Implicit Taxes in Imperfect Markets

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Abstract

Implicit taxes are defined as the pre-tax rate of return disadvantage earned on an investment that is taxed preferentially. Implicit tax theory predicts that implicit taxes will fully offset any benefit from preferential tax treatment leading to no benefit from lower explicit taxes; however, implicit tax theory assumes perfect market competition. This paper relaxes the assumption of perfect market competition and finds that firms in industries with lower competition bear lower implicit taxes, and firms in industries with higher competition bear higher implicit taxes. These findings are consistent with firms in industries with less competition having price setting power. Further, these findings are consistent with competition forcing firms in high competition industries to pass along tax savings to customers while firms in low competition industries can retain more of their tax savings. These findings further answer the call in the literature for more research on determinants of cross-sectional variation in implicit taxes (Shackelford and Shevlin 2001).

KEYWORDS: corporate taxation, corporate tax rates, implicit taxes, corporate tax preferences, cost advantage, market concentration

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Section I: Introduction

U.S tax law provides firms with tax preferences through reduced tax rates, tax credits, higher and earlier deductions, delayed income recognition, exemptions, etc. (Scholes et al. 2015). All else equal, this will encourage firms to increase investment in tax preferred areas, thus increasing the supply of outputs. In a perfectly competitive market this increase in output supply will drive down output price and reduce the rate of return in tax preferred areas (Jennings et al. 2012). Implicit tax theory holds that investment continues to increase in these tax preferred areas until there is no after tax rate of return difference between investing in a tax preferred versus non-tax preferred area (Nicholson 2005). This reduced pre-tax rate of return on an investment that is taxed preferentially is the implicit tax (Scholes et al. 2015). Using a large sample of U.S. firms, I seek to document whether variation in market competition impacts implicit tax formation. My work complements prior research that examines variation in explicit taxes (i.e. effective tax rates) (Hanlon and Heitzman 2010) and answers the call from Shackelford and Shevlin (2001) and Scholes et al. (2015) for more research that considers firms' entire tax burdens – both implicit and explicit. Because most existing tax research focuses only on firms' explicit tax burdens and has not attempted to measure and include implicit taxes in the analyses, the findings from these studies present a potentially incomplete picture of US corporations' tax burdens (Hanlon and Heitzman 2010).

Markets lie along a spectrum that ranges from perfectly competitive to monopolistic (Nicholson 2005). Economic theory suggests that in perfectly competitive markets implicit taxes will rise to fully offset any benefit from reducing explicit taxes (Scholes et al. 2015). Similarly, theory predicts that in monopolistic settings implicit taxes may be closer to zero and firms may retain more of their explicit tax preferences. However, in the U.S. economy monopolies or perfect

competition are unlikely to hold and in reality, most firms participate in markets that lie somewhere between these two extremes. Firms can face competition on the input side on what they purchase to produce their goods or services or on the supply side on what they sell to customers. Consistent with prior research (e.g., Kubick et al. 2015 and Chyz, Gaertner, and Laplante 2014), I focus on the supply side in this paper because measurement of competition on the supply side is much more straightforward. Kubick et al. (2015) and Chyz, Gaertner, and Laplante (2014) similarly focus on the supply side and both find results that they attribute to competitive market forces. Specifically, Kubick et al. (2015) finds that firms with higher product market power (i.e., less competition) engage in more tax avoidance, and Chyz et al. (2014) find that firms selling products with less elastic demand (i.e., potentially less competition) avoid more taxes than firms with more elastic demand. Similar to this paper, both of these papers focus on the supply side (the output side of what firms are producing and/or selling).

However, the competitiveness of the firms' input side could influence my results. There is reason to believe that the competitiveness of the input side for firms is similar to the demand side. If firms sell goods in a competitive market, then they are likely competing over the same inputs to production. In Appendix 2, in Figures 2 and 4, I show the effect on the price of goods if the supply increases under perfect competition and in a monopoly, respectively. In both instances, price decreases; however, the level of price decreases may be different between the two scenarios. Without controlling for the competitiveness of the demand of the inputs, interpretation of my results may be limited. On the demand side, Appendix 2, Figures 1 and 5 demonstrate the effect of an increase in demand under perfect competition or in a monopoly situation. In both situations a price increase occurs, but the degree of increase may differ between the two scenarios.

Prior research suggests that implicit taxes are generally not as high as would be expected in a perfectly competitive market (e.g., Ayers et al. 2000, Berger 1993, Engel et al. 1999, Erickson and Wang 1999, Guenther 1994, Henning and Shaw 2000, Miller 1977, Shackelford 1991, Stickney et al. 1983, Key 2008). Whether the findings from this prior research can be explained by measurable and predictable deviations from perfect market competition is an empirical question. To answer this question, I estimate market competition at the NAICS industry level using market concentration ratios of the top four firms and the Herfindahl-Hirschman index (HHI) (Callihan and White 1999). I then modify and extend the methodology developed in Jennings et al. (2012) to test variation in implicit tax differences arising from industry level competition. I provide detail of these tests in Section III.

I find that implicit taxes are lower for firms in industries with lower competition and higher in industries with higher competition as predicted by theory. Firms in industries with low competition (closer on the spectrum to a monopoly) appear to be able to retain some of the tax preference benefits whereas firms in industries that are more competitive have more of their explicit tax preference benefits eliminated by implicit taxes.

There are other reasons why prices would not fully respond to changes in supply including externalities, public goods, and imperfect information (Nicholson 2005). I focus on imperfect competition for several reasons. Competition can be reliably measured using several generally accepted measures. Further, competition can be measured for all industries unlike externalities and public goods, which may only be an issue for certain industries.

My findings should be of interest to managers, researchers, and tax policy makers. The accounting and finance literatures typically characterize firms' tax outcomes as reflecting a strategic focus or "investment" in tax minimization or tax planning (Mills et al. 1998). In other

words, managers expend resources to minimize taxes (Chyz et al., 2016a, Chyz et al., 2014). My results show that increased market competition will offset some of the benefits from paying lower explicit taxes. The results may help explain the "undersheltering puzzle" visited in prior literature – i.e., why more tax avoidance does not occur (Hanlon and Heitzman 2010; Weisbach 2001). Finally, my results inform tax policy by documenting sources of variation in implicit taxes. The existence of implicit taxes can provide a signal to policy makers that legislated tax preferences effectively incentivized a targeted area. At the same time policy makers will want to predict whether legislated tax preferences could lead to changes in firms' total tax burdens.[1]

The remainder of my paper is structured as follows. Section II discusses prior research and develops my hypothesis. Section III outlines my sample selection procedures, variable definitions, and research methodology. Section IV discusses some additional tests. I conclude in Section V.

[1] In future research, it would be interesting to examine rifle-shot provisions and implicit taxes. I would expect that rifle-shot provisions that lower explicit taxes that impact a single firm (or small number of firms) rather than an entire industry would be less subject to offsets in benefits in the form of implicit taxes than tax policies that impact an entire industry or large group of firms.

Section II: Prior Research and Hypothesis Development

a. What do we know about explicit and implicit taxes?

The literature regarding explicit U.S. corporate tax burdens is extensive and well developed. For example, prior literature finds a number of determinants of explicit taxes including firm size, capital structure, asset mix, profitability, international operations, tax shelter usage, compensation on pre-tax versus post-tax income, equity-based compensation, concentration of ownership, whether the tax department is a profit center, tax director compensation contracts, and top executive characteristics (Armstrong et al. 2012; Chen et al. 2010; Desai and Dharmapala 2006; Dyreng et al. 2010; Gupta and Newberry 1997; Hanlon and Heitzman 2010; Phillips 2003; Rego 2003; Robinson et al. 2010; Zimmerman 1983). However, this prior literature generally estimates tax burdens without directly measuring implicit taxes.

Implicit taxes arise as reductions in the benefits of explicit tax preferences. First, capital is attracted to tax-favored investments (or projects with lower explicit tax rates). As companies invest more and more capital in these tax favored projects, the supply curve shifts to the right (see Appendix 2 for an illustration). Eventually, in a perfectly competitive market, risk adjusted after tax rates of return will equalize among differentially taxed projects or firms (Jennings et al. 2012). Implicit taxes are thus the pre-tax return disadvantage that equalizes after tax rates of return. Implicit tax theory predicts that implicit taxes will fully offset explicit tax benefits leading to no benefit from investing in tax advantaged projects. This can also be looked at as a total tax burden story where in a perfectly competitive economy, the total tax burden, calculated as the sum of explicit and implicit taxes, is the same across projects and across firms (Callihan and White 1999). However, prior research suggests that the total tax burden varies and implicit taxes do not always fully offset explicit tax benefits (Wilkie 1992; Jennings et al. 2012).

Shackelford and Shevlin (2001) and Scholes et al. (2014) remind researchers and policy makers to consider "all taxes" in our analyses and that ignoring implicit taxes leaves a gap in our understanding. Prior research in implicit taxes measures implicit taxes at an aggregated asset level or at a firm level. Implicit taxes at the asset level are easier to conceptualize relative to implicit taxes at a firm level. Consider for example the case of municipal bonds. Interest from municipal bonds is generally not taxed to an investor, while interest from corporate bonds of comparable risk are subject to investor level taxation. However, one would expect differences in taxation to be reflected in the pre-tax rates of return. One would expect corporate bonds to have higher pre-tax returns than municipal bonds of comparable risk. One would also expect equal after tax rates of return between municipal and corporate bonds of comparable risk in a perfectly competitive economy. The lower pre-tax rate of return for tax favored municipal bonds is the implicit tax.

The ease of interpretation is likely to explain why much of the prior literature on implicit taxes has measured or examined variation in implicit taxes at an asset level (Ayers et al. 2000; Berger 1993; Engel et al. 1999; Erickson and Wang 1999; Guenther 1994; Henning and Shaw 2000; Miller 1977; Shackelford 1991; Stickney et al. 1983, Key 2008). Though a simplified interpretation, if we consider firms to be collections of investments made (assets purchased) and returns received then much of the same theory and logic that assists with understanding implicit taxes at the asset level can be extended to capture implicit taxes at the firm level. There are distinct advantages with attempting to capture implicit taxes at the firm level. Measuring implicit taxes at the firm level allows for better comparisons with much of the extant explicit tax literature that also uses firm level measures (Callihan and White 1999, Chyz et al. 2016b; Jennings et al. 2012; Salbador and Vendrzyk 2006; Markle et al. 2016). Prior research at the firm level finds that full implicit tax formation is impacted by the Tax Reform Act of 1986 (TRA86) (Jennings et al. 2012),

market power within niche industries or investments (Salbador and Vendrzyk 2006; Shackelford 1991; Stickney et al. 1983), aggressive tax planning (Jennings et al. 2012), tax shelter use (Jennings et al. 2012), multinational operations (Chyz et al. 2016b), and ability to shift income (Markle et al. 2016).

Miller (1977) discusses, among many things, the implicit taxes borne by holders of tax-preferred versus fully taxable corporate bonds. Stickney et al. (1983) examines a specific company – General Electric and subsidiaries – and finds evidence of implicit taxes on the tax preference benefits of tax transfer leasing. Shackelford (1991) studies a unique setting involving employee stock ownership plans (ESOPs) and finds that tax preferences for ESOPs incur implicit taxes. Berger (1993) investigates implicit taxes related to the 1981 Research and Development (R&D) tax credit and finds evidence of implicit taxes by isolating the impact of spending increases for R&D related to price increases (input price increases would be evidence of implicit taxes) versus volume increases. Guenther (1994) finds evidence of implicit taxes on treasury bills by comparing pre-tax returns of treasury bills around the rate changes (i.e. December versus January). Engel et al. (1999) find support for small but lower than theory predicts levels of implicit taxes for trust preferred stock by examining the rate of return investors were willing to accept for financial instruments identical except for the taxability of the interest/dividends. Erickson and Wang (1999) find evidence of implicit taxes in a specific transaction between two firms in which huge tax savings were achieved for one party; however, evidence of implicit taxes shows that at least a portion of the benefits were transferred to the other party via lower stock transfer prices. Ayers et al. (2000) analyzes the goodwill amortization deduction enactment and finds support that this tax preference (goodwill amortization deduction) generated implicit taxes by analyzing the relation between pre-existing goodwill and acquisition premiums before and after the enactment of the act

allowing the deduction of goodwill amortization from qualifying corporate acquisitions. Henning and Shaw (2000) examine changes around the tax deductibility of goodwill and find evidence of implicit taxes for this tax preference. Key (2008) examines implicit taxes for a unique sample of racehorse purchases where some are allowed bonus depreciation and finds evidence of implicit taxes but below the level theory predicts.

My paper builds upon this asset-level and firm-level research and will contribute to this literature stream by examining on a large scale one very important determinant of implicit taxes: market competitiveness.

The two papers most related to this study are Salbador and Vendrzyk (2006) and Callihan and White (1999). Callihan and White (1999) it is determined in Wright (2001) actually measures tax preferences rather than implicit taxes. And thus, their findings essentially can be interpreted as firms in more competitive industries have higher tax preferences. In my delta analysis test, I control for tax preferences and measure implicit taxes as the reduction in the benefit of the explicit tax preferences. This approach effectively controls for tax preferences. I leave it to future research to determine the interactive effect of tax preferences, implicit taxes, and competition. Salbador and Vendrzyk (2006) look at a niche industry – the defense contracting industry – and make assertions based on market power within this niche industry. Their results are limited to the particular industry, whereas my results are potentially more generalizable across a population.

A discussion of implicit taxes is incomplete without a short discussion of tax incidence. Tax incidence relates to who bears the tax. For explicit taxes, if an increase in explicit taxes can be passed through to a firm's customers through higher sales prices, then the customer bears the increased explicit taxes. Theoretical tax incidence literature generally determines that corporate tax incidence falls on the less mobile input factors, generally labor and services or capital (when

mobility of capital varies) (Harberger 2008; Gravelle 2008). Researchers typically examine tax incidence at an economy level and examine which groups bear the tax overall. While the incidence literature does not address implicit taxes directly, evidence in the incidence literature suggests that changes in economy-wide explicit taxes are borne to some extent by suppliers, employees, and customers and not just shareholders. This supports the notion that changes in implicit taxes offset at least some of the changes in explicit taxes (Jennings et al. 2012). The incidence of an explicit tax change can be borne by the firm itself or the input or output factors of the firm (i.e., suppliers and customers). Prior literature suggests that firms may take into account their ability (or inability) to pass on tax savings or costs to other parties when making investments into tax avoidance (Chyz et al. 2014). Although it complements and helps clarify implicit tax research, incidence is not the focus of this paper and is left for future research.

As discussed, implicit tax theory predicts equal total tax burdens (calculated as the sum of explicit and implicit taxes) across firms (Callihan and White 1999). In other words, implicit taxes should fully offset any benefit from lowering explicit taxes. While prior literature has found evidence that rejects implicit taxes fully offsetting all explicit tax preference benefits and total tax burdens not being perfectly equal across all firms, evidence supports the existence of varying degrees of implicit taxes (Jennings et al. 2012; Callihan and White 1999; Wilkie 1992). The general framework holds that the more a market diverges from being perfectly competitive (via lower market competitiveness), the more likely implicit taxes do not fully offset explicit tax benefits, as would be expected in a perfectly competitive market. Measuring market power as industry market concentration and a firm's market share, Callihan and White (1999) find evidence that the use of tax preferences varies with market competition.[2] Further, Salbador and Vendrzyk

[2] Callihan and White (1999) make claims regarding how implicit taxes vary with competition; however, Wright (2001) proves that their methodology was actually measuring tax preferences and not implicit taxes.

