base variable when constructing *PART*.

[69]Among others, Chen, Chen, Cheng, and Shevlin (2010) and McGuire, Wang, and Wilson (2011) use these same control variables in their studies of firms' tax avoidance. Cheng, Huang, Li, and Stanfield (2012), Gallemore, Thornock, and Maydew (2014), Hoopes, Mescall, and Pitman (2012), and Robinson, Sikes, and Weaver (2010) use these same base variables in their studies of firms' tax avoidance, but include additional control variables appropriate to their variable of interest. Higgins, Omer, and Phillips (2014) use almost all of these variables as their controls of tax avoidance.

$$TAXAVOID_{i,t} = \beta_1 + \beta_2\, PART_{i,t} + \beta_3 ROA_{i,t} + \beta_4 LEV_{i,t} + \beta_5 NOL_{i,t} + \beta_6 \Delta NOL_{i,t} + \beta 7 FORINC_{i,t} + \beta_8 CAPINT_{i,t} + \beta_9 EQINC_{i,t} + \beta_{10} R\&D_{i,t} + \beta_{11} MTB_{i,tt} + \beta_{12} SIZE_{i,tt} + \varepsilon_{i,t} \quad (1)$$

TAXAVOID is in turn *CASHETR*, $CASHETR_{WITHOUT}$, and *GAAPETR*. *SIZE* is the natural log of total assets. I discussed previously in Section 1.3 the calculation of the remainder of these variables and the reasons they are used as controls in tax-avoidance research. In the following discussion and presented in Figure 1 are the rejection rates when equation 1 is estimated using ordinary least squares analysis with additional fixed effect controls for industry and year. Results are qualitatively unchanged when equation 1 is estimated using ordinary least squares analysis and errors are clustered by industry and year.

Figure 1 illustrates that even a moderate correlation between stock growth and *PART* results in rejection rates that are much higher when *CASHETR* is the measure of tax avoidance than when $CASHETR_{WITHOUT}$ or *GAAPETR* is the measure of tax avoidance. When the correlation between *PART* and stock growth is zero, *PART* is a completely random variable. Accordingly, when the correlation between *PART* and stock growth is minimal, rejection frequencies are relatively close to expected rates across all effective tax rate measures of tax avoidance. As the correlation between *PART* and stock growth increases, the probability of rejecting the null hypothesis of no relationship between *PART* and tax avoidance increases dramatically only when *CASHETR* is the measure of tax avoidance. When the measure of tax avoidance excludes the unanticipated tax benefit from stock option exercise, as in $CASHETR_{WITHOUT}$ and *GAAPETR*, the rejection rates of the null hypothesis are much less sensitive to the correlation between *PART* and stock growth. For instance, when the correlation between stock growth and *PART* is 0.2, the rejection of the null hypothesis using a five percent significance level is 16.7 percent for *CASHETR*, but only 6.3 percent for $CASHETR_{WITHOUT}$ and 6.4 percent

for *GAAPETR*.[70] Overall, these results indicate that using *CASHETR* to measure tax avoidance can lead to inflated rejection rates in hypothesis tests of intentional tax avoidance if the variable of interest is even moderately correlated with stock growth.

1.5 Supplemental Analysis

1.5.1 Differences in cash effective tax rates with sorting based on controls of tax avoidance

Next, I use univariate tests to analyze the relationship between variables that have been shown in prior research to be related to tax avoidance and are often used as controls in studies of tax avoidance and the cash effective tax rate with and without the unanticipated tax benefit from employees' exercise of stock options. I show that excluding the unanticipated tax benefit from employees' exercise of stock options from *CASHETR* changes inferences that certain firms are relatively more aggressive tax avoiders.

The variables I use to sort firms into subsamples are those variables that are commonly used as controls in studies of tax avoidance. These. I use the variables discussed in Section 1.2.3, which have been seen in previous analyses. In addition, I use some variables rarely seen in studies of tax avoidance which Wilson (2009) and/or Lisowsky (2010) find helpful in predicting incidences of tax sheltering behavior. The additional variables are discretionary accruals estimated using the modified Jones model with performance matching (*DAP*), the existence of a pretax or after-tax litigation or insurance settlement (*LITIGATION*), mezzanine financing (preferred stock and

[70]Correlation of 0.20 between stock growth and researchers' variable(s) of interest is reasonable. For instance, among the limited set of firm characteristics I use in my tests, market-to-book, return on assets, and stock price high are all correlated with stock growth at about the 20% level.

convertible debt) scaled by total assets (*MEZZFIN*), the existence of equity in earnings (*EQUITY EARNINGS*), and the use of a Big Four auditor (*Big4*).[71,72]

I use each common control variable as a sorting variable to identify firms with a high value of the control and separate them from other firms. I identify firms with a high value of the control as those firms that fall into the highest quintile of the determinant's distribution.[73] After this sorting procedure, I use a two-sample median test to determine whether firms with a high value of that control have significantly different cash effective tax rates than other firms in the sample.[74] I conduct the tests first using $CASHETR_{WITHOUT}$ as the proxy for tax avoidance. For comparison, I repeat the tests using *CASHETR* as the proxy for tax avoidance. Table 18 shows the results of these tests.

Of the 15 firm characteristics used as a sorting variable, there are six instances (*MTB*, *NOL*, *ΔNOL, NEWECON*, *BIG4*, and *FORINC*) where the existence of a statistical difference between firms in the highest quintile of the sorting variable and other firms depends on the treatment of the unanticipated tax benefit from stock option exercise.

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[71]I do not include these additional variables in the main analysis because I want to demonstrate the relationship between unanticipated tax avoidance and those firm characteristics most commonly used as controls in studies of tax avoidance.

[72]Wilson (2009) and Lisowsky (2010) include discretionary accruals as a predictor of tax sheltering because Frank, Lynch, and Rego (2009) show that firms engaging in aggressive financial reporting are also likely to engage in aggressive tax avoidance practices. For similar reasons, Lisowsky also includes the existence of a pretax or after-tax litigation settlement as a predictor of tax sheltering because a firm's legal circumstances could be "a harbinger of aggressive practices." Lisowsky (2010) includes the use of mezzanine financing to predict tax sheltering because Treasury (1999) indentifies the use of financial engineering products as indicative of tax shelters. Treasury (1999) also indicates that the use of "promoters," including investment banks, law firms, and auditors, indicates tax shelter usage. Because of this indication, Lisowsky includes the use of a "Big 5" auditor as a predictor of tax sheltering. I include the use of a "Big 4" auditor because the fifth auditing firm that Lisowsky included has been dissolved.

[73]The designation as a *NEWECON* firm is the exception to the quintile sorting. Because firm SIC codes do not change year to year and *NEWECON* firms are only 12% of the sample, I test for differences between *NEWECON* firms and non-*NEWECON* firms.

[74]Results are qualitatively similar in both a two-sample T-test for equal means and in a Mann-Whitney-Wilcoxon test.

Specifically, I find that the *CASHETR* of firms with a high level of *MTB*, of firms that most often have an outstanding net operating loss carry forward, of firms using more net operating loss carry forwards, of *NEWECON* firms, and of firms that have a BIG4 auditor is significantly different than the *CASHETR* of firms in the rest of the sample. However, I find no difference in $CASHETR_{WITHOUT}$ between the subsamples. This finding provides preliminary evidence consistent with my contention that unanticipated cash tax savings from employee option exercise may cause researchers to falsely reject the null hypothesis of no relationship between these sorting variables and intentional tax avoidance (a Type I error).

I also find that firms with a high level of foreign income have a significantly different $CASHETR_{WITHOUT}$, but not *CASHETR*, than firms in the rest of the sample. This finding implies that the unanticipated tax benefit from stock options is obscuring a relationship between the sorting variable and intentional tax avoidance (a Type II error). These results provide further evidence that the inclusion of the unanticipated tax benefit from stock option exercise in tax avoidance measures can lead to different inferences than tax avoidance measures that do not include the unanticipated tax benefit. Researchers investigating firms' intentional tax avoidance should ensure that their results are not driven by the effects of the unanticipated tax benefit from employees' exercise of stock options.

1.5.2 Impact of stock options on measures of firms' tax risk

A developing stream of literature investigates the consequences and determinants of the riskiness of firms' tax positions. Two of the measures used by this literature to assess a firm's tax risk are summary statistics of firms' *CASHETR* over time: the standard deviation of *CASHETR* and the coefficient of variation of *CASHETR*.[75] Because the

[75]E.g., Guenther, Matsunaga, and Williams (2014), and Neuman, Omer, and Shelley (2013)

previous evidence suggests that the unanticipated tax benefit from employee stock option exercise can change researchers' inferences of tax avoidance when *CASHETR* is the measure of tax avoidance, it is plausible that the unanticipated tax benefit can also change researchers' inferences when using measures that are a summary statistic of *CASHETR*.

To test the impact of the adjustment for excess tax benefit from employees' exercise of stock options, I compare the firm-specific standard deviation and coefficient of variation of *CASHETR* and $CASHETR_{WITHOUT}$ over the seven years of my sample period for each firm in the sample. I expect that the standard deviation of *CASHETR* (*CASHETRSTD*) is different from the standard deviation of $CASHETR_{WITHOUT}$ *(*$CASHETR_{WITHOUT}STD$*),* but I do not have a prediction as to which one is higher. *CASHETRSTD* could be higher than $CASHETR_{WITHOUT}STD$ because the unexpected tax deduction from employees' exercise of stock options could disturb the otherwise smooth taxable income path desired by firms.[76] On the other hand, $CASHETR_{WITHOUT}STD$ could be higher than *CASHETRSTD* because, as Babenko and Tserlukevich (2009) identify, stock option exercise shifts tax deductions for compensation into more profitable years, smoothing taxable income and, thus, smoothing income tax payments. Eliminating a portion of a tax deduction that smoothes income tax payments would increase volatility.

Table 19 presents the descriptive statistics for the firm-specific measures of *CASHETRSTD,* $CASHETR_{WITHOUT}STD$*,* the coefficient of variation of *CASHETR* (*CASHETRCV),* and the coefficient of variation of $CASHETR_{WITHOUT}$ ($CASHETR_{WITHOUT}CV$*).* I find that $CASHETR_{WITHOUT}STD$ ($CASHETR_{WITHOUT}CV$*)* is significantly higher than *CASHETRSTD* (*CASHETRCV*) at the one percent level (at the five percent level). I then conduct an equality of variance F-test comparing the variance of $CASHETR_{WITHOUT}$ to the variance of *CASHETR* at the firm level to see if there are

[76]Graham and Smith (1999) show that a smooth income path reduces a firm's overall tax liability and should be desirable by firms.

significant differences between these two measures at the firm level.[77] *FTESTSIGNIF* is an indicator variable that turns on when the F-test indicates the variance of a firm's $CASHETR_{WITHOUT}$ significantly exceeds the variance of that firm's *CASHETR* during the sample period. For 12.24 (5.2) percent of firms in the sample, the variance of $CASHETR_{WITHOUT}$ is significantly higher than the variance of *CASHETR.*

As discussed previously, a nonrandom distribution of the effects of the unanticipated tax benefit from the exercise of employee stock options is of more interest to this study. Table 20 presents the mean and median of *CASHETRSTD*, $CASHETR_{WITHOUT}STD$, *CASHETRCV*, and $CASHETR_{WITHOUT}CV$ for firms in the highest quintile of *UNANTICIPATED* and for firms in the other four quintiles. I do not find any statistical differences between firms in the highest quintile *UNANTICIPATED* and firms in the other four quintiles across any of these measures.

When I conduct the equality of variance F-test for *CASHETR* and $CASHETR_{WITHOUT}$ on a firm-level basis, I find that the variance of *CASHETR* is significantly higher than the variance of $CASHETR_{WITHOUT}$ for 17.4 percent of firms in the highest quintile of UNANTICIPATED and for 10.9 percent of firms in the other four quintiles. Using a Chi-Square test, I find that the difference in these proportions is significant at the one percent level.[78] Therefore, these results provide some evidence that it is important for researchers using summary statistics of *CASHETR* as their variable of interest to consider whether they should include the unanticipated tax benefit from employee stock option exercise in their measure of firm tax risk.

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[77] I conduct this F-test on the firm level, rather than conducting an equality of variance F-test on *CASHETR* and $CASHETR_{WITHOUT}$ in the full sample because the latter compares the variance of *CASHETR* and $CASHETR_{WITHOUT}$ across firms, while *CASHETRSTD* and $CASHETR_{WITHOUT}STD$ measure the standard deviation within each firm.

[78] The variance of $CASHETR_{WITHOUT}$ is higher than the variance of *CASHETR* for 4.7 percent of firms in the highest quintile of UNANTICIPATED and 5.2 percent of firms in the rest of the sample. This difference is insignificant.

1.6 Conclusion

In addition to deliberate actions taken by management, a firm's tax liability can also be affected by actions outside the firm's direct control, as is the case with stock option exercise. The theoretical construct in prior research often implies an interest in tax avoidance that meets two criteria: 1) *intentional* action by firm management 2) affecting the firm's tax liability. In studies of intentional tax avoidance, reductions in tax liabilities arising from actions outside the firm's control, such as the exercise of stock options, should not be considered tax avoidance. When researchers use *CASHETR*, which includes the unanticipated tax benefit from the exercise of stock options, they mismeasure intentional tax avoidance. *GAAPETR* does not include the unanticipated tax benefit from employees' exercise of stock options and thus does not suffer from this mismeasurement of intentional tax avoidance. Using the excess tax benefit from stock option exercise disclosed by firms in the financing section of the statement of cash flows, I adjust *CASHETR* to remove the unanticipated tax benefit from employees' exercise of stock options ($CASHETR_{WITHOUT}$).

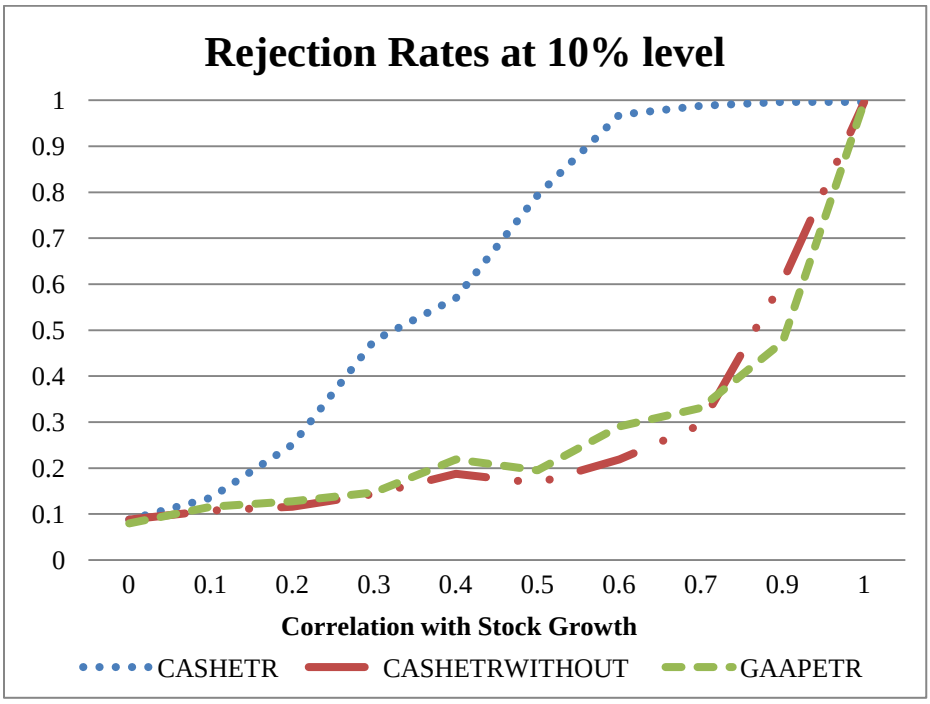
Using both parametric and non-parametric tests, I show that firms with the greatest unanticipated tax deduction are significantly more likely to be identified as aggressive tax avoiders when *CASHETR* is the measure of tax avoidance, but not when *GAAPETR* or $CASHETR_{WITHOUT}$ is the measure of tax avoidance. I also show that the unanticipated tax benefit from employees' exercise of stock options, i.e., the measurement error in *CASHETR*, is correlated with firm variables that are often used as control variables in studies of tax avoidance and/or that are related to variables of interest in tax-avoidance studies. This is of concern to researchers when using ordinary least squares analysis, as is common in tax avoidance research, because any measurement error in the dependent variable that is correlated with any independent variable included in the statistical test may bias the results of the test.

