Corporate value, price and dividend policy: a case study of U.S. listed firms

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Abstract: Focused upon the U.S. stock market, the paper investigates the role of dividend policy, its level and (in)stability, in generation of relative corporate value and relative stock price. Whilst relative corporate value is proxied by Tobin's q and relative stock price is operationalized by the four most frequent multiples (P/E, P/B, P/S and P/FCF), the dividend policy is represented by three popular metrics measuring the propensity to pay dividends. Controlling for operating and macroeconomic conditions, panel data techniques in a simultaneous equations framework are employed to 115,837 quarterly observations for 1,466 firms represented in the S&P 1500 Composite Index over the period 1989 – 2022. The findings reveal that dividend policy matters, albeit the response of Tobin's and multiples to dividend policy is asymmetric. In particular, corporate value of U.S. firms is found to increase with per-share dividend amounts, but decreases relative to the dividend payout ratio and yield. The established empirical evidence reaffirms claims against dividend neutrality and is useful in developing pre-selection investing strategies that relate practices in dividend policy to fundamental screening based on multiples.

Keywords: Tobin's q, multiples, dividend policy, S&P 1500 Composite, simultaneous panel data equations
JEL classification: G32, G35.

1. Introduction

In spite of some societal objections, the mainstream position in corporate finance is that the primary objective of a firm is to create and generate value to its equityholders and/or its stakeholders (Jensen 2002; De Luca 2018, pp. 7, 280; McKinsey et al. 2010, chap. 1). In generating value, firms deploy assets and confront their operating and investing decisions with financing choices and options regarding capital structure. A part of this process is the dividend policy that seeks a compromise between value distribution and reinvestment. Many firms pay cash dividends, but reasons may differ and are intensely debated in the corporate community (e.g. Al-Najjar & Kilincarslan 2019; Denis & Osobov 2008). The absence of an acceptable answer to the question why firms pay dividends that would universally fit all firms led Black (1976) to call this obscure phenomenon "the dividend puzzle", which is a term that often resurfaces in the corporate literature. Furthermore, dividend payments are generally presumed to exert differentiated effects upon stock price and stock value. Whilst it is documented that at an ex-dividend date stock prices drop with dividend distribution, be it less than the dividend per share (e.g., Campbell & Beranek 1955, Kalay 1982) or in the same amount (e.g., Boyd & Jagannathan 1994), the effects of dividend policy on stock value are disputable and controversial (Baker et al. 2002, p. 242; Frankfurter & Wood 2002, pp. 111-117). On the one hand, the theory of dividend irrelevance espoused by Miller & Modigliani (1961) builds on an idealized model of perfect markets with rational investors and is thus defied by vast empirical evidence with conflicting results (Baker & Weigand 2015; Al-Najjar & Kilincarslan 2019). On the other hand, it is a convenient ingredient of standard valuation approaches since it entails that dividend payments are not detrimental to firm value, which is in turn a crucial assumption behind a number of valuation models (e.g. Penman, 2013).

This paper is motivated by the grim recognition that a solution to the dividend puzzle is scarcely near at hand despite some vigorous statements (Baker et al. 2002, Wang 2020; Dewasiri et al. 2022), and that there need not be a symmetric response of stock price and stock value to decisions in the sphere of dividend policy. Dividend policy is limited here only to payments of cash dividends, whereas other forms of dividend policy such as scrip dividends, non-cash dividends, share splits or reverse stock splits are not on the agenda. For the U.S. stock market and the recent period of more than three decades, the present paper studies how corporate value and stock price simultaneously react to the level and (in)stability of cash dividends. Stock value and stock price are expressed in relative terms, in which corporate value is operationalized through Tobin's q, and stock price is represented by four multiples popular in fundamental corporate analysis as tools of stock screening or comparative valuation, i.e. the P/E, P/B, P/S and P/FCF ratios. The adopted approach of considering Tobin's q (as a measure of relative value generated) simultaneously alongside the four multiples (as indicators of relative stock price) provides one more advantage on top of studying the asymmetries between corporate value and stock price. Another onlook is that linking corporate value to multiples may provide a justification of fundamental screening that recommends buying stocks with small multiples and selling stocks with high multiples. Furthermore, dividend policy is stated through three standard metrics (the dividend payout ratio, dividend yield and dividend per share) considered in levels and as rolling standard deviations. Each metric captures a different dimension of dividend policy and its standard deviation relays information on its (in)stability in the recent period.

The empirical design stands on 115,837 quarterly observations of most firms represented in the S&P Composite 1500® Index that otherwise reproduces 90% of U.S. market capitalization, being populated by traded firms of all market sizes (big caps, mid caps and small caps). In this, the selection of 1,466 firms and the choice of period from 1989 to 2022 are limited by data availability. The goal of the paper is to determine how relative corporate value and relative stock price of U.S. listed firms respond to the level and (in)stability of dividend policy. The analysis is based on a model of simultaneous panel data equations in which Tobin's q and the four multiples are explained by dividend policy metrics whilst controlling for size, firm operating characteristics and macroeconomic conditions. The simultaneous consideration of different metrics of pecuniary content of shares provides a holistic view of the mechanism through which dividend policy affects value generation and price.

Whereas it is fully appreciated that contemporary research on aspects of dividend policy concentrates on emerging or less developed markets (e.g. Aivazian et al. 2003; Rajverma et al. 2019; Jabbouri et al. 2016; Dang et al. 2021), the U.S. stock market is a prototype capital market where the otherwise naïve assumptions of perfect competition, information asymmetry, absence of frictions and information efficiency appear most plausible. Since 2001 research interest on systemic issues in dividend policy has been directed mostly to questions where dividend policy is not explanatory, but explained (Pinto et al. 2020). This has not changed in the past few years as the research agenda has only been enriched by studying effects of the Covid-19 pandemic on dividend policy (e.g. Krieger et al. 2021; Ali 2022). The paper reignites the research front where dividend policy is an explanatory factor, and explores its role in value generation and stock price determination. At least three novel contributions are made therewith. First, several metrics of pecuniary content are considered and modeled at a time in a rigorous econometric fashion. Second, relative value generation is contrasted from relative stock price determination in a way that allows relating dividend policy safely to various accounting fundamentals simultaneously (such as earnings in the case of P/E, book value in the case of P/B). Third, dividend policy is portrayed not only in terms of relative or absolute levels, but also in terms of its (in)stability. If dividend policy is not neutral for value, irregularity and erraticity of dividend payments are factors that are likely to act to the detriment of both value and price. To the best knowledge of the authors, none of these novelties have been accommodated in the extant literature to date.

It must also be noted that the present research agenda goes in tune with future challenges in dividend policy research as envisioned by Ed-Dafali et al. (2023, p. 17) in their meta-literature review who listed the uncertain effects of dividend yield upon market valuation premiums as one of the 77 future research questions worthy of pursuit.

The rest of the paper is organized into five other sections. Section 2 provides a brief literature review. Sections 3 and 4 describe basic properties of data, the econometric model, and explain the choice of variables. Section 5 presents the results and Section 6 concludes.

2. Literature review

Aside from the troubling dividend puzzle, there is a lack of consensus amongst theorists of corporate finance whether and how dividend policy matters for value, and their views are somewhat in stark contrast with those held by the main actors of dividend policy in firms. Historically, the initial formation of theories went alongside a single continuum ranging from the thought that dividends are attractive and indispensable to value creation (pro-dividend school) to the opinion that dividends have adverse effects on corporate value (anti-dividend school). Yet, the dominant and heavily criticized interpretation has been for years the claim of dividend neutrality made by Miller and Modigliani (1961), which DeAngelo & DeAngelo (2006, p. 296) describe as "the foundational bedrock of modern corporate finance theory". Particularly the latter two authors are the most prominent critics of Miller and Modigliani's concept of dividend irrelevance. For one thing, they demonstrated rigorously that dividend policy matters and should be oriented on the full distribution of value generated by the firm in operations (DeAngelo & DeAngelo, 2006). For another thing, they even called for rejecting the implication emphasized by Miller and Modigliani (1961) that there is no optimal dividend policy, on the grounds that this outlook provides no prescription for managerial behavior (DeAngelo & DeAngelo, 2007). That said, this is somewhat at variance with the findings of surveys amongst corporate chief executive and financial officers that have been popular since the 1950s (e.g. Baker & Jabbouri 2016, 2017). In spite of some occasional inconclusive findings, the prevalent position is that managers perceive that dividend policy matters and that both individual and institutional investors demand regular dividend payments (Baker et al. 2010, pp. 251-306). Albeit the charge against the notion of dividend irrelevance led by DeAngelo & DeAngelo (2006, 2007) may be viewed as somewhat harsh, the beliefs embraced by the parties actually involved in dividend policy in firms give this critique of dividend neutrality a substantial share of credibility. As is also emphasized by Bhattacharyya (2007, p. 5), Miller and Modigliani's dividend-irrelevance argument fails to explain why firms, the public and the investment community all perceive dividends as important. Still, many firms simply do not pay dividends, which is an unceasing observation that opens the list of 13 stylized facts about dividend policy compiled by Bhattacharyya (2007, p. 9). Notably, the high proportion of firms paying no dividends (also, e.g. Fama & French 2001) contradicts the position of DeAngelo & DeAngelo (2006, 2007) who argued in favor of "full payout" as an optimal dividend policy.