(2006) find that in a very small industry, ability to set prices (i.e., more monopolistic) reduces implicit taxes at the firm level. How market competition impacts the degree of implicit tax formation has not been examined in the literature. My research fills this gap by examining market competition's impact on implicit tax formation, which is a natural test as implicit tax theory relies on the assumption of perfect competition.

b. Hypothesis Development

Implicit taxes arise due to increased demand or supply for a tax preferred asset or investment. From the supply side, suppose Congress allows for 50 percent immediate expensing on the purchase of equipment through bonus depreciation thus creating a tax preference. Due to this tax preference, firms purchase more equipment driving up supply of whatever they are producing. This leads to lower selling prices for the firms output, leading to lower pre-tax returns. This is the supply effect. Appendix 2, Figure 2 shows this scenario. In a perfectly competitive market, as the supply in the particular industry increases and shifts the supply curve to the right, the equilibrium point shifts driving the output price down on the outputs in the industry (Nicholson 2005). Supply increases in the industry and shifts the output price down to the point at which the equilibrium price equals the average cost in the industry, leading to zero profits (or no benefit for investing in the tax preferred item, i.e., equipment in this example) (Nicholson 2005). On the flip side, suppose this bonus depreciation is limited to a single firm that operates as a monopoly. In a monopoly, a firm operates at the point at which marginal revenue equals marginal cost (Nicholson 2005; Chamberlin 1933). Figures 3 and 4 show the monopoly supply scenario. A tax preference for the firm operating in a monopoly shifts the marginal cost curve down, leading to a change in the equilibrium intersection of marginal cost and marginal revenue (Nicholson 2005; Chamberlin 1933). This generally leads to an increase in quantity produced and in price. However, monopolies

can earn a positive profit as profit = (price – average cost)*quantity, where price is greater than or equal to average cost. If a firm operates in a monopoly, the firm is not forced to shift the entire benefit of the tax preference (via lower pre-tax return, in this case lower price) to the customers as is the case in a perfectly competitive market (Nicholson 2005). Figure 3 shows an example of how a monopoly chooses the point at which to produce (where marginal cost (MC) equals marginal revenue (MR)), and Figure 4 shows how this looks on a traditional supply and demand graph. Figure 5 shows the effect on price if the supplier operates in a monopoly and demand increases. In this case, supply produced does not change, and thus price is driven up. As the focus in this paper is on the supply curve, Figures 2 and 4 are most relevant.

Even though implicit tax theory suggests that I will find implicit taxes increasing in competition, I may not find results in my sample if all industries in my sample are competitive enough to cause implicit taxes to form. The Federal Trade Commission is tasked with the job of identifying and breaking up monopolies that exist that exhibit unfair trade practices such as price fixing (Averitt 1980). Therefore, industries in the United States may not vary enough in their competitiveness for identification of a relation between implicit taxes and competition.

Implicit tax theory implies that implicit taxes arise in the presence of tax preferences to fully offset the benefits of explicit tax preferences (Callihan and White 1999). Implicit tax theory assumes perfect competition. In a non-perfectly competitive market, implicit taxes may not fully offset the benefits of tax preferences leading to lower implicit taxes than would be expected in a perfectly competitive market (Callihan and White 1999). This theory leads to my hypothesis:

Hypothesis: Firms in industries with lower competition bear lower implicit taxes than firms in industries with higher competition.

Section III: Sample Selection Procedures, Variable Definitions, and Research Methodology

a. Sample Selection Procedures

I begin with all U.S. firms with available data in Compustat in the years 2002, 2007, and 2012. I use these three years because I require Census data to calculate my variables of interest, and the Census data is only produced every 5 years. I use the Census data to determine total industry sales within an industry. Compustat data captures only the public firms, and prior literature has suggested that this data biases results when measuring competition (Ali, Klasa, and Yeung 2009).[3] Further, I require return on equity (ROE) to be not greater than one nor less than zero, positive tax expense, positive pre-tax income, and positive stockholders' equity. I further require total assets of at least $10 million and pre-tax income of at least $500,000. My sample is further reduced by requiring Census industry level data.[4] I impose these requirements following Jennings et al. (2012) as these requirements increase the likelihood that low effective tax rates found in the sample are due to tax preferences from profitable firms as opposed to current year losses or low profits. The return on equity requirement removes outliers that are likely due to extreme situations or incorrect data. This results in 7,687 firm-year observations for my main tests.[5] Table 1 shows the effect each requirement has on the sample size. At the two digit NAICS level, this results in 21 industries represented in the sample with firm-year observations per industry ranging from 28 observations to 1,626 observations.[6] This breakdown by industry is shown in Table 2.

[3] Ali et al. (2009) find that many prior studies that use Compustat based industry measures cannot be confirmed using Census based industry measures.
[4] For my main sample, I require firms to merge at the 2 digit NAICS level with the census data.
[5] My main results hold if firms with NOL carryforwards are excluded. Excluding firms with NOL carryforwards results in a sample of 5,376 firms.
[6] I use the NAICS industry sales total from the Census data as this includes all firms and not just public firms. My main results hold if I use the 3 digit NAICS instead of the 2 digit NAICS.

b. Variable Definitions, Research Methodology, and Results

I use a modified and expanded version of the research methodology from Jennings et al. 2012. Using four main tests, I examine implicit taxes for firms in industries with low and high competition. I define competition by using Callihan and White's (1999) concentration ratio and the Herfindahl-Hirschman index (HHI). The concentration ratio (CR4) is defined as the total revenue for the top four firms by two digit NAICS[7], divided by the total sales for the industry (Callihan and White 1999). The HHI is calculated by squaring the market share of each firm and summing across two digit NAICS. The concentration ratio and the HHI capture whether an industry is dominated by a few large players. The higher the concentration ratio or HHI, the more an industry is dominated by a few large players and thus the more imperfect the market is (closer on the spectrum to a monopoly). Higher concentration ratios or HHI indicate less competition in an industry, and lower concentration ratios or HHI indicate more competition in an industry. The other main variables of interest are GAAP effective tax rate (GAAP_ETR defined as tax expense divided by pre-tax income), return on equity (ROE defined as net income divided by beginning of year shareholders' equity), and pretax return on equity (PTROE defined as pretax income divided by beginning of year shareholders' equity). The descriptive statistics are shown in Table 3 and are shown for all firm-years.[8] Panel A of Table 3 shows descriptive statistics for all firms-years in the sample, and Panels B and C show the descriptive statistics for firm-years in industries with high and low competition, respectively as defined by HIGH_CR4=0 and HIGH_CR4=1, respectively. In panel A, I show that the average GAAP effective tax rate (GAAP_ETR) for the sample is

[7] I use the historical NAICS throughout and for simplicity refer only to NAICS (as opposed to NAICSH).
[8] PTROE, TAX, GAAP_ETR, ROE, TOTAL ASSETS, LEVERAGE, CAP, INV, and RD are winsorized at 1 percent and 99 percent. My main results hold if these variables are not winsorized. My results further hold if I exclude NOL carryforward firm-years and do not winsorize. Leone et al. (2015) show winsorizing may bias some results. My results do not appear to be biased due to winsorizing.

0.3210, the average return on equity (ROE) is 0.1556, and the average pre-tax return on equity (PTROE) is 0.2312. Variables are defined in Appendix 1.

i. High v. Low Tax Preference Groups

In my first set of tests, I examine firms in industries with high and low competition as measured by concentration ratios and HHI below and above the median. Within each group, I compare the firms with high (low) and low (high) tax preferences (GAAP ETRs). I define PTROE as pretax income divided by shareholders' equity and TAX as tax expense divided by shareholders' equity. TAX as defined here represents the reduction in after tax return on equity due to explicit taxes (Jennings et al. 2012). In Table 4, Panel A, I first divide the sample into low competition (high CR4, ≥ median CR4 by year) and high competition (low CR4, < median CR4 by year). I further divide each subsample into high-tax and low-tax groups. The high-tax group represents the firms in each subsample by year that have the highest 40 percent of the GAAP_ETR distribution (lowest tax preferences), while the low-tax group represents the firms in each subsample by year that have the lowest 40 percent of the GAAP_ETR distribution (high tax preferences). I then take the differences in PTROE and TAX by high- and low-tax for each subsample (high and low competition). I am looking for whether as a group firms in high and low competition groups have differences, on average, in how much of their explicit tax advantage is offset by a pre-tax return disadvantage. If firms in less competitive industries bear lower implicit taxes than firms in more competitive industries, I will find a higher portion of the explicit tax benefit for firms in high competition industries is offset by a pre-tax return disadvantage than for firms in low competition industries.

For the low competition (CR4) subsample, I find that the TAX difference is 0.0455, which indicates that firms in the low-tax group have a 4.55 percent after tax return advantage to firms in

the high-tax group by paying lower GAAP_ETRs. If implicit tax theory holds, I should see an offsetting PTROE reduction for firms in the low-tax group. For the low competition (CR4) subsample, I find that high-tax firms have only a 2.04 percent pre-tax return advantage to firms in the low-tax group. The ratio of the PTROE and TAX differences for the low competition industry (CR4) firms of 44.84 percent indicates that firms in the low-tax industries can reduce their taxes and only incur an offsetting pre-tax return disadvantage of around 44.84 percent of the explicit tax savings. This is inconsistent with perfect implicit tax theory that suggests implicit taxes will through a pre-tax return disadvantage offset the entire benefit of lowering explicit taxes.

For the second subsample in Table 4, Panel A, I find that for firms in industries that are more competitive with low CR4, over 100 percent of the explicit tax benefits of low-tax firms are offset by a pre-tax return disadvantage on average. I specifically find that 129.76 percent of the explicit tax benefit (the 0.0562 difference in TAX between the high and low tax groups for high competition firms) is offset by a pre-tax return disadvantage (a disadvantage of 0.0729, which is the difference in PTROE between the high and low tax groups in the low CR4/ high competition column). There are several potential explanations for why this value is over 100 percent. In a perfect market, I would expect this value to be no more than 100 percent, which would indicate that 100 percent of the explicit tax benefits are eliminated via implicit taxes through pre-tax return reductions. One reason this value could be over 100 percent is that the measure is noisy. As I am trying to capture variation between the two groups (high and low competition), I am not concerned with noise influencing my inferences here because I have no reason to suspect that one group is influenced more or less than the other by noise. Another possible reason for this over 100 percent value could be that firms are overreacting and expending excess resources to lower their taxes. If this is true, some firms may be working to lower their explicit taxes to the detriment of their pre-

tax return leading to lower after tax profits, and if this is the case these firms may be better served to expending less resources to lowering explicit taxes. Overreaction and non-optimal tax related decisions has been documented in other literature, particularly the economics literature (Chetty, Looney, and Kroft 2009; Goldin and Homonoff 2013).

In Panel B, I substitute HHI for CR4 and find consistent results. Specifically, I find that for firms in low competition industries, approximately 34.44 percent of the explicit tax benefit for low tax firms is offset by a pre-tax return disadvantage (or implicit tax). And firms in high competition industries bear an offsetting pre-tax return disadvantage of 130.30 percent. Thus, for this first test, I find support that firms in industries with less competition exhibit an ability to bear lower implicit taxes.

ii. Correlations

Next I examine correlations between both PTROE and GAAP_ETR as well as between GAAP_ETR and ROE for firms in industries with high and low industry competition (based on CR4 and HHI).

Implicit tax theory holds that any benefit from lowering explicit taxes is eliminated via a pre-tax rate of return reduction leading to equal after tax rates of return regardless of explicit taxes paid (Scholes et al. 2015). Thus I expect to find PTROE and GAAP_ETR positively correlated as any decrease in GAAP_ETR would be related to a corresponding PTROE decrease for firms in industries with high competition and less positive or no correlation for firms in industries with low competition. Further, in a perfectly competitive market, I expect to find no relation between after tax return (ROE) and GAAP_ETR as any reductions in GAAP_ETR result in an offsetting pre-tax return reduction leading to no effect on after tax return (ROE). However, a negative relation between ROE and GAAP_ETR indicates an ability to retain explicit tax benefits as a reduction in

GAAP_ETR results in an increase in after tax return (ROE). I expect to find a more negative relation between GAAP_ETR and ROE for firms in industries with low competition.

In Table 5, Panel A, I find that there is no significant correlation between PTROE and GAAP_ETR for firms in low competition industries (high CR4), and I find that there is a significant positive correlation between PTROE and GAAP_ETR for firms in high competition industries (low CR4). And this difference is statistically significant using 2-tailed tests at the 1 percent or better level. This suggests that firms in high competition industries have a pre-tax return reduction when explicit taxes are lowered. And for firms in low competition industries, this pre-tax return disadvantage may not exist. In other words, firms may be able to lower explicit taxes without incurring implicit taxes in the form of lower pre-tax rates of return. Further, I find a negative and significant correlation between ROE and GAAP_ETR for both high competition and low competition (CR4) subsamples. However, I find that the correlation is significantly more negative for firms in low competition industries (high CR4). This suggests that firms in less competitive industries can retain benefits from lowering explicit taxes to a greater degree than firms in more competitive industries.

In Table 5, Panel B, I instead use HHI to divide my sample into high low and high competition subsamples, and I find consistent results.

iii. Regressions

The regressions in Table 6 follow the same theory and logic from my univariate correlation tests. However, in a regression I can examine correlations between GAAP_ETR and PTROE as well as GAAP_ETR and ROE conditional on covariates thought to predict variation in the GAAP_ETR. I control for size (LOG_ASSETS), leverage (LEVERAGE), capital intensity (CAP), inventory intensity (INV), research and development intensity (RD), and foreign operations

(MNE) (Jennings et al. 2012, Chyz et al. 2016b). Model 1 below corresponds to columns (1) and (2) in Table 6 Panel A, and Model 2 below corresponds to results in columns (3) and (4) in Table 6 Panel B. For both models (1) and (2), subscripts i, y, and n denote firm, year, and NAICS (2 digit) industry, respectively. The high competition variable (HIGH_COMPVAR) is measured by the concentration ratio (CR4) in columns (1) and (3) and by HHI in columns (2) and (4) in Table 6.

$$GAAP\_ETR_{i,y} = \beta_0 + \beta_1 PTROE_{i,y} + \beta_2 HIGH\_COMPVAR_{n,y} + \beta_3 PTROE_{i,y} x HIGH\_COMPVAR_{n,y} + \beta_4 LOG\_ASSETS_{i,y} + \beta_5 LEVERAGE_{i,y} + \beta_6 CAP_{i,y} + \beta_7 INV_{i,y} + \beta_8 RD_{i,y} + \beta_9 MNE_{i,y} + \sum \beta\, YEAR_y + \varepsilon \quad (1)$$

$$GAAP\_ETR_{i,y} = \beta_0 + \beta_1 ROE_{i,y} + \beta_2 HIGH\_COMPVAR_{n,y} + \beta_3 ROE_{i,y} x HIGH\_COMPVAR_{n,y} + \beta_4 LOG\_ASSETS_{i,y} + \beta_5 LEVERAGE_{i,y} + \beta_6 CAP_{i,y} + \beta_7 INV_{i,y} + \beta_8 RD_{i,y} + \beta_9 MNE_{i,y} + \sum \beta\, YEAR_y + \varepsilon \quad (2)$$

In these regressions, significance of the coefficients on the interaction terms PTROExHIGH_COMPVAR and ROExHIGH_COMPVAR (β_3) indicates firms in industries with high and low competition have different PTROE, GAAP_ETR and ROE, GAAP_ETR relations after controlling for size, leverage, capital intensity, inventory intensity, research and development intensity, and multinational operations. If implicit taxes are different between firms operating in industries characterized by relatively high or low competition, then I expect to find a negative coefficient on the interaction term (PTROExHIGH_COMPVAR) (β_3) in model (1) and no significance or weaker significance on the joint test for PTROE+PTROExHIGH_COMPVAR ($\beta_1 + \beta_3$). No significance on the joint test would suggest that firms in industries with low competition (HIGH_COMPVAR=1) get no offsetting pre-tax return reduction from lowering

explicit taxes. A negative coefficient on this interaction would suggest firms in industries with less competition (HIGH_COMPVAR=1, low competition) have lower GAAP_ETR, PTROE relations than firms in industries with high competition. As discussed in the correlation tests section, implicit tax theory predicts a pre-tax return (PTROE) reduction to offset the benefit from lowering explicit taxes (GAAP_ETR). Thus, a negative coefficient on the interaction term in columns (1) and (2) suggests that firms in industries with low competition bear lower implicit taxes.

