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A HISTORICAL PERSPECTIVE ON DUTCH AUCTION RATE PREFERRED STOCK

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ABSTRACT

In February of 2008, the $330 billion auction-rate security market began to fall apart. Brokerage houses that managed the periodic auctions refused to support their issues, so that auctions failed and liquidity disappeared. Investors had a wake-up call: an asset they had thought was a money-market equivalent was in fact something much more risky. In this paper, we consider this current meltdown in light of the 1980s history of Dutch Auction Rate Preferred Stock (DARPS). We conclude that a significant contributor to the recent problems was the marketing of DARPS to individuals, when the security was designed for corporate investors.

JEL: G01, G32, K34

KEYWORDS: Preferred Stock, Auction, Dividends Received Deduction

INTRODUCTION

In early 2008, owners of billions of dollars' worth of auction-rate securities learned that the assets they had presumed to be as safe as money-market assets were, instead, not only quite risky, but also temporarily completely illiquid. The brokerage houses that had been standing behind the securities' rate reset auctions stopped supporting the market, and auctions failed—resulting in no liquidity for investors and in extremely high rates for some issuers. In late summer of 2008, some large brokerages began to promise that they would buy back the auction-rate securities of their retail investors; intervention by regulators soon encouraged other brokerages to do the same.

Retail investors whose accounts were frozen for months blamed brokers for misrepresenting the safety and liquidity of auction-rate securities. Mitigation efforts included demands by investor groups and by government regulators for clearer disclosure. Even now, issuers and investment bankers are scrambling to create acceptable new substitutes, while consumer advocates are demanding explanations.

The liquidity risks inherent in auction rate securities have been well known since their creation in the 1980s. However, they may not have been appreciated by the retail investors who have only recently entered the market. The auction rate market traditionally has been the exclusive province of corporate cash managers, who were able to benefit from the dividends received deduction (DRD). This preferential tax treatment has allowed corporate investors to exclude from taxes up to 85% of the dividends they received. Since corporate investors thus faced a lower effective tax burden on these securities, issuers could offer a lower pre-tax return on them. In short, everybody won. Dutch Auction Rate Preferred Stock (DARPS) was developed in the early 1980s to facilitate this tax benefit-sharing by allowing corporate cash managers to capture dividends with relatively little price risk. However, changing market conditions later in the decade threatened to make the security obsolete. A concerted effort by broker-dealers to extend the market to individual investors saved DARPS from extinction, but at the cost of selling it to investors for whom it was not designed. Coincidentally, as the market expanded to include retail investors, the share of potential benefits accruing to issuers greatly increased.

Since retail investors could not benefit from the DRD, they were simply using DARPS as a cash equivalent. This focus made them especially vulnerable to auction failure. They certainly seemed the

least preared for, and the most affected by, the lost liquidity from the tidal wave of failures in February, 2008.

In this paper, we consider the recent auction-rate problems in light of the traditional use for the securities: as a dividend capture strategy. We argue that expanding the market to retail investors meant jamming a round peg into a square hole—it was an idea doomed to failure. We proceed as follows. In the next section, we review the literature on both the old and new incarnations of DARPS. In section three, we review the rise and fall of DARPS in the 1980s, stressing its use for tax benefit-sharing. Given this background on the traditional use for the security, we consider the current auction market meltdown in section four, highlighting the recent changes that made the market vulnerable.

LITERATURE REVIEW

Academic attention to DARPS has been spotty, mirroring DARPS' popularity in the market. There have been three general phases of relevant work: the early DARPS literature, which describes the asset's rise and fall during the 1980s; studies attempting to quantify implicit taxes, which evaluate various tax schemes employing different types of preferred stock; and more recent work assessing DARPS' contributions to the financial debacle of 2008. Two critical themes underlie all of the work, however—the potential tax benefits available for the proper clientele, and the unavoidable risk of auction failure.

The earliest of this literature focuses on preferred stock's use as a tax benefit-trading mechanism. Winger, *et al.* (1986) describe the early history of the precursor to DARPS, adjustable-rate preferred stock, ARPS. (We discuss ARPS more fully in the next section. See also Houston and Houston, 1990.) The authors acknowledge that taxes motivate ARPS trading, noting that "[s]upply and demand in the marketplace…should lead to ARPS prices that reflect a type of joint tax optimization on the part of issuers and investors." In practice, however, they find that the securities had drawbacks for corporate money managers: ARPS were more volatile than money-market comparison assets, and had relatively unattractive returns as well. These results were not much attenuated in ARPS mutual funds, since the preferreds in these funds all reset against the same reference assets. (See also Erickson and Maydew, 1998.) Market conditions also hurt ARPS. Interest rates were rising, making investors more inclined to be conservative ("it was not the time to…play the role of a hero"; Wilson, 1986a); investors were worried about tax reform; and the markets were unsettled by the "tidal wave" of negative investor sentiment unleashed by the failure of Continental Illinois and the Latin debt fiasco. Finally, there was liquidity risk. Winger *et al.* (1986) note that ARPS usually did not offer a conversion feature or a sinking fund, so that ARPS' prices were only able to remain "relatively constant." These unattractive features of ARPS led investors to turn to convertible adjustable preferred issues, which offered "a means for assuring that the investor can liquidate the investment for an amount equal to the original purchase price." This evolution toward greater price stability continued, of course, with DARPS.

Morse and Johnson (1994) explain that DARPS was originally marketed by investment bankers as a "tax-advantaged cash substitute." They compare DARPS' performance in the late 1980s to that of hedged dividend-capture programs, and find that DARPS were more "user-friendly" (because they required fewer intermediate transactions than did the hedged dividend capture programs, which use protective puts and covered calls to hedge) and generated higher and more consistent returns. Alderson, Brown, and Lummer's (1987) seminal paper on DARPS explains how its novel design features improved upon adjustable rate preferred stock, making corporate dividend capture safer by reducing potential price risk. Validating Winger *et al.*'s (1986) conjecture about ARPS, they find that the relative yields on CP and DARPS "accommodate" both the issuer and the investor—"to allocate the benefits of the corporate exclusion on dividend income among both the issuing and purchasing firms."

Notice that Alderson, Brown, and Lummer (1987) identify *firms* as the traders. If taxes were the motivation for trading these various types of preferred issues, then the clienteles for the trades would have been those who benefited from those potential tax benefits—corporations. The contemporary literature uniformly concurs with the identification of DARPS traders as corporations. Erickson and Maydew (1998) assert that preferred stock is held "by a particular type of investor (corporations)." Their finding of an implicit tax effect, measured around a threat to decrease the DRD—a threat that negatively affected only preferred stock, not common—strengthens this assertion. They summarize their findings by saying that "our results support the notion that corporate investors form a tax clientele for preferred stock." Similarly, Alderson and Fraser (1993) assert that DARPS was designed to "enhance the marketability of preferred equities to the tax clientele that values them most, corporate purchasers." (See also Engel, Erickson, and Maydew, 1999, on DARPS, and Winger, *et al.*, 1986, going even further back to ARPS.)

As we clarify in the next section, however, to benefit from DARPS, the trading companies must be in the right tax brackets. Houston and Houston (1990) provide strong evidence that, in the 1980s, DARPS indeed were traded by the "right" types of companies: issuers with low marginal tax rates and purchasers with high tax rates. As noted above, these issuing firms cannot derive the maximum benefit from debt tax shields, but can create similar benefits by issuing DARPS, since corporate investors will accept lower pre-tax yields on DARPS than on debt. The sharing of tax benefits is what Alderson, Brown, and Lummer (1987) say makes DARPS "an extremely valuable cash management vehicle for *fully taxable* companies to purchase from *zero tax* issuers" (emphasis added). Similarly, Alderson and Fraser (1993), after describing the factors that led to the decline of the DARPS market after 1987, assert that DARPS could still serve as a useful financing tool, albeit for a "very narrowly defined investor clientele for high-quality preferred stock" (i.e., corporate cash managers, "by design" the asset's "principal clientele," "virtually the only participants on the demand side of this segmented market," and for whom it is "exclusively" suitable) and a small set of potential issuers (i.e., "high-quality, low-tax-rate firms"). (Given the very specific nature of these potential trading partners, these authors conclude that the criteria result in "a market that is too small to be of consequence." We will see below that attempts to expand this market were almost certainly one of the primary causes of the DARPS meltdown of 2008.)

Taxes continued to be focus of literature written until just a few years ago. With the older work having established the corporate clientele on both sides of the trade, later work attempted to estimate the relative benefits to the participants and to quantify the implicit tax between the yields on tax-advantaged assets like DARPS and on comparable-risk comparison assets. (See Erickson and Maydew, 1998, for a full explanation of implicit taxes.) This more recent work also begins to hint at a new type of investor for DARPS—individuals.

Plesko (2005), using a weekly sample of DARPS auction results from 1985 to 1993, finds that taxes motivate the trades in these issues. He asserts that the auctions he studies are almost completely an institutional game: given that "taxable corporations are a clear, and targeted, clientele as potential buyers" of DARPS, and "firms with substantial [net operating losses] form a natural clientele as issuers," DARPS' "clientele are easily identified." In fact, DARPS "is marketed only to corporations." However, he sees some indications that individuals are participating in the market, referring to a 1988 Morgan Stanley estimate that up to 10% of preferred stock is held by individuals, and noting that both Lehman and the *Wall Street Journal* recommended preferred stock for individuals as early as 2001. (See Plesko, footnote 11; see also Engel, Erickson, and Maydew, 1999, footnote 8, for reference to individuals' holding of trust preferred—but not straight preferred—stock.)

Individual participation may also help explain Plesko's empirical results. While he finds that both the issuer and the investor share the tax benefits that motivate his trades, he observes that the proportion of those benefits accruing to the issuer increases over time. His main finding, however, is on implicit taxes: he finds that the relative pre-tax yields of DARPS and comparable commercial paper imply a marginal tax

rate less than the corporate maximum—a result he calls a "puzzle." This latter finding may imply that individual investors are active in the market.

Erickson and Maydew (1998) note that the highest implicit tax effect will occur when a stock's returns come solely from dividends and when corporations are the marginal holders of that stock. For example, given a DRD of 70% and a maximum marginal tax rate of 35%, the highest implicit tax rate is 27.4%. (Using equation (1), which we specify in the next section, we see that, given these tax and DRD values, the before-tax DARPS rate must be (.65)/[1-(1-.70)*.35] = .726*(before-tax CP rate). Thus, comparing the before-tax rates, we find that the DARPS rate is the CP rate times (1-.274), so that the implicit tax rate is 27.4%.) The authors note, however, that if individuals are the marginal investors, this implicit rate will be lower. Individuals do not benefit from the dividends received deduction, so their effective tax rate on DARPS is T. Their required pre-tax DARPS rate is higher, making the pre-tax difference between DARPS and CP—the implicit tax—smaller. (For example, if only individuals held DARPS, then the implicit tax would be zero, since there would be no difference between the tax burdens on the two assets for any investor.) Similarly, Engel, Erickson, and Maydew (1999) estimate the implicit tax cost of trust preferred stock relative to straight preferred—that is, the premium that investors will demand for holding trust preferred, whose dividends are not eligible for the dividends received deduction, and are therefore fully taxable to corporate investors. They show that the maximum implicit tax cost between the two is 27%, but that their empirical estimate is much lower (only 2.33%). They interpret this as evidence of a "discernible but small effect of investor-level taxation" on the preferreds' relative yields. The authors summarize their results by asserting that, in this case, the tax benefit to issuers apparently is much larger than the tax disadvantage to investors—a conclusion consistent with Plesko's (2005) observation that the share of benefits to issuers seems to be increasing over time.

As we will see later, the retail ownership that was hinted at in the late 1990s became the dominant characteristic of the demand-side for DARPS in 2008. Small, individual investors became significant owners of DARPS, and they were severely hurt when the rate-reset auctions started failing. Some commentators attempting to explain the debacle of 2008 have asserted that these liquidity risks were hidden until the market blew up. However, recognition of the risks inherent in auction-rate assets is clear from the early preferred stock literature. For example, in 1986, an article about adjustable-rate preferred stock (ARPS), DARPS predecessor, stated most emphatically:

> *ARPS are <u>not</u> money market instruments and are not substitutes for short-dated paper. They possess more of the characteristics of equities than of debt instruments, such as voting rights in certain circumstances, and liquidation rights superior to those of common and other junior securities but inferior to those of debt. Also, unlike most debt cases, failure to meet a dividend…is not an event of default…With few exceptions, they do not give the holder the right to put the stock back to the issuer for cash. (Wilson, 1986a)*

In addition, caps on ARPS were hit on some issues even in 1984, just two years after the assets were conceived (Wilson, 1986a).

As for DARPS, a 1986 article asserted that "[t]he instrument is not for the small or unsophisticated investor," but for the manager of "'temporarily' idle corporate funds" who could benefit from the DRD (Wilson, 1986b). The author clearly warned these potential corporate investors that they might be unable to sell their stock if there were insufficient demand at auction, a "failed" auction.

It is true that, during these earliest days, the possibility of a failed auction was considered remote. Alderson, Brown, and Lummer (1987) note that they ignored relative risk when comparing commercial paper and DARPS, since DARPS can provide investors with "an impressive degree of certainty"

regarding its reset to par every seven weeks. (McConnell and Saretto, 2009, provide supporting evidence for this sanguine assessment: between 1984 and 2006, auction-rate securities of all types suffered only 13 auction failures in over 100,000 auctions.) While Alderson, Brown, and Lummer go on to acknowledge that "[w]hat uncertainty remains is an element of liquidity risk," they assert that "this need not be a major concern," given the coordination of the reset auctions with the required holding period for the dividend exclusion. In fact, DARPS "enables the purchaser to realize the corporate dividend exclusion in a near riskless manner."

On the other hand, Alderson and Fraser (1993) clearly explain the "well known" liquidity risk of DARPS' auction failure: "existing holders who wish to divest have no recourse to the issuer in the event that the number of shares demanded at a dividend yield below the stated maximum rate is insufficient to cover the available supply." They stress that DARPS investors *must* accept some risk of auction failure, since only then will the security meet the IRS's "at-risk" requirement for the dividend received deduction: "the dividends received deduction and the potential for auction failure are inseparable: holders of money market preferred stock cannot simultaneously maintain a position in variable-rate preferred equity, take advantage of the dividends-received deduction, and avoid the risk of auction failure." In fact, their survey results found that the only security design feature that significantly affected their sample firms' decision to redeem their DARPS was this risk of auction failure. The importance of this possibility to issuers suggested to them that auction failure could signal poor credit quality, and lead to a self-fulfilling cycle of failures. These were not idle conjectures: in 1999, Winkler and Flanigan described the serial auction failures of M-Corp's DARPS in 1987 and 1988, the years immediately before the company failed.

Some regulators and practitioners were sounding alarms about auction failure. The Securities Industry and Financial Markets Association (SIFMA), an industry trade group for securities firms, broker-dealers, and asset managers, stressed the potential for auction failure in its best practices (2007): "[a]lthough the Maximum Rate is generally above a market Rate, Existing Owners may be disadvantaged if there is a Failed Auction because they are not able to exit their positions by means of the Auction." Much earlier, the IRS in 1990 clearly identified DARPS as equity, despite its use as a cash equivalent. Its revenue ruling 90-27 laid out the reasoning. DARPS was equity because it acts like traditional preferred: "[a] holder has no right to receive a certain sum on demand or on a specified date; a holder's rights on liquidation or bankruptcy are subordinate to claims of creditors; and receipt of dividends depends on their being declared and paid out of legally available funds" (Willens, Biebl, and Burge, 1990). Since the broker is not required to support the auctions, they may fail—meaning that investors have no guarantee that they can sell their shares.

By 2005, accounting firms had starting requiring their clients to stop classifying their auction-rate securities as "cash equivalents." Financial Accounting Standard 95 (FAS 95) defines cash equivalents as "short-term highly liquid investments…readily convertible to known amounts of cash [and] so near their maturity that they present insignificant risk of changes in value because of changes in interest rates." The standard asserts that only assets with maturities under three months when acquired will usually satisfy these requirements—DARPS would not qualify. (However, as was made clear during the hearings on auction-rate securities of the U.S. House of Representatives' Committee on Financial Services, these securities were still being classified as cash equivalents on retail investors' brokerage statements in 2008.) In 2005, Lance Pan of Capital Advisors Group warned that the FAS 95 interpretation of cash equivalents could lead corporate cash managers to abandon DARPS. More interestingly, he also predicted that a "contagion"—"more bad press"—could cause serial auction failures, and that "[i]nvestors with near-term cash needs may be gravely impacted as they are forced to sell at deep discounts." And, "We have always been concerned that the fragile liquidity and investor confidence of ARS may subject the securities to potentially violent market contagion that could lock up the entire market for days or weeks." The point of his article? To reiterate his company's warning to stay away from auction rate securities, or to "tender the security back at the earliest possible time before anyone else does."

Of course, the probability of a poor outcome may depend on market conditions. Winkler and Flanigan (1991) study the relative behavior of DARPS and CP during the market turmoil surrounding October 19, 1987. They conclude that investors quickly increase DARPS' risk premiums during market turbulence, so that DARPS is "not an acceptable substitute for commercial paper" and "should not be viewed as a near-cash investment." Similarly, McConnell and Saretto (2009) find that, as far back as 2003, auction rate bonds offered a small premium above money market alternatives, but that this spread widened considerably after auctions began failing in September, 2007. They also find that, starting that month, their auction-rate bonds also began to yield more than variable rate demand obligations (VRDOs) from the same issuers. Since VRDOs guarantee investors the right to sell the bonds back at par, this widening spread may have indicated investors' increasing liquidity concerns about the auction process. The authors summarize by saying that "ARS bonds were not priced as cash equivalents once the likelihood of auction failure became tangible during the late fall of 2007." (While McConnell and Saretto did not study auction rate preferred stock, they assert that "some very preliminary analyses" suggest that DARPS behaved like the bonds.) Finally, Plesko's (2005) result that the implied marginal tax rate between DARPS and CP is less than the maximum—which implies that fully taxed investors receive a higher after-tax rate on DARPS—may also reflect a default premium.

The presence of a default premium does not necessarily imply auction failure, however. McConnell and Saretto (2009) examine a sample of 793 auction rate bonds and find that the probability of their auctions' failure depended on their maximum allowable reset rate. Bonds with lower max rates fail more frequently. For example, the authors compare the failure rates for bonds whose max rates are contractually fixed with those whose max rates float relative to a reference rate. For the fixed issues, the average max rate is 14.1%; in contrast, for the floaters, the max rate averages 4.1%. Thus, having a floating max rate implies having a low max rate. The authors find that, during early 2008's worst failure period, up to 90% of the floaters failed, while only 13% of the fixed max-rate issues failed. They interpret their ability to link the probability of auction failure with bond characteristics as evidence that investors were rationally avoiding issues whose market-clearing rates were above their max rates. They also suggest that the problems in the ARS market resulted from a spillover, or "contagion," from the broader credit markets' response to the subprime crisis of 2007.

Having described the literature on both the original and more recent incarnations of DARPS, we now look more carefully at the tax treatment that initially spurred its creation.

DUTCH AUCTION RATE PREFERRED STOCK IN THE 1980s

Finance textbooks often describe preferred stock as a dominated security, with more restrictions for issuers than common stock, but without debt's tax deductibility (see, for example, Schall and Haley, 1986). The early variable-rate preferred stock literature explains the resulting "puzzle" of the "enigma" that is preferred stock by appealing to the dividends received deduction: issuers who may not be able to benefit from debt financing (because their tax rate is low, or because they have other tax shelters) may be able to issue low-rate preferred to corporate investors who can exclude most of their dividends from taxes. Taxes, then, provide a rationale for the existence of an apparently dominated security.

The ability of corporate investors to deduct a substantial proportion of the dividends they receive is meant to prevent triple taxation of those dividends. The excluded proportion, the DRD, was 85% when DARPS was developed in the 1980s. Thus, under this regime, corporate investors were taxed on only (1-DRD) = 15% of the dividends they received.

The ability to exclude such a substantial proportion of dividends from taxes made high-dividend stocks attractive to corporate cash managers. However, there was obviously a tension between the attractiveness of the dividends and the inherent risk of stocks that generated them. Cash managers devised hedging

schemes to couple their stock investments with covered calls and protective puts, but these programs were expensive and unwieldy. In 1982, a product was devised that allowed corporate investors to avoid the involved hedging required with dividend-capture programs: adjustable rate preferred stock (ARPS). Adjustable rate preferred stock reduced price risk by resetting its dividend rate every quarter. The new rate was set at a fixed spread above Treasuries, where the chosen Treasury benchmark was the highest of the current yields on bills, notes, or bonds. (Given that the yield curve was normal during this period, this effectively meant the ARPs were set at a fixed rate over T-bonds.)

While ARPS helped investors mitigate the interest rate risk of a dividend capture program, it had significant drawbacks. First, the 91-day reset period was much longer than the 46-day holding period required for dividend capture, so that investors selling after the holding period were still exposed to price risk. Second, the fixed spread over Treasuries precluded adjustments for changing credit risk, so that issues whose credit quality deteriorated might never reset to par. Finally, some investors were concerned that their cash management issues' yields were tied effectively to a long-term, rather than a short-term, benchmark.

In response to these problems with ARPS, innovative investment bankers created Dutch Auction Rate Preferred Stock (DARPS). DARPS met the problems of ARPS head on: its seven-week reset period better matched investors' required holding period, and its spreads were allowed to fluctuate, accommodating both closer links to desired benchmarks and changing credit quality. Yield flexibility was accomplished by resetting dividend rates through an auction. Investors who wished to ensure that they kept their shares submitted noncompetitive tenders. Investors who wished to participate in the auction submitted quantity/yield bids, which were ranked by the auctioneer from lowest to highest yield. Shares were awarded starting with the lowest yield; the highest accepted yield (the stop-out or clearing rate) determined the dividend rate for all shares. If the quantity of bids at the stop-out yield exceeded the available shares, *current* investors received pro-rata allocations (new bidders were excluded). (Contrast this auction mechanism to the old and current formats for Treasury auctions. Under the former, a discriminatory system, winning bidders received the yield they bid. In the current system, a single-price system, all winning bidders receive the stop-out rate, as with DARPS. However, under both Treasury systems, all bidders participate in the pro-rata allocation of available shares at the stop-out; none is excluded.)

DARPS issues often had rate collars, specifying the maximum and minimum possible reset rates (used in case the auction garnered insufficient demand or supply, respectively). Both of these reference rates usually were based on the market rate for AA-rated commercial paper (CP), a money market alternative asset. For example, Alderson, Brown, and Lummer (1987) note that a common collar during the early 1980s was 110% and 58% of the rate on AA CP. While the ceiling was set to partially compensate an investor for a failed auction (a possibility deemed remote, as discussed later), the floor was set to equate the after-tax return on DARPS to the after-tax return on CP.

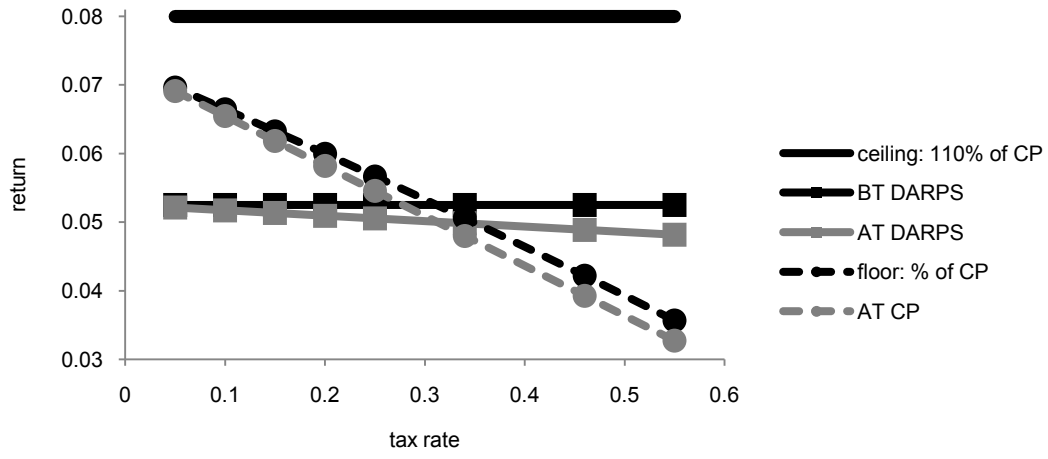
The DRD complicates the calculations of these after-tax rates. Since CP is fully taxable to the investor, its after-tax return is simply its before-tax return times the factor (1-T), where T is the marginal corporate tax rate. However, since corporate DARPS investors are able to exclude a large percentage of their dividends from taxes, their effective tax burden is much lower than their marginal tax rate would imply. For example, using the 85% dividends received deduction (DRD) and the 46% maximum marginal corporate tax rate from the early 1980s, we find the effective tax rate on DARPS dividends to corporate purchasers to be only (1-DRD)*T, or 6.9%. Using these relative tax burdens, we can find the equivalent before-tax return on DARPS as:

$$\text{before-tax equivalent rate for DARPS} = (\text{before-tax rate on CP}) * \frac{(1-T)}{[1-(1-DRD)*T]}, \qquad (1)$$

or, using the same DRD and T values, (before-tax rate on CP)*(1-.46)/[1-(1-.85)*(.46)] = (before tax rate on CP)*(58%). Thus, the 58% floor value was a consequence of the tax rate/DRD regime in place during the 1980s.

Figure 1 illustrates how these floor percentages would vary, using different marginal tax rates. The relationships pictured are based on the average values found by Alderson, Brown, and Lummer (1987) from their sample of 201 DARPS auctions held over the first half of 1986: a before-tax return on 60-day AA commercial paper of 7.273%, the comparable before-tax rate on DARPS of 5.251%, and an 85% dividend tax exclusion. The floor and ceiling rates are shown before tax. The ceiling—here set at 110% of the comparable CP rate, or 8.00%—is not a function of marginal rate. However, the "floor" is; this series shows the *before*-tax rate on DARPS at which an investor with a given T is indifferent between DARPS and CP. That is, it is the relationship shown in equation (1). (This series is purely hypothetical, since for these older DARPS the floor percentage is specified, given the contemporary tax/DRD regime. For example, as discussed above, Alderson, Brown, and Lummer's generic floor was set at 58% of BT CP, given the 46%/85% regime, for a pre-tax yield of 4.22%.) The *after*-tax CP rate lies below this DARPS floor as long as the marginal tax rate is positive. However, this simply reflects the comparison between before- and after-tax rates: on an after-tax basis, the series are identical—equating DARPS' after-tax yield to the after-tax CP rate is how the floor is established.

Figure 1: DARPS "Collar" under Initial 85% Corporate Dividend Tax Exclusion



DARPS "collar" under initial 85% corporate dividend tax exclusion, assuming various marginal tax rates. The DARPS floor is the before-tax rate on DARPS that equates its after-tax yield to the after-tax return on commercial paper. Investors prefer DARPS when their marginal tax rate is higher than approximately 32%; below that, they prefer commercial paper.

We can see the result of this more directly by considering the investor's actual decision: would she rather earn the after-tax rate on DARPS or on CP? Figure 1 makes it clear that the answer depends on her marginal tax rate. When T is high, DARPS dominate CP. While she would pay tax on all of her CP interest, realizing an after-tax return of (BT CP)*(1-T), she would pay tax on only a fraction of her DARPS' dividends—only 15% of them, given the DRD of 85%. As the investor's marginal tax rate rises, the benefit of this tax shelter rises: while her after-tax return for DARPS falls as T increases, it does so at a much lower rate for DARPS than for CP. This is the effect of the dividend exclusion. However, at tax rates below approximately 32%, the investors is better off with commercial paper. This is because an investor with a low marginal tax rate is less attracted by a tax shelter like DARPS.

For a given CP yield, Figure 1 also illustrates that the floor for DARPS falls as the marginal investor's tax rate rises. We can explain this by looking at equation (1). The floor rate for DARPS is set by multiplying

the before-tax rate on CP by a factor determined by the relative effective tax burdens: (1-T)/[1-(1-T)*DRD]. The numerator of this factor reflects the effective tax investors pay on CP interest; the denominator reflects the effective tax rate on DARPS dividends. Taking the derivative of this factor with respect to the marginal tax rate, we find:

$$\delta\text{factor}/\delta T = \frac{-1}{[1-(1-T)*DRD]} + \frac{(1-T)*DRD}{[1-(1-T)*DRD]^2} < 0. \quad (2)$$

Thus, all else equal, the floor set on a DARPS issue falls as the marginal tax rates rise. Investors taxed at higher rates are more interested in a tax shelter, and will therefore accept lower pre-tax rates on tax-advantaged assets. The preference of these highly taxed corporate investors for DARPS is shown by the right-hand shaded area in Figure 2.

But what of the issuers? Issuers choose between DARPS and CP based on which offers a lower after-tax cost. Since DARPS' dividends are not deductible, issuers must pay their before-tax rate. However, interest on CP is deductible, so the after-tax cost of CP to issuers is only (1-T)% of the before-tax CP rate. Thus, issuers prefer DARPS over CP when the *before-tax* cost of DARPS is lower than the *after-tax* cost of CP. Given the values assumed in Figures 1 and 2, this occurs when the issuer's tax rate is less than approximately 28% (as shown in the left-hand shaded area of the Figure 2). Issuers with relatively low tax rates (or who have many nondebt tax shields) are less able to avail themselves of the tax benefits of CP, and would be attracted to DARPS. Thus, Figure 2 illustrates the potential for profitable sharing of tax benefits between issuers and corporate investors—which is exactly what Alderson, Brown, and Lummer (1987) found actually happened in the early DARPS market.

Figure 2: Potential for Profitable Sharing of Tax Benefits between Issuers and Corporate Investors

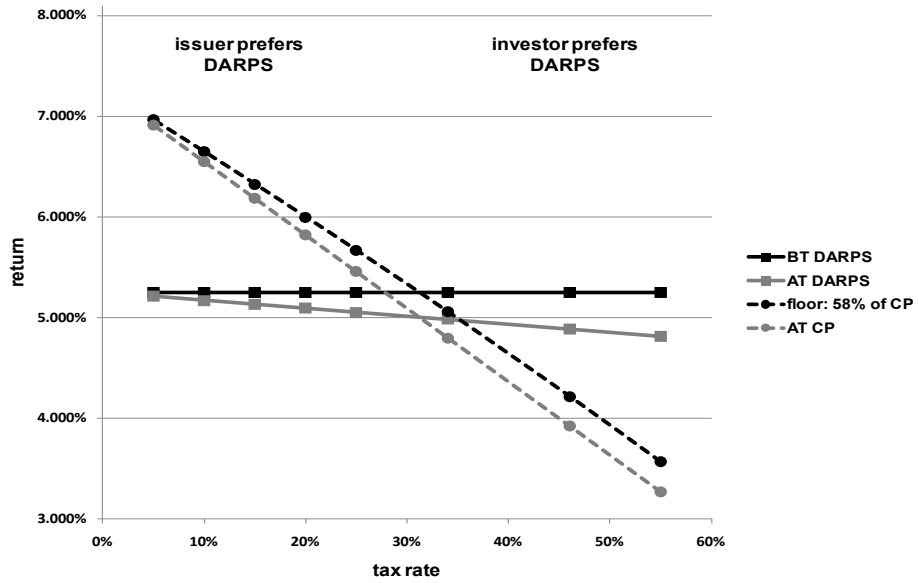


Figure 2. Issuers with low marginal tax rates prefer DARPS, since they are unable to benefit from the tax deduction for commercial paper interest. Conversely, highly taxed corporate investors prefer DARPS, since they can benefit most from the dividends received deduction. DARPS therefore allows both issuers and investors to benefit.

While this "tax arbitrage" drove the development of the market in the mid-1980s, the growth was short-lived, as regulatory changes dampened the enthusiasm of both issuers and investors for DARPS. For example, after the Tax Reform Act of 1986, marginal tax rates fell to 34%, and the corporate dividend tax

exclusion was reduced to 80%. (The DRD was further reduced to 70% at the end of 1987, where it has remained.) The investment tax credit was eliminated and depreciation terms were lengthened, reducing the number of nondebt tax shields available to issuers. These changes had the net effect of increasing the *effective* marginal corporate tax rate, making debt (and its tax shield) relatively more attractive to issuers. For a major issuer type, thrifts, there were also other headwinds for DARPS: the S&L crisis made investors much more wary of thrift issues, while regulators were demanding that the institutions increase their capital (a mandate they frequently met by shutting down their "nonsubsidiary subsidiaries funded with noninvestment investments"—that is, bankruptcy-remote subsidiaries that funded themselves with DARPS). (See also Houston and Houston, 1990, on thrifts' use of preferred stock.) All of these factors decimated the market for DARPS. (See Alderson and Fraser, 1993.)

Figure 3 illustrates the tax rate and DRD changes that helped lead to DARPS' demise. Comparing Figure 3 to Figure 1, we note three salient comparisons for given before-tax CP and DARPS rates. First, the DARPS floor rises when the DRD decreases. The lower DRD means that DARPS offer highly taxed investors less of a shelter, and must therefore offer *higher pre*-tax returns in order to compete with CP. Second, the after-tax DARPS return falls, since more of the dividends received are subject to taxation. Finally, the combination of the 70% DRD with the 34% marginal tax rate makes DARPS less attractive relative to CP. We can see this using the big, black boxes on the two DARPS curves in Figure 3. These boxes illustrate the marginal investor's decision, before and after the tax-law changes. The initial scenario, on the 85% DARPS curve, shows that the marginal investor's after-tax return on DARPS lies above the after-tax CP curve, so that the investor prefers DARPS. On the other hand, the after-tax DARPS return under the 70% DRD lies below the after-tax CP return.

Of course, we would not expect the same before-tax rate on DARPS under the new lower DRD/lower tax rate regime. Nonetheless, Figure 3 helps illustrate how such a regime change could decrease the suitability of DARPS for both issuers and investors.

Figure 3: Tax Reform Impact on Suitability of DARPS for Issuers and Investors

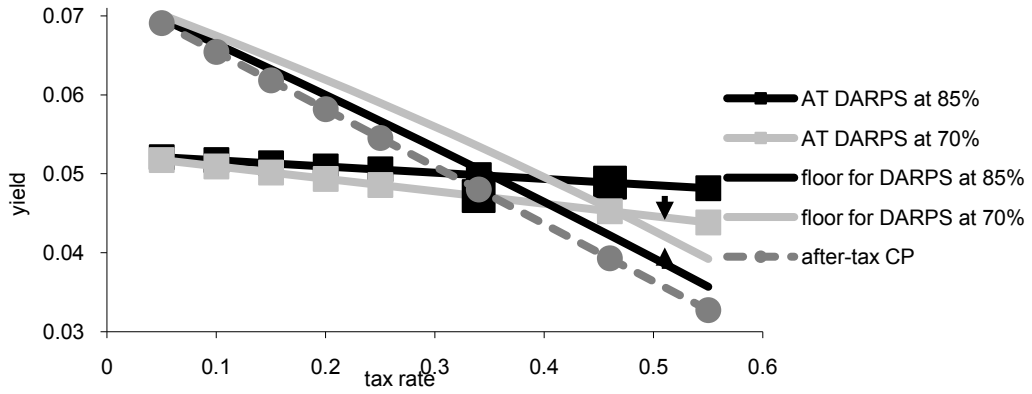


Figure 3. After the Tax Reform Act of 1986, the DRD and the marginal corporate tax rate were reduced. The net effect of these and other regulatory changes was an increase in corporations' effective tax rates. These changes reduced the benefits of DARPS for both issuers and investors. The two large black squares in the figure illustrate the result: under the original 46%/85% tax rate/DRD regime, highly taxed investors preferred DARPS. After the changes, CP was more attractive to these corporate investors. (We are assuming that the corporate investor owns less than 20% of the paying company.)

Figure 3 may also shed light on Plesko's (2005) result that the implied marginal tax rate between DARPS and CP is less than the maximum—his "muni-puzzle" equivalent. Implied lower tax rates mean a higher floor value for DARPS. It is possible that the lower implied tax rates are not a consequence of drawing lower-taxed corporations into the DARPS market as the market expands (a Miller, 1977, type of argument

that Plesko suggests), but of an increase in *individual* participation in the market (or, of course, both). Individuals would not benefit from the dividends received deduction, so would not view DARPS as a tax-advantaged security. They would therefore require a higher pre-tax return on DARPS than would corporate investors; this higher floor would then translate into a lower implicit tax rate in Plesko's analysis (see his Table 2). But why would retail investors be buying a security designed for corporate cash managers? And why were there any DARPS to buy at all, after the tax regime changes that threatened to doom them to obscurity? We discuss these questions in the next section.

THE DEBACLE OF 2008

Alderson and Fraser (1993) contend that DARPS is *exclusively* suitable for tax benefit-trading among corporations. However, this tax motivation is almost entirely absent from discussions of the recent auction-rate securities meltdown. This is undoubtedly because the $330 billion auction rate market of 2008 had become a heavily retail market. For example, by then, only 3% of auction-rate issues' collateral was "DRD-eligible" (Weaver, Bonilla, and Villasenor, 2008). More importantly, in 2008, only 35% of corporations allowed any of their short-term assets to be auction-rate securities, and only 4.9% actually had any (Lee, 2008). The market had expanded greatly, but not through traditional corporate participation. Broker-dealers had begun a concerted push to encourage individual investors to enter the market.

The problem with the shift toward individual ownership was that it implied a shift toward a complete emphasis on reaching for yield in short-term investments. Individual investors are not interested in the tax benefits from DARPS, since, for them, there are none. To expand the market by bringing in these sorts of investors, broker-dealers had to emphasize DARPS' yield advantage over money market alternatives. Some of the investors burned during the recent meltdown allege that, in so doing, the brokers neglected to mention any possible reduction in liquidity from substituting auction-rate securities for money markets.

In this section, we will describe both the supply- and demand-side changes that kept the DARPS market afloat until 2008. We start on the supply side by considering a particular type of issuer, closed-end funds, since their auction-rate issues are most comparable to the DARPS of the 1980s. We briefly describe the problems of 2008, as well as the new types of assets that are being created to mitigate them. However, the more important part of the 2008 story is on the demand side: the increased individual participation in the auction-rate market as a whole. Thus, we conclude this section by presenting evidence on the shift in the DARPS market toward retail investors, and on possible explanations for it.

The Supply Side: Issuers, the DARPS Meltdown, and the Search for Replacement Assets

On the supply side of the market, we still have issuers with relatively low tax rates. The auction rate market of the last few years has had four main issuer types: municipalities, student loan lenders, closed-end funds, and structured issuers (who back their auction-rate securities with CDOs). (See Goldsmith and Pinedo, 2008.) The municipal market is by far the largest, accounting for half of the $330 billion that the market reached at its peak in 2008. In fact, Bogert and Valenti attribute increased interest in auction rate securities to higher costs for letters of credit (required for VRDOs, which we discuss below) and the loosening of local regulations that increased the pool of municipal issuers. Municipalities and student-loan lenders tend to issue auction rate bonds, however, not preferred stock. Thus, while closed-end funds' share of the auction-rate market is relatively smaller—only $63 billion (19%) at the peak—these funds are the primary issuers of auction rate preferred stock. They therefore will be the only issuer type we will consider.

Closed-end funds' preferred shares are perpetual and usually cumulative (Lee, 2008), and are not marginable. The penalty rates for closed-end funds have been relatively low—much lower than municipal max rates, for example, which might rise 1600 basis points from a prior auction, compared to 30 bp for a closed-end fund. In fact, funds' max rates were occasionally even lower than the rates set at auction (Lee, 2008; Goldsmith and Pinedo, 2008). Closed-end funds issue preferred stock for leverage (unlike open-end mutual funds, which cannot), hoping to use the relatively inexpensive DARPS funding to magnify the return to their common shareholders. Thus, instead of tax benefit-sharing, these issuers are playing a more basic yield curve game: trying to borrow for long-term needs at short-term rates. (Using DARPS purely to allow long-term financing at short-term rates was a scheme that D'Silva, Gregg, and Marshall (2008) say we should all now see as "impossible": "If a funding instrument is long-term for one party, it must also be long-term for the counterparty.")

Fund leverage, however, must conform to a required debt-coverage ratio. The Investment Company Act of 1940 requires that funds have 200% asset coverage for preferred stock (A:PS = 2:1, or 50% leverage). Closed-end funds cannot announce or distribute dividends if their auction-rate leverage exceeds 50% (Anand, 2009). On the other hand, the coverage ratio for debt is much higher—300%. This explains why preferred stock has been so popular for these funds (and why it can be so difficult for funds to refinance their DARPS with debt, as we will see).

Closed-end funds' managers must balance the needs of both their preferred and common shareholders. In the current market upset, the former want their liquidity restored—even if the funds must sell assets to redeem the shares—while the latter want to benefit from the relatively low failure rates paid by some of the funds. We can explore this tension now by turning to consideration of the market meltdown of 2008.

In February, 2008, the auction-rate securities market froze, as hundreds of auctions failed. Investors who had believed that their investments were as liquid as money market funds suddenly realized that they could not sell their shares at auction at all, much less at par. This came as a shock—auction failures always had been extremely rare. Between 1984 and 2007, fewer than one hundred auctions had failed: 13 through 2006; 31 more in late 2007. Then came February, 2008: 67% (258 of 386) failed on the 12th, 87% on the 14th, and 66% on the 20th (CFS, 2008; Plancich and Starykh, 2008).

Before 2007, the few failures that there had been were caused by credit problems. Alderson and Fraser (1993), investigating the decline of the original incarnation of the DARPS market, found that the securities that were redeemed in the 1980s were from issuers whose credit quality had so deteriorated that their shares were no longer acceptable investments for corporate money managers. Quality problems continued to drive auction failures for over a decade after that; as recently as 2004, Skarr asserted that "[f]ailed auctions are associated with downgrades in credit quality of either the issuer or the insurer of the issue."

However, the problem in 2008 was not a quality problem. It was a liquidity problem. 2008's auctions failed because the broker-dealers who had been supporting the ARS market stopped doing so—they stopped placing their own bids to ensure that there was sufficient demand for the auction to clear. Broker-dealers' failure to support the auctions meant that investors were stuck with issues they had thought were cash equivalents. Even though investors were still receiving dividends (in fact, sometimes even high penalty dividends), they could not sell their issues at par. (However, Skarr's comment could still apply: many commentators link the rash of failures in mid-February, 2008 to downgrades to the monoline insurers who insured many ARS issues against default; see Lee, 2008.)

The Securities Industry and Financial Markets Association's (SIFMA) best practices specify that the broker-dealers have no obligation to support the market. They are not required to make an orderly market (Best Practices Subsection 4.2.1), to place bids to prevent a failed auction (4.3.5.(b)), or to offer investors

any duty "more extensive than normal dealer obligations governed by existing securities law." The Association notes, however, that "[d]ealers typically place Cover Bids to avoid a Failed Auction," and that "[t]he Association understands that Broker-Dealers routinely place Bids in Auctions generally."

This "typical" support was critical. On average, Nuveen had 25 bidders in its weekly auctions, six of whom were lead managers (CFS, 2008). More importantly, according to a report from the U.S. House of Representatives' Committee on Financial Services (CFS, 2008), between 2006 and 2008, "[n]early 85% of auctions would have failed or produced different results without the single broker's intervention" (Carolyn B. Maloney, CFS, 2008). This degree of support prompted William Galvin, Secretary of State for Massachusetts, to testify to that committee that brokers' "propping up" the market and "controlling" the rates set there led to the brokers' "foisting…securities off on unsuspecting clients" as they "unloaded" their own inventory and protected their investment banking clients, to whom they were "beholden." Galvin saw auctions like these as "fantasies," not viable rate-reset mechanisms.

The decisions by the supporting broker-dealers to allow auctions to fail has had severe ramifications for the auction-rate market. Corporate investors have suffered erosion in their asset values. All investors have lost liquidity; many have initiated lawsuits. Issuers have scrambled to create acceptable substitutes. February, 2008 may turn out to be the month that doomed DARPS to the "virtual extinction" that Alderson and Fraser (1993) had worried about fifteen years earlier.

Corporate investors whose DARPS investments are "frozen" may be forced to write them down. Statement of Financial Accounting Standards 115 (FAS 115) requires that investors recognize a decline in value when an asset has suffered an impairment that is "other than temporary." FAS 157 describes how to determine fair value, allowing investors to use internal models and/or "unobservable inputs" (i.e., a "Level III" valuation, as opposed to using actual market prices, or "Level I") when the investor cannot rely upon market quotes to determine value (that is, in situations like the current one, where trades are more "fire-sale" than "orderly," as required). Although Carfang (2008) notes that "impairments from higher quality, but illiquid, issues are likely to be resolved when the market reaches a new equilibrium," and therefore may be viewed as "temporary," he characterizes the "negligible" secondary market for auction-rate securities as populated only with "distressed sellers and vulnerable buyers." It may take a long time for the market to right itself, and there may be more losses in value in the meantime. Thus, he recommends that corporate investors value their DARPS using Level III models, and consider the decline in value as permanent—and therefore reportable under FAS 115.

While DARPS' effects on corporate investors' income statements can be painful, most of the legal and regulatory drama resulting from the market freeze has focused on getting individual investors access to their emergency funds. (We discuss retail participation in the DARPS market in the next section.) States' attorneys general have been active in seeking liquidity for small investors, with New York's and Massachusetts' AGs at the forefront of arranging settlements. (See CFS, 2008 for examples of these actions.) Settlements generally have resulted in retail investors' being made whole. Broker-dealers are buying these customers' shares at par, and are compensating investors who had already sold into the secondary market at a discount. Some customers are being offered 0% loans against the value of their shares. (These loans are significant. Remember that closed-end funds' DARPS are not marginable, which makes it difficult for brokers to help their customers by making loans against this collateral. However, FINRA has created temporary rules allowing brokers to lend up to 25% of their customers' DARPS value.) The type of relief varies depending on the characteristics of the investor, with the most generous remedies going to the smallest investors. The amounts involved are substantial; for example, the UBS settlement with New York Attorney General Andrew Cuomo includes $8.3 billion for individual investors and $10.3 billion for institutions (CFS, 2008).

In the wake of these settlements, issuers are feverishly working to refund their DARPS. Some closed-end funds have sold assets to fund redemptions. At the end of 2007, closed-end funds had $300 billion in assets; in November of 2008, the 640 extant funds had only about $200 billion (Maxey, 2008d). Most of the DARPS redemptions between March, 2008 and September, 2009 came from non-municipal finds: these funds redeemed over 80% of their issues ($27.13 billion redeemed, out of $33.33 billion outstanding as of 2/1/08), while the munis redeemed only 30% (Lawson, 2009). Overall, however, as of October, 2009, about two-thirds of the levered closed-end funds still had some DARPS outstanding (Maxey, 2009).

Asset sales alone, however, will not be sufficient to allow redemption of these remaining DARPS. Over 70% of closed-end funds use leverage to boost returns (Maxey, 2009); this strategy will continue. So far, issuers have turned to traditional forms of debt such as reverse repos, extendible notes, and bank loans or lines of credit to replace DARPS. However, these sources of leverage have not been sufficient. For example, municipal closed-end funds, which pay lower rates on their DARPS, could face much higher costs if they replaced them with bank loans (Maxey, 2008b). Also, closed-end funds that enjoyed the 2:1 coverage ratio with DARPS are wary of the 3:1 ratio required for debt. These sorts of considerations have driven the search for new types of leverage.

The financing innovations that seem to hold the most promise involve "hard puts"—the ability of an investor to *require* the issuer's agent to buy back her asset at par. Of these, tender option bonds and variable-rate demand obligations are generating the most interest.

In fall of 2008, several fund sponsors, such as Nuveen Investments, announced their intention to redeem their DARPS with variable-rate, credit enhanced bonds (tender option bonds, or TOBs). (See Goldsmith and Pinedo, 2008.) In October, the SEC allowed Eaton Vance to use the 2:1 coverage ratio for a TOB issuance, making TOBs a more attractive refunding option than they would be at the usual 3:1. TOBs are less expensive for issuers than alternatives such as VRDP (discussed below), but these bonds must be of high quality to be acceptable substitutes for investors (Maxey, 2009). This quality hurdle for bonds is motivating the search for new preferred-stock securities for DARPS refunding.

Closed-end funds wishing to refinance their DARPS with preferred stock have created variable-rate demand preferred, VRDP (the preferred-stock version of the variable rate demand obligation, VRDO). (Eaton Vance, which first started creating these with the SEC's blessing in June of 2008, calls them liquidity protected preferred shares, or LPPs; others have dubbed them liquidity enhanced adjustable rate securities, or LEARS. See Goldsmith and Pinedo, 2008.) Issuing VRDPs is the exclusive province of closed-end funds (CFS, p. 53). This puttable preferred is backed by a letter of credit and has a hard put. The put can only be exercised at a remarketing date (a dividend reset date, where the allocation and rate setting process is handled by a remarketing agent) or in the event that the liquidity facility cannot be renewed. Not allowing the investor to exercise the put on demand preserves the equity status of the investment, according to the IRS. On the other hand, the VRDPs' credit enhancement makes them eligible for ownership by money market mutual funds, significantly expanding the market for these assets. (The SEC's Rule 2a-7, the rule that provides guidelines and restrictions for money funds, requires a hard put or tender option to ensure safety.) However, importantly, these shares may only be purchased by qualified institutional buyers (Lawson, 2009).