Albeit dividend irrelevance is appealing and deeply rooted in analytical corporate finance, it is odd that it is actually echoed marginally in the scholarly dividend literature. The reason being, it is explicitly studied only in 15 out of the 270 articles published between 1981 and 2022 and reviewed in a bibliometric study by Ed-Dafali et al. (2023, p. 8). Frankfurter & Wood (2002) contest the classical pro-dividend, anti-dividend and dividend-neutrality trichotomy and advocate a different categorization after the nature of market structure or investor rationality. Theoretical views are then categorized as full information theories, information asymmetry models and behavioral models. Detailed discussions of dividend policy theories are available, e.g. in Frankfurter & Wood (2002) themselves or Bhattacharyya (2007).

It is taken somewhat lightly in empirical corporate finance research that value is a rather vague and ambiguous category difficult to operationalize, and that in spite of a smorgasbord of valuation models (e.g. McKinsey et al. 2010; De Luca 2018) they all necessitate inputs that may be subjective or not easy to supply. Moreover, (intrinsic) value and (market) price are two completely different pecuniary notions, which is not always fully admitted. For instance, Frankfurter & Wood (2002) operate with the term stock price in situations when stock value is a more appropriate term. The difficulties associated with computing value (or rather estimating it) and the sometimes overlapping meanings of stock price and stock value gave rise to a simplification in dividend research. Value and price metrics are considered concurrently and often indiscriminately in variant formulations of the same model, whilst the authors may speak of performance. For instance, Rajverma et al. (2019) investigated, *inter alia*, the impact of dividend payouts upon firm performance of Indian firms for a decade between 2007 and 2017, whilst using Tobin's q, P/B and logarithmized stock price as measures of firm value. Dang et al. (2021) proxied corporate value by Tobin's q and (non-logarithmized) stock price in studying the impact of dividend policy upon value of Vietnamese firms for the period 2006–2017. Farrukh et al. (2017) performed a similar analysis for Pakistani firms for the period 2006–2015, in which they represented shareholders' wealth by both earnings per share and (non-logarithmized) stock price. Running separate regression, oftentimes in competing configurations, all these studies pronounced a positive impact of a higher dividend payout policy upon corporate value.

It seems that there are not many relevant studies inquiring into the effects of dividend policy upon firm value in the empirical format of this paper or of Rajverma et al. (2019), Dang et al. (2021), Farrukh et al. (2017). This realization prompted Hauser & Thornton (2015, p. 663) to state: "Surprisingly, we find little research into the economic significance of dividend policy." Unlike these and other studies, here a solid distinction is made between corporate value and stock price, if both being considered in relative terms. Concerning the former, Tobin's q is widely used to mirror the market's expectations of a firm's future cash flows not only in dividend studies (e.g. Rajverma et al. 2019; Dang et al. 2021), but also elsewhere (Zhu et al. 2020; He et al. 2022). Tobin's q is a proxy for investment opportunities that springs out from a neoclassical framework developed by Tobin (1969) and bases its investment advice on comparing the market value of the firm (in the numerator) with the replacement cost of assets (in the denominator).[1] Albeit Fama & French (2001), Baker & Wurgler (2004), Hauser & Thornton (2017) as well as Rajverma et al. (2019) assign a similar interpretation to the P/B ratio, this metric, alongside the P/E, P/S and P/FCF ratios, are deemed in this study as metrics of relative stock price. The reason being, they are conventionally defined as a ratio of stock price to a specific fundamental in financial statements (Penman 2013, p. 76). Called multiples in corporate practice, they may roughly be

[1] In fact, computation or estimation of Tobin's q in practice is cumbersome or complicated, for which reason there have arisen a good many accounting simplifications. This paper applies the approach of Chung & Pruitt (1994) or Perfect & Wiles (1994) owing to its popularity in finance research. Yet, there are arguments articulated, e.g. by Bendle & Butt (2018), that this approximation need not be ideal, especially outside the financial sphere.

interpreted as a price that investors are willing to pay for a monetary unit of earnings (P/E), book value of equity (P/B), sales (P/S) and free cash flow (P/FCF). In this form, multiples are mere standardized prices with respect do various bases (Damodaran 2012, p. 453), although the bank of possible outlooks is much richer (Penman 1996, pp. 235-236). A pivotal recommendation for value investing that emanates from the legacy of Benjamin Graham is to invest into (value) stocks with comparatively low levels of multiples and sell (growth) stocks with comparatively high levels of multiples (Penman 2013, pp. 79-82).

Some variance also exists in measuring dividend policy. Several indicators have been entertained in the past literature that consider the level of cash dividends, but disregard their unstable patterns or volatility. A straightforward measure is the dividend per share (DPS), but as an absolute metric fails to relate the size of the per-share dividend payment to both earnings and stock price. This is repaired by the dividend payout ratio (DPR) and the dividend yield (DY) that relate DPS to net earnings and stock price, respectively. Whereas the changing patterns of DPS emit instantaneous signals of adjustments in the propensity to pay dividends, the DPR and DY are more complex. For one thing, the DPR captures the compromise made between the preference of future growth opportunities and current cash distributions. For another, it can also be traced to a firm's optimal dividend policy (Li 2016, p. 639). The DY measures the cash return on equity, although not relative to its book value, but relative to its market price. Obviously, the most frequent metric is the DPR that was applied as a measure of dividend policy, e.g., by Fama & French (2001), Aivazian et al. (2003), Li (2016), Rajverma et al. (2019), Dang et al. (2021). The dividend yield was utilized, e.g., by Aivazian et al. (2003), Ucar (2016), Farrukh et al. (2017), Singh et al. (2019), Dang et al. (2021), whilst the DPS found use in Farrukh et al. (2017) and Singh et al. (2019).

Accumulated evidence reveals that dividend stability is a factor that seems important in the eyes of top management, but is not included in empirical models of dividend policy. For instance, in his pioneering field experiment that initiated corporate survey of managerial beliefs, Lintner (1956) was first to document that equityholders prefer stable dividends for U.S. firms. Baker & Farrelly (1988) found that financial directors of U.S. dividend achievers accentuate the role of dividend stability more than those of general firms. Allen (1992) designated the desire to maintain a stable payout ratio alongside the recent dividend history as the dominant factors for British firms. Similar findings speaking of maintaining consistent dividend levels or keeping constant target payouts, albeit varying in importance, were established in more recent surveys by Brav et al. (2005, 2008), or Baker & Smith (2006). Yet, dividend policy stability has not been considered as a factor of stock value or price as of yet. In spite of the more complex nature of DPR and DY over DPS, survey evidence sometimes indicates that market participants attach greater importance to stable dividends than stable payout ratios (Baker & Jabbouri 2016, 2017). Hence, instability in DPR and DY (measuring directly or indirectly payout ratios) may have a more distortive effect upon value creation and stock determination than instability in cash payments embodied in DPS. To some extent, the asymmetric response of stock value or price to instability in these different metrics of dividend policy may not surface in this study since dividend instability is mostly apparent in emerging markets (Adaoglu 2000).

In this paper, relative value and price metrics (Tobin's q and multiples) are as regressands related to dividend policy measures that act as explanatory factors. For the sake of completeness, regressions of Tobin's q and multiples are not entirely new especially in applied investing practice. That said, both regressors in these models and the philosophy are completely different. These models are predictive in nature and their purpose is to furnish the analyst with an appropriate estimate of price (value) to identify mispricing of the whole market or individual securities. Regressors may be macroeconomic variables, expectational quantities, specific operational characteristics (e.g. Tregler 2005, pp. 40-42; Damodaran 2012, chapters 17-20).

3. Data and their characteristics

The data for the analysis were primarily obtained from FirstRate Data LLC which provides quarterly financial statements of U.S. listed companies that are filed with the Securities and Exchange Commission (SEC) and made subsequently available to the public. The dataset begins in Q4/1985 and is adjusted for restatements. Some other requisite information was obtained from Stock Market MBA or the Federal Reserve Bank of St. Louis, or imputed ad hoc. Table A1 in the Appendix gives a list of variables entering the regression analysis alongside an indication of their source and measurement units. All ratios are expressed such, and not in form of percentages (e.g. payout, dy, ros). Almost all variables are formulated as relative measures except cap (being multinomial variables), tot_ass (being a monetary variable properly deflated to 2015 prices), and three dummy variables (being binary variables).

The level of dividend policy is represented by three simple metrics described in the previous section: DPR (payout), DY (dy) and DPS (dps). In order to capture the (in)stability of dividend policy, these metrics are converted into standard deviations calculated on a sliding basis with a window of 6 consecutive quarters: sd6_payout, sd6_dy and sd6_dps. This sliding manner of calculation resulted in shorter time series for these three variables at the beginning of the historical record. A small value points to a stable dividend policy.