My results are consistent with my hypothesis that firms in industries with low competition bear lower implicit taxes than firms in industries with higher competition. Specifically, in Table 6 Panel A, I show that for firms in industries with low competition as measured by HIGH_CR4=1, the coefficient on the interaction term (PTROExHIGH_CR4) is -0.0341 (and is significant at the 5 percent or better level), and for firms in industries with low competition as measured by HIGH_HHI=1, the coefficient on the interaction term (PTROExHIGH_HHI) is -0.0339 (and is significant at the 5 percent or better level). This indicates that after controlling for a variety of determinants of implicit taxes, firms in industries with lower competition (high CR4 or HHI) have lower relations between PTROE and ETR, which suggests lower implicit taxes.[9,10,11] Additionally,

[9] In a joint test on the coefficients for PTROE, HIGH_COMPVAR, and PTROExHIGH_COMPVAR, I find that the relation for the overall sample between PTROE and GAAP_ETR is significantly different than zero at the 1 percent or better level.

[10] In a joint test on the coefficients PTROE+PTROExHIGH_COMPVAR, I find no significance. This suggests no relation between PTROE and GAAP_ETR for firms in industries with high values of CR4 (HHI), which supports the idea that firms in less competitive industries bear lower implicit taxes.

[11] In untabulated tests, I test whether the results here are robust to using firm fixed effects. The results for this regression are not robust to using firm fixed effects. This may be due to the small number of firm observations. 2,268 firms in the sample have one observation, 1,304 have two observations, and 1,874 have three observations. Firm fixed effects remove the entire effect that the regression is trying to capture for 2,268 firms and potentially a large portion of the effect for the remaining firms in the sample.

coefficients on control variables are generally consistent with prior literature except for capital intensity (CAP) (Jennings et al. 2012, Chyz et al. 2016b).[12]

In model (2) (results shown in Panel B of Table 6), I examine the relation between GAAP_ETR and ROE for firms in industries with high and low competition. As noted previously, a finding of no relation between explicit taxes (GAAP_ETR) and after tax return (ROE) would suggest implicit taxes are fully offsetting any explicit tax benefit as there is no after-tax return (ROE) increase for lowering explicit taxes (GAAP_ETR). A negative relation between the two would suggest firms can keep at least some of the benefit from lowering explicit taxes (GAAP_ETR), and the more negative the relation, the more benefit is being retained and thus the lower the implicit taxes.

In columns (3) and (4) of Table 6 Panel B, I find that the coefficient on the interaction term ROExHIGH_CR4 is -0.0794 (and is significant at the 1 percent level or better), and ROExHIGH_HHI is -0.0820 (and is also significant at the 1 percent level or better), which suggests that firms in industries with low competition have ROE, GAAP_ETR relations that are further away from zero (more negative), which suggests lower implicit taxes for firms in industries with less competition. [13,14] I expect similar results regarding the other control variables when ROE is substituted for PTROE in columns 3 and 4 from Table 6, which I find.

[12] In untabulated tests using industry level averages, I find an insignificant correlation between both competition measures (CR4 and HHI) and capital intensity (CAP) at the industry level. This suggests that after controlling for industry level competition, capital intensity has a different impact on effective tax rates (GAAP_ETR). I leave exploration of this effect to future research.

[13] In a joint test on the coefficients for ROE, HIGH_COMPAVR and ROExHIGH_COMPVAR, I find that the relation for the overall sample between ROE and GAAP_ETR is significantly different than zero at the 1 percent or better level.

[14] In a joint test on the coefficients ROE+ROExHIGH_COMPVAR, I find significance at the 1 percent or better level. This suggests that HIGH_COMPVAR industry firms are able to retain the benefits from tax preferences through lower implicit taxes.

iv. Delta Analysis

Next, I calculate implicit taxes following an adapted version of the delta analysis methodology from Jennings et al. (2012). Implicit taxes are measured as the reduction in explicit tax preference benefits retained by a firm. This is calculated by setting firm return on equity (ROE) equal to an equilibrium ROE, after adjusting each for tax preferences with differences between the two attributable to implicit taxes. I explain this process in more detail in the following paragraphs.

Tax preferences are any tax reduction mechanism that lowers the explicit taxes and therefore mechanically (absent implicit taxes) increases the after-tax return (ROE). I define tax preferences (λ) following Jennings et al. (2012) as the rate required to equalize after tax returns (ROE) between a firm and an equilibrium rate of return, absent implicit taxes. I define firm level after-tax return as ROE (= pre-tax income less tax expense scaled by beginning of year shareholder's equity). And I define equilibrium ROE as ROE*, which is the rate of return all firms earn in the market absent tax preferences and implicit taxes. Thus,

$$ROE = ROE^{*}(1 + \lambda)$$

I further extend the model to allow equilibrium wide tax preferences. I define equilibrium wide tax preferences as λ*, such that,

$$ROE(1 + \lambda^{*}) = ROE^{*}(1 + \lambda)$$

However, as discussed previously, implicit taxes reduce the explicit tax benefit retained via a lower pre-tax return. Thus, I extend the model to include implicit taxes (δ), which are defined as the reduction in tax preference benefits. And equilibrium implicit taxes are defined as δ*. This leads to the following model, which considers both implicit taxes and tax preferences,

$$ROE\big(1 + \lambda^{*}(1 - \delta^{*})\big) = ROE^{*}(1 + \lambda(1 - \delta))$$

The equation above models firm level ROE as equal to equilibrium ROE (ROE*) after adjusting for firm level and equilibrium level implicit taxes and tax preferences. I set equilibrium values equal to year averages (changing notation from general equilibrium as indicated by * to year average notation) for each group (high and low competition) as this controls for between group and year risk differences. Setting the equilibrium as the year-group average diverges from the Jennings et al. 2012 methodology who set the equilibrium at the industry-year average. I alternatively set the equilibrium at an industry-year average as I discuss below. Solving for ROE on the left-hand side results in my main model of interest:

$$\mathrm{ROE} = \frac{[1 + \lambda(1 - \delta)]}{[1 + \bar{\lambda}_{\mathrm{y}}(1 - \overline{\delta_y})]} \overline{\mathrm{ROE}}_{\mathrm{y}} + \varepsilon \quad (3)$$

In this model, implicit taxes (δ) are the reduction in explicit tax preference benefits eliminated through a pre-tax return disadvantage (lower PTROE and thus lower ROE).

Implicit tax theory predicts that implicit taxes will eliminate 100 percent of the explicit tax preference benefits. The higher the calculated implicit taxes (δ), the more tax preference benefits are eliminated by implicit taxes. An implicit tax (δ) value of 0 percent would suggest that implicit taxes do not eliminate any of the explicit tax preference benefits through a return reduction. Because my hypothesis predicts that I will find lower implicit taxes for firms in industries with lower competition, realizations of (δ) should decrease with competition.

Using maximum likelihood estimation, I separately estimate implicit taxes (δ) for firms in high competition (low HHI and CR4) and low competition (high HHI and CR4) industries. Table 7 shows the results of this estimation using the equilibrium set at the year-group average (where group is defined as above or below median competition measures). In Panel A, I find that for firms in less competitive industries (high CR4), implicit taxes eliminate 31.18 percent of the explicit tax preference benefits, while for firms in more competitive industries (low CR4), implicit taxes

eliminate 62.67 percent of tax preference benefits. And in Table 7, Panel B, when I measure industry competition with HHI, I find similar results. I find in low competition industries, 28.45 percent of explicit tax preference benefits are eliminated by implicit taxes, and 62.65 percent of explicit tax preference benefits are eliminated by implicit taxes for firms in high competition industries.[15]

Overall, I find that implicit taxes are higher for firms in industries with greater competition and lower for firms in industries with lower competition. These results are generally consistent with prior literature on the product demand side from Chyz, Gaertner, and Laplante (2014) and Kubick et al. 2015 who find that firms selling products with more inelastic demand pass on their tax avoidance costs less than firms that sell products with more elastic demand and firms with more individual market power exhibit more tax avoidance behavior.

[15] Alternatively, I have calculated delta using the two digit NAICS year averages as the equilibrium. I do not find confirming results with this analysis, which I attribute to this industry year average equilibrium removing the very variation among industries I am trying to capture.

Section IV: Additional Tests

a. Sample Restriction Relaxation and Additional Competition Measures

In this section, I consider relaxing data cuts and using additional competition measures to determine whether my main results are robust to additional model specifications.

I first relax the assumption that for a firm to be in a high competition (or low competition) industry it must be in an industry with competition above (or below) the median. I repeat my four main tests using quartiles instead of above and below median. In this set of tests, I start with my main sample of firms (n=7,687) and divide the sample into quartiles. Group (1) includes firms in industries with ≥ 75th percentile of CR4 or HHI, Group (2) includes firms in industries with ≥ 50th percentile and < 75th percentile of CR4 or HHI, Group (3) includes firms in industries with ≥ 25th percentile and <50th percentile of CR4 or HHI, and Group (4) includes firms in industries with <25th percentile of CR4 or HHI. The results for this analysis are shown in Tables 8-11. Specifically note that each test is reperformed on each quartile sample of firm-years. Thus, for the PTROE/TAX ratio analysis in Table 8, note that the middle 20% of firms are dropped (just like in the PTROE/ROE ratio test results shown in Table 4) so that I am comparing the top 40% and the bottom 40% of the GAAP ETR distribution for each quartile group, which results in a different sample of firms being dropped than in the median cut tests in Table 4.

Generally I find that my proxies for implicit taxes do not increase monotonically with competition. The mixed results in this section could be attributable noise in terms of differences in what competition means across different industries. It is also possible that the mixed results could be due to misclassified industry competition due to the nature of the variable measurement – e.g., 4 strong competitors in one industry could provide enough competition for an industry to be competitive while thousands of firms in another industry each rest in their own niche and do

not directly compete with one another. Thus, the median tests in the main analysis may have smoothed out more misclassification issues than the results in this section.

Next I test various additional measures of competition. I introduce three new categories of competition measures in this section including extended Census data from Jan Keil (Keil 2016), Gini Coefficient calculations, and Hoberg and Philips' (Hoberg and Philips 2016, 2010) calculations of number of competitors. The Census data from Keil is compiled by expanding upon the electronically available Census data through data requests from the Census. Keil consolidates into a machine-readable fashion Census data from 1987 through 2012. The Census data is only available every 5 years, so this represents data from 6 different years. I interpret results I find using the Keil data with caution; to my knowledge no published paper has used data compiled from this secondary source.[16]

The Gini Coefficient data is calculated using Compustat data. The Gini Coefficient was developed to measure income inequality (Ceriani and Verme 2012, Gini 1912, and Lorenz 1905). The Gini Coefficient is a value between zero and one with lower values representing more equality and higher values representing more inequality. The advantage to using the Gini Coefficient as a measure of competition is that it can be calculated for any year using Compustat data. However, I hesitate to interpret results using this measure with caution because the Gini Coefficient is calculated excluding private firms as Compustat only includes public firms. In industries where private firms make up a significant portion of sales, the Gini Coefficient calculated may be especially noisy and potentially biased. The Gini Coefficient is generally used as a measure of income inequality but has been used to measure distribution of a group to apply to various other situations including wastewater allocation (Sun et al. 2010), export growth (Amiti and Freund

[16] https://sites.google.com/site/drjankeil/data

2010), and source code development (Giger et al. 2011) to name a few. I calculate the Gini Coefficient for my Compustat sample of firms using the following model at the industry-year level, where industry is defined in multiple ways using two through five digit NAICS and two through four digit SIC:

$$Gini\ Coefficient = \frac{\left[100 + \frac{100 - 2S}{n}\right]}{100} \quad (4),$$

$where\ firms\ are\ ordered\ by\ revenue, S = y_1 + \cdots + y_{n+1}, n =$ $number\ of\ firms\ in\ a\ given\ industry, y_i = 100\left(\frac{c_i}{c_{n+1}}\right) for\ i = 1, \ldots, n+1, and\ c_i =$ $cumulative\ income\ totals.$ [17]

The Hoberg and Philips (2010, 2016) data uses textual analysis of the 10-K for each firm and based on products mentioned in the 10-K develops a count of the number of other firms with similar products mentioned – i.e., number of competitors.[18] This data is unique to the other competition measures used in this paper as it is the only true firm level measure of competition. However, this data still suffers from only being able to capture public firm measures, and the measure may be noisy to the extent that this measure does not accurately capture true competitors. Note that this variable increases with the amount of competition and I have opposite predictions relative to my other measures of competition.

I show descriptive statistics for this new data summarized in Table 12. Notice that the alternative competition measures shown in Table 12 have sample sizes (n) that vary and are larger in many instances than the sample I use in my main analyses. The increased sample size is potentially a benefit, but the data has limitations as have been previously mentioned.

[17] http://www.peterrosenmai.com/lorenz-curve-graphing-tool-and-gini-coefficient-calculator.
[18] http://hobergphillips.usc.edu/

In Table 13, I show the tax ratio analysis test for implicit taxes using a selection of competition measures including the three digit NAICS and SIC level industry for Keil's CR4.[19] the Gini Coefficient at the three digit NAICS level, and the Hoberg and Philip's number of competitors. I select each of these to show a variety of different competition measures. Panels A-F show the ratios defining high and low tax using a median split on effective tax rates, while Panels G-L show the ratios and define high and low tax using the top and bottom 40 percent of the effective tax rate distribution. I then show the results for both a median split and the top and bottom quartiles of competition. The median split splits firms into the Low and High competition groups by splitting at the median of competition, and the quartile splits show the highest versus lowest quartiles based on competition. The ratio in the last row of each panel represents the portion of explicit tax benefit that is on average eliminated by a pre-tax return on equity disadvantage. With the exception of Panels A and G (CR4 at the 3 digit NAICS, SIC using median split), the other panels show that firms in industries with higher competition bear higher implicit taxes, evidenced by having more of their explicit tax benefits eliminated by a pre-tax return on equity disadvantage.

