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What drives dividend smoothing? A meta regression analysis of the Lintner model

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ABSTRACT

We revisit the view of dividend smoothing as one of the most robust findings in the empirical corporate finance literature by employing meta-regression analysis (MRA). Using 99 empirical studies that employ Lintner`s dividend payout model we investigate the heterogeneity in reported dividend smoothing effects. We find evidence for (i) a mediocre degree of dividend smoothing across the analyzed literature, (ii) bi-directional publication bias -i.e. a tendency to preferably report positive and statistically significant smoothing as well as dividend smoothing coefficients close to zero (i.e. high speed of adjustment coefficients), and (iii) several drivers for the heterogeneity in reported smoothing coefficients such as the set of control variables or estimation technique. Our MRA can provide guidance for investors' expectations and future research on dividend smoothing.

JEL Classification: C83, G32, G35

Keywords: Meta regression analysis, dividend smoothing, Lintner model, publication bias

1. Introduction

The analysis of firms` cash disbursal to shareholders is a fundamental field of study within financial economics. Conducting a survey of 28 companies in the US, Lintner (1956) drew two key conclusions about corporate payout policy: (i) firms strongly base their current dividend on the previous dividend ("dividend smoothing") and (ii) firms have a long-term target payout ratio and partially adjust their dividend towards it, where a stronger adjustment reflects a higher speed of adjustment. Whereas the emergence of stock repurchases as an alternative payout method (Grullon and Michaely, 2002) is a major challenge for the assumption of a long-term payout ratio based on dividends only, the prior literature has rarely challenged the assumption of dividend smoothing.

Although the existence of dividend smoothing is regarded as a robust finding in the empirical literature, subsequent to Lintner's (1956) seminal study, its degree varies widely across the vast amount of empirical research. Factors such as the considered time period (Brav et al., 2005), the investigated country (Chemmanur et al., 2010) or the consideration of firm characteristics in the estimation of dividend payouts (Leary and Michaely, 2011) are potential drivers of these heterogeneous findings. However, the literature lacks a detailed understanding about the drivers of the variation in reported dividend smoothing coefficients. Added together, diverse empirical results as well as contradicting theoretical assumptions on dividend payout policies and smoothing effects indicate the need for a holistic quantitative overview of previous findings.

We therefore use a meta regression analysis (MRA) framework based on the MRA guidelines of Stanley et al. (2013) to provide a summarizing picture of this core topic of empirical corporate finance literature. Our MRA comprises 99 empirical studies on dividend smoothing that differ in study design characteristics such as the analyzed firms, region, time period, or the employed econometric technique.

Our study adds to the literature in several ways: (i) we assess whether previous results on dividend smoothing are affected by publication bias, i.e. a tendency to favor statistically significant results or findings that support a specific economic theory (Stanley, 2005), (ii) we summarize reported smoothing effects and derive a proxy for the 'true' effect after correction for potential publication bias, and (iii) we evaluate the modifications that have been made relative to Lintner's (1956) seminal study and identify the study characteristics that impact reported smoothing effects. The MRA results therefore offer a nuanced view on the different dividend smoothing effects reported in the literature and can provide helpful hints for future research on this important topic.

MRA refers to a meta-study where regression analysis is performed on previous regression results related to a specific research topic (Stanley and Jarrell, 1989). MRA hence is an approach to summarize existing empirical results on a specific economic phenomenon taking into account factors related to the underlying study design, such as the analyzed region, country, time period or the employed econometric technique, that drive heterogeneity in results (Nelson and Kennedy, 2009). According to Stanley (2001) there is consensus that MRA offers significant advantages compared to classical meta-analysis approaches such as narrative literature reviews. Initiated by Card and Krueger's (1995) seminal analysis on the relationship between minimum wages and employment MRA has been applied to a wide range of economic research areas[1] (e.g. Jarrell and Stanley, 1990; Longhi et al., 2005; Card et al., 2010; Feld et al., 2013; Bakucs et al., 2014; Oczkowski and Doucouliagos, 2014; Post and Byron, 2015; Valickova et al., 2015; Wang and Shailer, 2015; Zigraiova and Havranek, 2016; Demena and van Bergeijk, 2017).

[1] The application of MRA has its roots in natural science (e.g. DerSimonian and Laird, 1986)

Different empirical results may either reflect sampling errors or bias, mistakes in the analysis (Trotman and Wood, 1991), or reveal true differences in the analyzed population (Wang and Shailer, 2015). MRA enables to identify those issues, thus providing a quantitative overview across previous findings that allows to identify proxies for ’true’ dividend smoothing effects as well as publication biases. Moreover, MRA provides a setting to identify study characteristics such as the analyzed country, time span or employed data sets and econometric estimators that drive heterogeneity in reported results (Nelson and Kennedy, 2009; Hirsch, 2018). The MRA is particularly useful for the analysis of dividend smoothing as (i) all studies are based on the work of Lintner (1956) as a common model which implies that reported coefficients have a uniform interpretation across primary studies and (ii) the empirical results are mostly based on independent samples ensuring large heterogeneity in the meta data (Oczkowski and Doucouliagos, 2014). While previous summarizing insights on smoothing effects have mainly been derived on a subjective perception of a few key studies, MRA can draw a detailed picture on the reasons for the heterogeneous results found in the literature and allows to track the impact of all methodological refinements that have been made relative to Lintner’s (1956) seminal study.

Our results reveal a mediocre degree of dividend smoothing across the analyzed literature and provide evidence for bi-directional publication bias. In particular, we detect a preference to either report positive and statistically significant dividend smoothing coefficients or low dividend smoothing close to zero which indicates a high speed of adjustment of dividends towards a target payment. Moreover, we find that reported dividend smoothing effects are severely affected by study design characteristics. In line with several theoretical models such as agency, signaling, or tax models, controlling for firm characteristics in the estimation of dividend smoothing can play an important role in explaining heterogeneous dividend smoothing effects. We find that studies controlling for ownership report significantly higher dividend smoothing, while the consideration of debt and size among the set of control variables does not significantly influence dividend smoothing coefficients.[2] Moreover, our results suggest that there is no strong evidence for country specific differences in dividend smoothing. In contrast to several studies arguing in favor of higher dividend smoothing in the US –without conducting a systematical empirical literature review (e.g. Dewenter and Warther, 1998; Chemmanur et al., 2010)– we do not find a higher degree of dividend smoothing for the US compared to studies investigating the EU (excluding the UK), the UK, or developing countries. The emergence of stock repurchases is often regarded as a reason for a higher dividend smoothing in recent years. The availability of an alternative payout channel may allow firms to keep their dividend constant even in case of unexpected earnings changes. However, our results do not support the conclusion that dividend smoothing has increased subsequent to the availability of stock repurchases as an alternative payout method. The MRA also reveals significant differences of firms from the financial sector and other industries. Thus, our MRA provides investors with an estimate of the degree of dividend smoothing that can be expected depending on the market and the industry they invest in. Studies that rely on cash flows instead of published earnings as profit measure report significant higher dividend smoothing coefficients. Finally, our results confirm that applying GMM as the theoretically consistent econometric estimator for dividend smoothing can avoid an upward bias in the estimation of smoothing coefficients.

[2] Note that the MRA does not reveal the direct impact of additional control variables (e.g. size or debt) on dividend smoothing. In contrast, the MRA reveals the impact that omission/inclusion of these variables in the primary literature has on the resulting dividend smoothing coefficient.

The remainder of this paper proceeds as follows. Section 2 reviews the theoretical and empirical literature on dividend payout policies with a particular focus on Lintner`s model. In section 3, we present the MRA data generation and some descriptive statistics. Section 4 presents the MRA design and estimation results, while section 5 concludes.

2. Lintner model and further developments

The modern economic foundation of payout policy dates back to the seminal study by Modigliani and Miller (1958). Their irrelevance theorem does not only indicate the conditions under which payout policy is relevant for firm value such as taxes (Miller and Scholes, 1978), agency costs (Jensen, 1986) or dividend signaling models (Bhattarchya, 1979; Miller and Rock, 1985). It also stands in sharp contrast to a vast amount of literature that documents several drivers of payout policy. Dividend smoothing is one of the most robust findings in the empirical corporate finance literature and was first reported in Lintner's study (1956). Based on his survey evidence Lintner (1956) captures the idea of dividend smoothing and the existence of a long-term target payout of a firm *i* based on the following model:

$$\Delta D_{i,t} = \alpha_i + \lambda_i (D^*_{i,t} - D_{i,t-1}) + u_{i,t} \tag{1}$$

$$D^*_{i,t} = r_i E_{i,t} \tag{2}$$

where $\Delta D_{i,t}$ corresponds to the change in dividend payments relative to the dividend payments in the previous period ($D_{i,t-1}$). $D^*_{i,t}$ is the target dividend payment assumed to be equal to a fraction r_i of current after tax-earnings ($E_{i,t}$), λ_i reflects the speed of adjustment towards the target payment, and

$u_{i,t}$ is an error term. A coefficient of $0 < \hat{\lambda}_i < 1$ indicates that firms adjust their dividends partially towards the target in a given period. $\hat{\lambda}_i = 0$ (1) corresponds to no (full) adjustment.[3] Finally, Lintner (1956) assumes a positive constant (α_i) reflecting managers' reluctance to cut dividends.