In order to inform researchers of one implication of this concern, I conduct a research simulation. I construct a hypothetical firm characteristic correlated to varying degrees with stock growth. This hypothetical firm characteristic represents a number of firm characteristics that could be variables of interest in studies of tax avoidance. I test the null hypothesis that the hypothetical firm characteristic is not a determinant in a common model of tax avoidance. I show that the rejection rates of the null hypothesis are inflated when *CASHETR* is the measure of tax avoidance compared to the rejection rates when *GAAPETR* or $CASHETR_{WITHOUT}$ is the measure of tax avoidance. Thus, *CASHETR's* inclusion of the unanticipated tax benefit from employees' exercise of stock options can change researchers' inferences about intentional tax avoidance.

Researchers investigating intentional tax avoidance can address the analysis issues caused by the unanticipated tax benefit of stock options either through measurement selection or through sample selection criteria. Researchers investigating firms' intentional tax avoidance can address the implications of an unanticipated tax benefit from stock option exercise through their choice and calculation of effective tax rates. Because *GAAPETR* excludes the unanticipated tax benefit from employees' exercise of stock options, it is a good choice for researchers investigating firms' intentional tax avoidance. While *GAAPETR* does not include the unanticipated tax benefit from stock options, it has other limitations as a measure of tax avoidance (Hanlon and Heitzman, 2010). For instance, *GAAPETR* does not capture tax avoidance strategies that defer income recognition for tax purposes. Therefore, in some settings *CASHETR* may be a more appropriate measure of tax avoidance. In these studies, researchers can use firms' disclosure of the excess tax benefit in the financing section of the statement of cash flows to remove the unanticipated tax benefit from employees' exercise of stock options from *CASHETR*. As a second solution, researchers can remove from their sample those firms most likely to be experiencing an unanticipated tax benefit from employees' exercise of stock options and test the robustness of their results.

My results suggest that as researchers continue to explore tax avoidance they should consider whether the appropriate theoretical construct is limited to firms' *intentional* tax avoidance. If so, they should follow the suggestions above to avoid including the impact of unanticipated tax benefit from employees' exercise of stock options. Failing to do so may lead to unreliable tests and questionable inferences.

Figure 1. Rejection rates of PART as a determinant of tax avoidance



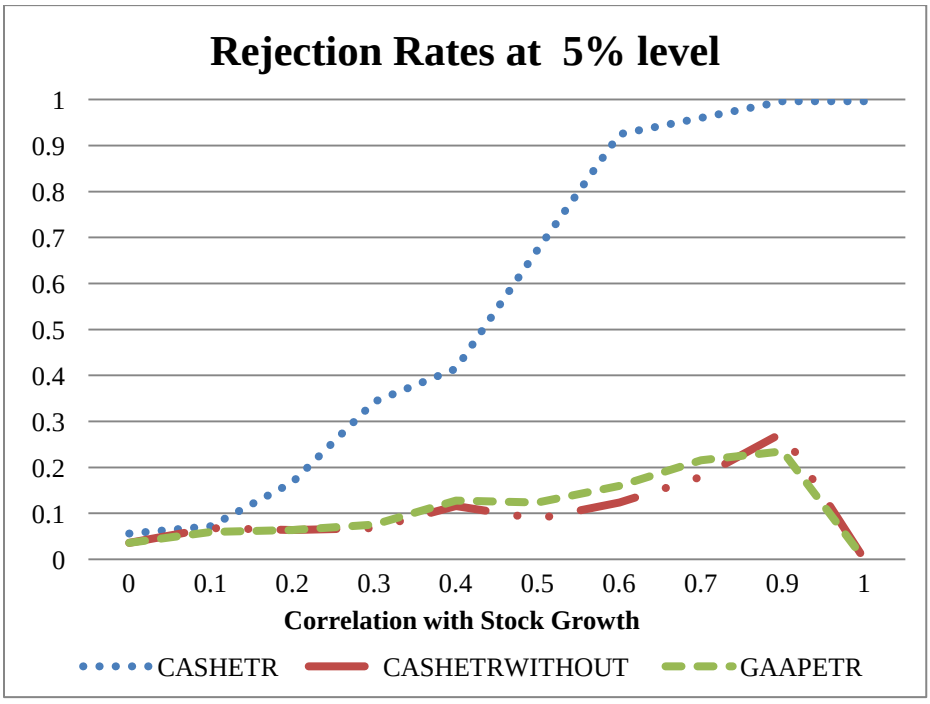
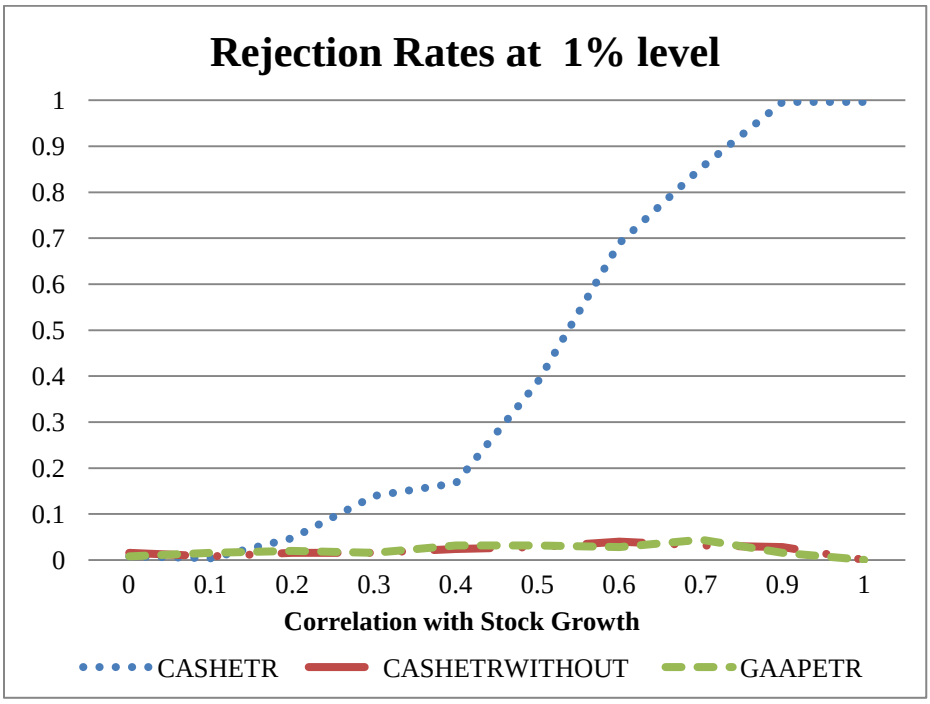


Figure 1 continued.



Note: These figures depict the frequency of rejecting the null hypothesis of no relationship in a multivariate test of a hypothetical partitioning variable, *PART*, as a determinant of tax avoidance. *PART* is constructed as a combination of stock growth and a random error term where the correlation between *PART* and stock growth is researcher controlled. For every correlation level, I calculated *PART* for each firm and then estimated the previous model, including fixed effects for the Fama-French 48 industries and year. I calculated rejection rates after following this procedure 1,000 times. I used the following model to conduct the multivariate analysis:

$$TaxAvoid_{i,t} = \beta_1 + \beta_2 PART_{,t} + \beta_3 ROA_{i,t} + \beta_4 Lev_{i,t} + \beta_5 NOL_{i,t} + \beta_6 \Delta NOL_{i,t} + \beta_7 ForInc_{i,t} + \beta_8 CapInt_{i,t} + \beta_9 EqInc_{i,t} + \beta_{10} R\&D_{i,t} + \beta_{11} MTB_{i,t} + \beta_{12} Size_{i,t} + \varepsilon_{i,t}$$

Tax avoidance is measured in turn by *CASHETR*, $CASHETR_{WITHOUT}$, and *GAAPETR*. *CASHETR* is a measure of the firm's income taxes paid compared to the firm's recognized income. $CASHETR_{WITHOUT}$ is a measure of the firm's cash taxes paid, including an adjustment to remove the unanticipated cash tax savings from option exercise, compared to income reported to shareholders. *GAAPETR* is a measure of the firm's reported tax expense compared to the firm's recognized income.

Table 1. Sample Selection

Firms with Compustat data for each year 2006-2012	3,430
Less firms with non-positive pretax book income	(674)
Less firms with missing option data	(1,003)
Main Sample	1,752

Table 2. Industry Composition

Industry	Option Sample	Compustat Population
Durables	2.33%	2.46%
Energy	3.75%	4.42%
Health	**7.26%**	**5.65%**
High Technology	**17.03%**	**13.90%**
Manufacturing	14.47%	13.87%
Non-Durables	4.94%	5.00%
Retail	10.44%	9.41%
Telecommunications	1.82%	3.37%
Utilities	3.18%	3.98%
Other	**34.79%**	**37.94%**
Total	100.00%	100.00%

Note: Bolded proportions are significantly different between the option sample and the Compustat population at the one-percent level using a Chi-square test.

Table 3. Comparison of Stock Option Usage

	Sample Firms					Compustat Firms				
	N	**Mean**	**Q1**	**Median**	**Q3**	**N**	**Mean**	**Q1**	**Median**	**Q3**
OPTGRPEREMP	1,747	0.49	0.02	0.09	0.32	2,467	0.59	0.02	0.08	0.30

Note: This table compares stock option usage of my sample of firms and Compustat firms. If there are no differences between these samples in terms of stock option usage than my sample should accurately reflect the impact of stock options on firms' effective tax rates.

Note: All statistics provided are averaged across all years in the sample period. All variables are described in Appendix A.

Table 4. Descriptive Statistics of Option Variables

	N	**Mean**	**Std**	**Q1**	**Median**	**Q3**
Option Variables						
EXCESS TAX BENEFIT	1,752	4.90	13.18	0.00	0.40	3.36
RECOGNIZED COST	1,752	12.40	37.83	0.28	2.16	9.02
REALIZED COST	1,752	24.81	80.81	0.79	4.20	17.75
DIFF_COST	1,752	10.34	28.83	-0.07	0.99	7.83

Note: This table provides descriptive statistics about option variables for firms included in the sample. All variables are the average values across the seven years in the sample period 2006-2007. All variables have been winsorized at the 1% and 99% levels.

Note: All variables are defined in Appendix A.

Table 5. Mean and Median *EXCESS TAX BENEFIT* and *DIFF_COST* and *UNANTICIPATED* Partitioned by the Sign of *DIFF_COST*

		Positive DIFF_COST			Non-Positive DIFF_COST	
		Mean	**Median**		**Mean**	**Median**
EXCESS TAX BENEFIT	1,256	6.22	0.87	496	1.56	0.05
DIFF_COST	1,256	19.23	3.41	496	-4.85	-1.04

Note: This table sorts firms on the sign of *DIFF_COST* and presents my estimates of the differences between my estimates of the realized and recognized costs of options. *DIFF_COST* and *EXCESS TAX BENEFIT* are defined in Table 4. *DIFF_COST* is my estimate of the unanticipated tax *deduction* from employees' exercise of stock options. *EXCESS TAX BENEFIT* is the unanticipated tax *savings* resulting from employees' exercise of stock options that results in a tax windfall. *UNANTICIPATED* is scaled by pretax book income. All means and medians are significantly different between the two subsamples.

Note: All variables are defined in Appendix A.

Table 6. Correlation between *EXCESS TAX BENEFIT* and *DIFF_COST*, when *DIFF_COST* is Positive

	EXCESS TAX BENEFIT	DIFF_COST
EXCESS TAX BENEFIT	1	0.86‡
DIFF_COST	0.57‡	1

Note: This table presents the correlation between firms' disclosed excess tax benefit and my calculation of the difference between the recognized and realized costs of stock options, *DIFF_COST*. Only firms with a positive *DIFF_COST* are included because *EXCESS TAX BENEFIT* is only reported for stock options that result in tax windfall, i.e., those exercises where the realized cost exceeds the recognized cost. Pearson correlations are presented above the diagonal and Spearman correlations are presented below the diagonal.

Note: All variables are defined in Appendix A.

*, †, and ‡ represent significance at the 10%, 5%, and 1% level, respectively.

Table 7. Descriptive Statistics of Option Variables Scaled by Pretax Book Income

	N	Mea	Std	Q1	Median	Q3
ANTICIP_DEDUCT	1,752	0.09	0.21	0.01	0.02	0.07
REAL_DEDUCT	1,752	0.12	0.22	0.02	0.05	0.11
UNANTICIPATED	1,752	0.02	0.16	-0.00	0.02	0.05

Note: This table presents descriptive statistics about the anticipated tax deduction from employee option exercise (*ANTICIP_DEDUCT*), the realized tax deduction from employee option exercise (*REAL_DEDUCT*), and the unanticipated tax deduction from stock option exercise (*UNANTICIPATED*). *ANTICIP_DEDUCT* is my estimate of firms' recognized cost from stock option compensation *(RECOG_COST)* scaled by pretax book income. *REAL_DEDUCT* is my estimate of the realized cost from employees' exercise of stock options (*REAL_COST*) scaled by pretax book income. *UNANTICIPATED* is an estimate of firms' unanticipated tax deduction, i.e., the difference between my estimates of the recognized and realized costs of stock options, scaled by pretax book income. All variables are the average values across the seven years in the sample period 2006-2007. All variables have been winsorized at the 1% and 99% levels.

Table 8. Correlation between *ANTICIP_DEDUCT, REAL_DEDUCT,* and *UNANTICIPATED*

	ANTICIP_DEDUCT	**REAL_DEDUCT**	**UNANTICIPATED**
ANTICIP_DEDUCT	1	0.69***	-0.35***
REAL_DECUT	0.57***	1	0.34***
UNANTICIPATED	-0.17***	0.55***	1

Note: This table presents the correlations between *ANTICIP_DEDUCT*, *REAL_DEDUCT, UNANTICIPATED*. Pearson correlation coefficients are presented above the diagonal and Spearman correlation coefficients are presented below the diagonal.

Note: All variables are defined in Appendix A.

*, †, and ‡ represent significance at the 10%, 5%, and 1% levels respectively.

Table 9. Comparison of the Impact Stock Option Tax Deductions of Firms with the Heaviest Stock Option use and Other Firms

	Mean		Median	
	LARGE GRANTERS	**Other Firms**	**LARGE GRANTERS**	**Other Firms**
ANTICIP_DEDUCT	10.02***	1.80	4.81***	0.62
REAL_DEDUCT	8.81***	3.12	4.47***	1.47
UNANTICIPATED	-1.19***	1.26	-0.06***	0.65
GAAPETR	26.83	27.47	28.65	29.04
CASHETR	20.84***	23.40	21.03***	24.35

Note: This table presents tests of the difference in the mean and median of *ANTICP_DEDUCT*, *REAL_DEDUCT*, and *UNANTICIPATED* between *LARGEGRANTER* and other firms. *LARGERGRANTER* firms are those in the highest quintile when firms are ranked on the number of stock options granted by the firm scaled by the market value of equity, averaged over the sample period. All variables are presented as a percentage of pretax income. All variables have been winsorized at the 1% and 99% levels.