Adding hard puts allows issuers to create assets investors will buy. However, closed-end funds must still find entities willing to backstop these new issues. As we noted earlier, during the 1980s, the S&L crisis and resulting thrift reform meant that institutions had to sell assets from off-balance sheet entities, shrinking their asset bases to improve their capital positions. Today's banks are also feeling balance sheet pressure, some of which stems from writedowns caused by the subprime mortgage debacle. As banks

work to reduce their own leverage, they are less willing to provide the types of credit enhancements needed for funds trying to refund their DARPS with VRDPs.

This reluctance is being expressed through banks' embrace of a new wrinkle: the six month "put-back-to." IRS Notice 2008-55 allows a liquidity provider to require the issuer to redeem securities after the liquidity provider has held them for six months. ("[A] liquidity facility for auction rate preferred stock may include an agreement by the issuer of the auction rate preferred stock to redeem the stock purchased by the liquidity provider under the liquidity facility after a minimum holding period of six months and after continuous good faith efforts to resell the stock in the periodic auctions at a price equal to the liquidation preference"; Bishop, 2008; IRS, 2008.) The Investment Company Institute (ICI) believes that banks are now unwilling to provide liquidity without this assurance. They note that, as of September 2009, the $500 million of DARPS' redemptions for VRDP were all effected more than a year earlier—in early August of 2008—only a few weeks after the June 13 effective date of the IRS notice. Those early issues did not require the six-month "put-back-to." However, no further VRDP redemptions had occurred, which the ICI attributed to banks' requiring the option. The group also enumerates other obstacles to refunding, noting that banks must "undertake comprehensive due diligence," including "addressing numerous legal and regulatory questions, as well as confirming compliance with internal capital and risk management standards" (Lawson, 2009). Nonetheless, they expect that the ultimate amount of VRDOs from these redemptions could total $10 billion.

Thus, in the wake of the auction-rate securities' meltdown, issuers are busy cleaning up their messes and scrambling for new ways to play the same game. The more interesting story, however, is on the other side of the market: the demand side. Who was buying the securities that imploded, and will they be participants in the retooled, hard-put market? We consider these questions in the next section.

The Demand Side: Retail Investors and DARPS

DARPS were created to help corporate cash managers capitalize on the dividends received deduction. However, by the time the market imploded in 2008, individual investors were heavily involved with DARPS. How did assets like these end up storing individuals' emergency funds?

We noted earlier that hints of individual ownership in the preferred stock markets have been around for years. For example, a *Wall Street Journal* article from late 2001 (Opdyke, 2001) highlights some financial planners who tout traditional preferred stock for their retail clients. The article does note that the vast majority of preferred is held by institutions, not individuals, that preferred stock represents just a sliver" of the size of the market for common stock, and that finding information on individual preferred issues can be like a "treasure hunt." It also clearly notes that, even for plain-vanilla preferred, liquidity risk is an issue: "they aren't appropriate investments for people who may need to quickly liquidate their holdings." (This liquidity risk is secondary, however, to credit risk, but the article assures us that individual investors can easily find "highly rated securities of stable companies generating plenty of cash"—like Bear Stearns.)

By 2004, there was more emphasis on retail investors, albeit wealthy ones. For example, Skarr (2004) asserts that auction-rate securities' investors "are typically high net worth individuals (for tax-exempt issues) or corporations (for taxable issues)." Lee (2008) concurs, and notes that closed-end fund investors in particular "are individuals who 'tend to have much greater household financial assets than either individual stock or mutual fund investors'" (citing an Investment Company Institute study). In 2008, an article in *The Economist* ("Kicked in the ARS," 8/16/08) asserted that there were around 100,000 retail investors is auction-rate securities, and that they were "well-to-do types and thus clued up enough to understand that higher yields suggest higher risk."

Susan Merrill, Executive Vice President and Chief of Enforcement at the Financial Industry Regulatory Authority (FINRA), testified at a hearing of the Congressional Committee on Financial Services that a survey of over 200 firms determined that by 2008, 43% of auction rate securities were held in retail investors' accounts, and another 21% were held by high net-worth individuals (CFS, 2008). (Linda Thomsen, Director of Enforcement for the SEC, testifying at the same hearing, agreed that there were more retail than institutional investors in the market, but said that the dollar holdings were split about equally.) Ms. Merrill described the evolution of the market toward the individual investors this way: "…the market actually started out as a more institutional market, and over time the issuers allowed a smaller amount to be the minimum that you could invest in an auction rate security, and once that amount got down to about $25,000, that is when you started to see more retail investors buying the product and the broker/dealer firms marketing to more retail investors."

A par value of $25,000 is significantly less than what DARPS had when it was purely an institutional product; as Alderson and Fraser (1993) note, the typical "auction exchange value" for DARPS originally was $100,000. Why the push to expand the market? Again, testimony submitted to the Committee on Financial Services (CFS, 2008) offers some insights. According to Frank J. Parker, Professor of Real Estate Development at Boston College: "[i]n the rush to keep these instruments solvent the large financial institutions involved went to the highways and byways to attract virtually anyone and everyone of individual high net worth to purchase these instruments." Similarly, the Congressional Research Service reported at the same hearing that auction-rate issues were "sold principally to retail investors," especially after "some large investment banks began to market [auction rate securities] more aggressively to small investors in an attempt to reduce their inventories" (citing the complaint in *Cuomo v. UBS Securities LLC et al.*).

Broker-dealers had built up these inventories by supporting the auction market with their own bids. However, as the subprime market problems began to spread, investors became increasingly wary of risky investments; there was a general reassessment of credit risk, and ultimately a rash of credit downgrades. Given that the DARPS market is highly credit-sensitive (see Alderson and Fraser, 1993), increased risk aversion led investors to retreat from the DARPS market. Dealers' inventories of DARPS became so large that continued support became untenable. To divest their holdings, these dealers had to make a concerted effort to market DARPS as a cash equivalent to individual investors.

These retail investors may have been anxious for a good quasi-cash alternative. Alderson and Fraser (1993) note that, unlike ARPS, DARPS were popular in the 1980s when interest rates were high. These authors expected that the benefits of this novel security for both issuers and investors would be smaller when rates were lower. Ironically, however, the recent extremely low level of rates is one of the factors that undoubtedly attracted individual investors to DARPS over the last few years, as they moved away from traditional CDs and money-market assets in search of higher yield.

Engel, Erickson, and Maydew (1999) assert that "investors are reluctant to purchase exotic-sounding securities… unless they receive a slightly higher yield." DARPS offered that yield, and thus may have seemed attractive to retail investors. However, DARPS were not money market instruments—in fact, money market funds were prohibited from owning them. We believe that DARPS were *sold* to retail investors. Maxey (2008c) notes that at UBS, financial advisors received part of the 25 bp DARPS management fee as a commission for selling these securities, but received nothing for putting their clients into the firm's money market fund. These fees, undoubtedly, were part of the "substantial incentives" that motivated advisors to sell auction rate securities, according to Massachusetts' Secretary of State William Galvin. In 2006, the SEC sanctioned 15 broker-dealers for "irregularities" in the auction-rate market, including failures to disclose to investors that dealer bids were supporting many auctions (CFS, 2008). Downplaying the liquidity risk of auction-rate securities allowed these dealers to expand the market. The broker-dealers are anxious to continue this expansion, even in the wake of DARPS'

meltdown: as closed-end funds replace their DARPS with LPPs, the chief investment officer for Eaton Vance says that, "The hope is to open up a much larger market for LPPs than ever existed for auction-rate preferred shares" (Maxey, 2008a).

CONCLUSION

DARPS was created in the 1980s to accommodate corporate cash managers who wanted a less volatile dividend capture strategy. The focus then was on the dividends-received deduction: corporate investors wanted to benefit from their unique ability to shelter 85% of their dividends from taxes. They just needed to be protected from the volatility inherent in preferred shares. As DARPS have been marketed more heavily toward retail investors in recent years, the original DRD motivation has been eclipsed by a focus on DARPS' cash-management possibilities. However, without the DRD, these possibilities—originally just a means to an end—have proved too risky. Not surprisingly, DARPS have not performed well in a role for which they were never intended.

In this paper, we review the traditional role of DARPS as a way for lightly taxed issuers and fully taxable investors to trade tax benefits. This perspective is critical for understanding the meltdown of the market in 2008. There have been changes on both the supply and demand sides of this market since its inception, although the latter are more pronounced. As long ago as 1993, Alderson and Fraser wondered if DARPS were a market-enhancing innovation or "a 'speculative balloon' slated for virtual extinction." Their question was prompted by changes in regulatory and tax changes that made DARPS less attractive to both issuers and corporate investors. They concluded that DARPS could still add value, but only to "a market that is too small to be of consequence." The market did survive, however, because of a concerted effort by broker-dealers to expand it to retail investors. This expansion toward counterparties for whom the security was not designed corresponds with the value shift that Plesko (2005) documents: DARPS went from offering benefits to both issuers and investors (as documented by Alderson, Brown, and Lummer in 1987), to benefitting issuers almost exclusively.

We conclude that this shift toward retail investors was a failure. James Preston, President and CEO of Pennsylvania Higher Education Assistance Agency, testified to the U.S. House of Representatives' Committee on Financial Services that "the auction rate market is not a viable product now or in the future. If it does come back, it will have to come back as a specific, *institutional* product where the risks are clearly understood and they are willing to hold it" (CFS, 2008; emphasis added). Future research, informed by the outcomes of the numerous ongoing lawsuits and regulatory actions investigating the auction-rate collapse, may be able to determine the relative contributions of ignorance and malfeasance. It will also be important to track the performance of the new securities being substituted for DARPS, especially those with hard puts, to assess their ability to accommodate the needs of both issuers and investors.

More importantly, future research will need to untangle the regulatory mishmash that has been created to clean up the auction-rate mess. Carfang (2008) described DARPS' structure as an amalgam of "periodic auctions, bizarre fail-rate formulas and myriad caps, maximums, exclusions and look-back provisions—which combine to challenge even the most astute treasurers and CFOs." However, what we may get instead could be even worse. Now, DARPS issued by closed-end funds is accepted as collateral at the discount window, even though the Fed considers it a hybrid debt/equity security. Now, VRDOs are considered equity for tax purposes, and yet are acceptable investments for money market funds. Now, we allow closed-end fund leverage from debt to have the same 2:1 coverage ratio as leverage from preferred stock. Appreciating the origins of DARPS as a corporate tax benefit-sharing mechanism may help individual investors evaluate the risks of the convoluted system arising to replace it. Trying to keep DARPS alive when its environment had died turned DARPS into a "financial roach motel"—an

investment investors to get into, but not out of (Spencer Bachus, CFS, 2008). Not understanding that mistake may mean we are doomed to repeat it.

REFERENCES

Alderson, Michael J., Keith C. Brown, and Scott L. Lummer (1987) "Dutch Auction Rate Preferred Stock," *Financial Management*, vol. 16(2), Summer, p. 68-73

Alderson, Michael J. and Donald R. Fraser (1993) "Financial Innovations and Excesses Revisited: The Case of Auction Rate Preferred Stock," *Financial Management*, vol. 22(2), Summer, p. 61-75

Anand, Shefali (2009) "Pimco's Auction-Preferred Shift, *Wall Street Journal*, 3/2

Bishop, Alfred C. (2008) "Auction Rate Preferred Stock—Effect of Liquidity Facilities on Equity Character," Internal Revenue Service Notice 2008-55, 6/13

Bogert, Tom, and Jennifer Valenti, "Variable Rate Debt Options: Auction Rate Securities," Bank of New York, undated presentation

Carfang, Anthony J. (2008) "Turbulent Markets Create ARS Management Challenges," *Financial Executive*, June

Committee on Financial Services (CFS, U.S. House of Representatives, 2008), "Auction Rate Securities Market: A Review of Problems and Potential Resolutions," Serial No. 110-140, September 18

D'Silva, Adrian, Haley Gregg, and David Marshall (2008) "Explaining the Decline in the Auction Rate Securities Market," Chicago Fed Letter, Number 256, November

Engel, Ellen, Merle Erickson, and Edward Maydew (1999) "Debt-Equity Hybrid Securities," *Journal of Accounting Research*, vol. 37(2), Autumn, p. 249-274

Erickson, Merle M. and Edward L. Maydew (1998) "Implicit Taxes in High Dividend Yield Stocks," *The Accounting Review*, vol. 73(4), October, p. 435-458

Goldsmith, Mara and Anna Pinedo (2008) "A Market Being Replaced," Morrison and Foerster, September

Houston, Arthur L. and Carol Olson Houston (1990) "Financing With Preferred Stock," *Financial Management*, Autumn, p. 42-54

Internal Revenue Service (IRS) (2008) "Auction Rate Preferred Stock: Effect of Liquidity Facilities on Equity Character," Internal Revenue Bulletin 2008-27, 7/7

"Kicked in the ARS: Auction-Rate Securities" (2008) *The Economist*, 8/16

Lawson, Keith (2009) "Auction Rate Preferred Stock—Extension of Notice 2008-55," Investment Company Institute Memorandum, 9/4

Lee, Stephanie (2008) "Auction Rate Securities: Bidders' Remorse? A Primer," NERA Economic Consulting, 5/6

Maxey, Daisy (2008a) "Help Nears for Auction-Rate Holders," Wall Street Journal, 6/17

Maxey, Daisy (2008b) "When 'Preferred Holders Come Second: In Auction-Rates, Some Funds Choose Not to Redeem, Protecting Common Shares," *Wall Street Journal*, 6/24

Maxey, Daisy (2008c) "In Auction Securities Crisis, Are Brokers the Victims, Too?" *Wall Street Journal*, 9/8

Maxey, Daisy (2008d) "Closed-End Funds Feeling the Stress," *Wall Street Journal*, 9/8

Maxey, Daisy (2009) "Closed-End Funds Still Feel the Pinch," *Wall Street Journal*, 10/9

McConnell, John J. and Alessio Saretto (2009) "Auction Failures and the Market for Auction Rate Securities," working paper, April

Miller, Merton H. (1977) "Debt and Taxes," The Journal of Finance, vol. XXXII(2), May, p. 261-273

Morse, Joel N. and James W. Johnson (1994) "Returns from Hedged Dividend Capture Programs and Dutch Auction Rate Preferred Stock," *Financial Management*, Spring, p. 11-12

Opdyke, Jeff D. (2001) "Low-Key Preferred Stock Could Ease the Low-Yield Blues," *Wall Street Journal*, 10/15

Pan, Lance (2005) "Forecasting a Perfect Storm: New Developments Aggravate the Potential Fall of the Auction rate Securities Market," Capital Advisors Group Research, 3/1

Plancich, Stephanie and Svetlana Starykh (2008) "2008 Trends in Securities Class Actions," NERA Economic Consulting, December

Plesko, George A. (2005) "Tax Effects in the Market for Auction Rate Preferred Stock," working paper presented at the University of Illinois Tax Research Symposium IX

Schall, Lawrence D. and Charles W. Haley (1986) *Introduction to Financial Management*, 4th edition, McGraw-Hill, New York

Securities Industry and Financial Markets Association (SIFMA, 2007) "Best Practices for Broker-Dealers of Auction Rate Securities"

Skarr, Douglas (2004) "Auction Rate Securities," Issue Brief, California Debt and Investment Advisory Commission, August

Weaver, Jeffrey L., Julio C. Bonilla, and Paolo L. Villasenor (2008) "An Overview of the Auction Rate Market: Where We've Been and Where We're Going," Wells Capital Management, May

Willens, Robert, Andrew R. Biebl, and Marianne Burge (1990) "IRS Rules on Auction Rate Preferred Stock," *Journal of Accountancy*, June, p. 29-30

Wilson, Richard S. (1986a) "Adjustable Rate Preferred Stocks," in Floating Rate Instruments, ed. by Frank J. Fabozzi, Probus Publishing Company, Chicago

Wilson, Richard S. (1986b) "Money Market Preferred Stock," in *Floating Rate Instruments*, ed. by Frank J. Fabozzi, Probus Publishing Company, Chicago

Winger, Bernard J., Carl R. Chen, John D. Martin, J. William Petty, and Steven C. Hayden (1986) "Adjustable Rate Preferred Stock," *Financial Management*, Spring, p. 44-57

Winkler, Daniel T. and George B. Flanigan (1991) "Default Risk Premia in the Near-Cash Investment Market: The Case of Auction Rate Preferred Stock Versus Commercial Paper," *The Journal of Financial Research*, Vol. XIV(4), Winter, p. 337-343

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EVIDENCE ON EFFECTIVE TAX RATES IN THE CZECH REPUBLIC

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ABSTRACT

The paper describes the development of the effective tax of natural persons in the Czech Republic. The analysis covers the period from 1993 to 2009. Two categories of taxpayers are compared: the first a single childless taxpayer, the other a family with two children, where only one spouse earns incomes. The results of the analysis clearly show a gradual, but not steady, decrease in effective tax rates for both categories of taxpayers. For single taxpayers, the effective tax rate decrease is in direct proportion with the amount of tax base. For married taxpayers the effective tax rate decrease is relatively steady for the whole time interval.

JEL: H2; K3; P2

KEYWORDS: Effective tax rate, development, incomes from enterprise, natural person, Czech Republic

INTRODUCTION

The Czech Republic, a relatively small European country, has been classified as a transformation economy. At the beginning of the 1990s, the Czech Republic was a part of the Czech and Slovak Federative Republic. Since 1993 it has been an autonomous country. It has since undergone a number of significant social and economic changes. The ultimate result was transformation from a centrally planned economy to a free market economy. Žídek (2006, p. 4) points division of opinions on the appropriate classification of the previous economic system. Some argue it should be classified as a centrally planned economy, while others argue it should be classified as a biased free market economy. Nevertheless, the extent, importance, and impact these changes had on the Czech economy was, and remains, fundamental and indisputable.

In the context of the abovementioned changes, new opportunities opened for natural persons in the in the form of enterprise and practice of independently gainful activities. Frequent and crucial changes took place during the development, not only in the categorization of these incomes for the purposes of the Trades Licensing Act (see Act No. 455/1991 Coll., on Trade Licensing), but also in the follow-up financial laws, particularly in the Act No. 586/1992 Coll., on Income Taxes (hereinafter Act on Income Taxes). A feature of the latter act, which represents the basic rights and obligations of taxpayers concerning the income taxes of natural persons and legal entities, is its high frequency of changes including changes in nominal tax rates, nontaxable parts of the tax base and tax abatements.

This paper is concerned with the development of the effective tax rate, which represents the impact of relevant regulation on a taxpayer. It is an undisputable fact that a taxpayer primarily perceives the nominal tax rates most dramatically. However, due to other factors such as nontaxable parts of the tax base or eventual tax abatements, nominal tax rates say very little about the amount of real tax burden.

The paper is divided into several parts. The first section gives a brief introduction. Section 2 contains the findings from the literature research that has been carried out regarding the so-called effective tax rate and other related questions. Section 3 gives a general introduction of the Czech Act on Income Taxes. Section 4 lists starting points for the constructed mathematical models, on the base of which the amount of effective tax rate for the taxable periods and the defined categories of taxpayers in focus has been

determined. Section 5 focuses on the presentation of graphical outputs of the mathematical models and on the analyses of acquired results. The last part of the paper, Section 6, includes conclusion, and emphasizes certain relevant questions.

LITERATURE REVIEW AND BACKGROUND

A common way to measure relative tax burden is the coefficient of the effective tax rate. The coefficient of the effective tax rate, can be used to determine the portion of payments from the total income. This coefficient has advantages compared to simple coefficients of nominal tax rates, as it also takes into account other factors including nontaxable parts of the tax base and tax abatements.

The basic classification of the indicators for effective tax burdens are listed in Schratzenstaller (2005, p. 91 et seq.). This author identifies two basic concepts of tax burden: Calculation of fictitious measures (estimation of the tax burden based on tax codes and tax rates); and Determination of factual tax rates using statistical data on tax payments. Schratzenstaller (2005, p. 93) presents a number of generally valid conclusions regarding both the corporate and personal effective tax rates. The author emphasizes the amount of tax duty is determined partly by tax rate and by taxable income, the latter showing considerable differences in individual countries. It is therefore safe to say that diverse statutory tax rates do not necessarily imply a different tax burden. And, vice versa that identical statutory tax rates necessarily lead to the same level of effective taxation. Široký also highlights this fact (2009, p. 61 – 62), however, from a slightly different point of view. In general, there are a substantial variations in the manner of determining taxable income. These factors are probably the main reason why little attention is paid to international comparison of the effective tax rates for natural person income.

The literature show that the effective tax rate generally receives considerable attention in the literature, however, not in connection with the aforementioned types of incomes of natural persons. Topics such as the effective tax rates in the case of corporate taxation, determination of the effective tax rates for investments, or the US tax system and its individual taxes, have been widely discussed. Bell and Kirschner (2009) deal with problems of effective property tax rates. In relation to the effective tax rate, attention is paid also to specific fields such as, bilateral effective tax rates. Loretz (2007) amplifies the findings of Devereux and Griffith on this topic and identifies variables that have influence on the amount of bilateral effective tax rates. In connection with the assessments of the tax questions regarding competition of the individual countries tax systems come into focus. In this respect, the question of coordination and cooperation in the field of taxes in the European Union is being widely discussed (Cnossen, 2003); (Zodrow, 2003).

Czech Act on Income Taxes Overview

The field of regulating direct taxes in the member states of the European Union is, in particular, an expression of the sovereignty of individual member states which have retained a larger element of autonomy in this field. The Act on Income Taxes came into force on January 1,1993 and was subsequently modified. Nevertheless, some principals and fundamental regulations are remain unchanged, including the classification of natural person incomes.

Incomes of natural persons from enterprise and from other independently gainful activities are one of the five basic income types distinguished in the Act on Income Taxes. The basic income categories are: a) incomes from employment and function benefits (§ 6); b) enterprise incomes and incomes from other independently gainful activities (§ 7); c) incomes from capital assets (§ 8); d) lease incomes (§ 9); e) other incomes (§ 10).

In connection with the abovementioned income categories, we recognize the so-called partial tax bases. The analysis was based on the premise that the only income of the taxpayer are the forms of income provided for in § 7 of the Act on Income Taxes, wherefore this partial tax base forms the total tax base of the income tax of natural persons. Frequent and often fundamental changes in the nominal tax rates (see Appendix 2). Changes in incomes included in the partial tax base, tax acknowledgeable expenses and changes in the nontaxable parts of the tax base amount or in abatements notwithstanding and conceptual changes were made in the years 2005, 2006 and 2008.

In 2005, the nontaxable part for children was abolished and transformed into the so-called tax allowance (provision § 35c of the Act on Income Taxes). This tax allowance can be, in compliance with the terms provided by law, claimed in the form of tax abatement, tax bonus, or tax abatement and tax bonus. A tax bonus is in principle an amount that can be rightfully requested by the taxpayer from state, if the amount of their tax duty before claiming the tax allowance for a child is lower than the tax allowance amount for a child. In contrast with the previous state, taxpayers could only reduce their partial tax base. A major change took place, because high claims often accrued for families with low income and several children (the maximum accruable amount made CZK 30,000 in the years 2005 – 2007; while it makes CZK 52,200 in 2008 – 2009).

In 2006, transformation of nontaxable parts of the tax base pertaining to the personal status of a taxpayer took place (e.g. nontaxable part for taxpayer, nontaxable part for incomeless spouse, nontaxable part due to disability of the taxpayer or due to the student status of the taxpayer). These nontaxable parts of the tax base were transformed into the form of tax abatements and transformed from § 15 of the Act on Income Taxes into the newly stipulated § 35ba of the Act on Income Taxes. A number of nontaxable parts of the tax base, however, remained in § 15 of the Act on Income Taxes (the data in brackets represent the year of their stipulation in the Act on the Income Taxes). These are namely the payments regarding gifts (since 1993), interests on credit from building saving and on mortgage credit (since 1998), pension additional insurance (since 1999), private life insurance (since 2001) and remunerations of tests verifying the results of further education (since 2007).

A completely fundamental change in the field of income taxation of natural persons became effective on January 01, 2008, when, among others, the flat tax rate amounting to 15% was introduced, and taxpayers with the respective income types had to face the removal of social and health insurance payments as provided by law from tax effective expenses.

DATA AND METHODOLOGY

This paper aims to take a closer look at the development of the effective rate of natural person income taxes for incomes attained through enterprise and other independently gainful activities in the Czech Republic since 1993. While emphasizing the implication of the impact and changes in basic nontaxable parts of the tax base and tax abatements (see Appendix 1). Deductible items of the tax base, other nontaxable parts of the tax base and other tax abatements were not considered in the mathematical models. For this reason, the final effective tax rate magnitudes can be perceived as being at the top limit, because exercising any further item listed in the preceding sentence would lead to its decrease.

The basis for the analysis is the formulation of the effective tax rate by means of discrete functions. In these functions the amount of gross tax base, that is tax base before claiming the above specified nontaxable parts of the tax base, and the amount of nominal tax rate and the amount of nontaxable parts of the tax base, tax abatements, represent the independent variables. The form of the mathematical model itself naturally reflects the respective legal regulation, which is determined from the view of particular content and the form of the function.

Two categories of taxpayers have been analyzed. These are those taxpayers who bear the highest and the lowest relative tax burden under the chosen circumstances. The first group, representing taxpayers with the highest effective tax rate are single childless taxpayers. A family with two dependent children, where only one spouse attaints incomes, represents the second category of taxpayers. The choice of exactly two children in the family has been made with respect to the fact that this number is representative with regard to the demographic development in the Czech Republic (Czech Statistical Office). For the sake of completeness, future research should examine families with varying numbers of children. The constructed mathematical models for both categories of taxpayers come out of the starting points and simplifications listed in Table 1.

Table 1: List of Starting Points and Simplifications for Mathematical Models

Starting Points and Simplifications for Constructed Mathematical Models
The taxpayer is a tax resident of the Czech Republic.
The incomes from enterprise and from other independently gainful activities are the only incomes of the taxpayer.
The lowest considered tax base is the amount of CZK 96,000, which equals the minimum monthly wage amounting to CZK 8,000 (the presented minimum wage amount has been valid since 2007); according to the exchange rate as of 30.09.2009 (CZK 17.178 for 1 USD), this represents the yearly tax base amount of USD 5,589.
The existence of minimal tax base was not taken into account. For taxable period of the years 2004 – 2007 the Act on Income Taxes contained an article (§ 7a) that stated conditions on which a taxpayer was obliged to figure out his tax liability from the minimal tax base in case his real tax base had been lower than by the law stated minimal tax base.
A step-by-step change for the purposes of discrete tax burden function is the change of the tax base by CZK 12,000 a year, which equals the amount of USD 699 according to the exchange rate as of 30.09.2009.
The highest tax base considered is the amount of CZK 1,200,000 (according to the exchange rate as of 30.09.2009, this represents the amount of USD 69,857).
The performance of the activity is being realized during the entire taxation period (the calendar year for natural persons). Taxpayers claim the following basic nontaxable (or tax abatements): for taxpayer; for incomeless spouse; for dependent children.
The tax burden amount for the years 1993 – 2008 was determined according to the state as of 31.12., and for the year 2009 according to the state relevant and effective as of 30.09.2009.

This table shows the development of the tax system in the Czech Republic. Computation of the effective tax rates is based on a number of simplifications. One is a disregard of the minimal tax base. Since the lowest considered amount of CZK 96,000 is lower than the minimal tax base, the "real" effective tax rate should be higher for the taxable period 2004, 2005, 2006 and 2007. However, there is set of conditions and exemptions for the application of this institute. Hence, some abstraction is expected.

The effective tax rate as seen in this paper corresponds to the relative tax burden, which is defined as the amount of tax duty provided for in the Act on Income Taxes (see § 16) against the tax base before the deduction of nontaxable parts of the tax base. Thus it corresponds to the concept presented by Široký (2008, p. 3) and can be sorted into the "fictitious tax burden" category, which assesses the tax burden indirectly based on the tax law analysis (see Schratzenstaller, 2005, p. 92). The effective tax rate can be mathematically expressed as follows:

$$ETR = \frac{T}{TB} \text{ x } 100 \text{ [\%]} \qquad (1)$$

where T (*Tax*) is the final tax duty [in CZK] determined according to § 16 of the Act on Income Taxes after the deduction of possible abatements and allowances and TB [in CZK] is the tax base before the nontaxable parts have been claimed. This choice of the tax base is not random. It aims to remove potential distortion resulting from the fact that the basic nontaxable parts of the tax base related to the person of the taxpayer have been relatively recently transformed into the form of tax abatements. For the sake of completeness, it is appropriate to note that social and health insurance are sometimes also included in the coefficient T for the purpose of determining the effective tax rate. However, this is not

considered here as this paper aims to describe purely the changes laid down in the Act on Income Taxes. Based on the abovementioned, four basic model groups can be identified. The time validity of the models and the basic procedure of setting the tax liability corresponding to them are stated in Table 2.

EMPIRICAL RESULTS

The results of the analysis are presented in the form of figures and relevant comments. Attention has been given to the step-by-step comparison of the effective tax burden and to the identification of reason for its changes.

Table 2: Basic Conceptual Models for Setting Tax Liability

Validity of the Model	Procedure of Setting the Tax Liability
From 1993 to 2004	difference between incomes and expenses forms the tax base
	tax base is reduced by nontaxable part (nontaxable parts) of the tax base
	tax duty is determined according to the tax base reduced by the nontaxable part (nontaxable parts) of the tax base in compliance with § 16 of the Act on Income Taxes (progressive tax rate)
In 2005	difference between incomes and expenses forms the tax base
	tax base is reduced by nontaxable part (nontaxable parts) of the tax base
	tax duty is determined according to the tax base reduced by the nontaxable part (nontaxable parts) of the tax base in compliance with § 16 of the Act on Income Taxes (progressive tax rate)
	in case of taxpayer with dependent children, tax allowance for children will be claimed
From 2006 to 2007	difference between incomes and expenses forms the tax base
	tax duty is determined based on the tax base in compliance with § 16 of the Act on Income Taxes (progressive tax rate)
	the calculated tax is reduced by tax abatement (abatements) and tax allowance for dependent children
From 2008 to 30. 09. 2009	difference between incomes and expenses forms the tax base
	tax duty is determined based on the tax base in compliance with § 16 of the Act on Income Taxes (flat-rate tax)
	the calculated tax is reduced by tax abatement (abatements) and tax allowance for children

This table shows how tax computations have developed in the Czech Republic. Although the methods of calculating the final tax duty in the last two models are practically identical, both are presented to point out the difference in the tax conception in § 16 of the Act on Income Taxes, drafted as a flat tax rate since 2008. It would be possible to perform another division within the existing models regarding the second category of taxpayers, family with two dependent children and only one gainful spouse, namely due to the application of § 13a of the Act on Income taxes, which contained the institute of tax calculation from the joint tax base of the spouses. The author of the paper does not mention these, he merely notes that while constructing the mathematical models for the years 2005 – 2007, the application of § 13a of the Act on Income Taxes has been considered.

Effective Tax Rate of Single Childless Taxpayers

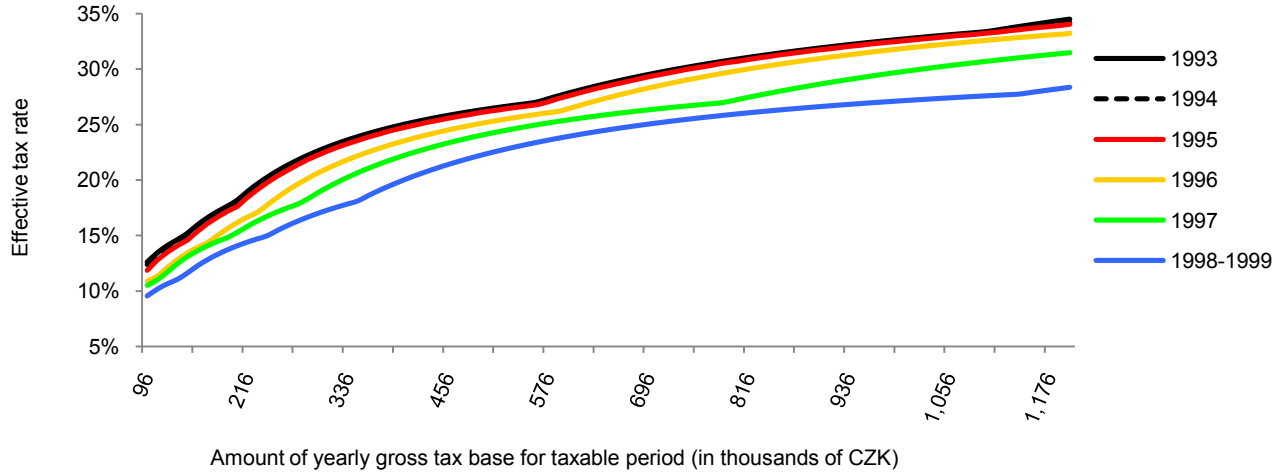
The development in taxation of natural persons for single childless taxpayers is analyzed in this section. Two time periods are analyzed: 1993 – 1999 and 1999 – 2009 The categorization considers the fact that there were no changes in the Act on Income Taxes in the magnitudes in focus during some years for the single childless taxpayer.

Families with Two Children and only One Gainful Spouse

A range of regulations that support families with children can be traced in the Czech Republic. Among the most visible, the social benefits system is frequently the subject of discussions. However, tax concessions for children do not fall behind in significance. Tax concessions for children took the form of a nontaxable part of the tax base until 2004 and took the form of a tax allowance since 2005.

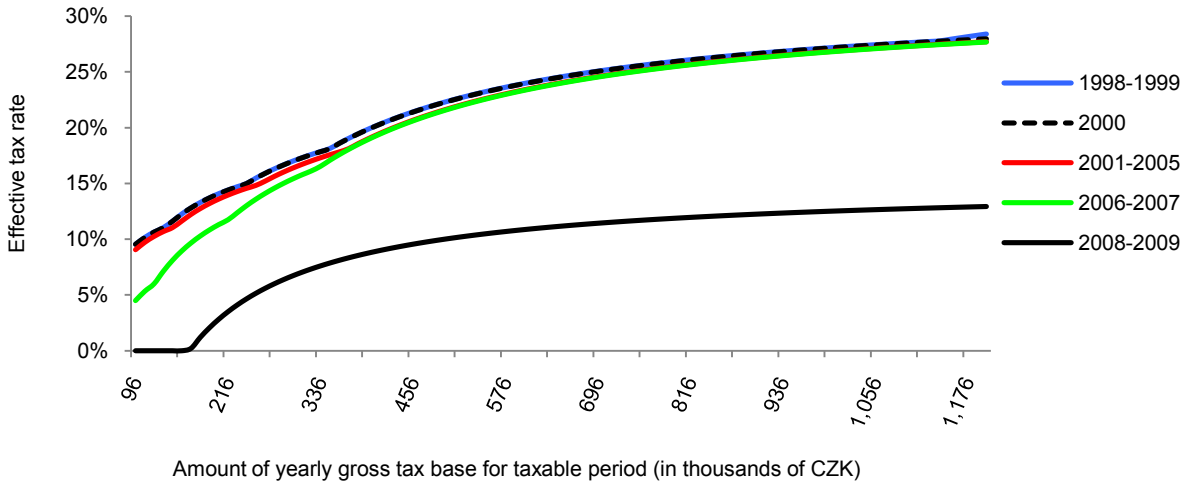
The Act on Income Taxes also offers concessions for families with spouses that are not gainfully active or achieves a minimal income level. The Act on Income Taxes allows tax calculations from the joint tax base of the spouses. This concept was advantageous in the case when one spouse was attaining high incomes,

Figure 1: Effective Tax Rate of Single Childless Taxpayers (years 1993 – 1999)



This figure shows development of tax rates from Development in the years 1993 – 1999. It shows a gradual decline of the effective tax rate in the scope of the entire yearly tax base. The effective tax rate in the years 1994 and 1995 displays an almost negligible change in comparison with the year 1993. This results from the fact that there has been only a very slight increase of the basic nontaxable part of the tax base for taxpayer in 1994 (from CZK 20,400 to CZK 21,600) while only the nominal tax rate in the highest brackets has decreased by 3 %. In the years 1996, 1997 and 1998 changes in both the nominal tax rates and the nontaxable part of the tax base for taxpayer took place in favor of taxpayers.

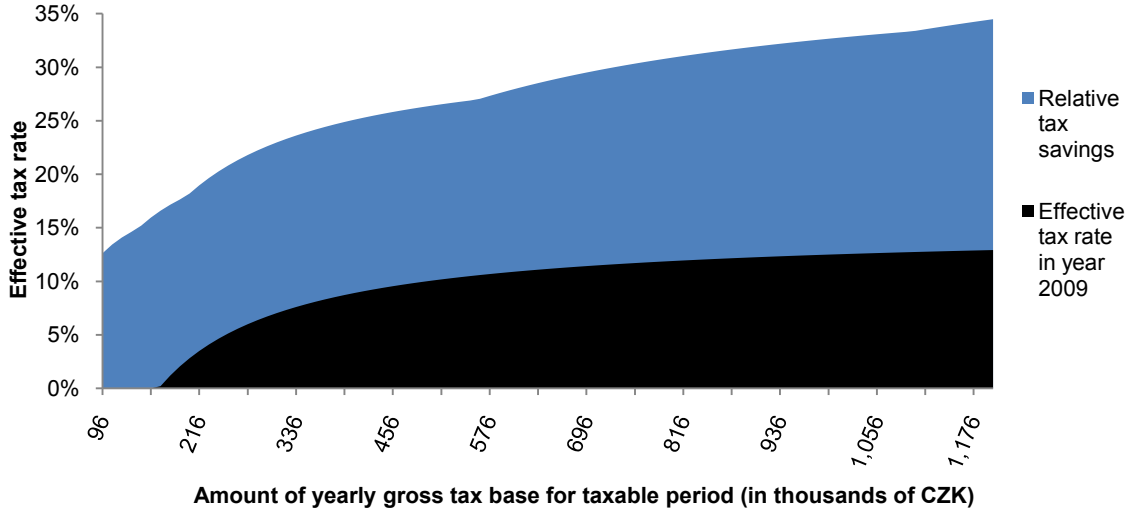
Figure 2: Effective Tax Rate of Single Childless Taxpayers (years 1999 – 2009)



This figure shows taxation development in the years 1999 – 2009. The figure shows a decrease in the effective tax rate. A radical change took place in connection with the amendment to the Act on Income Taxes of January 01, 2008. Effective 2008, the progressive tax rate was replaced by a flat tax rate amounting to 15%. The difference in the effective tax rate between the years 1999 and 2000 happens as a result of the abolishment of the 5th tax bracket with the effect from 2000, the bracket for tax base exceeding CZK 1,104,000. From 2006, apart from the changes in nominal tax rates, a transformation of some nontaxable parts of the tax base into the form o tax abatements took place. This affected the nontaxable part of the tax. Together with the decrease in nominal tax rates, this had a favorable effect on taxpayers.

while the other was attaining none. These divided tax bases were subject to lower tax rate than the original tax base. Mathematical models were calculated according to § 13a, which stipulated tax calculation from the joint tax base of the spouses.

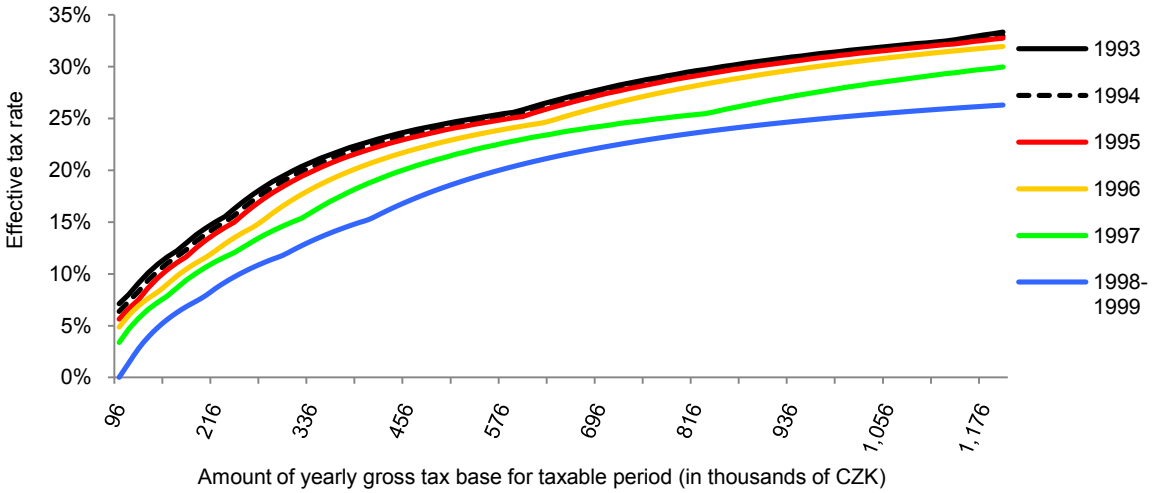
Figure 3: Relative Tax Savings for Single Childless Taxpayer (year 1993 compared with year 2009)



This figure presents the relative tax savings of a single childless taxpayer comparing the effective tax rates in 1993 and 2009. The figure shows that there was a significant decrease in the effective tax rate in the scope of the entire attained taxable income period assessed. On the other hand, the decrease was not equal for taxpayers from all income groups. Moreover, the tax base amount and the amount of the tax savings were more or less in direct proportion.

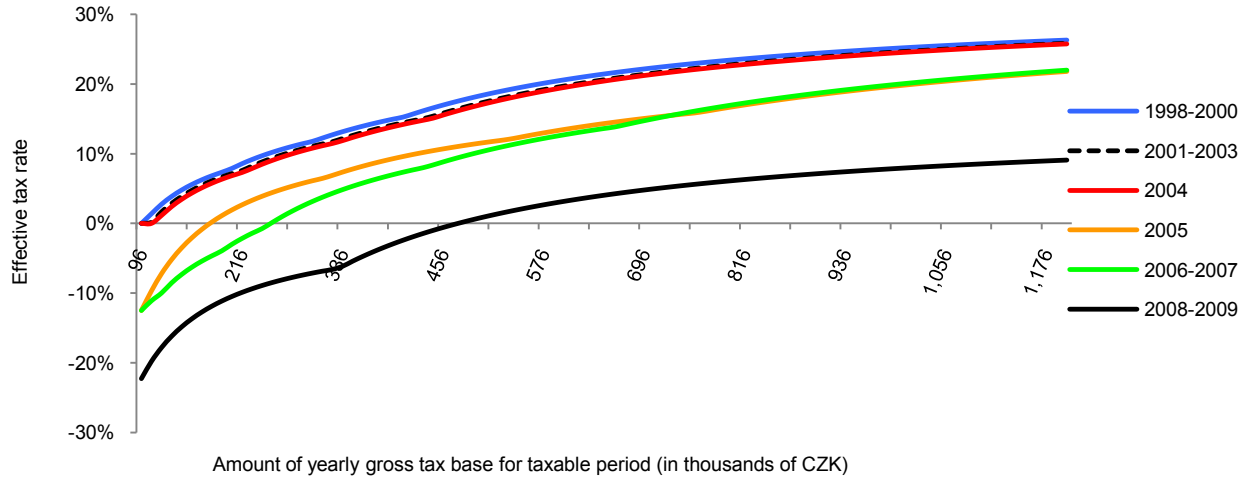
The scope of changes was larger for married than single taxpayers. More frequent changes in tax exemptions for married persons and the provision for tax calculation from the joint tax base of the spouses had a radical impact on the effective tax base. The time period has been divided into the two following periods: 1993 – 2000 and 2000 – 2009 to evaluate these changes.

Figure 4: Effective Tax Rate of Family with One Gainful Spouse and Two Children (years 1993 – 2000)



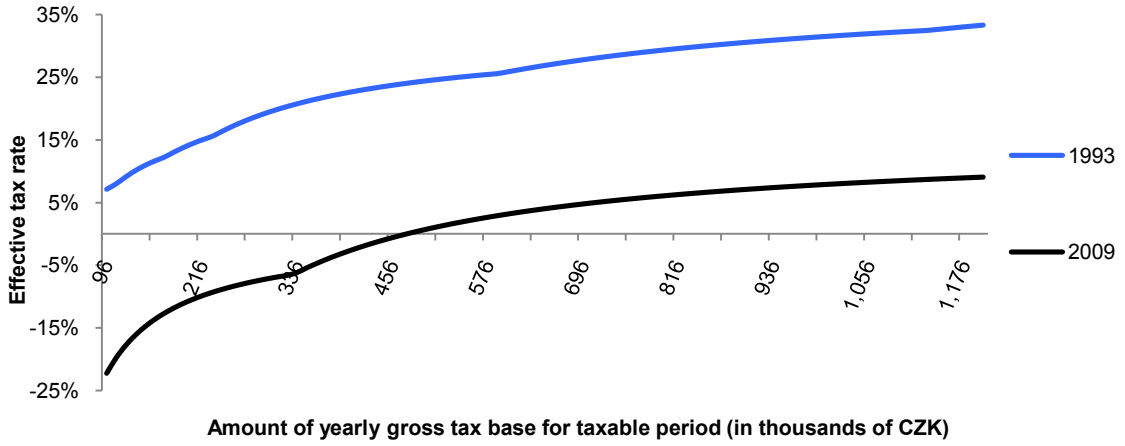
This figure shows effective tax rates for families The figure shows a gradual decrease in the effective tax rate in the time period of 1993 – 2000. The reduction of nominal tax rates and the increase in nontaxable parts of the tax base for dependent child, from CZK 9,000 in 1993 to 21,600 in 2000, had a relatively strong impact. In the time period in focus there was an increase in the nontaxable part for spouses not attaining a certain income level, in 1993 CZK 12,000 and in 2000 CZK 19,884.

Figure 5: Effective Tax Rate of Family with One Gainful Spouse and Two Children (years 2000 – 2009)



This table shows the effective tax rates for families from 2000-2009. Relatively negligible changes in the years 2000 – 2004 involved slight changes in nominal tax rates and in the amount of nontaxable parts of the tax base. A relatively significant shift in the effective tax rate decrease originated in the changes that came into effect in 2005, 2006 and 2008. In 2005 the taxpayers were able to apply the tax calculation from the joint tax base in their tax return for the first time, furthermore the transformation of the nontaxable part of the tax base for dependent child into the tax allowance for child took place. From 2008, the tax abatement for taxpayers significantly increased. There was also an increase in the abatement for incomeless spouse, CZK 24,840 in 2008 and 2009, and CZK 7,200 in 2006 and 2007. Finally, there was a change in the tax allowance for child, CZK 10,680 for 2008 and 2009; and CZK 6,000 for 2006 and 2007 The phenomenon occurred as a result of claiming the so called tax allowance for a child (see § 35c of the Act on Income Taxes), which could take the form of tax abatement or a tax bonus, or both.

Figure 6: Relative Tax Savings for Family with One Gainful Spouse and Two Children (year 1993 compared with year 2009)



This table compares the effective tax rate in marginal years. The relatively steady decrease in the effective tax rate is noticeable. For taxation of this category of taxpayers, measurements aiming to provide support for families with children have influenced significantly the effective tax rate.

CONCLUSION

This paper examines effective tax rates in the Czech Republic. Effective tax rates showed gradual a decrease for both single and married taxpayers. However, in case of single childless taxpayers, the decrease has not been steady. The amount of the tax reduction is in direct proportion with the amount of the tax base. The decrease during the period can be deemed significant. For families, where only one spouse attains taxable income, the trend of gradual decrease is also apparent and significant. However, examining the years 1993 and 2009, the effective tax rate decrease is relatively steady.

It remains uncertain to what extent the changes occur as a reaction to competition pressure. Owens (1993, p. 31) states that competitive considerations have not had a great influence on governments in determining their personal income tax schedule. This convergence is connected with political fashions which may be related to competitive pressures. In connection with the income taxation of natural persons, Pechman (1990, p. 1) points out the decreasing tax progressivity. These conclusions partially overlap with those presented by Lee and McKenzie (1989, p. 79), who point out the trend of marginal tax rate reductions and tax base broadening. On the basis of results presented in this paper trends are apparent in the Czech natural person tax law. The trend of tax base broadening is mainly in relation to changes effective January 01, 2008. The significant decrease in the effective tax rate in 2008 has been compensated for by tax base broadening.

The results presented in the paper must be interpreted with limitations. The paper deals with one obligatory payment of taxpayers affecting their disposable income. However, the Czech Republic comes under the States of the European Union with relatively high amounts of social and health insurance premiums which affect the total burden. In consequence of this fact it would be useful and suitable to include social and health insurance premiums in a follow-up analysis. Due to the complexity of the tax system, mathematical models were developed on a number of simplifications. Among the most important is a disregard of so called minimal tax base for the years 2004 – 2007. Nevertheless, this provision set a number of conditions and exemptions for the application of the minimal tax base so that its disregard could be assessed as acceptable. Future research might incorporate additional provisions of the tax law.

The paper deals only with one type of incomes of natural persons, namely with incomes from enterprise and from other independently gainful activities. From this point of view, it would be useful to compare effective tax rates of this category of incomes with effective tax rates of the incomes from employment. Future research could also examine a number of contextual matters. It would be interesting to assess the changes in effective tax rate and changes in Act on Income Taxes in relation to changes in political representations.