Inserting (2) into (1) and rearranging yields the following equation:

$$D_{i,t} = \alpha_i + \lambda_i r_i E_{i,t} + (1-\lambda_i) D_{i,t-1} + u_{i,t} \tag{3}$$

If we set $\lambda_i r_i = b_i$ and $1 - \lambda_i = d_i$ we end up with the following equation, which we refer to as the 'classical Lintner model' (Andres et al., 2009; Andres et al., 2015; Fama, 1974; Skinner, 2008):

$$D_{i,t} = \alpha_i + b_i E_{i,t} + d_i D_{i,t-1} + u_{i,t} \tag{4}$$

where $d_i = 1 - \hat{\lambda}_i$ can be interpreted as the degree of dividend smoothing. High values of d_i imply that managers strongly base current dividend payments on previous payments.[4]

Lintner (1956) tests this model using a sample of 28 US companies for the period 1947-1953 using OLS as estimation method. He finds a speed of adjustment of about 1/3 corresponding to a smoothing coefficient of 2/3 and a constant of 0.35. In accordance with Lintner's prediction, several other earlier

[3] Empirically, the speed of adjustment is not restricted to fall into the interval [0; 1]. In a robustness check, we exclude dividend smoothing coefficients outside this interval. This applies to 99 observations. The results are robust to this alternative sample.

[4] In the empirical implementation of (4) a constant speed of adjustment (λ) and target payout ratio (r) across analyzed firms is assumed.

studies such as Fama and Babiak (1968) and Watts (1973) also find smoothing coefficients close to 2/3 and a small but positive constant.

Until today, the partial adjustment model specified by (4) is still widely used in empirical studies dealing with dividend payouts (e.g. Michaely and Roberts, 2012; Andres et al., 2015). However, these studies differ heavily with respect to the analyzed time span, the investigated country, the econometric technique, or modifications of (4) leading to large heterogeneity in reported dividend smoothing parameters.

Following Lintner (1956) researchers started to adjust the classical model (equation (4)) by incorporating theoretical considerations as well as empirical phenomena more properly. Whereas empirical aspects concern the choice of the earnings measure or the appropriate estimation technique, theoretical considerations are primarily concerned with the extension of (4) by the correct set of control variables. In the following, we provide an overview of the most important modifications relative to the original work of Lintner (1956).

Fama and Babiak (1968) argue that target dividend payments are based on a fixed ratio of current earnings but assume that earnings are determined by the following process:

$$E_{i,t} = (1+\delta_i)E_{i,t-1} + v_{i,t} \tag{5}$$

with $v_{i,t}$ representing a serially uncorrelated error term. They further assume that dividends are fully adjusted to the expected change in earnings $\delta_i E_{i,t-1}$ but partially adjusted to the earnings surprise $(E_{i,t} - \delta_i E_{i,t-1})$. Using this assumption, plugging (2) and (5) in (1) yields:[5]

[5] Some authors (e.g. Dharan, 1988; Hines, 1996) include further lags of either the earnings or the dividend parameter.

$$\Delta D_{i,t} = \alpha_i + c_i \left[r_i (E_{i,t} - \delta_i E_{i,t-1}) - D_{i,t-1} \right] + r_i \delta_i E_{i,t-1} + u_{i,t} \tag{6}$$

Rearranging and setting $1 - c_i = d_i$, $b_i = c_i r_i$, and $f_i = r_i \delta_i (1 - c_i)$ leads to the following equation:

$$D_{i,t} = \alpha_i + d_i D_{i,t-1} + b_i E_{i,t} + f_i E_{i,t-1} + u_{i,t} \tag{7}$$

Lintner's (1956) findings are based on accounting profits as a measure of earnings. An important strand of the literature though relates dividend payments to the mitigation of free-cash-flow problems (e.g. Allen et al., 2000; Easterbrook, 1984; Jensen, 1986). Firms might be more inclined to adjust their dividend payments due to changes in cash flows. For this reason, many authors rely on cash-flows instead of or in addition to accounting profits when modelling dividend payouts (e.g. Andres et al., 2009; Renneboog and Szilagyi, 2015).

A further refinement relative to Lintner (1956) concerns an econometric issue. The classical Lintner model and its extensions include the lagged dependent variable among the set of independent variables. In this case, using OLS yields upward biased coefficient estimates ($\hat{d}$) of the lagged dependent variable (Hsiao, 1986). The within-group estimator, in turn, which has been used by many authors in subsequent studies, leads to a downward biased coefficient (Nickell, 1981; Baltagi, 2008). A growing number of studies (e.g. Naceur et al., 2006; Pindado et al., 2012; Andres et al., 2015) hence rely on Arellano and Bond's (1991) GMM-in-differences or Arellano and Bover's (1995)/Blundell and Bond's (1998)

GMM-in-systems estimators.[6] These approaches yield unbiased coefficient estimates ($\hat{d}$) of the lagged dependent variable (Baltagi, 2008).

The substantial rise in the volume of stock repurchases in and outside the US marks a major challenge for the concept of a long-term dividend payout. In recent studies, Skinner (2008), Brav et al. (2005), and Leary and Michaely (2011) report evidence questioning that firms base their payout on a target dividend ratio. Whereas stock repurchases gained in importance in the US from 1980 onwards, they emerged as an alternative payout method in many non-US countries at the end of the 1990s (Manconi et al., 2017).[7] The availability of a different payout method suggest that firms might use stock repurchases to disburse temporary earnings (Jagannathan et al., 2000) leading to higher dividend smoothing. Andres et al. (2015), Brav et al. (2005), and Choe (1990) find evidence in line with this prediction.

In addition, institutional differences across countries such as the taxation of dividends and capital gains or the frequency of dividend payments might be another reason for heterogeneous results in dividend smoothing. Andres et al. (2009), McDonald et al. (1975), and Short et al. (2002) find dividend smoothing coefficients that are different from the US analyzing samples of German, French, and UK firms, respectively. Chemmanur et al. (2010) compare the dividend policies of firms in the US and Hong Kong and relate the finding of a more flexible dividend payout in Hong Kong to differences in

[6] Arellano and Bover (1995) and Blundell and Bond (1998) show that GMM-in-systems is superior to GMM-in-differences when applied to samples with a short time series dimension.

[7] The basis for stock repurchases in the EU is the Second Council Directive of December, 13th, 1976 (77/91/EEC). However, as EU countries still had to translate the directive into national law, the volume in stock repurchases did not reach meaningful levels in any EU country before the end of the 1990s.

the equity ownership and tax regime across the two countries. As the tax status of investors as well as their equity ownership might also differ within countries, Chemmanur et al.'s (2010) finding can also be interpreted as consistent with different firm characteristics as drivers for the heterogeneity in dividend smoothing.

Leary and Michaely (2011) provide a thorough overview of potential firm-specific characteristics that are important to consider when estimating the degree of dividend smoothing. As we show in our meta-analysis, firm size, ownership structure as well as leverage are among the most commonly used firm characteristics that have been used as control variables in Lintner-type partial adjustment models. The inclusion of these variables is in line with agency models (e.g. Easterbrook, 1984; Jensen, 1986), signaling models (e.g. Bhattarchya, 1979; Miller and Rock, 1985), or tax-based models (e.g. Miller and Scholes, 1978; Allen et al., 2000). The MRA can reveal the impact of their inclusion/omission in equations (4) and (7) on the resulting degree of dividend smoothing.

Finally, several studies have excluded financial firms from their analysis due to different regulatory requirements for these firms. In addition, the evidence of DeAngelo et al. (2004) suggests substantial differences in payout policies across industries. We therefore consider industry sectors as another potential driver of heterogeneity in smoothing effects.

3. Meta regression data & descriptive statistics

In section 3.1 we describe the process of identifying the studies included in our MRA. Subsequently, we provide some descriptive statistics with respect to relevant study design characteristics in section 3.2.

3.1 SAMPLE SELECTION

First, we performed a literature search based on the MRA guidelines of Stanley et al. (2013) to identify all potentially relevant unpublished and published empirical studies on dividend smoothing. We performed an initial search with all reasonable combinations of the following key terms: "dividends", "payouts", "Lintner model", "dividend smoothing", "target payout", and "speed of adjustment". The following databases have been employed for the literature search: Econstor, Google Scholar, SSRN, Jstor, Wiley, Business Source Premier EBSCOhost, NBER, Econ papers. We then checked the reference lists of the identified studies by means of snowballing techniques to identify studies that have not been detected by the initial key term search (Longhi et al., 2005). This resulted in an initial set of 407 published and unpublished research papers. We then checked whether those studies are based on an empirical estimation of Lintner`s model or an extension of the latter. As MRA requires a uniform interpretation across the included coefficients, we excluded 6 studies that used logarithms of dividends and/or earnings. For the same reason 10 studies that estimated dividend smoothing individually for each firm and afterwards report mean values are dropped from the sample.[8] In addition, we ensured that articles by "predatory" publishers according to "Beall`s List of Predatory Journals and Publishers" are not considered.[9] Finally, we further excluded studies which are an earlier working paper version of a subsequently published paper. However, whenever two versions exist we compared the working paper version to the published version. More specifically, we extracted 28 unpublished smoothing coefficients from two working papers which have been excluded from the published version.

[8] If only means of firm-level smoothing coefficients are reported this also implies that precision measures for individual estimates are not available.

[9] This led to the exclusion of 3 articles. For more information on this list see: https://beallslist.weebly.com/.