Note: All variables are defined in Appendix A.

*, **, and *** represent significance at the 10%, 5%, and 1% level respectively.

Table 10. Comparison of the Impact of Stock Option Tax Deductions between Firms with the Most Stock Option Exercises and Other Firms

	Mean		Median	
	LARGE EXERCISERS	**Other Firms**	**LARGE EXERCISERS**	**Other Firms**
ANTICIP_DEDUCT	7.03***	2.53	2.87***	0.72
REAL_DEDUCT	9.41***	2.97	4.67***	1.41
UNANTICIPATED	2.18***	0.46	1.88***	0.42
GAAPETR	26.64	27.51	28.21	29.05
CASHETR	20.41***	23.51	20.81***	24.24

Note: This table presents tests of the difference in the mean and median of *ANTICP_DEDUCT*, *REAL_DEDUCT*, and *UNANTICIPATED* between *LARGEEXERCISER* and other firms. *LARGEEXERCISER* firms are those in the highest quintile when firms are ranked on the number of stock options exercised by the firm's employees scaled by the market value of equity, averaged over the sample period. All variables are presented as a percentage of pretax income. All variables have been winsorized at the 1% and 99% levels.

Note: All other variables are defined in Appendix A.

*, **, and *** represent significance at the 10%, 5%, and 1% level respectively.

Table 11. Correlations

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
UNANTICIPATED (1)	1	-0.04	0.10‡	0.10‡	0.01	0.01	0.08‡	0.19‡	-0.03	-0.08‡	0.04*	-0.02
TOTAL ASSETS (2)	-0.02	1	-0.10‡	-0.05†	0.01	-0.02	0.02	-0.09‡	-0.07‡	-0.09‡	-0.01	0.01
RETURN ON ASSETS (3)	0.25‡	-0.08‡	1	0.62‡	-0.07‡	0.28‡	0.28‡	0.20‡	0.09‡	-0.22‡	0.01	-0.06‡
MTB (4)	0.31‡	0.02	0.52‡	1	-0.02	0.17‡	0.16‡	0.18‡	0.18‡	-0.15‡	0.01	0.02
LEVERAGE (5)	-0.01	0.38‡	-0.10‡	0.01	1	0.37‡	-0.05*	0.08‡	-0.22‡	-0.07‡	0.10‡	0.03
CAPITAL INTENSITY (6)	0.05*	0.07‡	0.03	-0.05†	0.37‡	1	-0.01	0.09‡	-0.19‡	-0.05†	0.01	0.04
FOREIGN INCOME (7)	0.15‡	0.15‡	0.31‡	0.27‡	0.02	0.10‡	1	0.13‡	0.22‡	-0.12‡	0.28‡	0.13‡
STOCK GROWTH (8)	0.32‡	-0.11‡	0.34‡	0.32‡	0.07‡	0.21‡	0.17‡	1	0.18‡	0.05*	0.14‡	-0.02
R&D (9)	0.07‡	-0.15‡	0.23‡	0.31‡	-0.19‡	0.01	0.38‡	0.15‡	1	0.02	0.25‡	0.04*
RETURN VOLATILITY (10)	-0.08‡	-0.41‡	-0.31‡	-0.24‡	-0.15‡	-0.06†	-0.15‡	0.15‡	-0.02	1	0.03	-0.01
NOL (11)	0.07‡	0.04*	0.12‡	0.13‡	0.10‡	0.13‡	0.19‡	0.10‡	0.15‡	0.03	1	0.09‡
ΔNOL (12)	0.06‡	0.08‡	0.01	0.04*	0.07‡	0.06†	0.09‡	-0.06†	-0.01	0.07‡	0.31‡	1

Note: This table presents the correlations between *UNANTICIPATED* and the other variables included in my study. *UNANTICIPATED* is an estimate of the firm's unanticipated tax deduction, i.e., the difference between my estimates of the recognized and realized costs of stock options, scaled by pretax book income. Pearson correlation coefficients are presented above the diagonal and Spearman correlation coefficients are presented below the diagonal.

Note: All variables are defined in Appendix A.

*, †, and ‡ represent significance at the 10%, 5%, and 1% levels respectively.

Table 12. Correlations of UNANTICIPATED and Effective Tax Rates

Full Sample N=1,752		**GAAPETR**	**CASHETR**
	UNANTICIPATED	0.04*	-0.02
Positive UNANTICIPATED N=1,256			
	UNANTICIPATED	-0.03	-0.16‡
Non-Positive UNANTICIPATED N=496			
	UNANTICIPATED	0.12‡	0.17‡

Note: All variables are defined in Appendix A. This table shows the correlation between *UNANTICIPATED* and the effective tax rates for the full sample, those firms with a positive *UNANTICIPATED*, and those firms with a non-positive *UNANTICIPATED*. Firms where *UNANTICIPATED* is positive experience a tax windfall. Firms where *UNANTICIPATED* is negative experience a tax shortfall. All variables have been winsorized at the 1% and 99% levels.

Note: All variables are defined in Appendix A.

*, †, and ‡ represent significance at the 10%, 5%, and 1% levels respectively.

Table 13. Descriptive Statistics of Tax Avoidance Variables

	N	**Mean**	**Std**	**Q1**	**Median**	**Q3**
CASHETR	1,752	22.80	12.24	14.43	23.64	31.48
$CASHETR_{WITHOUT}$	1,752	25.16	13.15	16.44	26.36	34.95
GAAPETR	1,752	27.22	10.96	21.29	29.00	34.82

Note: All variables are defined in Appendix A. This table provides descriptive statistics about estimates of effective tax rates for firms included in the sample. All variables are the average values across the seven years in the sample period 2006-2007. All variables have been winsorized at the 1% and 99% levels.

Note: All variables are defined in Appendix A.

Table 14. Correlation between Effective Tax Rate Measures

	CASHETR	**CASHETR$_{WITHOUT}$**	**GAAPETR**
CASHETR	1	0.88‡	0.54‡
CASHETR$_{WITHOUT}$	0.87‡	1	0.49‡
GAAPETR	0.49‡	0.43‡	1

Note: This table presents the correlations between the effective tax rates. Pearson correlation coefficients are presented above the diagonal and Spearman correlation coefficients are presented below the diagonal.

Note: All variables are defined in Appendix A.

*, †, and ‡ represent significance at the 10%, 5%, and 1% levels respectively.

Table 15. Comparison of Variables between Quintile of Firms with the Largest Unanticipated Tax Benefit and Other Firms

	Mean		Median	
Sorted by UNANTICIPATED	**Highest Quintile**	**Other Firms**	**Highest Quintile**	**Other Firms**
Option Variables				
EXCESS TAX BENEFIT	8.07***	4.22	2.06***	0.22
RECOGNIZED COST	10.89	13.05	1.61***	2.38
REALIZED COST	40.42***	21.45	10.43***	3.41
DIFF_COST	22.77***	7.46	7.11***	0.38
UNANTICIPATED	0.20***	-0.02	0.12***	0.01
Firm Characteristics				
AT	2,961.4***	11,568.12	838.18***	1,855.28
ROA	0.09***	0.07	0.08***	0.06
LEV	0.15***	0.18	0.09***	0.14
MTB	3.44***	2.31	2.73***	1.75
CAPINT	0.22*	0.25	0.14	0.15
FORINC	0.02***	0.02	0.00***	0.00
R&D	0.04***	0.02	0.00***	0.00
STCKGRWTH3	1.43***	1.18	1.30***	1.09
NEWECON	0.23***	0.09	0.00***	0.00
RETURNVOL	49.09***	45.92	48.10***	44.86
STOCKPRICELOW	23.17	22.11	18.87	18.48
STOCKPRICEHIGH	42.99***	37.65	35.44**	32.03
NOL	0.49***	0.37	0.43***	0.00
ΔNOL	0.00	0.00	0.00***	0.00
Tax Avoidance Variables				
CASHETR	20.82***	23.43	21.61***	24.31
$CASHETR_{WITHOUT}$	25.60	25.24	27.39	26.31
GAAPETR	27.32	27.34	29.22	28.95

Note: This table presents tests of the difference in the mean and median of option variables between quintiles of firms sorted on *UNANTICIPATED*. *UNANTICIPATED* is the average difference between the realized and recognized cost for a firm, scaled by pretax income. All variables have been winsorized at the 1% and 99% levels.

Note: All other variables are defined in Appendix A.

*, **, and *** represent significance at the 10%, 5%, and 1% level respectively.

Table 16. Mann-Whitney-Wilcoxon Tests

Ranking Variable	Median Rank: Highest Quintile of UNANTICIPATED	Median Rank: Other Quintiles of UNANTICIPATED	Difference in ranks, unadjusted p-value	Difference in ranks, Industry adjusted p-value
CASHETR	749	911	0.0002	<0.0001
$CASHETR_{WITHOUT}$	917	866	0.7517	0.5755
GAAPETR	901	874	0.9202	0.8877

Note: This table presents the results of a non-parametric test of differences in the rank of tax avoidance variables between firms in the highest quintile of *UNANTICIPATED* and other firms. The equivalent parametric test is a two-sample t-test. Significant results imply that the highest quintile's tax avoidance rankings differ from the rankings of the remaining firms in the sample. Higher ranks are assigned to more aggressive firms.

Note: All variables are defined in Appendix A

Table 17. Proportion of Firms Identified as Aggressive Tax Avoiders

Ranking Variable	Proportion of firms ranked as aggressive tax avoiders: Highest Quintile of UNANTICIPATED	Proportion of firms ranked as aggressive tax avoiders: Other Quintiles of UNANTICIPATED	Chi-Square for differences in proportion
CASHETR	24.35%	18.97%	4.98**
$CASHETR_{WITHOUT}$	20.00%	20.06%	0.00
GAAPETR	20.86%	19.84%	0.18

Note: This table presents the results from testing whether there are significantly more firms in the highest quintile of *UNANTICIPATED* identified as aggressive tax avoiders than in the remaining quintiles of firms. Aggressive tax avoiders are identified as those firms whose effective tax rate falls into the 20th percentile of firms in the sample.

Note: All variables are defined in Appendix A

*, **, and *** represent significance at the 10%, 5%, and 1% level respectively.

Table 18. Differences in Cash Effective Tax Rates when Controls of Tax Avoidance are used as the sorting variable

Sorting Variable		CASHETR	$CASHETR_{WITHOUT}$
AT	**Q5**	22.48%	24.27%
	Q1-Q4	23.96%	26.58%
	t-statistic	**-1.75**	**-1.85**
ROA	**Q5**	27.49%	31.03%
	Q1-Q4	22.74%	24.88%
	t-statistic	**5.07**	**6.13**
LEVERAGE	**Q5**	17.92%	21.23%
	Q1-Q4	24.69%	27.25%
	t-statistic	**-7.47**	**-6.13**
MTB	**Q5**	22.64%	27.62%
	Q1-Q4	23.87%	25.77%
	t-statistic	**-2.09**	0.9
CAPITAL INTENSITY	**Q5**	18.83%	21.15%
	Q1-Q4	24.58%	27.25%
	t-statistic	**-5.30**	**-5.34**
FOREIGN INCOME	**Q5**	22.91%	26.74%
	Q1-Q4	23.88%	25.87%
	t-statistic	-0.12	**2.21**
R&D	**Q5**	19.88%	23.54%
	Q1-Q4	24.75%	26.9%
	t-statistic	**-5.78**	**-3.08**
NEWECON	**Q5**	19.8%	25.04%
	Q1-Q4	24.07%	26.12%
	t-statistic	**-3.48**	-0.82
NOL	**Q5**	22.41%	25.45%
	Q1-Q4	24.15%	26.22%
	t-statistic	**-2.58**	-0.84
ΔNOL	**Q5**	22.45%	25.19%
	Q1-Q4	23.97%	26.33%
	t-statistic	**-1.78**	-0.16

Table 18 continued.

Sorting Variable		CASHETR	$CASHETR_{WITHOUT}$
DAP	**Q5**	22.40%	23.71%
	Q1-Q4	24.07%	26.63%
	t-statistic	**-2.20**	**-2.34**
MEZZFIN	**Q5**	20.56%	24.68%
	Q1-Q4	24.57%	26.49%
	t-statistic	**-4.63**	**-2.68**
EQUITY EARNINGS	**Q5**	20.75%	21.98%
	Q1-Q4	24.39%	27.24%
	t-statistic	**-4.74**	**-4.58**
LITIGATION	**Q5**	23.04%	25.85%
	Q1-Q4	23.95%	26.12%
	t-statistic	-1.01	0.35
BIG4	**Q5**	23.31%	26.14%
	Q1-Q4	24.71%	25.19%
	t-statistic	**2.05**	-0.28

Note: This section uses univariate tests to analyze the relationship between controls of tax avoidance identified by prior research and the cash effective tax rate with and without unanticipated tax benefit from employees' exercise of stock options. *CASHETR* includes the unanticipated tax benefit from stock option exercise. $CASHETR_{WITHOUT}$ does not reflect the unanticipated tax benefit. The sample of firms is sorted on the control variable common in tax avoidance studies in the left hand column. The table presents the median cash effective tax rate among firms in the highest quintile of the control and median cash effective tax rate among firms in the other four quintiles. I conduct a two-sample median test identifying whether there are significant differences between the median cash effective tax rate among firms in the highest quintile of the control and the median cash effective tax rate among firms in the remaining four quintiles. The T-test statistics are presented. Bolded T-test statistics indicate that there are differences in the cash effective tax rate among the subsamples of firms at the ten-percent level. If the existence of significant differences changes based on the treatment of the unanticipated tax benefit from stock option exercise, it implies that inferences about which firms are relatively more aggressive tax avoiders may change depending on the treatment of the unanticipated tax benefit from stock options.

Note: All variables are defined in Appendix A.

Table 19. Descriptive Statistics for Measures of Firms' Tax Risk

	N	Mean	Std	Q1	Median	Q3
CASHETRSTD	1,752	0.14	0.10	0.06	0.11	3.36
$CASHETR_{WITHOUT}STD$	1,752	0.16	0.11	0.07	0.13	9.02
CASHETRCV	1,707	0.75	0.51	0.35	0.64	17.75
$CASHETR_{WITHOUT}CV$	1,709	0.76	0.50	0.3	0.69	7.83
FTESTSIGNIF	1,752	0.12	0.33	0.00	0.00	1.00

Note: This table presents the descriptive statistics of *CASHETRSTD*, *$CASHETR_{WITHOUT}STD$*, *CASHETRCV*, *$CASHETR_{WITHOUT}CV$*, and *FTESTSIGNIF*. *CASHETRSTD* measures the standard deviation of *CASHETR* within each firm during the sample period. *$CASHETR_{WITHOUT}STD$* measures the standard deviation of *$CASHETR_{WITHOUT}$* within each firm during the sample period. *CASHETRCV* measures the coefficient of variation of *CASHETR*. *$CASHETR_{WITHOUT}CV$* measures the coefficient of variation of *$CASHETR_{WITHOUT}$*. *FTESTSIGNIF* is an indicator variable that turns on when the variance of a firm's *$CASHETR_{WITHOUT}$* is larger than the variance of the firm's *CASHETR* during the sample period.

Note: All variables are defined in Appendix A.