In Table 14, I show the correlation tests for implicit tax differences. In this test, a positive PTROE, GAAP_ETR correlation represents that as GAAP_ETR decreases, an offsetting PROE reduction results, which is evidence of implicit taxes. A higher positive PTROE, GAAP_ETR correlation suggests higher implicit taxes. For the ROE, GAAP_ETR correlations, a correlation of zero suggests that lowering GAAP_ETR has no effect on after tax return (ROE). A negative ROE, GAAP_ETR correlation suggests that as a firm lowers its GAAP_ETR, its ROE increases which indicates they may be able to keep the explicit tax benefits. A correlation close to zero

[19] NAICS is used for the Census data from 1997 to the present, and SIC was used prior to 1997.

between ROE and GAAP_ETR suggests higher implicit taxes, and a more negative correlation suggests lower implicit taxes. Thus, I expect and find some mixed support for a higher positive correlation between PTROE and GAAP_ETR and a more negative correlation between ROE and GAAP_ETR for firms in higher competition industries, which suggests higher competition for firms in industries with higher competition. Specifically, I do not find support for implicit taxes being higher for firms in industries with high competition when measuring competition using the 3 digit NAICS and SIC using the CR4 from the Keil data in Table 14, Panels A and B. I find moderate support in the PTROE, GAAP_ETR correlations for competition measured using the Gini Coefficients in Table 14, Panels C and D. And I find moderate support in the PTROE, GAAP_ETR correlations for competition measured using the Hoberg and Philips number of competitors' data in Panels E and F. For the GAAP_ETR, ROE relation, I find mixed results as well. I find support for higher implicit taxes for higher competition industries when competition is measured using the Hoberg and Philips number of competitors and when comparing quartiles only (Panel F).

In Table 15, I show regression results for all of the competition variables listed in the descriptives in Table 12. Panels A and B of Table 15 shows the regression results for Models (5) and (6), respectively, below:

$$GAAP\_ETR_{i,y} = \beta_0 + \beta_1 PTROE_{i,y} + \beta_2 COMPVAR_{n,y} + \beta_3 PTROE_{i,y} x COMPVAR_{n,y} + \beta_4 LOG\_ASSETS_{i,y} + \beta_5 LEVERAGE_{i,y} + \beta_6 CAP_{i,y} + \beta_7 INV_{i,y} + \beta_8 RD_{i,y} + \beta_9 MNE_{i,y} + \sum \beta\, YEAR_y + \varepsilon \quad (5)$$

$$GAAP\_ETR_{i,y} = \beta_0 + \beta_1 ROE_{i,y} + \beta_2 COMPVAR_{n,y} + \beta_3 ROE_{i,y} x COMPVAR_{n,y} + \beta_4 LOG\_ASSETS_{i,y} + \beta_5 LEVERAGE_{i,y} + \beta_6 CAP_{i,y} + \beta_7 INV_{i,y} + \beta_8 RD_{i,y} + \beta_9 MNE_{i,y} + \sum \beta\, YEAR_y + \varepsilon \quad (6)$$

Variables are defined in Appendix 1. These models are similar to models (1) and (2) in the main results of this paper with the exception of how COMPVAR is defined. In these models and the results in Table 15, COMPVAR is defined using a continuous competition measure, a median split to define high competition (HIGH_50), the top 25 percent of the competition distribution by year (High_25), the bottom 25 percent of the competition distribution by year (Low_25), the top 10 percent of the competition distribution by year (High_10), and the bottom 10 percent of the competition distribution by year (Low_10). Panel A of Table 15 shows the coefficient signs for Model (5) and Panel B shows the coefficient signs for Model (6). The signs in the Table in the β_1 column show the sign of the coefficient for PTROE in model (5), Panel A and the coefficient for ROE in in model (6), Panel B. The signs are only shown where significant at the 10 percent or better level using two tailed tests. The β_3 columns show the signs for the coefficient on the interaction of PTROE and the CompVar in model (5), Panel A and the coefficient on the interaction of ROE and the CompVar in model (6), Panel B. The CompVar is defined as a continuous measure in the CompVar columns and above or below the 50 percent, 25 percent, or 10 percent as indicated in the other columns. The Competition Variable (CompVar) is defined in the leftmost column in the Table. In Panel A of Table 15, a positive β_1 coefficient indicates a positive relation between PTROE and GAAP_ETR, while a negative (positive) β_3 indicates a lower (higher) relation between PTROE and GAAP_ETR. A positive relation between PTROE and GAAP_ETR suggests the presence of implicit taxes following the same theory in the correlations section that a positive relation suggests that as a firm lowers its explicit taxes and GAAP_ETR declines, an offsetting return via lower PTROE results. Thus, the more positive the relation the higher the implicit taxes that are suggested. Specifically, in the CompVar column, a negative β_3 indicates that as the competition variable increases the relation between PTROE and GAAP_ETR declines, and vice

versa. For all competition variables with the exception of HP_COMP, as the variable increases, competition decreases and vice versa. For the HP_COMP variable, as this value increases, the number of competitors increases which increases the level of competition. Thus, for the continuous measure of competition variables, I find support for a lower PTROE, GAAP ETR relation (lower implicit taxes) for firms as competition decreases using a continuous measure of competition when competition is measured using a variety of competition measures including many Keil Census measures (Keil_CR4_2, Keil_CR8_2, Keil_CR4_3, Keil_CR8_3, Keil_CR4_4, Keil_CR8_4, Keil_CR4_5, Keil_CR8_5), Gini Coefficient measures (GC_NAICS_2, GC_NAICS_3, GC_SIC_3, GC_SIC_4, GC_NAICS_5), and the Hoberg and Philips measure (HP_COMP). In the other columns, I look at whether this continuous relation I find in the first two columns is driven by the extreme quartiles and deciles. The mixed results I find in the other columns suggest that the linear relation I find in the first two columns may be driven by a linear relation that exists despite anomalies in the ends of the distribution.

In Panel B, of Table 15, I show the signs of the correlation coefficients for model (6) using the same set up and competition variable definitions as in Panel A. Following the correlation tests theory, a negative relation between GAAP_ETR and ROE suggests firms are able to retain explicit tax savings that are not offset by implicit taxes, and thus a closer to zero relation indicates higher implicit taxes. I find very little support for implicit taxes varying with competition in Panel B for the alternate competition measures.

Table 16 shows the estimation of implicit taxes using Model (3) delta analysis. The delta in these Tables is the measure of implicit taxes, where implicit taxes are measured as the percentage of explicit tax savings (tax preference benefits) offset by implicit taxes, and thus higher values indicate higher implicit taxes. I show the results using median and quartile cuts for three

measures of competition including: Keil's CR4 at the three digit NAICS and SIC, the Gini Coefficient at the three digit NAICS, and Hoberg and Philips' number of competitors. In this analysis using median cuts (Panels A, C, and E), I only find support for higher competition firms having higher implicit taxes when competition is measured using CR4 at the three digit NAICS and SIC in Panel A. Further, I do not find support for a monotonic increase in implicit taxes as the quartile of competition increases in Panels B, D, and F.

b. Industry Level Tests

As competition in my main set of tests is measured at the industry level, I consider whether measuring and examining the existence of implicit taxes at the industry-year level as opposed to the firm-year level impacts the results. In untabulated tests, I find that my main results are generally supported when implicit taxes are examined at the industry level. All details except for those specifically mentioned are identical to the main set of comparable tests (i.e., Tables 4-6). For the PTROE/TAX ratio analysis (similar to Table 4), I find that when competition is measured using CR4 for the same sample as my main analysis, implicit taxes offset 79.95 percent of the explicit tax advantage for high competition (low CR4) industries and only 6.30 percent of the explicit tax advantage for low competition (high CR4) firms. In the correlation tests at the industry level (similar to Table 5), I find that for industries considered low competition (high CR4), the PTROE, GAAP_ETR correlation is 15.04 percent and 7.98 percent for high competition (low CR4) industries, however, the difference is not statistically different, which is likely driven by the low sample size when using industry-year level measures. And finally, for the regression tests at the industry-year level (comparable to Table 6, Panel A), and using model (1) at the industry-year level, I find that the coefficient on the interaction of PTROExHIGH_CR4 (low competition) is

positive and not statistically significant. The nonexistent results for the regression results here are likely driven once again by the low sample size in this analysis (n=62 here).

The weakness of my results in these other models suggests that the degree that competition impacts implicit taxes relies on how competition is measured. Further, my weak results in these sections may be evidence that the United States has done a good job of preventing monopolies and price fixing, and the weak and nonexistent results shown in this section may be due to all or most industries in the United States being competitive enough for implicit taxes to form.

Section V: Conclusion

In summary, I find that implicit taxes are higher and eliminate more of the explicit tax preference benefits when markets are more competitive as proxied for by market concentration ratios and the HHI in my main analysis. That is, when more monopolistic or oligopolistic powers are present and a few firms can control the market, then implicit taxes are lower and firms are able to retain more tax preference benefits.

Using four sets of tests, implicit taxes appear to be lower for firms and industries facing lower competition and vice versa. My results should be of interest to policy makers as tax preferences allowed in the tax code are meant to promote certain activities. If implicit taxes arise on these tax preferences, this indicates increased investment in these areas, which is the goal of the policy. If implicit taxes arise and fully offset the tax preference benefits, then the benefits of the tax preference may have accrued to the group benefited by the over-investment. However, if implicit taxes do not fully offset the explicit tax preference benefits, then the benefits of the tax preference are accruing to the shareholders of the firm, which is likely not the goal of the tax preference allowed for by Congress. My results should interest firm decision makers as implicit taxes should be taken into account when making tax related decisions as lowering the explicit tax rate at the expense of lowering ROE (via implicit taxes) may result when implicit taxes are borne. However, from the firm's perspective, in industries with less competition, investing in tax preference benefits may be extremely beneficial as implicit taxes are lower than in less competitive industries, and more benefit from investing in tax preferences may be retained by the firm. Further, my results should be of interest to researchers as most explicit tax research does not consider implicit taxes and as such, my findings that implicit taxes may vary predictably based on market factors could alter prior explicit tax findings. Finally, my results should be of interest to the general public who

may be concerned about firms not paying their share of taxes. If firms are paying lower explicit taxes but bearing high implicit taxes and potentially benefitting the public (e.g., through increased R&D) then the public should be unconcerned. However, for firms in less competitive markets (i.e., firms in more monopolistic type markets), the public's concern about firms not paying their fair share of taxes may be warranted as they pay lower explicit taxes and bear low offsetting implicit taxes.

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Appendices

APPENDIX 1: Variable Definitions

$GAAP\_ETR_{i,y}$	= tax expense/pretax income (txt/pi)
$PTROE_{i,y}$	= pretax income/beginning of year shareholders' equity
$ROE_{i,y}$	= after tax income/beg of year shareholders' equity = (pretax income - tax expense)/beginning of year shareholders' equity
Total $Assets_{i,y}$	= total assets (at)
Keil_CRX_Y	=Concentration Ratio of top X=4 or 8 firms for each industry (as defined by 2,3,4,or 5 digit NAICS or SIC). Note that NAICS is used for 1997-2015, and SIC is used for 1980-1996 in this sample. And SIC has a maximum of 5 digits. Data is provided by Jan Keil: https://sites.google.com/site/drjankeil/data
Keil_HHI_Y	=Herfindahl index for each industry (as defined by 2,3,4,or 5 digit NAICS or SIC). Note that NAICS is used for 1997-2015, and SIC is used for 1980-1996 in this sample. And SIC has a maximum of 5 digits. Note that data is not provided for HHI for 2 digit NAICS and SIC. Data is provided by Jan Keil: https://sites.google.com/site/drjankeil/data
GC_Z_Y	=Gini Coefficient measured using Z=SIC or NAICS, at the Y=2,3,4,or 5 digit level. The Gini Coefficient (GC) measures inequality, and is calculated as follows: GC=(100+(100-2S)/n)/100, where n=number of firms, S=sum of y_i, $y_i=100(c_i/c_{n+1})$, c_i=cumulative revenue (revt) totals after being sorted within each industry by revenue. (defined http://peterrosenmai.com/lorenz-curve-graphing-tool-and-gini-coefficient-calculator)
HP_COMP	= number of competitors as defined by Hoberg and Philips. Data is provided by Hoberg and Philips at: http://hobergphillips.usc.edu/
$CR4_{n,y}$	= top 4 firms' concentration ratio = total revenue (revt) of top 4 firms by NAICS 2 digit year / total sales for industry (Census)
$HHI_{n,y}$	=sum of market share squared by NAICS 2 digit year, where market share=total revenue (revt)/total sales for industry (Census)

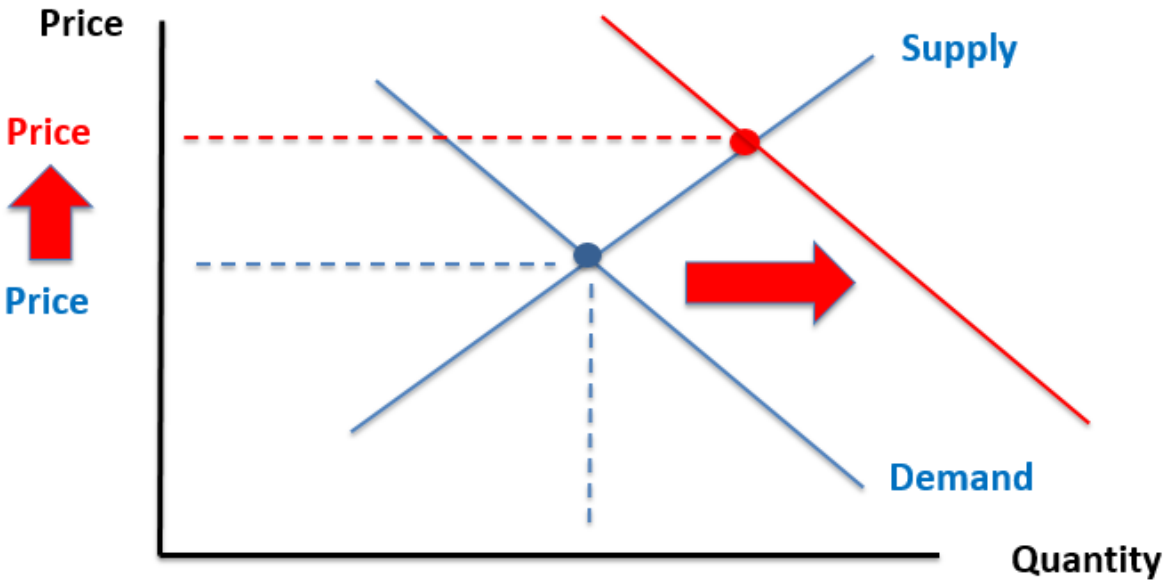

Figure 1: This figure shows the effect on price of an increase in demand in a perfectly competitive market.