Comparing the results of unpublished working papers to those of published articles allows to assess the presence of publication bias, caused by what is known as the file-drawer problem. This phenomenon arises if authors or editors prefer statistically significant results that support a particular theory (Valickova et al., 2015). However, as most articles are working papers before being eventually published it remains unclear whether recent working papers will remain unpublished gray literature or if they are published in their current form (Hirsch, 2018). Therefore, similar to Hirsch (2018) we only consider working papers that have been finalized more than five years ago (i.e. pre 2012) as "true" unpublished working papers that potentially suffer from the file-drawer problem.[10]

A more common option to test for publication bias is to analyze the relationship between reported coefficients and their estimation precision. We therefore excluded studies that fail to report a precision measure for individual estimates such as standard errors, p-values or t-values.[11] Moreover, as will become apparent below, the availability of precision measures is crucial for the correct econometric implementation of the MRA. Some studies focus on the estimation of the speed of adjustment coefficient ($\hat{\lambda}$) according to eq. (1) while others are interested in determining dividend smoothing ($\hat{d}$) (eq. (4) and (7)). We therefore converted all speed of adjustment coefficients to smoothing coefficients according to $\hat{d} = 1 - \hat{\lambda}$.

[10] As the literature provides little guidance on a specific time frame, we also classify papers that have been finalized more than three years ago as "true" unpublished papers as a robustness check. Note that it can also be the case that articles are not published due to quality issues with respect to method applied, writing style etc. If rational authors nevertheless already adopt the strategy to produce "desirable" results in the earlier stages of research as they prepare for journal publication including working papers in the MRA does not help to detect publication bias (Rusnak et al. 2013).

[11] Lintner (1956) is one example for a study that we had to exclude due to missing information on estimation precision.

To control our sample for unreasonable observations e.g. caused by reporting errors in the underlying studies we performed multivariate outlier screening using the 'bacon' algorithm proposed by Billor et al. (2000), which identifies outliers based on Mahalanobis distances (Weber, 2010). The application of the bacon algorithm led to the exclusion of 19 unreasonable observations.[12] This led to a final sample of 99 studies and 979 dividend smoothing coefficients ($\hat{d}$), the main coefficient of interest in our empirical analysis. 86 studies report several coefficients which are the result of estimations for subsamples or estimations based on different econometric approaches.[13] It is important to note that our final dataset comprises a diverse set of dividend smoothing estimates where each of the 979 identified coefficients refers to a unique combination of underlying dataset, model specification, regional focus, or time period analyzed.

Table A1 in the appendix provides a chronological overview of the final set of 99 studies on dividend smoothing. It can be observed that the literature search has identified a comprehensive dataset including studies from 1957 to 2016. Moreover, mean and median values of smoothing coefficients per

[12] E.g. two studies reported implausible standard errors. In both cases for the same underlying sample of firms and only slightly different model specifications significantly different standard errors for the smoothing coefficient that diverged by a factor of >1000 were reported.

[13] Examples are Persson (2013) who reports coefficients for different industry sectors, or Foerster and Sapp (2006) who split their sample into three different time frames. However, some reported results referring to subsamples within studies had to be excluded from our analysis as they cannot be captured by the MRA due to the fact that they only appear once. Examples are Athari et al. (2016) who report separate results related to a subsample of islamic banks, Persson (2013) who reports results for subsamples of firms with different market caps (small, mid, large), or Ameer (2007) who reports results for subsamples related to high and low growth firms.

study are reported in the right columns and provide a first indication that dividend smoothing varies significantly across literature.

3.2 DESCRIPTIVE STATISTICS

Table 1 summarizes the variables included in the MRA. It can be observed that the mean smoothing coefficient across included studies is 0.562 indicating the presence of a mediocre and slightly lower degree of dividend smoothing in comparison to Lintner's (1956) findings. The included explanatory variables have been selected based on two criteria: (i) the MRA shall cover the development from the classical Lintner model (equation 4) to more recent extensions and specifications as described in section 2 and (ii) cover to the largest possible extend the study design characteristics used to generate the dividend smoothing coefficients.

Table 1 reveals that 11.2% of identified smoothing coefficients originate from working papers that are at least five years old. 47.0% of the coefficients relate to a mean year of the analyzed sample after 1998. The year 1998 has been selected as a threshold since a large number of countries included in our dataset exhibits meaningful levels of stock repurchases as an additional payout channel from the end of the 1990s onwards. Baltagi (2008) shows that estimating partial adjustment models such as (4) and (7) with OLS leads to upward biased smoothing coefficients. Nevertheless, only 14.7% of the 979 coefficients have been generated by applying the unbiased GMM estimator while the remainder has either been estimated using OLS (55.3%), the fixed effects (within) estimator (15.7%), or by means of other methods (14.3%).[14] As pointed out above the GMM estimator can be differentiated into the difference- and system-approach with the system-estimator being superior when applied to panels with

[14] Examples for other methods are Probit, Tobit, Logit or Random Effects estimations.

a small time series dimension. However, as the majority of studies do not report which of the GMM approaches has been used, we do not further differentiate between GMM-in-systems and GMM-in-differences in our MRA. In addition, as the underlying literature is based on relatively long panels with an average time series dimension of 12.5 years, there are likely no significant differences in the results generated with the two approaches.

As regards extensions of the classical Lintner model specified by (4) it can be observed that 42.0% of reported coefficients are generated based on the classical version while the remainder of coefficients has been estimated based on extensions that include further explanatory variables such as firm size, debt, and ownership. While firm size (13.9%), debt (10.4%), and ownership (16.6%) represent the core of additional explanatory variables, 41.9% of the identified coefficients relate to estimations that include other firm-specific explanatory variables such as liquidity or growth opportunities.[15] Due to the heterogeneity of those variables across literature, they can only be considered as a joint set of 'other' explanatory variables. Another deviation from the original work of Lintner (1956) refers to the use of cash-flows as earnings measure, which applies to 11.3% of estimated smoothing coefficients. Finally, Table 1 indicates that the literature on dividend smoothing has also focused on a wide set of countries and industries. As regards countries, we have identified a general pattern of focus on the US (11.4%), the UK (8.3%), other EU countries (17.4%), and developing countries (34.4%) while the remainder of coefficients (27.7%) relate to a set of other countries which due to its diversity has to be captured by means of a single dummy variable.[16] To account for studies focusing on different industries, we

[15] See e.g. Leary and Michaely (2011) for an overview of potential firm-specific determinants of dividend smoothing.

[16] Countries which cannot be categorized into independent categories (e.g. Canada, China, or Russia) are assigned to the group "other countries". We refer to the definition of the World Bank to classify developing countries.

distinguish between firms from the service and consumer goods sector (1.5%), financial firms (15.0%), and manufacturing firms (6.1%). while the remaining coefficients are not based on a specific industry.

[Insert Table 1 about here]

4. Meta regression analysis

In section 4.1, we first provide a descriptive analysis of reported estimates that allows to derive preliminary hints regarding the presence of publication bias by means of a funnel plot. Moreover, a proxy for the 'true' smoothing value is derived. Section 4.2 then describes the MRA framework used, whereas section 4.3 focuses on econometric issues that need to be considered. Finally, section 4.4 presents and discusses the MRA results.

4.1 DESCRIPTIVE ANALYSIS OF THE 'TRUE'-EFFECT AND PUBLICATION BIAS

Before estimating MRA models we conduct a preliminary analysis of the dividend smoothing coefficient and of publication bias. Publication bias is the consequence of a favor for statistically significant results by authors or journal editors. Stanley (2005, 2008) suggests that the degree of this bias can be proxied by the correlation of estimates and their standard errors. If publication bias is present, a significant correlation between estimated coefficients and their standard errors, which leads to statistical significance should prevail (Oczkowski and Doucouliagos, 2014). To graphically illustrate this relationship Stanley and Doucouliagos (2010) propose to plot estimated coefficients against their precision, where precision is measured by the inverse of coefficients' standard errors (Oczkowski and Doucouliagos, 2014; Zigraiova and Havranek, 2016). If the underlying literature is not affected by publication bias, the estimated smoothing coefficients with high standard errors in the lower part of the plot shall be characterized by high but symmetrical variation around a proxy for the 'true' dividend smoothing coefficient, while estimates with low standard errors in the upper part of the plot should be characterized by low variation around the proxy for the 'true' value. Thus, without publication bias the plot should take the form of a symmetric inverted funnel. In turn, skewness of the funnel indicates favor for a specific direction of results and is therefore a hint for publication bias. In order to construct the funnel plot we follow Stanley (2005) and first derive a proxy for the 'true' smoothing coefficient by averaging the top 10% of most precisely estimated smoothing coefficients leading to a value of 0.728. We then plot estimated coefficients and their precision around this proxy for the 'true' value. The resulting funnel plot is shown in Figure 1. The funnel plot appears widely spread and indicates skewness towards positive smoothing coefficients close to one as well as high speed of adjustment coefficients (i.e. low dividend smoothing coefficient close to zero). This indicates bi-directional publication bias towards high dividend smoothing and a high speed of adjustment (i.e. low smoothing). To assess the degree of excess variation, we follow Stanley (2005) and calculate the following statistic for all j=1, …, 979 coefficient estimates: $\emptyset_j = \left|\left(\hat{d}_j - d\right)/se(\widetilde{d_j})\right|$, where $\widetilde{d_j}$ corresponds to the reported dividend smoothing estimates, $se(\widetilde{d_j})$ the corresponding standard errors, and d represents the true effect based on the top 10% of the most precisely estimated smoothing coefficients. In case a publication bias is absent, one would expect that $\emptyset_j$ should exceed 1.96 for only 5% of coefficient estimates. Using this statistic we find that $\emptyset_j$ exceeds 1.96 in 60.4% of the cases indicating a strong excess variation. This casts doubt on the assumption of a single underlying 'true' effect and points toward the presence of publication bias towards two directions: Authors might favor positive and high dividend smoothing coefficients ($\widetilde{d_j}$ close to one) as well as positive and low dividend smoothing coefficients corresponding to a high speed of adjustment ($\widetilde{d_j}$ close to zero).