The data set was collected and fixated as of Feb 2023 when the S&P 1500 comprised 1,503 stocks, and after the initial data screening removal of missing, incomplete or suspicious data, the exploitable sample reduced to 1,466 firms and a total of 115,837 quarterly observations ranging from Q4/1988 to Q3/2022. The sample consisted of 491 big caps, 392 mid caps and 583 small caps (whilst the S&P 1500 itself was populated by 503 big caps, 400 mid caps and 600 small caps). The sample had a format of unbalanced panel data with panels varying in length from 1 to 135 quarters. Since financial ratios are susceptible to atypical, nonsensical or non-defined values, and give in to immense variation that contaminates statistical explorations (e.g. negative values of multiples, division by zero values or negative debt-to-equity ratios), all firm-specific variables were winsorized as suggested by Boďa and Úradníček (2020). Winsorization was performed mostly on both sides at 0.035 applied to either side of the distribution, except the three standard deviation metrics, sd6_payout, sd6_dy and sd6_dps, that were winsorized only from above at 0.035. The cut-off level for winsorization was chosen to be fairly conservative and to retain most of the original information retained.

Basic descriptive statistics is reported in Table 1. As it happens, the sample is made up of firms that vary greatly in their quarterly characteristics and performance over the investigated period of three decades. The sample also includes firms that have economically unacceptable or alarming values of ratios, which in the present case means negative P/Es, P/FCFs, payout ratios, profit margins or net capital expenditure ratios. These instances testify of some (perhaps temporary) deficiencies in performance or indicate a certain set-up of dividend policy. For instance, a negative payout ratio or a payout ratio well above one signals a stable dividend policy maintained in the face of negative or low earnings, respectively.

Since the sample consists of firms that pursue an active dividend policy (i.e. pay some cash dividends on a regular or irregular basis) as well as those that implement a zero-dividend policy (i.e. they refrain from paying dividends entirely), three sub-samples of firms or observations can be distinguished:

- *Firms and observations when in a particular quarter some cash dividends are paid out regardless of the pattern applied in other quarters or the regularity or irregularity of* *dividend payments.* There are a total of 67,897 quarterly observations in the sample with a cash dividend paid, which pertains to 1,149 firms.

- *Firms and observations for firms that apply consistently a non-zero dividend policy with or without irregular patterns (such as skipping the dividend distribution in some of a few quarters).* The definition of a non-zero dividend policy requires that over twelve consecutive quarters (i.e. 3 years) a firm has made at least once a non-zero dividend payment. There are 77,692 such quarterly observations for 1,363 firms.
- *Firms and observations with no active dividend policy implemented.* To identify such firms, the definition of a non-zero dividend policy is simply negated, and a firm qualifies for a zero-dividend policy if it has paid no dividends whatsoever over twelve consecutive quarters (i.e. 3 years). There are 32,608 observations relating to 733 firms.

It is worth noting that the populations of firms with a non-zero dividend policy and those with a zero-dividend policy are not mutually exclusive for dividend policies may not be fixed over time, but managerial practices may (and really do) switch over decades. In fact, there are 630 firms that are included in either sample.

Hence, the full sample thus consists of 58.61% quarterly observations with a non-zero dividend payment, and 78.38% of firms in the sample over the investigated period made at least one dividend payment. From another angle, the sample contains 67.07% quarterly observations with a non-zero dividend policy, and a total of 92.97% of firms can be ascribed as firms active in the field of dividend policy.[2]

Table 1 Descriptive statistics of the variables applied in the analysis for all firms

Variable	# observations	Mean	Standard deviation	Minimum	Maximum	Median
Relative pecuniary metrics of firm value						
q1994	115,837	1.884	1.483	0.255	6.714	1.435
pe	115,837	18.607	27.145	-46.919	101.536	15.974
pb	115,837	3.299	2.980	0.450	13.499	2.287
ps	115,837	9.616	10.063	0.777	41.739	5.826
pfcf	115,837	37.547	143.919	-349.143	446.047	34.222
Metrics of dividend policy level and instability						
payout	115,837	0.267	0.437	–0.179	1.764	0.066
dy	115,837	0.004	0.005	0.000	0.019	0.002
dps	115,837	0.024	0.034	0.000	0.128	0.007
sd6_payout	113,225	0.412	0.898	0.000	4.008	0.052
sd6_dy	113,225	0.001	0.002	0.000	0.009	0.000
sd6_dps	113,225	0.024	0.051	0.000	0.225	0.003
Firm's characteristics and operating conditions						
tot_ass	115,837	1,542.787	2,892.354	15.138	12,799.190	361.845
assetturn	115,837	2.619	2.481	0.495	11.619	1.804
ros	115,837	0.076	0.129	–0.303	0.376	0.068
currat	115,837	2.167	1.720	0.000	7.608	1.720
ca2ta	115,837	0.410	0.253	0.000	0.891	0.408
debt2equity	115,837	0.660	0.796	0.000	3.349	0.413
capex2cf	115,837	0.314	0.695	–1.044	2.648	0.118
Macroeconomic conditions						
unrate	115,837	0.058	0.018	0.036	0.130	0.053
indpro_change	115,837	0.001	0.005	–0.022	0.015	0.002
cpi_change	115,837	0.006	0.006	–0.023	0.025	0.006
rintrate1Y	115,837	0.003	0.017	–0.030	0.043	–0.001
rgdp_gr	115,837	0.006	0.013	–0.085	0.079	0.006

[2] These proportions differ considerably from the statistics reported by Fama & French (2001) who detected a diminishing interest in paying cash dividends and who reported that in 1999 only 20.8% firms paid cash dividends. Nonetheless, as this share is derived from 5,113 U.S. listed firms in 1999, it includes a number of new listings with only a limited duration on a stock exchange in spite of their extraordinary investment opportunities.

gdp_gap	115,837	–0.015	0.020	–0.104	0.022	–0.013
Dummy variables						
dummy_gfc	115,837	0.067	0.250	0.000	1.000	0.000
dummy_covid	115,837	0.085	0.279	0.000	1.000	0.000
dummy_uawar	115,837	0.033	0.180	0.000	1.000	0.000

Note: The statistics on macroeconomic and dummy variables are computed from all firm-quarter observations as panels of individual firms vary from 1 to 135 quarters with an average length of 79.02 quarters. Aside from mean values, statistics on dummy variables do not convey their traditional meaning.

In a comparative fashion, Table A2 in the Appendix reproduces simplified descriptive statistics for the full sample and three sub-samples (i.e. "dividends paid", "non-zero dividend policy", and "zero dividend policy"), and confirms the presence of well-known differences between dividend payers and firms that do not pay dividends (e.g. Fama & French 2001). Firms that pay dividends are, on the whole, larger in size (tot_ass), more profitable or efficient (ros, assetturn), less flexible in terms of balance sheet structure (currat, ca2ta, debt2equity) and have more conservative Tobin's q and multiples (q1994, pe, pb, ps, pfcf). The detected heterogeneity is accommodated in the analysis by running separate models; to wit, for all observations, for observations with dividends paid, and for observations on firms with a non-zero dividend policy.

Finally, the relationship between the key variables, the five relative metrics of stock pecuniary content and three dividend policy metrics, is studied in Table A3 in the Appendix that shows the correlation matrix for all observations and observations for non-zero and zero dividend policy, respectively. Regardless of the approach to dividend policy, Tobin's q and the four multiples are all positively correlated, and correlations are stronger especially for the sub-sample of firms with a zero dividend policy. It seems that the P/B and P/S ratio reproduce fairly reliably information conveyed by Tobin's q. Likewise, the dividend policy metrics are strongly positively correlated, and the dividend yield seems very similar to the simple dividend per share. That said, the correlation between the two groups of key indicators is not very convincing in terms of absolute magnitude. The direction of association is not consistent and some correlation coefficients are not materially significant in spite of obvious statistical significance. The most notable association is between the payout dividend ratio and the P/E ratio, and is positive. Overall, the existence of strong correlation between Tobin's q and the multiples highlights only the need to study these ratios simultaneously, and not in isolation.

In order to provide reliable results, the adopted modeling approach expounded in the next section in fact requires that all variables included in regression equations be stationary. Some of the variables are represented in a manner avoiding trend-like patterns, especially in the case of macroeconomic variables (indpro_change, cpi_change, rgdp_gr, gdp_gap). For instance, an inflation rate cpi_change is employed instead of the price level, or an output gap estimate gdp_gap is employed instead of potential output. Yet, there may be uncertainty with some firm-specific variables such as Tobin's q and multiples (q1994, pe, pb, ps, pfcf) or total assets (tot_ass) that may display trending features. Table A4 in Appendix A reports the results of testing for unit roots in the relevant variables for which non-stationarity may be an issue. Specifically, the three dummy variables (dummy_gfc, dummy_covid, dummy_uawar) are not subject to the testing, and total assets are considered in the logarithmic form (log(tot_ass)), exactly as entered into the equations. In a manner consistent with the comparative estimation undertaken later in Section 5 for different categories of observations, the testing for unit roots is applied for all observations, for observations with (possibly occasional) dividend payments, and for observations of firms with a non-zero dividend policy. To assure some robustness, three standard panel unit root tests developed by Maddala & Wu (1999), Choi (2001) and Im et al. (2003) are utilized concurrently with intercepts included in individual ancillary regressions. They all have unit root in the null hypothesis, and stationarity as the alternative hypothesis. For brevity, as elsewhere, only statistical significances are reported, and they all indicate that all these time series in question can safely be handled as stationary. Two cases of an insignificant result (for ps and sd6_payout) are otherwise overridden by the results of other tests or the results for other sets of observations.