Table 20. Comparison of Measures of Tax Risk between the Quintile of Firms with the Largest Unanticipated Tax Benefit and Other Firms

	Mean		Median	
Sorted by UNANTICIPATED	**Highest Quintile**	**Other Firms**	**Highest Quintile**	**Other Firms**
CASHETRSTD	0.13	0.14	0.10	0.12
$CASHETR_{WITHOUT}STD$	0.16	0.15	0.13	0.13
CASHETRCV	0.76	0.75	0.70	0.63
$CASHETR_{WITHOUT}CV$	0.75	0.77	0.73	0.68
FTESTSIGNIF	0.17***	0.10	0.00	0.00

Note: This table presents tests of the difference in the mean and median of *CASHETRSTD*, *$CASHETR_{WITHOUT}STD$*, *CASHETRCV*, and *$CASHETR_{WITHOUT}CV$* between quintiles of firms sorted on *UNANTICIPATED*. *UNANTICIPATED* is the average difference between the realized and recognized costs for a firm, scaled by pretax income. All variables have been winsorized at the 1% and 99% levels.

Note: All variables are defined in Appendix A.

*, **, and *** represent significance at the 10%, 5%, and 1% level respectively.

CHAPTER 2: DIFFERENCES BETWEEN THE RECOGNIZED AND REALIZED COSTS OF STOCK OPTIONS

2.1 Introduction

The current financial reporting rules for stock option compensation, outlined under Accounting Standards Codification 718 (ASC 718), require firms to estimate the value of stock options granted to their employees at the grant date and to recognize this estimate as part of compensation expense.[79] The realized cost of stock options is the cash proceeds forgone because the stock is issued to an option holder at a below-market exercise price. The realized cost of a stock option is not known until the option is exercised and it almost always differs from the value of the stock option estimated at its grant date. After the initial expense recognition, a firm never trues-up their financial statements for the difference between the recognized expense and the eventually realized cost of stock options.

Critics contend that the failure of financial statements to inform investors of the amount of wealth transferred to employees is a major flaw of accounting for stock option compensation (Rue, Volkan, Best and Lobo, 2003). Congress has also expressed concern that the realized cost of stock options exceeds the options' recognized cost and the financial reporting rules and tax law allow firms to report a smaller income to taxing authorities than they report to their investors.[80] In June of 2007, the U.S. Senate Permanent Subcommittee on Investigations held a hearing to assess differences between the recognized cost of options under the financial reporting rules outlined under ASC 718 and the realized cost of stock options.[81] My study addresses these concerns by

[79]The financial reporting rules for stock option compensation are discussed in more detail in Appendix B.

[80]Congress was interested in the difference between the realized and recognized costs of stock options because the tax deduction for stock option compensation is the firms' realized cost of stock options.

[81] 155 Cong. Rec. S18745-S18750 (2009)

documenting the magnitude of the difference between recognized and realized stock option costs for all options granted by firms under ASC 718.

The difference between the recognized and realized costs of options is assessed using all firms in the Compustat population with stock option data available for every year following the required expensing of stock options, 2006-2012. Using this data, I estimate the firm's recognized and realized costs of stock option compensation, *RECOGNIZED_COST* and *REALIZED_COST* respectively.[82] I examine differences between firms' *RECOGNIZED_COST* and *REALIZED_COST* each year of the sample period and averaged across all years of the sample period.

During the sample period, I find that the majority of firms recognize less stock option expense than the actual wealth transferred from shareholders to employees when options are exercised. My estimates suggest that requiring firms to recognize the entire realized cost of stock options the median increase in the yearly compensation expense would be $0.99 million, or 1.46 percent of pretax book income. This translates into a wealth transfer from shareholders to employees of three cents per share in excess of the recognized compensation expense each year of the sample period. Shareholders in twenty-five percent of firms transferred to employees at least 11.58 cents per share more than recognized each year of the sample period. These findings are consistent with the concerns of critics and lawmakers that the recognized cost of stock options understates the realized cost of stock options.

My analysis provides useful information to regulators, financial statement users, and lawmakers. Regulators gain insight on differences between the wealth transferred from shareholders to employees and the cost of stock option compensation reported to

[82] These variables were described in Section 1.3.2 and in Appendix A.

shareholders under the current financial reporting rules for stock option compensation. Knowing the potential understatement of firms' recognized stock option expense compared to the realized stock option cost aids financial statement users' decision processes because they can more accurately assess the firm's total compensation expense. This analysis also informs lawmakers about firms' ability to generate tax deductions in excess of recognized expense through stock option compensation over a long period of time.

The rest of this chapter proceeds as follows. Section 2.2 discusses the motivation of this investigation and reviews prior literature. Section 2.3 presents the results of the empirical analyses. Section 2.4 contains supplemental analysis. Section 2.5 concludes this chapter.

2.2 Motivation

The financial reporting rules for stock option compensation are unique and complex. Beginning in 2006, the Statement of Financial Accounting Standards 123R, now Accounting Standards Codification 718 (ASC 718), requires firms to expense the fair value of stock options granted to employees as those options vest.[83] The fair value of a stock option is an estimate of the present value of the cost that the firm expects to realize upon option exercise.[84] The realized cost of stock option compensation is the cash the company forgoes because the employee buys the stock for less than the current market price. The unique feature of the financial reporting for stock option compensation

[83]Appendix B and Section 1.2.1 discuss the financial reporting of the recognized and realized costs of stock options and the related tax benefit.

[84]To value options, ASC 718-10-55-21 requires firms to use valuation models which, at a minimum, incorporate the following factors: the stock price at grant date, the exercise price, the expected life of the option, the expected volatility of the firm's stock (and any expected dividends) and the expected risk-free interest rate over the expected life of the option.

expense is that once options vest, a firm ***never recognizes an adjustment for the difference between the estimated and eventually realized costs of stock options***. These financial reporting rules for stock option compensation create a complication for users of financial statements since the recognized stock option compensation is an imprecise measure of the wealth transferred from owners to employees for services rendered.[85] Rue et al., 2003 consider the failure of recognized stock option expense to accurately reflect "economic reality...[of] the ultimate cash flow impact of the options" to be a major flaw in financial reporting.

Congress has also expressed concerns about the divergence of the recognized cost of options from the tax deduction for option compensation (which is the same as the realized cost of stock options). According to Congress, the realized cost of stock option compensation is generally larger than the recognized cost of stock option compensation, allowing firms to report a larger income to their investors than to the taxing authorities. In June of 2007, the Permanent Subcommittee on Investigations held a hearing in order to investigate the differences between the stock option expense recognized by firms and the realized cost of stock options to the firm.[86] The Subcommittee also used the book-tax reconciliation filed with a company's tax return to compare firms' recognized stock option expense to firms' tax deduction from option exercise. They found that for tax returns filed July 1, 2006 to June 30, 2007 U.S. companies' aggregate tax deductions (the realized cost) exceeded the aggregate recognized cost of stock options by about $48 billion. It was pointed out during the hearing that, because of the influence of stock price fluctuations, a

[85]This issue is distinct from the issue addressed in Chapter 1, which argues that the financial reporting rules for stock option compensation introduce measurement error into recognized tax expense.

[86] 155 Cong. Rec. S18745-S18750 (2009)

single year of data is not sufficient to conclude that the realized cost of options is generally higher than the recognized cost of options.

To provide evidence on the difference between the cost of options reported to shareholders and the eventual wealth transferred from shareholders, I use data disclosed by firms to estimate the realized cost of options exercised and the recognized cost of all options granted by a wide variety of firms across multiple years. My sample is different from previous studies in two distinct ways: (1) it includes options granted to both executives and non-executives and, (2) the sample period only includes years following the advent of mandatory stock option compensation recognition in 2006. Either of these differences can change conclusions about the relationship between the recognized and realized costs of stock options found in previous studies.

Previous literature focusing exclusively on executive stock options has found that executives make use of inside information in timing the exercise of their options (Dhaliwal, Erickson, and Heitzman, 2009 and Brooks, Chance, and Cline, 2012) and in back-dating options (Heron and Lie, 2007), both of which actions increase the difference between the recognized and realized costs of options. It is unclear whether non-executives have inside information or are able to use it in timing their stock option exercises (Huddart and Lang, 1996 and 2003). Also, it is doubtful whether non-executive employees have the ability to back-date stock options. Babenko and Tserlukevich (2009) find that eighty-nine percent of outstanding stock options of S&P 500 firms during 2005 were granted to non-executives. Therefore, differences between the recognized and realized costs of *executive* stock options may not be informative about differences between the recognized and realized costs of *all* stock options granted by firms.

The majority of prior research examining the fair value of options granted focuses on the accuracy of the inputs used in valuation models (e.g., Hodder, Maydew,

McAnallay, and Weaver, 2006; Choudhary, 2011; Johnston, 2006 and Cheng and Smith, 2013) and the choice of valuation model used to estimate the fair value of options granted (Bratten, Jennings, and Schwab, 2014). This research finds that firms make choices that minimize the estimated fair value of options granted, especially after the adoption of ASC 718 and its requirement to expense the fair value of options granted.

Only two other studies compare estimates of the realized value of granted options to their recognized cost: Marquardt (2002) and Anderson and Muslu (2014). Marquardt (2002) uses historic firm and industry data to estimate firm-specific inputs used in the Black-Scholes model for a sample of option-granting firms during 1963-1984.[87] She cannot reject the hypothesis that her estimate of the Black Scholes valuation of stock options at grant date fairly represents the ex-post (i.e. realized) cost of stock options. She also finds considerable variation in the Black-Scholes model's explanatory power across firms. For instance, contrary to concerns that fair value models result in fair value estimations which are universally less than the cost eventually realized, she found that the Black-Scholes model overestimated the realized value of stocks in seventy-three percent of her sample. Anderson and Muslu find that the disclosed fair value of stock options granted to 2,235 CEOs from 1992-2009 exceeded the realized cost of the options.[88]

Neither Marquardt (2002) nor Anderson and Muslu (2014) compare the recognized and realized costs of stock option compensation exclusively in the post-FAS123R era. Choudhary (2011) and Cheng and Smith (2013) find that when stock option expensing became mandatory, there was increased opportunism in determining the

[87]During this time period, firms' estimated inputs for the Black-Scholes model were unavailable because firms did not need to estimate the fair value of options. Option expense recognition rules during this time required that firms recognize expense for stock options only if the strike price of the option was more than the underlying stock's price at the grant date.

[88]This time period encompasses years with and without the required expensing of the fair value of options.

factors used in computing the fair value of options granted. Thus, conclusions reached about the difference between the fair value of options granted and the realized cost of options using data prior to the enactment may not hold following the required expensing of the fair value of stock options.

In the next section, I compare the recognized cost of options granted following the implementation of ASC 718 to the realized cost of options during the same time period to see whether the claim that ASC 718 allows the majority of firms to avoid recognizing the entire realized cost of stock options is valid.

2.3 Empirical Analysis

2.3.1 Firms' Disclosures

I use the same sample used in Chapter 1, namely, those firms in the Compustat population with option data available each year of the sample period, 2006-2012. Table 1 and Section 1.3.1 of Chapter 1 describe the sample selection criteria in more detail, while Table 2 presents the descriptive statistics discussed in Section 1.3.1. The sample requirement that firms have all option data available in every year of the sample period may raise concerns that my sample misrepresents stock option usage. To alleviate these concerns, I compare my sample to Compustat firms in terms of stock option usage and find no difference between my sample and Compustat firms in terms of stock option usage. Thus, requiring firms have all option data available in every year of the sample period does not create a sample that misrepresents stock option usage. Results of this test are presented in Table 3.

Table 21 presents information about the average and median number of stock options granted, exercised, and canceled for sample firms each year of the sample

period.[89] I present both the means and the medians of these variables' distributions because the use of stock option compensation is left skewed. The average and median number of options canceled and exercised follows an expected pattern, given economy-wide stock performance. For instance, during the recession in 2008 and 2009, the number of options expiring unexercised increases and the number of options exercised decreases compared with surrounding years as expected.[90] Option cancellation is the heaviest in 2009, with the average (median) number of outstanding stock options canceled being 1.29 (0.10) million. Option exercise is also the lightest in 2009, when the average (median) number of stock option exercised was 0.79 (0.11) million.

Following the implementation of FAS123R in 2006, I find that the number of stock options granted follows a decreasing trend. The only year where the number of stock options granted does not decline from the previous year is during the economy-wide recession in 2009. The average (median) number of options granted was largest in 2009 (2008), with 1.96 million (0.25 million) options granted, and the average (median) number of stock options granted was smallest in 2012, 1 million (0.12 million). In addition to finding a decreasing trend in the number of stock options granted, I also find that the average (median) sum of options canceled and exercised exceeds the number of options granted during every year of the sample period. This evidence indicates that, once the expensing of stock options became mandatory, firms reduced the number of options they granted to employees.[91]

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[89] Compustat aggregates canceled and forfeited stock options making it impossible to separately identify *the number of options canceled and the number of options forfeited*

[90] A larger number of option cancellations is also expected because there was higher employee turnover. Employees often lose the right to exercise options shortly after leaving a company.

[91]We cannot infer from data available in machine-readable form whether the total fair value of options granted has changed since the implementation of FAS 123R.

Table 22 reports average and median values for firms' estimated fair value of options granted and the inputs that firms are required to consider when determining the fair value of options granted. Firms must disclose these inputs in their financial statements. These variables follow patterns seen in the economy in general. The fair value of options granted fell in 2009, but quickly recovered in 2010. The only significant year-to-year change in the fair value of options granted occurs between 2008 and 2009 and between 2009 and 2010. This pattern is unexplained using the inputs to the valuation models that firms disclose in the footnotes to the financial statements.[92] When choosing inputs to valuation models, firms are advised to start with historic data (ASC 718-10-55-24). Consistent with this requirement, the expected option volatility used by firms to determine the fair value of options granted rose in 2009 and remained high during the rest of the sample period. The risk-free rate used by firms in option valuation models fell steadily throughout the sample period, mirroring the fall in the risk free rate in the market during this period. Overall, firms' option-granting behavior and choice of valuation model inputs appear to follow overall market conditions.

Because firms do not disclose the difference between the realized and recognized costs of stock options, I begin my analysis by examining firms' disclosed excess tax benefit, i.e., the cash tax savings from option exercises whose realized cost exceeds the recognized cost. As discussed in Section 1.3.2, this disclosure does not capture the tax effect of option exercises whose realized costs are exceeded by their recognized costs. However, it does provide partial evidence on the difference between the recognized and realized costs of stock options.[93] Grossing up the disclosed excess tax benefit by the

[92]The strike price of options does follow this pattern, however the valuation of stock options is not dependent on the strike price of options. It is dependent on the difference between the strike price of options and the stock price at grant date.

[93]For a more complete discussion, see Section 1.3.2.

statutory tax rate provides an estimate of the extent to which the realized cost exceeds the recognized cost for those options whose exercises result in a tax windfall. Summary statistics about firms' disclosed *EXCESS TAX BENEFIT* are presented in Table 23. Table 23 also presents *EXCESS_TAX_BENEFIT* scaled by pretax income and scaled by common shares outstanding to allow readers to assess the impact of unanticipated tax savings from stock options whose exercise results in a tax windfall.