[Insert Figure 1 about here]

Funnel plots, though, assume a single 'true' effect for different regions, sectors, time periods, or estimation techniques. Hence, possible publication bias within country or industry subsamples of reported smoothing coefficients cannot be detected with this method (Hirsch, 2018; Doucouliagos et al., 2005; Stanley 2005, 2008). In the following we therefore conduct MRA which provides a more objective analysis than funnel plots.[17]

4.2 META REGRESSION MODEL

While the funnel analysis performed in section 4.1 can provide first indications regarding the smoothing effect and publication bias its main disadvantage lies in the assumption that only a single 'true' effect exists.

We therefore perform several MRA`s based on different estimation strategies. Compared to funnel graphs, which can only reveal the degree of publication bias across the entire sample of smoothing coefficients, MRA enables to more precisely analyze possible publication bias by accounting for different subgroups in the sample (e.g. defined by time, countries, or industries). It is likely that those subgroups are affected by publication bias to varying degrees. MRA also allows to account for heterogeneity in reported coefficients driven by the underlying study design, i.e. the applied

[17] To further illustrate the distribution of dividend smoothing coefficients Figures A1 and A2 in the appendix show the frequency distribution and the Kernel density. In addition, we also captured the distribution of dividend smoothing coefficients based on median values of reported dividend smoothing coefficients and median precision per study. Figures A3-A5 in the appendix show the respective funnel plot, frequency distribution as well as Kernel density based on median values.

econometric estimator or the inclusion of additional independent variables when estimating dividend smoothing (Doucouliagos et al., 2005; Stanley 2005, 2008).

Following Stanley (2005, 2008) we implement several specifications of the following model:

$$\hat{d}_j = \beta_0 + \beta_1 se(\hat{d}_j) + \sum_n \beta_n x_{nj} + \varepsilon_j \qquad (8)$$

where the dependent variable reflects the j=1,… , 979 identified dividend smoothing coefficients $\hat{d}_j$. The standard error of each coefficient ($se(\hat{d}_j)$) is included as independent variable together with a vector $\boldsymbol{x} = \sum_n \beta_n x_{nj}$ of those variables reported in Table 1 that relate to structural characteristics of the underlying studies. The respective coefficients ($\hat{\beta}_n$) therefore capture the variance in reported smoothing coefficients caused by those characteristics. Finally, ε_j is an i.i.d. error term.

The inclusion of the standard error of estimated coefficients as an independent variable serves as a basis for testing for publication bias. If publication bias prevails across the analyzed literature a significant correlation between estimated coefficients and their standard errors should prevail (Oczkowski and Doucouliagos, 2014). Thus, authors will likely prefer those results where the quotient of the estimated coefficient and its standard error is equal or larger than two implying significance at the 5%-level or lower. In contrast if publication bias is not present estimated coefficients are distributed randomly around the ‘true’ value and there should be no significant correlation with standard errors. Testing $H_0 : \hat{\beta}_1 = 0$ can therefore be considered as a test for publication bias.

As indicated by the funnel plot in Figure 1, the research on dividend smoothing might be biased towards findings of high smoothing or a high speed of adjustment. In this case, we expect a different impact of $se(\hat{d}_j)$ over the domain of high dividend smoothing and low dividend smoothing coefficients (high speed of adjustment). Whereas authors focusing on dividend smoothing might prefer high dividend smoothing coefficients, authors with a focus on speed of adjustment might prefer lower dividend smoothing coefficients. Hence, to test for bi-directional publication bias, we use 0.5 as cutoff for coefficient estimates of $\hat{d}_j$ indicating a focus on high dividend smoothing parameter ($d_j > 0.5$) or high speed of adjustment parameters ($d_j \leq 0.5$). This yields the following specification (e.g. Bom and Ligthart, 2009):

$$\hat{d}_j = \beta_0 + \beta_2 D_1 se(\hat{d}_j) + \beta_3 D_2 se(\hat{d}_j) + \sum_n \beta_n x_{nj} + \varepsilon_j \quad (9)$$

where $D_1 = \begin{cases} 1\ if\ \hat{d}_j \leq 0.5 \\ 0\ otherwise \end{cases}$ and $D_2 = \begin{cases} 1\ if\ \hat{d}_j > 0.5 \\ 0\ otherwise \end{cases}$

Based on this specification $H_0 : \hat{\beta}_2 = 0$ is a test towards a publication bias in favor of low dividend smoothing coefficients (i.e. high speed of adjustment). $H_0 : \hat{\beta}_3 = 0$ in turn serves as our test for a publication bias towards high dividend smoothing coefficients.

Stanley and Doucouliagos (2012) suggest to also consider specifications where the standard error is introduced non-linearly. Non-linearity allows for a more flexible relationship between coefficients and standard errors over the domain of standard errors where publication bias will be less severe for estimates with low standard errors. We therefore also consider a specification of (9) where the standard error is introduced in a quadratic way:

$$\hat{d}_j = \beta_0 + \beta_2 D_1 se(\hat{d}_j)^2 + \beta_3 D_2 se(\hat{d}_j)^2 + \sum_n \beta_n x_{nj} + \varepsilon_j \quad (10)$$

where $D_1 = \begin{cases} 1 \; if \; \hat{d}_j \leq 0.5 \\ 0 \; otherwise \end{cases}$ and $D_2 = \begin{cases} 1 \; if \; \hat{d}_j > 0.5 \\ 0 \; otherwise \end{cases}$

Finally, in each specification the intercept $\hat{\beta}_0$ reflects the mean value of dividend smoothing corrected for publication bias given that the impact of all study design characteristics included in $\boldsymbol{x}$ is set to zero.

The presence of a dividend smoothing effect can hence be tested by $H_1 : \hat{\beta}_0 = 0$ and rejecting this hypothesis points towards the existence of an effect. According to Stanley (2005, 2008) the test of a non-significant MRA intercept is also known as precision effect test (PET).

4.3 ECONOMETRIC IMPLEMENTATION

Various econometric approaches are necessary to account for problems caused by the fact that the dependent variable of (8) to (10) is composed of estimated regression coefficients $(\hat{d}_j)$ (Stanley et al. 2013). These regression coefficients are derived by means of separate empirical studies implying heterogeneous variances that potentially cause heteroscedasticity in the error terms of (8) to (10) (Nelson and Kennedy, 2009). We therefore use weighted least squares (WLS) for the estimation of (8) to (10). As Stanley (2005) and Oczkowski and Doucouliagos (2014) point out $1/se(\hat{d}_j)^2$ can serve as an adequate weight as it captures the heterogeneous variances of the coefficients and thus generates heteroscedasticity corrected standard errors.[18]

Another econometric issue arises from the fact that most of the studies included in our MRA (86) provide more than one estimate. This implies that the meta-data is composed of clusters of estimates with similar error structures. Nelson and Kennedy (2009) point out that such within-cluster error correlation leads to biases in the standard errors of (8) to (10). To correct for within study-cluster correlation we follow Oczkowski and Doucouliagos (2014) and employ several techniques to derive unbiased standard errors. In particular, we first estimate (8) to (10) using WLS with heteroscedasticity robust standard errors as our base model. We then correct for within-study error correlation by estimating WLS models with study-cluster robust and bootstrapped clustered standard errors. More specifically, we use the wild bootstrap method which is particularly suited when study clusters are of significantly different sizes (Cameron et al., 2008; MacKinnon and Webb, 2017). Moreover, as Table A1 indicates, clusters in our sample are of significantly different sizes. According to MacKinnon and Webb (2017) the wild bootstrap may yield reliable inferences in this case.

Although panel estimators such as fixed and random effects are suitable to capture the clustered (i.e. panel) structure of our data, it is known that WLS with study-cluster robust standard errors is the more reasonable approach to estimate MRA models (Hirsch, 2018). Stanley and Doucouliagos (2013, 2015) demonstrate that WLS outperforms the random- and fixed effects estimator especially when the meta-data is affected by publication bias. Moreover, the fixed and random effects estimators are based on a set of adverse characteristics (Baltagi, 2008). First, coefficient clusters in our sample are of

[18] Note that the sample size can also serve as an indicator for estimation precision of coefficients as it is proportional to the inverse of the standard error (Stanley 2005).

considerably different sizes with a large number of clusters that contain a single observation only.[19] Nelson and Kennedy (2009) point out that employing the fixed effects estimator to such panels is disadvantageous as studies with a single observation will be eliminated from the estimation procedure. Second, application of the fixed effects estimator leads to inefficient estimates of (8) to (10) as study-specific fixed effects significantly decrease the degrees of freedom (Baltagi, 2008; Nelson and Kennedy, 2009). Third, to generate unbiased coefficients of (8) to (10) the random effects estimator requires zero correlation between the random effect and the explanatory variables (i.e. the standard errors as well as the variables in $\mathbf{x}$) (Baltagi, 2008; Stanley and Doucouliagos, 2013, 2015). Due to these disadvantages and the predominance of WLS in MRA models we consider the WLS estimations with study-cluster robust standard errors of (8), (9), and (10) as our main results while results with wild-bootstrapped standard errors shall serve as robustness checks.