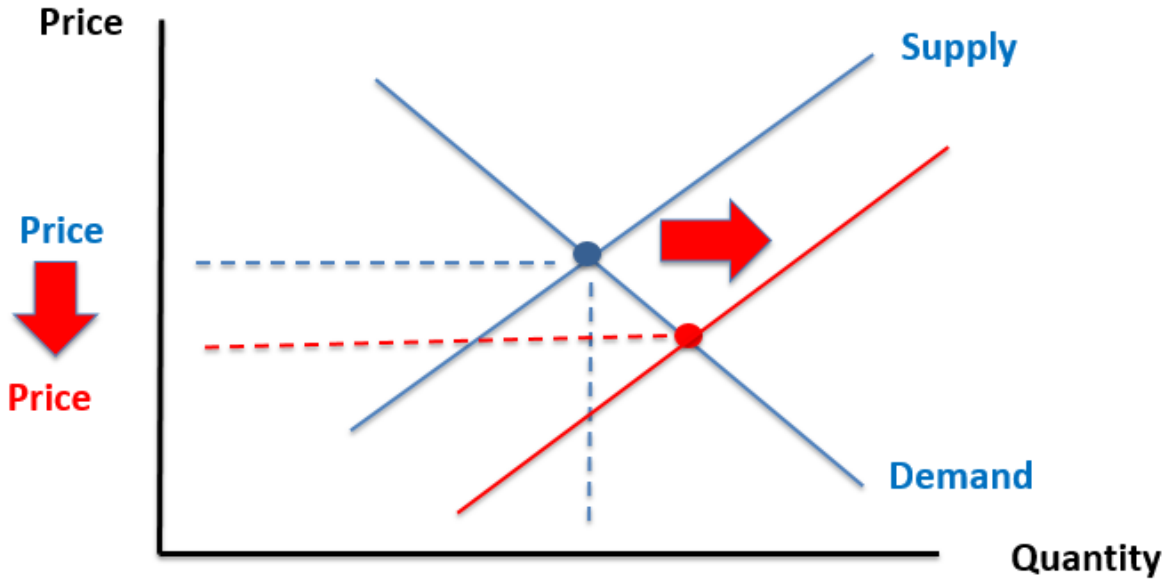

Figure 2: This figure show the effect on price of an increase in supply in a perfectly competitive market.

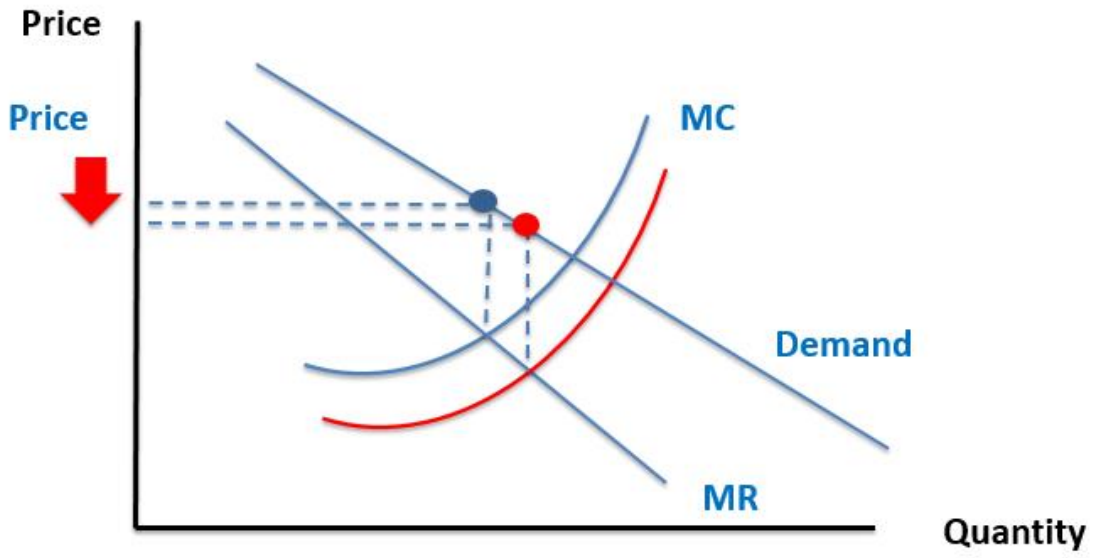

Figure 3: This figure shows the effect on price of a shift in the marginal cost in a monopoly. In a monopoly, the single firm produces at the point at which marginal revenue (MR) equals marginal cost (MC).

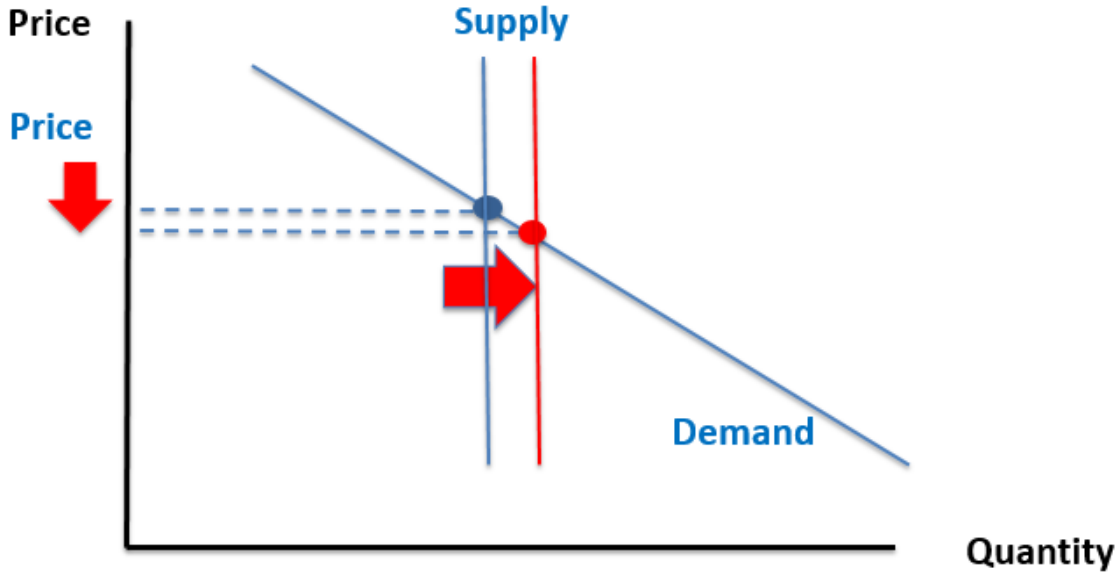

Figure 4: This figure shows the effect on price of a shift in the supply curve when the supplier operates as a monopoly.

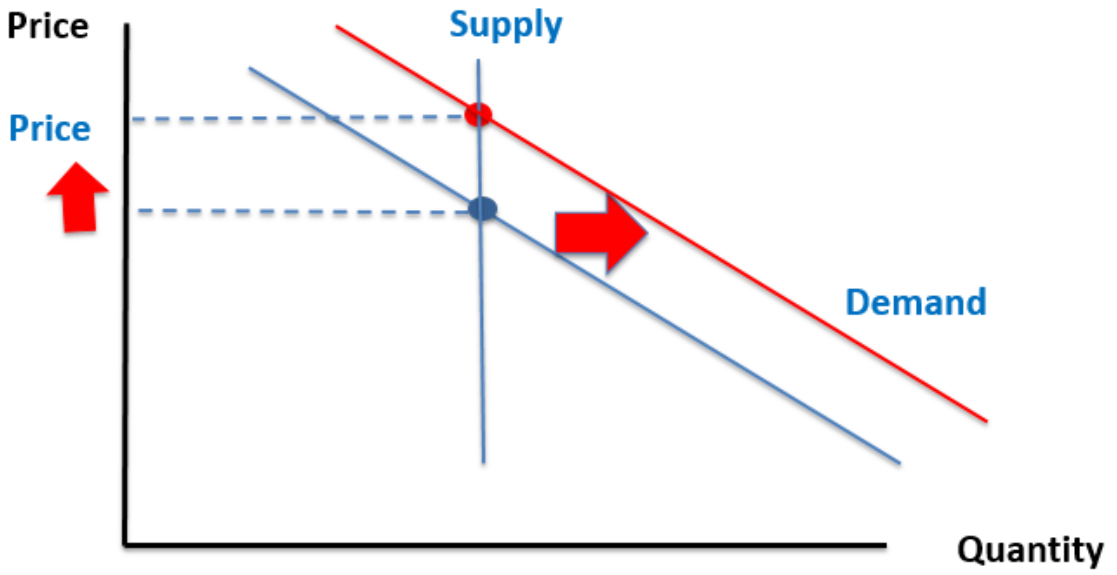

Figure 5: This figure shows the effect on price of a shift in the demand curve when the supplier operates as a monopoly.

TABLE 1: EFFECT OF SAMPLE SELECTION PROCEDURES ON SAMPLE SIZE

	PROCEDURE	SAMPLE
1	All U.S. firm-years from 2002, 2007, and 2012 Compustat with non-missing financial statement information	13,620
2	Delete firms where ROE is greater than 1	(457)
3	Delete firms where ROE is negative	(3,717)
4	Delete if tax expense (txt) is negative	(898)
5	Delete if pretax income is negative	(494)
6	Delete if negative stockholders' equity (at-lt)	(44)
7	Delete if total assets (at) < $10 million	(151)
8	Delete if Pretax book income (pi-spi) < $500,000	(97)
9	Delete if Census Industry Sales data unavailable or 0	(75)
	Total Sample	7,687

TABLE 2: SAMPLE COMPOSITION BY GENERAL INDUSTRY CATEOGRY

NAICS Code	Industry Category Description	HHI	CR4	Number of Firm-Years
33	Manufacturing (e.g., metal, agricultural)	0.0074	0.1128	1,626
52	Finance & insurance	0.0003	0.0242	1,524
32	Manufacturing (e.g., wood, plastics, rubber)	0.0175	0.2000	657
22	Utilities	0.0008	0.0271	599
51	Information	0.0009	0.0503	525
31	Manufacturing	0.0073	0.1045	371
42	Wholesale trade	0.0000	0.0043	313
54	Professional, scientific, & technical services	0.0001	0.0119	301
44	Retail Trade	0.0002	0.0213	294
21	Mining, Quarrying, & Oil & Gas Extraction	0.0024	0.0709	272
48	Transportation & Warehousing	0.0004	0.0273	204
56	Administrative & support & waste management & remediation services	0.0001	0.0142	173
72	Accommodation & food services	0.0001	0.0182	172
62	Health care & social assistance	0.0000	0.0034	157
45	Retail Trade	0.0061	0.1098	155
53	Real estate & rental & leasing	0.0000	0.0109	151
23	Construction	0.0001	0.0120	51
71	Arts, entertainment, & recreation	0.0000	0.0032	51
61	Educational services	0.0001	0.0120	32
49	Transportation & Warehousing	0.0289	0.3058	31
81	Other services (except public administration)	0.0000	0.0018	28
				7,687

This table shows the sample composition by 2 digit NAICS. HHI and CR4 are shown as averages of year HHI and CR4 by 2 digit NAICS.

TABLE 3: DESCRIPTIVE STATISTICS

Panel A: All Firm-years

	Mean	Standard Deviation	Median	25th Percentile	75th Percentile
n=7,687					
$GAAP\_ETR_{i,y}$	0.3210	0.1114	0.3455	0.2796	0.3812
$ROE_{i,y}$	0.1556	0.1255	0.1241	0.0769	0.1920
$PTROE_{i,y}$	0.2312	0.1842	0.1843	0.1122	0.2889
$CR4_{n,y}$	0.0553	0.0825	0.0191	0.0093	0.0585
$HHI_{n,y}$	0.0035	0.0082	0.0001	0.0000	0.0012
Total $Assets_{n,y}$	5,676.14	16,559.37	876.27	253.09	3,226.91
$LEVERAGE_{n,y}$	0.20	0.18	0.17	0.04	0.32
$CAP_{n,y}$	0.25	0.26	0.16	0.04	0.40
$INV_{n,y}$	0.10	0.13	0.03	0.00	0.15
$RD_{n,y}$	0.02	0.05	-	-	0.01
$MNE_{n,y}$	0.44	0.50	-	-	1.00

Panel B: High CR4_=0 (High Competition firm-years)

	Mean	Standard Deviation	Median	25th Percentile	75th Percentile
n=3,891					
$GAAP\_ETR_{i,y}$	0.3241	0.1072	0.3509	0.2842	0.3840
$ROE_{i,y}$	0.1489	0.1259	0.1170	0.0743	0.1770
$PTROE_{i,y}$	0.2234	0.1870	0.1745	0.1079	0.2709
$CR4_{n,y}$	0.0132	0.0092	0.0133	0.0039	0.0188
$HHI_{n,y}$	0.0001	0.0002	0.0001	0.0000	0.0001
Total $Assets_{n,y}$	6,369.08	18,405.05	1,009.79	352.90	3,506.74
$LEVERAGE_{n,y}$	0.21	0.19	0.17	0.05	0.33
$CAP_{n,y}$	0.23	0.27	0.08	0.02	0.39
$INV_{n,y}$	0.07	0.13	0.01	-	0.05
$RD_{n,y}$	0.00	0.02	-	-	-
$MNE_{n,y}$	0.27	0.44	-	-	1.00

TABLE 3 Continued

Panel C: High_CR4_=1 (Low Competition firm-years)

	Mean	Standard Deviation	Median	25th Percentile	75th Percentile
n=3,796					
$GAAP\_ETR_{i,y}$	0.3178	0.1155	0.3396	0.2714	0.3788
$ROE_{i,y}$	0.1625	0.1248	0.1331	0.0797	0.2079
$PTROE_{i,y}$	0.2393	0.1810	0.1952	0.1179	0.3059
$CR4_{n,y}$	0.1317	0.1006	0.1029	0.0528	0.2064
$HHI_{n,y}$	0.0097	0.0116	0.0040	0.0010	0.0187
Total $Assets_{n,y}$	4,965.86	14,392.33	720.98	186.21	2,898.84
$LEVERAGE_{n,y}$	0.20	0.17	0.18	0.03	0.32
$CAP_{n,y}$	0.28	0.23	0.21	0.10	0.40
$INV_{n,y}$	0.12	0.12	0.10	0.02	0.18
$RD_{n,y}$	0.04	0.06	0.01	-	0.05
$MNE_{n,y}$	0.61	0.49	1.00	-	1.00

This table provides descriptive statistics by firm-year except for CR4 and HHI. CR4 and HHI use values for the 21 industries in the sample. Subscripts i, y, and n represent firm level, year level, and NAICS (2 digit) industry level respectively. Panel A shows the descriptive statistics for all firm-years, Panel B shows the descriptive statistics for firm-years where HIGH_CR4=0, and Panel C shows the descriptive statistics for firm-years where HIGH_CR4=1. PTROE, TAX, GAAP_ETR, ROE, TOTAL_ASSETS, LEVERAGE, CAP, INV, and RD are winsorized at 1% and 99%. Variables are defined in Appendix 1.