Consistent with the patterns seen in the aggregate number of options exercised and canceled, *EXCESS TAX BENEFIT* is lowest in 2009 and highest in 2007. The median *EXCESS TAX BENEFIT* was zero in 2009 $0.23 million in 2007. The median cash tax savings arising from tax windfalls in an average year is $400 thousand. These savings are 0.51 percent of pretax income or 1.38 cents per share. Grossing up this figure by the statutory tax rate of 35% implies that the median difference in the realized cost of stock option compensation and the recognized cost of options is $1.14 million, which is the equivalent of 1.46 percent of pretax income or 3.94 cents per share, for stock option exercises resulting in a tax windfall.[94] The summary statistics also show that twenty-five percent of firms disclose an *EXCESS TAX BENEFIT* that is $3.36 million in an average year of the sample period. This amount of tax savings translate into a savings of at least 2.04 percent of pretax income or 5.32 cents per share for firms in the highest quartile of the distribution of *EXCESS TAX BENEFIT*. This implies that the realized cost of options outweighs the recognized cost of options by $9.60 million or more for twenty-five percent of firms in the sample for those options whose exercise results in a tax windfall. This difference means the realized cost of stock option compensation is larger than the recognized cost of stock option compensation by at least 5.83 percent of pretax income or

[94]$400,000÷0.35= $1,140,000 and 0.51%÷0.35=1.46% and 1.38÷0.35=3.94

at least 15.2 cents per share for twenty-five percent of firms for option exercises whose exercise result in a tax windfall.[95] Because these figures do not include options which result in a tax shortfall, they represent an upper limit of the estimate for the amount by which the realized cost of options exceeds the recognized cost of options for these firms. Next, to provide a more complete analysis of differences between the recognized and realized costs of stock options, I estimate the recognized and realized costs of all options granted and settled, canceled or forfeited, during the sample period.

2.3.2 Estimating stock option costs

To provide an estimate of the recognized and realized costs of all options granted, I use option data disclosed by firms and available in machine-readable form. *RECOGNIZED_COST* is an estimate of the expense that will be recognized for all options granted during a given year. *REALIZED_COST* is an estimate of the difference between the strike price of options exercised during the year and the firm's stock price at exercise, aggregated across all options exercised during the year. These estimates are discussed in detail in Section 1.3.2. However, because the objective of this essay is to document the difference between firms' recognized and realized costs of stock options, I want to emphasize one important assumption I make. Firms do not disclose the average market price of the underlying stock for option exercises during the year. Prior literature has not developed an estimate of this value. To calculate *REALIZED_COST,* I chose to use the simple average of the stock price high and low for the year as the underlying stock price upon option exercise. Given the aforementioned concern of critics and Congress that the recognized cost of stock options understates the realized cost, I make assumptions which avoid the criticism that my calculations bias in favor of this finding.

[95] $3.36÷0.35= 9.6 and 2.04%÷0.35=5.83% and 5.32÷.35=15.2

Prior research shows that option exercises are more likely to occur as the underlying stock price rises (e.g. Core and Guay, 2001). Thus, using a simple average of the stock price high and low for the year is likely to understate the true realized cost of stock options because it over-weights the influence of stock prices at the lower end of the stock price distribution.

DIFF_COST, the main variable of interest, is the difference between *RECOGNIZED_COST* and *REALIZED_COST*. A positive *DIFF_COST* indicates that the recognized cost of stock options is less than the realized cost of options. Table 23 reports the descriptive statistics for *DIFF_COST* and Figure 2 graphically illustrates this analysis. Options are rarely, if ever, exercised in the same year they are granted. The information provided by firms is not detailed enough to match the realized cost of an option to the originally recognized cost of that option. To address this timing mismatch, I also present the summary statistics for firms' *RECOGNIZED_COST*, *REALIZED_COST* and *DIFF_COST* averaged across the entire sample period in Table 23.

In all years except 2009, the realized cost of options is greater than the recognized cost of options for at least half of firms, which is consistent with my prior analyses. My estimates indicate that the median difference in the realized and recognized cost of options is $0.99 million in an average year of the sample period. At least twenty-five percent of firms have a realized stock options cost that exceeds the recognized stock option cost by $7.83 million dollars or more each year of the sample period. To aid in interpreting the impact of *DIFF_COST*, I scale *DIFF_COST* by pretax book income, the number of common shares outstanding and the firm's average total assets over the sample period.[96] These descriptive statistics are presented in Table 24 and illustrated in Figure 2.

[96]I scale by pretax book income instead of net income to avoid the additional complications of identifying the change in firms' tax expense caused by the exclusion of tax benefits recognized but never realized. See Chapter 1.

DIFF_COST scaled by pretax book income provides an estimate of the impact to pretax book income if firms were required to recognize the entire realized cost of stock options. The descriptive statistics indicate that, if firms were required to recognize the realized cost of stock options, the median change in pretax book income would be a decrease of 1.46 percent during this sample period.[97] The benefit of avoiding recognition of the fully realized cost of options is concentrated in a subset of firms. Twenty-five percent of firms would have to recognize additional compensation expense of at least 4.96 percent of their pretax book income during this sample period if expensing the entire realized cost were required. The twenty-five percent of firms on the other end of the spectrum recognize stock option compensation that is at least 0.39 percent of pretax book income more than their realized stock option costs. Cook, Huston, and Omer (2008) find that the median change in the third quarter to fourth quarter tax expense is a decrease of 0.21 percent of pretax book income among firms that would miss its earnings target without changes in its effective tax rate. Thus, the median realized stock option cost that does not get recognized impacts a firm's bottom line more than the additional tax planning that firms undertook in the fourth quarter to meet analysts' targets.

Scaling *DIFF_COST* by common shares outstanding provides an estimate of the additional wealth a shareholder of a single stock transfers to employees in excess of the compensation costs recognized.[98] I find that the median wealth transferred from shareholders to employees exceeded recognized compensation costs by three cents per

[97]In untabulated tests, I find that the average reduction in pretax book income if firms had to recognize the entire realized cost of options is significantly greater than zero in all years (except 2009).

[98]In additional analysis I scale *DIFF_COST* by total assets. I do not discuss the descriptive statistics because results are qualitatively similar to the results discussed when *DIFF_COST* is scaled by pretax book income or common shares outstanding.

share on average across years in my sample period.[99] Shareholders in twenty-five percent of firms transferred an additional 11.58 cents per share or more to employees on average across years in my sample period. Even in 2009, when previous analysis shows that the realized stock option costs is lowest, the wealth transferred to shareholders exceeded recognized compensation costs by at least 1.54 cents per share for twenty-five percent of firms. To illustrate the importance of these figures, Dhaliwhal, Gleason, and Mills (2004) find that firms that manage their effective tax rate to meet analysts' earnings per share targets only needed to increase earnings by 1.6 cents. This analysis also indicates that the amount of stock option compensation cost firms avoid recognizing is not trivial.

These sample-wide investigations provide further support for concerns of regulators, lawmakers, and academics that firms' realized cost of stock option compensation is generally greater than the cost of stock option compensation recognized by those firms. However, my results could also be the result of an economy-wide pattern of firms' reducing their use of stock option compensation. The analysis in the next section addresses this possibility.

2.4 Supplemental Analysis

Table 21 shows that in every year except 2009 the median number of options granted declined. Table 24 shows that my estimate of the fair value of options granted declines in every year of the sample period. It is possible that firms are reducing their reliance on stock option compensation following the implementation of ASC 718. Because options are exercised in years after the option was granted, *REALIZED_COST* could be less than *RECOGNIZED_COST* every year of my sample. This could be the

[99]I find that the median wealth transferred from shareholders to employees in excess of recognized compensation costs ranges from zero to five cents per year.

result of firms' reducing their reliance on stock option compensation and not because of the financial reporting rules of stock option compensation.

To alleviate concerns that reduction in firms' reliance on stock option compensation drives my results, I calculate a second measure, *TRUEUP*. *TRUEUP* is calculated by subtracting *REALIZED_COST* from an estimate at their original grant date of the fair value of options settled (canceled or exercised) during the sample period, *ORIG_FV*. It measures the additional expense firms would face if they were required to true-up the financial statements to fully recognize the difference between the realized cost of options settled during the year and the expense that was originally recognized (or would have been recognized under ASC 718).

Firms do not disclose when options that are settled, canceled or exercised, were originally granted or their fair value at grant. To calculate *ORIG_FV*, I first assign settled options to a grant year and then calculate the inputs to the Black-Scholes model using firm-specific data over an estimate of the expected life of the options starting in the grant year.[100] I assume that options exercised were granted four years prior to exercise and options canceled were granted eight years prior. I detail this assumption and the rest of the process in Appendix D. To estimate the fair value of options settled during the current year at their grant date, I use the Black-Scholes option pricing model and use firm-specific information to calculate the inputs to the model.

Given the previously mentioned concern that the recognized cost of options understates the realized cost of options, I make three choices that likely overstate *ORIG_FV*: use of the Black-Scholes valuation model, using ex-post option grant data to calculate the Black-Scholes inputs, and including forfeited options in *ORIG_FV*. First,

[100]While firms were required to disclose inputs to models estimating the fair value of options granted since 1995, reliable machine-readable data is only available beginning in 2006.

Hemmer, Matsunaga, and Shevlin (1994) have shown that the Black-Scholes model overestimates the fair value of options. Bratten, Jennings, and Schwab 2014 find that firms tend to use the valuation model that results in the lowest fair value of options. Thus, the use of the Black-Scholes fair value model likely results in valuations that are higher than what the firm would calculate. Second, the use of data ex-post to option grant implies that management had perfect foresight about stock price movements, risk-free interest rate movements, and the dividend-yield of the firm when calculating inputs to option fair value models. Choudhary (2011) finds that firms tend to use inputs for valuation models that downwardly bias the fair value estimates of options, especially after stock option expense recognition was required. Thus the ex-post data for valuation model inputs likely overstates the fair value of options because it is not subject to this downward bias. Third, firms are not required to recognize any expense for options that are forfeited before they have vested. Compustat data does not differentiate between options that were forfeited and options that were canceled. Because stock option compensation expense is not recognized for forfeited options, their inclusion in the estimate of *ORIG_FV* can only inflate this estimate. Therefore, assumptions made in calculating the fair value of options settled during the year are likely to overstate the value that was, or would have been, recognized under ASC 718.

In Figure 3, I plot the average and median *DIFF_COST* and *TRUEUP* each year of the sample period. *TRUEUP* follows the patterns seen in previous analysis when *DIFF_COST* was the variable of interest. In every year except 2009, the average and median *DIFF_COST* and *TRUEUP* are positive. This pattern lends credence to my earlier conclusions and provides support for concerns that recognizing the cost of options at their

fair value as of the grant date understates the ultimate wealth transfer from shareholders to employees.[101]

2.5 Conclusion

In this chapter, I estimate firms' recognized and realized costs of stock options using data from their stock option disclosures following the required recognition of stock option expense under ASC 718. Under ASC 718, the recognized cost of stock options is the fair value of options at their grant. Firms are not required to adjust the expense recognized after the realized cost of options is determined. Therefore, shareholders may not be informed of the total wealth transferred to employees. This information asymmetry is critics' main concern with the accounting rules for stock option compensation.

By using a sample of all firms in the Compustat population with option data available for every year following the implementation of ASC 718, 2006-2012, I am able to analyze data about all options granted by a wide variety of firms. Using firms' option disclosures, I estimate the recognized cost of stock option compensation and the realized cost of stock option compensation during the sample period. In every year of the sample period except 2009, both the average and median realized cost of stock options exceeds the recognized cost of stock options. In an average year of my sample period, I find that the median amount the realized cost of stock options exceeds the recognized cost of stock options is 1.46 percent of pretax book income. This is the equivalent of a wealth transfer from shareholders to employees that exceeds recognized compensation costs by three cents per share in an average year of the sample period.

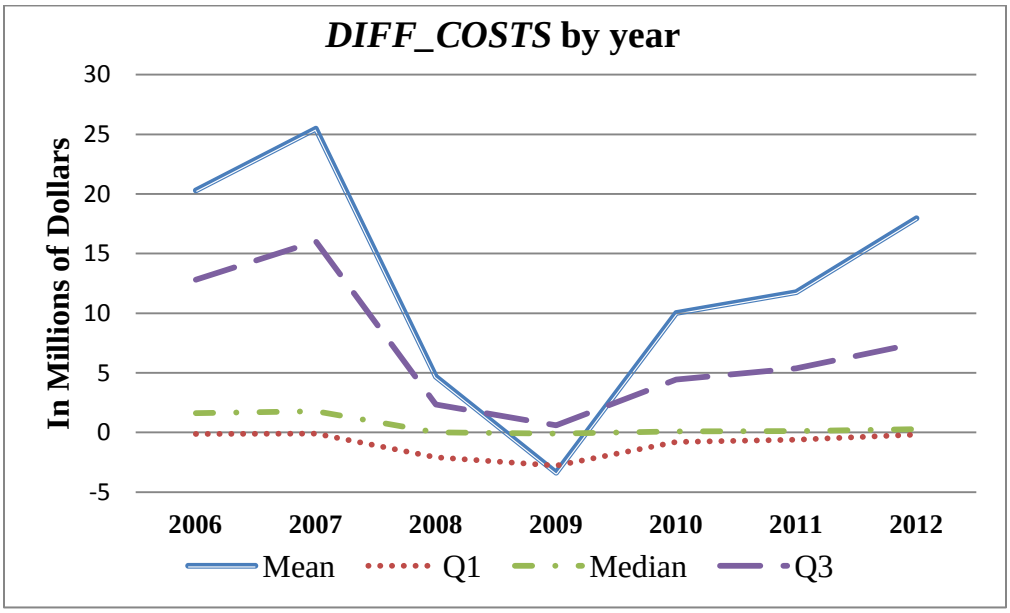
I also ensure that my results are not caused by firms' reducing their use of stock option compensation following the implementation of ASC 718. In supplemental analysis

[101]Other conclusions are qualitatively unchanged when *DIFF_COSTS* is replaced by *TRUEUP* scaled by sales.

I estimate the cost of options that would have been recognized under ASC 718 for options that are exercised, settled, or canceled during the sample period (*ORIG_FV*). I find that my main results are qualitatively unchanged when *ORIG_FV* is compared to firms' realized cost of stock option compensation.

These findings imply that shareholders are not fully informed through firms' financial statements about the wealth they transfer to employees. Because the realized cost of stock options is the tax deduction for stock option compensation, these findings also imply that the financial reporting rules for stock option compensation allow firms to report higher income to their shareholders than to the taxing authorities. Overall, I find evidence consistent with the concerns of critics and lawmakers that the recognized cost of stock options is generally less than the realized cost of stock options.