4.4 META REGRESSION RESULTS

To get an initial impression of publication bias, we follow the procedure used in prior MRAs (Card and Krueger, 1995; Hirsch, 2018; Stanley and Doucouliagos, 2012) and first estimate equations (8) to (10) without including the set of explanatory variables $\mathbf{x}$. The results are reported in Table 2. In the interpretation we focus on the WLS estimations of (8) to (10) with study-cluster robust standard errors as our main results (columns 4-6). The constant of each model indicates mean dividend smoothing

[19] We observe 13 studies that report just one coefficient. The maximum number of coefficients that a single study reports amounts to 57. The average number of coefficients reported in the included studies is 9.89. A standard deviation of 11.04 shows that the coefficient clusters in our sample are of considerably different size.

corrected for publication bias. Columns 4-6 reveal that this value is between 0.707 and 0.755 and thus close to the average of the 10% most precise measures derived as the proxy for ‘true’ smoothing above (0.728). The test for a significant impact of the constant i.e. the PET test (Stanley 2005, 2008) indicates for all specifications the presence of a significant smoothing effect.

[Insert Table 2 about here]

As rejecting $H_0 = \hat{\beta}_1 = 0$ points towards skewness of the funnel plot (Figure 1) this test is also known as the funnel asymmetry test (FAT) (Stanley 2005, 2008). The models that account for the standard error as independent variable in a linear way confirm the initial tendency of a publication bias revealed by the funnel plot. The results reveal a negative and significant relationship with the exception of an insignificant (and still) negative effect when wild-bootstrapped standard errors are used. The negative sign indicates that there might be either a tendency towards reporting low dividend smoothing coefficients (high speed of adjustment coefficients). However, as indicated above the funnel plot points to the existence of bi-directional publication bias. We address this issue through equations (9) and (10) by considering different impacts of the standard error depending on the magnitude of the estimated dividend smoothing coefficient. The results are in favor of publication biases towards high and low dividend smoothing effects, respectively. We find a significant and negative impact of the (squared) standard error for dividend smoothing coefficients smaller or equal to 0.5, which is higher in magnitude than the positive impact of the standard error for dividend smoothing coefficients larger than 0.5. In addition, the coefficient of the standard error for high dividend smoothing coefficients is significant in two out of six specifications, whereas the coefficient for low dividend smoothing coefficients is negatively significant in five out of six specifications.

[Insert Table 3 about here]

As already noted, a possible publication bias within subsamples related to countries, industries or other study design characteristics can only be detected by controlling for these factors in a multivariate MRA. Table 3 reports the results of various specifications of the multivariate regression models (8) to (10). Panel A contains the results based on equation (8). Panel B refers to the results based on equations (9) and (10) (standard error interacted with dummies for low and high dividend smoothing coefficients). The base category (captured in the constant) refers to the degree of dividend smoothing generated by OLS estimations of the classical Lintner model, corrected for publication bias and using pre-1998 data. Note that the regression coefficients are to be interpreted accordingly, i.e. a specific coefficient indicates how the related characteristic adds/subtracts dividend smoothing with respect to this base group. In line with the univariate results, the results show a negative impact when we account for the standard error in a linear manner (equation (8)). However, the coefficient for the standard error is not significant when we focus on the WLS estimations of (8)) with study-cluster robust standard errors as our main results. Compared to our univariate analysis, we find even stronger support for a bi-directional publication bias. All coefficients for the standard error are statistically significant and have the expected sign. Thus, when study design characteristics are considered our results corroborate the finding towards the presence of publication bias in favor of statistically significant smoothing coefficients as well as speed of adjustment coefficients (i.e. low smoothing coefficients).[20] Surprisingly, the working paper dummy is found to be statistically significant and positive, which

[20] In unreported robustness checks we use the mean and median of all 979 dividend smoothing coefficients as different cutoffs to distinguish between studies focusing on high and low dividend smoothing (speed of adjustment). The results are robust to this specification. Results of all robustness checks are available upon request.

indicates that working papers reports significantly higher dividend smoothing coefficients. Rusnak et al. (2013) argue that working papers already take into account the publication process and therefore do not differ much from published papers with respect to a tendency of reporting significant coefficient estimates. This implies that working papers which are older than 5 years report significantly higher dividend smoothing coefficients and likely do not suffer from the file drawer problem.[21]

Moreover, the multivariate MRA reveals several important findings with respect to the study design factors affecting the heterogeneity in reported dividend smoothing coefficients. As the base category we use the classical Lintner model (equation 4), estimated using OLS and pre-1998 US data, published in an academic journal. The constants of our main results –WLS with cluster robust standard errors reported in column 2 in Panel A and columns 3-4 in Panel B– reveal a significant degree of dividend smoothing for the base category ranging from 0.657 to 0.678. This degree is in line with Lintner (1956) who finds a very similar smoothing coefficient of 2/3 for the US.

Several studies (e.g. Choe, 1990; Brav et al., 2005; Andres et al., 2015) find evidence that the degree of dividend smoothing has increased in recent years possibly due to the emergence of stock repurchases as an additional method to disburse temporary earnings. If anything, our results indicate a slight evidence for lower dividend smoothing in more recent years (the respective coefficient of the variable capturing whether the mean sample period is >1998 is statistically significant in three cases and always negative).[22] We also find no evidence that the length of the analyzed time series impacts the degree of dividend smoothing (the coefficient has the expected negative sign but is only significant in two

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[21] The results are robust to an alternative time frame of three years.

[22] As a robustness check, we classify studies as "post-1998" if their sample period begins in 1999 or later. The results are robust to this alternative specification.

regression models and insignificant in our main regression models with cluster robust standard errors). In contrast, extensions of the classical Lintner model controlling for ownership find significantly higher dividend smoothing. This lends to support of agency conflicts as a primary driver of dividend smoothing (Leary and Michaely, 2011). Agency models as presented by Jensen (1986) and Easterbrook (1984) underline the importance of dividend smoothing as a disciplining device for managers to raise external finance from capital markets. Our results underline the importance of ownership as moderator for agency conflicts between managers and shareholders and determinant of dividend smoothing. Whether studies control for size, debt, or other firm characteristics does not have a significant impact on resulting dividend smoothing coefficients. Moreover, we find evidence that modifications of the classical Lintner model using cash flow instead of earnings measures detect significantly higher smoothing effects. Based on these results, firms adjust dividends faster to changes in earnings than to changes in cash-flows.

Our results provide evidence that the use of the econometric technique has a significant impact on estimated dividend smoothing coefficients. We find that the GMM estimator reduces the upward bias in dividend smoothing that emerges if (8) to (10) are estimated using OLS. Similarly, using fixed effects (within) estimation leads to significant lower smoothing coefficients compared to the base category OLS. Note that applying fixed effects estimation to autoregressive processes such as (8) to (10) leads to a downward biased estimate of dividend smoothing.[23]

[23] As the category 'other estimators' comprises multiple different estimation techniques such as probit, logit, or random effects as a robustness check we have excluded all observations related to this category. Even after excluding these observations, we do not find significant differences in reported dividend smoothing coefficients across estimation techniques.

The presence of dividend smoothing is particularly well documented for firms in the US. Several studies suggest that dividend smoothing is higher in the US than in other countries. For instance, Andres et al. (2009) document a more flexible dividend payout for German firms, whereas Chemmanur et al. (2010) and Dewenter and Warther (1998) document lower dividend smoothing for firms in Hong Kong and Japan. In contrast to this, our results do not suggest significant differences in smoothing effects across different countries. In a robustness check, we follow a broader classification of countries by La Porta et al. (1998, 2000). La Porta et al. (1998, 2000) relate investor protection, financing conditions and payout policy to the legal origin of countries and distinguish between common law and civil law counties. Using this classification, we find lower dividend smoothing for Scandinavian civil law countries relative to German civil law, French civil law and common law countries. However, we do not find systematic differences in dividend smoothing between common and civil law countries, or within common law countries such as the UK and the US. Overall, our results lend support to dividend smoothing as a global rather than country-specific phenomenon.

Finally, the results do not reveal that studies with a focus on firms that operate in the service and consumer goods sector generate significantly different dividend smoothing coefficients while significant higher dividend smoothing effects can be detected for firms operating in the financial sector.[24] Variance Inflation Factors indicate that multicollinearity among the set of explanatory variables (**x**) is not present. Model diagnostics reveal the overall significance of our specifications and

[24] As firms from the financial sector are subject to different regulatory requirements, we consider only those studies that explicitly exclude firms from the financial sector in a robustness check. Based on the remaining 29 studies with 397 observations, we do not find significant differences in the drivers dividend smoothing coefficients relative to the whole sample.

adjusted R^2 values amount to 47.8% up to 60.8%. The fact that R^2 is significantly higher for the specifications that consider bi-directional publication bias ((9) and (10)) compared to equation (8) reveals the superiority of the former specifications.

