The timing of tax induced trading around the ex dividend day in the Greek stock market

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Vassilis A. Efthymiou

Department of Accounting and Finance
Athens University of Economics and Business
Greece

Abstract

This paper examines the stock price behavior of Greek listed firms on the ex dividend day. We argue that the supposed tax neutrality for domestic investors is not sufficient to assure that the ex day price drop will equal the dividend amount when foreign investors with differential tax preferences have a significant participation in the Greek stock market. Also, we find clear evidence of cyclicality of the price drop on the ex dividend day that is driven by the selective timing of tax induced trading by domestic corporate and institutional investors. We believe that the times series variation of the ex day premium is an aspect of the ex day literature that provides scope for further meaningful research.

1. Introduction

There has been a plethora of research papers that attempt to explain why the price of stocks on the ex dividend day falls more or less than the dividend amount on a cross sectional basis, without explicitly accounting for the possibility of contemporaneous time variation of this relative valuation of dividends over the period examined. The first papers that suggested significant variation over time are those of Litzenberger and Ramaswamy (1979, 1980), Gordon and Bradford (1980) and Eades et al. (1984, 1994). Gordon and Bradford (1980) present evidence of counter-cyclicality of the relative price of dividends that seems to be high during recessions and low during expansions, in the US market. Subsequently, Eades et al. (1994) confirm the findings of counter-cyclicality of Gordon and Bradford (1980) and attribute their results to the persistent dividend capturing performed by corporations.

The objective of this article is to examine both the cross sectional variation and the time-series evolution of the relative pricing of dividends, as measured by abnormal returns on ex dividend days, using data from Greece where domestic investors are "supposed" to have tax neutral preferences between dividends and capital gains. Although we do find significant abnormal ex dividend day returns that vary across different dividend yield groups and over time, this result cannot be attributed to microstructure or short term arbitrage effects due to the distinctive institutional characteristics of the Greek stock market (ATHEX). First, prices are close to being decimalized throughout the whole period so that we consider a "tick size hypothesis" unlikely to apply in the Greek market. Second, we believe that short term arbitrage is not present in ATHEX over the period examined due to the 3 day length of the transaction clearing & settlement period (T+3) and the significantly small contribution of short selling, market makers and remote members to the daily trading volumes. Our empirical results corroborate this proposition.

Most of the literature that examines the tax preferences of investors over dividends and capital gains focuses on domestic investor clienteles and how domestic tax law amendments affect them while downplaying the importance of foreign investors

whose holdings of domestic stocks could have been substantial[1]. This article emphasizes the importance of foreign investors in the Greek stock market and how their presence could explain why the stock price on the ex dividend day drops less than the dividend in a domestic institutional environment that is seemingly dividend and capital gain tax neutral.

Additionally, we find that the relative price of dividends in Greece is cyclical, in contrast to the evidence for the US market (Eades et al. (1984), Gordon and Bradford (1980)) and we deduce that this is explained by strategic trading around the ex day by corporations that is induced by the local tax rules for dividends and capitals gains.

This paper is organized as follows. The first section describes the related theories regarding the price drop on the ex dividend day that attempt to explain any observed abnormal returns on the ex day. The second section develops our hypotheses contingent upon the corporate taxation imposed on dividends and capital gains and the local institutional framework within which stocks are traded. The third section describes our data and methodology. The fourth section presents the empirical results and examines whether they imply the stated hypotheses or not. Finally, the fifth section concludes the study.

2. Theory and Prior Research

Miller and Modigliani (1961) propose that in an efficient market with no taxes and transaction costs, at the ex dividend day, the price of the stock should theoretically drop by the exact amount of the dividend. Yet, empirical research has shown that the price drops by less than the amount of the dividend. The "tax clientele hypothesis", the "short term arbitrage and transaction cost hypothesis" and two "market microstructure hypotheses" attempt to explain the empirical inefficiency of the price drop on the ex dividend day[2].

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[1] Booth and Johnston (1984), Robin (1991), Liljeblom et al. (2001) and Kadapakkam and Martinez (2008) have explicitly accounted for inter-country dividend clienteles.

[2] Notably, attributing the abnormal ex dividend day returns to the differential tax treatment of capital gains and dividends is the most widely documented explanation in the literature.

Elton and Gruber (1970) first introduced the "tax clienteles hypothesis" that relates to the investors' preferences over dividends and capital gains. They suggested that investors in the same tax bracket are holding similar yield stocks according to the income tax bracket they are subject to. In particular, investors in high income tax brackets choose to hold low dividend yield stocks, while those in lower income tax brackets concentrate their holdings in high dividend yield stocks. Consequently, the price drop of individual stocks on the ex-day should reflect the tax bracket of the specific clientele. If there are as many clienteles as tax brackets, the price drop on the ex dividend day will vary with the dividend yield group in which the stock belongs to. Many studies have used changes in tax laws to test the tax clientele theory of Elton and Gruber (1970). Evidence supporting the tax effect is provided by several studies such as, Poterba and Summers (1984), Barclay (1987), Robin (1991), Lamdin and Hiemstra (1993), Lasfer (1995), Koski (1996), Bell and Jenkinson (2002) and Graham et al. (2003).

Alternatively, the "short-term arbitrage and transaction cost theory" is based on the premise that market pricing is dominated by short-term arbitrageurs. Kalay (1982) argues that short-term arbitrageurs would exploit any difference between the ex-dividend day price drop and the dividend until they are approximately equal. If transaction costs are zero, the ratio of the ex day price drop over the dividend must be equal to one since arbitrageurs have the same tax rate on their short-term capital gains and on dividends. In the presence of transaction costs, the price drop should fall within the range of the amount of the dividend plus or minus the bid ask spread that is paid over a "round-trip" transaction. Lakonishok and Vermaelen (1983), Karpoff and Walkling (1988), Boyd and Jagannathan (1994) and Wu and Hsu (1996) provide support for this explanation. The "short-term trading hypothesis" implies that investors that fall within different tax brackets do not restrict themselves to specific preferred dividend yield groups of stocks. They trade with each other across all dividend yield groups of stocks on the basis of their differing (opposite) preferences over dividends and capital gains. In general, high tax investors who hold the stock and want to avoid the tax burden of the dividend will sell at the cum day to low tax investors who accelerate their purchase of the stock due to a dividend capturing attitude. Likewise, low tax investors who hold the stock but would rather exclude it

from their portfolios for reasons unrelated to the dividend, will delay their sale until the ex day when they will sell to high tax investors who had foregone the dividend by also delaying their purchases until then. As long as this "opposite" categories of investors match each other in trading volume, no abnormal volume or returns should be detected on the cum or ex day.

An alternative "market microstructure explanation" includes Bali and Hite (1998) who argue that the stock price drops less than the dividend because of price discreteness rather than taxes. Frank and Jagannathan (1998) argue that the bid-ask bounce contributes to a price drop that is less than the dividend. However, Graham et al. (2003) and Jakob and Ma (2004) examine the effect of changes in price quotation and find no support for the microstructure explanation. Michaely (1991) argues that individual investors are less influential while institutional and corporate traders play a more significant role on the ex-dividend day price behavior when transaction costs are low. Eades et al. (1984) find evidence consistent with the tax clientele if the marginal investors are corporations.

In the analysis that follows we provide evidence in support of the Eades et al. (1984) proposition, as we will show that the average price drop on the ex-day varies over time as the tax related incentives for dividend capturing by corporations also change over time.

3. Institutional environment in Greece and Hypothesis Development

3.1 Taxation on Capital income distributed from Greek listed firms

Dividends are distributed to stock holders net of corporate income taxes. Nevertheless, at the shareholder level, neither dividends nor realized gains are subject to income taxes[3]. This way, double taxation of dividends is avoided for the whole period examined. Since 1998, transactions on the ATHEX are only subject to a

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[3] For dividends payable within the year 2009 a 10% tax will be withheld at the time of the dividend receipt that will constitute the final tax paid for dividends received. Similarly, from January 1st, 2010 a 10% tax will be withheld by the stock exchange from capital gains payable at the time of the stock sale.

transfer tax rate of 0.3% (reduced to 0.15% in 2005[4]) on the value of the proceeds that are received when a stock is sold. This tax is always imposed to all individual, corporate and institutional investors (excluding market makers), irrespective of whether the sale was profitable or not and is considered to have an insignificant impact on the preference of investors concerning dividends and capital gains. Also, no minimum holding period is required to make investors exempt from income taxes on the dividend or capital gains.