4. Modeling framework and empirical set-up

The modeling was based upon a set of five simultaneous equations with an identical set of regressors in each equation, but the model was applied in diverse regression configurations. With the benefit of a large data set, separate coefficients were estimated in a single model for small, mid and large caps. Hence, the information on market size embodied in the cap variable was taken explicitly into consideration. A generic model takes the following format

$$y^k_{i,t} = \alpha^k_i + \sum_c \iota(\text{cap}_{i,t} = c)\{\mathbf{x}'_{i,t}\boldsymbol{\beta}^{k,c} + \mathbf{z}'_t\boldsymbol{\delta}^{k,c}\} + u^k_{i,t}, \quad k \in \{1,...,5\},\ i \in \{1,...,N\},\ t \in T_i, \quad (1)$$

where the indices k, i, t and c designate the equation, firm, time and market capitalization category, respectively. The notation presumes that there are N firms, but with panels of history T_i possibly different for each firm i. The model is written compactly to include five equations, with $y^k_{i,t}$ being Tobin's q for k = 1, the P/E ratio for k = 2, the P/B ratio for k = 3, the P/S ratio for k = 4, and P/FCF ratio for k = 5. The random term is denoted by $u^k_{i,t}$, and the firm-specific intercept α^k_i is treated either as a fixed or random effect. The summation index c passes over all three capitalizations, i.e. c ∈ {small, mid, large}, and the index function ι(E) acts as a switcher that takes a value of 1 if E is true, and 0 otherwise. The summation representation assures that each capitalization c has its own equation-specific parameters $\boldsymbol{\beta}^{k,c}$ and $\boldsymbol{\delta}^{k,c}$, but these apply to the same firm-specific regressors $\mathbf{x}_{i,t}$ and systemic regressors $\mathbf{z}_t$.

More precisely, model (1) is a panel data model of seemingly unrelated regressions (SUR) whose further assumptions, algebraic properties and estimation details are available in Croissant & Millo (2019, pp. 64-68, pp. 154-157). Both fixed effects and random effects were considered and comparatively evaluated. They primarily differ in the assumptions placed on the intercept term α^k_i. A deeper description is omitted from the text since the distinction between both types of effects is well known. Conceptually, the generalization of a single-equation fixed-effect or random-effect model to the present SUR framework is trivial; yet, technically barely so. In order to account for correlation between the five equations in (5), three stage least squares (3SLS) were employed to estimate the parameters. Specifically, for random effects, the procedure rested in the approach of Baltagi (1981) combined with the method of Swamy & Arora (1972) to obtain initial estimates of covariance elements.

As suggested in the preceding section, the estimation was applied to all observations, for observations with dividends paid, and for observations on firms with a non-zero dividend policy. A total of six regression specifications, A1 & A2, B1 & B2, C1 & C2, were considered therewith according as only the level of dividend policy or both the level and the (in)stability were considered and included amongst regressors. Models A1 & A2 proxied dividend policy by the DPR, models B1 & B2 by the DY, and models C1 & C2 used DPS. For instance, the difference between models A1 and A2 is that A1 relies only one dividend policy regressor, payout, whereas A2 includes two such regressors, payout and sd6_payout. Using the notational convention of Table A1 in the Appendix, the equations in model (1) signify that relative stock value (q1994) as well as multiples (pe, pb, ps, pfcf) depend on dividend policy, specific operating-financial conditions $\mathbf{x}_{i,t}$ and general macroeconomic factors $\mathbf{z}_t$.

The vector of firm-specific regressors $\mathbf{x}_{i,t}$ was populated by variables proxying or measuring the firm's size (log(tot_ass)), liquidity (currat), asset and capital structure (ca2ta and debt2equity), sales profitability (ros), investment activity (capex2cf), dividend level (payout in models A1 & A2, dy in models B1 & B2, dps in models C1 & C2), and dividend (in)stability (sd6_payout in model A2, sd6_dy in model B2, sd6_dps in model C2). Hence, the length of $\mathbf{x}_{i,t}$ was

8 variables in models A1, B1 & C1, and 9 variables in models A2, B2 & C2. The vector of systemic macro factors $\mathbf{z}_t$ was identical to all firms and models and was made up of proxies or measures of labor force underutilization (unrate), industrial production change (indpro_change), inflation (cpi_change), real interest rates (rintrate1Y), real product change (rgdp_gr), business cycle phase (gdp_gap) and dummies for the Global Financial Crisis, Covid-19 pandemic and Russo-Ukrainian war (dummy_gfc, dummy_covid, dummy_uawar). As a results, it consisted of 9 variables.

In consequence of the “capitalization-switching” specification, models A1, B1 and C1 counted 3 × (8 + 9) = 51 parameters in the vectors $\boldsymbol{\beta}^{k,c}$ and $\boldsymbol{\delta}^{k,c}$, and models A2, B2 and C2 comprised 3 × (9 + 9) = 54 parameters. The number of observations per equation varied between a maximum 115,837 (all observations, models A1, B1 & C1) and a minimum 66,428 (observations with dividends paid, models A2, B2 & C2), which provided a safe margin for the associated loss in degrees of freedom.

The analysis was in entirety conducted in program R (R Core Team, 2023) with the help of functionalities of the `plm` packagee (Croissant & Millo, 2008).

5. Results

The full regression output is fairly extensive, and is therefore available only as the Online Appendix. Concise relevant portions of the output for models A1, B1 and C1 (only the level of dividend policy) and for models A2, B2 and C2 (both the level and (in)stability of dividend policy) are available in Tables 2, 3 and 4. These three tables report the results obtained indiscriminately for all observations (Table 2), for observations with a quarterly dividend payment (Table 3), and for observations of firms identified as applying a non-zero dividend policy (Table 4). Whereas the results for all firms in Table 2 apply also to firms paying no dividends or occasional non-payers, the results in Tables 3 and 4 are sort of better targeted estimates when dividend paying firms are spotlighted.

The full report includes estimates for both fixed and random effects, but the concise extracts are limited only to the models that came out as consistent according to the Hausman test at a 0.05 level of significance. In most cases it is fixed effects, but in three cases displayed in Table 3 the Hausman test gives an insignificant result, and random effects are reported instead. Nonetheless, there is no substantive difference between fixed and random effects anyway. Three variants of the R^2 measure are provided for the system and each equation, as they all have different informational power.[3] The small values of the R^2 (raw) measure indicate that individual effects take a considerable portion of overall variability. The determinants of the estimated cross-equation correlation matrices (in absolute values) far from zero indicate the existence of non-negligible correlation between the equations, and validate the use of 3SLS and a system framework.[4] With this correlation, separate per-equation estimation would likely be inefficient.

Tables 2, 3 and 4 exhibit only estimated regression coefficients for level and volatility metrics of dividend policy *granted they are significant at a 0.05 level*. Coefficients found insignificant are not displayed. In addition, each equation is subjected to two Wald-type tests to check as to whether the dividend policy measures (level metric or also volatility metric) for firm firms of all capitalization size are zero and whether there is no difference between small,

[3] “R^2 (demeaned)“ is derived from demeaned form of the model that follows from using a “within“ estimator. “R^2 (raw)“ appertains to original observations with ignorance of effects, “R^2 (conditional)“ pertains to original observations with full inclusion of estimated fixed or predicted random effects.

[4] The determinant of an identity matrix is 1 and the determinant of a square matrix filled by ones is 0, which provides the boundaries for possible values of a real correlation matrix with elements reset to their absolute values. Hence, the closer the determinant of a correlation matrix with absolute values is to 0, the stronger are the correlations.

mid and large cap firms regarding these measures. Insignificance of the former Wald test indicates a neutral influence of dividend policy.

In spite of the seeming heterogeneity of information conveyed by Tables 2, 3 and 4, some findings transpire as consistent. In the following summary, no distinction is drawn between observations with a dividend payment (Table 3) and firms applying a non-zero dividend policy (Table 4) owing the qualitative congruence of the results.