As our study design controls for many different factors that may have an impact on the reported dividend smoothing parameter, and theory provides us with little guidance on the factors that should be included in a meta-regression analysis, we also investigate the main drivers of the dividend smoothing parameters by Bayesian model averaging (BMA) (Raftery et al., 1997). BMA provides averages for posterior mean values and standard errors after running all combinations of a predefined set of explanatory variables (in our case 2^{20} combinations). We follow the procedure in Zigraiova and Havranek (2016) and run a reduced model using all variables with a posterior inclusion probability larger than 0.5 identified by BMA as explanatory variables. The results reported in Table A2 of the appendix corroborate our earlier findings and identify the choice of the earnings measure, the econometric technique used as well as the publication status as the main drivers of the heterogeneity of reported dividend smoothing coefficients.

Finally, to assess the robustness of the results with respect to the weighting strategy used and the handling of extreme values we estimated several further model specifications. First, we followed Zigraiova and Havranek (2016) and present results from specifications weighted by the inverse of the number of estimates reported per study. This gives the same importance to each study in the estimation by mitigating the effect of articles contributing a large number of coefficients. Second, for the whole sample (without exclusion of unreasonable values using the bacon algorithm) we estimate robust 0.5-quantile (median) regressions. The results are reported in Tables A3 and A4 and undermine our main findings regarding the direction of publication bias and the importance of the econometric estimator applied. There are some differences that are mainly related to the variables capturing the analyzed country or industry for which the robustness checks tend to produce a higher number of significant results. However, these variables have not been identified as explanatory variables with a high PIP in the BMA and thus do not alter our conclusions regarding the main drivers of reported dividend smoothing coefficients.

5. Conclusion

Our MRA sheds light on the reasons for heterogeneous results reported in the empirical literature on dividend smoothing using a large set of 99 empirical studies and 979 dividend smoothing coefficients that relate to different time periods, countries, industries, and econometric methods. The MRA reveals that the variability in reported smoothing coefficients is driven by publication bias towards high dividend smoothing or high speed of adjustment coefficients. We find that peer-reviewed publications based on an OLS estimation of the classical Lintner model, corrected for publication bias and using pre-1998 US data report on average a significant degree of dividend smoothing ranging from 0.657 to 0.678.

Analyzing post-1998 data does not reveal higher dividend smoothing in more recent years. This is in line with the findings of Leary and Michaely (2011) for the US who find that stock repurchases as an additional payout channel in recent years cannot explain the heterogeneity in reported dividend smoothing coefficients. However, we detect a large number of other factors that explain the variability in dividend smoothing coefficients. Our results suggest that accounting for ownership structure among the set of control variables is important when explaining different degrees of dividend smoothing. We find that the inclusion of ownership characteristics significantly increases estimated smoothing coefficients. Moreover, we find significant differences in results across the estimation techniques used. Studies using GMM estimation techniques, or fixed effects estimators find a considerably lower degree of dividend smoothing (-0.219 and -0.205) compared to studies employing OLS estimators. Differences in dividend smoothing do not seem to be driven by the country.

Overall, the results of our MRA provide a summarizing picture of the large amount of literature on dividend smoothing and allow to derive average smoothing effects for different regions, sectors, time periods, or estimation techniques. Under the assumption that 'best practice' in dividend smoothing estimation requires the inclusion of all relevant firm specific control variables and the GMM estimation technique, our MRA predicts (using earnings as profit measure) average smoothing effects of 0.536 for firms that do not operate in the financial sector.

The MRA results provide important insights for future research on this topic: Dividend smoothing estimates differ significantly depending on the inclusion of ownership as a driver of estimated dividend smoothing effects. Researchers should therefore consider the inclusion of ownership characteristics when estimating dividend smoothing. In case ownership characteristics are not available due to data limitations, researchers should discuss the consequences of the corresponding omitted variable bias. Our results provide support for significant differences in reported dividend smoothing effects for different estimation techniques. As the upward (downward) bias of the OLS (fixed effects) estimator is well-known for AR(1)-type regressions, in future studies researchers should carefully consider the choice of the estimation technique. In line with previous literature, future research should interpret results under careful consideration of the specifics of the analyzed industries. Based on our analysis, it is of particular relevance whether the study focuses on non-financial firms only.

Previous studies consider dividend smoothing as a general phenomenon that has increased in recent years. In contrast to this prevailing opinion, our MRA does not provide evidence for a general recent trend of higher dividend smoothing. Thus, analyzing the development of dividend smoothing over time and under consideration of different country settings might be a fruitful area for future research (Farre-Mensa et al., 2014). In general, future research should consider the fact that study design characteristics can have an important impact on dividend smoothing effects and the results should hence be interpreted accordingly.

Our results are also important from an investor perspective. Whereas Leary and Michaely (2011) find evidence that dividend smoothing is used to cope with free-cash flow problems, dividend smoothing might be an agency problem in itself (Lambrecht and Myers, 2012). Depending on the two different views, our results based on dividend smoothing allow investors to assess the severity of agency conflicts that they can expect depending on the industry they would like to invest in. Thus, investors should take into account that study design characteristics have an important impact on the resulting dividend smoothing effects and should build their expectation regarding returns accordingly.

References

Abdullah, N.M.H., Ahmad, Z., Roslan, S. (2012). The Influence of Ownership Structure on the Firms Dividend Policy Based Lintner Model. International Review of Business Research Papers 8(6): 71-88.

Adelegan, O. (2003). An Empirical Analysis of the Relationship between Cash Flow and Dividend Changes in Nigeria. R&D Management 15(1): 35-49.

Ahmed, H., Javid, A.Y. (2008). Dynamics and determinants of dividend policy in Pakistan (evidence from Karachi stock exchange non-financial listed firms). MPRA Paper No. 37342.

Ahmed, H., Javid, A.Y. (2009). Dynamics and Determinants of Dividend Policy in Pakistan (Evidence from Karachi Stock Exchange Non-Financial Listed Firms). International Research Journal of Finance and Economics 25(3): 148-171.

Aivazian, V.A., Booth, L., Cleary, S. (2006). Dividend Smoothing and Debt Ratings. Journal of Financial and Quantitative Analysis 41(2): 439-453.

Al-Ajmi, J. (2010). Modelling the dividend policy of banks in Gulf Cooperation Council countries. Applied Economics Letters 17(14): 1423-1428.

Al-attar A.M., Al-Shattarat, H.K., Yusuf, A.N. (2015). The effects of contextual factors on disaggregated earnings in explaining dividend changes in Jordanian firms. International Journal of Commerce and Management 25(2): 218-239.

Allen, F., Bernardo, A., Welch, I. (2000). A theory of dividends based on tax clientele. Journal of Finance 55(6): 2499-2536.

Al-Malkawi, H-A., Bhatt, M. I., Magableh, S. (2014). On the dividend smoothing, signaling and the global financial crisis. Economic Modelling 42: 159-165.

Al-Najjar, B. (2009). Dividend behaviour and smoothing new evidence from Jordanian panel data. Studies in Economics and Finance 26(3): 182-197.

Al-Najjar, B., Belghitar, Y. (2012). The information content of cash flows. Economic Issues 17(2): 57-70.

Al-Yahyaee, K.H., Pham, T.M., Walter, T.S. (2010). Dividend stability in a unique environment. Managerial Finance 36(10): 903-916.

Al-Yahyaee, K.H., Pham, T.M., Walter, T.S. (2011). Dividend smoothing when firms distribute most of their earnings as dividends, Applied Financial Economics 21(16): 1175-1183.

Alzahrani, M., Lasfer, M. (2009). The Impact of Taxation on Dividends: A Cross-Country Analysis. Working paper King Fahd University of Petroleum & Minerals, Dhahran.

Ameer, R. (2007). Dividend Payout of the Property Firms in Malaysia. Pacific Rim Property Research Journal 13(4): 451-472.

Ameer, R. (2008). Product market competition, regulation and dividend payout policy of Malaysian Banks. Journal of Financial Regulation and Compliance 16(4): 318-334.

Andres, C., Betzer, A., Goergen, M., Renneboog, L. (2009). Dividend policy of German firms: A panel data analysis of partial adjustment models. Journal of Empirical Finance 16(2): 175-187.

Andres, C., Betzer, A., van den Bongard, I., Goergen, M. (2014). Dividend Policy, Corporate Control and the Tax Status of the Controlling Shareholder. Working paper Schumpeter School of Business and Economics, Bergische Universität Wuppertal.

Andres, C., Doumet, M., Fernau, E., Theissen, E. (2015). The Lintner model revisited: Dividends versus total payouts. Journal of Banking and Finance 55: 56-69.

Arellano, M., Bond, S. (1991). Some tests of specification for panel data: Monte Carlo evidence and an application to employment equations". Review of Economic Studies 58 (2): 277-297.

Arellano, M., Bover, O. (1995). Another look at the instrumental variable estimation of error-components models. Journal of Econometrics 68: 29–51.

Arko, A.C., Abor, J., Adjasi, C.K.D., Amidu, M. (2014). What influence dividend decisions of firms in Sub-Saharan African?. Journal of Accounting in Emerging Economies 4(1): 57-78.

Athari, S.A., Adaoglu, C., Bektas, E. (2016). Investor protection and dividend policy: The case of Islamic and conventional banks. Emerging Markets Review 27: 100-117.

Baba, N., Ueno, Y. (2008). Are stock repurchases more flexible than dividends? The case of Japanese firms. Applied Financial Economics Letters 4(5): 315-318.