Foreign investors can freely receive dividends from companies that are listed on the ATHEX without being subject to a withholding tax, under Greek domestic law. In addition, foreign investors are mainly financial institutions and corporations rather than individual investors. In **Figure 1**, we note that although the participation of all foreign investors in the Greek stock market had been at the low level of 20% in the early 20ies, it grew steadily over the following years until it equalized the domestic investor participation.

<u>Insert **Figure 1** here</u>

The four countries with the largest participation in the Greek stock market within the period examined are, the United States of America, Luxembourg, United Kingdom and Cyprus contributing to the 55% - 65% of the total foreign trading activity in ATHEX. Over the period 2003 – 2008, their combined shareholdings varied within the range of 20% – 30% of the total market capitalization of the Greek stock market. Having reviewed the main features of the tax rules referring to dividends and capital gains within these countries, our overall conclusion is that dividends are more heavily taxed than capital gains for most of the period examined for these foreign investors. Most evident differences are the lenient taxation of long-term (namely, from investments held for more than a year) capital gains received by individual investors in the USA and the right to deduct capital losses from capital gains before the tax is accrued for both individual and corporate investors in the USA, UK and Luxembourg.

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[4] According to Greek Law 2742/1999 (article 22) the tax rate increased from 0.3% to 0.6% for the stock sales that occurred during the period October, 1999 until December, 2000. Then, according to Greek Law 2874/2000 (article 37), it fell back to 0.3% until December, 2004. Finally, after the Greek Law 3296/2004 (article 12), the rate was cut to 0.15% for the stock sales realized after January 1st, 2005. The pertinent tax is considered to be an indirect and not an income tax, given that it is imposed on the stock sale proceeds and not on the profit realized from the exchange transaction.

We conclude that given the relative tax disadvantage of dividends over capital gains for the foreign dividend tax clientele in combination with the neutrality of the domestic tax clientele, it is most probable that the price on the ex day will fall less than the amount of the dividend, ceteris paribus, on average.

Hypothesis<1a>: The price drop of Greek listed firms on the ex dividend day is expected to be less than the amount of the dividend, on average.

Hypothesis<1b>: As foreign investors increasingly take the place of domestic investors in the Greek stock market throughout the period 2000 – 2008, we expect the price drop of Greek listed firms on the ex dividend day to decline over time.

So far*,* we have explicitly pointed out that all shareholders of Greek listed equity can be divided into two main tax clienteles; foreign investors who would rather opt for capital gains realization before the ex day due to the relatively higher tax born on dividends received and domestic investors who are exempt from income taxation on both dividends and realized capital gains. According to Elton and Gruber (1970), each tax clientele would restrict its investments to the stocks that best match their tax preferences. Namely, foreign investors will choose to invest in a low dividend yield group of stocks in order to avoid increasing substantially their tax liabilities at the time of dividend payments. Likewise, other (domestic) investors who are neutral or have a tax-induced preference in favor of dividends will target high dividend yield stocks to include in their portfolios.

Hypothesis<2>: Low dividend yield stocks will attract investment from highly income taxed investors from abroad while tax exempt domestic investors will restrict themselves to high dividend yield stocks. This tax clientele assumption implies a positive (negative) relationship between the % dividend yield and the ex day price drop (abnormal return on the ex day).

Given the 100% tax exemption for individual domestic investors, they are deemed indifferent to whether they receive their share of the distributed profits of the firm in a dividend or realized capital gain form. As a result, they would have no incentive to exchange a scheduled dividend payment for a realized capital gain by selling the stock before the ex dividend date. Although one could argue that the same applies for

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corporations, namely, for both corporate and institutional investors, we believe that this is not the case. According to the Income Tax Law of Greek tax regulation, corporations are allowed to exclude both dividends and realized capital gains from the taxable income that is accrued during the financial year. However, realized capital gains from selling stocks are being accumulated within a tax reserve that will remain tax-free unless it is capitalized or distributed to the shareholders of the investing company. In such an instance, the reserve's balance will be taxed at the regular corporate income tax rates prevailing at that time. This tax regime that allows the transfer of capital charges from one year to another, applies for both institutional and corporate investors for the whole period examined until 2007, inclusive[5]. Thus, corporations that have accumulated positive realized capital gains, have a strong incentive to buy stocks with high dividend yields, in order to net off the capital gain reserve balance with the capital loss that is incurred due to the stock price drop on the ex dividend day. In effect, this will result in substantial tax saving for those corporations that decide to distribute the capital gain reserve. Consequently, a corporation that buys the stock on the cum day and sells it on the ex day, in effect, it performs tax arbitrage, with a net gain of the dividend received minus the ex day capital loss net of the tax that is payable upon distribution of the capital reserve, ceteris paribus. Assuming that this tax avoidance strategy is adopted by Greek corporations systematically, we expect them to "pursue" dividends after a positive momentum of the stock market in order to reduce their accumulated capital gain reserve and hence, reduce their future tax liability. In the same vein, after a negative momentum of the stock market, corporations have no particular preference over dividends and become tax neutral between these and capital gains, same as individual investors. Abnormal dividend capturing before the dividend goes ex will drive the stock price higher than normal on the cum day, resulting in a larger price drop on the day that the dividend goes ex when the price is assumed to reach its fair value excluding the dividend. Additionally, Eades, Hess and Kim (1994) suggest that high yield securities are the primary targets for tax arbitrage and strategic dividend capture

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[5] From 2008, according to new tax legislation issued for financial institutions, it is no longer permissible to transfer non taxed realized stock gains from one year to another in the form of a capital reserve. According to the new rules, banks can net annual gains from selling stocks off current or prior year capital losses (realized or unrealized) but any remaining positive value will be, necessarily, taxed at the prevailing corporate income tax rate in the year that it was accrued.

by corporations. Consequently, any time series variation of ex day abnormal returns caused by the ups and downs of the overall stock market will be more apparent with high dividend yield stocks. In short, the hypothesis to be tested is:

Hypothesis<3a>: After a series of positive market returns, the price drop on the ex day is expected to be higher than after a series of negative market returns. Hence, we predict a positive relationship between ex day price drops and the preceding market return. Put otherwise, we predict a negative relationship between ex day abnormal returns and the preceding market return.

Hypothesis<3b>: Corporate dividend capturing will more pronounced in high-yield securities.

In addition, positive reserves of accumulated realized capital gains can also be offset by unrealized capital losses that occur at the balance sheet date when the financial assets valuation is performed at the end of each year. Thus, corporations do not have to sell the dividend paying stocks on or after the ex dividend day in order to redeem the tax saving. Although a dividend capture attitude from corporations will translate into an above average demand for the stock before the dividend goes ex, there will be no "rush" in selling the stock after the ex day with view to cashing the capital loss. We deduce that corporations might or might not trade within a narrow window from the ex day, on a "round trip" (buy at cum – sell at ex day) basis. This presumption leads us to another hypothesis to be tested:

Hypothesis<4a>: Corporate dividend capturing during good market times, is expected to result in abnormal trading volumes before the ex-day.

Hypothesis<4b>: Nevertheless, there is no reason to predict abnormal trading volumes, within a narrow window after the ex dividend day.

3.2 The market microstructure and the institutional characteristics of the Athens Exchanges (ATHEX)

Throughout most of the period examined, ATHEX operated four stock markets, the "Main Market" where large cap firms are traded, the "Parallel Market" where

Medium and Small cap firms are traded, the "New Market" (NEHA)[6] and the "Greek Emerging Market" (EAGAK)[7]. In addition to the stock market, a Derivative (Futures, Options) and a Repo Market exist. Currently, the daily stock trades can be executed in different phases / mechanisms within the trading day; At the Open auction, Continuous Trading, Intraday Auctions, At the Close auction and Block Trades (Pre-Agreed Trades of large volumes). In addition, market, limit, stop, and at the open orders can be used to trade on the exchange. The majority of the trades is executed through a Continuous Automatic Matching Mechanism (see Table 1) by which orders taken from the Order Book are first matched by price and secondly, by the time that they have been introduced. Furthermore, execution priority does not vary with the size of the trade in order not to discriminate against investors that trade in small volumes.