TABLE 4: PTROE/TAX RATIOS

Panel A: High v. Low CR4

	Low Competition (High CR4) *(n=3,037)*		High Competition (Low CR4) *(n=3,112)*		Difference	
HIGH-TAX *(n=3,078)*						
PTROE Average	0.2416		0.2595		(0.0179)	**
TAX Average	0.0927		0.0991		(0.0064)	**
	(n=1,520)		*(n=1,558)*			
LOW-TAX *(n=3,071)*						
PTROE Average	0.2212		0.1866		0.0346	***
TAX Average	0.0472		0.0429		0.0043	**
	(n=1,517)		*(n=1,554)*			
Difference						
PTROE	0.0204	***	0.0729	***		
TAX	0.0455	***	0.0562	***		
RATIO (PTROE/TAX)	0.4484		1.2976			

Panel B: High v. Low HHI

	Low Competition (High HHI) *(n=3,049)*		High Competition (Low HHI) *(n=3,098)*		Difference	
HIGH-TAX *(n=3,077)*						
PTROE	0.2350		0.2632		(0.0283)	***
TAX	0.0901		0.1007		(0.0106)	***
	(n=1,526)		*(n=1,551)*			
LOW-TAX *(n=3,070)*						
PTROE	0.2200		0.1891		0.0309	***
TAX	0.0465		0.0438		0.0027	
	(n=1,523)		*(n=1,547)*			
Difference						
PTROE	0.0150	**	0.0741	***		
TAX	0.0436	***	0.0569	***		
RATIO (PTROE/TAX)	0.3444		1.3030			

TABLE 4 Continued

This table summarizes the ratios (PTROE/TAX) by above (≥) and below median (<) concentration ratios (CR4) and Herfindahl-Hirschman index (HHI). HIGH-TAX firms have GAAP_ETRs in the top 40% of the distribution, while LOW-TAX firms have GAAP_ETRs in the bottom 40% of the distribution. *, **, and*** indicate significance at the better than 10%, 5%, and 1% levels, respectively, using 2-tailed tests. Subscripts i, y, and n represent firm level, year level, and NAICS (2 digit) industry level respectively. PTROE, TAX, GAAP_ETR, ROE, TOTAL_ASSETS, LEVERAGE, CAP, INV, and RD are winsorized at 1% and 99%. See the Appendix 1 for variable definitions.

Difference	=high tax PTROE(TAX) - low tax PTROE(TAX)
High $CR4_{n,y}$	=1 for firms with ≥median $CR4_{n,y}$ by industry/year
High $HHI_{n,y}$	=1 for firms with ≥median $HHI_{n,y}$ by industry/year
Low $CR4_{n,y}$	=1 for firms with <median $CR4_{n,y}$ by industry/year
Low $HHI_{n,y}$	=1 for firms with <median $HHI_{n,y}$ by industry/year
$PTROE_{i,y}$	= pretax income/beginning of year shareholders' equity
$TAX_{i,y}$	= reduction to ROE caused by explicit taxes = tax expense/beginning of year shareholders' equity

TABLE 5: CORRELATIONS

Panel A: High v. Low CR4

	Low Competition (HIGH CR4) *(n=3,796)*		High Competition (LOW CR4) *(n=3,891)*		Difference	
$PTROE_{i,y}$,$GAAP\_ETR_{i,y}$	0.0245		0.1063	***	(0.0819)	***
$ROE_{i,y}$,$GAAP\_ETR_{i,y}$	(0.1551)	***	(0.0509)	***	(0.1042)	***

Panel B: High v. Low HHI

	Low Competition (HIGH HHI) *(n=3,813)*		High Competition (LOW HHI) *(n=3,874)*		Difference	
$PTROE_{i,y}$,$GAAP\_ETR_{i,y}$	0.0223		0.1055	***	(0.0832)	***
$ROE_{i,y}$,$GAAP\_ETR_{i,y}$	(0.1569)	***	(0.0522)	***	(0.1047)	***

Table 5 shows the Pearson correlation coefficients between PTROE and GAAP_ETR as well as for ROE and GAAP_ETR for firms in industries with low and high competition. *, **, and*** indicate significance at the at least 10%, 5%, and 1% levels, respectively, using 2-tailed tests. Tests of differences are calculated using z-statistics. Subscripts i, y, and n represent firm level, year level, and NAICS (2 digit) industry level respectively. PTROE, TAX, GAAP_ETR, and ROE are winsorized at the 1% and 99% See the Appendix 1 for variable definitions.

High $CR4_{n,y}$	=1 for firms with ≥median $CR4_{n,y}$ by industry/year
High $HHI_{n,y}$	=1 for firms with ≥median $HHI_{n,y}$ by industry/year
Low $CR4_{n,y}$	=1 for firms with <median $CR4_{n,y}$ by industry/year
Low $HHI_{n,y}$	=1 for firms with <median $HHI_{n,y}$ by industry/year

TABLE 6: Panel A: REGRESSIONS

$$GAAP\_ETR_{i,y} = \beta_0 + \beta_1 PTROE_{i,y} + \beta_2 HIGH\_COMPVAR_{n,y} + \beta_3 PTROE_{i,y} x HIGH\_COMPVAR_{n,y} + \beta_4 LOG\_ASSETS_{i,y} + \beta_5 LEVERAGE_{i,y} + \beta_6 CAP_{i,y} + \beta_7 INV_{i,y} + \beta_8 RD_{i,y} + \beta_9 MNE_{i,y} + \sum \beta YEAR_y + \varepsilon \quad (1)$$

	(1)	(2)
Dependent Variable:	GAAP_ETR	GAAP_ETR
	COMP_VAR: **$CR4_{n,y}$**	COMP_VAR: **$HHI_{n,y}$**
VARIABLES:		
$INTERCEPT_{i,y}$	0.336***	0.335***
	(47.48)	(47.96)
$PTROE_{i,y}$	0.0482***	0.0471***
	(4.787)	(4.749)
$HIGH\_COMP\_VAR_{n,y}$	0.00130	0.000340
	(0.255)	(0.0655)
$PTROE_{i,y}$x$HIGH_COMP_VAR_{n,y}$	-0.0341**	-0.0339**
	(-2.371)	(-2.344)
$LOG\_ASSETS_{i,y}$	-0.00174**	-0.00173**
		(-2.000)
$LEVERAGE_{i,y}$	-0.0151	-0.0150
	(-1.478)	(-1.469)
$CAP_{i,y}$	0.0236***	0.0249***
	(3.530)	(3.573)
$INV_{i,y}$	0.0395***	0.0414***
	(3.313)	(3.447)
$RD_{i,y}$	-0.255***	-0.254***
	(-6.218)	(-6.189)
$MNE_{i,y}$	0.00771**	0.00778**
	(2.342)	(2.387)
Joint Test:		
PTROE+PTROExHIGH_COMP_VAR	Not Sig.	Not Sig.
Year FE?	Yes	Yes
Observations	7,687	7,687
R-squared	0.036	0.036

TABLE 6 Continued: Panel B: REGRESSIONS

$$GAAP\_ETR_{i,y} = \beta_0 + \beta_1 ROE_{i,y} + \beta_2 HIGH\_COMPVAR_{n,y} + \beta_3 ROE_{i,y} x HIGH\_COMPVAR_{n,y} + \beta_4 LOG\_ASSETS_{i,y} + \beta_5 LEVERAGE_{i,y} + \beta_6 CAP_{i,y} + \beta_7 INV_{i,y} + \beta_8 RD_{i,y} + \beta_9 MNE_{i,y} + \sum \beta YEAR_y + \varepsilon \quad (2)$$

	(3)	(4)
Dependent Variable:	GAAP_ETR	GAAP_ETR
	COMP_VAR: $CR4_{n,y}$	COMP_VAR: $HHI_{n,y}$
VARIABLES:		
$INTERCEPT_{i,y}$	0.353***	0.353***
	(49.81)	(50.40)
$HIGH\_COMP\_VAR_{n,y}$	0.00661	0.00536
	(1.285)	(1.025)
$ROE_{i,y}$	-0.0634***	-0.0639***
	(-3.548)	(-3.627)
$ROE_{i,y}$ x$HIGH_COMP_VAR_{n,y}$	-0.0794***	-0.0820***
	(-3.235)	(-3.341)
$LOG\_ASSETS_{i,y}$	-0.00172**	-0.00172**
		(-2.018)
$LEVERAGE_{i,y}$	-0.00612	-0.00601
	(-0.595)	(-0.585)
$CAP_{i,y}$	0.0202***	0.0215***
	(3.031)	(3.098)
$INV_{i,y}$	0.0450***	0.0475***
	(3.815)	(3.999)
$RD_{i,y}$	-0.276***	-0.272***
	(-6.861)	(-6.763)
$MNE_{i,y}$	0.0127***	0.0130***
	(3.846)	(3.988)
Joint Test:		
ROE+ROExHIGH_COMP_VAR	***	***
Year FE?	Yes	Yes
Observations	7,687	7,687
R-squared	0.048	0.048

TABLE 6 Continued

Table 6 shows the coefficient estimates from a regression of GAAP_ETR on the independent variables listed. Panel A, Columns (1) and (2) use model (1), and columns (3) and (4) use model (2). Year fixed effects are included and standard errors are clustered by firm. Robust t-statistics are in parentheses. *, **, and *** indicate significance at the 10%, 5%, and 1% levels, respectively, using 2-sided tests. Subscripts i, y, and n represent firm level, year level, and NAICS (2 digit) industry level respectively. PTROE, TAX, GAAP_ETR, ROE, TOTAL_ASSETS, LEVERAGE, CAP, INV, and RD are winsorized at 1% and 99%. See the Appendix 1 for variable definitions.

$COMP\_VAR_{n,y}$	$=CR4_{n,y}$ or $HHI_{n,y}$
High $CR4_{n,y}$	=1 for firms with ≥median $CR4_{n,y}$ by industry/year
High $HHI_{n,y}$	=1 for firms with ≥median $HHI_{n,y}$ by industry/year
$HIGH\_COMP\_VAR_{n,y}$	=HIGH $CR4_{n,y}$ or HIGH $HHI_{n,y}$

TABLE 7: DIRECT ESTIMATION OF IMPLICIT TAXES (NAICS2)

PANEL A: HIGH v. LOW CR4

	Delta	Variance of Delta	n
Low Competition	0.3118	0.0151	3,796
High Competition	0.6267	0.0156	3,891

PANEL B: HIGH v. LOW HHI

	Delta	Variance of Delta	n
Low Competition	0.2845	0.0146	3,813
High Competition	0.6265	0.0163	3,874

Using Maximum Likelihood Estimation, Table 7 directly estimates the magnitude of implicit taxes for each group (above and below median CR4) by calculating delta (δ) using model (3) as shown below. Subscripts i, y, and n represent firm level, year level, and NAICS (2 digit) industry level respectively. PTROE, TAX, GAAP_ETR, ROE, TOTAL_ASSETS, LEVERAGE, CAP, INV, and RD are winsorized at 1% and 99%. See the appendix for variable definitions. Panels A and B set equilibrium values as the group (above or below median competition measures) year averages.

$$ROE = \frac{[1+\lambda(1-\delta)]}{[1+\overline{\lambda_n}(1-\overline{\delta_n})]}\overline{ROE_n} + \varepsilon \quad (3)$$

HIGH $CR4_{n,y}(HHI_{n,y})$ =1 for firms with ≥median $CR4_{n,y}(HHI_{n,y})$by industry/year

LOW $CR4_{n,y}(HHI_{n,y})$ =1 for firms with <median $HHI_{n,y}$ $(CR4_{n,y})$by industry/year

$\overline{ROE_y}$ =group average ROE.

T^*_y =equilibrium tax rate = year average

$\delta_{i,y}$ =implicit tax measure as calculated by model (3)

$\bar{\delta}_y$ =group average δ

$\varepsilon_{i,y}$ =error term

$\lambda_{i,y}$ =tax preferences = (T*-GAAP_ETR)/(1-T*)

$\bar{\lambda}_y$ =group average λ

TABLE 8: PTROE/TAX RATIOS (Quartiles)

Panel A: Competion by CR4

	(1) Lowest 25% Competition (Highest CR4)		(2) 25%-50%		(3) 50%-75%		(4) Highest 75% Competition (Lowest CR4)	
HIGH-TAX								
PTROE Average	0.2612		0.2444		0.2156		0.2509	
TAX Average	0.1019		0.0919		0.0858		0.0946	
	(n=746)		*(n=566)*		*(n=290)*		*(n=1074)*	
LOW-TAX								
PTROE Average	0.2335		0.1810		0.2246		0.2265	
TAX Average	0.0584		0.0435		0.0508		0.0466	
	(n=749)		*(n=568)*		*(n=293)*		*(n=1077)*	
Difference								
PTROE	0.0277	***	0.0634	***	(0.0090)		0.0244	***
TAX	0.0434	***	0.0483	***	0.0349	***	0.0481	***
RATIO (PTROE/TAX)	0.6384		1.3114		(0.2576)		0.5078	

Panel B: Competition by HHI

	(1) Lowest 25% Competition (Highest HHI)		(2) 25%-50%		(3) 50%-75%		(4) Highest 75% Competition (Lowest HHI)	
HIGH-TAX								
PTROE Average	0.2725		0.2271		0.2190		0.2444	
TAX Average	0.1057		0.0848		0.0848		0.0928	
	(n=732)		*(n=734)*		*(n=291)*		*(n=1117)*	
LOW-TAX								
PTROE Average	0.2421		0.1602		0.2257		0.2211	
TAX Average	0.0612		0.0347		0.0507		0.0464	
	(n=735)		*(n=736)*		*(n=293)*		*(n=1119)*	
Difference								
PTROE	0.0304	***	0.0670	***	(0.0068)		0.0233	***
TAX	0.0444	***	0.0501	***	0.0341	***	0.0463	***
RATIO (PTROE/TAX)	0.6837		1.3372		(0.1987)		0.5036	

TABLE 8 Continued

This table summarizes the ratios (PTROE/TAX) by above (≥) and below median (<) concentration ratios (CR4) and Herfindahl-Hirschman index (HHI). HIGH-TAX firms have GAAP_ETRs in the top 40% of the distribution, while LOW-TAX firms have GAAP_ETRs in the bottom 40% of the distribution. *, **, and*** indicate significance at the better than 10%, 5%, and 1% levels, respectively, using 2-tailed tests. Subscripts i, y, and n represent firm level, year level, and NAICS (2 digit) industry level respectively. PTROE, TAX, GAAP_ETR, ROE, TOTAL_ASSETS, LEVERAGE, CAP, INV, and RD are winsorized at 1% and 99%. See the Appendix 1 for variable definitions.