APPENDIX

Appendix 1: Development in the amount of basic nontaxable parts of the tax base, tax abatements and child tax allowance [in CZK]

Nontaxable part of the tax base	Year						
	1993	**1994**	**1995**	**1996**	**1997**	**1998**	**1999**
For taxpayer	20,400	21,600	24,000	26,400	28,800	34,920	34,920
For dependent child	9,000	10,800	12,000	13,200	14,400	21,600	21,600
For incomeless spouse	12,000	12,000	12,000	12,000	16,800	19,884	19,884

Nontaxable part of the tax base	Year					
	2000	**2001**	**2002**	**2003**	**2004**	**2005**
For taxpayer	34,920	38,040	38,040	38,040	38,040	38,040
For dependent child	21,600	23,520	23,520	23,520	25,560	-
For incomeless spouse	19,884	21,720	21,720	21,720	21,720	21,720

Abatements for taxpayer (§ 35ba of the Act on Income Taxes) and tax allowance (§ 35c of the Act on Income Taxes)	Year				
	2005	**2006**	**2007**	**2008**	**2009**
For taxpayer	-	7,200	7,200	24,840	24,840
For incomeless spouse	-	4,200	4,200	24,840	24,840
Tax allowance for 1 child	6,000	6,000	6,000	10,680	10,680

Appendix 2: Nominal Tax Rates for Income Taxes of Natural Persons in the Czech Republic Since 1993

Year 1993

Tax base		Tax			
from	to	fix amount		tax rate	for a base over
	60,000			15%	
60,000	120,000	9,000	+	20%	60,000
120,000	180,000	21,000	+	25%	120,000
180,000	540,000	36,000	+	32%	180,000
540,000	1 080,000	151,200	+	40%	540,000
1.080,000		367,200	+	47%	1.080,000

Year 1994

Tax base		Tax			
from	to	fix amount		tax rate	for a base over
	60,000			15%	
60,000	120,000	9,000	+	20%	60,000
120,000	180,000	21,000	+	25%	120,000
180,000	540,000	36,000	+	32%	180,000
540,000	1 080,000	151,200	+	40%	540,000
1.080,000		367,200	+	44%	1.080,000

Year 1995

Tax base		Tax			
from	to	fix amount		tax rate	for a base over
	60,000			15%	
60,000	120,000	9,000	+	20%	60,000
120,000	180,000	21,000	+	25%	120,000
180,000	540,000	36,000	+	32%	180,000
540,000	1.080,000	151,200	+	40%	540,000
1.080,000		367,200	+	43%	1.080,000

Year 1996

Tax base		Tax			
from	to	fix amount		tax rate	for a base over
	84,000			15%	
84,000	144,000	12,600	+	20%	84,000
144,000	204,000	24,600	+	25%	144,000
204,000	564,000	39,600	+	32%	204,000
564,000		154,800	+	40%	564,000

Year 1997

Tax base		Tax			
from	to	fix amount		tax rate	for a base over
	84,000			15%	
84,000	168,000	12,600	+	20%	84,000
168,000	252,000	29,400	+	25%	168,000
252,000	756,000	50,400	+	32%	252,000
756,000		211,680	+	40%	756,000

Years 1998 and 1999

Tax base		Tax			
from	to	fix amount		tax rate	for a base over
	102,000			15%	
102,000	204,000	15,300	+	20%	102,000
204,000	312,000	35,700	+	25%	204,000
312,000	1.104,000	62,700	+	32%	312,000
1.104,000		316,140	+	40%	1.104,000

Year 2000

Tax base		Tax			
from	to	fix amount		tax rate	for a base over
	102,000			15%	
102,000	204,000	15,300	+	20%	102,000
204,000	312,000	35,700	+	25%	204,000
312,000		62,700	+	32%	312,000

Years 2001 - 2005

Tax base		Tax			
from	to	fix amount		tax rate	for a base over
	109,200			15%	
109,200	218,400	16,380	+	20%	109,200
218,400	331,200	38,220	+	25%	218,400
331,200		66,420	+	32%	331,200

Years 2006 and 2007

Tax base		Tax			
from	to	fix amount		tax rate	for a base over
	121,200			12%	
121,200	218,400	14,544	+	19%	121,200
218,400	331,200	33,012	+	25%	218,400
331,200		61,212	+	32%	331,200

Years 2008 and 2009

Flat tax rate
15%

REFERENCES

Act No. 455/1991 Coll., on Trade Licensing, as amended

Act No. 586/1992 Coll., on Income Taxes, as amended

Bell, M. E. & Kirschner, Ch. (2009). A reconnaissance of Alternative Measures of Effective Property Tax Rates. *Public Budgeting & Finance*. vol. 29(2), 111 – 136.

Cnossen, S. (2003). How Much Tax Coordination in the European Union? *Journal International Tax and Public Finance*. vol. 10(6), 625 – 649.

Český statistický úřad (Czech Statistical Office). (2009, June 26). Úhrnná plodnost v letech 1950 – 2008 (Nativity Coefficients for the years 1950 – 2008). http://www.czso.cz/csu/redakce.nsf/i/uhrnna_plodnost_v_letech_1950_2008

Lee, D. R. & McKenzie, R. B. (1989). The International Political Economy of Declining Tax Rates. *National Tax Journal*. vol. 42(1), 79 – 83.

Loretz, S. (2007). Determinants of Bilateral Effective Tax Rates: Empirical Evidence from OECD Countries. *Fiscal Studies*. vol. 25(2), 227 – 249.

Owens, J. (1993). Globalisation: The implications for tax policies. *Fiscal Studies*. vol. 14(3), 21 – 44.

Pechman, J. A. (1990). The Future of the Income Tax. *The American Economic Review*. vol. 80(1), 1 – 20.

Schratzenstaller, M. (2005). Effective Company Taxation in Poland – Some Methodological Considerations and Empirical Results. *Journal Intereconomics*. vol. 40(2), 89 – 99.

Široký, J. (2008). Některé poznámky k vypovídací schopnosti pojmů „rovná daň" a „ekologické daně" (Some Notes to the Predicative Ability of the „Flat Tax" and „Ecological Taxes" Definitions). *Proceedings from the 13th international scientific conference Teoretické a praktické aspekty veřejných financí (Theoretical and Practical Aspects of Public Finances).* Praha: Oeconomica.

Široký, J. (2009). *Daně v Evropské unii (Taxes in the European Union).* Praha: Linde.

Zodrow, G. R. (2003). Tax Competition and Tax Cooperation in the European Union. *International Tax and Public Finance*. vol. 10(6), 651 – 671.

Žídek, L. (2006). *Transformace české ekonomiky: 1989 – 2004 (Transformation of the Czech economy: 1989 – 2004).* Praha: C. H. Beck.

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STABILITY OF RENTS AND RETURNS AS A SOURCE OF INTERNAL FINANCING: EVIDENCE FROM APPALACHIAN COAL PRODUCERS

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ABSTRACT

The role of steam coal was constrained by the Kyoto Protocol and the Copenhagen Climate Summit which call for reduced emissions of green house gases and related measures. These agreements increase the importance in properly managing emissions. Coupled with rapidly increasing demand from China and India, a study on the rents of the Appalachian coal mines is as important as it is timely. In this paper, we show that response surfaces of producers' surpluses are nonlinear with respect to changes in any parameters. They are closely related to a given flow pattern in which only m+n-l positive coal flows prevail. Only when the flow patterns change does the response surfaces of the producers' surplus undergo structural changes. Production taxes decrease supplier's welfare. Furthermore the result of the Friedman test indicates that the relative welfare position, measured in terms of producers' rents, differs significantly in our simulation.

JEL: B41; C15; H2; M48

KEYWORDS: Appalachian coal producers, rents and returns, internal financing, simulation technique, non-liner response function

INTRODUCTION

A major source of internal finance for producing firms in the Appalachian coal market is the generated rents or producer surplus. Some of the Appalachian areas were economically depressed especially before the era of skyrocketing oil price. Some had bounced back when crude oil price hit close to $150 a barrel. On the other hand, steam coal burning does generate substantial amount of pollution and has been considered one of the culprits of global warming. The main thrust of the Kyoto Protocol and Copenhagen Climate Summit is on the reduction of carbon dioxide emission and imposition of emission fees in terms of carbon tax or related measures. On the global level, a computable general equilibrium model may shed a light on the issue. On national level, however, such a simulation both mathematically consistent and price responsive, is lacking. One approach found successful for analyzing rents on a regional basis is that of spatial allocation modeling. The impact on location rents of Appalachian coal producers, due to changes in taxation policies or economic parameters (environments) in the framework of the spatial equilibrium model (Takayama and Judge 1964, 1971) has not been studied thus far due to the complex nature of the problem. Most of the applications were on shipment pattern of the commodity especially steam coal. In this paper, we first analytically investigate this problem; then we perform some simulations on the stability of rents or returns of the Appalachian steam coal producing regions. The analysis is based on an estimated spatial equilibrium model (Labys and Yang, 1980) from which "optimum" shipments between Appalachian producers and eastern utilities are determined. It is capable of generating a set of optimal coal productions, consumptions, coal flows, and prices which, in turn, permit a calculation of producers' surplus. With the computational aid of a software package (Cutler and Pass, 1971), such simulation can be made conveniently. It is encouraging that we discover some anomalies which contradict the long recognized classical result in the space-less models. Further, in view of current financial stringency at regional levels, the relationship between different taxes and interconnected spatial rents is worthy of a careful evaluation.

The paper is composed of three parts: (1) Mathematical Analysis of the Sensitivity of the Rent, (2) Nonparametric Analysis of the Rent Response Surface via Friedman's Test (M. Friedman, 1937), and (3)

Policy Implications. To the best of our knowledge, the results of the paper being previously unknown are to fill a void in the literature.

LITERATURE REVIEW AND BACKGROUND

Historical developments of the spatial equilibrium model have been along the line of Enke (1951), Samuelson (1952), and Takayama and Judge (1964, 1971). Further extensions and applications based on Cottle-Dantzig complementarity pivot theories (1968) or variation inequalities are witnessed in the works by Pang and Chan (1981), Irwin and Yang (1982, 1983), Friesz et a1. (1983), Takayama and Uri (1983), Dafermos and Nagurney (1983, 1984, 1989) Nagurney (1986), Yang and Labys (1985), Takayama and Hashimoto (1989), and Yang and Page (1993). Applications of the spatial equilibrium models have proliferated since the live stock feed model by Fox (1951) and egg model by Judge (1956). The continued interest can be witnessed via the model applications by Uri (1989) and Peeters (1990). Readers are referred to Labys and Yang (1991) for a discussion of advances of the spatial equilibrium models; and to Thompson (1984) and Labys (1989) for model applications.

Despite these advances, a study of the spatial rent of a production region has thus far evaded the literature. Our modest purpose of the paper is to fill a void in this regard.

The objective function of the original model is to maximize the "net social payoff" or NSP, which is the sum of the consumer's surplus of n demand regions and the producer's surplus (returns or rents) of m supply regions. In 1964, Takayama and Judge formally converted such problems into the operationally efficient quadratic programming model as shown below:

Maximize

$$NSP(x_i, y_j, z_{ij}) = \sum_{j\in J} a_j y_j - \frac{1}{2}\sum_{j\in J} b_j y_j^2 - \sum_{i\in I} c_i x_i - \frac{1}{2}\sum_{i\in I} d_i x_i^2 \sum_{i\in I}\sum_{j\in J} t_{ij} z_{ij} \quad (1)$$

Subject to

$$y_{ij} - \sum z_{ij} \le 0 \qquad \forall j \in J$$

$$x_{ij} - \sum z_{ij} \ge 0 \qquad \forall i \in I$$

$$z_{ij} \ge 0 \qquad \forall ij \in (I \times J)$$

where I, J and (IXJ) are sets of finite positive integer sets and their corresponding Cartesian product. The inverse demand and supply relations are linear functional mapping or $R_+ \to R_+$in which a_j and c_i denote intercepts of demand and supply equations in region j and i respectively; b_j and d_i denote slopes of the demand and supply equations; x_i and y_j denote output and consumption of region i and j; t_{ij} and z_{ij} are the unit transportation rate and commodity flow from supply region i to demand region j respectively. For the detail of the model, one can find excellent sources in Takayama and Judge (1971). In order to analyze the responses of the producer's rents, we need to form the Lagrange of the above problem:

$$L(x_i, y_j, z_{ij}, \alpha_j, \beta_j) = \sum_{j\in J} a_j y_j - \frac{1}{2}\sum_{j\in J} b_j y_j^2 - \sum_{i\in I} c_i x_i - \frac{1}{2}\sum_{i\in I} d_i x_i^2 - \sum_{i\in I}\sum_{j\in J} t_{ij} z_{ij} +$$

$$\sum_{j\in J} \alpha_j (\sum_{i\in I} z_{ij} - y_i) + \sum_{i\in I} \beta_i \left(-\sum_{j\in J} z_{ij} + x_i\right) \quad (2)$$

Where α_i and $ß_j$ are Lagrange multipliers (imputed steam coal prices) for the jth demand and ith supply region. The corresponding Kuhn-Tucker necessary (also sufficient) conditions take the form as follows:

$$\frac{\partial L}{\partial y_j} = a_j - b_j\overline{y_j} - \alpha_j \leq 0 \qquad and \qquad \frac{\partial L}{\partial y_j} \cdot \overline{y_j} = 0 \tag{3}$$

$$\frac{\partial L}{\partial x_i} = -c_i - d_i\overline{x_i} + \beta_i \leq 0 \qquad and \qquad \frac{\partial L}{\partial x_i} \cdot \overline{x_i} = 0 \tag{4}$$

$$\frac{\partial L}{\partial z_{ij}} = \overline{\alpha_j} - \overline{\beta_i} - t_{ij} \leq 0 \qquad and \qquad \frac{\partial L}{\partial z_{ij}} \cdot \overline{z_{ij}} = 0 \tag{5}$$

$$\frac{\partial L}{\partial \alpha_j} = \sum_{i \in I} \overline{z_{ij}} - \overline{y_j} \geq 0 \qquad and \qquad \frac{\partial L}{\partial \alpha_j} \cdot \overline{\alpha_j} = 0 \tag{6}$$

$$\frac{\partial L}{\partial \beta_i} = x_i - \sum_{j \in J} z_{ij} \geq 0 \qquad and \qquad \frac{\partial L}{\partial \beta_i} \cdot \overline{\beta_i} = 0 \tag{7}$$

Where the barred variables are optimum values.

The knowledge of equations (3), (4). (5), (6) and (7) is not adequate for the analysis since not all steam coal flows are positive in equation (5). We need to borrow a theorem by Silberberg (1970) and Gass (1985) that no more than m+n-l positive flows can appear in the base as optimal solutions. Therefore, the knowledge of m+n-l steam coal flow patterns must be known before conducting the impact analysis. This is the major difficulty in conducting a general sensitivity analysis in any mathematical programming model of this type. Hence, a suitable statistical test is necessary to complete such a stability test.

Given known flow patterns, we substitute equations (3) and (4) into equation (5) for $x_i > 0$ and $y_j > O$. In addition, by adding equation (6) to (7) for $\alpha_j > 0$ and $\beta_i > 0$, we have a system of m+n equations for the non-degeneracy case as shown below:

$$a_j - b_j\overline{y_j} - c_i - d_i\overline{x_i} = t_{ij} \qquad \forall \overline{z_{ij}} > 0 \tag{8}$$

$$\sum_{j \in J} y_j = \sum_{i \in I} x_i \tag{9}$$

Relation (8) and (9) form the base for our analysis and x_i's and $y_{j's}$ are proven to be uniquely solvable (Irwin and Yang 1982, 1983) since, in a single commodity spatial equilibrium model, the Kuhn-Tucker conditions are both necessary and sufficient for the sensitivity analysis. Note in the case of degeneracy which generates isolated trade patterns we have less than m+n-1 flows. In such a case we shall have more of equation (9) or information on "isolated trade patterns" to make up the loss in numbers of equation (8). This is what Samuelson (1952) called "degeneracy" in the sense that one block of steam coal flows are completely independent of that of the other block. In the case of zero y_j or x_i , we shall discard the variable until they become positive, since zero demand and supply have little economic meaning.

Rewriting equations (8) and (9) in matrix form and assuming the case of non-degenerate flows, we have

$$\begin{bmatrix} -b_j & -d_i \\ -1 \ldots -1 & +1 \ldots +1 \end{bmatrix} \begin{bmatrix} \bar{y}_1 \\ \vdots \\ \overline{y_n} \\ \overline{x_1} \\ \vdots \\ \overline{x_m} \end{bmatrix} = \begin{bmatrix} -a_j + c_i + t_{ij} \\ 0 \end{bmatrix} \tag{10}$$

or J K = L and hence K = J^{-1}L where JxR$^{(m+n)x(m+n)}$, KxR^{m+n}, LxR^{m+n}. where R^{m+n} denotes Euclidean mn dimensional space. Differentiating equation (10) with respect to all c_i's (C) and d_i's (D) takes the form

$$\begin{vmatrix} \frac{\partial \overline{y_1}}{\partial C} \\ \vdots \\ \frac{\partial \overline{y_n}}{\partial C} \\ \frac{\partial \overline{x_1}}{\partial C} \\ \vdots \\ \frac{\partial \overline{x_m}}{\partial C} \end{vmatrix} = J^{-1} \begin{vmatrix} 1 \\ \vdots \\ \vdots \\ \vdots \\ 1 \\ 0 \end{vmatrix} \tag{11}$$

$$\begin{vmatrix} \frac{\partial \overline{y_1}}{\partial D} \\ \vdots \\ \frac{\partial \overline{y_n}}{\partial D} \\ \frac{\partial \overline{x_1}}{\partial D} \\ \vdots \\ \frac{\partial \overline{x_m}}{\partial D} \end{vmatrix} = J^{-1} \begin{vmatrix} 0 \\ \vdots \\ 0 \\ \bar{x}_1 \\ \vdots \\ \bar{x}_m \end{vmatrix} \tag{12}$$

Note equation (11) is linear for a given set of slope parameters but equation (12) is not linear for a given set of intercept parameters. These relations are verified through separate computer runs.

MATHEMATICAL PROPERTY OF THE PRODUCER'S RENTS UNDER TAXATION AND CHANGING DEMAND AND SUPPLY ENVIRONMENTS

The net social payoff can be derived by subtracting equation (1) from the corresponding parts of complementary slackness of equations (3) through (7) or

$$NSP\left(a_j, b_j, c_i, d_i, t_{ij}, \bar{x}_i, \bar{y}_j, \bar{z}_{ij}\right) = \frac{1}{2}\sum_{i \in J} b_j \bar{y}_j^2 + \frac{1}{2}\sum_{i \in I} d_i \, \bar{x}_i^2 \tag{13}$$

The second term on the right hand side of equation (13) is the producer's surpluses or rents (PS) of the Appalachian coal producers at a set of optimal solutions which correspond exactly to the well-known

triangles above the supply curves. Evidently, the steeper the slope of the inverse supply curve (d_i) and/or the larger the optimum output ($\overline{x_\iota}$), the greater the value of rent ($\frac{1}{2}\sum_{i\in J} d_i x_i^2$) will be.

A coal-producing site with cost advantages due to production characteristics (seam thickness, less amount of sulfur dioxide contents, cheap production costs) and/or location advantages (strong demand from a nearby market) will enjoy a significant amount of economic rent; and hence is a source of tax revenues.

Within a given set of commodity flows, a federal specific tax is equivalent to changing all the intercepts of supply equations (C) as shown in equation (11). Hence, its impact on the producer's surplus can be evaluated as

$$\frac{\partial PS_i(a_j, b_j, c_i, d_i, t_{ij}, \bar{x}_i, \bar{y}_j)}{\partial C} = d_i \bar{x}_i \left(\frac{\partial \bar{x}_i}{\partial C}\right) \tag{14}$$

By the similar line of reasoning, the impact of an ad valorem tax (i.e., increasing the value of c_i and d_i by v/(l-v) for all iϵI) on the producer's surplus for a very small v is (1)

$$\frac{\partial PS_i}{\partial v} = \bar{d}_i \bar{x}_i \left(\frac{\partial \bar{x}_i}{\partial d_i}\right)\left(\frac{\partial d_i}{\partial v}\right) + \bar{d}_i \bar{x}_i \left(\frac{\partial \bar{x}_i}{\partial c_i}\right)\left(\frac{\partial c_i}{\partial v}\right) + \bar{x}_i^2 \left(\frac{\partial d_i}{\partial v}\right) \tag{15}$$

Where $\frac{\partial d_i}{\partial v} = \frac{v}{(1-v)}\overline{d_\iota}$ and $\frac{\partial c_i}{\partial v} = \frac{v}{(1-v)}\overline{c_\iota}$, in which c_i and d_i are the original unperturbed parameters.

The effect of changing slopes of demand and supply equation(s) in our case can be evaluated for given flow patterns:

$$\frac{\partial PS_i}{\partial b_j} = \bar{d}_i \bar{x}_i \left(\frac{\partial \bar{x}_i}{\partial b_j}\right) \tag{16}$$

$$\frac{\partial PS_i}{\partial d_i} = \bar{d}_i \bar{x}_i \left(\frac{\partial \bar{x}_i}{\partial d_i}\right) + \frac{1}{2}\overline{x_\iota^2} \qquad \forall\, i \in M \tag{17}$$

It is important to know that relations in equations (14), (15), (16) and (17) are neither deterministic nor linear; and they hold only in a given set of positive flow patterns. As is the case of analyzing response surface in flows, consumptions, and productions (Yang and Labys 1981, 1982; Page and Yang 1984) a deterministic conclusion is not feasible. However, once the directions of flow patterns are known, these relations can be predicted locally. In a later section, we shall employ a nonparametric test to perform the analysis on the producers' rents.

THE IMPACT ANALYSES OF SPATIAL RENTS

Based on the estimated equations shown in Tables 1A and 1B we will first investigate the response surface of the producer's rents for each supply region. The responses of the producer's rents under federal specific or unit taxes (dollars per ton of coal produced) are shown in Table 2. One wishes to ask if the producer's rents decrease monotonically as the federal tax rates are increased as is expected in classical welfare economics. Surprisingly enough, we observe a welfare anomaly as can be seen from Table II: the

producers' surpluses in Pennsylvania and Maryland coal mines increase from 2.3455 units (in 1973 10^7 dollars) in a no tax case to 2.38579 units with the imposition of fifty cents per ton of federal unit tax at the expenses of other producing regions.(2) As the tax rates are increased from fifty cents to one dollar per ton of coal produced, the producer's surpluses in the Pennsylvania and Maryland area drop rapidly to 1.71207 as compared with the fifty cent tax case (2.38579). As we arbitrarily increase the tax rate, the producers' rent in the same region bounces back again. Hence we observe an oscillating welfare position for Pennsylvania and Maryland coal mines. This observation contradicts the classical space-less model in which an increase in the unit tax is expected to decrease producer's rents. In light of this anomaly, an analytical and deterministic approach is not possible in evaluating welfare positions of producers in the Appalachian steam coal market.

Table 1A: Estimated Regression Equations

	Dependent Variable (Prices)	Adjusted Intercept *	Slopes
DEMAND EQUATION	P^d_1	69.8 (0.80)	-462.73 (-0.95)
	P^d_2	86.4 (19.33)***	-33.03 (-17.79)***
	P^d_3	57.5 (23.38)***	-20.5 (-16.50)***
	P^d_4	49.7 (2.68)**	-40.08 (-16.01)***
	P^d_5	61.3 (16.19)***	-12.71 (-21.46)***
	P^d_6	47.4 (7.9)***	-17.79 (-8.73)***
	P^d_7	61.6 (2.73)**	-22.13 (-9.28)***
DEMAND EQUATION	P^d_1	27 (29.28)***	4.46 (1.52)
	P^d_2	26.3 (24.85)***	4.221 (4.09)***
	P^d_3	25 (6.38)***	14.259 (4.24)***
	P^d_4	30.4 (15.22)***	25.07 (9.25)***
	P^d_5	23 (24.73)***	24.35 (9.28)***
	P^d_6	27 (118.02)***	2.6028 (4.01)***
	P^d_7	28.2 (9.21)***	59.62 (2.92)**

Intercept includes adjustment for exogenous variable influence. Values within parenthesis are t-va1ues.* *The original demand functions were estimated in the linear form of P = a û By + fz where z is a set of exogenous variables, which are emerged into the intercept term shown in the table. Values within parentheses are t-va1ues. Note that *,** and * denote significant at 1%,5% and 10% significance level *SOURCE: C. W. Yang, "A Critical Analysis of Spatial Commodity Modeling: The Case of Coal," Unpublished Ph.D. Dissertation (1979), Department of Economics, West Virginia University. W. C. Labys and C. W. Yang, "A Quadratic Programming Model of the Appalachian Steam Coal Market," Energy Economics, Vol. 2, No.2 (April 1980), pp. 86-95. Also see references (9) and (16).*

Table 1B: Transportation Cost (cents per million BTU)

FROM	1	2	3	4	5	6	7
TO							
1	19.1	22.2	20.2	20.5	21.2	24.3	26.8
2	14.5	18.3	13.5	16.9	17.6	20.4	23.3
3	13.2	13.8	11.8	16.6	20.3	16.7	19.8
4	18.8	19.8	19.6	22.5	21.8	17.1	18.1
5	15.1	13.3	13.7	12.6	17.2	13.4	15.7
6	21.1	22.5	21.8	19.2	14.1	16.9	7
7	21	24	20.9	16.5	14.7	13.6	14.3

Appalachian coal production states include: l=Pennsylvania, Maryland; 2=Ohio; 3=Northern West Virginia; 4=Southern West Virginia; 5=Virginia; 6=East Kentucky, Tennessee; and 7=A1abama. Eastern utilities coal consumption states include: 1 = Connecticut, Maine, Massachusetts, New Hampshire, Rhode Island, Vermont; 2 = New Jersey, New York, Pennsylvania, Washington DC, Maryland, Delaware; 3 = Indiana, Michigan; 4 = Illinois, Wisconsin, Minnesota; 5 = West Virginia, Ohio, Kentucky; 6 = Tennessee, Alabama, Mississippi; 7 = Virginia, North Carolina, Southern Carolina, Georgia, and Florida. The unit transportation cost from supply region 1 to demand region 1 for instance is 19.1 cents per million BTU. SOURCE: P. H. Mutschler, R. J. Evans and G. M. Larwood, Comparative Transportation Costs of Supplying Low-sulfur Fuels to Midwestern and Eastern Coal Markets, IC 8614, US Bureau of Mines, Washington, DC, 1972.

Table 2: Producer's Rents with Federal per Unit Taxes (in 1973 107 dollars and dollars per ton unit tax)

		Tax Rates					
Coal Supply Region	No Tax Imposed	$.50/tax	$1/tax	$1.50/tax	$2/tax	$2.50/tax	$3/tax
PA	2.34550	2.38578	1.71207	1.82547	1.25514	1.34560	0.86370
MD		+*	-*	+	-	+	-
OH	2.16387	1.55580	1.23575	0.84335	0.62140	0.35024	0.21322
		-	-	-	-	-	-
Northern	2.01157	1.76127	1.64820	1.4621	1.36641	1.19368	1.10738
WV		-	-	-	-	-	-
Southern	0.01524	0.00393	0.00144	0	0	0	0
WV		-	-				
VA	0.83426	0.72650	0.68550	0.60773	0.60094	0.50100	0.47027
		-	-	-	-	-	-
Eastern	2.31845	1.71586	1.46218	1.07151	0.88665	0.58294	0.44889
KY & TN		-	-	-	-	-	-
AL	0.57414	0.52196	0.36682	0.22871	0.12308	0.04991	0.00922
		-	-	-	-	-	-

** Rents are in 1973 dollars (millions); + denotes the amount of producer's rent that increases (compared with the zero tax case) as an additional tax is imposed; - denotes it decreases as an additional tax is levied. For instance, one dollar per ton federal tax is expected to cause Pennsylvania and Maryland supply region to reduce rent to $1.71207 million in 1973 dollars.*

Such oscillating patterns, however, are not observed in the cases of imposing federal ad valorem taxes (supply) in our example. The changing producer's surpluses are shown in Table 3. As is evident from Table 3, the welfare positions under such taxations deteriorate rapidly for Southern West Virginia and Alabama coal mines. Such a deterioration, especially in West Virginia, would have had profound impacts on local and state economies which depend heavily on the steam coal revenues.

The impacts on producer's rents are shown in Table 4 as slopes of all demand equations (B) are varied. Such variations in slopes may reflect the changing demand conditions for the Appalachian steam coal. The producer's rents in all supply regions of the Appalachian market would increase with the decreasing slopes of the demand schedules. This trend would help internal finance of the coal mine companies, especially in Southern WV, PA, MD, OH, Eastern KY and TN. However, producers in Northern WV, AL and VA would experience only relatively smaller increases in producers' rents.

Table 3: Producer's Rents with Federal Ad Valorem Taxes

	SUPPLY REGION						
TAX RATE	**PA & MD**	**OH**	**Northern WV**	**Southern WV**	**VA**	**Eastern KY & TN**	**AL**
NO TAX	2.3455	2.16387	2.01157	0.01524	0.83426	2.31845	0.57414
1%	2.29236	2.11999	1.98666	0.01297	0.92979	2.25668	0.56271
2%	2.2383	2.0751	1.96117	0.01083	0.82304	2.19382	0.55117
3%	2.18336	2.02926	1.9351	0.00883	0.817	2.12986	0.5395
4%	2.1275	1.98245	1.90845	0.007	0.81065	2.06484	0.52772
5%	2.07076	1.93464	1.88118	0.00533	0.80401	1.99879	0.51582
6%	2.01313	1.88586	1.8533	0.00386	0.79705	1.93173	0.50379
7%	1.95751	1.83897	1.82634	0.00264	0.79055	1.86738	0.48533
8%	1.90823	1.79832	1.80269	0.00172	0.78572	1.81127	0.45133
9%	1.86275	1.76136	1.781	0.00102	0.78188	1.76004	0.41805
10%	1.81735	1.72442	1.75927	0.0005	0.77804	1.70903	0.38557
15%	1.57108	1.51887	1.63807	0	0.75255	1.43105	0.23668
20%	1.29911	1.28398	1.49734	0	0.71685	1.12526	0.11597

Numbers in the table represent producer surplus (rent) in 1973 dollars (millions). For instance, a 5% ad valorem coal or carbon tax is expected to decrease the rent in Pennsylvania and Maryland area from $2.3455 million to $2.07076 million.

Table 4: Producer's Rents with Changing Slopes of All Demand Equations

	SUPPLY REGION						
% Change in all Demand Slopes	PA & MD	OH	Northern WV	Southern WV	VA	Eastern KY & TN	AL
-20%	3.22722	3.03928	2.45385	0.05531	1.05425	3.49491	0.6892
-15%	2.96235	2.77629	2.32413	0.04143	0.98933	3.13729	0.65555
-10%	2.73146	2.54596	2.20847	0.03047	0.93172	2.82682	0.62548
-5%	2.5271	2.34341	2.10494	0.0219	0.88037	2.5562	0.5985
0%	2.3455	2.16387	2.00157	0.01524	0.83426	2.31845	0.5744
5%	2.1835	2.00413	1.92708	0.01015	0.7927	2.10882	0.55204
10%	2.03842	1.86144	1.85032	0.00635	0.75511	1.92324	0.53193
15%	1.90812	1.73361	1.78042	0.00361	0.72099	1.75852	0.51359
20%	1.79035	1.61836	1.71637	0.00175	0.68987	1.61138	0.49675

***If the slopes of all demand functions in the Appalachian market increases by 10% due to a change in the nature of substitution between oil and steam coal, it can cause the rent in Pennsylvania and Maryland area to decrease from $2.3455 million to $2.03842 million in 1973 dollars.*

The last simulation involves changing the slopes of supply schedules. An increasing supply slope of a coal producing region may indicate the increasing cost in extracting an additional ton of coal from a deeper mine deposit. The results are reported in Table 5. With changes made in supply slopes, coal mines in Northern West Virginia and Alabama would experience declining producers' rents as slopes of supply schedules are graduate1y increased, while the rest of supply regions would gain producer-'s surpluses with their slopes getting steeper by the same percentage. Hence, we have observed from Table 5 that response surfaces of supply region's revenues are not monotonic. Losses of revenues in certain regions may be made at the expenses of other regions and there is no single way to tell these directions.

Table 5: Producer's Rents under Changing Slopes of All Supply Equations

	REGION / SUPPLY						
% Change in all Demand Slopes	PA & MD	OH	Northern WV	Southern WV	VA	Eastern KY & TN	AL
-20%	2.10433	1.89299	2.07167	0.00076	0.82667	1.84948	0.60162
-15%	2.16929	1.966	2.05396	0.00298	0.82843	1.97521	0.59352
	+	+	-	+	+	+	-
-10%	2.23115	2.03559	2.03775	0.00628	0.83016	2.09454	0.58631
	+	+	-	+	+	+	-
-5%	2.28942	2.10125	2.02406	0.01044	0.83226	2.20952	0.57992
	+	+	-	+	+	+	-
0%	2.3455	2.16387	2.00157	0.01524	0.83426	2.31845	0.57414
	+	+	-	+	+	+	-
5%	2.39733	2.22301	2.00014	0.02051	0.83618	2.42357	0.56874
	+	+	-	+	+	+	-
10%	2.44829	2.27949	1.99026	0.02616	0.83827	2.52266	0.56404
	+	+	-	+	+	+	-
15%	2.49486	2.3333	1.98053	0.03205	0.84014	2.61801	0.55953
	+	+	-	+	+	+	-
20%	2.53989	2.38339	1.9717	0.038101	0.84185	2.70901	0.55533
	+	+	-	+	+	+	-

*For instance, a 15% increase in all supply functions due to perhaps a stricter pollution standard is expected to increase the rent of Pennsylvania and Maryland region from $2.3455 million to 2.49486 million (1973 dollars). Note this is one of the paradoxical results, which differs from the classical space-less models: a stricter pollution standard is expected to decrease the rent of a supplier.

THE FRIEDMAN TEST ON RENTS OF THE APPALACHIAN COAL PRODUCING REGIONS

The welfare position in terms of locationa1 rents was analyzed mathematically in the previous section. That is, the responses of rents under federal taxes or from changes in general economic environments are typically mathematically intractable. Hence, a statistical procedure is needed to test the overall stability of relative welfare positions (in terms of rankings) for the seven Appalachian coal-producing regions. The producers' rent for the ith region (PS_i) is $\frac{1}{2}d_i\overline{x_i^2}$ where d_i (regression slope coefficient of the ith supply region) is essentially normally distributed and $\overline{x_i}$ represents the optimal coal production from the concave quadratic programming model. As the result, the probability distribution for the producer's rent PS_i may well not be normally distributed. Hence, the conventional analysis of variance cannot be used to test the stability of producers' rents. Instead, the Friedman Test (M. Friedman, 1937 and 1940) is used to perform the analysis of variance with the assumption that normality of the rent is violated.

The null hypothesis of the Friedman Test is that each ranking of the producers' rent within each block (row) is equally likely (i.e., the relative welfare positions in terms of the producers' rents is the same for each of seven Appalachian coal-producing regions). To avoid the violation on the assumption of the Friedman Test (Iman and Conover, 1989), we chose only those policies that generate independent rankings within each block (i.e., policy changes must be significant enough to avoid the identical ranking). The rankings of rents on seven Appalachian coal-producing regions are reported in Table 6 with the sum of ranking and average ranking for each coal producing region R_j and $\overline{R_j}$ shown in bottom lines. To test the null hypothesis, the Friedman F statistic with k-1 and (k-l)*(b-l) degrees of freedom are shown below:

$$F = \frac{(b-1)[B - bk(k+1)^2/4]}{A - B} \tag{18}$$

$$where\ A = \frac{bk(k+1)(2k+1)}{6} \tag{19}$$

$$B = \frac{1}{b}\sum_{j=1}^{k} R_j^2 \tag{20}$$

b = # of blocks or rows = 18

k = # of treatment or columns = 7

Rj = sum of rank for the j th column

The sample F from equation [18] of the Appalachian coal model is 134.81 and is significantly greater than the critical F = 2.809 at α = 1%. Consequently, the null hypothesis is rejected in favor of the claim that there exists a significantly unequal welfare position among seven coal-producing regions. To perform the multiple comparisons between each pair of coal- producing regions, we adopt the following rule (Iman and Conover, 1989):

$$IF \quad \left|\bar{R}_i - \bar{R}_j\right| > t\left(\frac{2(A-B)}{b(b-1)(k-1)}\right)^{\frac{1}{2}} \tag{21}$$

then there exists significant difference in relative welfare positions between region *i* and *j*. Note that *R1* is the average ranking for the *i*th region and *t* is evaluated with the significant level of *α/2* and the degree of freedom of *(b-l)(k-l)*. In our simulation, the right hand side of equation (21) equals 0.65 and it indicates that there exist significant differences in producers' rents between each pair of coal producing regions except Northern West Virginia and Eastern Kentucky-Tennessee in which the difference is insignificant. An examination of R's in Table 6 reveals that sizes of rents of seven coal producing regions can be ranked as shown in the last row: Pennsylvania and Maryland coal mines would receive highest location rent while Southern West Virginia coal mines remain in the least advantageous position.

CONCLUDING REMARKS

In the midst of green energy and in a carbon-constrained world, advocates for a permanent and increasing carbon tax seems to carry the day around the world. Steam coal is no doubt the primary source to generate electricity at utility companies in the U.S. The abundance of supply has its flip side: it is responsible for rapid increases in carbon dioxides and related pollutants. The close substitution between the coal and crude oil makes its price go hand-in-hand with volatile oil prices. For instance, the spot price was $57.40 per short ton during the recession (December, 2009).Over one hundred dollars per ton is entirely possible in the future when the demand is strong.

The role of steam coal constrained by the Kyoto Protocol and the Copenhagen Climate Summit, which calls for reduced emissions of green house gases and related measures, begins to become more important than ever. Coupled with rapidly increasing demand from China and India, a study on the rents of the Appalachian coal mines is as important as it is timely. Stricter pollution controls may be viewed as increasing slopes of all supply functions in the region. A federal ad valorem carbon tax is equivalent to shifting the supply functions proportionately. And a switch from high crude oil price can be modeled as decreasing the slopes of all the demand functions. Coal is known as a bulky commodity and as such the spatial equilibrium model is an ideal candidate for this purpose.

Due to the nonlinear nature of the rent, we expect the results to be different from the space-less economic models that have limited predictive power. The nonlinearity begs the use of Milton Friedman's nonparametric model developed 70 years ago. By using the spatial equilibrium model (Labys and Yang, 1980; Yang and Labys, 1985), we have performed simulations by calibrating parameters in demand and supply functions. We have shown that response surfaces of the producers' surpluses are in general nonlinear with respect to changes in any parameters. Also, they are closely related to a given flow pattern

in which only m+n-l positive coal flows prevail. Only when the flow patterns change would the response surfaces of the producers' surplus undergo structural changes. In this light, changing welfare positions of coal-producing regions are analytically unpredictable and in some cases do not follow the same direction.

Table 6: Rankings of Welfare Positions of Appalachian Coal Production Regions

	PA & MD	OH	Northern WV	Southern WV	VA	Eastern KY & TN	AL
No tax imposed	7	5	4	1	3	6	2
$1/ton tax(")	7	4	6	1	3	5	2
$2/ton tax	6	4	7	1	3	5	2
$2.5/ton tax	7	3	6	1	4	5	2
$3/ton tax	6	3	7	1	5	4	2
5% sales tax (supply)	7	5	4	1	3	6	2
8% sales tax (supply)	7	4	5	1	3	6	2
10% sales tax (supply)	7	5	6	1	3	4	2
15% sales tax (supply)	6	5	7	1	3	4	2
B(Change in all demand slopes)= -10%	6	5	4	1	3	7	2
B=5%	7	5	4	1	3	6	2
B=15%	7	4	6	1	3	5	2
B=20%	7	5	6	1	3	4	2
D(Change in all supply slopes)= -20%	7	5	6	1	3	4	2
D=-15%	7	4	6	1	3	5	2
D=-15%	7	4	5	1	3	6	2
D=-15%	7	5	4	1	3	6	2
D=-15%	6	5	4	1	3	7	2
Sum	121	80	97	18	57	95	36
$\bar{R}_t$	6.72	4.44	5.39	1	3.167	5.27	2

**A rank score 7 is considered the best (largest) rent revenue scenario whereas a rank score 1 denotes the worst (smallest) rent revenue scenario. For instance, the financial situation in Southern West Virginia did not improve for sometimes as can be seen from its score of 1.*

Consequently, one must be cautious in implementing the policy in the spatial allocation model in which transportation cost constitutes a good portion of the commodity price. While the taxation or other impact analyses on a space-less market in which transportation cost is zero have been long known in classical economic theory, the same cannot be said in the model of the spatial separated markets which are far more empirically relevant. The intractability of the spatial model suggests a proper use of simulation analyses. For instance, some federal carbon taxes may lead to the improvement of the financial positions of some regions at the expense of other coal supply regions. This is surprising and contradicts the long-established result in the classical space-less model.

That is, production taxes decrease producers' welfare (rent). Furthermore the result of the Friedman test indicates that the relative welfare position in terms of producers' rents differs significantly in our simulation. While coal mines in Pennsylvania, Maryland, Northern West Virginia, Tennessee, and Eastern Kentucky continue to enjoy better revenues from location rents, Southern West Virginia and Alabama coal mines remain in the disadvantageous positions within all reasonable parameter values in our simulation. Therefore, a good policy (e.g., a differential federal coal tax) is not possible without taking into consideration comprehensive considerations of welfare positions of the entire steam coal markets in the Appalachian steam coal markets.

Our paper has some limitations as well. First, the empirically estimated demand and supply functions are old and have limited predictive power. Second, an important vehicle in the carbon-constrained world cap and trade is not directly modeled. They remain, however, interesting avenue for future research in the field.

ENDNOTES

(1) A supply ad valorem coal or carbon tax at rate v is equivalent to dividing both intercepts and slopes by l/(l/v). Hence, the increase in both intercept and slope is l/(l-v) - 1 = v/(l-v), see Henderson and Quandt (1971).

(2) The producer's surpluses are computed as follows. First, 7 estimated regional demand and supply coal equations coupled with 49 transportation costs were fed into the quadratic programming subroutine (Cutler and Pass, 1971) to obtain optimum xi's, yj's and zij's.

Second, the producer's surplus can then be computed as $PS = \frac{1}{2} d_i \overline{x_i^2}$.

REFERENCES

Cottle, R. and Dantzig, G. (1968), Complementarity Pivot Theory of Mathematical Programming. in *Mathematics of Decision Sciences*, edited by G. Dantzig, Stanford, CA: Stanford University Press.

Cutler, L. and Pass, P. S. (1971), A Computer Program for Quadratic Mathematical Models Involving Linear Constraints, *Rand Report R-516-PR*.

Dafermos, S. and Nagurney, A.. (1983), An Iterative Scheme for Variational Inequalities. *Mathematical Programming,* 26, 40-47.

Dafermos, S. and Nagurney, A. (1984b), A Network Formulation of Market Equilibrium Problems and Variational Inequalities, *Operations Research Letters*, 3, 247-250.

Dafermos, S. and Nagurney, A.(1989), Supply and Demand Equilibration Algorithms for a Class of Market Equilibrium Problems, *Transportation Science*, 23, 118-124.

Enke, S. (1951), Equilibrium Among Spatial Separated Markets: Solution by Electric Analog, *Econometrica*, 19, 40-47.

Fox, K. A. (1951), A Spatial Equilibrium Model of the Livestock Feed Economy, *Econometrica*, 19, 547-566.

Friedman, M. (1937), The Use of Ranks to Avoid the Assumption of Normality Implicit in the Analysis of Variance, *Journal of American Statistical Association*, 32, 675-701.

Friedman, M. (1940), A Comparison of Alternative Tests of Significance for the Problem of M Rankings, *Annals of Mathematical Statistics*, 11, 86-92.

Friesz, T. L., Tobin, R. L., Smith, T. E. and Harker, P. T.. (1983), A Nonlinear Complementarity Formulation and Solution Procedure for the General Derived Demand Network Equilibrium Problem, *Journal of Regional Science*, 23, 337-361.

Gass, S. I. (1985), *Linear Programming Methods and Applications*, 5th edition, New York: McGraw-Hill Inc.

Henderson, J. M. and Quandt, R. E. (1971), *Microeconomic Theory: A Mathematical Approach* 2nd ed New York: McGraw-Hill Book Company.

Iman, R. L. and Conover, W. J. (1989), *Modern Business Statistics*, Second Edition, New York: John Wiley and Sons.

Irwin, C. L. and Yang, C. W. (1982), Iteration and Sensitivity for a Spatial Equilibrium Problem with Linear Supply and Demand Functions, *Operations Research*, 30(2), 319-335.

Irwin, C. L. and Yang, C. W. (1983), Iteration and Sensitivity for a Nonlinear Spatial Equilibrium Problem, in *Lecture Notes in Pure and Applied Mathematics*, 85 edited by A. Fiacco, New York: Marcel Dekker Inc., 91-107.

Judge, G. G. (1956), A Spatial Equilibrium Model for Eggs, Connecticut Agricultural Experiment Station, Storrs, CT.

Labys, W. C. (1989), Spatial and Temporal Price and Allocation Models of Mineral and Energy Markets, in *Quantitative Methods for Market Oriented Economic Analysis Over Space and Time*, edited by W. C. Labys, T. Takayama and N. D. Uri, Brookfield, VT: Gower Publishing Company Limited pp. 17- 47.

Labys, W. C. and Yang, C. W. (1991), Advances in the Spatial Equilibrium Modeling of Mineral and Energy Issues, *International Regional Science Review* 14, 1, 61-94.

Labys, W. C. and Yang, C. W. (1980), A Quadratic Programming Model of the Appalachian Steam Coal Market, *Energy Economics*, 86-95.

Mineral Year Book. (1974), Washington, DC: United States Bureau of Mines, U.S. Government Printing Office.

Mutschler, P. H., Evans, R. J. and Larwood, G. M.. (1972), Comparative Transportation Cost of Supplying Low-Sulfur Fuels to Midwestern and Eastern Coal Markets, U. S. Bureau of Mines, Washington, DC.

Nagurney, A. (1986), Computational Comparisons of Algorithms for General Asymmetric Traffic Equilibrium Problems with Fixed and Elastic Demands, *Transportation Research*, 20B, 78-84.

Page, P. N. and Yang, C. W., (1984), Severance Taxes and Spatial Characteristics of Energy Markets: The Case of Appalachian Coal, The 6th Annual North American Meeting of Energy Economists, San Francisco, CA.

Pang J. S. and Chan, D.(1981), Iterative Methods for Variational and Complementarity Problems, *Mathematical Programming*, 24, 284-313.

Peeters, L. (1990), A Spatial Equilibrium Model of the EC Feed Grain Sector, *European Review of Agricultural Economics* , 17,4 , 365-386.

Samuelson, P. A. (1952), Spatial Price Equilibrium and Linear Programming, *American Economic Review*, 42, 283-303.

Silberberg, E. (1970), A Theory of Spatially Separated Markets, *International Economic Review* 11, 334-348.

Steam-Electric Plant Factor (1974), Washington, DC, National Coal Association.

Takayama, T. and Hashimota, H. (1989), A Comparative Studies of Linear Complementarity Programming Models and Linear Programming Models in Multi-Regional Investment Analysis: Aluminum And Bauxite, in *Quantitative Methods for Market-oriented Economic Analysis Over Space and Time*, edited by W. C. Labys, T. Takayama, and N. D. Uri, Brookfield, VT: Gover Publishing Company.

Takayama, T. and Judge, G. (1964), Equilibrium Among Spatially Separated Markets: A Reformulation, *Econometrica*, 32, 510-524.

Takayama, T and Judge G. (1971), *Spatial and Temporal Price and Allocation Models,* Amsterdam: North-Holland Publishing Company.

Takayama, T. and Uri, N. (1983), A Note on Spatial and Temporal Price and Allocation Modeling, *Regional Science and Urban Economics*, 13, 455-470.

Thompson, R. L. (1989), Spatial and Temporal Price Equilibrium Agricultural Models, in *Quantitative Methods for Market Oriented Economic Analysis Over Space and Time,* edited by W. C. Labys, T.

Takayama and N. D. Uri, Brookfield, VT: Gower Publishing Company Limited pp. 49-65.

Uri, N. D. (1989), Linear Complementarity Programming: Electric Energy as a Case Study," in *Quantitative Methods for Market-oriented Economic Analysis Over Space and Time*, edited by W. C. Labys, T. Takayama, and N. D. Uri, Brookfield, VT: Gower Publishing Company, 165-188.

Yang, C. W. (1979), A Critical Analysis of Spatial Commodity Modeling: The Case of Coal, unpublished Ph.D. Dissertation, West Virginia University.

Yang, C. W. and Labys, W. C. (July 1985), A Sensitivity Analysis of the Linear Complementarity Programming Model: Appalachian Steam Coal and Natural Gas Markets, *Energy Economics* 7(3), 145-152.

Yang, C. W. and Labys, W. C. (1982), A Sensitive Analysis of the Stability Property of the QP Commodity Model, *Journal of Empirical Economics*, 7, 93-107.

Yang, C. W. and Labys, W. C. (1981), Stability of Appalachian Coal Shipments under Policy Variations, *The Energy Journal*, 2(3), 111-128.