The tick size has been minimal throughout the whole period ranging from 0.1% to 0.7% for stocks equal or greater than 3 Euros. According to the ATHEX Rulebooks, the tick size has changed over time as follows:

During the drachma currency era (before 1/1/2001) :

Stock Price	Tick size
< 1.000 Drs (3 Euros in approx.)	1 drachma (<0.003 Euros)
> 1.000 Drs (3 Euros in approx.)	5 drachmas (<0.015 Euros)

Tick size after Euro adoption until July 2008

Stock Price	Tick size
0,01 – 2,99	0,01
3,00 – 59,99	0,02
60,00 – ∞	0,05

(Source: ATHEX Rulebooks 2000-2008)

When the stock price resulting from the trade falls in between two ticks, rounding to the closest tick will be applied[8]. Assuming that there is an equal probability for the closing price to fall above or below the midpoint that lies between two tick points, we

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[6] The "New Market" (NEXA) was introduced at April 30, 2001 in order to provide a trading environment for companies with small market capitalization and low ownership dispersion but which are characterized as innovative and dynamic and operate under a specified Investment Plan.

[7] The Greek Market of Emerging Capital Markets (EAGAK) is a parallel market providing for cross-border trading in securities comprising shares in emerging market companies. It was established in 1997 by the Law 2533/1997.

[8] If it falls within an equal distance from both tick points, then the price will be rounded to the higher tick.

cannot attribute the abnormal returns on the ex dividend day to a tick size-related explanation similar to the one given by Bali and Hite (1998) and Graham, Michaely and Roberts (2003).

Since May 2001[9], both short selling and market making[10] have been allowed in the Greek stock market. Short selling is realized by the ATHEX Members through a reverse stock repo agreement with the Athens Derivatives Exchange Clearing House (ADECH). This means that in order to realize a short selling, the investor must have previously (or the same day at the latest) acquired the shares he short sells through a stock lending contract with ADECH. The maximum allowed short selling open position per investor and per share is the 1% of the free float of the share. Both market makers' and short sellers' trading has been minimal for the whole period examined. Evidential of this is **Table 1,** which reports that neither market making nor short selling as a percentage of the average daily transaction value ever exceeded 4%, for the years 2007 and 2008[11]. In addition, in the last quarter of 2006, foreign investors started to trade directly on the Exchange for the first time under a "remote member" status but overall remote member trading was minimal since then[12].

Insert **Table 1** here

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[9] For reference, see Regulation 1/216/17-5-2001 of the Capital Market Commission (Gov. Gaz. 667B/31-5-2001): "Market makers in the Main and Parallel Markets of the Athens Stock Exchange" and Regulation 2/216/17-5-2001 of the Capital Market Commission (Gov. Gaz. 667B/31-5-2001): "Short Sales in the Main and Parallel Markets of the Athens Stock Exchange".

[10] There are strict requirements for acquiring and holding on the license of market making such as adequate trading technology and organization, professionally certified staff, internal rules and controls, minimum duration for market making of financial instruments etc.

[11] We only account for the first 9 months of year 2008, as in October 2008, the short sales mechanism was temporarily suspended until May 2009, due to the worldwide market downturn.

[12] A remote member is an ATHEX Member not legally established in Greece that trades through a single Custodian acting as their representative. Trading by foreign investors under a "Remote member Status" was allowed since 2001 according to Regulation No 65 of the ATHEX Board of Directors (15-03-01) (Gov. Gaz. 632B/28-5-2001): "Granting of remote member qualification to EU Investment Services Companies". The first company that started trading as a Remote member in October 2006 was from Cyprus, within the framework of the common trading platform of Athens Exchange and Cyprus Stock Exchange. Since then, Remote member trading hardly exceeded 1% of the total annual trading value in ATHEX, until the year 2008 when the inclusion of UBS Ltd, Merill Lynch, Societe Generale S.A. and Deutche Bank in the Remote member list raised their annual participation to 2.82%.

The clearing and the settlement of a transaction is complete 3 days after the trade has been executed (T+3). Hence, the earliest that a trader can sell a recently acquired stock, is 3 days after its purchase. We deduce that in the case that short term arbitrageurs trade around the ex day with view to exploiting the ex day premium, they will be exposed to the market volatility - or the idiosyncratic volatility in the case of a market-hedged position - for too long.

Hypothesis<5>: Short term arbitrage is not expected to be prevalent in ATHEX over the period examined, due to the 3 day length of the transaction clearing & settlement period (T+3) and the significantly small contribution of short selling, market makers and remote members to the daily trading volumes.

The Greek stock market has experienced significant volatility in the past 13 years. As it is evident from the Year end values of the Athex Composite Index in **Figure 2,** that the stock market cycle spanning from 1995 to 2007 consists of 3 distinct phases; the 1995-1999 stock boom – some would rather call it *"bubble"*- the 2000-2003 stock market depreciation and the 2004-2007 stock re-appreciation. The dividend yield is calculated by dividing the total dividends distributed by the domestic companies composing the main index by the market capitalization. We note that after the end of the stock market rally in 2000, Greek listed firms significantly reduced their dividend yields.

<p align="center">Insert Figure 2 here</p>

Also, during these three distinct periods (1995-2007) the investor mix has changed dramatically. During the 1995-1999 stock price rally, the overwhelming majority of trades would be done by domestic individual investors attracted by the abnormal positive gains that could be realized within few days. In subsequent years (2000-2007), domestic investors were withdrawn and replaced by corporate and institutional investors. The latter is reflected in **Figure 3** that shows the 12 month average % participation rates of individual and non-individual (corporate & institutional) investors that move in opposite directions[13].

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[13] Official monthly % participation rates per investor type are available from ATHEX from May 2001 onwards, only.

Insert **Figure 3** here

According to **Figure 4**, corporate tax rates have declined over time, from 40% in late 90ies to 25% in 2008. Most of the decline took place throughout the period 2004-2007 when corporate tax rates declined every year by 3%, until they reached the level of 25% in 2007. Concurrently, both the mean and median dividend per share for our sample of dividend payments decreased in absolute Euro value. In particular, the mean dividend payout was almost halved in seven years time, from 0.36 Euros in 1998 to 0.19 Euros in 2005[14].

Insert **Figure 4** here

Due to the substantial decline in both corporate tax rates and dividend payouts in the period 2004-2007, dividend capturing is expected to be less prevalent, despite the fact that tax arbitrage induced by the upward movement of the market is deemed profitable. This results in another hypothesis, as follows:

Hypothesis<6>: Due to reduced incentives for dividend capturing in the years 2004-2007, we predict weak abnormal trading volumes before the ex dividend day and lower price drops on the ex days, compared to other periods of market upside (e.g. 1995-1999).

4. Data and Methodology

4.1 Sample construction and filtering

We use all stocks that were listed at the Athens Stock Exchange of Greece from January 4, 1988 until December 31, 2008. This is the entire history of stocks that can be provided by the Datastream database. It includes 467 common and preferred stocks of financial, non financial and utility corporations that pay dividends on an annual basis. On January 2, 2001, Datastream converts all historical numerical data from Greek Drachmas to Euros. We use data in Greek Drachmas for the period before

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[14] We opt for the dividend amount in Euros rather than the % dividend yield to present the change of corporate dividend policy over time, as the dividend yield would be sensitive to the stock market price fluctuations.

January 2, 2001 and data in Euros for the period after January 2, 2001. Ex dividend dates, dividends, and daily closing prices are used to measure abnormal performance on the ex day for individual stocks. The Total Return Index[15] (datatype reference: "RI") of Datastream is used to calculate daily returns except from the ex dividend day. As a market proxy, we use the ATHEX Composite Share Price Index (Datastream datatype: "PI") which is a market capitalization weighted index that depicts the performance of the 60 largest[16] companies that are traded in the Big Cap category of the Athens stock exchange. Finally, daily trading volumes are used to distinguish trading from non trading days for individual stocks.

Our initial sample is comprised of 4,340 ex dividend days spanning throughout our 21 year period. In order to increase the power of our tests, we apply several screening filters to our sample. First, we remove all dividends of preferred stocks. Second, we remove all ex days with confounding capital events. In specific, if a stock split, stock dividend, rights issue, bonus issue occurs within a [-10, +5] window from the ex day, then, the ex day is removed from the sample. Third, in order to have adequate degrees of freedom for our estimations, we exclude ex days that have more than 70 missing observations within the [-130, -1] window, due to no trading activity. Fourth, for quite a few of dividends, the value of the ex day price or the cum day price could be missing because the stock did not trade on those days. In this case, we cannot calculate abnormal returns or price drop ratios and hence, these observations are excluded from our sample. Table 2 displays the successive reductions of the sample due to the above mentioned filters, eventually yielding a final number of 2,472 usable observations (100% of our distribution).

Insert **Table 2** here

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[15] According to the definition provided by Datastream, the Total Return Index is a theoretical Price index that assumes that dividends are re-invested to purchase additional units of the stock at the closing price on the ex-dividend date. Furthermore, it is adjusted for subsequent capital changes such as stock splits and stock dividends.