Figure 2. DIFF_COST by Year



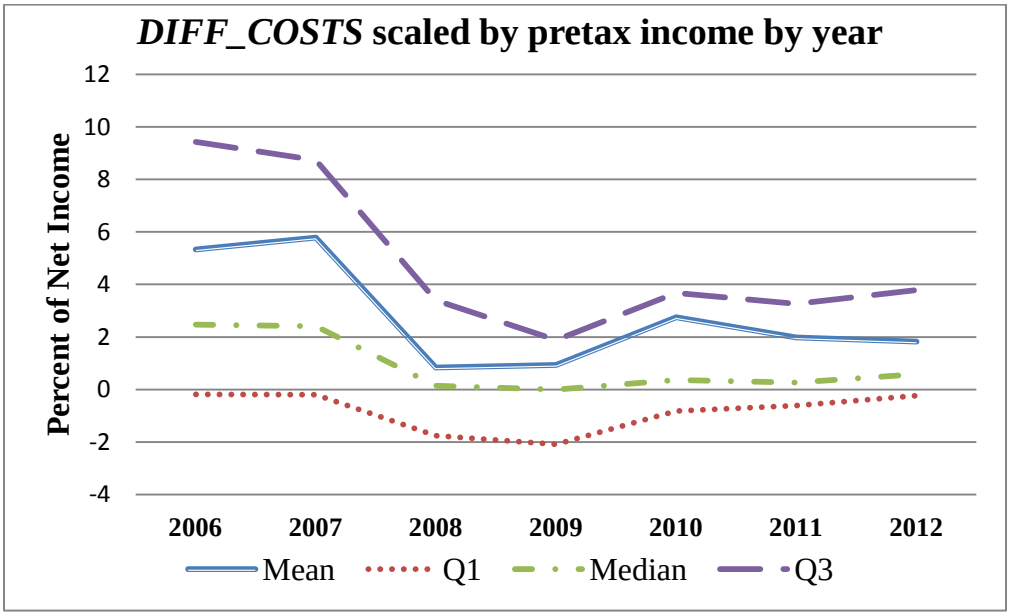
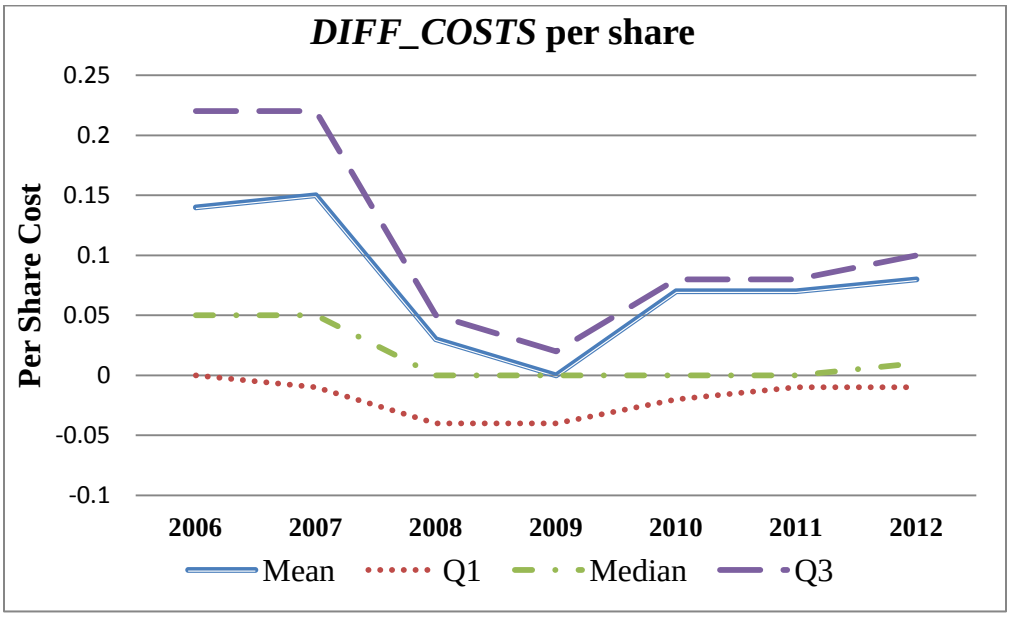
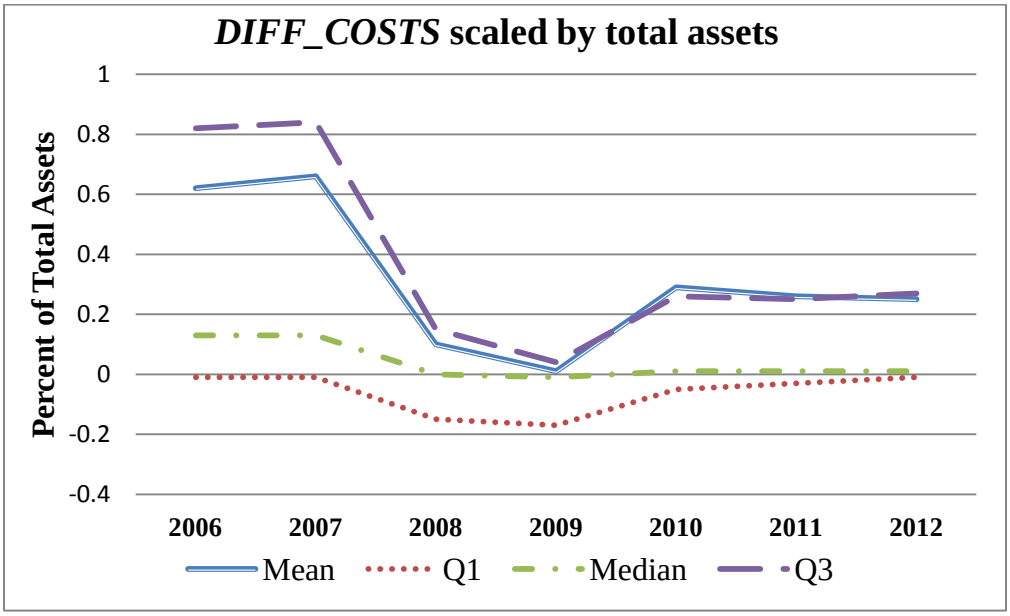


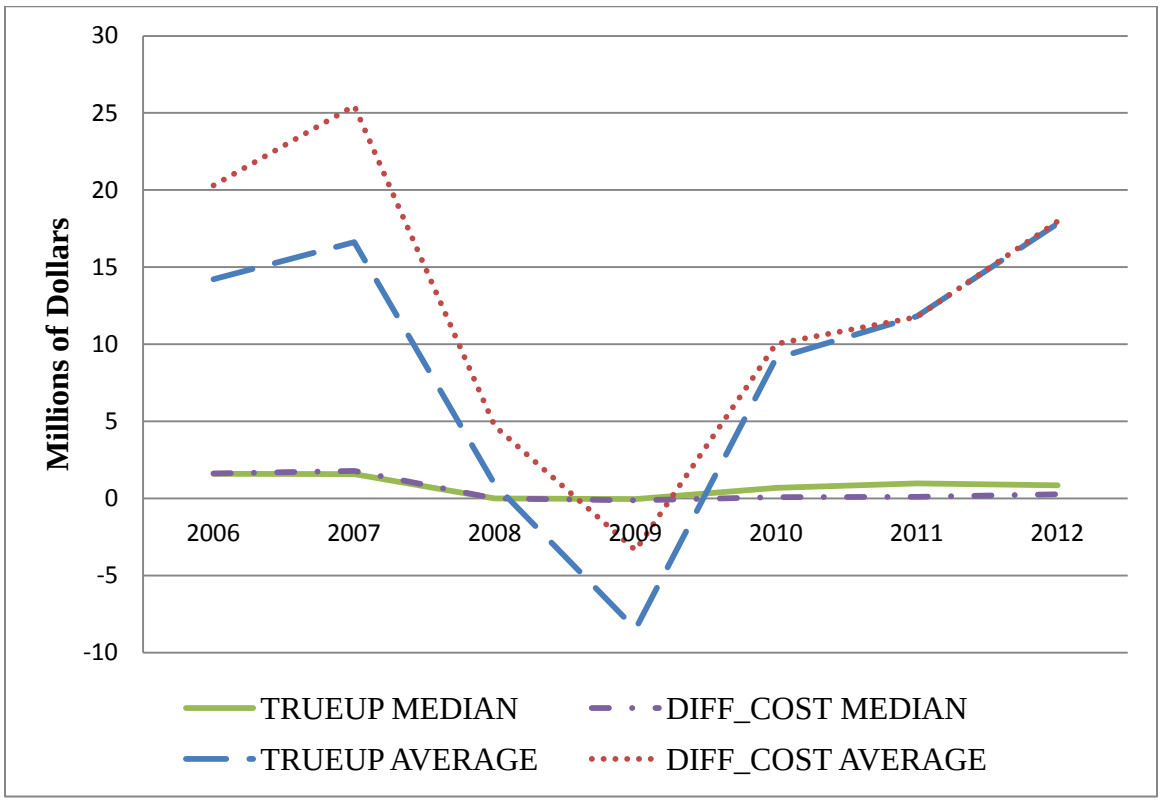
Figure 2 continued.





Note: The first table displays descriptive statistics for *DIFF_COST*, the difference between *REALIZED_COST* and *RECOGNIZED_COST*, each year of the sample period for all firms in my sample. *REALIZED_COST* is a researcher estimate of the realized cost of stock options settled (exercised or canceled) during the year. *RECOGNIZED_COST* is a research estimate of the recognized cost of stock options granted during the year. Appendix A details these calculations. The second table displays descriptive statistics for *DIFF_COST* as a percentage of pretax book income. The fourth table displays descriptive statistics for *DIFF_COST* as a percentage of total assets.

Figure 3. Comparison of TRUEUP and DIFF_COST



	MEDIAN		MEAN	
	TRUEUP	**DIFF_COST**	**TRUEUP**	**DIFF_COST**
2006	1.61	1.63	14.23	20.31
2007	1.57	1.79	16.63	25.47
2008	0.00	0.00	0.93	4.69
2009	-0.04	-0.11	-8.46	-3.36
2010	0.69	0.10	9.09	10.02
2011	0.98	0.11	11.82	11.78
2012	0.85	0.27	17.83	17.97

Note: *DIFF_COST* is the difference between *REALIZED_COST* and *RECOGNIZED_COST*. *TRUEUP* is the difference between *REALIZED_COST* and an estimate of the fair value at grant of all options settled during the year. Appendix A details the calculation of *REALIZED_COST*, *RECOGNIZED_COST*, and *DIFF_COST*. Appendix D details the calculation of *TRUEUP*. Each variable is summed across all firms in the sample period.

Table 21. Option Data by Year

		Average		
	N	**Options Granted**	**Options Exercised**	**Options Canceled**
2006	1,752	1.674	2.054	0.763
2007	1,752	1.545	2.190	0.754
2008	1,752	1.421	1.102	0.899
2009	1,752	1.961	0.793	1.294
2010	1,752	1.201	1.348	0.972
2011	1,752	1.061	1.295	0.756
2012	1,752	0.996	1.503	0.636

		Median		
	N	**Options Granted**	**Options Exercised**	**Options Canceled**
2006	1,752	0.263	0.419	0.076
2007	1,752	0.263	0.403	0.068
2008	1,752	0.282	0.203	0.084
2009	1,752	0.254	0.109	0.096
2010	1,752	0.191	0.217	0.080
2011	1,752	0.148	0.239	0.066
2012	1,752	0.115	0.226	0.060

Note: This table presents the average and median number of options canceled, exercised, and granted for firms in the sample each year. Firms disclose these data in their financial statement footnotes.

Table 22. Option Assumptions by Year

	N	Average FV Options Granted	Average Assumptions used in Option Valuation Models			
			Option Life	Stock Price Volatility	Risk Free Rate	Dividend Yield
2006	1,752	9.273	5.350	37.679	4.636	1.105
2007	1,752	9.383	5.322	35.975	4.500	1.113
2008	1,752	7.792	5.303	38.164	3.040	1.283
2009	1,752	5.909	5.363	45.389	2.257	1.572
2010	1,752	7.380	5.387	44.579	2.273	1.277
2011	1,752	8.138	5.446	44.033	1.900	1.281
2012	1,752	7.709	5.484	43.820	1.043	1.416

	N	Median FV Options Granted	Median Assumptions used in Option Valuation Models			
			Option Life	Stock Price Volatility	Risk Free Rate	Dividend Yield
2006	1,752	7.335	5.100	34.000	4.700	0.450
2007	1,752	7.310	5.100	32.000	4.600	0.495
2008	1,752	5.465	5.025	35.000	3.000	0.500
2009	1,752	3.905	5.170	43.000	2.200	0.600
2010	1,752	5.370	5.200	43.000	2.300	0.505
2011	1,752	5.315	5.300	42.000	1.900	0.700
2012	1,752	4.095	5.390	42.000	0.943	1.000

Note: The first column of this table presents the average fair value of options granted across all firms in each year of the sample. The assumptions used by firms in option valuation models, averaged across all firms in the sample, are also presented. Firms disclose these data in their financial statement footnotes.

Table 23. Descriptive Statistics for *EXCESS_TAX_BENEFIT*

	Mean	Std	Q1	Med	Q3
EXCESS TAX BENEFIT					
2006	8.34	35.50	0.00	0.14	3.86
2007	8.96	39.70	0.00	0.23	3.84
2008	5.39	29.96	0.00	0.06	1.83
2009	2.42	12.16	0.00	0.00	0.60
2010	4.90	29.89	0.00	0.00	1.50
2011	5.80	38.70	0.00	0.00	1.90
2012	6.36	37.92	0.00	0.00	2.10
Yearly Average	6.02	26.77	0.00	0.40	3.36
EXCESS TAX BENEFIT SCALED BY PRETAX BOOK INCOME (%)					
2006	2.24	8.62	0.00	0.29	2.78
2007	1.10	60.96	0.00	0.40	2.69
2008	1.96	16.51	0.00	0.00	1.36
2009	0.83	14.31	0.00	0.00	0.54
2010	-1.83	133.25	0.00	0.00	1.14
2011	1.39	9.01	0.00	0.00	1.34
2012	1.24	8.52	0.00	0.00	1.41
Yearly Average	1.00	21.53	0.00	0.51	2.04
EXCESS TAX BENEFIT PER COMMON SHARES OUTSTANDING (cents per share)					
2006	6.88	43.14	0.00	0.69	7.18
2007	6.81	34.77	0.00	0.91	6.85
2008	4.15	23.61	0.00	0.17	3.53
2009	2.40	27.16	0.00	0.00	1.16
2010	3.95	28.33	0.00	0.00	2.74
2011	4.23	15.24	0.00	0.00	3.69
2012	4.92	16.27	0.00	0.00	4.14
Yearly Average	4.76	25.00	0.00	1.38	5.32

Note: This table presents descriptive statistics for *EXCESS TAX BENEFIT*. Firms disclose *EXCESS TAX BENEFIT* in their financial statements. It is the cash tax *savings* from option exercises that result in a tax windfall. All variables are defined in Appendix A.

Table 24. Descriptive Statistics for Recognized and Realized Costs of Stock Options

	Mean	Std	Q1	Med	Q3
RECOGNIZED_COST					
2006	17.14	63.97	0.12	2.21	9.92
2007	16.15	51.61	0.11	2.30	10.35
2008	13.06	43.40	0.03	1.68	8.89
2009	11.95	53.13	0.00	1.26	6.58
2010	10.10	32.80	0.00	1.25	7.00
2011	9.78	37.17	0.00	1.16	7.08
2012	8.59	32.09	0.00	0.85	6.13
Yearly Average	12.40	37.83	0.28	2.16	9.02
REALIZED_COST					
2006	37.45	127.15	0.77	5.20	24.08
2007	41.62	132.86	0.73	5.11	26.71
2008	17.75	77.07	0.07	1.42	8.40
2009	8.59	39.60	0.00	0.41	4.29
2010	20.12	79.21	0.10	1.59	11.75
2011	21.56	92.69	0.11	1.88	13.03
2012	26.56	98.24	0.08	1.73	13.85
Yearly Average	24.81	80.81	0.79	4.20	17.75
DIFF_COST					
2006	20.31	102.26	-0.12	1.63	12.82
2007	25.47	99.11	-0.10	1.79	16.09
2008	4.69	55.59	-2.08	0.00	2.35
2009	-3.36	49.71	-2.78	-0.11	0.59
2010	10.02	69.63	-0.80	0.10	4.45
2011	11.78	89.18	-0.59	0.11	5.39
2012	17.97	86.91	-0.18	0.27	7.47
Yearly Average	12.41	58.48	-0.08	0.99	7.83

Note: This table presents descriptive statistics for *REALIZED_COST*, *RECOGNIZED_COST* and *DIFF_COST*. *REALIZED_COST* is a researcher estimate of the firms' realized cost of stock options settled (exercised or canceled) during the year. *RECOGNIZED_COST* is a research estimate of the firms' recognized cost of stock options granted during the year. *DIFF_COST* is the difference between *REALIZED_COST* and *RECOGNIZED_COST*. All variables are defined in Appendix A.