1. In comparative terms, equations for Tobin's q and P/S are most successful in terms of explanatory power regardless of the regression configuration.
2. *Dividend policy, in one form or another, does exert its systematic influence upon relative stock price and value regardless of the regression configuration.* This is discernible both in the individual estimated coefficients and in the results of the Wald test. Almost all dividend policy metrics are significant across firms of different capitalizations. Exceptions are the influence of DPS upon P/E for dividend payers and the DPR on P/S for dividend paying and non-paying firms. Notwithstanding, Tobin's q and other multiples are significantly influenced in these cases.
3. As follows from a casual comparison of the estimated regression coefficients and chiefly from the results of the Wald test, in most cases the effect of dividend policy upon relative stock price and value is unequal across firms of different capitalizations. This holds almost as a rule when all firms are treated as a block, representing a mixture of dividend payers and non-payers. Hence, also *firm size in terms of capitalization generally matters for the effects of dividend policy*.
4. For all firms and for dividend payers, the response of Tobin's q to dividend policy is asymmetric and depends on whether dividends are measured in relative or absolute terms. Tobin's q responds negatively to the relative dividend policy metrics, DPR and DY, but positively to the absolute amount of cash dividends, DPS. In other words, higher relative stock values are associated with smaller dividend payout ratios and yields, but higher dividend payments. In consequence, dividend policy does matter for value and dividends are relevant, but the market assigns different interpretations to signals from dividend policy. Whereas cash dividends are greeted favorably and translate to a higher relative stock value, dividend policy impacts value negatively when cash dividends are high relative to earnings made (new value generated) or current traded price (current perception of value). A less regular pattern is detected for the effect of dividend policy instability since instability in dividend payout ratios has a detrimental influence on relative stock value, but instability in cash dividend payments is mostly a positive factor. All in all, this suggests that value is positively driven by cash dividends updated upwards whilst maintaining a fixed payout ratio. Disregarding possible share issues or repurchases, this setting implies that cash dividends should be increased by realizing high(er) net earnings at an unchanged payout ratio so as to achieve a larger relative stock value, and advices against raising dividends without an appropriate coverage of higher earnings.
5. For all firms and for dividend payers, P/FCF seems virtually insensitive to dividend policy, albeit it may respond negatively to the level of the DY. For most capitalization sizes, dividend policy metrics for both level and instability are insignificant and attest to a zero influence. The detected pattern of constant P/FCF across different dividend policy settings divorces P/FCF from the other three multiples. Dividend policy does not affect the manner how the market prices corporate cash flow.
6. For all firms and for dividend payers, the level of the DPR is found a consistently positive factor of P/E, a mostly deleterious factor of P/B and a neutral or positive factor of P/S. Yet, the instability of the DPR exerts a negative influence upon all these three multiples. Controlled for other factors, firms with high and stable payout ratios record, on average,

higher P/E and P/B ratios. Yet, the effect of the DPR is asymmetric since higher dividend ratios translate to smaller P/B ratios.

7. For all firms and for dividend payers, the DY impacts negatively, through its level and instability, upon P/E, P/B and P/S. Controlled for other factors, firms with higher dividend yields show lower P/E, P/B and P/S ratios, and these are even decreased with erratic dividend yields.
8. For all firms and for dividend payers, the level of DPS seems mostly of a negative or neutral impact upon P/E, but its instability may improve P/E. That said, the effect of DPS upon P/B is positive or mostly positive, although the instability of DPS exerts mostly a neutral influence. Hence, the amount of cash dividends acts positively in regard to P/B and partially also P/S ratios, but seems to be of a neutral impact upon P/E ratios.
9. Finally, the estimated regression coefficients of dividend policy do not always vary monotonically with three capitalization categories (i.e. small caps – mid caps – big caps). Notwithstanding, the response of Tobin's q and P/S to all metrics of the dividend policy level as well as the response of P/B to the DPR and DY or the response of P/E to the DY is regularly more pronounced for small caps. The pattern indicates that corporate value and relative stock price in small-cap firms are typically more exposed to variation in dividend policy settings than in mid-cap or large-cap firms. This heightened sensitivity is another manifestation of small firms, and may be ascribed to the size effect.

In summary, these results indicate that dividend policy affects relative stock value and price differently and the effect varies with diverse conceptualizations of dividend policy. The only metric of relative stock price that is found irresponsive to both the level and the (in)stability of dividend policy is the P/FCF ratio. The dividend yield is systematically negatively correlated with relative stock value captured by Tobin's q and relative stock price captured by the P/E, P/B and P/S ratio. Absolute amounts of cash dividends boost relative stock value as proxied by Tobin's q, but when taken relative to net earnings as dividend payout ratios, their influence is negative. The P/B ratio behaves in a way similar to Tobin's q. Most often, the instability of dividend policy is detrimental or at least neutral to relative stock value represented by Tobin's q and relative stock price measured by P/E, P/B, P/S, except some infrequent cases associated with the volatility of cash dividends represented by DPS. These deviations from a general pattern may be due to the asymmetric nature of standard deviation as a measure of variation, which means that also increases in paid dividends are deemed as (unnecessary) variation. Corporate value and some multiples of small-cap firms are more exposed to settings in the level of dividend policy than firms of a higher capitalization.

To some degree, it is possible to contrast the present results with those of other studies grounded in a similar econometric configuration. Whilst Dang et al. (2020) discovered a favorable impact of the dividend yield upon Tobin's q for Vietnamese firms (2,278 annual observations), here the impact is established negative. Albeit Rajverma et al. (2019) found for Indian firms a positive effect of the dividend payout ratio upon both Tobin's q and the P/B ratio (4,210 annual observations), the present study in both cases indicates a negative effect. The present findings are thus in contradiction with both of the cited studies. On the one hand, their focus is upon emerging markets with a more modest data set. On the other hand, this inconsistence may only be an indication that the effects of dividend policy need not be uniform across different economic environments. Emerging markets are marked typically by rather volatile and often irregular economic conditions that inevitably impact the price-setting mechanism of financial markets or shapes views on dividend policy. An example is inflation since in emerging markets like Vietnam or India inflation tends to be higher and less predictable than in the U.S. It has been noted that dividend policy may be distorted by inflationary pressures (e.g. Basse & Reddemann 2011, pp. 36-37) and that there may be asymmetries in how dividend decisions are undertaken in an inflationary environment of developing and advanced countries (e.g. Baker & Jabbouri 2016, p. 281). In emerging markets dividend payments are conditional on satisfactory corporate earnings (Adaoglu 2000), in consequence of which instability may affect the underlying mechanism between dividend policy and stock value and price. Finally, the detected irregularity in responsiveness of relative stock value and price to dividend instability, according as dividend policy is operationalized by DPS or the other two metrics, may be related to the differentiated perceptions of market participants who are more anxious about instability in cash dividends than payout ratios, even though this finding is established for an emerging market (Baker & Jabbouri 2016, 2017).

6. Summary and conclusion

The paper studies the currently somewhat neglected question of how dividend policy affects corporate value generation or its market perception. Whereas the extensive room paid to dividend issues in the scholarly literature and textbooks of corporate finance leaves no one in doubt about the significance of dividend policy for corporate management, the theoretic position is not so straightforward since there is no consensus on the reasons for which firms pay cash dividends (i.e. the dividend puzzle) and what effect dividends have upon firm value. Miller & Modigliani (1961) may have laid foundations of analytical corporate finance, but their theory is contested on a number of objections, and this skepticism is likely to continue. Interestingly, there are not many relevant studies that would explore the links between dividend policy and corporate value in spite of the fact that this link, or its "absence", is the central assertion of Miller and Modigliani's dividend neutrality. Responding to the faltering interest in these issues, the paper investigates in a case study of U.S. listed firms represented in the S&P Composite 1500® Index how dividend policy affects relative corporate value and stock price. By using 115,837 quarterly observations for more than three decades of history, dividend policy is operationalized by three different metrics, whereas relative corporate value is proxied by Tobin's q and relative stock price by four popular multiples. The handful of relevant studies of this sort focused upon emerging markets, and operated with sparser data sets. In the present case, the use of Tobin's q for relative corporate valuation is more justified since the U.S. stock market, not necessarily efficient, is a liquid market with a plethora of participants and heavy trading; hence, stock price adjusts swiftly to new signals.

The econometric analysis hinges upon several configurations of a SUR model consisting of five simultaneous equations with Tobin's q and four multiples as regressands. The results indicate that dividend policy matters for both relative corporate value and relative stock price, albeit the effects are differentiated and asymmetric. Relative corporate value of U.S. firms increases with the amount of cash dividends, but decreases in respect of the dividend payout ratio and yield. The pattern exhibited by relative stock price is more varied and heterogeneous. Yet, the P/FCF ratio seems rather unaffected by dividend policy of whatever construal. The pattern of response of the P/B ratio to dividend policy mimics closely the response of Tobin's q. In contrast, the P/E ratio responds agreeably to the dividend payout ratio, but is rather insensitive to the amount of cash dividends. The pattern of reaction of the P/S ratio is more irregular. Finally, the instability of dividend policy exerts generally a negative impact on Tobin's q, the P/E, P/B and P/S ratio except the effect of variation in absolute cash dividends per share upon Tobin's q. Corporate value in small firms is more sensitive to the configuration in dividend policy than in mid-cap or large-cap firms.

Managers are right that dividends matter. The results defy the thesis of dividend neutrality formulated by Miller & Modigliani (1961) even though the effect of dividends upon corporate value is not uniform and depends on their measurement. Corporate value reacts positively to the level and instability of dollar dividend payments, but negatively to the level and instability of dividend ratios, which suggests for corporate financial management a value-maximizing dividend strategy oriented on growth of per-share dividend payments, but with a constant (non necessarily high) target payout ratio. This is attainable through growth in per-share net earnings and application of a stable dividend payout ratio. It is somewhat untoward that the asymmetric response of corporate value to different dividend categories both points against dividend neutrality and opposes pro-dividend and anti-dividend views simultaneously.