[16] The shares that are eligible for inclusion in the index are first ranked on the basis of their Average Market Capitalization. Next, these shares are ranked on the basis of their Trading Value excluding blocks. The final criterion for the ranking of the shares results from the numeric average of the two ranking sequences. Then, the 60 first shares in this final criterion rank are selected for the composition of the Composite Index of the Main Market, provided that they trade at the Main Market (that refers to the "Big Cap" category) of the Stock Exchange.

4.2 Methodology

We perform standard event study methodology where abnormal returns and volumes are estimated around the ex dividend day for different periods and groups of stocks. Hypothesis testing is performed on Price Drop Ratio which is calculated in a way similar to Michaely (1991). The Market Risk adjusted Price Drop Ratio (PDR) and the abnormal Total Return on the ex day (AXR) is calculated as follows:

Market Risk adjusted Price drop ratio:

$$PDR_i = \frac{P_i^{cum} - \left(\dfrac{P_i^{ex}}{1 + \hat{R}_i^{normal}} \right)}{D_i} \ ,$$

Abnormal Return on the ex dividend day:

$$AXR_i = \frac{P_i^{ex} - P_i^{cum} + D_i}{P_i^{cum}} - \hat{R}_i^{normal}$$

Normal Return calculated over estimation period:

$$\hat{R}_{it}^{normal} = \hat{\alpha}_i + \hat{\beta}_i R_t^{market}$$

where P_i^{ex} is the price of the stock on the ex-dividend day for stock i, P_i^{cum} is the closing price on the cum day (the day before the stock goes ex-dividend) for stock i, D_i is the euro amount (net of the distributing company tax) of the dividend for stock i, $\hat{R}_{it}^{normal}$ is the expected daily return of stock i, estimated by the market model and R_t^{market} is the daily return of the market proxy index.

We adjust the ex dividend closing price by the expected daily return of the stock. We calculate this normal return using the OLS market model estimated over the estimation window of [-130, -31] days, where day "0" is the ex dividend day. As a proxy for market return, we use the % change of the daily value of the ATHEX Composite Share Price index. We refrain from using an arithmetic mean of the individual stock daily returns over the estimation period as a measure of the expected

return at the ex day, to account for the fact that calendar time clustering is likely. As stated in the seminal paper of Brown & Warner (1980), when the events fall in the same calendar time, they will most likely be correlated as they will be driven by the same market impact. This within sample event dependence will result in either higher Type I error when abnormal performance is not present in reality or higher sample variance that will reduce the power of the t-tests when the null of hypothesis of normal performance is indeed false. Out of all the dividends distributed by Greek firms within one year, approximately 75-90% of these go ex in the months of May, June, July and August[17]. By using market model adjusted abnormal returns we take the common market risk factor out of the equation, so that the abnormal returns of time clustered ex days do not co-vary within sample.

Following Michaely and Vila (1995) and Graham et al. (2003), we measure abnormal trading volume, by the Abnormal Turnover Ratio (ATO) as follows:

Abnormal Turnover

$$ATO_i = \frac{TO_i - \overline{TO}_i^{normal}}{\overline{TO}_i^{normal}}$$

where

$\overline{TO}_i^{normal} = \frac{1}{T-t}\sum_{-t}^{-T} TO_{it}$ is the arithmetic mean Turnover over the estimation period,

$TO_{it} = \frac{Volume_{it}}{No\ of\ shares_{it}}$ is the daily Turnover for stock i

This way, we avoid distortions in % volume changes created by capital changes occurring within the estimation [-130, -31] window. The daily Abnormal Turnover (ATO) is the % difference between the actual Turnover on the day examined and the Average Turnover estimated during the estimation period. In the following section, we move to the testing of our propositions and the reasoning of how the empirical results support them in practice.

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[17] For example, for the years 2004 – 2008, out of the 912 ex days included in our sample, 785 dividends (i.e. 86% of total) were paid in the months of May, June, July and August.

5. Testing and Empirical results

5.1 Descriptive Statistics for the final sample

Before we begin our statistical analysis, we trim the upper and lower 2.5% quantile of the distribution in order to limit the outliers' impact[18]. Thus, our final sample consists of 2,349 observations that will be used for the analysis that follows.

In Table 3, we present summary statistics for the mean PDR and the AXR on the ex day calculated using both the entire (100%) and the trimmed (95%) samples over the pertinent period 1988-2008. We note that the 5% trimming reduces significantly the variance of our ratios whereas it does not seriously impact on the measures of central tendency.

<p align="center">Insert Table 3 here</p>

The mean PDR for the 100% and 95% of the distribution is 0.6720 and 0.5832 respectively, significantly less than 1. This verifies the 1a hypothesis that states that PDRs will be less than one due to the relative tax disadvantage of dividends over capital gains for the majority of foreign investors that is not affected by the overall tax neutrality of domestic investors. Consequently, statistically significant abnormal returns occur on the ex-day, a finding that agrees with previous empirical research on the ex day behavior of Greek listed firms done by Milonas and Travlos (2001) for the 1994-1999 period and Dasilas (2009) for the 2000-2004 period. We will perform the whole rest of the analysis, using the 95% trimmed sample that excludes 123 outlier observations from the upper and lower tail.

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[18] We consider this reasonable, given the two main reasons that outliers can occur for. First, there are cases where a stock with a minimal dividend yields exhibits substantial idiosyncratic volatility on the ex-day, resulting in extreme market risk adjusted Price Drop ratio values. Second, data entry errors are likely; within the outliers that were dropped we detected two instances where although the actual dividend payment was 40.0 or 80.0 Greek Drachmas (0.12 or 0.24 Euros), the figures extracted from the database were 4.0 or 8.0 Greek Drachmas respectively (0.012 or 0.024 Euros), hence distorting the calculated ex day returns.

5.2 Hypothesis testing on means across investor clienteles

For the period 2001-2008[19], we rank our ex dividend days on the basis of dividend yield and for each dividend yield quintile we calculate the average Euro dividend amount and the mean PDR, as reported in Table 4.

<p align="center">Insert Table 4 here</p>

We note that the mean PDR starts at 0.62 on the upper dividend yield quintile, then falls to 0.35 within the middle quintile and then moves back to a high value of 0.60 at the lowest dividend yield quintile. Such a U shape pattern has also been documented by Elton and Gruber (1970), Michaely (1991) and Zhang et al. (2008) and does not necessarily contradict the tax clientele **hypothesis 2**. According to Elton and Gruber (1970), this is due to the fact that firms with negligible dividend payouts also have substantially volatile prices, so that they exhibit relatively excessive price drops on the ex dividend day, hence, "distorting" the PDRs that are calculated for their stocks. The apparent positive correlation between the dividend yield and the dividend size[20], implies that the same conclusions would have been drawn if PDRs were ranked in terms of the Euro dividend amount instead of the % dividend yield.

5.3 Hypothesis testing on means over time

In order to test the time series variation of the PDR in relation to the stock market performance we calculate mean PDRs separately for the successive periods 1995-1999, 2000-2003 and 2004-2007 that represent three distinct phases of the stock market cycle over the entire period 1995- 2007. The 1995-1999 period refers to an abrupt upside, the 2000-2003 period refers to a downside and the 2004-2007 period refers to a steady upside of the stock market. Table 5 shows average PDR values separately for the three periods across five different dividend yield quintiles, from highest to lowest quintile. We note that the average PDR moves in parallel with the

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[19] We restrict the analysis to this sub-period because official data on the increasing % participation of foreign investors in the Greek stock market becomes available by ATHEX from 2001 onwards.

[20] The Pearson Correlation coefficient between the % dividend yield and the Euro dividend size is 0.267, significant at the 1% level.

market direction, namely, it starts with a value of 0.75 in the 1st period, falls to 0.49 in the 2nd period and rises back to 0.55 in the 3rd period. This trend persists in almost all five dividend yield quintiles and is more pronounced in the highest dividend yield group of stocks.

Insert **Table 5** here

In order to test the significance of the difference of mean PDRs for the three different market states – periods, we test the hypothesis of zero difference of means, for the two resulting comparisons, namely, between the 1st and the 2nd period (1995-99 versus 2000-03) as well as between the 2nd and the 3rd period (2000-03 versus 2004-07). In the 1st pair of compared mean PDRs, all differences computed across all five dividend yield quintiles are positive while the difference referring to the highest dividend quintile is highly significant. In the 2nd pair of periods compared, all differences computed except from the 2nd dividend yield quintile are negative with the difference referring to the highest dividend quintile being highly significant too. These results conform to the stated **3rd hypothesis** as they indicate the cyclicality of the mean PDR that seems to follow the overall market movement (*hypothesis 3a*), especially, in the group of high dividend yield stocks (*hypothesis 3b*). Moreover, although the PDR in the years 2004-2007 rises due to the upward movement of the market, it remains significantly lower than the PDRs of the comparable market upside in the 1st period 1995-1999, across all dividend yield quintiles. This can be attributed to the presumed weaker incentives for dividend capturing as postulated in the **6th hypothesis.** Finally, the overall downward trend of PDR from 2001 onward is consistent with the **1b Hypothesis** that postulates a PDR decline for the 2000-2008 period as foreign investors increase their ownership in Greek listed firms.