Table 25. Descriptive Statistics for Scaled *DIFF_COST*

	Mean	Std	Q1	Med	Q3
DIFF_COST SCALED BY PRETAX BOOK INCOME (%)					
2006	5.33	24.14	-0.19	2.47	9.43
2007	5.79	22.39	-0.20	2.41	8.73
2008	0.84	19.07	-1.76	0.14	3.40
2009	0.93	18.61	-2.09	0.00	1.88
2010	2.75	19.70	-0.82	0.36	3.68
2011	1.98	17.66	-0.61	0.26	3.26
2012	1.83	17.61	-0.24	0.58	3.78
Yearly Average	2.78	8.72	-0.39	1.46	4.96
DIFF_COST PER COMMON SHARE OUTSTANDING (cents per share)					
2006	14.11	28.45	-0.45	5.30	22.19
2007	14.53	29.04	-0.52	5.35	21.76
2008	3.35	20.35	-3.92	0.00	5.07
2009	0.38	14.56	-4.46	-0.43	1.54
2010	6.91	21.96	-1.82	0.40	7.72
2011	6.77	21.37	-1.47	0.32	7.74
2012	8.34	23.14	-0.66	0.81	10.27
Yearly Average	7.77	14.78	-0.31	3.02	11.58
DIFF_COST SCALED BY TOTAL ASSETS (%)					
2006	0.62	1.80	-0.01	0.13	0.82
2007	0.66	1.78	-0.01	0.13	0.84
2008	0.10	1.22	-0.15	0.00	0.15
2009	0.01	0.91	-0.17	-0.01	0.04
2010	0.29	1.25	-0.05	0.01	0.26
2011	0.26	1.14	-0.03	0.01	0.25
2012	0.25	1.06	-0.01	0.01	0.27
Yearly Average	0.31	0.80	0.00	0.07	0.46

Note: This table presents yearly descriptive statistics for firm's *DIFF_COST SCALED BY RECOG_COST, DIFF_COST SCALED BY NET INCOME, DIFF_COST PER COMMON SHARE OUTSTANDING*, and *DIFF_COST SCALED BY TOTAL ASSETS*. The descriptive statistics for *DIFF_COST SCALED BY PRETAX INCOME* and *DIFF_COST SCALED BY TOTAL ASSETS* are presented as a percentage. *DIFF_COST PER COMMON SHARE OUTSTANDING* is presented as cents per share. *DIFF_COST* is defined in Appendix A.

APPENDIX A: VARIABLE DESCRIPTIONS

A.1 Option Variables

OPTGRPEREMP: An estimate of a firm's stock option usage. The average number of options granted by a firm during the sample period scaled by the number of employees of the firm. This variable is not reset to zero when it is missing.

EXCESS TAX BENEFIT: The excess tax benefit (in millions) reported on the firm's statement of cash flows in the financing section. Firms report the tax benefit from option exercise in two different sections of the statement of cash flows: cash flow from operations and cash flow from financing. The division of the tax benefit between these two sections depends on the firm's recognized tax benefit from options, which is based on GAAP stock option expense as the options vest. The operating section of the statement of cash flows contains the amount of cash tax benefit included in current tax expense when the option was granted. The financing section contains the remaining portion.

RECOGNIZED_COST: An estimate of the expense that will be recognized for stock options granted in the current year (in millions), which is the product of the number of options granted, the average fair value of those options, and one minus an estimated forfeiture rate. Following Marquardt (2002) I assume a 4% forfeiture rate.

REALIZED_COST: An estimate of the cash forgone by the company in the current year because employees' exercised stock options and were able to buy the stock at a lower price than the firm could get on the open market (in millions). The realized stock option cost in a year is equal to the number of options exercised in that year multiplied by the difference between the average strike price of those options and the average market price of the underlying stock when those options were

exercised. The firm discloses both the number of options exercised and the average strike price of those options. I assume that the average market price of the underlying stock is the average of the stock price high and low for the year. This cost is also the realized tax deduction.

DIFF_COST: An estimate of a firm's unanticipated tax deduction from employees' exercise of stock options during the sample period (in millions). DIFF_COST is calculated as the difference between REALIZED_COST and RECOGNIZED_COST.

ANTICIP_DEDUCT: RECOGNIZED_COST scaled by pretax book income.

REAL_DEDUCT: REALIZED_COST scaled by pretax book income.

UNANTICIPATED: DIFF_COST scaled by pretax book income.

A.2 Firm Characteristics

ΔNOL: The change in tax-loss carryover from year t-1 to year t, scaled by lagged total assets.

AT: A firm's total assets.

CAPINT: Net Property, Plant, and Equipment for the year scaled by lagged total assets.

FORINC: Pretax foreign income for the year t scaled by lagged total assets.

LEV: Total long term debt scaled by lagged total assets.

MTB: Market-to-book ratio, measured as market value of equity (calculated as share price multiplied by total common shares outstanding) divided by book value of equity.

NEWECON: Firms that have SIC codes indicating that they manufacture computers, semiconductors, telephone equipment, or wholesale computer-related products, or that they create software or are internet-related. SIC codes 3570-3579, 3661, 3674, 3674, 5045, 5961, or 7370-7379.

NOL: An indicator variable equal to one when there is a tax loss carry forward during the year.

R&D: Research and development expense scaled by total assets.

RETURNVOL: The standard deviation of annualized daily returns.

ROA: The ratio of pretax book income less extraordinary items scaled by lagged total assets.

STOCKGROWTH3: Growth of stock price over the previous 3 years.

STOCKPRICEHIGH: The highest stock price during the year.

STOCKPRICELOW: The lowest stock price during the year.

A.3 Tax Avoidance Variables

CASHETR: A firm's cash income tax payments during the year divided by pretax book income adjusted for special items.

GAAPETR: A firm's reported tax expense divided by pretax book income.

$CASHETR_{WITHOUT}$: A measure that reflects a firm's planned and expected tax benefit realized during the period relative to its reported pretax book income. It is a firm's cash income tax payments adjusted for the excess tax benefits disclosed in the financing section of the statement of cash flows divided by pretax book income adjusted for special items.

CASHETRCV: The coefficient of variation of CASHETR within a firm during the sample period, 2006-2012. The coefficient of variation is calculated by dividing the firm-specific standard deviation of CASHETR during the sample period by the firm-specific mean of CASHETR during the sample period.

$CASHETR_{WITHOUT}$CV: The coefficient of variation of $CASHETR_{WITHOUT}$ within a firm during the sample period, 2006-2012. The coefficient of variation is calculated by dividing the firm-specific standard deviation of $CASHETR_{WITHOUT}$ during the

sample period by the firm-specific mean of $CASHETR_{WITHOUT}$ during the sample period.

CASHETRSTD: The standard deviation of CASHETR within a firm during the sample period, 2006-2012.

$CASHETR_{WITHOUT}$STD: The standard deviation of $CASHETR_{WITHOUT}$ within a firm during the sample period, 2006-2012.

FTESTSIGNIF: an indicator variable that turns on when an F-test for the equality of variance indicates the variance of a firm's $CASHETR_{WITHOUT}$ significantly exceeds the variance of that firm's *CASHETR* during the sample period.

APPENDIX B: BACKGROUND AND DISCUSSION OF THE ASC 718 RULES FOR RECOGNIZING THE COST OF STOCK OPTION COMPENSATION

B.1 Background

In the early 1970s, corporations began compensating their employees with stock-based compensation. APB 25, issued in October 1972, required firms to recognize expense for stock options granted on the firm's stock only when the difference between the strike price of the option and the stock price at the grant date was greater than zero (the intrinsic value method). One of the reasons cited for not requiring recognition of all stock option expense at the grant date was the absence of a reliable method for calculating the value of employee stock options. Interestingly, one of the more popular methods to estimate the value of options, the Black-Scholes method, was published just one year later in 1973. Option-based compensation soon rose in popularity, leading the FASB to reconsider the accounting for stock-based compensation. FASB issued Statement of Financial Accounting Standard 123 (FAS 123) in 1995.

FAS 123 permitted companies to continue using the intrinsic value method established with APB 25, but it also encouraged companies to consider expensing the fair value of options granted (the fair value method). Firms must estimate the fair value of options on their stock because options are not usually traded on the open market. While FAS 123 did not require firms to recognize expense for the fair value of options granted, it did require firms to disclose the fair value of options granted in the notes to the financial statements. In a bid to increase the comparability of firms' financial statements (both with other U.S. firms and with financial statements issued under IFRS), the FASB revised FAS 123 (FAS 123R) in 2004. FAS 123R, now ASC 718, was implemented in 2006. ASC 718 requires companies to expense the fair value of options on their own stock granted to their employees as those options vest [ASC 718-10-25-1]. The fair value of stock options at grant date is a measure of the expected value of the stock options at

exercise. As with all expected value calculations, the firm must make assumptions about future events to calculate their expense. ASC 718-10-55-21 requires that companies must, at a minimum, consider the following factors in determining the fair value of their options: the stock price at grant date, the exercise price, the expected life of the option, the expected volatility of the firm's stock (and any expected dividends) and the expected risk-free interest rate over the expected life of the option.[102]

Once options vest, a firm never trues-up its financial statements as future events unfold. [103, 104] Lack of adjustment is a unique feature of stock option compensation expense. Because options are discounted for time and risk, the fair value of stock options estimated at the grant date can understate the amount of cash inflow that the firm will forgo in the future when option holders buy the stock at a discount. However, if the firm's stock price falls after options vest and the options are underwater, the options will never be exercised. In this case, the firm recognized an option expense even though the firm will not miss out on cash inflow because no discount is taken on a stock purchase. The

[102]These factors were established with FAS 123.

[103]Firms never recognize any additional expense and never reverse previously recognized expense to correct for misestimations.

[104]To illustrate the uniqueness of the accounting treatment of options, consider the accounting treatment of stock appreciation rights (SARs). With SARs the holder receives, in cash, the difference between the stock price at an exercise date of their choice and the stock price at grant date (set price). For both SARs and options the risk is the same for firms and employees: the compensation will only have value if the firm's stock price rises. If the vesting period of options and SARs is the same, then the SARs and options should have the same fair value at grant date. The realized cost to the firm is also the same for options and SARs. With SARs, the firm experiences a cash outflow for the difference between the stock price and set price. With options, the firm forgoes a cash inflow for the difference between the stock price and exercise price because the employee can purchase the stock at a discounted price. Both SARs and options result in the firm recognizing compensation expense for the fair value at grant date of options or SARs that vested that year. Despite the similarity of these two compensation vehicles, once the compensation is earned they receive very different accounting treatments. Recognition of compensation expense for an option increases the firm's equity, while recognition of compensation expense for SARs increases the firm's liabilities. The SAR liability is marked to market each year, resulting in additional compensation expense recognition as the firm's stock price rises. No similar adjustments are made for options.

lack of any adjustment for these differences means that the potential cost that options pose to current investors is not presented on the face of the financial statements.

The comments that the FASB received in response to the exposure draft for ASC 718 are evidence of the controversy over the mandatory expensing of the fair value of stock options. The FASB received no less that 6,500 comment letters. There were two main complaints about ASC 718. First, there was no reliable method for estimating the fair value of options. Opponents of expensing argued that the inclusion of stock option expense requiring estimations that were never corrected erodes the reliability of the financial statements. In addition, managers could opportunistically bias their estimates of option value to minimize the recognized stock option expense. The latter concern reflects the era in which ASC 718 was passed. The accounting scandals of the early 2000s were part of the reason that ASC 718 was issued. Investors were wary of being deceived by management. The second major complaint about ASC 718 was that firms might not have to recognize the full cost of options. Because the recognized compensation expense for stock options was based on the fair value of options at grant while the realized cost of stock options was based on the exercise price, the recognized and realized costs could be very different. Option holders do not have the immediate right to cash. Because the option might never have value, models calculating stock option value are discounted for both time and risk inherent in the option. Therefore, it was argued, it was likely that the expense recognized in the income statement would underestimate the firm's future cost. Although ASC 718 has been in effect since 2006, no other study has investigated how the cost of stock options recognized under the current financial reporting rules relates to the cost of stock options realized for all options granted by a firm.

B.2 ASC 718 Implementation

B.2.1 Profitable firms without a net operating loss carry forward

To calculate the total stock option expense for a grant of options, a firm must first determine the fair value of each option. The fair value of each option is the difference between the stock price upon expected exercise and the strike price of the option, discounted for risk and the time value of money. In other words, the expected fair value of each option is the discounted amount of cash the firm will forgo in the future when employees buy the stock at a price below what the market is willing to pay. A firm only has to recognize stock option compensation expense for the options that it expects will vest.

Total grant expense--the total amount of stock option compensation expense the firm will recognize for the grant--is the product of the number of options granted, the fair value of each option, and one minus the forfeiture rate. The forfeiture rate captures the percentage of options that the firm expects will not be earned, for example, if employees leave the firm before options vest.[105] Firms amortize the total grant expense ratably throughout the options' vesting period. As stock option compensation expense is recognized, the offsetting journal entry increases the equity section of the balance sheet through additional paid in capital. A firm never adjusts its income statement or equity section for any differences between the assumptions made in estimating an option's fair value and the actual outcomes or, in other words, for differences between the estimated cost and subsequent revelations of the true option cost.

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[105]Forfeitures are different from option cancellation. A forfeiture occurs when rights to an option are given up before it vests.A cancellation occurs when rights to an option are given up after it has vested

As options vest and stock expense is recognized, a corresponding deferred tax benefit is recognized to account for the future tax benefit associated with the options. The deferred tax benefit establishes a deferred tax asset. The deferred tax benefit recognized equals the recognized stock option expense times the firm's applicable tax rate. The estimated future tax benefit reduces the total tax expense recognized on the financial statements in the vesting period. The reporting of the tax benefit of stock option exercise is more complex for firms in a tax loss position or firms with an existing net operating loss for tax purposes (NOL) than for firms with positive taxable income and no NOL carry forwards. I begin my discussion by focusing on firms with positive taxable income without an existing NOL.

After options vest, employees determine exercise or cancellation. When an employee exercises an option, the firm gets a tax deduction for the difference between the firm's stock price upon exercise and the strike price. Canceled options result in no tax deduction. Once options are exercised, the firm is either in a tax windfall or tax shortfall position. If the realized tax benefit exceeds the previously recognized estimated tax benefit, the company experiences a tax windfall. Under ASC 718 a firm can only incorporate the tax benefit from options into their current tax expense to the extent that a deferred tax asset was established for them in a previous period. The remaining tax benefit from option exercise flows directly to the firm's equity section of the balance sheet as part of additional paid in capital (APIC- Tax Windfall). If the estimated tax benefit exceeds the realized tax benefit, the firm experiences a tax shortfall. The accounting treatment of a tax shortfall depends upon the balance of APIC- Tax Windfall. If APIC- Tax Windfall has a balance greater than the amount of the shortfall, the shortfall reduces APIC- Tax Windfall and the firm recognizes no adjustments to deferred or total tax expense. If the balance in APIC- Tax Windfall is smaller than the shortfall, the

shortfall first reduces APIC- Tax Windfall to zero and then increases deferred tax expense and, therefore, total tax expense, by the difference. If APIC-Tax Windfall has a zero balance, the full shortfall increases deferred tax expense. Canceled options are accounted for as a shortfall.