The findings also have implications for practical investing based on multiples. Screening on multiples is normally undertaken without any heed to dividend policies adopted by the firms, and the sole advice is to choose stocks with small values of multiples. When such a screening is conducted with the use of the P/E ratio, this means preferring stocks with possibly high per-share dividend payments, but low payout ratios, which is synchronous with the reaction of Tobin's q to dividend policy. In the case of such stocks, corporate value indicated by Tobin's q is comparatively higher. The said synchronicity is cum grano salis manifested also by the P/S ratio, but the P/B ratio varies with dividend policy differently. This means that for dividend-paying stocks, screening on multiples should rely on the P/E or P/S ratio, or on their combination. A combination of two or more multiples in screening is fairly common (e.g. Rossi & Forte 2016, pp. 38-41), but for dividend-paying stocks the most common combination P/E & P/B should be avoided, and perhaps replaced by P/E & P/S.

Of course, in spite of the good intention to make the present analysis comprehensive and address several issues that transpire in the extant empirical analysis, the findings are fairly limited by the focus on the U.S stock market, and their discrepancy with the few relevant studies posits a question whether they are also compatible with the realities of emerging, or at least non-U.S., markets. Some factors have not been taken into consideration such as life cycle (Baker & Weigand 2015, p. 136), risk (Rajverma et al. 2019) or cultural influences and broader societal and institutional phenomena (Bae et al. 2012; Ucar et al. 2016), even though these represent a promising research front. Some of them can only be implemented in a comparative context with a panel of countries.

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Table 2 Selected regression results for all observations

Model		Only level of dividend policy			Both level and instability of dividend policy		
		A1 (payout)	**B1 (dy)**	**C1 (dps)**	**A2 (payout)**	**B2 (dy)**	**C2 (dps)**
System							
Observations		115,837 (unbalanced, N = 1,466, T = 1–135)			113,225 (unbalanced, N = 1,420, T = 2–135)		
Hausman test		***	***	***	***	***	***
Reported effects		fixed	fixed	fixed	fixed	fixed	fixed
R^2 (demeaned)		0.2026	0.1667	0.1617	0.2043	0.1492	0.1630
R^2 (raw)		0.0862	0.0554	0.0516	0.0865	0.0534	0.0515
R^2 (conditional)		0.4368	0.4361	0.4337	0.4389	0.3275	0.4358
det(|est.Σ_{cor}|)		0.2931	0.3082	0.2964	0.2878	0.3028	0.2911
Tobin's q							
big caps	level metric	-0.056***	-54.511***	1.282***	-0.051***	-54.289***	1.050***
	volatility metric				-0.019***	-8.938**	0.237*
mid caps	level metric	-0.084***	-37.185***	0.579*	-0.075***	-34.292***	0.800**
	volatility metric				-0.015*	-15.288***	
small caps	level metric		-20.136***	2.759***	0.031*	-21.638***	2.172***
	volatility metric				-0.029***	6.212*	1.145***
R^2 (demeaned)		0.1185	0.1343	0.1195	0.1210	0.0427	0.1227
R^2 (raw)		0.0447	0.0507	0.0451	0.0453	0.0417	0.0459
R^2 (conditional)		0.6662	0.6718	0.6666	0.6699	0.1219	0.6705
Wald test (all zero)		***	***	***	***	***	***
Wald test (all equal)		***	***	***	***	***	***
P/E							
big caps	level metric	35.925***	-689.930***	-19.709***	36.572***	-650.138***	-18.726**
	volatility metric				-0.606***	-305.025***	
mid caps	level metric	37.370***	-433.089***	-34.068***	37.862***	-381.657***	-35.143***
	volatility metric				-0.717***		
small caps	level metric	32.495***	-232.913***		33.209***	-207.728***	
	volatility metric				-0.776***	-152.425*	
R^2 (demeaned)		0.2475	0.0427	0.0416	0.2500	0.0427	0.0415
R^2 (raw)		0.2136	0.0416	0.0391	0.2158	0.0417	0.0391
R^2 (conditional)		0.1388	0.1221	0.1219	0.1389	0.1219	0.1218
Wald test (all zero)		***	***	***	***	***	***
Wald test (all equal)		***	***	*	***	***	*
P/B							
big caps	level metric	-0.079**	-131.974***	5.605***	-0.063*	-123.491***	5.419***
	volatility metric				-0.050***	-61.244***	
mid caps	level metric	-0.115***	-88.454***	2.802***	-0.099**	-81.385***	2.872***
	volatility metric				-0.039**	-44.090***	
small caps	level metric	0.058*	-55.368***	4.937***	0.082**	-57.537***	3.380***
	volatility metric				-0.062***		2.541***
R^2 (demeaned)		0.4449	0.4483	0.4453	0.4442	0.4482	0.4448
R^2 (raw)		0.1358	0.1420	0.1367	0.1343	0.1408	0.1353
R^2 (conditional)		0.6021	0.6076	0.6029	0.6046	0.6104	0.6055
Wald test (all zero)		***	***	***	***	***	***
Wald test (all equal)		***	***	***	***	***	***

Model		Only level of dividend policy			Both level and instability of dividend policy		
		A1 (payout)	B1 (dy)	C1 (dps)	A2 (payout)	B2 (dy)	C2 (dps)
P/S							
big caps	level metric		-461.201***	4.960***		-439.461***	5.109***
	volatility metric				-0.134***	-158.990***	
mid caps	level metric		-280.331***		0.216*	-248.568***	
	volatility metric				-0.273***	-165.708***	-1.782*
small caps	level metric	1.021***	-137.646***	21.690***	1.103***	-130.639***	18.233***
	volatility metric				-0.301***		3.930***
R^2 (demeaned)		0.1825	0.1886	0.1824	0.1871	0.1932	0.1865
R^2 (raw)		0.0187	0.0241	0.0187	0.0192	0.0246	0.0190
R^2 (conditional)		0.7074	0.7094	0.7074	0.7117	0.7137	0.7116
Wald test (all zero)		***	***	***	***	***	***
Wald test (all equal)		***	***	***	***	***	***
P/FCF							
big caps	level metric		-1597.984***	-122.529***		-1692.892***	-130.481***
	volatility metric						
mid caps	level metric						
	volatility metric						
small caps	level metric						
	volatility metric						
R^2 (demeaned)		0.0194	0.0194	0.0195	0.0191	0.0192	0.0193
R^2 (raw)		0.0180	0.0185	0.0184	0.0179	0.0184	0.0183
R^2 (conditional)		0.0697	0.0697	0.0697	0.0695	0.0695	0.0695
Wald test (all zero)		•	***	***	ns	***	***
Wald test (all equal)		*	***	***	•	***	***

Note: A full regression report for both fixed and random effects can be found in the Online Appendix. To conserve space, the regression output in this table is limited solely to dividend policy metrics representing level and instability, and only the effects that are indicated by the Hausman test at a 0.05 level of significance are displayed in this table. In addition, only estimates of regression coefficients significant at a 0.05 level of significance are reported, and for the Hausman and Wald tests, only significance labels are displayed.

Legend: Significance labels follow this notational norm: *** for a p-value ≤ 0.001, ** for a p-value ≤ 0.01, * for a p-value ≤ 0.05, • for a p-value ≤ 0.10, ns otherwise.

Table 3 Selected regression results for observations with dividends paid

Model		Only level of dividend policy			Both level and instability of dividend policy		
		A1 (payout)	**B1 (dy)**	**C1 (dps)**	**A2 (payout)**	**B2 (dy)**	**C2 (dps)**
System							
Observations		67,897 (unbalanced, N = 1,149, T = 1–135)			66,428 (unbalanced, N = 1,112, T = 1–135)		
Hausman test		•	ns	***	***	ns	***
Reported effects		random	random	fixed	fixed	random	fixed
R^2 (demeaned)		0.2761	0.1841	0.1654	0.2800	0.1864	0.1675
R^2 (raw)		0.0001	0.0001	0.0001	0.0001	0.0001	0.0001
R^2 (conditional)		0.2700	0.2627	0.2836	0.2818	0.2620	0.2827
$\det(\lvert est.\Sigma_{cor}\rvert)$				0.1654	0.2800		0.1675
$\det(\lvert est.\Sigma_{cor,individ}\rvert)$		0.3421	0.3021			0.2864	
$\det(\lvert est.\Sigma_{cor,idiosyncratic}\rvert)$		0.3322	0.4057			0.3962	
Tobin's q							
big caps	level metric	-0.068***	-67.593***	2.060***	-0.054***	-67.355***	1.921***
	volatility metric				-0.040***		0.331***
mid caps	level metric	-0.061***	-47.592***	0.711**	-0.056***	-48.383***	0.769**
	volatility metric				-0.012*		
small caps	level metric	-0.049***	-40.198***	2.192***	-0.034**	-42.564***	1.941***
	volatility metric				-0.039***	7.598**	0.768***
R^2 (demeaned)		0.1177	0.1798	0.1195	0.1222	0.1825	0.1235
R^2 (raw)		0.0001	0.0001	0.0001	0.0001	0.0001	0.0001
R^2 (conditional)		0.3912	0.3619	0.3906	0.3876	0.2885	0.3869
Wald test (all zero)		***	***	***	***	***	***
Wald test (all equal)		ns	***	***	ns	***	***
P/E							
big caps	level metric	40.353***	-893.200***		41.000***	-856.594***	
	volatility metric				-0.840***	-327.668***	
mid caps	level metric	41.964***	-655.957***		42.532***	-593.026***	-19.595*
	volatility metric				-1.021***		
small caps	level metric	40.025***	-482.058***		40.777***	-433.746***	
	volatility metric				-1.219***	-306.986***	
R^2 (demeaned)		0.5672	0.0178	0.0132	0.5712	0.0169	0.0127
R^2 (raw)		0.0000	0.0000	0.0001	0.0000	0.0000	0.0001
R^2 (conditional)		0.3050	0.3097	0.3096	0.3057	0.3105	0.3106
Wald test (all zero)		***	***	•	***	***	•
Wald test (all equal)		***	***	ns	***	***	ns
P/B							
big caps	level metric	-0.144***	-175.335***	6.263***	-0.111***	-168.040***	6.207***
	volatility metric				-0.098***	-47.570***	
mid caps	level metric	-0.085**	-122.701***	4.036***	-0.070*	-123.796***	3.806***
	volatility metric				-0.047***		
small caps	level metric	-0.064**	-105.001***	5.308***		-107.845***	4.124***
	volatility metric				-0.080***	13.834*	2.341***
R^2 (demeaned)		0.5067	0.5058	0.5141	0.5112	0.5189	0.5064
R^2 (raw)		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
R^2 (conditional)		0.0996	0.0978	0.0974	0.0992	0.0971	0.0992
Wald test (all zero)		***	***	***	***	***	***
Wald test (all equal)		*	***	**	***	***	***