5.4 Regression Analysis

In order to confirm the results above, we regress the abnormal returns on individual ex days (AXR) against the mean ATHEX market return and a set of control variables, over the whole period examined 1988-2008. The coefficients on the mean market return and the dividend yield variables are expected to capture the time series and the

cross sectional component of the AXR variation, respectively. The arithmetic mean of the ATHEX Composite Share Price Index is calculated over the window [-130, -31] from the ex day. We use control variables in order to account for the dividend yield clientele, trading liquidity and the idiosyncratic volatility of individual stocks. Dividend yield is calculated by dividing the dividend amount by the cum-dividend day closing price. We also include the square of the % dividend yield in order to control for a non linear relationship between the AXR and the % dividend yield. Mean Turnover is defined as the average % (Volume / Number of shares outstanding) over the estimation window [-130, -31]. We measure the idiosyncratic component of the individual stock total volatility by the Root Mean Square residual Error (RMSE) that has been derived from the market model estimated during the estimation window [-130, -31][21]. The OLS estimation method is used for the regression and t-statistics are computed with heteroscedasticity consistent standard errors, according to the White (1980) correction.

Model 1

$$AXR_i = \alpha + \beta_{1i}MR_i + \beta_{2i}dy_i + \beta_{3i}(dy_i)^2 + \beta_{4i}Turnover_i + \beta_{5i}IdioRisk_i + \varepsilon_i$$

We run the regression again after including period dummy variables for the sub-periods 1995-1999, 2000-2003 and 2004-2007 (Model 2), in order to control for the possibility of seasonality of the ex day premium (AXR). Each dummy variable takes the value '1' if the ex day falls in the pertinent sub-period for which the dummy is defined, or the value '0' otherwise.

In Table 6 we observe that all beta coefficients[22] that are significant at a 1% level have the expected signs. First, the negative beta of the market return validates our basic **3a hypothesis** that states that PDRs are cyclical and accordingly, AXRs are countercyclical in relation to the overall stock market performance. Second, the

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[21] As a robustness test, we repeat the regression analysis while replacing the RMSQE with the standard deviation of the individual security's returns divided by the standard deviation of the market returns , σ_i / σ_m (Michaely and Vila (1995)) , both estimated during the window [-130, -31]. Using this alternate variable yields almost identical regression results.

[22] The parameters have been tested for collinearity according to the approach followed by Belsley, Kuth and Welsch (1980). No significant collinearity was detected as all Eigenvalue Condition indices were below 10.

positive and negative sign on the 1st and 2nd power of dividend yield respectively, indicate that AXR is a nonlinear function (inverse U-shape) of dividend yield, in line with our findings in section **5.2**.

Insert **Table 6** here

The short term trading hypothesis postulates a negative relationship between turnover and AXR, given that arbitrage will be more intense in low transaction cost - highly liquid - stocks, hence eliminating any apparent AXR on the ex dividend day. Furthermore, it predicts that AXRs should be significantly higher for high idiosyncratic volatility stocks that effectively deter arbitrageurs from trading around the ex dividend day. We observe, that, although the beta coefficients of the mean turnover and the residual volatility have the expected signs - negative and positive respectively-, they remain insignificant at a 10% level, hence, providing weak support for the "short term trading" theory, in agreement with our 5th **hypothesis**. In the 2nd regression Model, all 3 dummy variables are insignificant at a 10% level while the betas and t-statistics of the other explanatory variables do not materially differ from those of the 1st Model. We conclude that the significant negative relationship between the AXR and the mean market return cannot be attributed to seasonal effects.

5.5 Abnormal Trading Volume Analysis

We extend our analysis to trading volumes by calculating the abnormal turnover of daily volumes (ATO) for each individual day, over the period [-10, +10] around the ex dividend day. Then we average ATOs across our sample separately for each day within the [-10, +10] window as depicted in Table 7.

Insert **Table 7** here

We repeat the same analysis for the three distinct sub-periods, 1995-1999, 2000-2003, 2004-2007 with the entire sample of ex days and for the period 1988-2008 with both the entire sample and the highest dividend yield quintile of stocks. As previously hypothesized (*hypothesis 4a*), for the whole sample of years and ex days (4th column in Table 7), we find that there is significantly positive abnormal trading in the 4 days

preceding the day '0', that can be attributed to dividend capturing by corporations for the already stated reasons. What is more, after the ex day, trading falls back to almost normal levels indicating that short term professional arbitrage activity within a narrow window before and after the ex day is not visible (*hypothesis 5*) and that dividend capturing corporate investors are in no rush to realise their capital losses (*hypothesis 4b*). This explicitly confirms the validity of the **4th hypothesis** that refers to positive abnormal trading reaction around the ex day. Lakonishok and Vermaelen (1983) argue that as potential trading profits net of transaction costs are, ceteris paribus, relatively higher for high yield stocks, the abnormal trading activity will be more pronounced for high yield stocks. This (*hypothesis 3b*) is confirmed by the fact that our proposition remains valid for the high dividend yield quintile of stocks that exhibit significantly positive abnormal trading turnover 3 days before and at the ex day (5th column in Table 7) over the entire period 1988-2008.   Yet more, in the days '-1' and '-2' before the ex day, abnormal turnover for the high dividend yield stocks is, characteristically, two times greater than the abnormal turnover of the total sample.

Finally, we compare volume turnovers across the three already defined phases of the market cycle and we deduce that dividend capture is most visible in the years 1995-1999 during which already capitalised capital gains induce corporate investors to "buy the dividend" for tax saving reasons. Next, as the market moves from bull to bear sentiment in the period 2000-2003, dividend capture ceases, abnormal volumes around the ex day become insignificant (or even negative) and the price drop ratio only reflects the tax preferences of the different dividend clienteles' participation in the Greek securities market. In the 3rd sub-period 2004-2008, although abnormal turnover is positive for the 3 days preceding the ex day '0', a sign of probable dividend capture, they remain insignificant at a 10% level. Thus, dividend capture proves to be weak despite the fact that the market is back on a positive momentum, hence, providing opportunities for tax arbitrage for domestic corporate investors. Nevertheless, as our **6th hypothesis** predicts, this can be explained by the augmented participation of dividend-averse foreign investors and the severe decline of the corporate tax rate and the dividend payout over the last decade that diminishes the expected profit net of transaction cost from tax arbitrage performed by domestic corporations around the ex dividend day.

6. Conclusions and further insights

Initially, this paper attempts to explain the ex dividend day puzzle in the Greek stock market (ATHEX) that is seemingly tax neutral, given that neither dividends nor capital gains are taxed upon receipt at the shareholder level for the period 1988-2008. Given that there is weak support for a short term arbitrage or microstructure based explanation, first, we conclude that the dividend preferences of foreign investors with substantial stakes in Greek listed firms, could drive price drops below the dividend amount on the ex day. Second, we reveal an apparent time series variation of the ex day price drops that co-vary with the overall stock market return throughout three distinct up and down phases of the market cycle during the period 1995-2008. We attribute this result to the selective timing of tax-induced trading performed by domestic corporate and institutional investors.

We believe that although research concerning the stock price behaviour on the ex dividend day has been extensive, disproportionate weight has been put to the cross-sectional and microstructure-related investigation of the sources of the ex day premium. Further research on the time variation of the ex day returns might bring new hypotheses as to how the relative pricing of the dividend on the ex day reflects investor preferences that change according to their dynamic behavioural characteristics.