Yang, C. W. and Page, W. P. (1993), Sensitivity Analysis of Tax Incidence in a Spatial Equilibrium Model, *Annals of Regiiona1 Science*, 27, 1-17.

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FINANCIAL COMMUNICATION ON THE WEB EVIDENCE FROM BELGIUM

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ABSTRACT

The ambition of this research is to identify the determinants of internet financial communication of small- and medium-sized firms quoted on non-regulated markets in Belgium. First, a scoring was established to determine the intensity with which firms use the internet as a vector of financial communication. To do this, an analysis grid was built on the basis of a review of the literature, highlighting the rules for disclosure of information through the Web. The score was then regressed via ordinary least squares on variables presented in the literature as determiners of the firms' financial communication. The main results of the findings bring to light three fundamental determiners of this score: membership or not in the information technology sector, the performance of the company and the market on which the company is quoted.

JEL: G10, M15, C31, O32.

KEYWORDS: financial communication, non-regulated financial markets, Web site, Small- and medium-sized firms.

INTRODUCTION

In recent years, the internet has become a privileged channel for current and potential investors to collect financial information. For year 2006, Léger (2008, p. 91) notes that 83% of individual investors were internet users, versus 57% in 2002. The proportion of potential investors and shareholders surfing the web in search of financial information has thus increased exponentially. Internet, a real tool for managing the investor relationship, therefore allows the financial community and the public investor to evaluate companies by providing financial information to them (Barredy and Darras, 2008, p. 3). Almilia and Budisusetyo (2008) even assert that traditional company reports on paper are outmoded.

The originality of the study presented here resides in its research object. Our analysis concerns small- and medium-sized firms quoted on the unregulated markets in Belgium: Alternext and the Free Market. Those markets are relatively recent and, to our knowledge, have not yet been the topic of such a research project. Inspired by the English Alternative Investment Market ("AIM"), Alternext Paris was launched in May 2005. Alternext Brussels followed in June 2006. The Free Market was elaborated in November 2004 by Euronext Brussels on the model of the Free Market established in the Paris Stock Exchange in 1996.

The Free Market et. alternext have been legally considered MTFs (multilateral trading facilities) since November 1st, 2007. They are unregulated markets in the sense of the European directives and Belgian financial legislation. Companies listed on these markets are not forced to publish their accounts in the IAS / IFRS standards or to conform to the Belgian Code of Governance.

The Free Market of Euronext Brussels includes twenty-eight companies. It was created to answer the accessibility difficulties of companies that did not have a minimal market capitalization of 50 to 75 million euros. "No precondition, no anteriority of the accounts and no minimal percentage of distribution are required for registration on the Free Market" (Goldberg-Darmon, 2006). In matters of communication, companies listed on this market are subject to more flexible rules (Euronext, 2008). Alternext Brussels counts nine firms. On this unregulated but organized market, certain conditions have to be met for

companies to be listed: it has to have existed for two years and appeal to a listing sponsor who will help prepare the IPO and make sure that obligations to provide information are respected. Furthermore, the amount of public offering has to be at least 2.5 million euros. Once quoted on Alternext, the company will have to publish its periodic information (annual financial report and biannual financial status) and will remain subject to monitoring by the CBFA (Financial Banking and Insurance Committee). CBFA approval of the prospectus is required for all listed companies. These two unregulated markets are thus appropriate for small- and medium-sized firms avid to raise capital without necessarily plying to excessively binding listing rules.

The research here has two objectives. First we want to determine with what intensity companies use the internet as a vector of financial communication. And then, we want to identify the determiners of this level of communication through the web. In the first step, we highlight the principles of financial communication on the web underlined by the literature. These elements help us build our website analysis grid. Then, through a literature review, we formulate our research hypotheses concerning the determiners of financial communication over the web. In the third part, we will present our methodology. The results are discussed in the fourth section.

LITERATURE REVIEW

A review of the literature was completed to identify norms of information disclosure through the web. This review of the literature will allow us to bring to the foreground an analysis grid of web sites in terms of financial communication of small- and medium-sized firms quoted on unregulated markets in Belgium. The authors advance the role of the annual report (Pervan, 2006; Euronext, 2006; Dutta and Bose, 2007; Léger, 2008; Barredy and Darras, 2008) and of the interest that it represents for the investor. It must be possible to download the annual accounts. Dutta and Bose (2007) go more in detail in their study and observe the presence of audit reports, financial ratios, and intermediate results over several years. In its recommendations, Euronext (2006) also underlines the importance of a table summarizing the main key figures. Pervan (2006), Dutta and Bose (2007), Léger (2008) as well as Barredy and Darras (2008) also recommend that firms communicate the history of share prices as well as share dividends. According to the recommendations of Euronext (2006), on-line publishing of the introduction prospectus is strongly desired. Léger (2008) has a similar way of thinking. Press releases (Pervan, 2006; Euronext, 2006 Dutta and Bose, 2007; Léger, 2008), the shareholding structure (Euronext, 2006; Dutta and Bose, 2007; Léger, 2008; Barredy and Darras, 2008), and the organization chart (Pervan, 2006; Euronext, 2006; Dutta and Bose, 2007) are all available to interested investors.

Dutta and Bose (2007) think that managers' income must be known. This would make less sense for the small-and medium-sized firms studied that do not have to follow the Belgian Code of Governance. All the authors mentioned above agree that a particular relationship must be knitted with the shareholder. This can be done through a periodic newsletter (Euronext, 2006; Dutta and Bose, 2007), a specific web page (Pervan, 2006; Barredy and Darras, 2008), an address, a telephone and\or an email address of a specific contact person for investors (Pervan, 2006; Euronext, 2006; Dutta and Bose, 2007; Barredy and Darras, 2008; Léger, 2008), a specific forum (Barredy and Darras, 2008), a letter to the shareholders (Leger, 2008; Barredy and Darras, 2008), answers to FAQs (Dutta and Bose, 2007; Léger, 2008), the schedule of financial communication events (Euronext, 2006; Dutta and Bose, 2007; Barredy and Darras, 2008; Léger, 2008), the shareholder's guide and rights and a club for shareholders (Léger, 2008). The on-line publishing of minutes from the general assembly and analysts' meetings can also be a real added value in the financial communication of the company (Léger, 2008). Companies cannot limit themselves to a distribution of accounting information - data on the activity itself is important too. For example, market shares and evolution of the competitive environment are recommended (Kleiber, 2003 quoted by Barredy and Darras, 2008). This review of the literature allowed us to create a web site analysis grid that will be

used to analyze the web sites of companies concerned by this study. The objective is to score the quantity of communication of every company in our population.

Table 1: An Analysis Grid of Web Sites

1) Financial reports	
Current year	Annual reports Annual account Audit report Intermediate results Management reports
Previous years	Annual reports Annual account Audit report Intermediate results Management reports
Prospectus of IPO	
Financial ratios financiers and/or main key figures	
Board of directors reports	
General assembly reports	
Explanation about data	
Financial analysts reports	
2) Investors information	
Specific webpage for investors	
Link to Euronext's website	
Current share's price	
History of share's price	
Current dividend	
Previous dividends	
Shareholder structure	
Number of shares	
Organization chart	
Shape and composition of the organs of governance	
Letter to shareholder	
Specific contact for investors	
Shareholder forum	
FAQ	
Shareholders' schedule	
Shareholders' guide	
Shareholders' rights	
Press release	
Press review	
3) Website's ergonomy	
On front page:	« Investors » « Press »
Several languages version of website	
Date of last changes on the website	
Help tools	
Search engine	
Roadshow	
Joining a periodic letter	
Get the press release by mail	
4) Firm's profile	
History	
Activities	
Strategy	
President's words	
Contact	
Market share	
Position regards to competitors	

HYPOTHESES DEVELOPMENT

Although until now research was not conducted on companies quoted on unregulated markets in Belgium, several studies have handled the question of the determinants of financial communication over the web

(Craven and Martson, 1999; Asbaugh et. al., 1999; Debreceny et. al., 2002; Ettredge et. al, 2002; Rodriguez and Menezes, 2003; Xiao et. al., 2004, Mendes-da-Silva and Christensen, 2004; Laswad et. al., 2005; Bollen et. al., 2006; Paturel et. al., 2006; Andrikopoulos et. al., 2007). These authors tried to identify the explanatory variables of financial disclosure on the internet. Here we will list these variables that are at the basis of our research hypotheses.

The Size of the Firm

Big companies have to bear a greater asymmetry of information between managers and shareholders. Because of this, agency costs must be incurred (Debreceny et. al. 2002). Besides, big companies being more publicly visible, tend to look after their reputation and their image to avoid governmental interventions. It follows that bigger sized companies provide more information than small firms (Debreceny et. al. 2002; Ettredge et. al 2002; Rodriguez and Menezes 2003; Xiao et. al. 2004, Mendes-da-Silva and Christensen 2004; Bollen et. al. 2006; Andrikopoulos et. al. 2007). Size is measured according to market value (Debreceny et. al. 2002; Xiao et. al. 2004, Mendes-da-Silva and Christensen. 2004; Bollen et. al. 2006), the annual sales (Andrikopoulos et. al. 2007), the turnover, the number of workers, the total assets or the market value of the company (Rodriguez and Menezes on 2003).

From here, we formulated the following hypothesis:

Hypothesis 1: the size of the company has a positive effect on its internet financial communication score.

In our research size is measured using the natural logarithm of the total assets. The market value, available on the Euronext site, could also have been a good indicator but its correlation with growth potential would have distorted the results of our econometric model. The growth potential (Hypothesis 6) is measured by taking the difference between market value and book value of the firm. The annual sales and turnover are not available for all the companies given that some of them publish their accounts in abbreviated form and not in complete form.

Debt Level

According to Debreceny et. al. (2002), to assure creditors of its capacity to pay off, more indebted companies would tend to disclose more information. Thus, the ratio of long-term debts over the total assets would be positively connected to the strategy of information disclosure. Andrikopoulos et. al. (2007) add that an increase in debts leads to an increase in agency conflicts between shareholders and creditors (Jensen and Meckling, 1976) and that an improvement in communication on the internet can reduce these agency costs. In light of this research, Andrikopoulos et. al. (2007) hypothesized the existence of a positive relation between the level of debts and the degree of information disclosure on the web. Paturel et. al. (2006) distinguish between private debts (measured according to the ratio of banking debts to the total assets) and public debts (measured according to the ratio of bonded debts to the total assets). They hypothesize that private debt has a negative impact on the score of web disclosure, whereas public debt has a positive impact. Laswad et. al. (2005) notice a positive relation between the debts of the local authorities they studied and their level of disclosure on the web.

Based on this background the following hypotheses is forwarded:

Hypothesis 2: the debt of the company has a positive effect on its internet financial communication score.

In our research debt is measured using the ratio of long-term debts to the total assets, in accordance with most of the previous studies.

Performance

According to Xiao et. al. (2004), managers of profitable companies should let their performance be known to assure their position, attract capital and reduce the risk of their company being under estimated. They measure profitability by means of Return on Assets (ROA). The hypothesis of a positive relation between the performance and the level of distribution of information on the web, advanced by Ettredge et. al. (2002) and by Andrikopoulos et. al. (2007), is not confirmed. Paturel et. al. (2006) also think that the more successful the company is, the more the level of information disclosure will be raised. This hypothesis will be validated for their sample of French companies. On the other hand, a negative relation will be obtained for the British companies in their study. It would seem that the level of communication is raised more for companies presenting weaker performances. They explain this result by "the effect of the publication of favourable information on the risk of competition "(Paturel et. al. 2006, p29). Mendes-da-Silva and Christensen (2004) find a negative relation between the performance (measured by the annual profit per share) and the level of information disclosure on the web. A negative relation is also obtained by Debreceny and Rahman (2005) between the performance (measured by ROE) and the frequency of information disclosure on the web. The majority of the consulted empirical studies having put in evidence the negative influence of performance on the financial communication score, we emit this hypothesis:

Hypothesis 3: the performance of the company has a negative effect on its internet financial communication score.

In our research, performance is measured along two dimensions: an exploitation (operation) dimension measured in terms of ROA before amortization (EBITDA / total asset) and a rather financial dimension measured in terms of ROE before tax (net profit before tax / equity capital).

The Dispersion of the Capital

Debreceny and Rahman (2005) as well as Paturel et. al. (2006) assert the more diluted shareholding is, the more numerous agency problems will be. In that case, significant and frequent communication is recommended. On the other hand, when shareholding is mainly in the hands of a family or some big shareholders, they have access to information internally and are thus less inclined to spread information outside. They thus establish a positive relation between information disclosure and dispersal of shareholding. Xiao et. al. (2004) demonstrate a different impact on the extent of the financial communication on the web when shares are held by governmental agencies and public enterprises (negative effect), by institutional investors (positive effect) or by foreign investors (absence of effect). Ashbaugh et. al. (1999) as well as Bollen et. al. (2006) notice a positive relation between the proportion of shares available for individual investors and the level of information disclosure on the web. From this we propose the hypotheses:

Hypothesis 4: the dispersal of the capital has a positive effect on the internet financial communication score.

In our research dispersal of capital is measured by free float. It indicates the percentage of participation held by the public. It is obtained by subtracting shares held by leaders and institutional investors from the entirety of shares on the market

The Sector

Companies having a certain know-how and\or advanced technology have assets that are difficult to assess such as research and development, human and intellectual capital, etc. and will thus tend to spread more information. Indeed, their accounting data underestimate their value and underestimate their future

earnings. Furthermore, these companies are subjected to fast and frequent changes connected to the technological world (Debreceny et. al. 2002). Xiao et. al. (2004) notice that companies in the IT sector tend to spread more information on the web. Indeed, they master this technology and want to demonstrate their expert position on the subject. On the other hand, Bollen et. al. (2006) discover a negative relation between the level of technology and the level of information disclosure on the web. The hypothesis arguing that the company being a part of a high technology sector and where the investments in research are considerable spreads more information was not verified by Rodrigues and Menezes (2003). We propose the following hypothesis:

Hypothesis 5: membership in the IT sector has a positive effect on the internet financial communication score.

Within the framework of this study, we chose to integrate a binary variable making it possible to determine a company's membership in the IT sector. To do so, the companies among having the code NACE BEL 2008 is 61 (telecommunications), 62 (programming, computer advising and other computing activities), 63 (information departments) or 70.210 (advising in public relations and in communication) are considered to be in the IT sector and are assigned a value of 1. Other companies obtain the value zero.

Growth Potential

Debreceny et. al. (2002) underscore the impact of growth potential and intangible assets within the company. Indeed, these two elements influence the market-to-book value ratio but are highlighted with difficulty in financial and accounting information. To estimate their importance, it is enough to observe the difference between book value and market value. In such a context, companies would tend to communicate more to limit information asymmetry. However, their results show that companies high growth have a negative and significant relation with distribution of information on the web. This can be explained by the fact that the property costs of a company with strong growth grow exponentially with the distribution of information. For that reason, the owners of the company would be less inclined to communicate. Debreceny and coauthors find no significant relation for companies with a low level of growth. Bollen et. al. (2006) notice no relation between the distribution of information and the level of growth of the company. Bearing this in mind, we put forth this hypothesis:

Hypothesis 6: the growth potential of a company has a negative effect on its internet financial communication score.

In our research growth potential is measured by the difference between the market value (available on the Euronext website) and the book value.

DATA AND METHODOLOGY

Our study concerns 37 companies quoted on unregulated markets in Brussels. With the help of our analysis grid (see Table 1) built on the basis of the literature review above, we examine the websites of companies and we give them one point for each item on the site. A score is thereby obtained for every company (see Table 2). This scoring method is often used in information disclosure studies (Larran & Giner, 2002). Using this score we are be able to estimate the degree of website information disclosure of the 37 companies in this study. Next, the scores are analyzed using ordinary least squares (OLS), as in Ben Rhouma and Cormier (2007), Jouini (2007), Paturel et. al. (2006), Debreceny and Rahman (2005) did.

RESULTS

Using our analysis grid (see Table 1), we examined the websites of all the companies in our population. A point was given for every item of the analysis grid on the website. The scores in Table 2. The primary results of our analysis are presented in Tables 3, 4 and 5. Among 51 items present in our analysis grid, some are literally absent from websites (previous intermediate results, letter to the shareholders, shareholder's guide, date of the last modification of the site and market shares of the company). Less than 10% of small- and medium-sized firms quoted on unregulated markets present these elements on their website: the previous and current dividends, a forum for shareholders, a help tool, the location of the company, the previous audit reports, FAQs, the rights of the shareholders, the current annual report, the report of the general assembly, the reports of financial analysts and the message from the president. Only five companies talk about the intermediate results, the previous annual reports and the current share price. The current audit reports, a search engine as well as the possibility of receiving press releases by mailing are offered by 16.2% of small- and medium-sized firms. About 20% of small- and medium-sized firms show their annual accounts, the report of the Board of directors and their strategy. Nine companies reveal the shape and the composition of their organs of governance and offer the possibility of a subscribing to a newsletter.

Table 2: Score of Financial Communication

Firms	*Market*	*Score*
OTC	Free Market	2
Oxbridge	Free Market	3
Val st L	Free Market	3
5ème saison	Free Market	4
Fred&Ginger	Free Market	5
Eryplast	Free Market	6
Sodiplan	Free Market	6
TEAM	Free Market	6
PNS	Free Market	8
Archimède	Free Market	9
Fixinox	Free Market	9
Flexos	Free Market	9
Tetrys	Free Market	9
MCLS	Free Market	10
Pharco	Free Market	10
Haacht	Alternext	11
Antigoon	Free Market	12
RVA	Free Market	12
EMD Music	Free Market	13
SV Pat	Free Market	13
Iceconcept	Free Market	14
Newtree	Free Market	15
Realco	Free Market	15
Reibel	Free Market	15
De rouck	Alternext	15
Vision IT gp	Alternext	16
Proximedia	Free Market	17
Arpadis	Free Market	18
Newton 21	Free Market	18
BSB	Alternext	18
Ecodis	Alternext	18
Propharex	Free Market	20
Evadix	Alternext	20
Rentabiliweb	Alternext	22
Emakina	Alternext	23
U learning	Free Market	24
Porthus	Alternext	24

Less than 30% of observed websites contain the shareholding structure as well as the organization chart of the company. The company history as well as the past annual reports are presented by twelve companies.

About 38% of the companies publish the schedule of the shareholders meetings, a particular contact for the investors and the current annual report. Fifteen small- and medium-sized firms present financial ratios or key figures, whereas seventeen propose a link to the Euronext website. More than half of the companies post their prospectus of initial public offering as well as a press review. About 65% of websites show press releases and provide a version of the website in several other languages. More than 70% of websites offer the access to "press" and "investors" tabs from the front page. The vast majority of sites present the activities of the company (86.5 %) and show how to contact the firm (94.6%).

Table 3: Variables Definition

Variables	Measure
Sector	IT firms = 1 and other firms = 0
Debts	Total Debts/ total assets.
Performance	ROA = EBITDA / total assets
	ROE = net profit before tax / equity capital
Dispersion of capital	Free float
Growth	Market value – book value
Size	Log total assets

This tables shows how the explanatory variables are measured. They were obtained from the Belfirst database (version 2008) published every year by the Van Dijk Office in partnership with the National Bank of Belgium. For each variables, we considered the last year of availability of the accounts.

Table 4: Descriptive Statistics of Variables

Variables	Mean	Std. Dev.	Min	Max
Score	12.75676	6.206651	2	24
Debts	0.5341804	0.2474827	0.0295779	0.9313824
Roa	8.183714	11.95672	-25.59	34.25
Roe	4.711715	45.84808	-134.18	133.83
Freefloat	0.2283806	0.1118438	0.001	0.49
Growth	-8163213	$1.76 * 10^7$	$-7.64* 10^7$	6450999
Size	15.70034	1.115419	12.88157	17.90549

This table shows descriptive statistics of the explanatory variables.

Table 5: Correlation between Variables

	Score	Sector	Market value	Debts	Roa	Roe	Freefloat	Growth	Size
Score	1.0000								
Sector	.04210	1.0000							
Market value	0.2618	0.2548	1.0000						
Debts	-0.3689	-0.0719	-0.1579	1.0000					
Roa	-0.2517	0.1463	-0.0051	0.4670	1.0000				
Roe	-0.2717	0.1338	0.0374	0.1577	**0.6300**	1.0000			
Freefloat	-0.0361	0.0665	-0.3335	0.1380	0.0052	-0.1184	1.0000		
Growth	-0.2245	-0.2637	**-0.9697**	0.0355	-0.0498	-0.0624	0.2984	1.0000	
Size	0.3083	-0.1130	0.5364	-0.2461	-0.1813	-0.1412	-0.3266	-0.3926	1.0000

This table shows the correlations between explanatory variables. Growth potential is strongly correlated with capitalization as expected. As a consequence, we have chosen not to retain the market capitalization as a measure of the size, in order to be able to simultaneously test the influence of the size and the growth on the financial communication score of companies. Furthermore, considering the important correlation between the ROA and the ROE, we use two different models to test the influence of performance on communication score.

Casual observation indicates that companies with the best scores are mainly registered on Alternext. This can be explained by the fact that the listing on Alternext implies the obligation of periodic information disclosure. Although no requirement stipulates that this information also be posted on the internet, we can suppose that companies having already prepared and supplied this information elsewhere go ahead and put it on the web. We thus decided to add the variable "market" in our model. Companies quoted on

Alternext are assigned the value zero, and those registered on the Free Market are assigned a value of one. The general model takes on the following shape:

Score =ά +ß1 (market) + ß2 (sector) + ß3 (size) + ß4 (performance) + ß5 (dispersion of capital) + ß6 (potential growth) + ß7 (debts)

Regression results are presented in Table 6. Two models were tested: one taking into account the ROA and the other ROE as the measure of the performance. A White test demonstrated the presence of heteroscedasticity of the residues within model two. To obtain valid estimations of the variances and the covariances of our estimators, we used heteroscedasticity corrected variances and standard deviations. A Breush-Godfrey test shows the presence of residuals autocorrelation. In model one, only the coefficient of the "sector" variable appears to be statistically significant. The positive sign of this coefficient confirms hypothesis 5. Membership in the IT sector positively affects the internet financial communication score. This result confirms the conclusions of Debreceny et. al. (2002) and of Xiao et. al. (2004). Companies belonging to the IT sector apparently use the internet as a vector of financial communication more than companies in other sectors do. We can pinpoint here their desire to demonstrate their expertise on the subject and to show investors the value of their know-how.

Table 6: Results of the Regressions by OLS

	Model 1 general	**Modele 1 refined**	**Modele 2 general**	**Modele 2 refined**
Market	-4.397672	-5.633189	-4.215354	-5.739111
	0.1584	*0.013***	*0.1782*	*0.010**
Sector	5.343104	4.519201	5.389797	4.494681
	*0.0323***	*0.037***	*0.0514****	*0.0576***
Size	1.054878		0.930151	
	0.3461		*0.4477*	
Roa	-0.1025471	-0.137414		
	0.266	*0.076****		
Roe			-0.035615	-0.03966
			*0.0163***	*0.0030***
Freefloat	-1.467246		-3.025930	
	0.879		*0.7860*	
Growth	$3.45*10^{-8}$		$3.09*10^{-8}$	
	0.615		*0.5471*	
Debts	-2.507757		-3.930871	
	0.601		*0.3585*	
cons	0.8382754	16.90373	3.065783	16.05172
	0.966	*0.000**	*0.8877*	*0.000**
Number of obs	34	35	34	35
F stat	2.98	7.26	3.39	7.74
Prob > F	0.0197**	0.0008*	0.0103**	0.0005*
R-squared	0.4448	0.4126	0.4776	0.4281
Adj R-squared	0.2953	0.3558	0.3369	0.3728
Root MSE	5.3951	5.0979	5.2331	5.0302

*This table shows the regression estimates of the equation: Score =ά + ß1 (market) + ß2 (sector) + ß3 (size) + ß4 (performance) + ß5 (dispersion of capital) + ß6 (potential growth) + ß7 (debts). Model 1 and Model 2 use ROA and ROE respectiverly as the measure of the performance. The two models are refined thanks to a Wald test wich allows removal of the less significant variables. The first line in each cell is the regression coefficient. The second line is the t-statistic. ***, ** and * indicate the significance at the 1, 5 and 10 percent levels respectively.*

To refine this model, we proceeded to a Wald test on the coefficients of variables "freefloat", "growth", "debts" and "size". The results of this test prompted us not to reject the null hypothesis and to extract these four variables from model one. The removal of these variables allowed a net improvement in the quality of adjustment of this model 1. The variables "market" and "performance" have a negative and statistically significant influence on the financial communication score. So the fact of being quoted on the Free Market negatively influences the financial communication score on the web. This can be explained by the absence of financial communication requirements in this market. Another argument that could be

advanced concerns the type of investor interested in these two markets. Indeed, we can imagine that the communication effort is greater when the company faces more specialized investors. A more in-depth study concerning the structure of shareholding and the type of investor interested in these two markets could provide additional insight.

Hypothesis three, which postulates a negative influence of performance on the financial communication score on the web, is confirmed. Our results support the results presented by Mendes-Da-Silva and Christensen (2004), Paturel et. al. (2006), Debreceny and Rahman. (2005). Model two was then refined via the preliminary realization of a Wald test applied to least statistically significant variables ("freefloat ", "growth", "debts" and "size"). The results of model two are similar to those obtained previously and confirm the validation of hypotheses three and five of this research as well as the importance of the listing market as regards the determination of the financial communication score on the web. Other hypotheses were not confirmed: the coefficients of the variables of size, debts, dispersion of the capital, and the growth potential were not significant.

CONCLUSION

The role of company websites "to inform and to seduce, to explain and to convince, to attract and to develop loyalty" (Léger 2008, p. 92). The goal is to anticipate the questions of potential investors, to answer them by means of clear and complete information as well as to facilitate the interaction with these partners in the company. Internet use has exceeded the simple promotion of company products because the promotion of the relations with present and future investors has also become an objective pursued by website creators (Geerlings & al, 2002). According to Léger (2008, p. 90), the internet changed the modalities of sharing information with shareholders because the information is quickly updated and spread. Furthermore, this information is accessible, archived and available at any time (Geerlings & al, 2002; Léger 2008).

The research objectives in this study were to determine the intensity companies use internet as a vector of financial communication and to identify the determiners of this level of communication through the web. In order to reach these objectives we used a scoring on the first step and the ordinary least squares (OLS) method on the second. We first observed the websites of companies quoted on unregulated markets in Belgium, thanks to our analysis grid built on the basis of the main elements advanced in the literature. We thus obtained a score for each firm included in our study. We then identified the determinants of the financial communication score obtained by means of a regression.

Membership in the IT sector has a positive impact on the financial communication score on the web, indicating the IT sector communicates more financial elements through their websites than other firms. Performance has a negative effect on the financial communication score through the web, according to hypothesis three, which states that the less successful companies will tend to communicate more. The market on which the company is listed also has a negative impact indicating that companies quoted on the Free Market will inform less than firms registered on the Alternext market. The latter are subjected to the obligation of periodic information disclosure, contrary to companies quoted on the Free Market, but nothing indicates however that they have to provide this information on the internet. The results of our econometric analysis nonetheless show their tendency to do so. We can imagine therefore that having these various documents ready, they also choose to disclose them on the web.

The originality of this study resides in its population. Here we have focused on companies quoted on unregulated markets in Belgium which have not previously been studied. Such an original study has disadvantages: our sample is quite small (37 firms). In the future we could imagine adding the unregulated French market in order to get a more expansive field of study. The differences between Alternext and the Free Market could be observed in greater depth. This study could be extended by a

more detailed analysis of shareholder structures and the type of target investor for each unregulated market.

REFERENCES

Almilia, L. & Budisusetyo, S (2008) "The practice of financial disclosure on corporate website: Case study in Indonesia", *Proceeding international conference on Business & Management*, Universiti Brunei Darussalam, 8-9 January, 21p.

Almilia, L. & Budisusetyo, S (2008) "Corporate Internet reporting of banking industry and LQ45 firms: an Indonesia example", *Proceeding the first Parahyangan international Accounting and Business conference*, Bandung, February 13-15, 26p.

Andrikopoulos, A. & Diakidis, N (2007) "Financial reporting practices on the Internet: the case of companies listed in the Cyprus stock exchange", *working paper*, 22p.

Ashbaugh, H., Johnstone, K. & Warfield, T (1999) "Corporate reporting on the Internet", *Accounting horizons*, vol.13, no 3, September, p. 241-257.

Barredy, C. & Darras, N (2008) « L'utilisation d'Internet dans la communication auprès des actionnaires minoritaires dans les entreprises familiales cotées », *Journal des entreprises familiales*, vol.1, no.1, Hiver, p. 41-68.

Ben Rhouma A. et Cormier D. (2007), "Déterminants de la communication sociale et environnementale des entreprises françaises" 28ème Congrès de l'Association Francophone de Comptabilité « Comptabilité et Environnement », IAE Poitiers, Mai 2007.

Bollen, L., Hassink, H. & Bozic, G (2006) "Measuring and explaining the quality of Internet investor relations activities: a multinational empirical analysis", *International Journal of Accounting Information Systems*, vol. 7, p.273-298.

Craven, B.M. & Marston C.L (1999) "Financial reporting on the Internet by leading UK companies", *The European Accounting Review*, vol 8, no. 2, p. 321-333

Debreceny ,R., Gray, G. and Rahman, A., (2002). The determinants of Internet financial reporting, *Journal of Accounting and Public Policy*, vol. 21, Issues 4-5, Winter, p. 371-394.

Debreceny, R. & Rahman, A (2005) "Firm-specific determinants of continuous corporate disclosures", *The International Journal of Accounting*, vol. 40, Issue 3, p. 249-278.

Dutta, P. & Bose, S (2007) "Web-based corporate reporting in Bangladesh: an exploratory study", *The cost and management*, vol.35, no. 6, November-December, p. 29-45.

Ettredge, M., Richardson, V. & Scholz, S (2002) "Dissemination of information for investors at corporate web sites", *Journal of Accounting and Public Policy*, no. 21, October, p. 357-369.

Euronext (2006). « Recommandations pour un parcours boursier réussi sur le Marché Libre », 15 décembre, 4p. http://www.euronext.com/fic/000/010/800/108002.pdf

Euronext (2008). « Guide pratique : les PME et la Bourse. Alternext et le Marché Libre », Nautadutilh, 21 avril 2008, 58p. http://www.euronext.com/fic/000/033/337/333372.pdf

Geerlings, J., Bollen, L., Hassink, H., (2002). Investor relations on the Internet: a survey of the Euronext zone, *European Accounting Review*, *Taylor and Francis Journals*, vol. 12(3), September, p. 567-579.

Goldberg-Darmon, M., (2006), « L'introduction en Bourse. Les nouvelles règles d'admission. Eurolist, Alternext, Marché libre », *Revue Banque Editions*, Paris, 123p.

Jensen, M.C. & Meckling W.H. (1976), « Theory of the firm: managerial behavior, agency costs and ownership structure », *Journal of Financial Economics*, vol.3, p. 305-360.

Jouini S. (2007), "Les facteurs déterminants et les caractéristiques de la stratégie des entreprises en matière de communication financière sur leur site Web" 28ème Congrès de l'Association Francophone de Comptabilité « Comptabilité et Environnement », IAE Poitiers, Mai 2007.

Larran M. and Giner B. (2002), « The Use of the Internet for Corporate Reporting by Spanish Companies", *The International Journal of Digital Accounting Research*, ISSN: 1577-8517, Vol. 2, No. 1, pp. 53-82

Laswad, F., Fisherb, R., and Oyelerec, P., (2005). Determinants of voluntary Internet financial reporting by local government authorities, *Journal of Accounting and Public Policy*, vol. 24, Issue 2, March-April, p. 101-121.

Leger, J.Y., (2008). *La communication Financière*, Paris, DUNOD, 2ème édition, 278p.

Mendes-da-Silva, W. & Christensen, T (2004) "Determinants of Voluntary Disclosure of Financial Information on the Internet by Brazilian Firms", August 30, Available at http://ssrn.com/abstract=638082

Paturel, R., Matoussi, H. & Jouini, S (2006) « Les motivations de la communication financière des entreprises françaises et britanniques à travers le web », *5ème Colloque International de la recherche en sciences de gestion*, Hammamet, Tunisie, Mars.

Pervan, I (2006) "Voluntary financial reporting on the Internet – Analysis of the practice of Croatian and Slovene listed joint stock companies", *Financial theory and practice*, vol. 30 (1), p. 1-27.

Rodriguez, L. & Menezes, C (2003) "Financial reporting on the Internet. The Portuguese case", *RAE Electronica*, vol. 2, no. 2, 22p.

Xiao, J., Yangb, H. & Chow, C (2004) "The determinants and characteristics of voluntary Internet-based disclosures by listed Chinese companies", *Journal of Accounting and Public Policy*, vol. 23, Issue 3, May-June, p. 191- 225.

BIOGRAPHY

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MARKET CONCENTRATION MEASURES AND INVESTMENT DECISIONS IN MEXICAN MANUFACTURING FIRMS

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ABSTRACT

We study how different measures of market concentration explain investment decisions of Mexican manufacturing firms. The Herfindahl-Hirschman Index is the traditional measure of market structure concentration. The Dominance Index is a competition measure used by Mexican regulators. The econometric assessments suggest that investment decisions of Mexican firms can be better explained by the Dominance Index than by the Herfindahl-Hirschman Index. Thus our results suggest that the Mexican Dominance Index might be useful as a measure of market structure and competition. The results also suggest that market concentration reduces investment. These conclusions are based on several econometric assessments.

JEL: L40; L22; L60

KEYWORDS: Dominance Index, Herfindahl-Hirschman Index, Investment, Mexico, Manufacturing

INTRODUCTION

Traditional economic theory indicates that the maximization of profits explains the behavior and decisions of firms. Particularly, from the view of financial economics, firms are considered as flows of financial streams that depend on investments. Such view explains why the study of optimal investment decisions and their determinants is considered an important research field for economists.

Here we study the determinants of investment decisions in Mexican manufacturing firms because studies for emerging economies are relatively scarce. Particularly, we focus on how market concentration, as a proxy of market structure and competition, influences investment decisions. The assumption underlying our study is that Mexican firms face constraints imposed by its competitors and by nature.

In the literature, competition constraints are analyzed with market concentration indexes. In this study we follow this practice. The Herfindahl-Hirschman Index (HHI) is the usual measure of competition. However it is not the only one. An alternative measure is the Dominance Index (DI) proposed by Garcia Alba (1990). The main difference between these measures is that the DI explicitly accounts the size of firms to measure competition.

We analyze how these two measures of market concentration may explain investment decisions of Mexican manufacturing firms. We focus on micro, small, medium and large size firms. We control for certain firm characteristics that capture the constraints that firms face by nature. They include firm size, cash flow, capital intensity and investment opportunities.

The contributions of this research focus on two areas. The former contributions relate to the literature on investment determinants. Traditional studies focus on developed economies, not in emerging ones. The second contribution is methodological. To the best of our knowledge, econometric comparisons of the HHI and the DI as market concentration measures do not exist.

The paper is organized as follows. Section 2 reviews the literature. Section 3 describes the methodological design: data, variables and model specification. Section 4 shows our regression results. Section 5 discusses them in terms of their implications for economic policy. Section 6 concludes.

LITERATURE REVIEW AND BACKGROUND

Here we review the economic literature about firm investment decisions. The review follows the guidelines of the Structure-Conduct-Performance (SCP) paradigm. We begin our review by describing the concentration indexes analyzed in this investigation. Then we indicate some studies that have analyzed the determinants of investment decisions on empirical and theoretical grounds.

Traditional industrial organization studies analyze firms under the basis of the SCP paradigm. This paradigm explains firms´ decisions and their performance in terms of the notion of market structure. In such studies, the Herfindahl-Hirschman Index (HHI) is the standard measure of market structure and concentration.

The HHI measures market structure under the assumption that firms of a market are identical and that competition is symmetric. Thus the HHI is an adequate measure of concentration and competition when big differences do not exist among the firms. Methodologically, the index is measured as the inverse of the number of firms. Its construction only takes into account the concentration of output.

The Dominance Index (DI) is a measure used by Mexican regulators since the nineties. Garcia Alba (1990) developed it to assess how differences in firms´ size may affect the strategic interactions in the market. In fact, the DI assesses the capacity of two o more small firms to compete against large firms. Thus it is an index that considers how total output is allocated among the firms

Market concentration indexes have been subject to criticism under methodological basis. Particularly, Ten Kate (2006) argues that the DI is a hybrid between a concentration index and an inequality index. He also argues that changes in strategic interactions may not be properly taken into account with the index. Moreover he argues that identical firms are not necessarily better competitors than different ones.

The relevance of the discussion regarding market concentration indexes is not only methodological. Some theoretical studies explicitly suggest that market structure modifies the behavior of firms. The paper of Akdoğu and MacKay (2006) is relevant for our purposes because they argue that investment decisions depend on the strategic interactions prevailing in the markets. Moreover, in a later study they confirm that investment depends inversely on industry concentration (Akdoğu and MacKay, 2008).

Empirical evidence is not conclusive. For example, Lee and Hwang (2003) do not find any relationships between market structure determinants and investment decisions in the Korean telecommunication industry. Indeed they conclude that market structure (measured by the HHI) is not a determinant of Research and Development (R&D) investment. However, in another study Escrihuela-Villar (2008) concludes that investment depends directly on market concentration.

Interestingly both studies, Lee and Hwang (2003) and Escrihuela-Villar (2008), indicate that certain determinants are necessary to understand the relationships between market structure and investment. Concretely, both studies indicate that firm size and investment opportunities determine investment decisions. Particularly, Escrihuela-Villar (2008) finds that large firms invest more than small ones.

Evidence from developed economies confirms that further determinants are necessary to analyze the relationships between market structure and investment. Mishra (2007) and Czarnitzk and Binz (2008) find direct relationships among investment intensity, market structure and firm size. Bøhren, Cooper and

Priestley (2007), D'Erasmo (2007) and Ughetto (2008), also find direct relationships among investment decisions and cash flow, firm size and capital intensity. De Marzo and Fishman (2007) find that investments for small and medium firms are sensitive to cash flows.

Empirical research on the relationships between market structure and investment for emerging economies are limited. Existing studies mostly focus on other determinants of investment decisions. For example, Adelegen and Ariyo (2008) and Bokpin and Onumah (2009) find that firm size, cash flow and investment opportunities may explain investment decisions. The first study focuses on the Nigerian economy. The second one analyses manufacturing firms in several emerging markets.

We emphasize that further studies are necessary to understand the relationships among market structure and investment decisions in emerging economies. Here we propose an econometric analysis with the HHI and DI measures of market concentration to analyze such relationships. We include some complementary determinants according the findings of previous studies. The methodological issues and outcomes regarding such analysis are described in the following sections.

METHODOLOGY

Here we describe the methodological design of the investigation. Specifically, we describe the sources of data and the indicators used in the econometric assessments. Furthermore we describe the econometric modeling and testing procedure used to analyze the relationships among market structure and investment decisions in the Mexican manufacturing firms.

Data Sources

We use data from the "Economic Census 2003" reported by the Mexican Bureau of Statistics (INEGI). Such census is constructed accordingly to the North-American-Industry-Classification-System (NAICS). We use a longitudinal data set because data of previous censuses are built with non-comparable methodologies. In Mexico census data are collected every five years. Currently, data for the census collected in 2008 is not available.

In the census, firm-level data are not available due to confidentiality reasons. We deal with such constraint by constructing a set of four representative firms for each of the 182 industries. We build the representative firms accordingly to the number of employees. A micro firm has no more than 10 employees. A small firm has between 11 and 50. A medium firm has between 51 and 250. A large firm has at least 251 employees. This classification follows the one of the Mexican Economics Ministry for manufacturing firms.

The census classifies firms of each industry into groups according to the number of employees. For example, the first group includes firms with 0 to 2 employees. The second group includes firms with 3 to 5, and so on. The census has 12 classificatory groups for each of the 182 industries. As we have indicated, the Mexican Economics Ministry uses a different classification for the firms. Table 1 shows the relationships between both classifications.

The first step to build a variable that describes the behavior for a representative firm of size j of industry i is to calculate a weight indicator. We use the mean of the number of employees by group to calculate it. This is calculated as follows:

$$P_{ijt} = \frac{n_{ijt} M_{jt}}{\sum_{t} n_{ijt} M_{jt}} \qquad (1)$$
$$i = 1,...,182$$
$$j = 1,2,3,4$$
$$t = 1,...,12$$

where P_{ijt} is the weighted indicator of the industry i, size j, group t; n_{ijt} is the number of firms of the industry i, size j, group t; M_{jt} is the mean of the number of employees of size j in group t; the subindex i refers to the i-th industry; the subindex j refers to the firm of size j (micro, small, medium and large firms); the subindex t refers to the t-th groups included in the size-j classification.

Table 1: The Census and the Mexican Economics Ministry Classifications for the Firms of an Industry

Census´ Classification of Firms in the Industry i(t)	Employees in the Firms that Belong to Group t	Mean of Employees in the Firms that Belong to Group t (Mjt)	Type of Firm According to the Mexican Economics Ministry´ classification	Firms´ Size According to the Type of Firm (j)
1	0-2	1	Micro	1
2	3-5	4	Micro	1
3	6-10	8	Micro	1
4	11-15	13	Small	2
5	16-20	18	Small	2
6	21-30	25	Small	2
7	31-50	40	Small	2
8	51-100	75	Medium	3
9	101-250	175	Medium	3
10	251-500	375	Large	4
11	501-1000	750	Large	4
12	1000+		Large	4

This table shows the relationships between the Economic Census´ classification and the one of the Mexican Economics Ministry. The census classifies firms of each industry into groups according to the number of employees. The census has 12 classificatory groups for each of the 182 industries. Mexican Economics Ministry´ classification for manufacturing firms considers four types. A micro firm has no more than 10 employees. A small firm has between 11 and 50. A medium firm has between 51 and 250. A large firm has at least 251 employees. The mean of employees for the firms of the twelfth group is the average of employees with respect to the total of firms in the twelfth group.

The second step is to use the weighted indicator of each one of the four representative firms of industry i to estimate each variable assessed econometrically. We multiply P_{ijt} by each variable included in the census classification for each one of the twelve groups of firms V_{ijt} (see Table 2 for a list of variables). Such multiplications added accordingly to each subindex t will provide us with a variable each representative firm of size j of the industry i.

$$RF_{ij} = \sum_{t} P_{ijt} V_{ijt} \qquad (2)$$
$$i = 1,...,182$$
$$j = 1,2,3,4$$
$$t = 1,...,12$$

where RF_{ij} is a variable associated to the representative firm of the industry i, size j; P_{ijt} is the weighted indicator of the industry i, size j, group t.

Variables

Here we describe the main variables used in our study. We use the ones proposed by Bøhren, Cooper and Priestley (2007) and Akdoğu and Mackay (2008). The variables used in the econometric assessments are summarized in the following table:

Table 2: Investment and Its Determinants (Variables)

Variables	Measures	Indicator of the Census
Investment	Fixed capital expenditures	Gross fixed capital formation (Value of fixed assets bought during 2003 minus the value of fixed assets sales)
Investment opportunities	Ratio of output to capital	Ratio of production value to fixed capital stock
Market concentration	Market concentration measures	Herfindhal-Hirschman Index Dominance Index
Cash flow	Earnings	Net earnings
Firm size	Fixed assets	Total value of fixed assets
Capital intensity	Ratio of capital to labor	Ratio of fixed capital stock to number of employees

This table shows the variables and indicators used in the econometric assessments. The dependent variable is investment. The other variables are the independent variables used in this investigation. The table includes the definitions of the variables (indicators) according to the Economic Census of INEGI (Mexican Bureau of Statistics).

The measures of market concentration are the HHI and the DI indexes. We do not build indexes for each industry because certain groups of industries can be considered, for practical purposes, as competitors in the same market. We deal with this fact by grouping the industries in subsectors. We estimate 21 subsector level measures of market concentration. We use the total number of firms that belong to each group of industries to build the measure that corresponds to each subsector.

The measure of market concentration assumes that all the firms in a subsector are in the same market. Under that assumption, we define the HHI as follows:

$$HHI_s = \sum_{k=1}^{n} m_{ks}^2 \tag{3}$$

where m_{ks} represents the share of the firm k in the total product of the subsector s; n is the number of firms in the subsector s.

The Dominance Index is estimated in the same way as the HHI. Firms using similar raw material inputs, similar capital equipment, and similar labor are classified in the same subsector. Thus, we estimate again 21 subsector level measures of market concentration. Again, the measure of market concentration assumes that all the firms in a subsector are in the same market. Under that assumption, we define the DI as:

$$DI_s = \sum M_{ts} \overline{Y}_{ts} \tag{4}$$

where M_{ts} is the share of the production of the group t in the production of the subsector s; $\overline{Y}_{ts}$ is the firm average production of the group t, subsector s.

Modeling Specification and Econometric Techniques

We use a log-linear functional form specification to describe the relationships between market structure and investment. Such specification allows the regression coefficients to measure the elasticity of investment with respect to each independent variable (determinant). Moreover, the log transformation reduces the possibility of heteroscedasticity problems. Thus the model specification is:

$$\ln I_{ij} = \alpha_0 + \alpha_1 \ln IO_{ij} + \alpha_2 \ln CF_{ij} + \alpha_3 \ln S_{ij} + \alpha_4 \ln MC_{ij} + \alpha_5 \ln KI_{ij} + \varepsilon_{ij} \quad (5)$$

where I_{ij} is investment; IO_{ij} represents the investment opportunities; CF_{ij} is cash flow; S_{ij} is the size of the firm; MC_{ij} is the market concentration; KI_{ij} represents the capital intensity; e_{ij} is the random error term.

The analysis relies on several estimations of the equation (5). Concretely it relies on two sets of regressions. The first set includes estimations that use the HHI index as measure of market concentration. The second set uses estimations with the DI index. Each set is conformed by four regressions that assess how market concentration relates to investment for firms of a specific size (micro, small, medium and large). We use Ordinary Least Squares (OLS) for estimation purposes in both sets of regressions. In addition, we use specification-error Ramsey tests. The tests allow us to validate the econometric assumptions regarding the functional specification form and to detect omitted-variable bias.

EMPIRICAL ASSESSMENT

Table 3 reports the summary of descriptive statistics of the variables. The variable means seem to depend on the size of the firms. The means associated to micro firms are smaller than the ones of small firms. The means associated to medium firms are smaller than the ones of large firms. These facts support the necessity to differentiate firms by size.

Table 3: Summary Statistics

	Obs	Mean	Std. Dev.	Min.	Max.	Obs	Mean	Std. Dev.	Min.	Max.
Variables	**Micro firms**					**Medium firms**				
Investment	118	16.66	5.61	3.82	31.48	147	16.91	3.44	5.29	24.98
Cash flow	118	28.28	5.24	9.11	42.73	147	24.53	3.39	8.67	30.90
Firm size	118	26.45	5.01	12.76	40.00	147	22.79	3.40	7.48	31.60
Capital intensity	118	8.86	1.77	0.16	13.65	147	8.51	1.86	3.32	16.52
Investment opportunities	118	-2.09	1.75	-14.01	1.11	147	0.24	1.17	-4.28	2.97
HHI	118	-5.65	0.77	-6.74	-2.04	147	-5.45	0.87	-6.74	-2.04
DI	118	-3.21	1.01	-5.35	-1.11	147	-3.16	1.10	-5.35	-1.11
Variables	**Small firms**					**Large firms**				
Investment	107	24.10	6.18	5.25	38.00	118	22.04	8.57	5.86	37.63
Cash flow	107	40.43	5.67	10.04	51.46	118	31.04	11.11	10.32	47.82
Firm size	107	36.32	5.76	6.51	49.51	118	29.07	10.46	9.44	44.52
Capital intensity	107	12.42	2.44	3.17	21.33	118	10.32	3.72	3.14	19.97
Investment opportunities	107	-1.82	1.60	-5.07	3.53	118	-0.46	1.87	-4.63	3.86
HHI	107	-5.53	0.92	-6.74	-2.04	118	-5.47	0.89	-6.74	-2.04
DI	107	-3.17	1.05	-5.35	-1.11	118	-3.28	1.14	-5.35	-1.16

This table shows summary statistics. It presents measures of central tendency. Also, this table shows the independent and dependent variables used in model specification. The dependent variable is investment. Summary statistics is presented for micro, small, medium and large firms. Values are expressed in natural logarithms.

Table 4 reports the regression outcomes for the first set of regressions. Apparently, the HHI coefficient is positive and significant only for micro firms. Firm size coefficients are positive and significant, independently of the type of firm. In most cases, the coefficients associated to cash flows and investment

opportunities are significant. Investment opportunities and firm size coefficients are positive and significant for small firms. The cash flow coefficient is negatively correlated with investment decisions and is statistically significant. Medium and large firms show similar patterns. In all cases, the results show high values of R^2. In addition, the joint significance F tests suggest that the independent variables are necessary to explain investment decisions.