Model		Only level of dividend policy			Both level and instability of dividend policy		
		A1 (payout)	**B1 (dy)**	**C1 (dps)**	**A2 (payout)**	**B2 (dy)**	**C2 (dps)**
P/S							
big caps	level metric		-546.077***	7.655***		-526.656***	8.853***
	volatility metric				-0.101***	-127.382***	
mid caps	level metric	0.245**	-362.985***		0.326***	-342.694***	
	volatility metric				-0.233***	-81.047***	
small caps	level metric	0.557***	-286.147***	18.664***	0.568***	-274.479***	14.764***
	volatility metric				-0.243***	-43.217**	2.929***
R^2 (demeaned)		0.1758	0.1745	0.1936	0.1787	0.1971	0.1784
R^2 (raw)		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
R^2 (conditional)		0.2430	0.2422	0.2420	0.2437	0.2428	0.2437
Wald test (all zero)		***	***	***	***	***	***
Wald test (all equal)		***	***	***	***	***	***
P/FCF							
big caps	level metric		-2108.258***	-73.452*		-2118.562***	
	volatility metric						
mid caps	level metric		-999.377**			-941.638**	
	volatility metric						
small caps	level metric		-1057.167***			-1044.418***	
	volatility metric				-2.257*		
R^2 (demeaned)		0.0163	0.0165	0.0164	0.0166	0.0167	0.0166
R^2 (raw)		0.0002	0.0003	0.0003	0.0002	0.0003	0.0002
R^2 (conditional)		0.3754	0.3736	0.3735	0.3730	0.3712	0.3730
Wald test (all zero)		ns	ns	***	ns	***	ns
Wald test (all equal)		ns	**	ns	•	**	ns

Note: A full regression report for both fixed and random effects can be found in the Online Appendix. To conserve space, the regression output in this table is limited solely to dividend policy metrics representing level and instability, and only the effects that are indicated by the Hausman test at a 0.05 level of significance are displayed in this table. In addition, only estimates of regression coefficients significant at a 0.05 level of significance are reported, and for the Hausman and Wald tests, only significance labels are displayed.

Legend: Significance labels follow this notational norm: *** for a p-value $\leq$ 0.001, ** for a p-value $\leq$ 0.01, * for a p-value $\leq$ 0.05, • for a p-value $\leq$ 0.10, ns otherwise.

Table 4 Selected regression results for observations on firms with a non-zero dividend policy

Model		**Only level of dividend policy**			**Both level and instability of dividend policy**		
		A1 (payout)	**B1 (dy)**	**C1 (dps)**	**A2 (payout)**	**B2 (dy)**	**C2 (dps)**
System							
Observations		77,692 (unbalanced, N = 1,363, T = 1–135)			77,692 (unbalanced, N = 1,363, T = 1–135)		
Hausman test		***	***	***	***	***	***
Reported effects		fixed	fixed	fixed	fixed	fixed	fixed
R^2 (demeaned)		0.2424	0.1745	0.1640	0.2428	0.1472	0.1644
R^2 (raw)		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
R^2 (conditional)		0.3380	0.3348	0.3383	0.3379	0.3089	0.3383
$\det(\lvert est.\Sigma_{cor}\rvert)$		0.3023	0.3379	0.3122	0.3030	0.3384	0.3127
Tobin's q							
big caps	level metric	-0.050***	-55.968***	2.416***	-0.041***	-54.622***	2.269***
	volatility metric				-0.023***	-9.424***	0.412***
mid caps	level metric	-0.078***	-40.608***	1.142***	-0.069***	-38.167***	1.171***
	volatility metric				-0.019**	-15.295***	
small caps	level metric	-0.046***	-28.767***	1.552***	-0.027*	-28.036***	1.063***
	volatility metric				-0.049***	-5.204*	0.909***
R^2 (demeaned)		0.1264	0.1614	0.1283	0.1277	0.0226	0.1296
R^2 (raw)		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
R^2 (conditional)		0.4062	0.3892	0.4058	0.4053	0.2600	0.4055
Wald test (all zero)		***	***	***	***	***	***
Wald test (all equal)		ns	***	***	•	***	***
P/E							
big caps	level metric	38.428***	-680.521***		38.653***	-625.581***	
	volatility metric				-0.582***	-384.862***	
mid caps	level metric	39.050***	-469.816***	-18.182*	39.427***	-423.777***	-19.645*
	volatility metric				-0.857***	-288.508**	
small caps	level metric	35.428***	-294.840***		35.823***	-256.280***	
	volatility metric				-1.041***	-274.396***	
R^2 (demeaned)		0.4145	0.0222	0.0202	0.4150	0.0226	0.0203
R^2 (raw)		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
R^2 (conditional)		0.2582	0.2600	0.2599	0.2582	0.2600	0.2600
Wald test (all zero)		***	***	•	***	***	•
Wald test (all equal)		***	***	ns	***	***	•
P/B							
big caps	level metric	-0.080**	-138.614***	7.403***	-0.057*	-129.152***	7.335***
	volatility metric				-0.059***	-66.277***	
mid caps	level metric	-0.096**	-96.163***	4.952***	-0.078**	-89.614***	4.829***
	volatility metric				-0.040**	-41.045***	
small caps	level metric		-70.230***	4.118***		-67.986***	2.745***
	volatility metric				-0.079***	-15.969**	2.558***
R^2 (demeaned)		0.4830	0.4875	0.4831	0.4831	0.4886	0.4835
R^2 (raw)		0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
R^2 (conditional)		0.1089	0.1088	0.1089	0.1089	0.1088	0.1089
Wald test (all zero)		***	***	***	**	***	***
Wald test (all equal)		ns	***	***	ns	***	***

Model		Only level of dividend policy			Both level and instability of dividend policy		
		A1 (payout)	B1 (dy)	C1 (dps)	A2 (payout)	B2 (dy)	C2 (dps)
P/S							
big caps	level metric		-462.164***	12.243***		-438.100***	12.149***
	volatility metric					-168.572***	
mid caps	level metric		-292.592***		0.190*	-266.682***	
	volatility metric				-0.195***	-162.368***	
small caps	level metric	0.524***	-188.957***	15.271***	0.644***	-177.570***	12.910***
	volatility metric				-0.316***	-81.034***	4.396***
R^2 (demeaned)		0.1705	0.1838	0.1711	0.1709	0.1848	0.1712
R^2 (raw)		0.0001	0.0000	0.0001	0.0001	0.0000	0.0001
R^2 (conditional)		0.3467	0.3457	0.3466	0.3468	0.3455	0.3467
Wald test (all zero)		***	***	***	***	***	***
Wald test (all equal)		***	***	***	***	***	***
P/FCF							
big caps	level metric		-1726.074***			-1715.131***	-68.774*
	volatility metric						
mid caps	level metric						
	volatility metric						
small caps	level metric			88.231*			
	volatility metric				-2.198*		
R^2 (demeaned)		0.0174	0.0175	0.0175	0.0174	0.0175	0.0175
R^2 (raw)		0.0001	0.0001	0.0001	0.0001	0.0001	0.0001
R^2 (conditional)		0.5701	0.5701	0.5701	0.5701	0.5701	0.5702
Wald test (all zero)		ns	***	*	ns	***	*
Wald test (all equal)		ns	***	**	ns	***	**

Note: A full regression report for both fixed and random effects can be found in the Online Appendix. To conserve space, the regression output in this table is limited solely to dividend policy metrics representing level and instability, and only the effects that are indicated by the Hausman test at a 0.05 level of significance are displayed in this table. In addition, only estimates of regression coefficients significant at a 0.05 level of significance are reported, and for the Hausman and Wald tests, only significance labels are displayed.

Legend: Significance labels follow this notational norm: *** for a p-value ≤ 0.001, ** for a p-value ≤ 0.01, * for a p-value ≤ 0.05, • for a p-value ≤ 0.10, ns otherwise.