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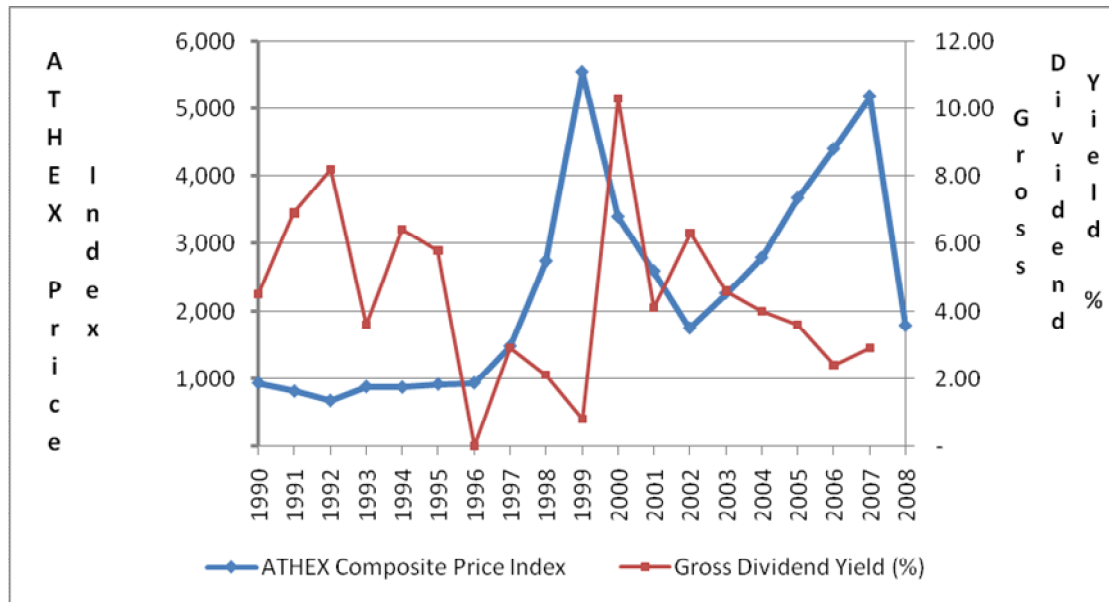
Figure 1: The time series of the %Participation of Foreign and Domestic Investors
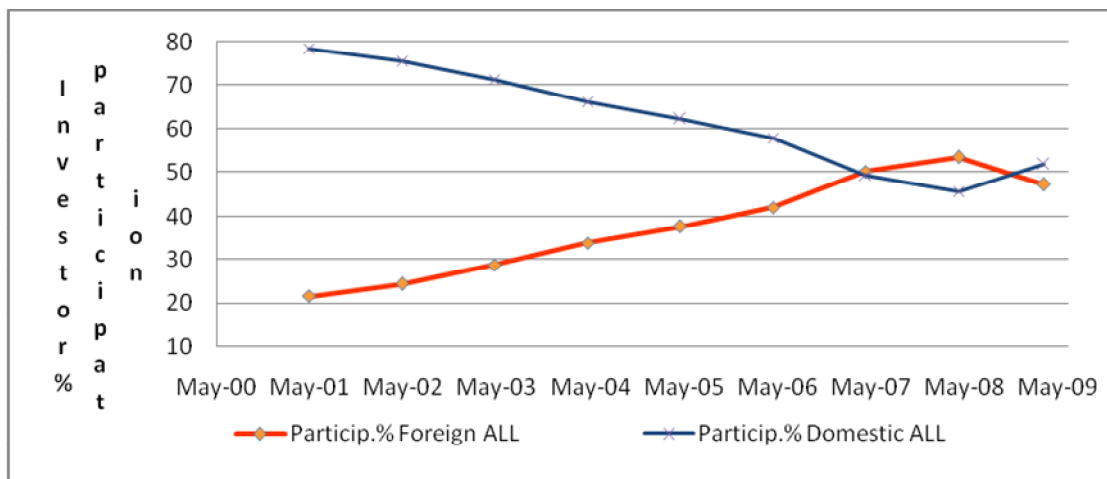
(Source: *Athens Exchange, Monthly Statistics Bulletin, 2003-2009*)

The evolution of the participation of foreign and domestic investors is measured by the monthly % ownership of total market capitalisation from May 2001 until April 2009.

Figure 2: The time series of the % dividend yield and the Value of the ATHEX Composite Share Price Index

(Source: World Federation of Exchanges)

The ATHEX Composite Share Price Index is a market capitalization weighted index that depicts the performance of the 60 largest companies that are traded in the "Main Market" (Big Cap category) of the Athens stock exchange. The Gross Dividend Yield is calculated by dividing the total dividends distributed by the domestic companies composing the ATHEX Composite Share Price Index by the market capitalization of the index.

Figure 3: The time series of the % Participation of Individual and Non-individual Types of investors

(Source: Athens Exchange, Monthly Statistics Bulletin, 2003-2008)

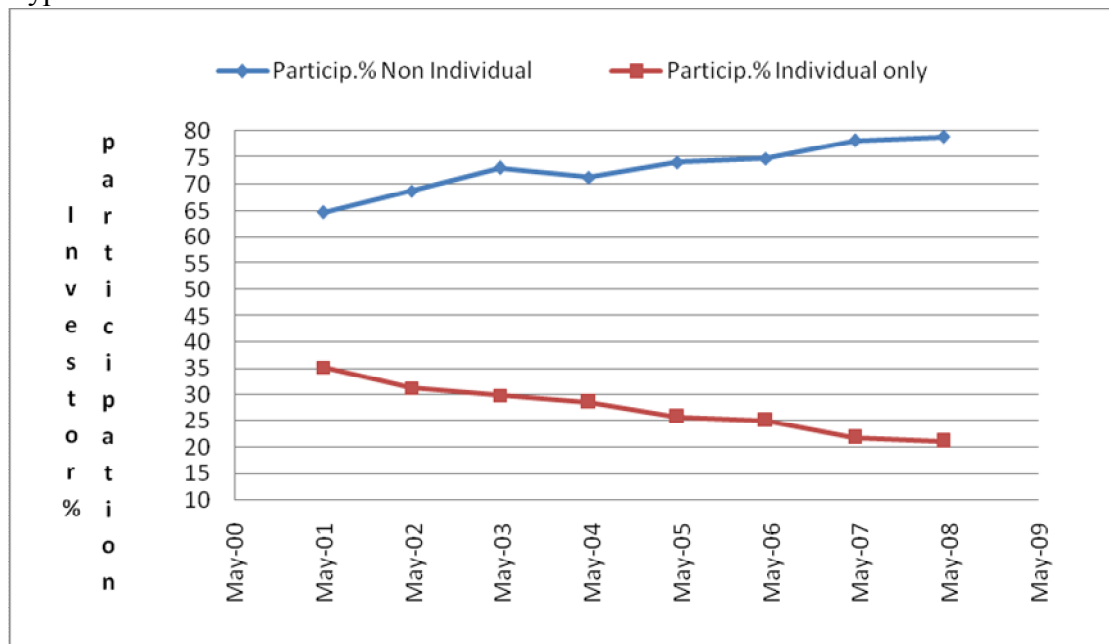The evolution of the participation of individual and non-individual investors is measured by the monthly % ownership of total market capitalisation from May 2001 until April 2009. Individual investors include both domestic and foreign. Non-individual investors include both corporate and institutional, and both domestic and foreign.

Figure 4: The evolution of the % corporate tax rate and the average € dividend payment per share of Greek listed firms over the period 1994 – 2008.
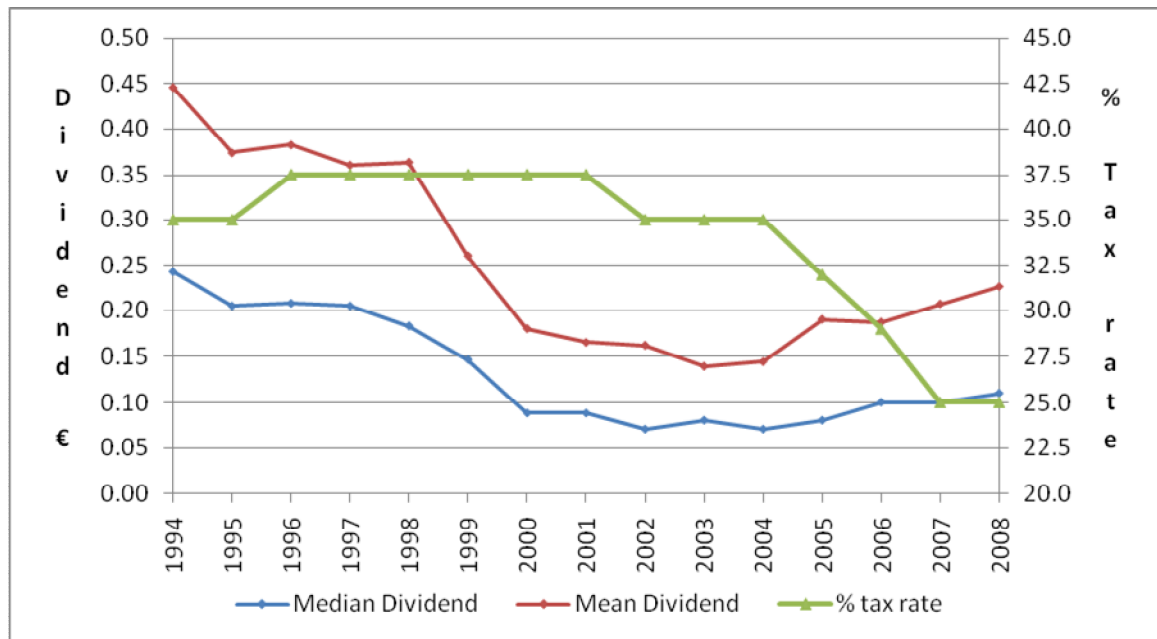
The mean and median € dividend per share have been calculated on a year basis for the sample of Greek listed stocks under examination, over the period 1994-2008. The sample consists of 2,472 dividend distributions by common stocks of any industry and capitalisation size that had been listed on the Athens stock exchange over that period. For the years 1996-2001, financial institutions were taxed at a higher corporate rate (40%) than other non-financial listed firms (35%). For that period, we estimate an arithmetic mean (37.5%) of the two reported income tax rates.