Table 4: HHI Concentration Measures and Investment Decisions in Mexican Manufacturing Firms (OLS Regressions)

Firm Size	Micro	Small	Medium	Large
	Regression indicators			
Investment opportunities	0.39	1.91***	1.55***	1.60***
	(1.14)	(5.36)	(3.56)	(4.86)
Herfindahl- Hirschman Index (HHI)	0.67***	0.24	-0.056	-7.50
	(2.98)	(0.92)	(-0.35)	(-0.70)
Cash flow	-0.40	-1.62***	-1.27***	-1.16***
	(-1.21)	(-4.60)	(-2.90)	(-3.55)
Firm size	1.47***	2.70***	2.26***	2.15***
	(4.63)	(7.44)	(4.75)	(5.61)
Capital intensity	0.02	-0.06	0.02	0.02
	(0.24)	(-0.44)	(0.19)	(0.18)
Constant	-6.57***	-2.84	-4.11***	-3.76***
	(-2.69)	(-1.09)	(-3.45)	(-4.91)
Observations	118	107	147	118
F	225.16***	134.10***	109.58***	444.44***
Prob > F	0.00	0.00	0.00	0.00
R^2	0.91	0.86	0.79	0.95

*This table reports results for OLS regressions. They use the Herfindahl- Hirschman Index as a proxy of market structure. The dependent variable is investment. The results are presented for firm size. The t-statistics are given in parenthesis. ***, **, and * indicate significance at the 1, 5 and 10 percent levels respectively.*

Table 5 reports the regression outcomes for the second set of regressions. Here we find that the DI coefficient is a negative and statistically significant for medium and large firms. The coefficients associated to investment opportunities are positive and significant in most cases. Cash flow coefficients are negative and statistically significant. The coefficients associated to firm size are positive and significant in all cases.

Table 5: DI Concentration Measures and Investment Decisions in Mexican Manufacturing Firms (OLS Regressions)

Firm size	Micro	Small	Medium	Large
	Regression Indicators			
Investment opportunities	0.17	1.87***	1.68***	1.57***
	(0.49)	(5.23)	(3.83)	(4.80)
Dominance Index (DI)	0.11	-0.04	-0.20*	-4.43*
	(0.62)	(-0.19)	(-1.66)	(-1.82)
Cash flow	-0.21	-1.58***	-1.41***	-1.15***
	(-0.64)	(-4.48)	(-3.18)	(-3.57)
Firm size	1.27***	2.64***	2.40***	2.13***
	(3.92)	(7.35)	(5.01)	(5.63)
Capital intensity	0.17	-0.03	0.02	0.05
	(0.49)	(-0.24)	(0.18)	(0.50)
Constant	-10.50***	-4.34*	-4.42***	-3.53***
	(-4.82)	(-1.81)	(-4.38)	(-4.62)
Observations	118	107	147	118
F	207.74***	132.86***	112.14***	456.12***
Prob > F	0.00	0.00	0.00	0.00
R^2	0.90	0.86	0.79	0.95

*This table reports results for OLS regressions. They use the Dominance Index as a proxy of market structure. The dependent variable is investment. The results are presented for firm size. The t-statistics are given in parenthesis. ***, **, and * indicate significance at the 1, 5 and 10 percent levels respectively.*

Like in the previous set of regressions, the results show high values of R^2. Such values confirm that the explanatory variables can explain investment decisions. Again the F tests confirm that the set of independent variables explains them. So, apparently both sets of regression may provide similar information. The only exception relies on the positive and significant coefficient associated to the market concentration variable for micro firms in the first set of regressions.

We support the robustness of our previous results with specification-error Ramsey tests. Such tests allow us to deal with the differences of information. Here we use two versions of the Ramsey test. The first one, the traditional RESET test, uses powers of the estimated independent variable as regressors. The second one uses powers of the RHS variables. The null hypothesis is that the model is adequately specified in both versions of the test.

The outcomes of the tests of both sets of regressions suggest that the econometric assessments for small, medium and large firms do not have specification errors. The modeled relationships between market concentration and investment decisions seem adequate in most cases. However, the exception is referred to micro firms. For these firms, the regressions suggest the existence of omitted variable-bias and/or incorrect functional forms.

The Ramsey tests suggest that the differences reported between the two sets of regressions should not be considered relevant. In fact, the comparison of the reported outcomes and tests suggest that the regressions that include the DI index might be better than the ones that include the HHI index. We support this statement on the basis that the only significant coefficients associated to the concentration variables appear in the second set of regressions (see Table 5). As we have indicated, the regression of the first set associated to the micro firms has specification errors (see Tables 4 and 6).

Here is important to point out that the outcomes suggest that how market concentration affects investment decisions depends on the size of the firms. According to the regressions with the DI index, it seems that concentration significantly reduces investment for medium and large size firms. When firms are micro or small ones, the evidence is not conclusive due to specification errors and non significant variables (see Table 5).

Table 6: Model Validation (Specification Tests)

Firm size	Micro	Small	Medium	Large
Models with Herfindhal-Hirschaman Index (HHI)				
Ramsey test				
(H_0: Model has no specification error)	7.06***	0.85	2.24*	0.82
Prob > F	0.0002	0.4720	0.0859	0.4875
Ramsey test, rhs				
(H_0: model has no omitted variables)	2.66***	0.76	0.80	0.81
Prob > F	0.0020	0.7197	0.6788	0.6655
Models with Dominance Index (DI)				
Ramsey test				
(H_0: model has no omitted variables	7.68***	0.90	2.35*	0.43
Prob > F	0.0001	0.4465	0.0750	0.7287
Ramsey test, rhs				
(H_0: model has no omitted variables)	2.84***	0.75	0.74	0.66
Prob > F	0.0011	0.7295	0.7434	0.8123

*This table shows results of Ramsey test. It is used to detect specification errors. This table shows two versions of the of the Ramsey test. Ramsey test (rhs) uses powers of the independent variables. Instead Ramsey test uses powers of the fitted values of the dependent variable. ***, **, and * indicate significance at the 1, 5 and 10 percent levels respectively.*

We conclude by indicating that the evidence supports the view that market concentration reduces investment, at least in medium and large firms. Thus, according to our results, competition may promote

investment. Furthermore the evidence provides elements to support the statistical adequacy of the DI index as an adequate measure of market concentration. Moreover, the results suggest that the regressions that include the DI index might be better than the ones that include the HHI index.

DISCUSSION

Here we have assessed the relationships between market structure and investment decisions in the Mexican manufacturing firms. The assessments suggest that market concentration may reduce investment, at least in medium and large firms. Thus, competition may promote investment. Furthermore, they confirm that certain firm characteristics may be useful to explain investment decisions. Particularly, firm size seems an important determinant.

However, it is interesting to point out that some findings seem counter intuitive. For example, capital seems not to influence investment decisions. Furthermore, cash flows seem to have an inverse relationship with investment. We believe that such findings may be explained on the basis that manufacturing firms are intensive in labor. When firms are labor-intensive, investments may rely on new "costly" workers that reduce cash flows.

Methodologically, the assessment procedure seems useful to explain the investment decisions of small, medium and large firms. Furthermore, it supports the hypothesis that investment decisions in micro firms may depend on other determinants, in addition to the market structure ones. Ekanem and Smallbone (2007) include, among these determinants, the intuition, the social networks and the experience of the entrepreneurs.

Empirically, we believe that the most interesting findings relate to the usefulness of the different market concentration measures. Our econometric assessment suggests that the Dominance Index (DI) is a better determinant of investment decisions than the Herfindahl-Hirschman Index (HHI). In practice, this finding implies that the degree of competition can affected by differences in the size of the firms in the market. Thus regulators may need to consider these differences when dealing with competition issues.

We conclude by indicating that our findings have implications for regulatory and policy purposes. Probably, the most important one is associated to the necessity to promote the Dominance Index as an alternative measure of market competition. Another one relates to the necessity to encourage competition among the Mexican firms in order to increase investment. Finally, a third one relates to the necessity to encourage studies on the determinants of investment in micro and small size firms because our evidence is not conclusive.

CONCLUSIONS

We have studied how alternative measures of market concentration, as proxy indicator of market structure, may explain investment decisions of Mexican manufacturing firms. Here we have focused on the HHI and the DI measures. We have developed an econometric analysis that uses data for the last census available in Mexico (2003). We have controlled by firm size, cash flow, capital intensity and investment opportunities.

Methodologically, the empirical study has relied on two regression sets. The first set includes estimations that use the HHI index as measure of market concentration. The second one includes estimations that use the DI index. We have used OLS techniques for estimation purposes. In addition, we have used Ramsey tests to validate the econometric outcomes. We have used data of the census to build the indicators of the 182 industries that integrate the Mexican manufacturing sector.

Our findings confirm that market structure may influence investment decisions. Concretely they suggest that concentration may reduce investment. Thus they confirm the findings of Akdoğu and MacKay (2008). Our findings also suggest that the DI index is a better determinant than the HHI one. Furthermore, they suggest that firm size and investment opportunities have a direct relationship with investment. Cash flows, on the other hand, have an inverse one. Interestingly, capital intensity is not related to investment decisions.

We believe that our study provides some ideas for further research. For example, extensions of our analysis could be used to analyze investment decisions in firms that provide financial and non-financial services. The "Economic Census 2008", when available, may provide data useful for comparison purposes. Finally, our results also suggest that further studies on the determinants of investments in micro and small firms may be necessary.

REFERENCES

Adelegan, O.A. & Ariyo, A. (2008) "Capital Market Imperfections and Corporate Investment Behavior: A Switching Regression Approach Using Panel Data for Nigerian Manufacturing Firms", *Journal of Money, Investment and Banking*, vol. 2, March, p. 16-38

Akdoğu, E. & MacKay, P. (2006) "Externalities and Corporate Investment", Working Paper Series, February, p. 1-39

_____ (2008) "Investment and Competition", *Journal of Financial and Quantitative Analysis*, vol. 43(2), June, p. 299-330

Bøhren, Ø., Cooper, I. & Priestley, R. (2007) "Corporate Governance and Real Investment Decisions", European Finance Association, Working Paper, March, p. 1-29

Bokpin, G.A. & Onumah, J.M. (2009) "An Empirical Analysis of the Determinants of Corporate Investment Decisions: Evidence from Emerging Market Firms", *International Research Journal of Finance and Economics*, vol. 33, November, p. 134-141

Czarnitzk, D. & Binz, H.L. (2008) "R&D Investment and Financing Constraints of Small and Medium-Sized Firms"**,** Discussion Paper No. 08-047, Centre for European Economic Research, p. 1-28

D'Erasmo, P. (2007) "Investment and Firm Dynamics", Working Paper, University of Texas at Austin, July, p. 1-33

DeMarzo, P.M. & Fishman, M.J. (2007) "Agency and Optimal Investment Dynamics", *The Review of Financial Studies,* Oxford Journals, vol. 20, January, p. 151-188

Ekanem, I. & Smallbone, D. (2007) "Learning in Small Manufacturing Firms. The Case of Investment Decision Making Behavior", *International Small Business Journal*, vol. 25(2), April, p. 107-129

Escrihuela-Villar, M. (2008) "Innovation and Market Concentration with Asymmetric Firms", *Economics of Innovation and New Technology*, vol. 17(3), p. 195-207

García Alba Iduñate, P. (1990) "Un Enfoque para Medir la Concentración Industrial y su Aplicación al Caso de México", *El Trimestre Económico*, vol. LVII (226), Abril-Junio, FCE, México, p. 317-341

Lee, M.H. & Hwang, I.J. (2003) "Determinants of Corporate R&D Investment: An Empirical Study Comparing Korea's IT Industry with Its Non-IT Industry", *ETRI Journal*, vol. 25(4), August, p. 258-265

Mishra, V. (2007) "The Determinants of R&D Expenditure of Firms: Evidence from a Cross-Section of Indian firms", *Economic Papers,* vol. 26(3), September, Economic Society of Australia, p. 237-248

Ten Kate, A. (2006) "The Dominance Index in Mexican Merger Control: Does it Perform Better than the HHI?", *The Antitrust Bulletin*, vol. 51(2), Summer, p. 383-409

Ughetto, E. (2008) "Does internal finance matter for R&D? New evidence from a panel of Italian firms", *Cambridge Journal of Economics*, vol. 32(6), April, p. 907-925

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ADDITIONAL EVIDENCE ON UNIVERSITY RANKINGS BY COST OF LIVING ADJUSTED FACULTY COMPENSATION

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ABSTRACT

This paper ranks 500 universities and colleges based on compensation paid to their faculty. The analysis examines universities both on a raw basis and cost of living adjusted basis. This work extends the previous literature by examining a broader group of schools. This research includes private universities and community colleges. Most previous literature is limited to the examination of public universities. Similar to previous papers, the results here show that cost of living adjusted salaries differ dramatically from raw salary figures. The results suggest that administrators should design compensation packages that reflect cost of living realities in their area. Faculty seeking employment opportunities should carefully consider cost of living issues.

INTRODUCTION

Faculty in the academic job market must assess a number of factors when evaluating a job offer. Faculty must aggregate information on these factors using their own weighting scheme to make an informed decision. One important factor is financial compensation. Comparing salary offers from multiple institutions is difficult at best due to differences in benefits, work demands, and cost of living. Cost of living varies considerably across the United States and internationally. Despite the importance of cost of living issues in evaluating job offers, few studies examine costs of living adjusted salaries offered by universities. The focus of this paper is to compare cost of living adjusted salaries.

Figlio (2002) found a positive relationship between salary levels and the quality of teachers hired at U.S. public schools. The evidence suggests that universities receive benefits by paying higher salaries. As such administrators have a strong motivation to develop compensation plans that appropriately balance compensation paid with faculty quality desired.

Study of the impact of differential costs of living (COL) salary values was pioneered by Boothe (1933) and Winakor (1943). More recently researchers have examined COL adjusted salaries within a locality or university (See Stoops 2007, and Foster 2002, and Guilkey, Mroz, Rhode and Salemi, 2009). In a recent study, Jalbert, Jalbert and Hayashi (2010), produced a comprehensive study COL adjusted salaries at U.S. universities.

This paper extends the work of Jalbert, Jalbert and Hayashi (2010) by including a broader group of schools. The Jalbert, Jalbert and Hayashi (2010) study was limited to examining salaries at public U.S. universities that offered at least a bachelor degree. This study uses a different dataset that includes both public and private schools. In addition, the study here includes schools at both the university level and community college level. Finally, the study here includes specialized schools within universities, such as medical and law schools. While Jalbert, Jalbert and Hayashi (2010), examined both salary and benefit data in the aggregate and by faculty rank, the study here is limited to an examination of salary information and is not separated by faculty rank.

The evidence presented here shows that COL adjusted salaries differ dramatically in some instances from raw salaries. Moreover, universities rank significantly different on a raw basis than on a cost of living adjusted basis. Statistical tests verify the rank differences are significant. The remainder of the paper is organized as follows. In the next section literature on the relative salaries of faculty are presented. A discussion of the data and methodology utilized follows. Rankings and analysis are provided in the ranking results section. Some statistical analyses are presented in the empirical test results section. The paper closes with some concluding comments.

LITERATURE REVIEW

Fournier and Rasmussen (1986) estimated cost of living differences between state salaries. They found public education salary rankings differ substantially by state when cost of living is considered. Ong and Mitchel (2000) use the Big Mac index and purchasing power parity to compare cost of living adjusted salaries at institutions throughout the world. The Big Mac index is based on the cost of a McDonald's Big Mac sandwich at various locations. The results show widely varying cost of living adjusted salaries across countries. Hong Kong and Singapore pay the highest cost of living adjusted salaries with the United States ranking in the middle of the pack.

Fogg (2006) examined COL adjusted salaries at eleven top research universities. Five of eleven schools changed ranking at least 3 places when raw rankings were compared to COL adjusted rankings. Interestingly, on a raw basis, the salary range was $40,300 while on a COLA basis, the range was $52,096. Browne and Trieschmann (1991) examined COLA salaries at 106 major research institutions in 1988. In general, the authors find that real salaries differ substantially from nominal salaries. Marginal state income tax rates and faculty union status did not impact the level of employee benefits. However, variation in taxes and cost of living did affect the competitiveness of salaries across universities.

Zeglen and Tesfagiorgis (1993) examined full professor salaries from one doctorate granting institution located in each of the United States. They found that rankings of faculty salaries by institution differ substantially when adjustments are made for both cost of living and tax differences. Rankings were more affected by cost of living differences than by tax differences.

Alexander (2001) examined data from 1979-1998. He examined raw salaries, unadjusted for cost of living differences, to identify differences between compensation at public and private universities. He found that salary and benefit levels are higher at private institutions. He notes that competitiveness of public institutions with regard to salary and benefits has declined over time. Many other authors have also documented the declining competitiveness of public universities including Bell, 2000, Ehrenberg, 2003, Hamermesh, 2002 and Zogni 2003.

Related to faculty compensation is the extent to which faculty supplement their compensation with consulting and other external activities. Marsh and Dillon (1980) found that on average faculty supplement their income with external activities by about 15 percent. They write that some of this income is earned during off-duty periods by faculty on nine month appointments. To the extent that professors earn supplemental income, and there is variation in these earnings across universities, direct or COL adjusted salary comparisons may be biased.

Jalbert, Jalbert and Hayashi (2010) examined COL adjusted salaries and benefits of faculty. Their study examined salary and benefit data for some 574 public universities. They categorize universities based on the highest degree offered. Separate rankings of universities based on faculty rank are provided. The results show that university rankings based on raw salaries are dramatically different than rankings based on COL adjusted salaries. They find an average rank difference of 121 places between raw and COL

adjusted rankings. In a companion study Jalbert, Jalbert and Hayashi (2009) ranked states based on the COL adjusted salaries. Similar ranking differences are identified.

As noted earlier, the work here extents the work of Jalbert, Jalbert and Hayashi (2010) by using a data set that includes both universities and community colleges. The paper extends the work of both Jalbert, Jalbert and Hayashi (2010) and Alexander (2001), by ranking both public and private institutions.

DATA AND METHODOLOGY

Data on average salaries of full time faculty, highest degree conferred by the university and city where the university is located were obtained from Stateuniversity.com. Schools are classified as associate degree, bachelor degree, master degree, doctorate degree granting, or a law school. The data includes five hundred schools. One hundred seven schools were classified as Associate degree granting, 42 schools as bachelor conferring, 80 as master conferring, 244 as doctorate conferring and 27 as law schools. It is important to point out that the dataset is not exhaustive as many notable universities and colleges are not included in the Stateuniversity.com database. Thus it is critical not to interpret the study results beyond a comparison of those schools contained in the data.

Each city where a university is located was searched against the Yahoo.com real estate website, neighborhood information section. This section reports, among other things, a cost of living index for U.S. cities. This data was combined with the www.stateuniversity.com data. The results presented here are dependent on the accuracy of these datasets. Any errors in these datasets will also manifest themselves in the findings presented here.

To complete the analysis, the average COL adjusted salary at each school was computed. Consider a university that is located in a city with cost of living index, *COLindex*. The university reports a nominal average salary for its faculty, *Salary*. Then the COL adjusted salary, *COLSal,* is computed as follows:

$$COLSal = \frac{Salary}{COLindex(\frac{1}{100})} \tag{1}$$

For example, consider a University that reports an average nominal salary of $100,000 per year. The city is located in a city with a cost of living index of 125. The COLA salary is computed as:

$$COLSal = \frac{\$100{,}000}{125\left(\frac{1}{100}\right)} = \$80{,}000$$

The interpretation is that a salary of $100,000 in this city is comparable to a salary of $80,000 in a city with *COLindex* equal to 100.

To further examine the differences in rankings, we compute the change in ranking for each university in the sample. Defining the raw ranking for university i as $RRNK_i$ and the COL adjusted ranking to be $COLRNK_i$, then the rank difference is:

$$RDIF_i = COLRNK_i - RRNK_i \tag{2}$$

To conserve space we do not report rank changes here, but do use them for our calculations. The interested reader can easily compute the rank differences as needed.

Next, universities are ranked separately based on raw salaries and COL adjusted salaries. A combined ranking and sub rankings based on degree offered are provided. Finally, we use the Z-test on rank differences and Kendall Tau correlation test on the rankings to determine if the COL adjusted rankings differ from nominal data rankings (Kendall, 1938).

Summary statistics of the data are reported in Tables 1 and 2. Table 1 shows the number of reporting universities within each state. The total number of reporting universities are identified in the column titled ALL. California and New York have the largest numbers of reporting institutions at 130 and 75 respectively. The remaining columns break the data down by the types of degrees offered.

Table 1: Distribution of Universities

STATE	ALL	DOCTORATE	MASTER	BACHELOR	ASSOCIATE	LAW
AK	1	0	0	0	1	0
AL	3	3	0	0	0	0
AR	1	1	0	0	0	0
AZ	11	3	1	0	7	0
CA	130	34	10	9	71	6
CO	6	4	1	1	0	0
CT	16	9	4	1	2	0
DC	7	5	1	0	0	1
DE	2	2	0	0	0	0
FL	11	7	3	0	0	1
GA	3	3	0	0	0	0
HI	2	1	0	1	0	0
IA	3	2	0	1	0	0
IL	20	11	2	1	5	1
IN	4	3	1	0	0	0
KS	1	1	0	0	0	0
KY	2	2	0	0	0	0
LA	2	1	0	0	0	1
MA	32	18	6	5	0	3
MD	8	6	0	2	0	0
ME	3	0	0	3	0	0
MI	15	5	1	0	6	3
MN	4	1	0	2	0	1
MO	4	3	0	1	0	0
NC	5	4	0	1	0	0
NE	1	1	0	0	0	0
NH	3	2	0	0	0	1
NJ	24	12	7	0	5	0
NM	1	1	0	0	0	0
NV	2	2	0	0	0	0
NY	75	35	22	8	6	4
OH	8	6	1	0	1	0
OK	2	2	0	0	0	0
OR	3	2	1	0	0	0
PA	30	16	8	4	1	1
RI	7	2	4	0	0	1
SC	4	3	1	0	0	0
TN	2	2	0	0	0	0
TX	18	15	1	1	0	1
UT	2	2	0	0	0	0
VA	9	6	2	0	0	1
VT	2	1	0	0	0	1
WA	5	2	3	0	0	0
WI	5	2	0	1	2	0
WV	1	1	0	0	0	0
TOTAL	**500**	**244**	**80**	**42**	**107**	**27**

This table shows the number of observations used in the analysis of each state. The column labeled ALL indicate the number of observations in the full sample without regard to type of degree offered. The columns labeled DOCTORATE, MASTER, BACHELOR ASSOCIATE, LAW indicate the number of observations in each state where the degree level indicated was the highest offered.

Table 2 shows some sample statistics. The first series of rows show ranking information. The first row shows the number of observations and the second shows the average rank difference between raw salary rankings and COL adjusted rankings. The third column shows the percentage rank change. The fourth and fifth rows report the largest improvement and decline in rankings of COL adjusted rankings relative to raw rankings. For example, for the full sample, there were 500 total observations. The average rank difference between raw salaries and COL adjusted salaries is 136.09 places. This implies the average rank changed by 27.22 percent (139.09/500). The largest improvement in ranking was 484 places, and the largest decrease in ranking was 380 places.

The second series of rows shows mean and standard deviation information. Interestingly, the variance of COL adjusted salaries are higher than raw salaries. This implies that the difference in salaries are more dramatic on a COL adjusted basis than a raw basis. For example in the full sample, the mean salary is $83,891 with a standard deviation of $13,268. On a COL adjusted basis, the mean salary is $73,288 with a standard deviation of $19,251. The standard deviation of COLA salaries is $5,983 larger than the raw salary standard deviation. This finding is in spite of the fact that the COLA salary mean is lower. This finding is consistent with findings reported earlier by Fogg (2006).

The final two sets of rows in Table 2 report the maximum and minimum salaries reported by any institution in the sample. The statistics are reported on both a raw and COL adjusted basis. Particularly interesting is that the COL adjusted minimum salary is very low in each of the samples. In the full sample, one institution has a COL adjusted salary of just $19,887.

Table 2: Summary Statistics

	Full	Doctorate	Master	Bachelor	Associate	Law
N	500	244	80	42	107	27
Mean Rank Difference	136.09	70.08	22.18	10.57	38.07	6.67
Percentage Rank Difference	27.22	28.72	27.73	25.17	35.58	24.70
Largest Rank Improvement	484	211	73	32	100	25
Largest Rank Decline	380	165	63	28	90	15
Mean Salary	83,891	85,401	80,769	85,026	77,479	103,153
Standard Deviation of Salary	13,268	12,309	9,222	19,685	5,555	18,956
Mean COLA Salary	73,288	77,019	68,262	72,039	64,799	88,945
Standard Dev. of COLA Salary	19,251	17,539	17,209	27,871	14,065	12,333
Maximum Salary	191,733	135,564	109,180	191,733	104,030	154,936
Maximum COLA Salary	210,696	128,350	105,438	210,696	93,956	128,936
Minimum Salary	70,889	70,889	70,905	70,953	71,107	72,586
Minimum COLA Salary	19,887	21,249	21,121	19,887	23,641	35,560

This table shows summary statistics. Largest Rank Improvement is the largest rank increase of COLA rankings compared to Raw Salary rankings. Largest Rank Decline is the largest rank decrease of COLA Salary rankings compared to Raw Salary rankings.

RANKING RESULTS

Next, universities are ranked as a single group based on their nominal salaries and COL adjusted salaries. Exhibit 1 presents the results. The results are ordered based on the state in which the universities are located. The first column indicates the institution name and he second indicates the highest degree offered by the institution. The notation is as follows: *A*, *B*, *M*, *D* and *L* indicate that the highest degree offered by the institution is an Associate, Bachelor, Master, Doctor or Law degree respectively. Notation followed with a + indicates that the institution offers some additional element above and beyond the degree indicated but not sufficient to reach the next higher level. For example, M+ indicates that the university offers certificate programs above the Master level. *ST* indicates the state where the university is located. *COLINDX* indicates the cost of living index for the city where the university is located as

obtained from Yahoo.com. *RAWSAL* is the average salary paid to full time faculty by the institution. COLSAL is the cost of living adjusted salary. *RAWSALRANK* and *COLSALRANK*, rank the institutions based on raw and cost of living adjusted salaries respectively.

The University of Texas Anderson Medical Center is the highest paying institution with an average salary of $191,733. As this institution is located in a low cost of living area, the COL adjusted salary is $210,696, which gives it a first place ranking on a COL adjusted bases as well. Other schools that rank well on both a raw and COL adjusted basis include New York Law School (2nd and 14th, California Institute of Technology (5th and 34th), University of Pennsylvania (6th and 3rd), Princeton University (8th and 57th), Yale University (14th and 20th) and University of Chicago (15th and 30th).

While some institutions rank well on both a raw and COL adjusted basis, others do not. Harvard University ranks third based on raw salaries, but only 323 on a COL adjusted basis. University of California Hastings College of Law ranks seventh on a raw basis and 201st on a COL adjusted basis. Massachusetts Institute of Technology ranks 18th on a raw basis but only 426th on a COL adjusted basis. Stanford ranks 25th on a raw basis and 312th on a COL adjusted basis.

At the other end of the spectrum, some schools that rank very poorly on a raw basis fare much better on a COL adjusted basis. Schools that improve in rankings most are generally located in Midwestern states. Some notable findings are that University of Michigan Dearborn (490th to 133rd) and Western Michigan University (500th to 150th) improve rankings by 357 and 350 places respectively. Another group of large universities showing major improvements include University of Texas San Antonio (395th to 90th) , University of Tennessee (447th to 141st) , Saint Louis University (457th to 153rd) and Louisiana State University (435th-135rd). Close behind these universities in improvement levels are University of Texas Christian University, University of Arkansas, Iowa State, University of Cincinnati, University of Nebraska, University of Oklahoma and University of Tulsa.

In order to compare schools in their peer groups, the analysis continues by grouping schools based on the highest degree offered. The results in Exhibit 2 examine universities that offer a doctorate degree. The top paying schools on a raw basis largely resemble the full sample results. Schools that rank well both on a raw and COL adjusted basis include California Institution of Technology, Pennsylvania State University, Princeton, Yale and the University of Chicago. While Harvard University ranks at the top of the raw salary rankings at $135,564, this salary translates to only $66,780 on a COL adjusted basis giving Harvard a COL adjusted ranking of 185th. Other notable schools that perform well on a raw basis but poorly on a COL adjusted basis include Stanford, Naval Postgraduate School, Massachusetts Institute of Technology, New York University, Boston College and University of California San Diego. Schools that have much higher rankings on a COL adjusted basis include Western Michigan, Louisiana State, St. Louis University, University of Arkansas and University of Tennessee. The lowest paying school on a COL adjusted basis is Polytechnic University in Brooklyn, NY at $21,249.

Exhibit 3 shows rankings of schools offering Masters degrees. The results show that Gooding Institute of Nurse Anesthesia and Thunderbird were the two best paying schools on a COL adjusted basis at $105,438 and $105,106 respectively. CUNY Brooklyn College and Sarah Lawrence College are the poorest paying schools on a COL adjusted basis at $21,121 and $34,525 respectively. Schools ranking high on both a COL adjusted and raw basis include the Gooding Institute of Nurse Anesthesia, Thunderbird, Widener University-Harrisburg and Oberlin College. Universities that ranked poorly on a raw basis, but well on a COL adjusted basis include University of Michigan Dearborn, California University of Pennsylvania, Furman University and Clarion University of Pennsylvania.

Exhibit 4 ranks schools that offer bachelor degrees. The University of Texas MD Anderson Cancer Center ranks highest on both a raw and COL adjusted basis. Perhaps surprising is the high rank of

military schools. US Naval Academy, US Military Academy and US Coast Guard Academy rank 2,3 and 4 on a raw basis and 7, 2, 3 on a COL adjusted basis respectively. The U.S. Air Force Academy, while ranked lower holds down a very respectable 12th place on a COL adjusted basis. CUNY Medgar Evers College and Haverford College rank lowest on a COL adjusted basis at 19,887 and $37,515 respectively.

Exhibit 5 shows the results for Associate degree granting schools. Miracosta College and Santa Monica College rank highest on a raw basis with salaries of $104,30 and $94,604 respectively. On a COL adjusted basis, Henry Ford Community College and Muskegon Community College pay best at $93,956 and $93,104 respectively. Large differences are present between raw and COL adjusted rankings. Few schools are highly ranked on both lists. Notable exceptions are Miracosta College, San Joaquin Delta C, Riverside Community College, Reedly College and Fresno City College. Schools ranking high on a raw basis but much lower on a COL adjusted basis include Santa Monica College, College of Marin, SUNY Westchester Community College and Ohlone College. Schools ranked low on a raw basis but much higher on a COL adjusted basis include Monroe Community College, Merced College, Glendale Community College and Paradise Valley Community College.

The last set of degree based rankings are presented in Table 6. This table ranks law schools. A separate ranking for law schools is provided due to the specialized nature of the degrees offered in these schools. South Texas College of Law ranks highest on a COL adjusted basis while Brooklyn Law School ranks lowest. Schools having substantially different raw and COL adjusted rankings include Brooklyn Law School, University of California Hastings College of Law, Appalachian School of Law, and CUNY School of Law at Queens College.

EMPIRICAL RESULTS

Next, statistical tests are conducted to determine the extent that COL adjusted rankings differ from raw rankings. If the ordering of the COLA salaries mirrors raw salaries, problems associated with comparing raw salaries are substantially reduced. If universities rank in the same order, salaries would be different by a scale factor only. On the other hand, if rankings of raw and COLA salaries are significantly different, serious errors could result from raw salary comparisons. To determine the significance of the salary differences, we conduct two tests of rank congruence.

If the two rankings are substantially the same, the difference between the rankings should not be statistically different from zero. The first ranking congruence test is a Z test on the ranking differences to determine if they differ from zero. The tests are conducted on the full sample and on each of the subsamples. The null hypothesis is:

H_o: *There is no difference between university rankings based on raw and cost of living adjusted salaries.*
H_a: *University rankings based on raw and cost of living adjusted salaries are different.*

The results are presented in Panel A of Table 3. The first figure in each cell is the number of observations. The second figure is the mean difference between raw and COL adjusted rankings. The third figure in each cell is the two-tailed test statistic followed by a significance indicator. For each test, the results indicate a significant difference between the two rankings at the one percent level. Thus the evidence strongly supports the contention that school salaries rank differently on a raw and COL adjusted basis.

The second test of ranking congruence is Kendall's Tau test of rank correlation (Kendall, 1938). In this case the test is to determine if the two rankings are related or independent of each other. The hypotheses are specified as follows:

H_o: University rankings based on raw and cost of living adjusted salaries are independent
H_a: University rankings based on raw and cost of living adjusted salaries are related.

The results are presented in Panel B of Table 3. The first figure in each cell is the correlation between the two rankings. The second figure is the p-value along with a significance indicator. The third figure in each cell is the coefficient of determination. The results are mixed. The null hypothesis is rejected for the full sample, doctorate, master and bachelor degree samples. However the null hypothesis is not rejected for associate degrees and marginally rejected for law degrees. In general, the results from this test, suggest that the two rankings are related to some degree.

The combined results from Panel A and B of Table 3 indicate that the two rankings are significantly different from each other, but do have an element of relatedness. These findings suggest the need for additional research to identify characteristics that lead to similar and different rankings, and the consequences faced by schools, students, administrators, faculty and students when the rankings follow a particular pattern.

Table 3: Tests of Ranking Congruence Z-Test on Rank Differences

Panel A: Z-Test on Rank Differences

	Full	Doctorate	Master	Bachelor	Associate	Law
N	500	244	80	42	107	27
Mean Difference	136.09	70.08	22.18	10.57	38.07	6.67
Z	30.58***	21.92***	11.60***	8.82***	16.97***	6.10***

Panel B: Kendall's Tau Test for Rank Correlation

	Full	Doctorate	Master	Bachelor	Associate	Law
Correlation	0.219	0.175	0.187	0.312	0.013	0.265
P-Value	0.001***	0.001***	0.014**	0.004***	0.842	0.055*
Coefficient of Determination	0.048	0.031	0.035	0.098	0.000	0.070

*This table shows the results of Ranking Congruence tests. Panel A shows the results of a Z-test on the ranking differences. The reported test statistic is for a two tailed test. The first figure in each cell is the number of observations. The second figure in each cell is the average rank difference between raw salary rankings and cost of living adjusted salary rankings. The third figure is the test statistic from the Z-test. Panel B shows the results of the Kendall's Tau test for rank correlation. The first figure in each cell is the correlation. The second figure in each cell is the significance. The third figure in each cell is the coefficient of determination. ***, **, and * indicate significance at the 1, 5 and 10 percent levels respectively. The number of observations in each sample are the same as indicated in Table 2.*

CONCLUDING COMMENTS

Equitable faculty compensation across states, universities and departments has long been an issue in higher education. In this paper we rank 500 colleges and universities based on raw and cost of living adjusted salaries paid to faculty. A comprehensive analysis across all schools as well as separate analysis based on the levels of degrees offered by the institution. This research extends the research of Jalbert, Jalbert and Hayashi by considering both public and private institutions and by including schools whose highest degree conferred is the associate.

The analysis indicates that comparing salary and compensation data on a cost of living adjusted basis produces substantially different university rankings than comparing raw salary figures. The average difference between raw and COL adjusted salary rankings was136 places in a ranking of 500 schools. The ranking differences are found to be significantly different using two testing techniques.

The analysis here has limitations. First, many U.S. universities and colleges are not included in the sample. Inference outside this sample should be done cautiously. Second, Cost of Living Index data was obtained for the city where the school is located. In many instances, faculty may be able to live in a much lower COL area by commuting to work. If this occurs, the data presented here may not be an accurate

depiction of the realities experienced by faculty. A third limitation is that different academic fields have different academic salary levels. For example, business professors are commonly high paid while humanities professors are generally paid less. To the extent that different schools have different program mixes, it should not be surprising that salaries differ across universities. We also are not able to account for supplemental earnings of faculty members. If supplemental earnings differ across universities, different salary levels may be appropriate. Finally, the results here are dependent on the quality of data presented by Stateuniversity.com and the Yahoo Real Estate website. To the extent that these datasets contain errors, the results presented here will also be in error. These and other areas remain a fertile area for additional research.

Exhibit 1: Rankings of All Universities by Average Faculty Compensation

UNIVERSITY	DEG	ST	COLA INDX	RAW SAL	COLA SAL	RAW SAL RANK	COLA SAL RANK
Prince William Sound CC	A	AK	115	72,865	63,361	429	357
Auburn U	D	AL	90	79,696	88,551	259	81
U of Alabama at Birmingham	D	AL	90	76,847	85,386	316	111
The U of Alabama	D	AL	88	77,861	88,478	302	83
U of Arkansas	D	AR	89	72,550	81,517	446	158
Chandler/Gilbert CC	A+	AZ	102	72,384	70,965	452	277
Thunderbird	M+	AZ	95	99,851	105,106	51	22
Midwestern U	D	AZ	95	78,207	82,323	290	151
Mesa CC	A	AZ	97	72,992	75,249	425	227
South Mountain CC	A	AZ	98	74,087	75,599	383	225
Phoenix C	A	AZ	98	72,605	74,087	444	238
Paradise Valley CC	A	AZ	98	71,664	73,127	474	250
Scottsdale CC	A	AZ	131	72,199	55,114	460	423
Rio Salado C	A	AZ	100	73,977	73,977	390	241
Arizona St U Tempe	D	AZ	100	84,198	84,198	180	124
U of Arizona	D	AZ	96	82,950	86,406	205	103
Soka U of America	M	CA	139	71,182	51,210	489	450
Bakersfield C	A	CA	93	78,196	84,082	291	126
U of California-Berkeley	D	CA	147	106,216	72,256	31	258
Grad. Theological Union	D	CA	147	72,238	49,141	459	457
Cal. St U-Channel Islands	M	CA	155	71,761	46,297	471	468
Pacifica Grad. Inst	D	CA	158	73,267	46,372	418	467
Cal. St U-Dominguez Hills	M+	CA	118	71,922	60,951	468	378
Claremont Grad. U	D	CA	134	105,822	78,972	32	185
Keck Grad. Inst	D	CA	134	104,281	77,822	37	202
Harvey Mudd C	B	CA	134	96,951	72,351	68	257
Pomona C	B	CA	134	92,844	69,287	91	298
Claremont McKenna C	B	CA	134	88,372	65,949	135	334
Scripps C	B+	CA	134	86,357	64,446	154	349
Pitzer C	B	CA	134	80,841	60,329	232	383
San Joaquin C of Law	L	CA	105	72,586	69,130	445	301
West Hills C-Coalinga	A	CA	97	73,877	76,162	392	219
El Camino C-Compton	A+	CA	110	72,840	66,218	430	329
Orange Coast C	A+	CA	134	83,523	62,331	194	366
West Los Angeles C	A+	CA	138	74,353	53,879	374	435
De Anza C	A+	CA	201	82,547	41,068	215	479
Cypress C	A	CA	133	85,333	64,160	165	353
U of California-Davis	D	CA	126	91,003	72,225	107	259
City of Hope Grad. Sch of Biol Sci	D	CA	118	103,037	87,319	41	96
C of the Redwoods	A+	CA	106	77,284	72,909	310	253
Coastline CC	A	CA	141	83,889	59,496	189	391
Ohlone C	A+	CA	149	88,005	59,064	137	396
Fresno City C	A	CA	99	82,666	83,501	212	139
Western St U-Col of Law-Argosy	L	CA	128	89,815	70,168	113	288
Fullerton C	A+	CA	128	84,464	65,988	175	332
Glendale CC	A	CA	95	72,767	76,597	434	214
Chabot C	A	CA	123	84,464	68,670	175	303
California St U-East Bay	M	CA	123	72,609	59,032	443	397
Golden West C	A+	CA	153	83,762	54,746	191	427
U of California-Irvine	D	CA	153	92,316	60,337	97	382

UNIVERSITY	DEG	ST	COLA INDX	RAW SAL	COLA SAL	RAW SAL RANK	COLA SAL RANK
Irvine Valley C	A	CA	153	84,463	55,205	177	421
C of Marin	A	CA	365	86,858	23,797	148	496
U of California-San Diego	D	CA	191	96,918	50,742	69	453
U of La Verne	D	CA	135	72,791	53,919	433	434
Antelope Valley C	A	CA	102	72,930	71,500	428	269
West Hills C-Lemoore	A	CA	102	74,606	73,143	366	249
Las Positas C	A+	CA	137	80,768	58,955	233	400
Wyotech-Long Beach	A	CA	121	86,147	71,196	157	274
Long Beach City C	A+	CA	121	77,934	64,408	299	350
Foothill C	A+	CA	342	80,852	23,641	231	497
Southwestern Law Sch	L	CA	131	123,889	94,572	11	47
U of Cal.-Los Angeles	D	CA	131	106,239	81,098	29	166
U of Southern California	D	CA	131	99,593	76,025	52	221
Occidental C	M	CA	131	80,157	61,189	240	375
Hebrew Union C-Cal. Branch	D	CA	131	78,608	60,006	282	387
Los Angeles Trade Tech C	A	CA	131	78,093	59,613	296	390
Cal. St U-Los Angeles	D	CA	131	72,800	55,573	432	414
West Coast U	B	CA	131	72,458	55,311	449	418
Pepperdine U	D	CA	381	95,012	24,938	76	494
Merced C	A	CA	96	72,095	75,099	462	230
U of California-Merced	D	CA	96	71,652	74,638	475	231
Saddleback C	A	CA	138	89,554	64,894	118	343
Modesto Junior C	A	CA	99	72,668	73,402	439	246
Naval PostGrad. Sch	D	CA	151	115,393	76,419	16	217
Monterey Peninsula C	A+	CA	151	73,702	48,809	404	459
Moorpark C	A+	CA	142	74,325	52,342	375	445
Saint Marys C of California	D	CA	149	79,221	53,168	269	438
Cerritos C	A	CA	111	78,978	71,151	274	276
Mills C	D	CA	124	91,746	73,989	102	240
Miracosta C	A	CA	122	104,030	85,270	39	112
Chapman U	D	CA	132	82,617	62,589	213	363
Butte C	A+	CA	102	73,368	71,929	416	263
Oxnard C	A	CA	126	73,509	58,340	413	401
C of the Desert	A+	CA	127	72,299	56,928	455	408
Pacific Grad. Sch of Psych.	D	CA	188	87,807	46,706	139	462
Western U of Health Scis	D	CA	110	79,234	72,031	267	261
Cal. St Poly U-Pomona	M	CA	110	75,454	68,595	347	304
California Inst of Tech	D	CA	133	132,203	99,401	5	34
Pasadena City C	A+	CA	133	79,521	59,790	262	388
Los Medanos C	A	CA	105	73,866	70,349	394	284
Diablo Valley C	A+	CA	136	73,572	54,097	408	431
Porterville C	A	CA	98	76,425	77,985	326	198
Chaffey C	A+	CA	123	74,943	60,929	357	379
Shasta C	A	CA	108	71,107	65,840	494	336
Reedley C	A	CA	103	82,702	80,293	211	169
Cerro Coso CC	A	CA	95	73,819	77,704	397	203
Riverside CC	A+	CA	106	83,362	78,643	198	187
U of California-Riverside	D	CA	106	83,264	78,551	202	188
Sacramento City C	A+	CA	102	71,124	69,729	493	292
Hartnell C	A	CA	116	78,596	67,755	283	315
San Bernardino Valley C	A+	CA	104	74,059	71,211	384	273
Skyline C	A+	CA	146	78,789	53,965	280	432
Cal. Western Sch of Law	L	CA	129	107,311	83,187	26	144
Thomas Jefferson Sch of Law	L	CA	129	90,885	70,453	108	283
U of San Diego	D	CA	129	90,647	70,269	109	286
San Diego St U	D	CA	129	73,099	56,666	420	410
U of Cal. Hastings C of Law	L	CA	166	129,238	77,854	7	201
U of San Francisco	D	CA	166	94,291	56,802	83	409
Golden Gate U-San Francisco	D	CA	166	88,477	53,299	133	436
San Francisco Cons. of Music	M+	CA	166	85,560	51,542	160	448
City C of San Francisco	A+	CA	166	81,212	48,923	227	458
San Francisco St U	D	CA	166	74,358	44,794	373	473
Mt. San Jacinto CC DiSt	A	CA	97	71,632	73,847	477	242
San Jose St U	M	CA	141	75,092	53,257	351	437
Evergreen Valley C	A	CA	141	73,813	52,350	398	444
San Jose City C	A	CA	141	72,705	51,564	437	447

UNIVERSITY	DEG	ST	COLA INDX	RAW SAL	COLA SAL	RAW SAL RANK	COLA SAL RANK
Cal. Poly St U-San Luis Obispo	M	CA	132	72,526	54,944	448	425
Palomar C	A	CA	124	80,134	64,624	241	346
C of San Mateo	A	CA	162	75,530	46,623	346	463
Contra Costa C	A	CA	110	73,780	67,073	399	321
U of California-Santa Barbara	D	CA	179	94,786	52,953	78	440
Santa Barbara City C	A	CA	179	74,956	41,875	355	477
Westmont C	B+	CA	179	70,953	39,639	498	484
Santa Clara U	D	CA	139	89,672	64,512	115	347
C of the Canyons	A	CA	237	83,271	35,135	201	489
U of California-Santa Cruz	D	CA	150	86,039	57,359	159	406
Santa Monica C	A	CA	175	90,604	51,774	110	446
Thomas Aquinas C	B	CA	121	73,766	60,964	400	377
Santa Rosa Junior C	A+	CA	124	78,432	63,252	287	358
Columbia C	A	CA	112	74,321	66,358	376	327
Stanford U	D	CA	159	107,976	67,909	25	312
San Joaquin Delta C	A+	CA	100	86,329	86,329	155	104
U of the Pacific	D	CA	100	75,956	75,956	335	224
Los Angeles Mission C	A	CA	159	73,549	46,257	409	470
Taft C	A+	CA	90	77,391	85,990	308	106
El Camino CC District	A+	CA	134	79,073	59,010	271	398
Mendocino C	A	CA	113	71,246	63,050	487	360
Los Angeles Valley C	A	CA	165	76,567	46,404	321	466
Ventura C	B	CA	137	75,844	55,361	340	417
C of the Sequoias	A+	CA	98	78,992	80,604	273	168
Victor Valley C	A+	CA	101	77,706	76,937	303	210
Mt San Antonio C	A+	CA	140	84,137	60,098	182	386
Rio Hondo C	A	CA	119	82,136	69,022	218	302
Whittier C	M	CA	119	78,248	65,755	289	338
Los Angeles Harbor C	A+	CA	131	75,299	57,480	350	405
Los Angeles Pierce C	A	CA	214	71,214	33,278	488	491
U of Colorado at Boulder	D	CO	130	81,614	62,780	223	362
Colorado C	M	CO	90	79,925	88,806	250	79
U of Denver	D	CO	101	73,395	72,668	415	255
Colorado St U	D	CO	106	73,759	69,584	401	293
Colorado Sch of Mines	D	CO	118	84,649	71,736	173	265
US Air Force Academy	B	CO	90	74,518	82,798	367	146
Western Connecticut St U	D	CT	129	76,107	58,998	333	399
Asnuntuck CC	A+	CT	111	72,011	64,875	464	344
Fairfield U	M+	CT	203	78,154	38,500	292	485
U of CT Sch of Med & Dent	D	CT	111	93,604	84,328	88	122
Quinnipiac U	D	CT	123	87,144	70,849	144	279
Trinity C	M	CT	113	79,796	70,616	256	281
Rens. Hartford Grad Cntr	M	CT	113	94,455	83,588	80	136
Wesleyan U	D	CT	114	87,222	76,511	143	216
Central Connecticut St U	D	CT	108	72,286	66,931	456	322
Yale U	D	CT	111	116,817	105,241	14	20
U of New Haven	D	CT	110	74,797	67,997	361	310
Southern Connecticut St U	D	CT	111	73,232	65,975	419	333
US Coast Guard Academy	B	CT	108	101,058	93,572	47	54
Connecticut C	M	CT	108	71,093	65,827	496	337
GateWay CC	A+	CT	98	71,163	72,615	491	256
U of Connecticut	D	CT	111	93,230	83,991	90	127
George Washington U	D	DC	129	97,095	75,267	66	226
Georgetown U	D	DC	129	96,142	74,529	72	233
Gallaudet U	D	DC	129	88,218	68,386	136	306
American U	D	DC	129	85,298	66,122	167	330
U of the DC DA Clarke Sch of Law	L	DC	129	79,879	61,922	253	370
Wesley Theological Seminary	M	DC	129	77,659	60,201	305	385
Catholic U of America	D	DC	129	76,700	59,457	319	392
U of Delaware	D	DE	106	86,060	81,189	158	164
Widener U-Delaware Campus	D	DE	106	104,299	98,395	36	38
U of Miami	D	FL	115	82,126	71,414	219	270
Stetson U	M+	FL	92	72,966	79,311	427	183
Nova Southeastern U	D	FL	116	73,022	62,950	423	361
U of Florida	D	FL	93	81,911	88,076	221	88
Florida Coastal Sch of Law	L	FL	93	86,738	93,267	150	60