Appendix

Table A1 Variables applied in the analysis and their sources

Notation	Definition and units of measurement	Source
Relative pecuniary metrics of firm value		
q1994	Tobin's Q§ (= (market capitalization + book value of net debt) / book value of total assets)	Db*
pe	P/E ratio (= market capitalization / net earnings)	Db
pb	P/B ratio (= market capitalization / book value of equity)	Db
ps	P/S ratio (= market capitalization / total sales)	Db
pfcf	P/FCF ratio (= market capitalization / free cash flow)	Db
Dividend policy metrics of level and instability		
payout	Dividend payout ratio†	Db
dy	Dividend yield†	Db
dps	Dividend per share (real US$)	Db*
sd6_payout	Rolling standard deviation of payout over 6 consecutive quarters	Db*
sd6_dy	Rolling standard deviation of dy over 6 consecutive quarters	Db*
sd6_dps	Rolling standard deviation of dps over 6 consecutive quarters	Db*
Firm's characteristics and operating conditions		
cap	Market capitalization category (3 nominal size classes: small, mid, large)	SM
tot_ass	Total assets (millions of real US$)	Db*
assetturn	Asset turnover†	Db*
ros	Profit margin (return on sales)†	Db*
currat	Current ratio†	Db
ca2ta	Current to total assets ratio†	Db*
debt2equity	Debt to equity ratio†	Db
capex2cf	Net capital expenditure to free cash flow ratio†	Db*
Macroeconomic conditions		
unrate	Civilian unemployment rate†	FRED
indpro_change	Change of the industrial production index (quarterly change) †	FRED
cpi_change	Consumer price index inflation (quarterly change) †	FRED
rintrate1Y	One-year real interest rate (p.a.) †	FRED
realgdp_gr	Real gross domestic product growth rate (quarterly change) †	FRED
gdp_gap	Real output gap †	FRED
Dummy variables		
dummy_gfc	Dummy for the Global Financial Crisis (1 throughout all quarters of 2007 and 2008)	ad hoc
dummy_covid	Dummy for the Covid-19 pandemic (1 throughout all quarters of 2020 and 2021)	ad hoc
dummy_uawar	Dummy for the Russia-Ukraine war (1 throughout all quarters of 2022)	ad hoc

Legend: §) In line with empirical convention, Tobin's q was computed by using the simplified accounting-based formula developed independently by Chung & Pruitt (1994), and Perfect & Wiles (1994). †) The dagger symbol in the superscript † signals that the variable is expressed as a proportion or a relative quantity (and not as a percentage). The following notation is adopted for sources of data: "Db" indicates values available outright from Financial Data db (https://financialdatadb.com/d/us-historical-financial-data), "Db*" stands for values calculated additionally from data provided by Financial Data db, "SM" signals Stock Market MBA (https://stockmarketmba.com/), "FRED" denotes the Federal Reserve Economic Data platform (https://fred.stlouisfed.org/), and "ad hoc" signals manual imputation.

Note: Non-macroeconomic volume variables and ratio indicators are derived from balance sheet, income and cash flow items reported in quarterly financial statements.

Table A2 Descriptive statistics of the variables applied in the analysis for all firms

Group of firms	All observations (# obs = 115,837)		Dividends paid (# obs = 67,897)		Non-zero dividend policy (# obs = 77,692)		Zero dividend policy (# obs = 32,608)	
Variable	Mean	Median	Mean	Median	Mean	Median	Mean	Median
Relative pecuniary metrics of firm value								
q1994	1.884	1.435	1.574	1.296	1.688	1.342	2.374	1.767
pe	18.607	15.974	18.731	15.962	18.563	15.959	19.164	16.721
pb	3.299	2.287	3.060	2.162	3.168	2.211	3.672	2.580
ps	9.616	5.826	9.098	5.739	9.105	5.629	10.614	6.348
pfcf	37.547	34.222	39.396	37.200	37.259	35.188	39.854	34.368
Dividend policy metrics of level and instability								
payout	0.267	0.066	0.456	0.316	0.381	0.250	0.000	0.000
dy	0.004	0.002	0.007	0.005	0.006	0.004	0.000	0.000
dps	0.024	0.007	0.041	0.030	0.034	0.023	0.000	0.000
sd6_payout	0.412	0.052	0.655	0.190	0.582	0.148	0.000	0.000
sd6_dy	0.001	0.000	0.002	0.001	0.002	0.001	0.000	0.000
sd6_dps	0.024	0.003	0.034	0.011	0.033	0.009	0.000	0.000
Firm's characteristics and operating conditions								
tot_ass	1,542.787	361.845	2,184.167	661.640	1,911.094	511.857	616.673	162.490
assetturn	2.619	1.804	2.988	2.073	2.846	1.988	1.947	1.404
ros	0.076	0.068	0.100	0.079	0.089	0.074	0.046	0.054
currat	2.167	1.720	1.781	1.467	1.914	1.554	2.812	2.245
ca2ta	0.410	0.408	0.350	0.343	0.373	0.367	0.504	0.510
debt2equity	0.660	0.413	0.744	0.532	0.718	0.496	0.495	0.195
capex2cf	0.314	0.118	0.335	0.116	0.334	0.121	0.276	0.125

Table A3 Correlation matrix of the key variables

	q1994	pe	pb	ps	pfcf	payout	dy	dps
All observations (# obs = 115,837)								
q1994	1.000							
pe	0.323	1.000						
pb	0.664	0.339	1.000					
ps	0.605	0.317	0.453	1.000				
pfcf	0.251	0.235	0.246	0.249	1.000			
payout	–0.088	0.324	–0.010	0.109	0.082	1.000		
dy	–0.250	–0.035	–0.178	0.000	0.005	0.766	1.000	
dps	–0.161	0.033	–0.056	0.084	0.063	0.767	0.922	1.000
Non–zero dividend policy (# obs = 77,692)								
q1994	1.000							
pe	0.372	1.000						
pb	0.649	0.357	1.000					
ps	0.561	0.357	0.395	1.000				
pfcf	0.277	0.213	0.261	0.258	1.000			
payout	0.031	0.484	0.019	0.220	0.108	1.000		
dy	–0.209	–0.084	–0.242	0.037	–0.017	0.681	1.000	
dps	–0.026	0.057	0.001	0.207	0.101	0.650	0.790	1.000
Zero dividend policy (# obs = 32,608)								
q1994	1.000							
pe	0.240	1.000						
pb	0.710	0.303	1.000					
ps	0.739	0.255	0.610	1.000				
pfcf	0.213	0.269	0.224	0.243	1.000			
payout	NA	NA	NA	NA	NA	1.000		
dy	NA	NA	NA	NA	NA	NA	1.000	
dps	NA	NA	NA	NA	NA	NA	NA	1.000

Note: Albeit Spearman correlation is employed to measure pair-wise association between the variables, the results are not altogether different from Pearson correlation. Dividend metrics for zero-dividend policy firms were all zero, which makes calculation of correlation both insensible and impossible, which is indicated by NAs.

Table A4 Panel unit root tests for the variables applied in the analysis

Group of firms	All observations (# usable obs = 96,444)			Dividends paid (# usable obs = 49,573)			Non-zero dividend policy (# usable obs = 61,036)		
Test	MW	Choi	IPS	MW	Choi	IPS	MW	Choi	IPS
Relative pecuniary metrics of firm value									
q1994	***	***	***	***	***	***	***	***	***
pe	***	***	***	***	***	***	***	***	***
pb	***	***	***	***	***	***	***	***	***
ps	***	***	***	ns	***	***	***	***	***
pfcf	***	***	***	***	***	***	***	***	***
Dividend policy metrics of level and instability									
payout	***	***	***	***	***	***	***	***	***
dy	***	***	***	***	***	***	***	***	***
dps	***	***	***	***	***	***	***	***	***
sd6_payout	***	***	***	***	***	***	ns	***	***
sd6_dy	***	***	***	***	***	***	***	***	***
sd6_dps	***	***	***	***	***	***	***	***	***
Firm's characteristics and operating conditions									
tot_ass	***	***	***	***	***	***	***	***	***
assetturn	***	***	***	***	***	***	***	***	***
ros	***	***	***	***	***	***	***	***	***
currat	***	***	***	***	***	***	***	***	***
ca2ta	***	***	***	***	***	***	***	***	***
debt2equity	***	***	***	***	***	***	***	***	***
capex2cf	***	***	***	***	***	***	***	***	***

Note: The choice of testing procedures was limited by their ability to handle non-balanced panels. In particular, a modified P test recommended for use with macro panels (which is the case now as the number of units is "large") is selected from amongst the testing procedures proposed by Choi (2001). To assure meaningful results, the original data set was reduced to contain at least 12 consecutive quarterly observations for each firm, which explains the decrease of the effective sample size for the testing. The lag length needed in ancillary regressions was determined by dint of the Schwarz information criterion restricted to 4 quarterly lags at most.

Amongst Legend: MW, Choi and IPS denote the panel unit root tests of Maddala & Wu (1999), Choi (2001) and Im et al. (2003), respectively. Significance labels follow this notational norm: *** for a p-value ≤ 0.001, ** for a p-value ≤ 0.01, * for a p-value ≤ 0.05, • for a p-value ≤ 0.10, ns otherwise.