Table 1: Average daily € value of transactions (in million of Euros)

Average daily € trade value	01.01.2007 - 31.12.2007		01.01.2008 - 30.09.2008	
per Trading Phase	Large Cap.	All	Large Cap.	All
At the Open	6.41	6.99	7.21	7.84
ContinuousTrading	271.68	297.56	238.33	246.4
Intraday Auctions	0.89	2.28	0.74	1.13
Closing Auction	22.3	22.42	25.78	25.78
At the Close	10.34	11.49	8.48	8.86
Total	311.62	340.73	280.54	290.03
BlockTrades	93.42	100.52	63.35	65.24
Grand total	405.04	441.25	343.89	355.26
% Short selling	2.5%	2.3%	1.6%	1.6%
% Market Makers	3.0%	2.9%	4.0%	3.9%
% Total Value	91.8%	100.0%	96.8%	100.0%

(Source: *Athens Exchange, Monthly Statistics Bulletin, 2003-2009*)

The table shows the average daily € value of transactions per intra-day trading phase. The percentages of average daily short selling and market making are calculated ignoring the daily trade value of block trades. All Euro figures are in millions.

Table 2: Filters of Sample Screening

SAMPLE SCREENING	Ex days Removed	Remaining Amount
Number of Ex days extracted from DataStream (Initial sample)		**3,430**
Ex days that pertain to Preferred stocks	404	3,026
Ex days close to a "confounding event": Any capital change within a [-10, +5] window	173	2,853
Ex days that have less than 60 trading days within the 130 day period before the ex day	141	2,712
Ex days whose calculated Price Drop Ratio / Abnormal Return reports a missing value	240	**2,472**
Total removed	**958**	

This table reports the filters that we have applied to our initial sample in order to increase the quality of our inputs and enhance the power of our testing.

Table 3: Descriptive Statistics for the Ex dividend day during the period 1988–2008.

	PRICE DROP RATIOS		EXCESS RETURNS	
Descriptive Statistics	**100% Sample**	**95% Sample**	**100% Sample**	**95% Sample**
Dividend (in Euros)	0.2465	0.2554	0.2465	0.2554
Dividend Yield	0.0274	0.0286	0.0274	0.0286
Sample size	2,472	2,349	2,472	2,349
PDR / EXR				
Mean	0.6720	0.5832	0.0116	0.0111
Median	0.6255	0.6255	0.0094	0.0094
Standard Deviation	4.7843	1.6490	0.0310	0.0237
Minimum	-47.01	-5.8406	-0.1562	-0.0470
Maximum	132.91	7.6441	0.2548	0.0771
Ho:"PDR=1","EXR=0"				
Student's t	(-3.41)	(-12.25)	18.65	22.80
p-value	0.0007	< 0.0001	< 0.0001	< 0.0001
Wilcoxon Signed Rank	< 0.0001	< 0.0001	< 0.0001	< 0.0001

The (100%) sample includes 2,472 ex dividend days of annually dividend paying firms that are listed on the Athens stock exchange (ATHEX) for the period 1988-2008. The Price Drop Ratio (PDR) is defined as $(P^{cum} - P^{ex}_{adjusted})/Div$ and the Abnormal Ex day Return (AXR) is defined as $[(P^{ex}-P^{cum} + Div)/P^{cum} - R^{normal}]$. P^{cum} is the closing price on the cum-dividend day, $P^{ex}_{adjusted}$ is the closing price on the ex-dividend day adjusted for the market risk on that day and Div. is the dividend amount. The OLS market model is used over an estimation window [-130, -31] from the ex day '0', to estimate the expected return R^{normal} and to adjust $P^{ex}_{adjusted}$ for the market risk. T-statistics and p-values are calculated for the null hypotheses of "PDR=1" and "AXR=0" against the alternative hypothesis of "PDR≠1" and "AXR≠0". The same descriptive statistics are presented for the 95% of the sample, after trimming the top and bottom 2.5 percentiles of the PDR / AXR distribution.

Table 4: PDR per Dividend Yield Quintile for the period 2001 – 2008

Dividend % Yield Quintiles	No of Obs.	Mean Dividend €	Mean PDR (t-statistic)
5.73% (4.0% - 22.5%)	305	0.3029	0.6182*** (-10.70)
3.35% (2.8% - 4.0%)	305	0.2338	0.4468*** (-13.73)
2.40% (2.0% - 2.8%)	305	0.1877	0.3525*** (-11.32)
1.63% (1.3% - 2.0%)	305	0.1154	0.4008*** (-7.07)
0.88% (0.1% - 1.3%)	305	0.0572	0.5989*** (-2.78)
Total 2.78% (0.1% -22.5%)	1,525	0.1794	0.4834*** (-13.96)

The testable sample, after trimming the top and bottom 2.5% percentiles, includes 1,525 ex dividend days of annually dividend paying firms that are listed on the Athens stock exchange (ATHEX) for the period 2001-2008. The data are grouped into % dividend yield quintiles. Dividend yield is calculated by dividing the dividend amount by the cum-dividend day closing price. The Price Drop Ratio (PDR) is defined as $(P^{cum} - P^{ex}_{adjusted})/Div$ where P_{cum} is the closing price on the cum-dividend day, $P^{ex}_{adjusted}$ is the closing price on the ex-dividend day adjusted for the market risk on that day and Div. is the dividend amount. The OLS market model is used over an estimation window [-130, -31] from the ex day '0' to adjust $P^{ex}_{adjusted}$ for the market risk. T-statistics in parentheses are calculated for the null hypothesis of "PDR=1" against the alternative hypothesis of "PDR≠1". ***, ** and * denote statistical significance at 1%, 5% and 10% level, respectively.

Table 5: Price Drop Ratios: Means and difference of means for the Periods: 1995 - 1999, 2000 - 2003 and 2004 - 2007

Dividend % Yield Quintiles	1995 - 1999	2000 - 2003	2004 - 2007	Difference 1995 - 1999 2000 - 2003	Difference 2000 - 2003 2004 - 2007
5.61% (3.1% - 22.5%)	0.7475*** (-5.01) 101	0.4938*** (-9.65) 163	0.6648*** (-6.15) 149	0.2537*** (3.49)	-0.1710** (-2.26)
3.35% (2.2% - 5.1%)	0.5067*** (-7.98) 103	0.4036*** (-7.65) 163	0.5023*** (-9.69) 149	0.1031 (1.04)	-0.0990 (-1.06)
2.27% (1.4% - 3.3%)	0.5157*** (-4.96) 103	0.4648*** (-4.91) 163	0.4750*** (-6.50) 150	0.0509 (0.35)	-0.0100 (-0.08)
1.49% (0.8% - 2.2%)	0.8288 (-0.86) 102	0.4184*** (-3.23) 163	0.3410*** (-5.58) 149	0.4104 (1.54)	0.0774 (0.36)
0.77% (0.1% - 1.4%)	1.1350 (0.40) 102	0.6547 (-1.46) 163	0.7457 (-1.38) 149	0.4803 (1.16)	-0.0910 (-0.3)
2.67% (0.1% - 22.5%) Total	0.7458*** (-3.07) 511	0.4871*** (-7.78) 815	0.5456*** (-9.25) 746	0.2588** (2.44)	-0.0590 (-0.71)

The testable sample, after trimming the top and bottom 2.5% percentiles, includes 2,349 ex dividend days of annually dividend paying firms that are listed on the Athens stock exchange (ATHEX) for the period 1988-2008. The data are grouped into % dividend yield quintiles. Dividend yield is calculated by dividing the dividend amount by the cum-dividend day closing price. The Price Drop Ratio (PDR) is defined as $(P^{cum} - P^{ex}_{adjusted})/Div$ where P_{cum} is the closing price on the cum-dividend day, $P^{ex}_{adjusted}$ is the closing price on the ex-dividend day adjusted for the market movement on that day and Div. is the dividend amount. The OLS market model is used over an estimation window [-130, -31] from the ex day '0', to estimate the expected return R^{normal} and to adjust $P^{ex}_{adjusted}$. The last two columns report the difference of mean PDR between different sub-periods 1995-1999, 2000-2003 and 2004-2007. T-statistics in parentheses are calculated for testing mean PDR (H_o: "PDR=1" against H_{alt}: "PDR≠1") and difference of mean PDRs (H_o: "ΔPDR=0" against H_{alt}: "ΔPDR≠0"). Sample sizes are reported below t-statistics. ***, ** and * denote statistical significance at 1%, 5% and 10% level, respectively.