Difference	=high tax PTROE(TAX) - low tax PTR(TAX)
High $CR4_{n,y}$	=1 for firms with ≥median $CR4_{n,y}$ by industry/year
High $HHI_{n,y}$	=1 for firms with ≥median $HHI_{n,y}$ by industry/year
Low $CR4_{n,y}$	=1 for firms with <median $CR4_{n,y}$ by industry/year
Low $HHI_{n,y}$	=1 for firms with <median $HHI_{n,y}$ by industry/year
$TAX_{i,y}$	= reduction to ROE caused by explicit taxes = tax expense/beginning of year shareholders' equity

TABLE 9: CORRELATIONS (Quartiles)

Panel A: High v. Low CR4

	(1) Lowest 25% Competition (Highest CR4)		(2) 25%-50%		(3) 50%-75%		(4) Highest 75% Competition (Lowest CR4)	
$PTROE_{i,y}$,$GAAP\_ETR_{i,y}$	0.0321	*	0.0093		0.1559	***	0.0274	
$ROE_{i,y}$,$GAAP\_ETR_{i,y}$	(0.1420)	***	(0.1911)	***	0.0028		(0.1323)	***

Panel B: Competition by HHI

	(1) Lowest 25% Competition (Highest HHI)		(2) 25%-50%		(3) 50%-75%		(4) Highest 75% Competition (Lowest HHI)	
$PTROE_{i,y}$,$GAAP\_ETR_{i,y}$	0.0315	*	0.0166		0.1468	***	0.0370	
$ROE_{i,y}$,$GAAP\_ETR_{i,y}$	(0.1424)	***	(0.1625)	***	(0.0104)		(0.1233)	***

This table summarizes the ratios (PTROE/TAX) by quartile of the concentration ratios (CR4) and Herfindahl-Hirschman index (HHI). Group (1) includes firms in industries with ≥ 75th percentile of CR4 or HHI, Group (2) includes firms in industries with ≥ 50th percentile and < 75th percentile of CR4 or HHI, Group (3) includes firms in industries with ≥ 25th percentile and <50th percentile of CR4 or HHI, and Group (4) includes firms in industries with <25th percentile of CR4 or HHI. HIGH-TAX firms have GAAP_ETRs in the top 40% of the distribution, while LOW-TAX firms have GAAP_ETRs in the bottom 40% of the distribution. *,**,and*** indicate significance at the better than 10%, 5%, and 1% levels, respectively, using 2-tailed tests. Subscripts i, y, and n represent firm level, year level, and NAICS (2 digit) industry level respectively. PTROE, TAX, GAAP_ETR, ROE, TOTAL_ASSETS, LEVERAGE, CAP, INV, and RD are winsorized at 1% and 99%. Variables are defined in Appendix 1.

Difference	=high tax PTR(TAX) - low tax PTR(TAX)
$TAX_{i,y}$	= reduction to ROE caused by explicit taxes = tax expense/beginning of year

TABLE 10: REGRESSIONS (Quartiles)

Dependent Variable:	(1) GAAP_ETR	(2) GAAP_ETR	(3) GAAP_ETR	(4) GAAP_ETR
	COMP_VAR:	COMP_VAR:	COMP_VAR:	COMP_VAR:
VARIABLES	$HHI_{n,y}$	$HHI_{n,y}$	$CR4_{n,y}$	$CR4_{n,y}$
Constant	0.338***	0.358***	0.339***	0.359***
	(48.70)	(51.47)	(48.13)	(50.73)
PTR	0.0377***		0.0388***	
	(4.128)		(4.180)	
ROE		-0.0910***		-0.0904***
		(-5.670)		(-5.551)
HIGH_COMP_VAR	-0.00735	-0.00634	-0.0112**	-0.00973*
	(-1.374)	(-1.177)	(-1.985)	(-1.710)
PTROExHigh_COMP_VAR	-0.0179		-0.0186	
	(-1.189)		(-1.232)	
ROExHigh_COMP_VAR		-0.0327		-0.0301
		(-1.303)		(-1.196)
LOG_ASSETS	-0.00189**	-0.00196**	-0.00209**	-0.00214**
	(-2.179)	(-2.283)	(-2.392)	(-2.471)
LEVERAGE	-0.0147	-0.00571	-0.0148	-0.00584
	(-1.435)	(-0.555)	(-1.445)	(-0.568)
CAP	0.0234***	0.0208***	0.0219***	0.0192***
	(3.537)	(3.131)	(3.373)	(2.954)
INV	0.0454***	0.0520***	0.0504***	0.0560***
	(3.830)	(4.435)	(4.212)	(4.733)
RD	-0.241***	-0.258***	-0.233***	-0.253***
	(-5.860)	(-6.413)	(-5.715)	(-6.332)
MNE	0.00873***	0.0140***	0.0104***	0.0154***
	(2.690)	(4.285)	(3.132)	(4.595)
Year FE?	Yes	Yes	Yes	Yes
Observations	7,687	7,687	7,687	7,687
R-squared	0.037	0.047	0.038	0.048

TABLE 10 Continued

High $CR4_{n,y}$	=1 for firms with ≥75th percentile $CR4_{n,y}$ by industry/year
High $HHI_{n,y}$	=1 for firms with ≥75th percentile $HHI_{n,y}$ by industry/year
$HIGH\_COMP\_VAR_{n,y}$	=HIGH $CR4_{n,y}$ or HIGH $HHI_{n,y}$

This table summarizes the regression results for model (1) in Columns (1) and (2), and model (2) in columns (3) and (4). Robust t-statistics in parentheses. *, **, and*** indicate significance at the better than 10%, 5%, and 1% levels, respectively, using 2-tailed tests. Subscripts i, y, and n represent firm level, year level, and NAICS (2 digit) industry level respectively. PTROE, TAX, GAAP_ETR, ROE, TOTAL_ASSETS, LEVERAGE, CAP, INV, and RD are winsorized at 1% and 99%. See the Appendix 1 for variable definitions.

TABLE 11: DIRECT ESTIMATION OF IMPLICIT TAXES (Quartiles)

PANEL A: HIGH v. LOW CR4

	Delta	Variance of Delta	n
(1) Lowest Competition (HIGHEST CR4)	0.3727	0.0159	2,689
(2)	0.2067	0.0150	729
(3)	0.8970	0.0134	1,418
(4) Highest Competition (LOWEST CR4)	0.2202	0.0175	1,867

PANEL B: HIGH v. LOW HHI

	Delta	Variance of Delta	n
(1) Lowest Competition (HIGHEST HHI)	0.3961	0.0148	2,794
(2)	0.3111	0.0149	730
(3)	0.7593	0.0133	1,837
(4) Highest Competition (LOWEST HHI)	0.2674	0.0191	1,833

Using Maximum Likelihood Estimation, Table 11 directly estimates the magnitude of implicit taxes for each group (above and below median CR4) by calculating delta (δ) using model (3) as shown below. Subscripts i, y, and n represent firm level, year level, and NAICS (2 digit) industry level respectively. PTROE, TAX, GAAP_ETR, ROE, TOTAL_ASSETS, LEVERAGE, CAP, INV, and RD are winsorized at 1% and 99%. Groups (1)-(4) are formed based on CR4 or HHI quartiles by year with (1) representing the highest quartile CR4 and HHI, and (4) representing the lowest CR4 and HHI. Group (1) includes firms in industries with $\geq$ 75th percentile of CR4 or HHI, Group (2) includes firms in industries with $\geq$ 50th percentile and < 75th percentile of CR4 or HHI, Group (3) includes firms in industries with $\geq$ 25th percentile and <50th percentile of CR4 or HHI, and Group (4) includes firms in industries with <25th percentile of CR4 or HHI. See Appendix 1 for variable definitions.

TABLE 11 Continued

$$\mathrm{ROE} = \frac{[1+\lambda(1-\delta)]}{[1+\overline{\lambda_n}(1-\overline{\delta_n})]}\overline{\mathrm{ROE}_n} + \varepsilon \quad (3)$$

$\overline{ROE_y}$ =Industry average ROE.

T^*_y =equilibrium tax rate = year average

$\delta_{i,y}$ =implicit tax measure as calculated by model (3)

$\overline{\delta_y}$ =industry average δ

$\varepsilon_{i,y}$ =error term

$\lambda_{i,y}$ =tax preferences = (T*-GAAP_ETR)/(1-T*)

$\overline{\lambda_y}$ =industry average λ, where λ is calculated for each FF48 industry, and then

TABLE 12: DESCRIPTIVE STATISTICS (Additional Competition Measures)

	n	Mean	Standard Deviation	Median	25th Percentile	75th Percentile
$GAAP\_ETR_{i,y}$	133,290	0.33	0.28	0.36	0.27	0.40
$ROE_{i,y}$	133,290	0.17	0.14	0.13	0.08	0.20
$PTROE_{i,y}$	133,290	0.25	0.22	0.20	0.12	0.31
Total $Assets_{n,y}$	133,290	5,034.12	41,480.39	337.41	64.57	1,635.02
$LEVERAGE_{n,y}$	133,281	0.22	0.19	0.20	0.05	0.35
$CAP_{n,y}$	129,669	0.28	0.26	0.20	0.05	0.44
$INV_{n,y}$	130,437	0.12	0.15	0.05	0.00	0.20
$RD_{n,y}$	132,948	0.02	0.11	-	-	0.01
$MNE_{n,y}$	133,290	0.30	0.46	-	-	1.00
Keil_CR4_2	22,615	7.17	4.35	6.20	4.20	7.40
Keil_CR8_2	22,615	11.37	6.54	9.90	6.80	11.80
Keil_CR4_3	22,840	13.07	11.00	8.90	6.30	18.00
Keil_CR8_3	22,840	19.22	14.33	14.70	9.90	26.20
Keil_HHI_3	4,620	0.01	0.02	0.01	0.01	0.01
Keil_CR4_4	22,931	26.80	14.36	20.80	18.10	38.80
Keil_CR8_4	22,931	34.94	16.30	31.60	23.80	48.10
Keil_HHI_4	4,784	0.03	0.03	0.03	0.01	0.05
Keil_CR4_5	15,164	28.26	14.34	25.60	17.70	34.30
Keil_CR8_5	15,163	38.49	16.97	35.80	26.40	47.90
Keil_HHI_5	4,768	0.05	0.04	0.04	0.02	0.06
GC_NAICS_2	131,598	0.85	0.08	0.89	0.81	0.90
GC_NAICS_3	131,512	0.80	0.11	0.82	0.73	0.90
GC_NAICS_4	130,160	0.76	0.14	0.77	0.67	0.88
GC_SIC_2	133,290	0.81	0.10	0.84	0.74	0.90
GC_SIC_3	133,290	0.76	0.14	0.77	0.67	0.87
GC_SIC_4	133,288	0.72	0.15	0.73	0.62	0.83
GC_NAICS_5	124,770	0.72	0.18	0.74	0.62	0.86
HP_COMP	59,348	146.42	204.67	54.00	16.00	165.00

Table 12 provides descriptive statistics by firm-year See Appendix 1 for variable definitions. This data includes firm-year data for years 1980-2015 with data requirements (1)-(7) from Table (1) applied excluding the 2002, 2007, and 2012 fiscal year requirement. Each competition variable (all variables listed in this table except for GAAP_ETR, ROE, PTROE, and Total Assets) have specific data limitations.

TABLE 13: PTROE/TAX RATIOS (Additional Competition Measures)

Panel A: High v. Low CR4 (NAICS 3 and SIC 3) (median split)

	Low Competition (High CR4)		High Competition (Low CR4)		Difference	
HIGH-TAX (Top 50%)						
PTROE Average	0.2839		0.2778		0.0061	
TAX Average	0.1164		0.1071		0.0093	***
	(n=8005)		*(n=3418)*			
LOW-TAX (Bottom 50%)						
PTROE Average	0.2185		0.2294		(0.0109)	
TAX Average	0.0541		0.0539		0.0002	
	(n=8002)		*(n=3415)*			
Difference						
PTROE	0.0654	***	0.0484	***		
TAX	0.0623	***	0.0532	***		
RATIO (PTROE/TAX)	1.0492		0.9097			

Panel B: High v. Low CR4 (NAICS 3 and SIC 3) (Quartiles)

	Low Competition (High CR4)		High Competition (Low CR4)		Difference	
HIGH-TAX (Top 50%)						
PTROE Average	0.2916		0.2992		(0.0076)	
TAX Average	0.1217		0.1156		0.0061	**
	(n=6313)		*(n=1388)*			
LOW-TAX (Bottom 50%)						
PTROE Average	0.2218		0.2190		0.0029	
TAX Average	0.0564		0.0495		0.0069	***
	(n=6309)		*(n=1386)*			
Difference						
PTROE	0.0698	***	0.0803	***		
TAX	0.0653	***	0.0661	***		
RATIO (PTROE/TAX)	1.0683		1.2150			

TABLE 13 Continued

Panel C: High v. Low Gini Coefficient (GC) (NAICS 3) (median split)

	Low Competition (High GC)		High Competition (Low GC)		Difference	
HIGH-TAX (Top 50%)						
PTROE Average	0.2903		0.2839		0.0063	***
TAX Average	0.1173		0.1158		0.0015	**
	(n=33512)		*(n=32266)*			
LOW-TAX (Bottom 50%)						
PTROE Average	0.2221		0.2155		0.0066	***
TAX Average	0.0526		0.0533		(0.0007)	
	(n=33490)		*(n= 32244)*			
Difference						
PTROE	0.0682	***	0.0684	***		
TAX	0.0647	***	0.0625	***		
RATIO (PTROE/TAX)	1.0538		1.0944			

Panel D: High v. Low Gini Coefficient (NAICS 3) (Quartiles)

	Low Competition (High GC)		High Competition (Low GC)		Difference	
HIGH-TAX (Top 50%)						
PTROE Average	0.2799		0.2783		0.0016	
TAX Average	0.1124		0.1139		(0.0015)	
	(n=18835)		*(n=15809)*			
LOW-TAX (Bottom 50%)						
PTROE Average	0.2111		0.2025		0.0085	***
TAX Average	0.0509		0.0525		(0.0017)	
	(n=18811)		*(n=15790)*			
Difference						
PTROE Average	0.0688	***	0.0758	***		
TAX	0.0616	***	0.0614	***		
RATIO (PTROE/TAX)	1.1183		1.2340			

TABLE 13 Continued

Panel E: High v. Low Number of Competitors (Hoberg and Philips) (median split)

	Low Competition (Low Number of Competitors)		High Competition (High Number of Competitors)		Difference
HIGH-TAX (Top 50%)					
PTROE Average	0.2749		0.2475		0.0274
TAX Average	0.1063		0.0645		0.0418
	(n=14773)		*(n=14912)*		
LOW-TAX (Bottom 50%)					
PTROE Average	0.2504		0.1844		0.0660
TAX Average	0.0646		0.0368		0.0278
	(n=14760)		*(n=14903)*		
Difference					
PTROE	0.0245	***	0.0631	***	
TAX	0.0417	***	0.0277	***	
RATIO (PTROE/TAX)	0.5884		2.2806		

Panel F: High v. Low Number of Competitors (Hoberg and Philips) (Quartiles)

	Low Competition (Low Number of Competitors)		High Competition (High Number of Competitors)		Difference
HIGH-TAX (Top 50%)					
PTROE Average	0.2729		0.2166		0.0563
TAX Average	0.1055		0.0791		0.0264
	(n=7231)		*(n=7438)*		
LOW-TAX (Bottom 50%)					
PTROE Average	0.2549		0.1760		0.0789
TAX Average	0.0676		0.0370		0.0307
	(n=7221)		*(n=7427)*		
Difference					
PTROE	0.0180	***	0.0406	***	
TAX	0.0379	***	0.0421	***	
RATIO (PTROE/TAX)	0.4761		0.9649		

TABLE 13 Continued

Panel G: High v. Low CR4 (NAICS 3 and SIC 3) (median split)

	Low Competition (High CR4)		High Competition (Low CR4)		Difference	
HIGH-TAX (Top 40%)						
PTROE Average	0.2865		0.2800		0.0065	
TAX Average	0.1201		0.1098		0.0103	***
	(n=6405)		*(n=2734)*			
LOW-TAX (Bottom 40%)						
PTROE Average	0.2083		0.2175		(0.0092)	
TAX Average	0.0450		0.0443		0.0007	
	(n=6401)		*(n=2732)*			
Difference						
PTROE	0.0782	***	0.0625	***		
TAX	0.0751	***	0.0655	***		
RATIO (PTROE/TAX)	1.0406		0.9532			