B.2.2 Positive Taxable Income with NOL carry forward

If a firm has an existing NOL, there are two methods available to determine how much benefit from stock options it used. First, the with-and-without approach assumes that there is no realized tax benefit from stock options until the tax liability with the option deduction is less than the tax liability without the option deduction. If a firm has an existing NOL that is greater than or equal to their current year taxable income, stock options do not reduce the tax liability. The firm does not adjust current tax expense or APIC- Tax Windfall for any of the tax benefit of options until all prior NOLs have been utilized. Therefore, these firms do not recognize any benefit from stock option exercise in the current period. Next, using the tax law ordering approach, a firm would determine the sequence of the tax benefit recognized based on the ordering of deductions under the tax law. Under tax law, the current-year stock compensation deduction comes before NOL carry forwards. Thus, firms following the tax law ordering method would recognize the benefit of stock options if they have positive income before considering NOLs.

B.2.3 Non-Positive taxable income

If a firm does not have positive taxable income before considering the stock option deduction, it does not realize any of the tax benefit from stock option exercise. In this case, the firm is not allowed to recognize any tax benefit from stock option deductions. This means neither the current tax expense on the income statement nor the APIC- tax Windfall account reflects the tax benefit from stock option deduction. Firms are instructed to keep track of this information off the firm's books.

B.2.4 Other financial statement effects of the tax benefit of stock options

When calculating diluted EPS, the number of shares in the denominator includes the incremental shares issued if all exercisable options were exercised. Calculating the number of incremental common shares from option exercise requires firms first to calculate the cash inflow from the exercise of all options that have vested and are not underwater, taking into account the tax benefit of options. The firm then calculates how many shares it could buy back on the open market from this hypothetical cash inflow from stock option exercise. The diluted EPS calculation includes the difference between the number of potentially exercisable shares and the number of buyback shares. As mentioned previously, the tax benefit appears on the statement of cash flows divided between the operating and financing sections.[106]

[106]If there is a cash shortfall then no piece would be recognized in the financing section because in that case current tax expense includes all of the tax benefit from stock option exercise.

APPENDIX C: STOCK OPTION COMPENSATION NUMERICAL EXAMPLE

Suppose a firm grants 31,200 options on January 1, 20X0, to its employees. To simplify the example we will assume that this is the firm's first and only option grant. The options have a strike price equal to the current stock price, $100, and vest evenly over a three-year period. The Black-Scholes value of each option is $10. The firm expects that four percent of the options will be forfeited based on the experience of similar firms. The total fair value of the options granted is $312,000. After applying the forfeiture rate, the firm will recognize stock option compensation expense of $300,000, $100,000 each year in 20X0, 20X1, and 20X2. The offsetting journal entry to the compensation expense increases additional paid in capital.

Dr. Compensation Expense	$100,000	
Cr. APIC Stock Options		$100,000

Continuing with the above example, assume the applicable tax rate is 40 percent. Assume throughout the example that the firm's tax rate is perpetually equal to the statutory rate of 40%). During 20X0, 20X1, and 20X2, the firm will record a deferred tax benefit of $40,000 and establish a deferred tax asset for the expected future tax deduction from option exercise.

Dr. Deferred Tax Asset	$40,000	
Cr. Income Tax Expense (Deferred)		$40,000

If we assume that employees accept grants in the place of salary equal to the fair value of the grant, the firm's *GAAPETR* for 20X0, 20X1, and 20X2 is unaffected by replacing salary with options.[107] The firm's current taxable income is higher with option compensation than it would be if the company used only salary because option grants are

[107] GAAPETR is calculated by dividing a firm's reported tax expense by pretax book income.

not immediately deductible on a firm's tax return. Because the firm's tax liability is higher, ceteris paribus cash taxes paid will be higher for 20X0, 20X1, and 20X2, compared to the reported tax expense. Accordingly, *CASHETR* will be higher than if the firm had used only salary compensation.[108]

By the end of 20X2 all of the stock options in this grant have vested and the company has recognized $300,000 in compensation expense, increased APIC Stock options by $300,000, decreased deferred tax expense by $120,000, and increased deferred tax assets by $120,000. For simplification, assume employees holding four percent of stock options left the company before the options vested so these options were forfeited at the expected rate.

We have explored how options, as they vest, affect the financial statements and measures of tax avoidance. Unlike other forms of compensation, such as salary, options can affect a firm's financial statements after they are fully owned by employees. After an option is vested, it can be canceled.[109] Cancellation occurs when an option can no longer be exercised under the terms of the option. One of the reasons for option cancellation is that the option reaches the end of its stated life (almost always 10 years). Another common reason options are canceled is that employees leave the company. Often employees have a limited amount of time after leaving a company to exercise options or the options are canceled. When options are canceled, the firm does not adjust compensation expense previously recognized, but it does remove the deferred tax asset

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[108] CASHETR is calculated by dividing cash taxes paid by pretax book income adjusted for special items

[109]Cancellation is different from forfeiture in that cancellations occur after the options have vested and forfeiture occurs before the options vest. Forfeitures occur because the conditions to earn the options are never met, for instance when an employee leaves the firm before the vesting period expires. Cancellations occur when an option goes unexercised after it is earned, for instance when the stock price never rises above the strike price of the option.

on its balance sheet. This removal does not necessarily affect tax expense on the financial statements.

Continuing the above example, let us assume that in 20X3 the options are underwater. The terms of the options state that employees must exercise their options before leaving the company. Employees holding 500 options leave the company without exercising the options, therefore these options are canceled. Each option has a $4 deferred tax benefit tied to it ($10 × 40%). Hence, the firm will remove $2,000 of deferred tax assets from the books because there is no balance in APIC- Tax Windfall.

Dr. Income Tax Expense (Deferred)	$2,000	
Cr. Deferred Tax Asset		$2,000

Because no options were exercised during 20X3, the firm's true tax liability is unaffected by the use of stock option compensation. However, the adjustment for option cancellation increases the firm's total tax expense and therefore increases the firm's *GAAPETR* compared to what *GAAPETR* would be if the firm had used only salary compensation. However, the reversal of a deferred tax benefit that was never realized means that a multi-year measure of *GAAPETR* including both the year the option vests and the year it is canceled will be correct.

Assume that in 20X4 the firm's stock price rises and the employees' options are no longer underwater. Employees exercise 5,000 options when the stock price is $150. The firm experiences a cash inflow of $500,000 ($100 × 5,000).[110] The journal entries to record the effects of option exercise on owner's equity mirror the journal entries made when stock is sold. The company increases cash and splits the value received for the

[110] Companies have different strategies in obtaining the shares the employee gets after option exercise. For instance, the firm may buy back shares on the open market to fulfill the option exercise or it may draw on a reserve of shares that have not yet been in circulation.

stock between common stock and APIC. Continuing with the example above and assuming that each share of stock has $1 par value, the firm would debit cash $500,000, credit common stock $5,000, and credit APIC for the difference, $495,000.

Dr. Cash	$500,000	
Cr. Common Stock		$ 5,000
Cr. APIC Stock Options		$495,000

In 20X4 the firm gets to take a tax deduction of $250,000 (($150 - $100) × 5,000) related to the option exercise. If the firm has a tax rate of 40%, its tax liability is reduced by $100,000. The firm previously recorded a deferred tax benefit of $4 per share, or $20,000, for the options exercised this year. The firm has a tax windfall benefit of $80,000 during 20X4. As discussed previously, the firm does not get an additional deduction on its income statement for the unanticipated tax deduction. Instead, it adjusts equity directly.

Dr. Income Taxes Payable	$100,000	
Cr. Income Tax Expense (Current)		$20,000
Cr. APIC- Tax Windfall		$80,000
Dr. Income Tax Expense (Deferred)	$20,000	
Cr. Deferred Tax Asset		$20,000

In 20X4 the firm's tax return includes a $250,000 deduction for stock options, meaning the firm's tax liability is reduced by $100,000. Its *CASHETR* reflects the full tax benefit of stock option exercise and is lower than it would be if they had originally used salary compensation exclusively. The total tax expense reported on the income statement is unaffected by stock option exercise (the entry for current and deferred tax expense offset each other), and the firm’s *GAAPETR* is not different than if the firm had used

salary compensation exclusively. *GAAPETR* does not reflect the windfall portion of the tax benefit from the stock option exercise.

In 20X5, the company's stock price falls and options are again underwater. Employees holding 500 options leave the company without exercising them. This cancellation is accounted for differently than the cancellation in 20X3 because the firm now has a positive balance in the APIC- Tax Windfall account from the tax windfall in 20X4. In this case, instead of debiting deferred tax expense and reversing the recognized tax benefit that was never realized, the tax windfall account is debited.

Dr. APIC- Tax Windfall	$2,000	
Cr. Deferred Tax Asset		$2,000

In 20X5, neither the firm's income statement nor its tax return includes any deductions for stock option compensation. The firm's *GAAPETR* and *CASHETR* are not different than they would have been if the firm had only used salary compensation. Unlike the circumstances in 20X3, the understatement of *GAAPETR* is not corrected with a multi-year measure, even if the years include the grant year and the year of cancellation.

In 20X6, the company's stock price rose and all remaining options (4,000 options) were exercised when the stock price was $103. The firm receives $400,000 for option exercise.

Dr. Cash	$400,000	
Cr. Common Stock		$4,000
Cr. APIC SO		$396,000

The firm gets a tax deduction of $12,000 (($103-$100) × 4,000) for the exercise of these options resulting in a reduction in current tax liability of $4,800. The estimated tax benefit to be taken off the books is $16,000 ($10 × 40% × 4,000). Because the

reduction in tax liability is less than the estimated tax benefit, the firm is in a tax shortfall position. It reduces the tax windfall by the amount of the shortfall.[111]

Dr. Income Tax Expense (Deferred)	$ 4,800	
Dr. APIC- Tax Windfall	$11,200	
Cr. Deferred Tax Asset		$16,000
Dr. Income Taxes payable	$ 4,800	
Cr. Income Tax Expense (Current)		$4,800

The firm's tax return in 20X6 reflects a tax deduction of $12,000, ($103-$100) × 4,000, from stock option exercise. The firm's tax liability is reduced by $4,800, and the firm's *CASHETR* reflects this tax benefit. Because the firm's total tax expense is unaffected by option exercise (i.e., the journal entries to current and deferred tax offset each other), *GAAPETR* is not different in 20X6 than if the company had used salary compensation exclusively. However, the *GAAPETR* in the grant year was understated because a recognized deferred tax benefit was not realized.

The following table summarizes the impact of stock option compensation on tax avoidance measures in the previous example.

[111] If the firm did not have an existing tax windfall, it would increase (debit) deferred tax expense for the difference between the estimated benefit and the actual benefit.

Table C1. Stock option compensation effects on effective tax rate measures

	20X0	20X1	20X2	20X3	20X4	20X5	20X6
GAAPETR*	No effect	No effect	No effect	No effect	Does not detect full tax benefit of stock options	No effect	No effect
CashETR*	Higher	Higher	Higher	No effect	Lower	No effect	Lower

Note: This table summarizes the impact of stock option compensation on tax avoidance measures in the previous example.

* The effective tax rate measure is compared to compensating employees with salary equal to the fair value of options as they are earned (vesting period)

APPENDIX D: CALCULATION OF *TRUEUP*

TRUEUP is an estimate of the additional expense firms would face if they were required to true-up the financial statements to fully recognize the difference between the realized cost of options settled during the year and the expense that was originally recognized (or would have been recognized under ASC 718) for these options. *TRUEUP* is calculated as the difference between an estimate of the realized cost of options settled, canceled or exercised, during 2006-2012 and an estimate of the fair value of those options when the options were originally granted.[112] Estimating the fair value at grant date of options settled requires a multi-step process since firms disclose neither when the particular options settled during the year were originally granted nor the fair value of the settled options at grant. First, I must make assumptions about the options' grant date. Next, using firm-specific ex-post data I calculate the factors ASC 718-10-55-21 and 22 require companies to consider when determining the fair value of options granted over the expected option life starting in the assumed grant year.[113] Finally, I use these factors as inputs to the Black-Scholes model to estimate the fair value of the options at their original grant date, *ORIG_FV*. The following paragraphs detail these steps.

The first step in estimating *ORIG_FV* for stock options settled during the 2006-2012 is to assign these stock options an original grant date. I rely on findings in previous literature in assigning grant dates. I assume that canceled options were granted eight years prior to cancellation. Carpenter, Stanton, and Wallace (2011) use proprietary data to show that almost all options are issued with an expiration date that is ten years prior to

[112] While firms were required to disclose inputs to models estimating the fair value of options granted since 1995, reliable machine-readable data is only available beginning in 2006.

[113] Firms are required to consider: the exercise price of the option, the current price of the underlying share, the expected volatility of the price of the underlying share, the expected dividends on the underlying share, and the risk-free interest rate(s)

the grant. Options are canceled by default when their expiration date passes. However, options are also canceled when an employee looses the right to that option, for instance, if they leave the company without exercising all outstanding stock options. While the choice of eight years is arbitrary, it is a reasonable estimate of the average grant date for options canceled during the year. I assume that exercised options were granted four years prior to exercise. Previous studies, such as Huddart and Lang (1996), show that recent vesting is a significant predictor in exercise behavior. Carpenter, Stanton, and Wallace (2010) find options are exercised an average of 68 months before expiration and almost all options expire ten years after they are granted, which means options are exercised an average of about 52 months, or 4.33 years after grant. Therefore, four years is a reasonable estimate of the time lapse between option grant and option exercise.

After identifying an assumed grant date of settled options, the next step in calculating *ORIG_FV* is to estimate the factors that firms are required to consider under ASC 718-10-55-21 and 22 when determining the fair value of options granted: the expected life of the option, the current price of the underlying stock, the exercise price of the option, the expected volatility of the underlying stock over the life of the option, the expected dividends on the underlying share of stock, and the expected risk-free interest rate. Using the disclosed option data for the 2006-2012 years, I find that the expected life of the options granted by a firm has little variation.[114] Therefore, I assume that the average option life disclosed by the firm as being used in fair value model calculations during this period is the assumed option life that would have been used in prior years. Because strike price is generally equal to the market price at issuance, I set the exercise price of the option to the price of the underlying stock, and assume that all options

[114]I find the coefficient of variation of the firm-specific disclosed assumed option life is 0.102, the lowest of all the inputs disclosed by firms.

granted during the year were granted at the average of the firm's highest and lowest stock prices of the year. The remaining factors that firms are required to consider (the volatility of the underlying stock price, the expected dividends on the underlying stock, and the risk-free interest rate) must be estimated over the expected life of the option. I use ex-post firm-specific data to calculate these factors over the assumed expected life of the option starting in the assigned grant year. The ex-post option volatility is calculated as standard deviation of the natural logarithm of the firm's daily CRSP returns during the assumed option life. The risk-free rate is calculated as the return on one-month Treasury Bills during the assumed option life. The dividend yield is the firm-specific dividend yield over the assumed option life. By using ex-post data I imply that managers have perfect foresight about these factors, which is the most reasonable estimate of managers' ex-ante expectations.

Finally, after calculating these factors I use the Black-Scholes model to calculate *ORIG_FV*. *TRUEUP* is the difference between *ORIG_FV* and an estimate of the realized cost of options settled, *REALIZED_COST*, aggregated across all firms in the sample each year of the sample period. *REALIZED_COST* is calculated as the difference between the average of the firm's stock price high and stock price low for the year multiplied by the number of options exercised during the year.[115]

[115]*REALIZED_COST* is described in more detail in Section 1.3.2 and Appendix A.

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