UNIVERSITY	DEG	ST	COLA INDX	RAW SAL	COLA SAL	RAW SAL RANK	COLA SAL RANK
Florida International U	D	FL	115	75,824	65,934	341	335
Saint Thomas U	D	FL	106	76,461	72,133	325	260
Gooding Inst of Nurse Anesthesia	M	FL	97	102,275	105,438	43	19
Florida St U	D	FL	97	74,475	76,778	368	211
U of South Florida	D	FL	98	72,151	73,623	461	244
Rollins C	M	FL	112	71,526	63,863	480	354
U of Georgia	D	GA	96	80,086	83,423	245	140
Emory U	D	GA	104	109,401	105,193	19	21
Georgia Inst. of Tech-Main C	D	GA	104	94,432	90,800	82	72
U of Hawaii at Manoa	D	HI	188	76,555	40,721	322	480
Brigham Young U-Hawaii	B	HI	185	76,163	41,169	332	478
Iowa St U	D	IA	87	73,977	85,031	390	116
Grinnell C	B	IA	82	74,294	90,602	378	74
U of Iowa	D	IA	92	85,300	92,717	166	65
St John's C	M	IL	128	74,059	57,859	384	402
U of Illinois at UC	D	IL	87	88,551	101,783	132	29
The John Marshall Law Sch	L	IL	114	125,878	110,419	10	17
U of Chicago	D	IL	114	115,963	101,722	15	30
Illinois Inst of Tech	D	IL	114	89,515	78,522	119	189
Spertus C	D	IL	114	83,532	73,274	193	247
U of Illinois at Chicago	D	IL	114	80,050	70,219	247	287
Loyola U Chicago	D	IL	114	79,696	69,909	259	290
Toyota Tech Inst at Chicago	D	IL	114	79,254	69,521	266	294
DePaul U	D	IL	114	75,853	66,538	339	325
Illinois C of Optometry	B	IL	114	74,141	65,036	382	341
McHenry County C	A+	IL	105	74,717	71,159	363	275
Oakton CC	A	IL	108	80,072	74,141	246	237
Elgin CC	A	IL	96	77,702	80,940	304	167
Northwestern U	D	IL	121	106,217	87,783	30	91
Evanston NW Healthcare Anest	M+	IL	121	96,548	79,792	71	173
C of DuPage	A	IL	120	85,501	71,251	163	271
C of Lake County	A	IL	102	78,970	77,422	275	207
Rosalind Franklin U of Med & Sci	D	IL	95	88,438	93,093	134	63
Lewis U	D	IL	97	76,462	78,827	324	186
Indiana U-Bloomington	D	IN	85	83,356	98,066	199	39
U of Notre Dame	D	IN	80	97,084	121,355	67	6
Rose-Hulman Inst of Tech	M	IN	80	79,398	99,248	263	36
Purdue U-Main Campus	D	IN	94	74,373	79,120	372	184
U of Kansas	D	KS	86	79,912	92,921	251	64
U of Kentucky	D	KY	90	75,413	83,792	348	132
U of Louisville	D	KY	85	74,614	87,781	365	92
Southern U Law Center	L	LA	87	89,874	103,303	111	26
Louisiana St U & Ag & Mec C	D	LA	87	72,740	83,609	435	135
Amherst C	B	MA	128	99,224	77,519	54	206
U of Massachusetts Amherst	D	MA	128	86,555	67,621	151	318
Massachusetts Sch of Law	L	MA	140	98,440	70,314	62	285
New Engl& Sch of Law	L	MA	127	99,147	78,069	55	196
Boston U	D	MA	127	88,682	69,828	130	291
Suffolk U	D	MA	127	85,560	67,370	160	320
Northeastern U	D	MA	127	84,621	66,631	174	324
U of Massachusetts-Boston	D	MA	127	79,317	62,454	265	364
Simmons C	D	MA	127	72,303	56,931	454	407
Massachusetts Maritime Academy	M	MA	121	71,727	59,279	472	394
Harvard U	D	MA	203	135,564	66,780	3	323
Massachusetts Inst of Tech	D	MA	203	111,151	54,754	18	426
Boston C	D	MA	251	100,515	40,046	50	483
National Grad. Sch of Quality Mgt.	M	MA	142	98,184	69,144	63	300
U of Massachusetts-Lowell	D	MA	116	92,217	79,497	98	177
Tufts U	D	MA	124	88,928	71,716	129	266
Franklin W. Olin C of Engineering	B	MA	176	89,218	50,692	124	456
Southern New Engl Sch of Law	L	MA	129	84,135	65,221	183	340
U of Massachusetts-Dartmouth	D	MA	129	80,361	62,295	237	367
Smith C	D	MA	110	89,358	81,235	122	162
Wheaton C	B	MA	137	75,769	55,306	342	419
Mount Holyoke C	M	MA	107	79,848	74,624	255	232
Western New Engl& C	M	MA	100	78,344	78,344	288	191

UNIVERSITY	DEG	ST	COLA INDX	RAW SAL	COLA SAL	RAW SAL RANK	COLA SAL RANK
Bentley U	D	MA	128	93,596	73,122	89	251
Brandeis U	D	MA	128	88,622	69,236	131	299
Babson C	M+	MA	239	109,180	45,682	20	471
Wellesley C	B	MA	239	96,876	40,534	70	482
Williams C	M	MA	118	92,589	78,465	94	190
C of the Holy Cross	B	MA	102	72,649	71,225	441	272
Worcester Poly Inst	D	MA	102	84,897	83,232	171	142
U of Mass Med Sch Worcester	D	MA	102	82,751	81,128	210	165
Clark U	D	MA	102	75,911	74,423	336	235
United Sts Naval Academy	B	MD	128	108,940	85,109	21	114
U of Maryl&-Baltimore	D	MD	103	93,671	90,943	86	70
Johns Hopkins U	D	MD	103	91,142	88,487	106	82
U of Baltimore	D	MD	103	87,520	84,971	141	117
U of Maryl&-Baltimore County	D	MD	109	75,671	69,423	344	296
Loyola C in Maryland	D	MD	103	73,725	71,578	403	268
U of Maryland-C Park	D	MD	111	94,181	84,848	84	120
National Labor C	B	MD	122	77,020	63,131	313	359
Bowdoin C	B	ME	103	86,825	84,296	149	123
Bates C	B	ME	92	77,266	83,985	311	128
Colby C	B	ME	91	85,023	93,432	169	56
Ave Maria Sch of Law	L	MI	98	94,455	96,383	80	42
U of Michigan-Ann Arbor	D	MI	98	93,667	95,579	87	45
Oakland CC	A+	MI	123	80,396	65,363	236	339
Henry Ford CC	A+	MI	85	79,863	93,956	254	52
U of Michigan-Dearborn	M	MI	85	71,164	83,722	490	133
Wayne St U	D	MI	78	77,591	99,476	306	33
Michigan St U C of Law	L	MI	90	108,031	120,034	23	8
Michigan St U	D	MI	90	83,941	93,268	187	59
Grand Rapids CC	A+	MI	84	74,030	88,131	388	86
Western Michigan U	D	MI	86	70,889	82,429	500	150
Thomas M. Cooley Law Sch	L	MI	82	101,791	124,135	45	4
Schcraft C	A	MI	86	74,469	86,592	369	100
Monroe County CC	A	MI	84	74,274	88,421	380	84
Muskegon CC	A+	MI	78	72,621	93,104	442	62
Walsh C of Act & Bus Admin	D	MI	93	78,910	84,849	278	119
U of Minnesota-Twin Cities	D	MN	102	95,046	93,182	75	61
Carleton C	B	MN	99	81,213	82,033	226	154
William Mitchell C of Law	L	MN	101	104,832	103,794	34	24
Macalester C	B	MN	101	78,782	78,002	281	197
Missouri U of Sci & Tech	D	MO	82	76,016	92,702	334	66
Washington U in St Louis	D	MO	88	101,014	114,789	48	13
St Louis C of Pharmacy	B	MO	88	73,747	83,803	402	130
Saint Louis U-Main Campus	D	MO	88	72,266	82,120	457	153
U of North Carolina at Chapel Hill	D	NC	84	94,078	111,998	85	16
Davidson C	B	NC	122	86,508	70,908	152	278
Duke U	D	NC	90	103,733	115,259	40	11
North Carolina St U at Raleigh	D	NC	103	80,649	78,300	235	192
Wake Forest U	D	NC	87	81,371	93,530	224	55
U of Nebraska-Lincoln	D	NE	81	76,792	94,805	318	46
Franklin Pierce Law Center	L	NH	107	89,367	83,521	121	138
U of New Hampshire	D	NH	110	79,233	72,030	268	262
Dartmouth C	D	NH	130	91,216	70,166	105	289
Rutgers U-Camden	M	NJ	98	88,989	90,805	127	71
Union County C	A	NJ	138	74,828	54,223	360	429
Middlesex County C	A	NJ	127	73,077	57,541	422	404
The C of New Jersey	M+	NJ	109	79,779	73,192	257	248
Rowan U	D	NJ	107	78,120	73,009	294	252
Stevens Inst of Tech	D	NJ	136	92,067	67,696	100	317
New Jersey City U	M+	NJ	126	80,898	64,205	230	352
Rider U	M+	NJ	109	83,447	76,557	196	215
Drew U	D	NJ	145	76,202	52,553	331	443
Ramapo C of New Jersey	M	NJ	197	80,126	40,673	242	481
Montclair St U	D	NJ	140	82,895	59,211	206	395
Rutgers U-New Brunswick	D	NJ	119	94,478	79,393	79	180
New Jersey Inst of Tech	D	NJ	122	97,229	79,696	65	174
Rutgers U-Newark	D	NJ	122	92,734	76,011	93	222

UNIVERSITY	DEG	ST	COLA INDX	RAW SAL	COLA SAL	RAW SAL RANK	COLA SAL RANK
U of Med. & Dent. of New Jersey	D	NJ	122	83,318	68,293	200	307
The Richard Stockton C of New Jersey	D	NJ	117	75,627	64,638	345	345
Bergen CC	A	NJ	153	73,531	48,059	411	460
Princeton U	D	NJ	136	127,018	93,396	8	57
Princeton Theological Seminary	D	NJ	136	92,076	67,703	99	316
County C of Morris	A	NJ	177	74,260	41,955	381	476
Gloucester County C	A	NJ	118	72,653	61,570	440	371
Seton Hall U	D	NJ	148	76,212	51,495	330	449
Kean U	M+	NJ	126	81,873	64,979	222	342
William Paterson U of New Jersey	M+	NJ	136	83,593	61,465	192	372
U of New Mexico	D	NM	93	72,429	77,881	450	200
U of Nevada-Las Vegas	D	NV	97	79,972	82,445	249	149
U of Nevada-Reno	D	NV	109	80,977	74,291	229	236
Albany Law Sch	L	NY	105	120,953	115,193	12	12
SUNY at Albany	D	NY	105	82,151	78,239	217	194
Bard C	D	NY	106	82,997	78,299	204	193
SUNY at Binghamton	D	NY	96	79,899	83,228	252	143
Fordham U	D	NY	135	89,144	66,033	126	331
Manhattan C	M+	NY	166	74,377	44,805	371	472
Sarah Lawrence C	M	NY	231	79,753	34,525	258	490
CUNY Lehman C	M+	NY	166	76,835	46,286	317	469
Brooklyn Law Sch	L	NY	377	134,061	35,560	4	488
SUNY Health Sci Center at Brooklyn	D	NY	377	89,826	23,827	112	495
Poly U	D	NY	377	80,107	21,249	244	498
CUNY Brooklyn C	M+	NY	377	79,627	21,121	261	499
CUNY Medgar Evers C	B	NY	377	74,975	19,887	354	500
SUNY at Buffalo	D	NY	87	87,068	100,078	146	32
New York Inst of Tech-Central Islip	M	NY	125	101,775	81,420	46	160
Hamilton C	B	NY	103	81,966	79,579	220	176
Farmingdale St C	B	NY	131	71,685	54,721	473	428
CUNY Queens C	M+	NY	204	78,094	38,281	295	486
CUNY Sch of Law at Queens C	L	NY	204	104,407	51,180	35	451
Adelphi U	D	NY	177	83,520	47,186	195	461
Nassau CC	A	NY	177	78,130	44,141	293	474
Hobart William Smith Cs	M	NY	94	72,003	76,599	465	213
Webb Inst	B	NY	139	78,583	56,535	284	411
Colgate U	M	NY	95	86,218	90,756	156	73
Hofstra U	D	NY	129	89,556	69,423	117	295
Cornell U	D	NY	101	104,113	103,082	38	27
CUNY York C	M	NY	135	74,422	55,127	370	422
US Merchant Marine Acad	M	NY	196	99,397	50,713	53	454
CUNY LaGuardia CC	A	NY	164	71,829	43,798	470	475
Siena C	B	NY	105	71,911	68,487	469	305
Dorothea Hopfer Nursing-M.V.	A	NY	140	78,956	56,397	276	412
Iona C	M+	NY	154	71,647	46,524	476	464
New York Law Sch	L	NY	135	154,476	114,427	2	14
Rockefeller U	D	NY	135	125,953	93,299	9	58
Columbia U in the City of New York	D	NY	135	112,879	83,614	17	134
CUNY Grad. Sch & U Center	D	NY	135	107,152	79,372	27	182
New York U	D	NY	135	100,528	74,465	49	234
Pace U-New York	D	NY	135	95,326	70,612	74	282
Teachers C at Columbia U	D	NY	135	91,819	68,014	101	309
Cooper Union Adv of Sci & Art	M	NY	135	91,660	67,896	103	313
CUNY Bernard M Baruch C	M+	NY	135	89,691	66,438	114	326
CUNY City C	M+	NY	135	85,556	63,375	162	356
New York Inst of Tech-Manhattan	D	NY	135	84,241	62,401	179	365
Barnard C	B	NY	135	83,830	62,096	190	369
Hebrew Un Jewish Inst of Rel	D	NY	135	82,771	61,312	209	373
CUNY Hunter C	M+	NY	135	80,652	59,742	234	389
The New Sch	D	NY	135	80,126	59,353	242	393
Yeshiva U	D	NY	135	77,867	57,679	300	403
CUNY John Jay C Criminal Justice	M	NY	135	75,750	56,111	343	413
SUNY C of Optometry	D	NY	135	74,945	55,515	356	415
Union Theological Seminary	D	NY	135	74,841	55,438	359	416
Jewish Theol Sem of America	D	NY	135	72,807	53,931	431	433
Fashion Inst of Tech	M	NY	135	71,507	52,968	481	439

UNIVERSITY	DEG	ST	COLA INDX	RAW SAL	COLA SAL	RAW SAL RANK	COLA SAL RANK
Bank Street C of Education	M	NY	135	70,991	52,586	497	442
Dowling C	D	NY	145	73,515	50,700	412	455
New York Inst of Tech-Old Westbury	D	NY	332	84,193	25,359	181	493
Clarkson U	D	NY	95	77,295	81,363	309	161
Vassar C	M	NY	114	84,062	73,739	186	243
St John's U-New York	D	NY	135	91,519	67,792	104	314
U of Rochester	D	NY	94	92,833	98,759	92	37
Rochester Inst of Tech	D	NY	94	73,012	77,672	424	204
Union C	B	NY	103	76,264	74,043	329	239
Union Grad. C	M+	NY	103	74,000	71,845	389	264
Suffolk County CC	A	NY	124	75,879	61,193	338	374
Stony Brook U	D	NY	147	89,170	60,660	125	380
CUNY C of Stn Island	M+	NY	160	74,282	46,426	379	465
Rockland CC	A	NY	145	80,189	55,303	239	420
Syracuse U	D	NY	90	81,277	90,308	225	75
SUNY Health Sci Center at Syracuse	D	NY	90	71,979	79,977	466	171
SUNY C of Env Sci & Forestry	D	NY	90	71,482	79,424	483	179
Rensselaer Poly Inst	D	NY	103	92,469	89,776	95	76
SUNY Inst of Tech Ut.-Rome	M+	NY	95	71,487	75,249	482	228
SUNY Westchester CC	A	NY	148	89,352	60,373	123	381
New York Medical C	D	NY	148	77,867	52,613	300	441
United Sts Military Academy	B	NY	113	108,794	96,278	22	44
Hebrew Un C-Jewish Inst Rel	D	OH	86	85,426	99,333	164	35
U of Cincinnati	D	OH	86	74,319	86,417	377	102
Case Western Reserve U	D	OH	84	87,144	103,743	144	25
Ohio St U-Main Campus	D	OH	88	88,974	101,107	128	31
Air Force Inst of Tech-GS Eng Mgt	D	OH	84	101,821	121,215	44	7
Lakel& CC	A	OH	93	74,616	80,232	364	170
Oberlin C	M	OH	88	83,109	94,442	203	49
The U of Toledo-Health Sci Campus	D	OH	81	73,871	91,199	393	69
U of Oklahoma Norman	D	OK	86	74,985	87,192	353	97
U of Tulsa	D	OK	84	75,372	89,729	349	77
Oregon Health & Sci U	D	OR	111	83,377	75,114	197	229
Reed C	M	OR	111	77,004	69,373	314	297
Lewis & Clark C	D	OR	111	73,581	66,289	407	328
Lehigh U	D	PA	96	92,430	96,281	96	43
Bloomsburg U of Pennsylvania	D	PA	87	71,126	81,754	492	156
American C	M	PA	145	78,506	54,142	285	430
Bryn Mawr C	D	PA	145	74,057	51,074	386	452
California U of Pennsylvania	M+	PA	84	71,534	85,160	479	113
Dickinson Sch of Law- Penn St U	L	PA	94	106,777	113,593	28	15
Clarion U of Pennsylvania	M+	PA	87	73,591	84,587	406	121
Lafayette C	B	PA	97	82,541	85,094	216	115
Widener U-Harrisburg Campus	M	PA	91	95,363	104,795	73	23
Haverford C	B	PA	204	76,531	37,515	323	487
Indiana U of Penn-Main	D	PA	87	71,587	82,284	478	152
Franklin & Marshall C	B	PA	95	77,532	81,613	307	157
Bucknell U	M	PA	90	79,196	87,996	270	89
Penn St U-Penn St Great Valley	M	PA	134	86,385	64,466	153	348
Mansfield U of Pennsylvania	M	PA	87	71,966	82,720	467	147
Delaware County CC	A	PA	114	73,314	64,311	417	351
Penn St U-Penn St Harrisburg	D	PA	90	73,080	81,200	421	163
Millersville U of Pennsylvania	M+	PA	100	72,735	72,735	436	254
U of Pennsylvania	D	PA	101	129,633	128,350	6	3
Temple U	D	PA	101	84,783	83,944	172	129
Drexel U	D	PA	101	78,918	78,137	277	195
Saint Joseph's U	D	PA	101	72,425	71,708	451	267
Carnegie Mellon U	D	PA	85	98,742	116,167	59	10
U of Pittsburgh-Pittsburgh Campus	D	PA	85	75,890	89,282	337	78
Pittsburgh Theological Seminary	D	PA	85	72,988	85,868	426	108
U of Scranton	D	PA	86	71,315	82,924	486	145
Slippery Rock U of Pennsylvania	D	PA	87	72,672	83,531	438	137
Pennsylvania St U-Main Campus	D	PA	103	79,064	76,761	272	212
Swarthmore C	B	PA	110	94,867	86,243	77	105
Villanova U	D	PA	241	78,868	32,725	279	492
Roger Williams U Sch of Law	L	RI	118	98,876	83,793	58	131

UNIVERSITY	DEG	ST	COLA INDX	RAW SAL	COLA SAL	RAW SAL RANK	COLA SAL RANK
Roger Williams U	M	RI	118	80,226	67,988	238	311
U of Rhode Island	D	RI	128	78,047	60,974	298	376
Brown U	D	RI	109	102,530	94,064	42	51
Rhode Isl& Sch of Design	M	RI	109	82,796	75,960	207	223
Providence C	M	RI	109	73,618	67,539	405	319
Bryant U	M+	RI	124	87,734	70,753	140	280
Medical U of South Carolina	D	SC	103	79,989	77,659	248	205
Clemson U	D	SC	93	74,045	79,618	387	175
U of South Carolina-Columbia	D	SC	91	75,029	82,449	352	148
Furman U	M	SC	88	72,060	81,886	463	155
The U of Tennessee	D	TN	87	72,532	83,370	447	141
Vanderbilt U	D	TN	81	98,519	121,628	61	5
The U of Texas at Austin	D	TX	101	87,822	86,952	138	98
Texas A&M Health Sci Center	D	TX	88	89,598	101,816	116	28
Texas A & M U	D	TX	88	81,177	92,247	228	67
Southern Methodist U	D	TX	98	84,102	85,818	185	109
U of Texas SW Med Cntr Dallas	D	TX	98	76,408	77,967	327	199
Texas Christian U	D	TX	85	73,843	86,874	396	99
The U of Texas Medical Branch	D	TX	89	71,099	79,887	495	172
U of TX M.D. Anderson Cancer Cntr	B	TX	91	191,733	210,696	1	1
South Texas C of Law	L	TX	91	117,332	128,936	13	2
Baylor C of Medicine	D	TX	91	108,031	118,715	23	9
Rice U	D	TX	91	99,033	108,827	56	18
U of Houston	D	TX	91	78,092	85,815	297	110
U of Texas Hlth Sci Cntr Houston	D	TX	91	76,600	84,176	320	125
The U of Texas at Dallas	D	TX	92	86,889	94,445	147	48
Trinity U	M	TX	84	77,122	91,812	312	68
U of Texas at San Antonio	D	TX	84	73,855	87,923	395	90
U of TX Hlth Sci Ctr at S. Ant	D	TX	84	73,456	87,448	414	95
St Marys U	D	TX	84	71,324	84,910	485	118
Brigham Young U	D	UT	94	82,793	88,078	208	87
U of Utah	D	UT	98	74,746	76,271	362	218
Inst for the Psych Scis	D	VA	136	74,864	55,047	358	424
Virginia Poly Inst & St U	D	VA	96	84,111	87,616	184	93
U of Virginia	D	VA	105	98,964	94,251	57	50
George Mason U	D	VA	134	84,942	63,390	170	355
Appalachian Sch of Law	L	VA	85	82,553	97,121	214	41
Washington & Lee U	M	VA	99	76,357	77,128	328	208
U of Richmond	M	VA	100	79,392	79,392	264	181
Virginia Commonwealth U	D	VA	100	73,544	73,544	410	245
C of William & Mary	D	VA	109	83,932	77,002	188	209
Middlebury C	D	VT	110	87,370	79,427	142	178
Vermont Law Sch	L	VT	104	89,402	85,963	120	107
U of Washington-Bothell Campus	M	WA	121	98,540	81,438	60	159
U of Washington-Seattle Campus	D	WA	120	105,126	87,605	33	94
Seattle U	D	WA	120	72,304	60,253	453	384
U of Washington-Tacoma Campus	M	WA	104	97,602	93,848	64	53
U of Puget Sound	M	WA	104	70,905	68,178	499	308
U of Wisconsin-Madison	D	WI	95	84,316	88,754	178	80
Madison Area Technical C	B+	WI	95	72,250	76,053	458	220
Milwaukee Area Technical C	A+	WI	89	78,496	88,198	286	85
Marquette U	D	WI	89	76,982	86,497	315	101
Waukesha County Technical C	A	WI	115	71,476	62,153	484	368
West Virginia Sch of Ost. Med.	D	WV	87	85,178	97,906	168	40

The first column indicates the institution name. The second column indicates the highest degree offered by the institution. The notation is as follows: *A*, *B*, *M*, *D* and *L* indicate that the highest degree offered by the institution is an Associate, Bachelor, Master, Doctor or Law degree respectively. Notation followed with *A+* indicates that the institution offers some additional element above and beyond the degree indicated but not sufficient to reach the next higher level. For example, *M+* indicates that the university offers certificate programs above the Master level. *ST* indicates the state where the university is located. *COLINDX* indicates the cost of living index for the city where the university is located as obtained from Yahoo.com. *RAWSAL* is the average salary paid to full time faculty by the institution. COLSAL is the cost of living adjusted salary. *RAWSALRANK* and *COLSALRANK*, are the ranking of the institution based on raw and cost of living adjusted salaries respectively.

Exhibit 2: Salaries for Doctorate Degree Granting Institutions Only

UNIVERSITY	AVG FT SAL	COLA ADJ SAL	SAL RNK	COLA SAL RNK	UNIVERSITY	AVG FT SAL	COLA ADJ SAL	SAL RANK	COL SAL RNK
U of Pennsylvania	129,63	128,350	3	1	U of TX Hlth Sci Ctr	73,456	87,448	212	61
Vanderbilt U	98,519	121,628	34	2	City of Hope GS of B.	103,03	87,319	24	62
U of Notre Dame	97,084	121,355	37	3	U of Oklahoma	74,985	87,192	190	63
Air Force Inst of Tech-GS	101,82	121,215	26	4	U of Texas at Austin	87,822	86,952	85	64
Baylor C of Medicine	108,03	118,715	12	5	Texas Christian U	73,843	86,874	206	65
Carnegie Mellon U	98,742	116,167	33	6	Marquette U	76,982	86,497	167	66
Duke U	103,73	115,259	23	7	U of Cincinnati	74,319	86,417	200	67
Washington U in St Louis	101,01	114,789	27	8	U of Arizona	82,950	86,406	122	68
U of North Carolina at	94,078	111,998	48	9	Pittsburgh Theological	72,988	85,868	220	69
Rice U	99,033	108,827	31	10	Southern Methodist U	84,102	85,818	112	70
Yale U	116,81	105,241	6	11	U of Houston	78,092	85,815	160	71
Emory U	109,40	105,193	11	12	U of Alabama at Birm	76,847	85,386	168	72
Case Western Reserve U	87,144	103,743	90	13	Iowa St U	73,977	85,031	203	73
Cornell U	104,11	103,082	22	14	U of Baltimore	87,520	84,971	87	74
Texas A&M Health Sci	89,598	101,816	71	15	St Marys U	71,324	84,910	240	75
U of Illinois at UC	88,551	101,783	81	16	Walsh C of Act & Bus	78,910	84,849	155	76
U of Chicago	115,96	101,722	7	17	U of Maryland-C Park	94,181	84,848	47	77
Ohio St	88,974	101,107	77	18	CT Sch Med & Dent	93,604	84,328	51	78
SUNY at Buffalo	87,068	100,078	92	19	Arizona St U Tempe	84,198	84,198	109	79
Wayne St U	77,591	99,476	165	20	U of TX Hlth Sci Ctr	76,600	84,176	171	80
California Inst of Tech	132,20	99,401	2	21	U of Connecticut	93,230	83,991	53	81
Hebrew Union C-Jewish	85,426	99,333	98	22	Temple U	84,783	83,944	104	82
U of Rochester	92,833	98,759	54	23	U of Kentucky	75,413	83,792	187	83
Widener U-Delaware	104,29	98,395	20	24	Columbia U New Yrk	112,87	83,614	9	84
Indiana U-Bloomington	83,356	98,066	118	25	Louisiana St U & Ag	72,740	83,609	224	85
West Virginia Sch of Ost.	85,178	97,906	101	26	Slippery Rock Penn	72,672	83,531	225	86
Lehigh U	92,430	96,281	57	27	U of Georgia	80,086	83,423	140	87
U of Michigan-A. Arbor	93,667	95,579	50	28	The U of Tennessee	72,532	83,370	227	88
U of Nebraska-Lincoln	76,792	94,805	169	29	Worcester Poly Inst	84,897	83,232	103	89
The U of Texas at Dallas	86,889	94,445	93	30	SUNY at Binghamton	79,899	83,228	145	90
U of Virginia	98,964	94,251	32	31	U of Scranton	71,315	82,924	241	91
Brown U	102,53	94,064	25	32	U South Carolina-Col	75,029	82,449	189	92
Wake Forest U	81,371	93,530	132	33	U of Nevada-LV	79,972	82,445	143	93
Princeton U	127,01	93,396	4	34	Western Michigan U	70,889	82,429	244	94
Rockefeller U	125,95	93,299	5	35	Midwestern U	78,207	82,323	158	95
Michigan St U	83,941	93,268	113	36	Indiana U of Penn	71,587	82,284	238	96
U of Minnesota	95,046	93,182	41	37	Saint Louis U	72,266	82,120	233	97
Rosalind Fr. Med & Sci	88,438	93,093	83	38	Bloomsburg U of Penn	71,126	81,754	242	98
U of Kansas	79,912	92,921	144	39	U of Arkansas	72,550	81,517	226	99
U of Iowa	85,300	92,717	99	40	Clarkson U	77,295	81,363	166	100
Missouri U of Sci & Tech	76,016	92,702	179	41	Smith C	89,358	81,235	74	101
Texas A & M U	81,177	92,247	134	42	Penn St U- Harrisburg	73,080	81,200	217	102
The U of Toledo-Health	73,871	91,199	204	43	U of Delaware	86,060	81,189	95	103
U of Maryland-Baltimore	93,671	90,943	49	44	U Mass Med Sch	82,751	81,128	126	104
Georgia Inst of Tech	94,432	90,800	45	45	U of Cal.-Los Angeles	106,23	81,098	15	105
Syracuse U	81,277	90,308	133	46	SUNY Hlth Sci Ctr at	71,979	79,977	236	106
Rensselaer Poly Inst	92,469	89,776	56	47	The U of Texas Med	71,099	79,887	243	107
U of Tulsa	75,372	89,729	188	48	New Jers. Inst of Tech	97,229	79,696	35	108
U of Pittsburgh-Pitt.	75,890	89,282	182	49	Clemson U	74,045	79,618	202	109
U of Wisconsin-Madison	84,316	88,754	107	50	U of Mass-Lowell	92,217	79,497	59	110
Auburn U	79,696	88,551	146	51	Middlebury C	87,370	79,427	88	111
Johns Hopkins U	91,142	88,487	66	52	SUNY Env Sci & For.	71,482	79,424	239	112
The U of Alabama	77,861	88,478	164	53	Rutgers U-New	94,478	79,393	44	113
Brigham Young U	82,793	88,078	124	54	CUNY G.S. & U Ctr.	107,15	79,372	14	114
U of Florida	81,911	88,076	130	55	Purdue U	74,373	79,120	198	115
The U of Texas at San	73,855	87,923	205	56	Claremont Grad. U	105,82	78,972	18	116
Northwestern U	106,21	87,783	16	57	Lewis U	76,462	78,827	173	117
U of Louisville	74,614	87,781	196	58	U of Cal-Riverside	83,264	78,551	120	118
Virginia Poly Inst & St U	84,111	87,616	111	59	Illinois Inst of Tech	89,515	78,522	73	119
U of Wash-Seattle	105,12	87,605	19	60	North Carolina St	80,649	78,300	136	120

UNIVERSITY	AVG FT SAL	COLA ADJ SAL	SAL RNK	COLA SAL RNK	UNIVERSITY	AVG FT SAL	COLA ADJ SAL	SAL RANK	COL SAL RNK
Bard C	82,997	78,299	121	121	Suffolk U	85,560	67,370	97	183
SUNY at Albany	82,151	78,239	128	122	Central Connecticut St	72,286	66,931	232	184
Drexel U	78,918	78,137	154	123	Harvard U	135,56	66,780	1	185
U of TX SW Med Ctr	76,408	77,967	175	124	Northeastern U	84,621	66,631	106	186
U of New Mexico	72,429	77,881	228	125	DePaul U	75,853	66,538	183	187
Keck Grad. Inst	104,28	77,822	21	126	Lewis & Clark C	73,581	66,289	209	188
Rochester Inst of Tech	73,012	77,672	219	127	American U	85,298	66,122	100	189
Medical U of South	79,989	77,659	142	128	Fordham U	89,144	66,033	76	190
C of William & Mary	83,932	77,002	114	129	Southern Connecticut	73,232	65,975	215	191
Florida St U	74,475	76,778	197	130	Florida International U	75,824	65,934	184	192
Pennsylvania St U	79,064	76,761	153	131	Richard Stockton	75,627	64,638	186	193
Wesleyan U	87,222	76,511	89	132	Santa Clara U	89,672	64,512	70	194
Naval PostGrad. Sch	115,39	76,419	8	133	George Mason U	84,942	63,390	102	195
U of Utah	74,746	76,271	195	134	Nova Southeastern U	73,022	62,950	218	196
U of Southern California	99,593	76,025	30	135	U of Colorado Boulder	81,614	62,780	131	197
Rutgers U-Newark	92,734	76,011	55	136	Chapman U	82,617	62,589	127	198
U of the Pacific	75,956	75,956	180	137	U of Mass Boston	79,317	62,454	148	199
George Washington U	97,095	75,267	36	138	NY Inst of Tech Man.	84,241	62,401	108	200
Oregon Health & Sci U	83,377	75,114	117	139	U of Mass-Dartmouth	80,361	62,295	137	201
U of California-Merced	71,652	74,638	237	140	Hebrew Un C-Jewish	82,771	61,312	125	202
Georgetown U	96,142	74,529	39	141	U of Rhode Island	78,047	60,974	161	203
New York U	100,52	74,465	28	142	Stony Brook U	89,170	60,660	75	204
Clark U	75,911	74,423	181	143	U of California-Irvine	92,316	60,337	58	205
U of Nevada-Reno	80,977	74,291	135	144	Seattle U	72,304	60,253	230	206
Mills C	91,746	73,989	63	145	Hebrew Un C-Cal.	78,608	60,006	157	207
U of South Florida	72,151	73,623	235	146	Catholic U of America	76,700	59,457	170	208
Virginia Commonw.	73,544	73,544	210	147	The New Sch	80,126	59,353	138	209
Spertus C	83,532	73,274	115	148	Montclair St U	82,895	59,211	123	210
Bentley U	93,596	73,122	52	149	Western Connecticut	76,107	58,998	178	211
Rowan U	78,120	73,009	159	150	Yeshiva U	77,867	57,679	162	212
U of Denver	73,395	72,668	213	151	U of Cal. Santa Cruz	86,039	57,359	96	213
U of California-Berkeley	106,21	72,256	17	152	Simmons C	72,303	56,931	231	214
U of California-Davis	91,003	72,225	67	153	U of San Francisco	94,291	56,802	46	215
Saint Thomas U	76,461	72,133	174	154	San Diego St U	73,099	56,666	216	216
Western U of Health Scis	79,234	72,031	150	155	Cal. St U-Los Angeles	72,800	55,573	222	217
U of New Hampshire	79,233	72,030	151	156	SUNY C of Optometry	74,945	55,515	191	218
Colorado Sch of Mines	84,649	71,736	105	157	Union Theol Sem	74,841	55,438	193	219
Tufts U	88,928	71,716	78	158	Inst for the Psych Scis	74,864	55,047	192	220
Saint Joseph's U	72,425	71,708	229	159	Mass Inst of Tech	111,15	54,754	10	221
Loyola C in Maryland	73,725	71,578	208	160	Jewish Theol Sem Am.	72,807	53,931	221	222
U of Miami	82,126	71,414	129	161	U of La Verne	72,791	53,919	223	223
Quinnipiac U	87,144	70,849	90	162	Golden Gate U-San	88,477	53,299	82	224
Pace U-New York	95,326	70,612	40	163	Saint Marys of CA	79,221	53,168	152	225
U of San Diego	90,647	70,269	68	164	U of Cal-Santa	94,786	52,953	43	226
U of Illinois at Chicago	80,050	70,219	141	165	New York Medical C	77,867	52,613	162	227
Dartmouth C	91,216	70,166	65	166	Drew U	76,202	52,553	177	228
Loyola U Chicago	79,696	69,909	146	167	Seton Hall U	76,212	51,495	176	229
Boston U	88,682	69,828	79	168	Bryn Mawr C	74,057	51,074	201	230
Colorado St U	73,759	69,584	207	169	U of CA-San Diego	96,918	50,742	38	231
Toyota Tech Inst at	79,254	69,521	149	170	Dowling C	73,515	50,700	211	232
Hofstra U	89,556	69,423	72	171	Grad. Theol. Union	72,238	49,141	234	233
U of Maryland-Balt. Cty	75,671	69,423	185	172	Adelphi U	83,520	47,186	116	234
Brandeis U	88,622	69,236	80	173	Pacific Grad. S. Psych.	87,807	46,706	86	235
Gallaudet U	88,218	68,386	84	174	Pacifica Grad. Inst	73,267	46,372	214	236
U of Med & Dent of New	83,318	68,293	119	175	San Francisco St U	74,358	44,794	199	237
Teachers C at Columbia	91,819	68,014	62	176	U of Hawaii at Manoa	76,555	40,721	172	238
U of New Haven	74,797	67,997	194	177	Boston C	100,51	40,046	29	239
Stanford U	107,97	67,909	13	178	Villanova U	78,868	32,725	156	240
St John's U-New York	91,519	67,792	64	179	NY Inst of Tech-Old	84,193	25,359	110	241
Princeton Theol Sem	92,076	67,703	60	180	Pepperdine U	95,012	24,938	42	242
Stevens Inst of Tech	92,067	67,696	61	181	SUNY Hlth Sci Ctr	89,826	23,827	69	243
U of Mass Amherst	86,555	67,621	94	182	Poly U	80,107	21,249	139	244

This table shows the rankings of U.S. Doctorate degree granting institutions based on compensation paid to faculty. AVG FT SAL is the average full time salary paid as reported by www.stateuniversity.com. COLA ADJ SAL is the cost of living adjusted salary. SAL RANK ranks the institutions based on the salary paid to faculty. COLA SAL RANK ranks the institutions based on cost of living adjusted salaries.

Exhibit 3: Salaries for Master's Degree Granting Institutions Only

UNIVERSITY	AVG FT SAL	COLA ADJ SAL	SAL RNK	COLA SAL RNK	UNIVERSITY	AVG FT SAL	COLA ADJ SAL	SAL RANK	COL SAL RNK
Gooding Inst of Nurse	102,275	105,438	2	1	Roger Williams U	80,226	67,988	29	41
Thunderbird	99,851	105,106	4	2	Cooper Union Adv of Sci	91,660	67,896	13	42
Widener U-Harrisburg	95,363	104,795	10	3	Providence C	73,618	67,539	59	43
Rose-Hulman Inst Tech	79,398	99,248	38	4	CUNY Bernard M	89,691	66,438	14	44
Oberlin C	83,109	94,442	24	5	Connecticut C	71,093	65,827	78	45
U of Washington-Tacoma	97,602	93,848	8	6	Whittier C	78,248	65,755	43	46
Trinity U	77,122	91,812	47	7	Kean U	81,873	64,979	26	47
Rutgers U-Camden	88,989	90,805	15	8	Penn St U-Penn St Great	86,385	64,466	17	48
Colgate U	86,218	90,756	18	9	New Jersey City U	80,898	64,205	27	49
Colorado C	79,925	88,806	32	10	Rollins C	71,526	63,863	73	50
Bucknell U	79,196	87,996	40	11	CUNY City C	85,556	63,375	20	51
California U Penn	71,534	85,160	72	12	William Paterson	83,593	61,465	22	52
Clarion U Pennsylvania	73,591	84,587	60	13	Occidental C	80,157	61,189	30	53
U of Michigan-Dearborn	71,164	83,722	77	14	Cal. St U-Dominguez	71,922	60,951	68	54
Rens. Hartford Grad Cntr	94,455	83,588	11	15	Wesley Theological	77,659	60,201	46	55
Mansfield U Penn	71,966	82,720	67	16	CUNY Hunter C	80,652	59,742	28	56
Furman U	72,060	81,886	65	17	Massachusetts Maritime	71,727	59,279	70	57
U of Washington-Bothell	98,540	81,438	6	18	California St U-East Bay	72,609	59,032	63	58
NY Inst of Tech-Central	101,775	81,420	3	19	St John's C	74,059	57,859	57	59
Evanston NW Healthcare	96,548	79,792	9	20	CUNY John Jay C	75,750	56,111	51	60
U of Richmond	79,392	79,392	39	21	CUNY York C	74,422	55,127	54	61
Stetson U	72,966	79,311	61	22	Cal. Poly St U-San Luis	72,526	54,944	64	62
Williams C	92,589	78,465	12	23	American C	78,506	54,142	41	63
Western New Engl& C	78,344	78,344	42	24	San Jose St U	75,092	53,257	53	64
Washington & Lee U	76,357	77,128	50	25	Fashion Inst of Tech	71,507	52,968	74	65
Hobart William Smith Cs	72,003	76,599	66	26	Bank Street C of	70,991	52,586	79	66
Rider U	83,447	76,557	23	27	San Fran. Cons. of Music	85,560	51,542	19	67
Rhode Isl& Sch of Design	82,796	75,960	25	28	Soka U of America	71,182	51,210	76	68
SUNY Inst of Tech at	71,487	75,249	75	29	US Merchant Marine	99,397	50,713	5	69
Mount Holyoke C	79,848	74,624	33	30	Iona C	71,647	46,524	71	70
Vassar C	84,062	73,739	21	31	CUNY C of Stn Island	74,282	46,426	56	71
The C of New Jersey	79,779	73,192	35	32	Cal. St U-Channel Islands	71,761	46,297	69	72
Millersville U of	72,735	72,735	62	33	CUNY Lehman C	76,835	46,286	49	73
Union Grad. C	74,000	71,845	58	34	Babson C	109,18	45,682	1	74
Bryant U	87,734	70,753	16	35	Manhattan C	74,377	44,805	55	75
Trinity C	79,796	70,616	34	36	Ramapo C of New Jersey	80,126	40,673	31	76
Reed C	77,004	69,373	48	37	Fairfield U	78,154	38,500	44	77
Natl. G. Sch of Qlty Mgt.	98,184	69,144	7	38	CUNY Queens C	78,094	38,281	45	78
Cal. St Poly U-Pomona	75,454	68,595	52	39	Sarah Lawrence C	79,753	34,525	36	79
U of Puget Sound	70,905	68,178	80	40	CUNY Brooklyn C	79,627	21,121	37	80

This table shows the rankings of U.S. master degree granting institutions based on compensation paid to faculty. AVG FT SAL is the average full time salary paid as reported by www.stateuniversity.com. COLA ADJ SAL is the cost of living adjusted salary. SAL RANK ranks the institutions based on the salary paid to faculty. COLA SAL RANK ranks the institutions based on cost of living adjusted salaries.

Exhibit 4: Salaries for Bachelor's Degree Granting Institutions Only

UNIVERSITY	AVG FT SAL	COLA ADJ SAL	SAL RNK	COLA SAL RNK	UNIVERSITY	AVG FT SAL	COLA ADJ SAL	SAL RANK	COL SAL RNK
U of TX M.D. Anderson	191,733	210,696	1	1	Davidson C	86,508	70,908	13	22
US Military Acad	108,794	96,278	3	2	Pomona C	92,844	69,287	9	23
US Coast Guard Acad	101,058	93,572	4	3	Siena C	71,911	68,487	40	24
Colby C	85,023	93,432	15	4	Claremont McKenna C	88,372	65,949	11	25
Grinnell C	74,294	90,602	33	5	Illinois C of Optometry	74,141	65,036	34	26
Swarthmore C	94,867	86,243	8	6	Scripps C	86,357	64,446	14	27
US Naval Academy	108,940	85,109	2	7	National Labor C	77,020	63,131	25	28
Lafayette C	82,541	85,094	17	8	Barnard C	83,830	62,096	16	29
Bowdoin C	86,825	84,296	12	9	Thomas Aquinas C	73,766	60,964	35	30
Bates C	77,266	83,985	24	10	Pitzer C	80,841	60,329	20	31
St Louis C of Pharmacy	73,747	83,803	36	11	Webb Inst	78,583	56,535	22	32
US Air Force Academy	74,518	82,798	32	12	Ventura C	75,844	55,361	29	33
Carleton C	81,213	82,033	19	13	West Coast U	72,458	55,311	38	34
Franklin & Marshall C	77,532	81,613	23	14	Wheaton C	75,769	55,306	30	35
Hamilton C	81,966	79,579	18	15	Farmingdale St C	71,685	54,721	41	36
Macalester C	78,782	78,002	21	16	Franklin Olin C of Eng.	89,218	50,692	10	37
Amherst C	99,224	77,519	5	17	Brigham Young Hawaii	76,163	41,169	28	38
Madison Area Technical	72,250	76,053	39	18	Wellesley C	96,876	40,534	7	39
Union C	76,264	74,043	27	19	Westmont C	70,953	39,639	42	40
Harvey Mudd C	96,951	72,351	6	20	Haverford C	76,531	37,515	26	41
C of the Holy Cross	72,649	71,225	37	21	CUNY Medgar Evers C	74,975	19,887	31	42

This table shows the rankings of U.S. bachelor degree granting institutions based on compensation paid to faculty. AVG FT SAL is the average full time salary paid as reported by www.stateuniversity.com. COLA ADJ SAL is the cost of living adjusted salary. SAL RANK ranks the institutions based on the salary paid to faculty. COLA SAL RANK ranks the institutions based on cost of living adjusted salaries.

Exhibit 5: Salaries for Associate Degree Granting Institutions Only

UNIVERSITY	AVG FT SAL	COLA ADJ SAL	SAL RNK	COLA SAL RNK	UNIVERSITY	AVG FT SAL	COLA ADJ SAL	SAL RANK	COL SAL RNK
Henry Ford CC	79,863	93,956	31	1	Asnuntuck CC	72,011	64,875	98	55
Muskegon CC	72,621	93,104	92	2	Palomar C	80,134	64,624	29	56
Monroe County CC	74,274	88,421	65	3	Long Beach City C	77,934	64,408	45	57
Milwaukee Area Tech C	78,496	88,198	40	4	Delaware County CC	73,314	64,311	82	58
Grand Rapids CC	74,030	88,131	69	5	Cypress C	85,333	64,160	10	59
Schcraft C	74,469	86,592	61	6	Prince Will. Snd CC	72,865	63,361	86	60
San Joaquin Delta C	86,329	86,329	7	7	Santa Rosa Junior C	78,432	63,252	41	61
Taft C	77,391	85,990	48	8	Mendocino C	71,246	63,050	103	62
Miracosta C	104,03	85,270	1	9	Orange Coast C	83,523	62,331	17	63
Bakersfield C	78,196	84,082	42	10	Waukesha Cnty Tech	71,476	62,153	102	64
Fresno City C	82,666	83,501	21	11	Gloucester County C	72,653	61,570	91	65
Elgin CC	77,702	80,940	47	12	Suffolk County CC	75,879	61,193	52	66
C of the Sequoias	78,992	80,604	34	13	Chaffey C	74,943	60,929	56	67
Reedley C	82,702	80,293	20	14	SUNY Westchester	89,352	60,373	4	68
Lakeland CC	74,616	80,232	59	15	Mt San Antonio C	84,137	60,098	14	69
Riverside CC	83,362	78,643	18	16	Pasadena City C	79,521	59,790	32	70
Porterville C	76,425	77,985	51	17	Los Ang. Trade Tech	78,093	59,613	44	71
Cerro Coso CC	73,819	77,704	73	18	Coastline CC	83,889	59,496	15	72
C of Lake County	78,970	77,422	36	19	Ohlone C	88,005	59,064	5	73
Victor Valley C	77,706	76,937	46	20	El Camino CC District	79,073	59,010	33	74
Glendale CC	72,767	76,597	88	21	Las Positas C	80,768	58,955	26	75
West Hills C-Coalinga	73,877	76,162	71	22	Oxnard C	73,509	58,340	80	76
South Mountain CC	74,087	75,599	67	23	Middlesex County C	73,077	57,541	83	77
Mesa CC	72,992	75,249	84	24	Los Angeles Harbor C	75,299	57,480	54	78
Merced C	72,095	75,099	97	25	C of the Desert	72,299	56,928	95	79
Oakton CC	80,072	74,141	30	26	Dorothea Hopfer Nurs.	78,956	56,397	37	80
Phoenix C	72,605	74,087	93	27	Rockland CC	80,189	55,303	28	81
Rio Salado C	73,977	73,977	70	28	Irvine Valley C	84,463	55,205	13	82
Mt. San Jacinto CC Dist	71,632	73,847	101	29	Scottsdale CC	72,199	55,114	96	83
Modesto Junior C	72,668	73,402	90	30	Golden West C	83,762	54,746	16	84
West Hills C-Lemoore	74,606	73,143	60	31	Union County C	74,828	54,223	57	85
Paradise Valley CC	71,664	73,127	100	32	Diablo Valley C	73,572	54,097	77	86
C of the Redwoods	77,284	72,909	49	33	Skyline C	78,789	53,965	38	87
GateWay CC	71,163	72,615	105	34	West Los Angeles C	74,353	53,879	62	88
Butte C	73,368	71,929	81	35	Evergreen Valley C	73,813	52,350	74	89
Antelope Valley C	72,930	71,500	85	36	Moorpark C	74,325	52,342	63	90
C of DuPage	85,501	71,251	9	37	Santa Monica C	90,604	51,774	2	91
San Bernardino Val. C	74,059	71,211	68	38	San Jose City C	72,705	51,564	89	92
Wyotech-Long Beach	86,147	71,196	8	39	City C of San	81,212	48,923	24	93
McHenry County C	74,717	71,159	58	40	Monterey Pen. C	73,702	48,809	76	94
Cerritos C	78,978	71,151	35	41	Bergen CC	73,531	48,059	79	95
Chandler/Gilbert CC	72,384	70,965	94	42	C of San Mateo	75,530	46,623	53	96
Los Medanos C	73,866	70,349	72	43	Los Angeles Valley C	76,567	46,404	50	97
Sacramento City C	71,124	69,729	106	44	Los Angeles Mission	73,549	46,257	78	98
Rio Hondo C	82,136	69,022	23	45	Nassau CC	78,130	44,141	43	99
Chabot C	84,464	68,670	11	46	CUNY LaGuardia CC	71,829	43,798	99	100
Hartnell C	78,596	67,755	39	47	County C of Morris	74,260	41,955	66	101
Contra Costa C	73,780	67,073	75	48	Santa Barbara City C	74,956	41,875	55	102
Columbia C	74,321	66,358	64	49	De Anza C	82,547	41,068	22	103
El Camino C-Compton	72,840	66,218	87	50	C of the Canyons	83,271	35,135	19	104
Fullerton C	84,464	65,988	11	51	Los Angeles Pierce C	71,214	33,278	104	105
Shasta C	71,107	65,840	107	52	C of Marin	86,858	23,797	6	106
Oakland CC	80,396	65,363	27	53	Foothill C	80,852	23,641	25	107
Saddleback C	89,554	64,894	3	54					

This table shows the rankings of U.S. associate degree granting institutions based on compensation paid to faculty. AVG FT SAL is the average full time salary paid as reported by www.stateuniversity.com. COLA ADJ SAL is the cost of living adjusted salary. SAL RANK ranks the institutions based on the salary paid to faculty. COLA SAL RANK ranks the institutions based on cost of living adjusted salaries.