Table 6: Regressions for the whole period 1988 – 2008

Variable	Model 1	t-statistic	Model 2	t-statistic
Intercept	0.0004	0.23	0.0005	0.23
Market Return	-0.5929***	-2.74	-0.7611***	-2.58
Dividend Yield	0.5859***	8.91	0.5819***	8.69
(Dividend Yield)^2	-4.8833***	-6.67	-4.8862***	-6.65
Mean Turnover	-0.0172	-1.31	-0.0197	-1.48
Idiosync.Volatility	0.0304	0.79	0.0293	0.75
Dummy (1995_99)			0.0014	0.67
Dummy (2000_03)			-0.0003	-0.19
Dummy (2004_07)			-0.0003	-0.18
R^2 adjusted		**0.043**		**0.042**
F-Statistic		**21.85**		**13.82**

The testable sample, after trimming the top and bottom 2.5% percentiles, includes 2,349 ex dividend days of annually dividend paying firms that are listed on the Athens stock exchange (ATHEX) for the period 1988-2008. The table reports two OLS regressions, one with and one without dummy variables for sub-periods 1995-1999, 2000-2003 and 2004-2007. The dependent variable is the Abnormal Ex day Return (AXR) that is defined as $[(P^{ex}-P^{cum} + Div)/ P^{cum} - R^{normal}]$. P^{cum} is the closing price on the cum-dividend day, P^{ex} is the closing price on the ex-dividend day, Div is the dividend amount and R^{normal} is the expected stock return on the ex day according to the OLS market model estimated over the window [-130, -31] from the ex day. The Market Return is the arithmetic mean of the ATHEX Composite Share Price Index calculated over the window [-130, -31] from the ex day. Dividend yield is calculated by dividing the dividend amount by the cum-dividend day closing price. Mean Turnover is defined as the average % (Volume / Number of shares outstanding) over the estimation window [-130, -31]. We measure the idiosyncratic component of the individual stock total volatility by the Root Mean Square residual Error (RMSE) that has been derived from the market model estimated over the estimation window [-130, -31]. The dummy variables takes the value '1' if the ex day falls in the pertinent sub-period and the value '0' otherwise. T-statistics are computed with heteroscedasticity consistent standard errors, according to the White (1980) correction. ***, ** and * denote statistical significance at 1%, 5% and 10% level, respectively.

Table 7: Mean Abnormal Volume Turnover (ATO) of each trading day around the ex dividend day.

Day	1995 - 1999	2000 - 2003	2004 - 2007	All %dy 1988 - 2008	High %dy 1988 - 2008
-10	0.0621 (0.90) 494	0.1446 (1.64) 832	0.0294 (0.30) 726	0.0714 (1.48) 2,305	0.0797 (0.71) 453
-9	0.0862 (1.10) 496	1.1274 (1.31) 831	-0.0417 (-0.56) 725	0.4126 (1.32) 2,300	0.0705 (0.62) 449
-8	0.0828 (1.19) 491	0.3309* (1.93) 831	-0.0302 (-0.26) 729	0.1220 (1.64) 2,305	0.0018 (0.02) 456
-7	0.0952 (1.23) 494	0.0866 (1.06) 831	-0.0834 (-1.45) 726	0.0059 (0.15) 2,305	0.0056 (0.07) 453
-6	0.1102 (1.37) 495	0.0624 (0.96) 830	0.3145 (1.10) 728	0.1409 (1.47) 2,310	0.6122 (1.37) 452
-5	0.1486 (1.95) 500	0.0067 (0.07) 830	-0.1194 (-1.54) 729	-0.0050 (-0.11) 2,320	0.0287 (0.41) 462
-4	0.5085** (2.07) 502	0.2977 (1.44) 830	-0.1913 (-0.61) 729	0.2698** (1.98) 2,316	0.3633 (1.30) 456
-3	0.1941** (2.48) 498	0.2642 (1.25) 830	0.1609 (0.93) 726	0.2232** (2.14) 2,307	0.1497** (1.99) 452
-2	0.2757** (2.09) 504	0.1765 (1.63) 826	0.0406 (0.58) 734	0.1452** (2.52) 2,323	0.2822** (1.92) 462
-1	0.4757*** (3.56) 512	0.0849 (1.02) 835	0.1216 (1.65) 735	0.2056*** (3.98) 2,349	0.5611*** (3.64) 470
0	0.2035** (2.01) 512	0.3527 (1.22) 835	-0.1673*** (-4.40) 735	0.1147 (1.07) 2,349	0.1793** (2.46) 470
1	0.4004* (1.71) 501	0.0039 (0.05) 833	-0.0750 (-0.69) 727	0.0572 (0.84) 2,319	0.3002 (1.17) 454
2	0.1457* (1.79) 499	0.2388 (1.39) 831	-0.0615 (-0.73) 724	0.0731 (1.04) 2,308	0.0552 (0.61) 448

3	0.1765*	-0.0590	0.4039	0.1284	0.0064
	(1.83)	(-0.85)	(0.83)	(0.82)	(0.06)
	499	832	727	2,314	452
4	0.3057**	0.1036	-0.1343**	0.0545	0.1186
	(2.41)	(1.12)	(-2.14)	(1.07)	(0.92)
	499	834	727	2,319	456
5	0.1965	0.0272	-0.1871***	-0.0209	0.0403
	(1.57)	(0.41)	(-3.78)	(-0.48)	(0.39)
	495	831	727	2,309	450
6	0.1010	0.0182	-0.1104	-0.0044	0.0137
	(1.06)	(0.29)	(-1.77)	(-0.10)	(0.10)
	502	828	727	2,314	450
7	0.2018	0.0781	-0.1466***	0.0043	-0.0784
	(1.15)	(0.74)	(-3.09)	(0.08)	(-1.18)
	492	830	727	2,304	453
8	0.2757	0.0819	-0.1099	0.0593	0.0467
	(1.54)	(0.82)	(-1.82)	(1.00)	(0.41)
	497	834	725	2,311	453
9	0.2316	0.1196	-0.0418	0.0822	0.0422
	(1.37)	(0.99)	(-0.50)	(1.28)	(0.41)
	488	829	728	2,305	461
10	0.4148	0.0593	0.0144	0.1003	-0.0523
	(1.42)	(0.64)	(0.14)	(1.28)	(-0.75)
	494	818	724	2,292	451

The testable sample, after trimming the top and bottom 2.5% percentiles, includes 2,349 ex dividend days of annually dividend paying firms that are listed on the Athens stock exchange (ATHEX) for the period 1988-2008. The table reports Abnormal Turnover over a [-10, +10] day window from the ex day '0', averaged across the sample. The Abnormal Turnover (ATO) is defined as the % [(Turnover on the day examined - Mean Turnover) / Mean Turnover] where Mean turnover is the average % (Volume / Number of shares outstanding) over the estimation window [-130, -31] from the ex day '0'. Mean ATO is reported separately for sub-periods 1995-1999, 2000-2003 and 2004-2007 (1st, 2nd, 3rd column), for the entire period 1988-2008 (4th column) and just for the highest % dividend yield quintile of ex days (5th column). T-statistics in parentheses are calculated for testing mean ATO (H_o: "ATO=0" against H_{alt}: "ATO≠0"). Sample sizes are reported below t-statistics. ***, ** and * denote statistical significance at 1%, 5% and 10% level, respectively.