Panel H: High v. Low CR4 (NAICS 3 and SIC 3) (Quartiles)

	Low Competition (High CR4)		High Competition (Low CR4)		Difference	
HIGH-TAX (Top 40%)						
PTROE Average	0.2928		0.2974		(0.0046)	
TAX Average	0.1250		0.1167		0.0083	**
	(n=5047)		*(n=1112)*			
LOW-TAX (Bottom 40%)						
PTROE Average	0.2087		0.2027		0.0059	
TAX Average	0.0462		0.0375		0.0086	***
	(n=5052)		*(n=1108)*			
Difference						
PTROE	0.0842	***	0.0947	***		
TAX	0.0788	***	0.0792	***		
RATIO (PTROE/TAX)	1.0678		1.1961			

TABLE 13 Continued

Panel I: High v. Low Gini Coefficient (GC) (NAICS 3) (median split)

	Low Competition (High GC)		High Competition (Low GC)		Difference	
HIGH-TAX (Top 40%)						
PTROE Average	0.2931		0.2855		0.0076	***
TAX Average	0.1215		0.1188		0.0027	***
	(n=26816)		*(n=25819)*			
LOW-TAX (Bottom 40%)						
PTROE Average	0.2134		0.2055		0.0079	***
TAX Average	0.0437		0.0438		(0.0001)	
	(n=26785)		*(n=25791)*			
Difference						
PTROE	0.0797	***	0.0800	***		
TAX	0.0777	***	0.0749	***		
RATIO (PTROE/TAX)	1.0252		1.0675			

Panel J: High v. Low Gini Coefficient (NAICS 3) (Quartiles)

	Low Competition (High GC)		High Competition (Low GC)		Difference	
HIGH-TAX (Top 40%)						
PTROE Average	0.2834		0.2810		0.0024	
TAX Average	0.1165		0.1169		(0.0004)	
	(n=15071)		*(n=12655)*			
LOW-TAX (Bottom 40%)						
PTROE Average	0.2031		0.1915		0.0115	***
TAX Average	0.0428		0.0433		(0.0005)	
	(n=15046)		*(n=12624)*			
Difference						
PTROE	0.0803	***	0.0894	***		
TAX	0.0737	***	0.0736	***		
RATIO (PTROE/TAX)	1.0897		1.2155			

TABLE 13 Continued

Panel K: High v. Low Number of Competitors (Hoberg and Philips) (median split)

	Low Competition (Low Number of Competitors)		High Competition (High Number of Competitors)		Difference
HIGH-TAX (Top 40%)					
PTROE Average	0.2715		0.2540		0.0174
TAX Average	0.1071		0.0968		0.0103
	(n=11824)		*(n=11934)*		
LOW-TAX (Bottom 40%)					
PTROE Average	0.2415		0.1788		0.0627
TAX Average	0.0563		0.0300		0.0263
	(n=11806)		*(n=11918)*		
Difference					
PTROE	0.0300	***	0.0752	***	
TAX	0.0508	***	0.0668	***	
RATIO (PTROE/TAX)	0.5899		1.1268		

Panel L: High v. Low Number of Competitors (Hoberg and Philips) (Quartiles)

	Low Competition (Low Number of Competitors)		High Competition (High Number of Competitors)		Difference
HIGH-TAX (Top 40%)					
PTROE Average	0.2685		0.2226		0.0458
TAX Average	0.1059		0.0832		0.0228
	(n=5790)		*(n=5954)*		
LOW-TAX (Bottom 40%)					
PTROE Average	0.2446		0.1726		0.0719
TAX Average	0.0591		0.0318		0.0273
	(n=5775)		*(n=5939)*		
Difference					
PTROE	0.0239	***	0.0500	***	
TAX	0.0468	***	0.0514	***	
RATIO (PTROE/TAX)	0.5111		0.9730		

TABLE 14: CORRELATIONS (Additional Competition Measures)

Panel A: High v. Low CR4 (NAICS 3 and SIC 3) (median split)

	Low Competition (HIGH CR4) *(n=16007)*		High Competition (LOW CR4) *(n=6833)*		Difference	
$PTROE_{i,y}$,$GAAP\_ETR_{i,y}$	0.0930	***	0.0199	*	0.0731	***
$ROE_{i,y}$,$GAAP\_ETR_{i,y}$	(0.0410)	***	(0.0080)		(0.0330)	**

Panel B: High v. Low CR4 (NAICS 3 and SIC 3) (Quartiles)

	Low Competition (HIGH CR4) *(n=12622)*		High Competition (LOW CR4) *(n=2774)*		Difference	
$PTROE_{i,y}$,$GAAP\_ETR_{i,y}$	0.1016	***	0.2149	***	(0.1133)	***
$ROE_{i,y}$,$GAAP\_ETR_{i,y}$	(0.0357)	***	0.0277		(0.0634)	

Panel C: High v. Low Gini Coefficient (GC) (NAICS 3) (median split)

	Low Competition (HIGH GC) *(n=67002)*		High Competition (LOW GC) *(n=64510)*		Difference	
$PTROE_{i,y}$,$GAAP\_ETR_{i,y}$	0.0515	***	0.0788	***	(0.0273)	***
$ROE_{i,y}$,$GAAP\_ETR_{i,y}$	(0.0148)	***	(0.0191)	***	0.0043	

Panel D: High v. Low Gini Coefficient (NAICS 3) (Quartiles)

	Low Competition (HIGH GC) *(n=37646)*		High Competition (LOW GC) *(n=31599)*		Difference	
$PTROE_{i,y}$,$GAAP\_ETR_{i,y}$	0.1019	***	0.1183	***	(0.0164)	**
$ROE_{i,y}$,$GAAP\_ETR_{i,y}$	(0.0188)	***	0.0205	***	(0.0393)	

Panel E: High v. Low Number of Competitors (Hoberg and Philips) (median split)

	Low Competition (Low Number of Competitors) *(n=29533)*		*High Competition (High Number of Competitors)* *(n=29815)*		Difference	
$PTROE_{i,y}$,$GAAP\_ETR_{i,y}$	(0.0024)		0.0968	***	(0.0992)	***
$ROE_{i,y}$,$GAAP\_ETR_{i,y}$	(0.0273)	***	(0.0129)	**	(0.0144)	*

TABLE 14 Continued

Panel F: High v. Low Number of Competitors (Hoberg and Philips) (Quartiles)

	Low Competition (Low Number of Competitors)	*High Competition (High Number of Competitors)*		
	(n=14452)	*(n=14865)*		Difference
$PTROE_{i,y}$,$GAAP\_ETR_{i,}$	(0.0114)	0.0543	***	(0.0657) ***
$ROE_{i,y}$,$GAAP\_ETR_{i,y}$	(0.0131)	(0.0318)	***	0.0187

This table shows the Pearson correlation coefficients between PTROE and GAAP_ETR as well as for ROE and GAAP_ETR for firms in industries with low and high competition. *,**,and*** indicate significance at the at least 10%, 5%, and 1% levels, respectively, using 2-tailed tests. High and low competition groups are determined by a median split for each competition measure each year. Tests of differences are calculated using z-statistics. Subscripts i, y, and n represent firm level, year level, and NAICS (2 digit) industry level respectively. PTROE, TAX, GAAP_ETR, ROE, TOTAL ASSETS, LEVERAGE, CAP, INV, and RD are winsorized at the 1% and 99%. See Appendix 1 for variable definitions.

TABLE 15: SUMMARY OF REGRESSION TESTS (Additional Competition Measures)

Panel A: PTROE, ETR Regressions

Comp Vars:	CompVar		High_50		High_25		Low_25		High_10		Low_10	
	B_1	B_3	B_1	B_3	B_1	B_3	B_1	B_3	B_1	B_3	B_1	B_3
Keil_CR4_2	+	-				+	+			+	+	
Keil_CR8_2	+	-				+	+			+	+	
Keil_CR4_3	+	-		+		+	+			+	+	
Keil_CR8_3	+	-		+		+	+			+	+	+
Keil_HHI_3					-							
Keil_CR4_4	+	-	+		+		+			+	+	
Keil_CR8_4	+	-	+				+			+	+	
Keil_HHI_4												
Keil_CR4_5	+	-	+	-	+	-		+				
Keil_CR8_5	+	-	+	-		-		+				
Keil_HHI_5												
GC_NAICS_2	+	-	+	-	+		+		+	-	+	
GC_NAICS_3	+	-	+		+		+		+	+	+	-
GC_NAICS_4	+		+	+	+		+		+		+	-
GC_SIC_2			+		+	+	+	-	+	+	+	-
GC_SIC_3		+	+	+	+	+	+	-	+	+	+	-
GC_SIC_4		+	+	+	+	+	+	-	+	+	+	-
GC_NAICS_5		+	+	+	+	+	+	-	+	+	+	-
HP_COMP		+	-	+		+	+	-	+	+	+	

TABLE 15 Continued

Panel B: ROE, ETR Regressions

Comp Vars:	CompVar		High_50		High_25		Low_25		High_10		Low_10	
	B_1	B_3	B_1	B_3	B_1	B_3	B_1	B_3	B_1	B_3	B_1	B_3
Keil_CR4_2	-		-		-		-		-		-	
Keil_CR8_2	-				-		-		-		-	
Keil_CR4_3	-		-		-		-		-		-	
Keil_CR8_3	-		-		-		-		-		-	
Keil_HHI_3												
Keil_CR4_4	-		-		-	+	-		-		-	
Keil_CR8_4	-		-		-		-		-	+	-	
Keil_HHI_4					-						-	
Keil_CR4_5	-		-		-		-		-		-	
Keil_CR8_5	-		-		-		-		-		-	
Keil_HHI_5									-		-	
GC_NAICS_2		-	-		-		-		-		-	-
GC_NAICS_3	+	-	-		-		-	+	-	+	-	+
GC_NAICS_4	-		-	+	-		-		-		-	
GC_SIC_2		-	-		-	+	-		-	+	-	+
GC_SIC_3	-	+	-	+	-	+	-		-	+	-	+
GC_SIC_4	-	+	-	+	-	+	-	-	-	+	-	
GC_NAICS_5	-		-	+	-	+	-		-		-	-
HP_COMP	-		-		-		-	+	-		-	

This table summarizes the regression results for multiple regressions. Regressions in Panel A use model (1), and regressions in Panel B use model (2), where HIGH_COMPVAR is substituted for a continuous measure (CompVar), a greater than or equal to median dummy variable for competition (High_50), a greater than or equal to top 25% dummy variable for competition (High_25), a less than 25% dummy variable for competition (Low_25), a greater than or equal to top 10% dummy variable for competition (High_10), and a less than 10% dummy variable for competition (Low_10). CompVar defines the competition variables as: Keil_CR4_X, Keil_CR8_X, Keil_HHI_X, GC_NAICS_X, and GC_SIC_X, where X=1,2,3,4,or 5. This table shows the coefficient signs on the variables of interest. The B_1 columns in Panel A and B show the sign of the coefficient on PTROE and ROE in models (1) and (2) respectively. The B_3 column shows the sign of the interacted variable PTROE or ROE and the CompVar in models(5) and (6) respectively. + and - represent a positive or negative, respectively, coefficient at the at least 10% two-tailed level of significance. Note that all competition measures in this table with the exception of HP_COMP, higher values indicate lower competition. See Appendix 1 for variable definitions.

TABLE 16: DIRECT ESTIMATION OF IMPLICIT TAXES (Additional Competition Measures)

PANEL A: HIGH v. LOW CR4 (NAICS3 and SIC3) (<50%,>=50%)

	Delta	Variance of Delta	n
Low Competition	0.7673	0.0177	16,007
High Competition	0.9795	0.0183	6,833

PANEL B: CR4 Low to High Competition (NAICS3 and SIC3) (25% groups)

	Delta	Variance of Delta	n
Lowest Competition	0.7578	0.0184	12,622
(25-50%)	0.8391	0.0174	2,225
(50-75%)	0.9891	0.0172	4,059
Highest Competition	0.4267	0.0196	2,774

PANEL C: HIGH v. LOW Gini Coefficient (GC) (NAICS 3) (<50%,>=50%)

	Delta	Variance of Delta	n
Low Competition	0.9591	0.0184	67,002
High Competition	0.8718	0.0157	64,510

PANEL D: Gini Coefficient (NAICS 3) Low to High Competition (25% groups)

	Delta	Variance of Delta	n
Lowest Competition	0.8896	0.0166	37,646
(25-50%)	0.9742	0.0207	27,119
(50-75%)	0.8631	0.0176	32,911
Highest Competition	0.8899	0.0137	31,599

TABLE 16 Continued

PANEL E: HIGH v. LOW Number of Competitiors (Hoberg and Philips)

	Delta	Variance of Delta	n
Low Competition	0.9683	0.0172	29,533
High Competition	0.8964	0.0123	29,815

PANEL F: Number of Competitors (Hoberg and Philips) Low to High Competition

	Delta	Variance of Delta	n
Lowest Competition	0.9894	0.0175	14,452
(25-50%)	0.8159	0.0169	15,081
(50-75%)	0.7099	0.0152	14,680
Highest Competition	0.9566	0.0093	14,865

Using Maximum Likelihood Estimation, this table directly estimates the magnitude of implicit taxes for each group (above and below median competition measures, and groups by quartile) by calculating delta (δ) using model (3) as shown below. Groups (1)-(4) are formed based on competition measure quartiles by year with (1) representing the highest quartile competition variable, and (4) representing the lowest competition variable. Group (1) includes firms in industries with ≥ 75th percentile of the competition variable, Group (2) includes firms in industries with ≥ 50th percentile and < 75th percentile of the competition variable, Group (3) includes firms in industries with ≥ 25th percentile and <50th percentile of the competition variable, and Group (4) includes firms in industries with <25th percentile of the competition variable. See appendix for variable definitions.Subscripts i, y, and n represent firm level, year level, and industry level respectively. PTROE, TAX, GAAP_ETR, ROE, TOTAL_ASSETS, LEVERAGE, CAP, INV, and RD are winsorized at 1% and 99%. See Appendix 1 for variable definitions.

$$ROE = \frac{[1+\lambda(1-\delta)]}{[1+\overline{\lambda_n}(1-\overline{\delta_n})]}\overline{ROE}_n + \varepsilon \quad (3)$$

$\overline{ROE}_y$ =Industry average ROE.
T^*_y =equilibrium tax rate = year average
$\delta_{i,y}$ =implicit tax measure as calculated by model (3)
$\bar{\delta}_y$ =industry average δ
$\varepsilon_{i,y}$ =error term
$\lambda_{i,y}$ =tax preferences = (T*-GAAP_ETR)/(1-T*)
$\bar{\lambda}_y$ =industry average λ, where λ is calculated for each FF48 industry, and then

Vita

Hannah Smith was born in Memphis, TN. She attended the University of Georgia for her undergraduate degree and the University of Tennessee for her master of accountancy degree before working for PwC's tax practice in Atlanta, GA. She received a graduate research assistantship to attend the University of Tennessee for her PhD, where she graduated with this degree in May 2017. She plans to begin her job as an Assistant Professor at San Diego State University in August of 2017.