Exhibit 6: Salaries for Law Degree Granting Institutions Only

UNIVERSITY	AVG FT SAL	COLA ADJ SAL	SAL RNK	COLA SAL RNK	UNIVERSITY	AVG FT SAL	COLA ADJ SAL	SAL RANK	COL SAL RNK
South Texas C of Law	117,33	128,936	7	1	Roger Williams U Sch	98,876	83,793	15	15
Thomas M. Cooley Law	101,79	124,135	13	2	Franklin Pierce Law	89,367	83,521	22	16
Michigan St U C of Law	108,03	120,034	8	3	Cal. Western Sch of	107,31	83,187	9	17
Albany Law Sch	120,95	115,193	6	4	New Engl& Sch of	99,147	78,069	14	18
New York Law Sch	154,47	114,427	1	5	U of Cal. Hastings C	129,23	77,854	3	19
Dickinson Law- Penn St	106,77	113,593	10	6	Thomas Jefferson Sch	90,885	70,453	18	20
John Marshall Law Sch	125,87	110,419	4	7	Massachusetts Sch of	98,440	70,314	16	21
William Mitch. C of Law	104,83	103,794	11	8	West. St U-C of Law	89,815	70,168	20	22
Southern U Law Center	89,874	103,303	19	9	San Joaquin C of Law	72,586	69,130	27	23
Appalachian Sch of Law	82,553	97,121	25	10	Southern New Engl	84,135	65,221	24	24
Ave Maria Sch of Law	94,455	96,383	17	11	U of the DC DA	79,879	61,922	26	25
Southwestern Law Sch	123,88	94,572	5	12	CUNY Law Queens	104,40	51,180	12	26
Florida Coastal S Law	86,738	93,267	23	13	Brooklyn Law Sch	134,06	35,560	2	27
Vermont Law Sch	89,402	85,963	21	14					

This table shows the rankings of U.S. law degree granting institutions based on compensation paid to faculty. AVG FT SAL is the average full time salary paid as reported by www.stateuniversity.com. COLA ADJ SAL is the cost of living adjusted salary. SAL RANK ranks the institutions based on the salary paid to faculty. COLA SAL RANK ranks the institutions based on cost of living adjusted salaries.

REFERENCES

Alexander, F.K. (2001) "The Silent Crisis: The Relative Fiscal Capacity of Public Universities to Compete for Faculty," *The Review of Higher Education,* vol. 24(2), p. 113-129.

Bell, L. (2000) "More Good News, So Why the Blues?" *Academe*, vol. 86(March/April), p. 1-4.

Boothe, Viva (1933) Salaries and the Cost of Living in Twenty-Seven State Universities and Colleges,1913-1932, Ohio State University Press, Columbus, OH.

Browne M.J. and J.S. Trieschmann (1991) "Salary and Benefit Compensation at American Research Universities," *The Journal of Risk and Insurance,* vol. 58(3, Sept.) p. 513-524

Ehrenberg, R.G. (2003) "Studying Ourselves: The Academic Labor Market, Presidential Address to the Society of Labor Economists, Baltimore, May 3, 2002," *Journal of Labor Economics*. vol. 21(2), p. 267-287

Figlio, D. (2002) "Can public schools buy better-qualified teachers?" *Industrial and Labor Relations Review,* vol. 55 (4, July), p. 686-699.

Fogg, P. (2006) "Where the Living is Easy: When Strong Salaries Combine with Low Costs, Professors can Live the Good Life," *The Chronicle of Higher Education*, vol. 52(34, April 28) p. A12.

Foster, N. (2002) "Cost of Living Not Offsetting Kansas State U. Low Faculty Salaries," *University Wire,* Monday, November 11, p. 1

Fournier, G.M. and D.W. Rasmussen (1986) "Salaries in Public Education: The Impact of Geographic Cost-of Living Differentials," *Public Finance Review,* Vol. 14(2), p. 179-198

Guilkey, D.K., T.A. Mroz, P.W. Rhode and M.K. Salemi (2009) "Comparing UNC-CH Faculty Salaries and Compensation Levels to those at Other Research Universities," *Unpublished Manuscript,*downloaded July 2009 at www.unc.edu/~jfstewar/home/tuition/salaries.htm

Hammermesh, D.S. (2002) "Quite Good—For Now," *Academe,* vol. 88(March/April), p. 20-42

Jalbert, T., M. Jalbert and K. Hayashi (2009) "State Rankings of Cost of Living Adjusted Salaries," *Accounting and Taxation*, vol. 1(1) p. 121-137.

Jalbert, Terrance, Mercedes Jalbert (2010) "University Rankings by Cost of Living Adjusted Faculty Salaries *International Journal of Management and Marketing Research,* vol. 3(2) p. 85-118.

Jalbert, T., M. Jalbert and G. Perrina (2004) "Does Degree Matter? An Empirical Analysis of CEO Educational Paths," *Journal of College Teaching and Learning* Vol. 5(1) May p. 65-73

Jalbert, T., R. Rao, and M. Jalbert (2002) "Does School Matter? An Empirical Analysis of CEO Education, Compensation and Firm Performance," *International Business and Economics Research Journal*, Vol. 1(1) Winter, p. 83-98

Kendall, M. (1938) "A New Measure of Rank Correlation", *Biometrika*, vol. 30, p. 81-89.

Marsh, H.W. and K.E. Dillon (1980) "Academic Productivity and Faculty Supplemental Income," *Journal of Higher Education* vol. 51(5), p. 546-555

Ong, L.L. and J.D. Mitchel (2000) "Professors and Hamburgers: An International Comparison of Real Academic Salaries," *Applied Economics,* vol. 32, p. 869-876.

Realestate.yahoo.com Neighborhood Info Section accessed at: realestate.yahoo.com/neighborhoods. Accessed on June 4-7, 2009.

Stateuniversity.com (2010) "Top Schools by Category: Ranked by Highest Salary for Full Time Faculty," downloaded July 1, 2010 from www.stateuniversity.com

Stoops, T. (2007) "Surprising Truth about Teacher Pay," *EdmondSun.com,* September 10, Accessed July 15, 2009 at: www.edmondsun.com

Winakor A.H. (1943) "The Faculty Dollar: Cost of Living for Faculty Members in State Universities," *The Journal of Higher Education,* vol. 14(8, Nov.) p. 421-425.

Zeglen M.E. and G. Tesfagiorgis (1993) "Cost of Living and Taxation Adjustments in Salary Comparisons,"*Paper Presented at the Thirty-Third Annual Forum of the Association for Institutional Research May 16-19, The Chicago Marriott, Chicago, IL.* p. 1-22.

Zoghi C. (2003) "Why have Public University Professors Done So Badly?" *Economics of Education Review*, vol. 22(February), p. 45-57

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RATIO OF DEFERRED TAX LIABILITIES TO SHARES AS A PREDICTOR OF STOCK PRICES

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ABSTRACT

This research examines whether deferred tax ratios predict US stock prices. The importance of deferred tax ratios stems from the existence of two separate reporting systems. US financial reporting is subject to managerial discretion, but US tax reporting is not. Investors may prefer to review tax numbers which are free from earnings management. However, only financial numbers are publicly disclosed. Deferred tax items enable investors to translate the financial results into less subjective numbers. Deferred tax liabilities also indicate successful tax planning. Correlation and regression establish the ratio of deferred tax liabilities over shares is more related to price than traditional ratios, such as basic earnings per share, earnings per share including extra items, cash flow per share, and book value per share.

JEL: M40

KEYWORDS: Deferred tax liabilities over shares, ratios, US stock prices, deferred tax items

INTRODUCTION

This research seeks to show that deferred tax liabilities to shares (DTL/Sh.) is so related to price that price to DTL/Sh. could replace price to earnings and other ratios in determining whether a stock is overpriced or underpriced. No ratio currently utilized seems entirely effective in ascertaining whether a stock is priced adequately. This study uses a data set of 3,016 US stocks, which allows us to draw statistically robust conclusions. Correlation and regression identify the statistical significance of the relationship between DTL/Sh. and price.

Even though the relevant literature shows relationships between the deferred tax accounts and earnings, no known research harnesses these relationships into some useful ratio. This relatively simple but powerful finding has heretofore been undiscovered likely for two reasons. First, the US market overemphasizes earnings and therein earnings per share. Second, despite the research demonstrating otherwise, market participants continue to misunderstand the predictive power of deferred tax accounts.

Deferred tax liabilities (DTLs) and deferred tax assets (DTAs) are the important considerations. The true benefits of DTLs tend not to be understood. There are two separate reporting systems in the US: the financial reporting system and the tax reporting system. In the US financial reporting system, managers have significant discretion over reported numbers. The US tax system does not provide that flexibility. Thus, investors may prefer to review tax numbers that are free from earnings management. Unfortunately, only the financial reporting numbers are publicly disclosed. However, investors can utilize the financially reported deferred tax items to reconcile the two systems. In fact, they enable investors to translate the financial results into numbers less subject to discretion and therein produce higher quality information to predict what US stock prices should be.

The research here shows that, DTL/Sh. explains price significantly more than previous research on deferred tax assets (DTAs) and deferred tax liabilities (DTLs). The research here provides significant value in establishing two findings: 1) the superiority of price to DTL/Sh. over price to earnings, and other ratios and 2) greater significance in the relationship between DTLs and price than has been found in previous research.

The remainder of the paper is organized as follows. In the next section the relevant literature is discussed. This section is followed by a discussion of the data and methodology used in the paper. The paper continues with a presentation of the empirical results. The paper closes with some concluding comments and suggestions for future research.

LITERATURE REVIEW

While accountants have emphasized the power of the accrual method to explain stock prices, finance professionals have disregarded these reported numbers as too subject to managerial discretion and resorted to cash flows and dividend methods to value stocks (Orpurt and Zang, 2009). Further, there have been struggles within each discipline to find the guiding light to simplify on average what the stock price should be for any particular company (Penman and Sougiannis, 1998).

The price to earnings ratio has been investors' favorite quick method to test what stock prices should be on average. However the price to book ratio could increase in importance with the gradual shift toward fair values and the emphasis on balance sheets over income statements (Penman and Zhang, 2006). Indeed, FAS 157 and other provisions indicate this trend. However, the benefit of more relevant balance sheets comes with the price of potentially less value relevant earnings numbers (Paananen and Parmar, 2008). Moreover, the price to earnings ratio has not always been that useful. Many companies do not have any earnings, forcing investors to utilize the price to sales ratio. If deferred tax liabilities over the number of shares (DTL/Sh.) is a better predictor of stock prices than traditional prediction variables, it might replace these traditional quick method measures.

Using DTA's to predict stock prices has not received attention in the literature, perhaps because the number of researchers who have the necessary understanding of financial and tax accounting is not extensive. Together the meaning of DTLs and DTAs under FAS 109 requires knowledge of financial and tax accounting (Graham et al., 2010). Financial accounting implies that liabilities are not preferred, so many consider DTAs are superior to DTLs in their value to companies. Unfortunately, this understanding is not correct.

Companies take their book income times the tax rate to determine their income tax expense. Theoretically, at the time of this entry, they also record income taxes payable as what they have reported on their income tax return (taxable income times the relevant tax rates). The book income tax expense and the taxes payable usually are not equal because of temporary differences between book income and taxable income. Cost recovery best exemplifies temporary differences. For book purposes then, companies could select straight-line cost recovery. However, for tax purposes, they would generally choose modified accelerated cost recovery, which resembles double-declining balance book depreciation. This situation creates the temporary difference, resulting in an ordinary deferred tax liability.

Depreciation method choice is not the only difference. Under the tax system, companies can elect to write off $250,000 immediately in the year that property is purchased and placed in service. However, this cost recovery is permitted only to the extent that they have sufficient business income and have not placed in service more than $850,000 of property. After taking advantage of this cost recovery, companies in recent years have then been able to recover an extra 50 percent as bonus depreciation for property in the year placed in service.

The subsequent discussion shows that DTLs are valuable and, in fact, more valuable than DTAs. DTLs involve tax planning (Graham et al., 2010). DTLs signify that companies submit less in tax payments than expected based on book income. DTAs show that more tax is being paid than was expected based on book income. As generating positive net cash flows is generally favorable, DTL's worth is already on

display. In fact, to some, utilizing these positive net cash flows is the best means to value companies (Orpurt and Zang, 2009).

The time value of money conceptually explains this value of DTLs. Deferring taxes provides the opportunity to invest the savings to earn some return, making the dollar of tax savings today from DTLs more valuable than the dollar of tax savings in the future from DTAs. Thus, from the level of DTLs, investors would tend to find guidance in setting prices.

Even though the desirability of producing DTLs instead of DTAs is settled, some still would question why DTL/Sh. would be relevant to determining the stock price. DTLs include the results of so many different types of transactions within their numbers. Only the retained earnings account contains results of more types of transactions. DTLs represent many of the comprehensive income items that do not move through net income. These items include gains on investments that, though they are realized, are not recognized for tax purposes. They also include derivatives, foreign exchange, and other related transactions. This area could be explored in other research.

Some contend that DTL/Sh. is not relevant to price. To them, price is based on expectations of future recurring earnings. DTLs are volatile because of business cycles (Graham et al., 2010). Until the underlying meaning of DTLs is considered, the persistence, and therein the relevance, of DTL/Sh. cannot be determined. DTL/Sh. is persistent in every meaning of that term. As taxes are paid every year, to the extent there is taxable income, skilled tax management postpones paying taxes to the extent possible and therein provides more earnings after taxes each year in the future. Thus, insofar as the presence of skilled tax management can provide for tax savings every year, DTL/Sh. is entirely persistent. Large DTL/Sh. numbers then signal successful tax management. Thus, investors could be willing to pay premiums on stocks based on the level of DTL/Sh.

Large DTL/Sh. numbers signal more than just successful tax management. Though companies can utilize deferred taxes to manage earnings (Graham et al., 2010), managerial discretion through earnings management can signal future increases in net cash receipts over cash payments. With this discussion set to the side, there is substantial power to this tax minimization strategy signal because of the aggressiveness it implies (Frank et al., 2009). The Internal Revenue Service (IRS) tends to challenge companies with large DTLs because, if successful, it receives back more for each increment of employee time spent (Mills, 1998). Successful tax minimization does signal aggressiveness (Frank et al., 2009). The presence of aggressiveness anywhere implies aggressiveness everywhere (Frank et al., 2009). Aggressive companies tend to have higher equity values compared with more neutral, non-aggressive companies (Frank et al., 2009). This logic shows why DTL/Sh. has the opportunity to be statistically significant to determining price.

DTL/Sh. provides signals beyond just characterizing the quality of tax management and the overall company aggressiveness. An important signal can be in the financial accounting area. Differences between depreciation for book and tax comprise much of the DTL category (Graham et al., 2010). The choice of straight-line depreciation for book purposes seems not to be conservative from an expense view. However, it can be from the gain view. Less depreciation expenses are reported in early years compared to sum-of-the-years and double-declining balance, but over time the depreciation expenses can be identical. Even with less expenses reported in earlier years, straight line becomes conservative if the properties in question are sold before they are fully depreciated to their salvage values. The reason is straight line would result in the lowest gain reported for book income purposes. Understanding that they can still meet earnings targets, managers could choose methods that lower earnings below what they could be. This fact would signal an expectation of future increases in profitability. Thus, DTL/Sh. could also signal conservative accounting, which would be rewarded in the market (LaFond and Watts, 2008).

DTL/Sh. is more explanatory of US stock prices than the traditional prediction variables of earnings per share, cash flow per share, and book value per share and the control variables of retained earnings per share, market capitalization, and shares. This result is demonstrated through statistical significance as DTL/Sh. is one-to-one directly correlated with price and is the most explanatory t-statistic in regression.

The connection between taxes and stock prices is well established (Blouin et al., 2004). Thus, research on the relevance of deferred taxes to stock price is nothing new (Graham et al., 2010). In 1972, Beaver and Dukes established that the presence of deferred tax items in earnings provides incremental value over the absence of those components. In 1986, Rayburn followed, establishing tax accruals as more informative of price than cash flows. In 1994, Chaney and Jeter essentially supported Beaver and Dukes. Amir et al., Amir and Sougiannis, Ayers, and Dhaliwal et al. followed with their 1997, 1999, 1998, and 2000 research.

This current line of research examines the relationship between price as the dependent variable and deferred tax items as explanatory variables. Researchers include other explanatory variables to identify, by comparison, how powerful deferred tax items are. This line of inquiry is what the present research advances. The research of Amir et al. (1997), Amir and Sougiannis (1999), Ayers (1998), and Dhaliwal et al. (2000) exemplifies this line.

Amir et al. (1997) explore which separate components of deferred tax accounts significantly influence price based on their tendencies to reverse. The following important deferred tax components are involved: amortization and depreciation; losses, carryforwards, and credits; restructuring costs; environmental costs; employee benefits; etc. They find that the market discounts deferred tax account components with regard to how likely they are to reverse and how long they take to reverse.

Amir and Sougiannis (1999) look at one category of DTAs. Their research reviews how investors utilize DTAs, specifically with respect to carryforwards, in determining prices. They find that earnings from carryforward companies are less persistent, but the DTAs carryforwards do not limit investors' predictive capabilities in setting prices. The next researcher moves from research on one category of DTAs to research on differences between standards.

Ayers (1998) investigates whether FAS 109 is more relevant than Accounting Principles Board (APB) 11. The research finding is that FAS 109 has greater relevance to price than APB 11. Ayers (1998) also provides that DTLs and DTAs have separable effects on price. This discovery lends credibility to this research methodology, looking only at DTLs' effect on price through DTL/Sh.

Dhaliwal et al. (2000) determine whether DTLs that are not reported on the balance sheet are valued in the context of FIFO or LIFO choices. If investors choose to value all companies based on FIFO, it would require an adjustment of LIFO to this method. If the general market has increasing costs for inventory, then some price effect could result from implying an increase to DTLs. Dhaliwal et al. (2000) find that the market does value the DTLs that are not on the balance sheet.

Another research methodology involves exploring the valuation of deferred tax accounts at the time of changes in corporate tax rates. Givoly and Hayn (1992) test the market pricing of DTLs under APB 11 during the 1986 income tax rate reduction from 46 percent to 34 percent. Stock prices move with the level of DTLs as the market imports their reversal (from declining tax rates) into those prices. The change in price in the following two situations: where DTLs are less likely to be realized or the components of DTLs have more time to reversal on average.

Chen and Schoderbek (2000) continue this methodology. Their research examines whether, before any earnings releases, investors adjust stock prices in the aftermath of uniform DTL increases. The

methodology involves reviewing the effect of the 1 percent change in corporate tax rates in 1993. They find that the market does not import those changes into price. Graham et al. (2010) remark that stock prices import information from DTLs. However the market does not always discount DTLs based on the time until reversal. This finding differs from the research results of Givoly and Hayn (1992) and Amir et al. (1997). Ultimately, research should resolve this conflict on what effect time until reversal has on stock price.

Sansing (1998) examines whether authorities should revise the current financial reporting standards to require discounting DTLs. The applicable standards do not force discounting for many reasons. DTLs also face uncertainty as to the effects of time until reversal of the temporary differences. The research finds that DTLs should receive valuation at the full book number. Guenther and Sansing (2000) consider two conditions as necessary for DTLs to be reported at their book numbers. These conditions are that companies record the assets and liabilities underlying the deferred tax items at present value and take tax deductions under the cash basis. Investors generally prefer discounting to reliance on book values. Guenther and Sansing (2004) demonstrate that time until reversal does not influence DTL valuation. As many finance researchers have shown, only cash flow effects can make time until reversal relevant to DTL value. The reversal pace relies on book depreciation, which has no cash flow implications. Thus, finance does influence this research.

The next line of research involves whether the presence of tax items on the financial statements is relevant to price. This research generally utilizes comparisons to book income without any deferred tax disclosures. Lipe (1986) expresses that the category income tax expense gives more information that is relevant to price than other earnings components do. Thomas and Zhang (2009) establish that market income tax expense positively, which differs from other expense items. The reasoning could be that this item helps measure economic income.

Hanlon et al. (2005) review whether estimated taxable income discloses certain information relevant to price that book income does not. Their results show that book income has the larger coefficient and t-statistic. However, estimated taxable income still is statistically significant, which indicates that it provides information that book income does not. Nevertheless, they do discover that overall book income is more value relevant than taxable income.

Ayers et al. (2009) consider company differences in the areas of tax strategy and earnings quality. They compare estimated taxable income and book income. They find that estimated taxable income for companies that engage in significant tax planning has lower information value. However, estimated taxable income for companies that could engage in earnings management has higher information value. Raedy (2009) and Chen et al. (2007) support this finding of lower information value for estimated taxable income disclosed from companies engaging in significant tax planning.

Lev and Nissim (2004) research the effect of taxable-to-book-income differences on earnings growth and therein earnings quality. They determine that this ratio provides information that accrued earnings and cash flows do not. Companies make discretionary accruals for book, not taxable, income disclosures. Reversals reduce the quality of accrued earnings. To the extent that companies seek to have consistent taxable income, estimated taxable income provides information on expected future taxable income. Thus, recording high estimated taxable income currently shows an expectation of high taxable income and therein high book income in the subsequent years. Because companies tend to recognize income for tax before the corresponding revenue for book, high taxable-to-book-income ratios should forecast high future book revenues. Because companies tend to recognize deductions for tax after expenses for book, high taxable-to-book-income ratios should forecast low future book expenses.

Hanlon (2005) determines that companies with the largest book-to-tax differences have less persistent earnings, accruals, and cash flows. Where book income is substantially less than estimated taxable income, stock pricing properly imports persistence of earnings and cash flows but overstates accruals' persistence. Where book income is substantially greater than estimated taxable income, stock pricing properly imports accruals' persistence but understates the persistence of earnings and cash flows. Blaylock et al. (2009) discover that aggressive tax strategy that results in book income substantially greater than taxable income best explains persistence in earnings and accruals.

Thomas and Zhang (2007) look at the relationship between estimated taxable income and future returns. Unexpected results for estimated taxable income correspond with stock returns six months later. Lev and Nissim (2004) find it to be one year. Thomas and Zhang (2007) discuss two reasons for this discovered relationship. The tax surprise could forecast subsequent book income not ascertainable from the current book income numbers. It could also forecast other subsequent financial information.

Weber (2009) shows that only for companies with lower-quality information does the relationship between book-to-tax differences and future returns exist. The research finds that prediction errors are statistically significant to taxable-to-book-income ratios. It also discloses that prediction errors are more positive where large book-to-tax differences exist. Chen et al. (2003) support these results.

Graham et al. (2010) demonstrate that tax information has an effect on future stock returns and prices. As this literature review has shown, there is incremental value to DTLs. There are also two lines of research into DTLs. Despite all this deferred tax research, there has not been inquiry into whether deferred tax ratios can predict stock prices.

US DATA AND METHODOLOGY

The US data was gathered from Compustat's Global Vantage database as of January 29, 2010. After the companies with no price data available are removed, 3,016 US companies are left. This sample is the basis for this research. Each of the respective variables is gathered directly or indirectly from this information source. Correlations and regressions are utilized to show the power of DTL/Sh. in predicting US stock prices. DTLs are placed over the denominator of shares to compare companies on identical terms. If the basis for comparison were just DTL, market capitalization could skew the results. Larger market capitalization companies would have larger DTLs ceteris paribus.

Price is market capitalization divided by the number of shares. Thus, it makes sense to divide the DTL by those shares as well to enhance comparability between categories. No known researcher has made this simple calculation for inquiry purposes. Thus, there is continued value to this process. Basic earnings per share, earnings (including all items then) per share, book value per share, DTL/Sh., and retained earnings per share (RE/Sh.) are included. The variables presented with DTL/Sh., except for market capitalization and number of shares, are included because they are the standards for valuing stock prices. RE/Sh. is included as the control to demonstrate how significant DTL/Sh. is.

Because of the trend toward fair values and the increasing importance of book value per share, some could be concerned that other variables on the balance sheet could be at the level of significance of DTL/Sh. Thus, RE/Sh. is included to represent all the other variables on the balance sheet and therein demonstrate that no other variable on the balance sheet is at the level of DTL/Sh. RE/Sh. incorporates much of what comprises the DTL/Sh. and more. Thus, if it is not more statistically significant or explanatory than DTL/Sh., nothing else on the balance sheet could be.

Care should be taken as Lev and Nissim (2004) indicate that current taxable income and DTLs are not imported into stock prices. Care should also be taken to separate out DTLs from DTAs as Amir et al.

(1997) show. Thus, it could be desirable to isolate the DTL into the long-term component and separate the DTLs from DTAs. Any legacy Compustat system would do these tasks automatically.)

RESULTS

As the correlation results in Table 1 demonstrate, DTL/Sh. is statistically significant at the .01 level and is one-to-one directly correlated with stock price. RE/Sh. is less associated with price with a correlation of 0.053. Basic earnings per share and earnings per share including all items with correlation of 0.465 is less associated with price. The ratio of cash flows per share is .159, even less associated with price. Book value per share is 0.20, less associated with price. These results indicate that DTL/Sh. is more explanatory than the traditional prediction variables for determining stock price. Book value per share is close to the level of DTL/Sh. but is still less associated.

Table 1: Correlation

	Price	DTL/Sh	RE/Sh	EPS Basic	EPS Extra	CF/Sh	BV/Sh	Mkt. Cap.	Sh
Price	1								
DTL/Sh	1.000***	1							
RE/Sh	.947***	.947***	1						
EPS Basic	.535***	.537***	.770***	1					
EPS Extra	.535***	.537***	.770***	1.000***	1				
CF/Sh	.841***	.844***	.960***	.899***	.899***	1			
BV/Sh	.980***	.980***	.992***	.684***	.684***	.924***	1		
Mkt. Cap.	.144***	.141***	.136***	.086***	.086***	.124***	.139***	1	
Sh	-.005	-.005	-.003	.004	.005	-.001	-.004	.774***	1

*Price is the price of the US stocks. The ratio DTL/Sh represents deferred tax liabilities for each company over its shares. The ratio RE/Sh stands for retained earnings per share. EPS Basic is earnings per share without extra items. EPS Extra is earnings per share with all items included. The ratio of CF/Sh represents cash flows per share. Mkt. Cap. is the market capitalization. Sh stands for the number of shares. ** Correlation is significant at the .05 level. *** Correlation is significant at the .01 level.*

What is important is that dividing by the number of shares does not change the results. The category described as number of shares is not statistically significant to price. That control is important. With shares removed then, the DTLs can be isolated as the predominant component causing this correlation with price.

Market capitalization is .856, less associated with price than DTL/Sh. However, it is statistically significant. DTLs could be somewhat related to market capitalization. For the year in question, companies with assets of $250 million or more had 96.9 percent of the book-tax differences, which was higher than their percentages of the country's assets, book income, and taxable income (Plesko, 2002). The reason for market capitalization's correlation with stock price could well be due to the large number of institutional investors in the US. As they do not want to acquire 5 percent of any company and therein have to begin SEC filing routines, institutional investors largely gravitate toward larger market capitalization companies. This gravitation increases their stock prices relative to smaller market capitalization companies ceteris paribus. As Plesko (2002) mentions, companies with higher market capitalizations have more book-tax differences and therein more DTL than other companies do. As such, higher market capitalization companies have higher DTL/Sh., which could partly influence the extent to which DTL/Sh. explains share prices.

The next discussion involves regression. All the regression involves changes to the following formula:

$$Price = Intercept + \beta 1(DTL/Sh) + \beta 2(RE/Sh) + \beta 3(EPS\ Basic) + \beta 4(EPS\ Extra) + \beta 5(CF/Sh) + \beta 6(BV/Sh)$$

Column 1 is the formula without *β4(EPS Extra)*. Column 2 is the formula without *β3(EPS Basic)*. The next column is *Price = Intercept + β1(DTL/Sh)*. Column 4 is *Price = Intercept + β2(RE/Sh)*. Column 5 is *Price = Intercept + β3(EPS Basic)*. Column 6 is *Price = Intercept + β4(EPS Extra)*. Column 7 is *Price = Intercept + β5(CF/Sh)*. The final column is *Price = Intercept + β6(BV/Sh)*.

As Table 2 shows, regression supports these findings with DTL/Sh. statistically significant with the highest t-statistic (46.375). The t-statistic is 14.387 stronger than BV/Sh. and 37.846 stronger than earnings per share in each format. The ratio of cash flows per share is not positive with respect to price and is almost the identical distance from DTL/Sh. in t-statistics that the earnings per share ratios are. RE/Sh. is also not positive and is close to 20 less in strength than the t-statistic for DTL/Sh.

Table 2: Regression

Price Non-standardized coefficient (t-statistic)	**No β4**	**No β3**	**β1**	**β2**	**β3**	**β4**	**β5**	**β6**
Intercept	2.376***	2.373***	6.892***	34.179***	74.213**	74.159**	42.074**	18.124**
	(2.772)	(2.769)	(5.806)	(2.791)	(2.310)	(2.309)	(2.047)	(2.409)
DTL/Sh	7.833***	7.832***	13.009***					
	(46.372)	(46.375)	(1758.035)					
RE/Sh	-.971***	-.971***		1.392***				
	(-26.830)	(-26.827)		(161.406)				
EPS Basic	.636***				10.141***			
	(8.528)				(34.783)			
EPS Extra		.636***				10.141***		
		(8.529)				(34.782)		
CF/Sh	-.627***	-.626***					10.963***	
	(-8.754)	(-8.753)					(85.430)	
BV/Sh	1.118***	1.118***						1.027***
	(31.991)	(31.988)						(271.990)

*These results are from regressions on price. The non-standardized coefficient is reported. Beneath it for each variable is the t-statistic. Intercept represents all the explanatory variables not expressed within the separately stated regression variables. DTL/Sh stands for the deferred tax liabilities over shares. RE/Sh represents retained earnings per share. EPS Basic has no statistics reported because it is collinear. EPS Extra involves earnings per share including all items. CF/Sh stands for cash flows per share. BV/Sh is the book value per share. ** Correlation is significant at the .05 level. *** Correlation is significant at the .01 level.*

As Penman and Zhang (2006) discuss, the ratio of price to earnings is the most utilized valuation technique. However, the ratio of price to DTL/Sh. is more relevant because earnings per share provides lower-quality price information than DTL/Sh. does. Book value per share explains price more adequately than any category of earnings per share, making price to book relevant for comparison purposes. However, even book value per share is less explanatory than DTL/Sh. Thus, price to DTL/Sh. could well be the best means to determine stock prices in the US.

CONCLUDING COMMENTS

Even after this discussion, there is still no reason why the DTL/Sh. should be one-to-one correlated with prices. Sloan (1996) provides the necessary logic. Investors do not properly incorporate persistence into their expectations. Nevertheless, the following paragraphs review this current research process.

Given that 3,016 US companies are included in the data set, so the results are statistically robust. Correlation shows DTL/Sh. to be one-to-one correlated with US stock prices. Regression on price then supports this finding as DTL/Sh. is more statistically significant to price than the components of the traditional prediction ratios, earnings per share from price to earnings, cash flows per share from price to cash flows, book value per share from price to book, etc. The retained earnings per share control shows that other balance sheet categories could not have similar predictive value as DTLs. The market capitalization control emphasizes that, even though larger companies tend to have more DTLs, this

largeness factor is not driving the DTL results. The number of shares also is not statistically significant to price, showing that DTLs are underlying the statistical significance of the ratio of DTL/Sh. to price.

Future research could examine this phenomenon over more years and in other markets. The results could continue over more years for the US market and could continue in other markets. However, if DTL/Sh. were not as predictive of price over more years and in other markets, it would not diminish the extraordinary significance of this finding. In fact, if this relationship did not continue into future years, it would be an interesting project to determine why this time period was so significant to the relationship between DTL/Sh. and price.

REFERENCES

Accounting Principles Board (1967), Opinion No. 11, Accounting for income taxes. Stamford: APB.

Amir, E., and Kirschenheiter, M. (1997), The valuation of deferred taxes. *Contemporary Accounting Research*, 14, 597-622.

_____, and Sougiannis, T. (1999), Analysts' interpretation and investors' valuation of tax carryforwards. *Contemporary Accounting Research*, 16, 1-33.

Ayers, B. (1998), Deferred tax accounting under SFAS No. 109: an empirical investigation of its incremental value-relevance relative to APB No. 11. *The Accounting Review*, 73, 195-212.

_____, Jiang, X., and Laplante, S. (2009), Taxable income as [the results] measure: the effects of tax planning and earnings quality. *Contemporary Accounting Research*, 26, 15-54.

Beaver, W., and Dukes, R. (1972), Intraperiod tax allocation, earnings expectations, and the behavior of security prices. *The Accounting Review*, 47, 320-332.

Blaylock, B., Shevlin, T., and Wilson, R. (2009), Tax avoidance, large positive book-tax differences, and earnings persistence. Working paper, University of Washington.

Blouin, J. L., Raedy, J. S., and Shackelford, D. (2004), Did dividends increase immediately after the 2003 reduction in tax rates? NBER Working Paper W10301.

Chaney, P., and Jeter, D. (1994), The effect of deferred taxes on security prices. *Journal of Accounting, Auditing, and Finance*, 9, 91-116.

Chen, K., and Schoderbek, M. (2000), The 1993 tax rate increase and deferred tax adjustments: Test of functional fixation. *Journal of Accounting Research*, 39, 23-44.

_____, Danielson, M., and Schoderbek, M. (2003), Analysts' interpretation of transitory earnings components: Evidence from forecast revisions after disclosure of the 1993 deferred tax adjustment. *Journal of Accounting, Auditing, and Finance*, 18, 333-353.

Chen, L., Dhaliwal, D., and Trombley, M. (2007), The impact of earnings management and tax planning on the information content of earnings. Working paper, University of Arizona.

Dhaliwal, D., Trezevant, R., and Wilkins, M. (2000), Tests of deferred tax explanation of the negative association between the LIFO reserve and firm value. *Contemporary Accounting Research*, 17, 41-59.

Financial Accounting Standards Board. (1992), Statement of Financial Accounting Standards No. 109, Accounting for Income Taxes. Norwalk: FASB.

Frank, M., Lynch, L. J., and Rego, S. (2009), Tax reporting aggressiveness and its relation to aggressive financial reporting. *The Accounting Review*, 84, 467-496.

Givoly, D., and Hayn, C. (1992), The valuation of the deferred tax liability: evidence from the stock market. *The Accounting Review*, 67, 394-410.

Graham, J. R., Raedy, J. S., and Shackelford, D. (2010), Research in accounting for income taxes. Working paper, NBER.

Guenther, D., and Sansing, R. (2004), The valuation relevance of reversing deferred tax liabilities. *The Accounting Review*, 79, 437-451.

_____, and Sansing, R. (2000), Valuation of the firm in the presence of temporary book-tax differences: The role of deferred tax assets and liabilities. *The Accounting Review*, 75, 1-12.

Hanlon, M. (2005), The persistence and pricing of earnings, accruals, and cash flows when firms have large book-tax differences. *The Accounting Review*, 80, 137-166.

LaFond, R., and Watts, R. (2008), The information content of conservatism. *The Accounting Review*, 83, 447-478.

Lev, B., and Nissim, D. (2004), Taxable income, future earnings, and equity values. *The Accounting Review*, 79, 1039-1074.

Lipe, R. (1986), The information contained in the components of earnings. *Journal of Accounting Research*, 24, 37-64.

Mills, L. (1998), Book-tax differences and Internal Revenue Service adjustments. *Journal of Accounting Research*, 36, 343-356.

Orpurt, S., and Zang, Yo. (2009), Do direct cash flow disclosures help predict future operating cash flow and earnings? *The Accounting Review*, 84, 893-935.

Paananen, M., and Parmar, Ni. (2008), The adoption of IFRS in the UK. Working paper, University of Hertfordshire.

Penman, S. H., and Sougiannis, T. (1998), Comparison of Dividend, Cash Flow, and Earnings Approaches to Equity Valuation. *Contemporary Accounting Research*, 15, 343-383.

_____, and Zhang, J. (2006), Modeling sustainable earnings and P/E ratios with financial statement analysis, Working paper, Columbia University.

Plesko, G., 2002. Reconciling corporation book and tax net income, tax years 1996-1998. *Statistics of Income Bulletin*, 111-132.

Raedy, J. (2009), Discussion of "Taxable income as a performance measure: The effects of tax planning and earnings quality." *Contemporary Accounting Research*, 26, 55-63.

Rayburn, J. (1986), The association of operating cash flow and accruals with security returns. *Journal of Accounting Research*, 24, 112-133.

Sansing, R. (1998), The deferred tax liability. *Journal of Accounting Research*, 36, 357-363.

Sloan, R. (1996), Do stock prices fully [show] information and accruals and cash . . . about future earnings? *The Accounting Review*, 71, 289-315.

Thomas, J., and Zhang, F. (2007), Tax income momentum. Working paper, Yale University.

_____, and _____ (2009), Valuation of tax expense. Working paper, Yale University.

Weber, D. (2009), Do analysts and investors fully appreciate the implications of book-tax differences for future earnings? *Contemporary Accounting Research*, 26, 1175-1206.

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AUDIT COMMITTEE EFFECTIVENESS IN THE LARGEST US PUBLIC HOSPITALS: AN EMPIRICAL STUDY

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ABSTRACT

Most research focuses on the role of audit committees in the private sector and less in the public sector, especially public hospitals. Therefore, we investigate the role and quality of public hospital audit committees in controlling problems in financial reporting and in major Federal award programs. We investigate all publicly available Office of Management and Budget Circular A-133 audit reports on internal controls over Federal reporting for public hospitals. We then conduct a follow-up study on the administrators of these reporting units. We find the presence of a committee and the committee's specific quality characteristics of independence, financial expertise, and increased activity, positively correlate with reduced frequencies of internal control problems. In addition, we find audit committees with financial expertise associated less frequently with material weaknesses over financial reporting and over major Federal programs. Our findings extend corporate governance research to the public health care sector, provide additional support for the Sarbanes-Oxley Act of 2002 and the Office of Management and Budget Circular A-123 requirements, and answer questions found in prior research on non-profit hospitals given by Vermeer et al. (2006) and Pridgen & Wang (2007).

JEL: M4, H5, H7

KEYWORDS: Audit committee; internal control; Office of Management and Budget Circular A-133 audit; material weakness.

INTRODUCTION

Audit Committees (ACs) serve an important monitoring mechanism in corporate governance. In the aftermath of highly publicized corporate scandals, such as Enron, WorldCom, and Tyco, the Sarbanes-Oxley Act of 2002 increased the committee's responsibility in providing greater transparency and an internal control structure over financial reporting in private sector. In like manner, the public sector also increased the committee's responsibilities. The U.S. Government Accountability Office (GAO) recommends that public sector entities consider the benefit of using ACs in governmental units (George, 2005; Hardiman, 2006).

Because of the investigations of ACs operating in the private sector and the correspondingly few studies about the role and effectiveness of ACs in the public sector, especially in public health care, (e.g., DeZoort et al., 2002; Hermalin & Weisbach, 2003; Vermeer et al., 2006), we extend the prior corporate governance research to the public health care sector. We do this by examining the impact of ACs in Federally funded public hospitals and healthcare systems (hereafter public hospitals).

Every year, more than 10 million people in the United States (U.S.) receive health care from public hospitals. More than 80% of public hospitals provide many essential community-wide services, such as primary, trauma, and neonatal intensive care to uninsured patients (Zaman et al., 2004). The indigent and uninsured population is growing, with more than 47 million uninsured Americans and illegal aliens (Gilmer & Kronick, 2005; Adamy & Meckler, 2010). To address this gap in healthcare coverage, U.S.

public hospitals have become "safety net" institutions (Baxter & Mechanic, 1997; Fishman & Bentley, 1997). The stated mission of public (safety net) hospitals is to "always be there when other institutions cannot, are not, or do not want to be there" (Stolzenberg, 2000, p.347). Since public hospitals have a special commitment to provide health care to the uninsured (Bazzoli et al., 2003; NAPH, 2009) and low-income populations (NAPH, 2009; Zaman et al., 2004), they play a significant and critical role in our community. Public hospitals are extensions of state and local governments thus, are exempt from the State and Federal corporate income tax. Public hospitals are charitable in nature. However, they generally do not fit the definition of Section 501 (c) (3) of the Internal Revenue Code for a charitable organization. While public hospitals receive direct tax support, most operate independent of the local government. In this position, they must maintain a separate budget and cannot expect continuous bailouts for fiscal incompetence (Armario, 2010).

The Sarbanes-Oxley Act of 2002 (SOX) (U.S. House of Representatives, 2002; hereafter SOX) mandated important changes in the structure and operation of ACs to improve corporate governance in public corporations (private sector). Governance is not only important in private sector but also in public sector. While many provisions of SOX do not apply to the public sector, SOX has spurred the public to consider the value and role of ACs to promote and improve sound governance in public sector (Deloitte & Touche, 2005; Gorge, 2005; Hardiman, 2006). Additionally, respected organizations have advocated for more widespread and effective use of ACs in the public sector. For example, the Government Finance Officers Association (GFOA) (2002) and the Office of Management Budget (OMB) encourage and recommend the establishment of an AC or its equivalent (Deloitte & Touche, 2005). Likewise, the Institute of Internal Auditors (n.d.) encourages all public sector entities to establish an effective AC to demonstrate greater accountability.

Prior research related to corporate ACs focuses primarily on large publicly traded companies, which documents that AC characteristics are associated with improved governance and financial reporting quality (e.g., Krishnan, 2005; McMullen, 1996; Owens-Jackson et al., 2009). Empirical evidence about whether ACs of public hospitals improve governance and accountability is scarce. Although this is found, in part, for non-profit hospitals recently by Vermeer et al., (2006) and Pridgen & Wang (2007).

The purpose of this study is to investigate whether ACs (presence and characteristics) in public hospitals impact organizational accountability, measured by reported internal control problems in A-133 reports. Our sample consists of all publicly available A-133 audit reports on internal controls over Federal reporting and a follow-up study conducted on the administrators of all of their 75 public hospitals operating in the U.S. We examine the relationship between the presence and the characteristics of public hospital ACs and the quality of internal control over financial reporting and major Federal award programs.

We find a significant relationship between the presence of ACs and internal control quality. We also find that independence, financial expertise, and activity level (meeting frequency), exhibit a significant negative association with the incidence of internal control problems. Our findings are consistent with prior research in public companies, suggesting that AC quality characteristics have a positive impact on financial reporting (e.g., Abbott et al., 2004; Carcello & Neal, 2000; Krishnan, 2005; Owens-Jackson et al., 2009). In addition, our results provide insights into the monitoring function of public hospital ACs. Thus, when funding is at risk due to insufficient controls, as required by Federal grants, hospitals respond by increasing the monitoring function of ACs.

The next section introduces the background and hypotheses. Section 3 describes research method. Section 4 follows with data collection. Section 5 presents empirical results. The final section contains conclusion, limitations, and future studies.

BACKGROUND AND HYPOTHESES

Prior Literature on Audit Committees

The effects of the enactment of SOX, failures in the quality of government audits (George, 2005), and recent public sector scandals, such as $2 million spending scandal in the Roslyn school district (Strugatch, 2004) and Jackson Health System' gross mismanagement (Dorschner, 2010), have contributed to the call for improved governance in the governmental entities. In response to this call, the GFOA and AICPA published guidance for the structure, responsibilities, activities and operations of ACs at different levels of governmental entities (David, 2009).

Many empirical study focusing on public companies provide evidence suggesting that firms with an AC (e.g., DeChow et al. 1996; Defond and Jiambalvo 1991; McMullen 1996) and AC characteristics (e.g., Abbott et al., 2004; Lee et al., 2004; Uzun et al., 2004; Krishnan, 2005; Owens-Jackson et al., 2009) are more likely to have higher quality of financial reporting. In general, these studies indicate a positive association between the presence and characteristics (size, independence, financial expertise, and or meeting frequency) of an AC and the quality of financial reporting. Defond and Francis (2005) suggest that more AC research needs to be done after the enactment of SOX. They also call for future research to build on the existing AC studies to develop a better and deeper institutional understanding of auditing issues.

The research conducted in heath care generally focuses on nonprofit hospitals. For example, Wagner et al. (1988) use surveys to report the role of ACs in three service industries, municipal government, hospitals, and banks. They find that the AC of nonprofit hospitals the monitor internal auditor, engage the independent auditor, and evaluate audit results. In addition, Wagner et al. (1989) reported survey results of the extent to which non-profit hospitals used ACs, the composition and responsibilities of such committees, and the perception of the effectiveness of these committees. Based on their survey, 54 percent of the hospitals had either an AC or similar control committee. A majority of hospital ACs were composed of three to five members. Most hospital ACs had a majority of outside directors and were chaired by an outsider.

Urbancic and Hauser (1991) argue that the organizational governance of a hospital improves with an effective functioning AC. They conduct a study to analyze the structure, responsibilities, and activities of hospital ACs. The sample size is 141 hospitals including 20 government-sponsored hospitals. Similar to Wagner et al. (1989), they found 54 percent of hospitals in their survey with an AC. In addition, the average member size on ACs is 6.6, most members serving on the AC were outside directors, 47 percent of the ACs had an accountant serving as a member, and most of ACs meets two to four times a year.

Because of the recent changes in governance, we would expect that the use of ACs have increased. A more recent study, Vermeer et al. (2006) examine the composition of nonprofit ACs and the factors associate with their composition. These nonprofit organizations include hospitals and university/colleges. They find that 75 percent of the sample entities have an AC. Of this sample, ACs in hospitals/universities are more likely to have at least one financial expert on the AC, but those ACs in hospital/universities are less likely to have entirely independent directors on ACs. Pridgen and Wang (2007) examine whether the use of ACs by nonprofit hospitals improves organizational accountability. Using a sample of nonprofit hospitals selected from the years 2001 to 2004, they only find in one year (2002) where reported internal control weakness in administering Federal program are significantly less with the use of an AC. They do not find such a relationship in other three years. Furthermore, they find no relationship between the use of an AC and reported internal control weaknesses associated with financial statement audits.

While these studies by Wagner et al. (1988, 1989), Urbancic and Hauser (1991), and Vermeer et al. (2006) extend AC research to the nonprofit area, most of these studies did not include government or public health care sector hospitals. In addition, they did not test the monitoring effect of these ACs in their organizations. The later study, Pridgen and Wang (2007), examines the monitoring effect of ACs in nonprofit hospitals. This study, however, found mixed results. Furthermore, Vermeer et al. (2006) argue nonprofit organizations that receive government grants are more likely to have ACs due to the increased demand for effective monitoring. Since public hospitals are extensions of government entities and dependent upon direct government financial support, these facilities demand more effective monitoring to fulfill reporting and internal control requirements. Therefore, these arguments by Vermeer et al. (2006) provide support for the value of our sample selection.

OMB Circular A-133 Audit (Single Audit)

ACs oversee the results of A-133 audits. OMB (2003) Circular A-133, *Audits of States, Local Governments, and Nonprofit Organizations,* applies to major Federal programs administered by the grant recipient. OMB Circular A-133 requires that all public hospital institutions that receive Federal grants in excess of $500,000 complete the A-133 audit at least nine months after the close of the fiscal year. Auditors of these public hospitals are required to report on the fairness of the financial statements and report on the internal control related to the financial reporting and major Federal programs; compliance with laws, regulations, provisions of contracts or grant agreements applicable to Federal program; and whether the schedule of expenditures of major Federal awards programs is presented fairly.

Prior literature concerning hospital institutions that receive federal funds under the OMB Circular A-133 audit requirements is limited. The study discussed earlier by Pridgen and Wang (2007), using a sample subject to the requirements of OMB Circular A-133, examines whether the use of an AC reduces the likelihood of reported internal control weakness. However, they did not examine whether AC characteristics (such as size, independence, financial expert, and/or meeting frequency) improve organizational governance and accountability, which is the focus of private sector empirical research studies (e.g., Abbott et al., 2004; Agrawal & Chadha, 2005; Bedard et al., 2004; Krishnan, 2005).

Internal Control Weaknesses

As a condition for participation in Federal grant programs, public hospitals must have adequate and sufficient internal controls to ensure that the hospital complies with all applicable Federal and state laws and regulations. In addition, the hospital must have internal controls in place so that they properly administer the Federal programs. If internal controls are not sufficient, a hospital risks losing the Federal grant funding.