Baiyao, Z. (2011). Dividend Policy in Mainland China and USA. Bachelor thesis Hong Kong Baptist University.

Baker, H.K., Chang, B., Dutta, S., Saadi, S. (2013). Canadian corporate payout policy. International Journal of Managerial Finance 9(3): 164-184.

Bakucs, Z., Falkowski, J. Fertö, I. (2014). Does Market Structure Influence Price Transmission in the Agro-food Sector? A Meta-analysis Perspective. Journal of Agricultural Economics 65(1): 1-25.

Baltagi, B.H. (2008) *Econometric Analysis of Panel Data*. Chichester, UK: John Wiley & Sons.

Bawa, K.S., Kaur, P. (2012). Empirical validity of Dividend Policy Models in The Indian Manufacturing MSMEs. International Journal of Multidisciplinary Management Studies 2(1): 18-39.

Banks, S., Cheffins, B., Goergen, M. (2009). Dividends and politics. European Journal of Political Economy 25(2): 208-224.

Behm, U., Zimmermann, H. (1993). The empirical relationship between dividends and earnings in Germany. Zeitschrift für Wirtschafts- und Sozialwissenschaften 113(2): 225-254.

Benavides, J., Berggrun, L., Perafan, H. (2016). Dividend payout policies: Evidence from Latin America. Finance Research Letters 17: 197-210.

Benhamouda, Z. (2007). UK corporate share repurchases: an empirical analysis of corporate motives and payout policies, Durham theses, Durham University. Available at Durham E-Theses Online: http://etheses.dur.ac.uk/2137/.

Benzinho, J. (2004). The dividend policy of the Portuguese corporations: Evidence from Euronext Lisbon. Working paper ISCAC Coimbra Business School.

Bhattarchya, S. (1979). Imperfect Information, Dividend Policy, and "The Bird in the Hand" Fallacy. The Bell Journal of Economics 10(1): 259-270.

Billor, N., Hadi, A.S., Velleman, P.F. (2000). BACON: blocked adaptive computationally efficient outlier nominators. Computational Statistics & Data Analysis 34: 279-298.

Blundell, R., Bond, S. (1998). Initial conditions and moment restrictionsin dynamic panel data models Journal of Econometrics 87: 115-143.

Bodla, B.S., Pal, K., Sura, J.S. (2007). Examining Application of Lintner's Dividend Model in Indian Banking Industry. ICFAI Journal of Bank Management 6(4): 40-59.

Bom, P.R.D., Ligthart, J.E. (2009) How productive is public capital? A meta-regression analysis. Working Paper 09-12, International Studies Program, Georgia State University.

Boţoc, C., Pirtea, M. (2014). Dividend Payout-Policy Drivers: Evidence from Emerging Countries. Emerging Markets Finance and Trade 50(4): 95-112.

Brav, A., Graham, J.R., Harvey, C.R., Michaely, R. (2005). Payout policy in the 21st century. Journal of Financial Economics 77(3): 483-527.

Bremberger, F., Cambini, C., Gugler, K., Rondi, L. (2016). Dividend Policy in Regulated Network Industries: Evidence from the EU. Economic Inquiry 54(1): 408–432.

Brittain, J.A. (1964). The Tax Structure and Corporate Dividend Policy. American Economic Review 54(3): 272-287.

Cameron, A.C., Gelbach, J.B., Miller, D.L. (2008). Bootstrap-based Improvements for Inference with Clustered Errors. Review of Economics and Statistics 90(3): 414-427.

Card, D., Krueger, A.B. (1995). Time-Series Minimum-Wage Studies: A Meta-Analysis. American Economic Review 85(2): 238-243.

Card, D., Kluve, J., Weber, A. (2010) Active Labour Market Policy Evaluations: A Meta- Analysis. Economic Journal 120 (548): 452-477.

Chan, K.F., Powell, J.G., Shi, J., Smith, T. (2016). Dividend persistence and dividend behavior. Accounting and Finance: doi: 10.1111/acfi.12208.

Chemmanur, T.J., He, J., Hu, G., Liu, Y.H. (2010). Is dividend smoothing universal? New insights from a comparative study of dividend policies in Hong Kong and the U.S. Journal of Corporate Finance 16(4): 413-430.

Chen, X., Sinha, A. K. (2016). Large Shareholders and Dividends: Game Theoretic Analysis of Shareholder Power. Working paper California State University, Bradley University.

Choe, H. (1990). Intertemporal and Cross-sectional Variation of Corporate Dividend Policy. Ph.D. Dissertation. University of Chicago.

Correia da Silva, L., Goergen, M., Renneboog, L. Dividend policy of German firms. A dynamic panel data analysis of partial adjustment models. Working paper Cardiff University, Oxford Economic Research Associates, Tilburg University.

Dai, Q. (2007). Influence of a Tax Reform on Dividend Clienteles. Working paper Binghamton University.

Darling, P.G. (1957). The Influence of Expectations and Liquidity on Dividend Policy. Journal of Political Economy 65(3): 209-224.

DeAngelo, H., De Angelo, L., Skinner, D. (2004). Are dividends disappearing? Dividend concentration and the consolidation of earnings. Journal of Financial Economics 72(3): 425-456.

DeAngelo, H., De Angelo, L., Skinner, D. (2008). Corporate Payout Policy. Foundations and Trends in Finance 3(2-3): 95-287.

DeAngelo, H., DeAngelo, L. (2000). Controlling stockholders and the disciplinary role of corporate payout policy - a study of the Times Mirror company. Journal of Financial Economics 56(2): 153-207.

Demena, B.A., van Bergeijk, P.A.G. (2017) A Meta-Analysis of FDI and Productivity Spillovers in Developing Countries. Journal of Economic Surveys 31(2): 546-571.

DerSimonian, R., Laird, N. (1986). Meta-analysis in clinical trials. Controlled Clinical Trials 7(3): 177-188.

Desai, M.A., Foley, C.F., Hines Jr., J.R. (2001). Repatriation Taxes and Dividend Distortions. National Tax Journal 54(4): 829-851.

Dewenter, K.L., Warther, V.A. (1998). Dividends, Asymmetric Information, and Agency Conflicts: Evidence from a Comparison of the Dividend Policies of Japanese and U.S. Firms. Journal of Finance 53(3): 879–904.

Dharan, B.G. (1988). The Association between Corporate Dividends and Current Cost Disclosure. Journal of Business Finance & Accounting 15(2): 215-230.

Doucouliagos, H., Laroche, P., Stanley, T.D. (2005). Publication Bias in Union-Productivity Research? Relations industrielles / Industrial Relations 60(2): 320-347.

Easterbrook, F.H. (1984). Two Agency-Cost Explanations of Dividends. American Economic Review 74(4): 650-659.

Esteban, J.M.D, Pérez, O.L.d.F. (2001). Dividend Policy of European Banks. Working paper Universidad de Burgos.

Fama, E.F. (1974). The Empirical Relationships between the Dividend and Investment Decisions of Firms. American Economic Review 64(3): 304-318.

Fama, E.F., Babiak, H. (1968). Dividend Policy: An Empirical Analysis. Journal of the American Statistical Association 63(324): 1132-1161.

Farre-Mensa, J., Michaely, R. Schmalz. M. (2014). Payout Policy. Annual Review of Financial Economics 6: 75-134.

Feld, L.P., Heckemeyer, J.H., Overesch, M. (2013). Capital structure choice and company taxation: A meta-study. Journal of Banking & Finance 37(8): 2850–2866.

Feldstein, M.S. (1970). Corporate Taxation and Dividend Behaviour. Review of Economic Studies 37(1): 57-72.

Foerster, S.R., Sapp, S.G. (2006). The changing role of dividends: a firm-level study from the nineteenth to the twenty-first Century. Canadian Journal of Economics 39(4): 1316-1344.

Garrett, I., Priestley, R. (2000). Dividend Behavior and Dividend Signaling. Journal of Financial and Quantitative Analysis 35(2): 173-189.

Goncharov, I., Triest, S. v. (2011). Do fair value adjustments influence dividend policy?. Accounting and Business Research 41(1): 51-68.

Grullon, G., Michaely, R. (2002). Dividends, Share Repurchases, and the Substitution Hypothesis. Journal of Finance 57(4): 1649-1684.

Gugler, K. (2003). Corporate governance, dividend payout policy, and the interrelation between dividends, R&D, and capital investment. Journal of Banking and Finance 27: 1297-1321.

Gugler, K., Yurtoglu, B.B. (2003). Corporate governance and dividend payout policy in Germany. European Economic Review 47(4): 731-758.

Gunathilaka, C. (2014). What Drives the Payout Policy? Evidence from Sri Lanka: A Dynamic Panel Data Analysis. Wayamba Journal of Management 3(2): 1-16.

Haddad, A.E., Al Shattarat, W.K., Al-Hamadeen, R.M. (2008). Partial-Adjustment-Models of Dividend Policy Behaviour for Industrial Jordanian Firms. Corporate Ownership & Control 5(4): 356-372.

Haleem, F., Javid, A.Y. (2011). Modeling Dividend Behavior in Pakistan. Information Management and Business Review 3(6): 289-301.

Hayunga, D.K., Stephens, C.P. (2009). Dividend behaviour of US equity REITs. Journal of Property 26(2): 105-123.