The reporting requirements over internal control for the A-133 audit are similar to reporting requirements of SOX at publicly traded companies. As part of the A-133 audit, the external auditor identifies any reportable conditions or material weaknesses over financial reporting and major federally sponsored programs.

A reportable condition over financial reporting occurs when a misstatement could arise (or has arisen) in the financial statements or the schedule of Federal award expenditures, in all material respects, in relation to the financial statements taken as a whole (OMB, 2003, Section 500). Table 1 outlines the A-133 audit reporting guidelines.

A reportable condition over major Federal award programs occurs when the external auditor does not obtain reasonable assurance that internal controls are in place and are operating effectively and that the major Federal programs comply with 14 program and financial requirements (OMB, 2004). Table 2

outlines the reporting requirements of the OMB over reportable conditions and non-compliance for A-133 reports. Typically, these may include funding current operations with noncurrent funds, improper billing and collection procedures, and lack of proper documentation for billing, receiving and controlling for supplies, services, other resources and more.

Table 1: A-133 Audit Reporting Guidelines

Audit Results	OMB Citation
The type of report the auditor issued on the financial statements (e.g., unqualified opinion, qualified opinion, adverse opinion, or disclaimer of opinion).	OMB 2003, Section 505 (d) (1) (i)
Where applicable, a statement that reportable conditions in internal control were disclosed by the audit of the financial statements and whether any such conditions were material weaknesses.	OMB 2003, Section 505 (d) (1) (ii)
A statement as to whether the audit disclosed any noncompliance which is material to the financial statements.	OMB 2003, Section 505 (d) (1) (iii)
Where applicable, a statement that reportable conditions in internal control over major programs were disclosed by the audit and whether any such conditions were material weaknesses.	OMB 2003, Section 505 (d) (1) (iv)
The type of report the auditor issued on compliance for major programs (i.e., unqualified opinion, qualified opinion, adverse opinion, or disclaimer of opinion).	OMB 2003, Section 505 (d) (1) (v)
A statement as to whether the audit disclosed any audit findings, which the auditor is required to report under the requirements listed in Table 2.	OMB 2003, Section 505 (d) (1) (vi)
A statement as to whether the auditee qualified as a low-risk auditee.	OMB 2003, Section 505 (d) (1) (ix)

This table 1 shows a brief summary of the auditor's results that shall be included in the audit reports.

Table 2: OMB Reporting Requirements over Reportable Conditions and Non-compliance

Reporting Requirement	OMB Citation
Reportable conditions in internal control over major programs.	OMB 2003, Section 510 (a) (1)
Material non-compliance with the provision of laws, regulations, contracts, or grant agreements related to a major program.	OMB 2003, Section 510 (a) (2)
Known questionable costs, which are greater than $10,000 for a type of compliance requirements for a major program.	OMB 2003, Section 510 (a) (3)
Know questionable costs, which are greater than $10,000 for a Federal program and is not audited as a major program.	OMB 2003, Section 510 (a) (4)
Known fraud affecting a Federal award.	OMB 2003, Section 510 (a) (6)

This table 2 shows a brief summary of the audit finding that the auditor shall report in the audit reports

Development of Hypotheses

Prior studies about corporate ACs typically use agency theory to develop and test hypotheses (e.g. Carcello & Neal, 2000, 2003; Klein, 2002). Because public hospitals have no shareholders or owners, the concept of agency is less applicable. A theory with much more relevance to public sector hospitals is resource dependency, which provides a relevant framework for examining a diverse set of issues related to nonprofit and governmental organizations and their boards (e.g., Anheier, 1997; Brown, 2005; Hillman & Dalziel, 2003; Miller-Millesen, 2003; Pridgen & Wang, 2007; Vermeer et al., 2006, 2009). This theory provided by Pfeffer and Salancik (1978) posits that an organization's need for resources is a determinant of its structure and activities. Public hospital board (and therefore AC) members are more likely to be selected according to resource dependency theory (Pfeffer, 1973; Pfeffer & Salancik, 1978; Vermeer et

al., 2006, 2009), and hence are typically chosen for their support of management or because of their access to or control of funding sources. According to the latter, the funding sources tend to monitor the outcomes of funding, such as in the government audits of public hospitals. Therefore, in these cases, the AC members would act to prevent the misstatements of management, as would agency theory-based AC members who would monitor management in the interests of the corporate stockholders (Jensen & Meckling, 1976; Fama & Jensen, 1983).

Vermeer et al. (2006) find nonprofit organizations that receive government funds are more likely to have effective monitoring by ACs. The receipt of government funds, specially these that are subject to OMB Circular A-133 audit, brings with it many additional reporting and internal control requirements, and in turn leads to an increased demand for creating an AC to perform monitoring functions. This demand suggests that having an AC in organizations subject to OMB Circular A-133 audit improves the internal controls over major Federal awards. Moreover, Vermeer et al. (2006) argue that nonprofit hospitals and universities with government-sponsored grants are more likely to have effective monitoring by ACs. Since public hospitals have much higher levels of complexity in their operations and are subject to extensive and complex regulations and rules related to the Medicare, Medicaid, and other funding sources, the demand is higher for a strong internal control structure. Thus, public hospitals have an increased need for the monitoring functions of ACs.

Based on the discussion above, ACs are generally more effective in hospitals with Federal grants and required government audits (Vermeer et al., 2006), consistent with resource dependence theory. Therefore, we would anticipate H1 for public hospitals:

Hypothesis 1: The presence of an AC in public hospital is positively associated with the quality of the internal controls reported in government audits.

Prior research on corporations finds the AC characteristics of size, of meeting frequency, of independence, whether the members are independent of management, and of financial expertise, whether the committee has a financial expert, to serve as proxies for AC quality. (For examples, see Abbott et al., 2003, 2004; Bedard et al., 2004; Carcello & Neal, 2000, 2003; Chen et al., 2005; Felo et al., 2003; Klein, 2002; Krishnan, 2005; McMullen Raghunandan, 1996; Xie et al., 2003; Zhang et al., 2007).

For publicly traded corporations, Krishnan (2005) and Zhang et al. (2007) find the association between this AC quality and internal control problems. Krishnan (2005) compares 128 public corporations who changed auditors and had reported internal control (8-K) deficiencies from 1994-2000 with those firms who did not change auditors and had no internal control deficiencies. She finds those committees with self-reported independence and financial expertise questions also to have financial control problems, i.e., AC quality to be associated with internal control quality. Similarly, Zhang et al. (2007) compare a sample of firms with internal control weaknesses and match these firms to a sample of control firms without internal control weaknesses. They find increases internal control weaknesses when the firm's audit committee has less financial expertise.

By increasing audit committee's quality characteristics, corporations also obtain a significantly lower cost of debt financing (Anderson et al., 2004). Other studies in public corporations find at least one improved committee quality (size, independence, and financial expertise) related to improved quality financial reporting outcomes (Carcello & Neal, 2000; Klein, 2002; Felo et al., 2003; Xie et al., 2003; Abbott et al., 2004; Bedard et al., 2004; Agrawal & Chadha, 2005; Raghunandan and Rama, 2007). Even though very few studies test the monitoring effect of these ACs in public hospitals, we anticipate AC quality characteristics to have a similar impact for public hospitals, H2:

Hypothesis 2: A public hospital's AC quality is positively associated with the quality of internal controls reported in government audits.

METHODOLOGY

We investigate these two hypotheses following the design of Krishnan (2005) and recommendations of Vermeer et al. (2006). We first define the conceptual variables and then provide their corresponding constructs. Due to data limitations and the nature of our population, we did not test for all variables investigated by Krishnan (2005). However, we added a variable (*HOSPAGE*) to our study not tested by Krishnan (2005).

We estimate the following logistic regression equation to identify the determinants of ICPROB:

$$ICPROB = \alpha + \beta_1 SIZE + \beta_2 INDEP + \beta_3 EXPERT + \beta_4 MEET + \beta_5 FDISTRESS + \beta_6 CFOEXP + \beta_7 BIG4 + \beta_8 TENURE + \beta_9 IAUDIT + \beta_{10} LASSET + \beta_{11} HOSPAGE + \varepsilon$$

The Dependent Variable and Its Construct

We define the dependent variable as the presence of a reported control problem ("a significant control deficiency") as identified in the A-133 report. Its construct, internal control problem, *ICPROB*, we code either 1 or 0 according to the reported presence or absence of this deficiency.

The A-133 categorizes identified internal control problems as either material weaknesses or reportable conditions. The AICPA standards contained in Government Auditing Standards (GAS) define these terms (U.S. Government Accountability Office [GAO], 2003). On July 27, 2007, the Comptroller General of the U.S. issued the July 2007 revision of GAS to supersede the 2003 revision and to update the definitions and terminology for internal control deficiencies to be consistent with the Public Company Accounting Oversight Board (PCAOB) and AICPA terminology (GAO, 2007). While the U.S. GAO updated the standards, the 2005 A-133 reports we used to define internal control in this study follow the 2003 revision of GAS.

The Independent Variables

The AC

We define the independent variables similarly to Krishnan (2005). The first is the presence or absence of an audit committee (*AC*) responsible for the internal controls. We code *AC* 1, if a public hospital has an AC, and 0 otherwise.

The next variable is the quality characteristics of the AC. While the Securities and Exchange Commission (SEC) has no regulatory authority over public hospitals, their requirements provide a benchmark for examining the quality of ACs of public hospitals. The SEC (1999) benchmark requires ACs to have (1) at least three members, (2) all members are independent of management, and (3) at least one member with financial expertise.

The *Blue Ribbon Committee Report* (1999) implies that ACs should meet at least quarterly. Similarly, the National Association of Corporate Directors (1999) indicates this minimum recommendation. Therefore, in addition to the three SEC requirements, we add a fourth measure of AC quality, meeting frequency. Those ACs that meet five or more times a year, exceed the minimum of four, and therefore this frequency defines a measure of quality.

Consequently, we use four parameters, size (*SIZE*), independence (*INDEP*), financial expertise (*EXPERT*), and meeting frequency (*MEET*) to proxy for AC quality. We code *SIZE* 1 if the AC consists of at least three members, and 0 otherwise. *INDEP* is coded 1 if the AC consists entirely of (non-management) independent members, and 0 otherwise. We code *EXPERT* 1 if the AC includes at least one member with financial expertise as defined by the AICPA Audit Committee Toolkit (and illustrated by Morrow & Pastor, 2007), and 0 otherwise. *MEET* is coded 1 if the AC met more than four times during the 2005 fiscal year, and 0 otherwise.

Other Monitors

Three monitors – management qualifications, the external auditors, and internal audit function – interact with ACs to contribute to the control environment (COSO, 1992). These monitors form the basis of the control environment and affect the entity's internal controls (Krishnan, 2005).

Management Qualifications: Similar to Krishnan (2005), we use as a proxy for management qualifications (*CFOEXP*) the presence of a CPA certification, or similar financial experience of the Chief Financial Officer (CFO) or Controller.

The External Auditor: The external auditor characteristics include auditor type (*BIG4*) and auditor tenure (*TENURE*). We include external auditor control variables since they may have an independent effect on the internal control quality (Krishnan, 2005). Section 404 of SOX requires that every registrant to contain an assessment by management of the design and operating effectiveness of its internal control over financial reporting in its financial statements and independent auditor to attest to the management's assessment of the company's internal control over financial reporting (SEC, 2003). In addition, these variables serve to control for differences in auditors' discovery, determination, and reporting of control problems (Krishnan, 2005).

It is generally assumed that "brand name" (Big Four International) auditors enhance audit quality. Prior studies on the use of Big Four auditors focus mostly on public corporations. The Big Four auditors generally have more audit expertise and experiences, and greater resources to identify control issues than non- Big Four auditors do (Ge & McVay, 2005; Doyle et al., 2007; Francis & Yu, 2009). Brand-name auditors generally have higher quality of financial reporting (Becker et al., 1998; Francis et al., 1999; Reynolds & Francis, 2000; Francis & Yu, 2009). Becker et al. (1998) and Reynolds and Francis (2000) argue that Big Six auditors are able to detect earnings management and act to curb opportunistic earnings management. Becker et al. (1998), Francis et al. (1999), and Reynolds and Francis (2000) provide evidence that clients with the use of Big Six auditors have lower discretionary accruals than clients with the use of non- Big Six auditors. Francis and Yu (2009) find that clients audited by larger offices of Big Four auditors are also less likely to have aggressively managed earnings. Moreover, Krishnan (2005) finds that companies with internal control problems are more likely to have Big Five auditors than companies with no internal control problems. Ge and McVay (2005) find that companies with larger audit firms are more likely to disclose a material weakness in internal control, after controlling for business complexity, firm size, and firm profitability.

Auditor tenure (*TENURE*) is the second proxy for external auditor quality. Research finds a negative association between auditor tenure and the measures of control quality, such as discretionary accruals (Frankel et al., 2002; Johnson et al., 2002; Myers et al., 2003), the likelihood of failures in auditor reporting (Geiger & Raghunandan, 2002), and the incidence of internal control problems (Krishnan, 2005). However, in public hospitals where the auditor would provide the lower audit fee financial audit and the Federal programs audit, tenure is less likely used into obtain additional consulting and to treat the audit fee as annuity or to breed familiarity so as to reduce professional skepticism. Here, auditor tenure

may actually increase the auditor's ability to find reportable conditions and may be required as some programs are not audited each year.

Internal Audit Function: The internal audit department (*IAUDIT*) is a primary resource available to the AC to assist in their responsibility over corporate governance (Gramling et al., 2004). The internal audit department's role is to identify and monitor internal controls uses, and hence may help to reduce the control problems. Iyer and Watkins (2008) find that nonprofit organizations engaging external or internal auditors are more likely to have a code of conduct and have periodic assessments of internal controls.

Other Variables

We identify three additional variables – the size, age, and financial distress of the hospital – that have a potential impact on internal control quality.

Hospital Size: We measure public hospital size as the logarithm of total assets (*LASSET*), as used in Krishnan (2005). In the business sector, large firms generally have higher quality internal controls (e.g., Defond & Jiambalvo, 1991). Large firms likely have more financial reporting processes and control procedures in place (Ge & McVay, 2005). These firms generally have higher quality employees and resources as well as the ability to invest in internal control systems. The findings on the association of firm size and the quality of internal control yielded mixed results. Krishnan (2005) finds that firm size is positively associated with the incidence of internal control problems. However, Doyle et al. (2007) and Ge and McVay (2005) find that firm size is negatively associated with the disclosure of material weaknesses in internal control.

Hospital Age: The hospital's age (*HOSPAGE*) is another control variable that may be associated with the quality of internal control. Younger firms likely have less established processes and procedures of internal control, and might have employees with less experience compared to older, more established firms (Ge & MvVay, 2005). Empirical studies by Doyle et al. (2007) find that younger firms (measured by the number of years the firm has price information on Center for Research in Security Prices) are more likely to disclosure material weaknesses in internal control.

Financial Distress: Establishing and maintaining proper internal controls require financial resources. Financial distress hospitals may not be able to invest adequately time and/or money in maintenance of proper controls. In a sample from public corporations, Doyle et al. (2007) and Ge and McVay (2005) find that financially weaker firms are less likely to properly fund proper internal controls. Similarity, Krishnan (2005) also finds that financial distress associated with the increased likelihood of internal control problems.

We used the modified Altman Z-Score model to proxy the probability of bankruptcy or financial distress (*FDISTRESS*). Altman originally developed the "Z-Score" 40 years ago (Altman, 1968). Altman and others have modified the original model to non-manufacturing industries (Altman, 1973; Altman et al., 1995). For example, Kroeze (2005) use the modified model to predict airline corporate bankruptcies. Several researchers applied the model to predict financial distress in a health care setting. Almwajeh (2004) and Langabeer (2006) find that the revised model is a good predictor of financial distress in a hospital setting. Technically, a score less than 2.6 would indicate that the hospital has a very likely probability of bankruptcy or financial distress. We code *FDISTRESS* 1 if the Altman Z-Score is less than 2.6, and 0 otherwise.

Data

While there are over 1,100 public, non-federal acute care hospitals in the United States, most are relatively small (Regenstein & Huang, 2005). Eighty-five percent have fewer than 200 beds (Regenstein & Huang, 2005). Based upon our initial investigation these smaller hospitals generally do not receive sufficient Federal awards to require an A-133 audit. Therefore, we limited our investigation to hospital and hospital systems with bed sizes over 200 and operated by state, county, city, or hospital district or authority from the U.S. News/American Hospital Association National Directory provided by American Hospital Association (AHA). The AHA is an association of health care provider organizations and is a national database that includes data on almost 5,000 public and private hospitals, health care systems, networks and other providers of care. This yielded a population of 154 reporting hospitals.

We also contacted each of the 154 by either email or telephone using a standardized questionnaire (a two-page form) to obtain and to verify as best as possible the financial and nonfinancial information. Each of these 154 responded with information on how to obtain their copies of their 2005 fiscal year audited financial statements and A-133 reports, if they were available, and information on their ACs.

Seventy-six hospitals did not have an A-133 audit because they did not expend $500,000 or more in federal grants during 2005 and three more hospitals did not complete the year 2005 A-133 audit as of January 31, 2007. These three have missed the reporting deadline for 2005 reports (OMB, 2003), and these three confirmed this by the questionnaire. By removing these 79, we find 75 public hospitals that meet the A-133 audit requirement for 2005 fiscal year. We sent the questionnaire to the hospitals via email, fax, and/or USPS mail. Since every state in the U.S. has a law requiring that public records be open and available for inspection and copying by any member of the public (e.g., Georgia Open Records Act; Section 610.011of Missouri Sunshine Law; The 2006 Florida Statutes), the response rate was 100 percent.

We use the published audited financial statements with A-133 reports to assess our measures of financial distress, auditor type, and hospital size. We also collected additional documentation from each of the 75 hospitals to construct the AC variables, the qualification of management variable, the auditor tenure variable, the internal audit function variable, and the age of hospital variable. We classify an AC member as either an independent member or non-independent/affiliated member as in prior research (Beasley, 1996; Carcello & Neal, 2000, 2003; Klein, 2002; Krishnan, 2005). Independent members are not employees or officers. We consider employees of banks, accounting firms, law firms, and others in public corporations as independent members for our study. In addition, we consider public (or appointed) officials as independent members since they are not paid.

Because the definition of "financial expertise" varies, we asked the respondent the same two different questions used by Vermeer et al. (2006) to determine the presence of financial experts on the AC. The first question asks for the "number of [audit or similar function committee] members who are CPAs." The second question asks for the "number of [audit or similar function committee] members (other than CPAs) who have senior-level accounting or finance experience."

EMPIRICAL RESULTS

Descriptive Statistics

As seen in Panel A of Table 3, 62 of the 75 public hospitals (83 percent) have an AC or have a committee similar to an AC. In addition, Panel A of Table 3 reports the means (in some cases, percentages) and standard deviations for those hospitals with ACs (AC sample) and those without ACs (NOAC sample). Hospitals with no ACs (NOAC) have more internal control problems (*ICPROB*, p-value = 0.048 < 0.05),

higher probability of bankruptcy or financial distress (*FDISTRESS*, p-value = 0.059 < 0.10), are less likely to have an internal audit function (*IAUDIT*, p-value = 0.004 < 0.01) and a Big 4 auditor (*BIG4*, p-value = 0.004 < 0.01), and are smaller in size (*LASSET*, p-value = 0.04 < 0.05). These tests adjust for the differences in sample sizes (62 versus 13).

Table 3: Sample Statistics for All (75) Hospitals and for 62 Hospitals with Audit (or Similar) Committees

Panel A: Descriptive Statistics for All Hospitals

	AC Sample		NOAC Sample		Diff. in +		
Variable	**Mean**	**Std. Dev.**	**Mean**	**Std. Dev.**	**Means**	**t-statistics ++**	**p-value**
ICPROB	0.290	0.458	0.615	0.506	-0.325	2.14	0.048**
FDISTRESS	0.309	0.465	0.615	0.506	-0.306	2.03	0.059*
CFOEXP	0.903	0.298	0.692	0.480	0.211	-1.52	0.150
BIG4	0.678	0.471	0.231	0.439	0.447	-3.29	0.004***
TENURE	7.339	7.045	6.769	8.776	0.570	-0.22	0.829
IAUDIT	0.677	0.471	0.231	0.439	0.446	-3.29	0.004***
LASSET	6.212	0.903	5.391	1.248	0.821	-2.25	0.040**
HOSPAGE	72.839	40.167	83.000	47.720	-10.161	0.72	0.484
n	62		13				

Panel B: Frequency Counts for Dichotomous Variables for 62 Hospitals with Audit (or Similar) Committees

Variable	**Number of Hospitals with Audit Committees Coded 1**	**Number of Hospitals with Audit Committees Coded 0**
ICPROB	18 (29%)	44 (71%)
SIZE	61 (98%)	1 (2%)
INDEP	46 (74%)	16 (26%)
EXPERT	54 (87%)	8 (13%)
MEET	33 (53%)	29 (47%)
FDISTRESS	18 (29%)	44 (71%)
CFOEXP	56 (90%)	6 (10%)
BIG4	42 (68%)	20 (32%)
IAUDIT	42 (68%)	20 (32%)

*,**,*** = p-value < .10, .05, .01, respectively, one-tail if in predicted direction, two-tail otherwise.

\+ Difference in means may actually be differences in percentage, where appropriate.

++ Test for significant differences in means.

AC sample is the sample of hospitals with audit committees.

NOAC sample is the sample of hospitals without audit committees.

Variable Definitions:

ICPROB = 1 for a hospital has internal control problems, and 0 otherwise;

FDISTRESS = 1 if the Altman's Z-Score is less than 2.6 (technically bankrupt), and 0 otherwise;

CFOEXP = 1 if the Chief Financial Officer (or Controller) has a CPA certification or previous experience in a similar capacity with another company, and 0 otherwise;

BIG4 = 1 if audited by Big 4 accounting firm, and 0 otherwise;

TENURE = number of years the auditor has audited the client;

IAUDIT = 1 if internal audit function exists, and 0 otherwise;

LASSET = natural logarithm of total assets (in million);

HOSPAGE = number of years the hospital has been existed;

SIZE = 1 if an audit committee has at least three members, and 0 otherwise;

INDEP = 1 if audit committee members are totally independent, and 0 otherwise;

EXPERT = 1 if audit committee members with at least one financial expertise, and 0 otherwise;

MEET = 1 if an audit committee meets more than four times annually during the sample year, and 0 otherwise.

This panel A of table 3 reports the means (in some cases, percentages) and standard deviations for all 75 hospitals. The panel B of table 3 shows the results of frequency counts for dichotomous variables for 62 hospitals.

Panel B of Table 3 shows that 71 percent of the hospitals in our sample have no internal control problems and are not under financial distress. Ninety-eight percent of the sample hospitals have at least three members on the ACs. Seventy-four percent of the hospital ACs have fully independent members. Eighty-seven percent of our sixty-two hospitals have at least one financial expert on the ACs. In addition, slightly more than half of the hospitals in our sample meet more than four times annually.
Of the 62 public hospitals in our sample, only 18 (29 percent) of the public hospitals had a "good" AC (e.g., had solely independent AC directors, had at least one financial expert, and met more than four times a year). Thus, this data suggests that there is a room for improvement with regard to the composition and functioning of public hospital ACs.

Support for Hypothesis 1 (H1)

Table 4 presents support for H1, additional to the positive results for *ICPROB* in Table 3. For those 13 hospitals without ACs (AC = 0), more than half (8) have problems, whereas for those with ACs (AC = 1), less than a third (18) have problems. For the twenty-six hospitals with internal control problems, sixteen have reportable conditions and ten have material weaknesses. Thirty-four of the 62 hospitals (55 percent) have an audit committee while the other 28 hospitals (45 percent) have committee that assume the roles similar to an audit committee (such as finance committee, finance and audit committee, fiscal affair committee, finance and compliance committee, financial review committee, and university audit committee).

Table 4: Chi-Square Analysis of All Reporting Hospitals

		AC		
	Frequency	1	0	**n**
ICPROB	1	18	8	26
	0	44	5	49
	n	62	13	75
	Chi-Square			
	P-value	0.025*		

** = p-value <.05.*
Variable Definitions:
ICPROB = 1 if a hospital with internal control problems, and 0 otherwise;
AC = 1 if a hospital with an audit committee, and 0 otherwise;
Table 4 presents support for hypothesis 1 that the presence of an AC in public hospital is positively associated with the quality of the internal controls reported in government audits

Support for Hypothesis 2 (H2)

Table 5 shows, for H2, the results of the logistic regression model and the relationship between quality of the AC (size, independence, financial expertise, and meeting frequency) and the incidence of control problems (*ICPROB*). The first measure of quality, committee size (*SIZE*) is not related to control problems (p-value = 0.985 > 0.05). However, the other three characteristics are related. Those committees with solely independent members (*INDEP,* p-value = 0.05 < 0.10), possessing at least one financial expert (*EXPERT*, p-value = 0.036 < 0.05), and increased meeting frequency (*MEET*, p-value = 0.045 < 0.05) are negatively associated with the incidence of control problems. All one-tailed Chi-square p-values are in one sense two-tailed normal "z" values, so the argument that independence is related to control problems, the one-side argument, is then significant at p-value = 0.025 < 0.05.

Among the additional control variables, these control problems are positively related to the incidence of financial distress (*FDISTRESS)* (p-value = 0.027 < 0.05). The use of Big Four auditor (*BIG4*) (p-value

=0.029 < 0.05), and the number of years the hospital has been existed (p-value= 0.074 < 0.10) are negatively related to control problems, as anticipated. In addition, auditor tenure (*TENURE*, p-value =0.108) is not statistically significant but close, as these are two tail p-values, and has a negative sign suggesting the possibility that tenure could be a positive influence.

Table 5: Logistic Regression for the Incidence of Internal Control Problems for 62 Hospitals with Audit Committees

$$ICPROB = \alpha + \beta_1 SIZE + \beta_2 INDEP + \beta_3 EXPERT + \beta_4 MEET + \beta_5 FDISTRESS + \beta_6 CFOEXP + \beta_7 BIG4 + \beta_8 TENURE + \beta_9 IAUDIT + \beta_{10} LASSET + \beta_{11} HOSPAGE + \varepsilon$$

Variable	Expected Sign	Coefficient Estimate	Logistic p-value	Wald Chi-Square
Intercept	+/-	20.782	0.974	0.001
SIZE	-	-10.753	0.985	0.000
INDEP	-	-1.760	0.050*	3.829
EXPERT	-	-3.223	0.036**	4.413
MEET	-	-2.046	0.045**	4.008
FDISTRESS	+	1.940	0.027**	4.910
CFOEXP	-	-0.396	0.762	0.092
BIG4	+/-	-2.083	0.029**	4.755
TENURE	-	-0.104	0.108	2.590
IAUDIT	-	0.202	0.843	0.039
LASSET	+/-	-0.037	0.950	0.004
HOSPAGE	-	-0.025	0.074*	3.204
Chi-Square			27.244	
(p-value)			0.004	
Adjusted R			0.203	
N			62	

*,** = p-value < .10, .05, respectively, one-tail if in predicted direction, two-tail otherwise.

Variable Definitions:

ICPROB = 1 if a hospital with internal control problems, and 0 otherwise;
SIZE = 1 if an audit committee has at least three members, and 0 otherwise;
INDEP = 1 if audit committee members are totally independent, and 0 otherwise;
EXPERT = 1 if audit committee members with at least one financial expertise, and 0 otherwise;
MEET = 1 if an audit committee meets more than four times annually during the sample year, and 0 otherwise;
FDISTRESS = 1 if the Altman's Z-Score is less than 2.6 (technically bankrupt), and 0 otherwise;
CFOEXP = 1 if the Chief Financial Officer (or Controller) has a CPA certification or previous experience in a similar capacity with another company, and 0 otherwise;
BIG4 = 1 if audited by Big 4 accounting firm, and 0 otherwise;
TENURE = number of years the auditor has audited the client;
IAUDIT = 1 if internal audit function exists, and 0 otherwise;
LASSET = natural logarithm of total assets (in million);
HOSPAGE = number of years the hospital existed.

ICPROB $= \alpha + \beta_1 SIZE + \beta_2 INDEP + \beta_3 EXPERT + \beta_4 MEET + \beta_5 FDISTRESS + \beta_6 CFOEXP + \beta_7 BIG4 + \beta_8 TENURE + \beta_9 IAUDIT + \beta_{10} LASSET + \beta_{11} HOSPAGE + \varepsilon$

This table 5 shows the logistic regression estimates of the equation:

Sensitivity Analysis

What differentiates ACs is financial expertise. Of the 62 with ACs, forty hospitals with financial expertise do not have any control problems, whereas, only twenty-two with this expertise do. We examine whether public hospitals that have ACs with a financial expert are less likely to have more severe internal control problems, material weakness. Table 6 shows the severity of the internal control problem (material weakness) can be predicted best by the absence of financial expertise. Consistent with the findings found in publicly traded corporations by Krishnan (2005) and Zhang et al. (2007), we find that the ACs for those large hospitals possessing at least one financial expert (*EXPERT*) (p-value = 0.086 < 0.1) are less likely to have a material weakness in internal controls. Among the additional control

variables, management quality (*CFOEXP*, p-value = 0.109) is not statistically significant but close, as Table 6 presents two tail p-values, and has a negative sign suggesting the possibility that a CFO with a CPA certification or similar financial experience could be a positive influence.

Table 6: Logistic Regression for the Incidence of Material Weaknesses for 62 Hospitals with Audit Committees

$$MATWEAK = \alpha + \beta_1 SIZE + \beta_2 INDEP + \beta_3 EXPERT + \beta_4 MEET + \beta_5 FDISTRESS + \beta_6 CFOEXP + \beta_7 BIG4 + \beta_8 TENURE + \beta_9 IAUDIT + \beta_{10} LASSET + \beta_{11} HOSPAGE + \varepsilon$$

Variable	Expected Sign	Coefficient Estimate	Logistic p-value	Wald Chi-Square
Intercept	+/-	-0.496	0.999	0.000
SIZE	-	14.254	0.985	0.000
INDEP	-	-1.001	0.522	0.410
EXPERT	-	-4.005	0.086*	2.947
MEET	-	-1.690	0.257	1.285
FDISTRESS	+	1.197	0.251	1.319
CFOEXP	-	-2.244	0.109	2.562
BIG4	+/-	-0.301	0.800	0.064
TENURE	-	-0.037	0.639	0.220
IAUDIT	-	1.878	0.261	1.265
LASSET	+/-	-1.381	0.127	2.325
HOSPAGE	-	-0.031	0.134	2.249
Chi-Square			13.181	
(p-value)			0.282	
N			62	

* = p-value < .10, one-tail if in predicted direction, two-tail otherwise.

Variable Definitions:

MATWEAK = 1 if a hospital with material weaknesses, and 0 otherwise;
SIZE = 1 if an audit committee has at least three members, and 0 otherwise;
INDEP = 1 if audit committee members are totally independent, and 0 otherwise;
EXPERT = 1 if audit committee members with at least one financial expertise, and 0 otherwise;
MEET = 1 if an audit committee meets more than four times annually during the sample year, and 0 otherwise;
FDISTRESS = 1 if the Altman's Z-Score is less than 2.6 (technically bankrupt), and 0 otherwise;
CFOEXP = 1 if the Chief Financial Officer (or Controller) has a CPA certification or previous experience in a similar capacity with another company, and 0 otherwise;
BIG4 = 1 if audited by Big 4 accounting firm, and 0 otherwise;
TENURE = number of years the auditor has audited the client;
IAUDIT = 1 if internal audit function exists, and 0 otherwise;
LASSET = natural logarithm of total assets (in million);
HOSPAGE = number of years the hospital existed.

This table 6 shows the absence of financial expertise predicts severity of the internal control problem (material weakness).

CONCLUSION, LIMITATIONS, AND FUTURE STUDIES

In this study, we examine the association between the presence and quality characteristics of public hospital ACs and control problems over financial reporting and major Federal award programs. We test our hypotheses using all publicly available A-133 audit reports of the largest U.S. public hospitals and a follow-up study improving prior research that uses restricted settings or data (e.g., Carcello & Neal, 2003; Krishnan, 2005; Vermeer et al., 2006, 2009). From 75 audit reports, we find support for our hypotheses. Just the presence of an audit committee (H1), and especially one with independence, financial expertise, or increased activity (H2), improves internal control over financial reporting and major Federal awards. Specially, our results support the argument made by Vermeer et al. (2006) that nonprofit hospitals or universities that receive government grants, particularly those subject to the OMB Circular A-133 audit,

are more likely to have ACs that are effective in monitoring. The monitoring function of public hospital ACs increases when monitoring is a prerequisite for obtaining resources.

As in prior research, we find other variables as part of the control systems that influence the internal control quality. Auditor size or type is often associated with improved client internal controls (Ashbaugh-Skaife et al., 2007). This was found in nonprofits by Vermeer et al. (2006) but not in corporations by Krishnan (2005). In addition, we find older hospitals are more likely to have "ironed out the kinks" in their internal control processes (Doyle et al., 2007), not investigated by Krishnan (2005).

Consistent with the research in publicly traded corporations by Krishnan (2005) and Zhang et al. (2007), we find that the ACs for those large hospitals possessing at least one financial expert are less likely to have a material weakness in internal controls.

These specific findings extend results found in prior research to organizations with direct taxpayer support, extending this corporate governance research to large public hospitals (governmental setting) and answering questions found in prior research on nonprofit hospital setting (Vermeer et al., 2006; Pridgen & Wang, 2007).

Because only 75 A-133 audit reports are publicly available, the sample size limits this study. More reports may eventually become available because of increasing governmental standards for hospitals, but as these SOX measures are adopted by nonprofits (Iyer & Watkins, 2008), the number of hospitals without ACs is then also likely to decrease, removing the ability to measure the effect of the presence of an AC.

Similar to Krishnan (2005), we use the self-reported AC independence to proxy board independence. Future research can re-examine this proxy for those cases where board members are less likely to be non-independent or politically influenced, such as in the case of hospital districts, which remain autonomous, receive some governmental funding but are not subject to OMB A-133 audits. Unfortunately, without the A-133 audit report, it is difficult to objectively measure the hospital's internal control problems. Additional research should include longitudinal study examining the development and maturity of these control committees over time (Miller-Millensen, 2003), and defining the financial expert as one with accounting (CFO, CEO, or auditor) or non-accounting expertise (SEC, 2003; Krishnan & Lee, 2009).

REFERENCE

Abbott, L. J., Parker, S., & Peters, G. F. (2004). Audit committee characteristics and restatements. *Auditing: A Journal of Practice and Theory 23*, 69-87.

Abbott, L. J., Parker, S., & Peters, G. F., & Raghunandan, K. (2003). The association between audit committee characteristics and audit fees. *Auditing: A Journal of Practice and Theory 22*, 17-32.

Adamy, J., & Meckler, L. (2010). Obama retreats on health. *Wall Street Journal (Online)*. New York, N.Y.: Jan 21, 2020.

Agrawal, A., & Chadha, S. (2005). Corporate governance and accounting scandals. *Journal of Law and Economics 48*, 371-406.

Almwajeh, O. (2004). *Applying Altman's Z-Score Model of Bankruptcy for the Prediction of Financial Distress of Rural Hospitals in Western Pennsylvania*. Dissertation. Indiana University of Pennsylvania.

Altman, E. I. (1968). Financial ratios, discriminant analysis, and the prediction of corporate bankruptcy. *Journal of Finance 23*, 589-609.

Altman, E. I. (1973). Predicting railroad bankruptcies in America. *The Bell Journal of Economics and Management Science 4*, 184-211.

Altman, E. I., Hartzell, J., & Peck, M. (1995). *Emerging Markets Corporate Bonds: A Scoring System*. Salomon Brothers Inc, New York.

Anderson, R. C., Mansi, S. A., & Reeb, D. M. (2004). Board characteristics, reporting integrity, and the cost of debt. *Journal of Accounting and Economics 37*, 315-342.

Anheier, H. K., Toepler, S., & Sokolowski, S. (1997). The implications of government of funding of nonprofit organizations: Three propositions. *International Journal of Public Sector Management (June)*, 190-213.

Armario, C. (March 10, 2010). Major Miami hospital system in 'death spiral' as it runs low on cash; reflects woes nationwide. Los Angeles Times. Available at http://www.latimes.com/business/nationworld/wire/sns-ap-us-miami-hospital-insolvency,0,650089.story

Ashbaugh-Skaife, H., Collins, D. W., & Kinney, W. R. Jr. (2007). The discovery and reporting of internal control deficiencies prior to SOX-mandated audits. *Journal of Accounting and Economics 44*, 166-192.

Baxter, R. J., & Mechanic, R. E. (1997). The status of local health care safety nets. *Health Affairs 16*, 7-23.

Bazzoli, G. J., Manheim, L. M., & Waters, T. M. (2003). U.S. hospital industry restructuring and the hospital safety net. *Inquiry – Excellus Health Plan 40*, 6- 24.

Beasley, M. (1996). An empirical analysis of the relation between the board of director composition and financial statement fraud. *The Accounting Review 71*, 443-465.

Becker, C. L., Defond, M. L., Jiambalvo, J., & Subramanyam, K. R. (1998). The effect of audit quality on earnings management. *Contemporary Accounting Research 15*, 1-24.

Bedard, J., Chtourou, S. M., & Courteau, L. (2004). The effect of audit committee expertise, independence, and activity on aggressive earnings management. *Auditing: A Journal of Practice and Theory 23*, 13-35.

Blue Ribbon Committee (BRC). (1999). *Report and Recommendations of the Blue Ribbon Committee on Improving the Effectiveness of Corporate Audit Committees*. Stamford, CT: BRC.

Brown, W. A. (2005). Exploring the association between board and organizational performance in nonprofit organizations. *Nonprofit Management and Leadership* (Spring), 317-339.

Carcello, J. V., & Neal, T. L. (2000). Audit committee composition and auditor reporting. *The Accounting Review 75*, 453-467.

Carcello, J. V., & Neal, T. L. (2003). Audit committee characteristics and auditor dismissals following "new" going-concern reports. *The Accounting Review 78*, 95-117.

Chen, Y. M., Moroney, R., & Houghton, K. (2005). Audit committee composition and the use of an industry specialist audit firm. *Accounting and Finance 45*, 217-239.

Committee of Sponsoring Organizations of the Treadway Commission (COSO). (1992). *Internal control – Integrated framework*. New York, NY: AICPA.

David, I. T. (2009). Characteristics of effective audit committees in federal, state, and local governments. *The Journal of Government Financial Management 58*, 44-48.

Dechow, P. M., Sloan, R. G., & Sweeney, A. P. (1996). Causes and consequences of earnings manipulation: An analysis of firms subject to enforcement actions by the SEC. *Contemporary Accounting Review 13*, 1-36.

DeFond, M. L., & Francis, J. R. (2005). Audit research after Sarbanes-Oxley. *Auditing: A Journal of Practice and Theory 24*, 5-30.

DeFond, M. L., & Jiambalvo, J. (1991). Incidence and circumstances of accounting errors. *The Accounting Review 66*, 643-655.

Deloitte & Touche LLP. (2005). *Resource guide: Public sector audit committees.* New York, NY: Deloitte & Touche LLP.

DeZoort, T. (1997). An analysis of experience effects on audit committee members' oversight judgments. *Accounting, Organizations and Society 23*, 1-21.

DeZoort, T., Hermanson, D. R., Archambeault, D., & Reed, S. (2002). Audit committee effectiveness: A synthesis of the empirical audit committee literature. *Journal of Accounting Literature 21*, 38-75.

Dorschner, J. (February 26. 2010). Audit slams Jackson Health System over money mess. The Miami Herald. Available at: http://www.miamiherald.com/2010/02/26/1501038/audit-slams-jackson-over-money.html

Doyle, J., Ge, W., & MvVay, S. (2007). Determinants of weaknesses in internal control over financial reporting. *Journal of Accounting and Economics 44*, 193-223.

Fama, E. F., & Jensen, M. C. (1983). Separation ownership and control. *Journal of Law and Economics 26*, 301-325.

Felo, A. J., Krishnamurthy, S., & Solieri, S. A. (2003). Audit committee characteristics and the perceived quality of financial reporting: *An empirical analysis.* Working paper. Pennsylvania State University.

Fishman, L. E., & Bentley, J. D. (1997). The evolution of support for safety-net hospitals. *Health Affairs 16*, 30-47.

Francis, J. R., Maydew, E. L., & Sparks, H. C. (1999). The role of Big 6 auditor in the credible reporting of accruals. *Auditing: A Journal of Practice and Theory 18*, 17-34.

Francis, J. R., & Yu, M. D. (2009). Big 4 office size and audit quality. *The Accounting Review 84*, 1521-1552.

Frankel, R. M., Johnson, M. F., & Nelson, K. K. (2002). The relation between auditors' fees for nonaudit services and earnings management. *The Accounting Review 77,* 71-105.

Ge, W., & McVay, S. (2005). The disclosure of material weaknesses in internal control after the Sarbanes-Oxley Act. *Accounting Horizons 19*, 37-158.

Geiger, M. A., & Raghunandan, K. (2002). Auditor tenure and audit reporting failures. *Auditing: A Journal of Practice and Theory 21*, 67-78.

George, N. (2005). The role of audit committees in the public sector. *The CPA Journal 75*, 42-43.

Gilmer, T., & Kronick, R. (2005). It's the premiums, stupid: Projections of the uninsured through 2013. *Health Affairs 24*, 889.

Government Finance Officers Association. (2002). *Establishment of audit committees (1997 and 2002).* Available at: http://www.gfoa.org/services/rp/caafr/caafr-establishment-audit-committees.pdf

Gramling, A. A., Maletta, M. J., Schneider, A., & Church, B. K. (2004). The role of the internal audit function in corporate governance: A synthesis of the extant internal auditing literature a directions for future research. *Journal of Accounting Literature 23*, 194-244.

Hardiman, P. (2006). Public sector audit committees. *Government Finance Review 22*, 50-53.

Hermanlin, B. E., & Weisbach, M. S. (2003). Board of directors as an endogenously determined institution: A survey of the economic literature. *Economic Policy Review – Federal Reserve Bank of New York 9*, 7-26.

Hillman, A. J., & Dalziel, T. (2003). Boards of directors and firm performance: Integrating agency and resource dependence perspectives. *Academy of Management Review 28*, 383-396.

Institute of Internal Auditors. (n.d.). The audit committee in the public sector. Position statement from the Institute of Internal Auditors. Available at: www.theiia.org/iia/download.cfm?file=349

Iyer, V. M., & Watkins, A. L. (2008). Adoption of Sarbanes-Oxley measures by nonprofit organizations: An empirical study. *Accounting Horizons 22*, 255-277.

Jensen, M. C., & Meckling, W. H. (1976). Theory of the firm: Managerial behavior, agency costs, and ownership structure. *Journal of Financial Economics 3*, 305-360.

Johnson, V. E., Khurana, I. K., & Reynolds, J. K. (2002). Audit-firm tenure and the quality of financial reports. *Contemporary Accounting Research 19,* 637-660.

Klein, A. (2002). Audit committee, board of director characteristics, and earnings management. *Journal of Accounting and Economics 33*, 375-400.

Krishnan, J. (2005). Audit committee quality and internal control: An empirical analysis. *The Accounting Review 80,* 649-675.

Krishnan, J., & Lee, J. N. (2009). Audit committee financial expertise, litigation risk, and corporate governance. *Auditing: A Journal of Practice & Theory 28*, 241-261.

Kroeze, C. (2005). Predicting Airline Corporate Bankruptcies Using a Modified Altman Z-Score Model. Dissertation. University of Nevada.

Langabeer, J. (2006). Predicting financial distress in teaching hospitals. *Journal of Health Care Finance 33,* 84-92.

Lee, H. Y., Mande, V., & Ortman, R. (2004). The effect of audit committee and board of director independence on audit resignation. *Auditing: A Journal of Practice & Theory 23*, 131-146.

McMullen, D. A., & Raghunandan, K. (1996). Enhancing audit committee effectiveness. *Journal of Accountancy 182*, 79-81.

Miller-Millesen, J. L. (2003). Understanding the behavior of nonprofit boards of directors: A theory-based approach. *Nonprofit and Voluntary Sector Quarterly 32*, 521-547.

Morrow, J. F., & Pastor, J. (2007). Eight habits of highly effective audit committees. *Journal of Accountancy 204*, 46-51.

Myers, J. N., Myers, L. A., & Omer, T. C. (2003). Exploring the term of the auditor-client relationship and the quality of earnings: A case for mandatory auditor rotation? *The Accounting Review 78*, 779-799.

National Association of Corporate Directors. (1999). *Report of the NACD Blue Ribbon Commission on audit committee*. Washington, DC.: NACD.

National Association of Public Hospitals and Health Systems (NAPH). (2009). *2007 Annual Survey Results Highlight the Importance of the Nation's Safety Net Hospital and Health Systems*. Washington, DC.: NAPH.

Office of Management and Budget (OMB). (June 27, 2003). *OMB Circular A-133, Audits of States, Local Governments, and Non-Profit Organizations.* Washington, DC.: OMB.

Office of Management and Budget (OMB). (December 21, 2004). *Revisions to OMB Circular A-123, Management's responsibility for internal control.* Washington, DC.: OMB.

Owens-Jackson, L. A., Robinson, D., & Shelton, S. W. (2009). The association between audit committee characteristics, the contracting process and fraudulent financial reporting. *American Journal of Business 24*, 57-65.

Pfeffer, J. (1973). Size, composition, and function of hospital board of directors: A study of organization-environment linkage. *Administrative science Quarterly 17*, 218-228.

Pfeffer, J., & Salancik, G. (1978). *The External Control of Organizations: A Resource Dependence Perspective*. New York, NY: Harper and Row.

Pridgen, A., & Wang, K. (2007). The role of audit committees in nonprofit organizations: An empirical investigation. *Proceedings of the American Accounting Association,* August 6, 2007, Chicago. Available at http://aaahq.org/GNP/information/activities/2007MYM/Session9_PridgenWang.pdf.

Raghunandan, K., & Rama, D. V. (2007). Determinants of audit committee diligence. *Accounting Horizons 21*, 265-280.

Regenstein, M., & Huang, J. (2005). Stresses to the safety net: The public hospital perspective. National Public Health and Hospital Institute. Available at: http://www.kff.org/medicaid/upload/Stresses-to-the-Safety-Net.pdf.

Reynolds, J. K., & Francis, J. R. (2000). Does size matter? The influence of large clients on office-level auditor reporting decisions. *Journal of Accounting and Economics 30,* 375-400.

Securities and Exchange Commission (SEC). (1999). *NYSE Rulemaking: Order Approving Proposed Rule Change Amending the Audit Committee Requirements and Notice of Filing and Order Granting Accelerated Approval of Amendments No. 1 and No. 2 Thereto.* Release No. 34-42233. Washington, DC, SEC.

Securities and Exchange Commission (SEC). (2003). *Final Rule: Management's Reports on Internal Control over Financial Reporting and Certification of Disclosure in Exchange Act Period Reports.* Release Nos. 33-8238; 34-47986. Washington, DC., SEC.

Stolzenberg, E. A. (2000). Governance change for public hospitals. *Journal of Healthcare Management 45,* 347-350.

Strugatch, W. (2004). Nonprofit Agencies' books face more scrutiny. *New York Times* (September 12): 14LI

U. S. House of Representative, Committee on Financial Services. (2002). *Sarbanes-Oxley Act of 2002. Public Law No. 107-204*. Washington, DC.: Government Printing Office.

U. S. General Accounting Office (GAO). (2003). *Government Auditing Standards 2003 Revision.* Washington, DC.: GAO.

U. S. General Accounting Office (GAO). (2007). *Government Auditing Standards July 2007 Revision.* Washington, DC.: GAO.

Uzun, H., Szewczyk, S. H., & Varma, R. (2004). Board composition and corporate fraud. *Financial Analysts Journal 60*, 33-43.

Urbancic, F. R., & Hauser, R. C. (1991). Hospital audit committees: A comparative analysis of structural and functional characteristics. *Hospital & Health Services Administration 36*, 383-396.

Vermeer, T. E., Raghunandan, K., & Forgione, D. A. (2006). The composition of nonprofit audit committees. *Accounting Horizons 20*, 75-90.

Vermeer, T. E., Raghunandan, K., & Forgione, D. A. (2009). Audit fees at U.S. nonprofit organizations. *Auditing: A Journal of Practice & Theory 28*, 289-303.

Wagner, N. A., O'Keefe, H. A., & Bostwick, W. I. (1988). Audit committee functions for municipalities, hospitals and banks. *The CPA Journal 58*, 46-53.

Wagner, N. A., O'Keefe, H. A., & Bostwick, W. I. (1989). The use of audit committee in hospitals. *The Woman CPA 51*, 4-6.

Xie, B., Davidson III, W. N., & Dadalt, P. J. (2003). Earnings managements and corporate governance: the role of the board and the audit committee. *Journal of Corporate Finance 9*, 295-316.

Zaman, O., Lukens, E., & Cummings, L. (2004). *American's public hospitals and health systems, 2004:Results of the annual NAPH hospitals characteristic survey.* NAPH, Washington. DC: NAPH

Zhang, Y., Zhou, J., & Zhou, N. (2007). Audit committee quality, auditor independence, and internal control weaknesses. *Journal of Accounting and Public Policy 26*, 300-327.

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