Hines Jr, J.R., Desai, M.H., Foley, C.F. (2007). Dividend Policy Inside the Multinational Firm. Financial Management 36(1): 5-26.

Hines, J.R. Jr. (1996). Dividends and Profits - Some Unsubtle Foreign Influences. Journal of Finance 51(2): 661-689.

Hirsch, S. (2018). Successful in the long run: A meta-regression analysis of persistent firm profits. Journal of Economic Surveys 32(1): 23-49.

Hsiao, C. (1986). Analysis of Panel Data. Cambridge University Press, Cambridge.

Hussain, J. (2011). Corporate dividends decisions: evidence from Saudi Arabia. Journal of Risk Finance 12(1): 41-56.

Hutagalung, S., Yahya, M.H., Kamarudin, F., Osman, Z. (2013). The Dividend Payout Policy – A Study on Malaysian Financial Institutions. Pertanika J. Soc. Sci. & Hum. 21(S): 127-148.

Jagannathan, M. Stephens, C.P., Weisbach, M. (2000). Financial flexibility and the choice between dividends and stock repurchases, Journal of Financial Economics 57(3): 355-384.

Jarrell, S.B., Stanley, T.D. (1990) A Meta-Analysis of the Union-Nonunion Wage Gap. Industrial & Labor Relations Review 44: 54-67.

Jensen, M.C. (1986). Agency Costs of Free Cash Flow, Corporate Finance, and Takeovers. American Economic Review 76(2): 323-329.

Kamat, M.S., Kamat, M.M. (2012). An Application of Partial Adjustment Equation in Determining Payout Behavior using an Extended Instrumental Variable Approach. Working paper VVM's Shree Damodar College, Goa University.

Kamat, M.S., Kamat, M.M. (2013). Economic reforms, determinants and stability of dividends in a dynamic setting. Journal of Asia Business Studies 7(1): 5-30.

Kanoja, S., Bhatia, B.S. (2013). Dividend Decisions and Payout Policy: An Empirical Analysis of Listed Indian Companies. Working paper University of Delhi.

Karathanassis, G.A., Chrysanthopoulou, E.Ch. (2005). The relationship Between Ownership Structure and Corporate Dividend Policy – Evidence from the Athens Stock Exchange. Working paper Athens University of Economics and Business.

Khan, T. (2006). Company Dividends and Ownership Structure: Evidence from UK Panel Data. The Economic Journal 116(510): C172-C189.

Kim, J., Jeon, Y. (2015). Dividend Policy and Corporate Social Responsibility: A Comparative Analysis of Multinational Enterprise Subsidiaries and Domestic Firms in Korea. Emerging Markets Finance and Trade 51(2): 306-319.

Kinfe, T. (2011). Determinants of Dividend payout: An Empirical Study on Bank Industry in Ethiopia. Master thesis Addis Ababa University School of Business and Public Administration Department of Accounting and Finance School of Graduate Studies.

Korkeamaki, T., Liljeblom, E., Pasternack, D. (2010). Tax reform and payout policy: Do shareholder clienteles or payout policy adjust?. Journal of Corporate Finance 16(4): 572-587.

Kumar, J. (2003). Ownership Structure and Dividend Payout Policy in India. Working paper Indira Gandhi Institute of Development Research.

Kumar, R., Kumar Jha, P. (2012). Determinants of Corporate Dividend Policy in India - A Study of Listed IT Companies at BSE. Working paper Faculty of Management Studies, BHU.

La Porta, R., Lopez-de-Silanes, F., Shleifer, A., Vishny, R.W. (1998). Law and Finance. Journal of Political Economy 106(6): 1133-1155.

La Porta, R., Lopez-de-Silanes, F., Shleifer, A., Vishny, R.W. (2000). Agency Problems and Dividend Policies around the World. Journal of Finance 55(1): 1-33.

Lambrecht, B.M., Myers, S. C. (2012). A Lintner model of payouts and managerial rents. Journal of Finance 67(5): 1761–1810.

Leary, M.T., Michaely, R. (2011). Determinants of Dividend Smoothing: Empirical Evidence. Review of Financial Studies 24(10): 3197-3249.

Lintner, J. (1956). Distribution of incomes of corporations among dividends, retained earnings, and taxes. American Economic Review 46(2): 97-113.

Longhi, S., Nijkamp, P., Poot, J. (2005) A Meta-Analysis Assessment of the Effect of Immigartion on Wages. Journal of Economic Surveys 19(3): 451-477.

Manconi, A., Peyer, U., Vermaelen, T. (2017) Are Buybacks Good for Long-Term Shareholder Value? Evidence from Buybacks around the World. European Corporate Governance Institute (ECGI) - Finance Working Paper No. 436/2014, INSEAD Working Paper No. 2013/101/FIN.

McDonald, J.G., Jacquillat, B., Nussenbaum, M. (1975). Dividend, Investment and Financing Decisions: Empirical Evidence on French Firms. Journal of Financial and Quantitative Analysis 10(5): 741-755.

McDonald, R., Soderstrom, N. (1986). Dividend and Share Changes: Is There a Financing Hierarchy? NBER working paper series. Working Paper No. 2029.

MacKinnon, J.G., Webb, M.D. (2017). Wild Bootstrap Inference for Wildly Different Cluster Sizes. Journal of Applied Econometrics 32(2): 233-254.

Michaely, R., Roberts, M.R. (2012). Corporate Dividend Policies: Lessons from Private Firms. Review of Financial Studies 25(3): 711-746.

Miller, M.H., Rock, K. (1985). Dividend Policy under Asymmetric Information. Journal of Finance 40(4): 1031-1051.

Miller, M., Scholes, M. (1978). Dividends and Taxes. Journal of Financial Economics 6(4): 333-364.

Modigliani, F., Miller, M. (1958). The Cost of Capital, Corporation Finance and the Theory of Investment. American Economic Review. 48(3): 261–297.

Mohsin, H.M., Ashraf, M.S. (2011). Monetary policy restriction and dividend behavior of Pakistani firms: an empirical analysis. MPRA Paper No. 34052.

Mollah, Sabur A. (2009). Testing Partial Adjustment Dividend Behavioral Models in Emerging Markets: Evidence from Pre and Post Market Reforms in Bangladesh. Global Journal of Business Research 3(1): 1-14.

Mookerjee, R. (1992). An empirical investigation of corporate dividend pay-out behaviour in an emerging market. Applied Financial Economics 2(4): 243-246.

Mueller, D.C. (1967). The Firm Decision Process: An Econometric Investigation. The Quarterly Journal of Economics 81(1): 58-87.

Naceur, S., Goaied, M., Belanes, A. (2006). On the Determinants and Dynamics of Dividend Policy. International Review of Finance 6(1-2): 1-23.

Naceur, S., Goaied, M., Belanes, A. (2016). A Re-examination of Dividend Policy: A Dynamic Panel Data Analysis. Working paper ESSEC Tunis, IHEC Carthage.

Nakamura, A. (1985). Rational Expectations and the Firms Dividend Behavior. Review of Economics and Statistics 67(4): 606-615.

Nakamura, M. (1989). Asymmetry in the Dividend Behavior of US and Japanese Firms. Managerial and Decision Economics 10(4): 261-274.

Nelson, J.P., Kennedy, P.E. (2009). The Use (and Abuse) of Meta-Analysis in Environmental and Natural Resource Economics: An Assessment. Environmental and Resource Economics 42(3): 345-377.

Nickell, S. (1981). Biases in Dynamic Models with Fixed Effects. Econometrica 49(6): 1417-1426.

Oczkowski, E., Doucouliagos, H. (2014). Wine Prices and Quality Ratings: a Meta-Regression Analysis. American Journal of Agricultural Economics 97(1): 103-121.

Omet, G. (2004). Dividend Policy Behaviour in the Jordanian Capital Market. International Journal of Business 9(3): 287-300.

Pal, K, Goyal, P. (2007). Leading Determinants of Dividend Policy: A Case Study of the Indian Banking Industry. Decision 34(2): 88-112.

Pandey, I.M., Bhat, R. (2007). Dividend behavior of Indian companies under monetary policy. Managerial Finance 33(1): 14-25.

Pandey, I.M. (2003). Corporate Dividend Policy and Behaviour: The Malaysian Evidence. Asian Academy of Management Journal 8(1): 17–32.

Perez-Gonzalez, F. (2003). Large Shareholders and Dividends: Evidence from U.S. Tax Reforms. Working paper Columbia University.

Persson, R. (2013). Dividend policy behavior: An analysis of firms listed at Stockholm Stock Exchange. Bachelor thesis Uppsala University, Department of Economics, EKONOMIKUM - Centre for Economic Sciences.

Pindado, J., Requejo, I., Torre, C. de la (2012). Do Family Firms Use Dividend Policy as a Governance Mechanism? Evidence from the Euro zone. Corporate Governance: An International Review 20(5): 413-431.

Post, C., Byron, K. (2015) Women on boards and firm financial performance: A meta-analysis. Academy of Management Journal 58(5): 1546-1571.

Powell, J.G., Shi, J., Smith, T. (2004). Dividend persistence and return predictability. Working paper School of Finance and Applied Statistics, Faculty of Economics and Commerce, The Australian National University, Canberra.

Raftery, A.E., Madigan, D., Hoeting, J.A. (1997). Bayesian model averaging for linear regression models. Journal of the American Statistical Association 92: 179–191.

Rahman, N. (2002). Ownership structure and dividend smoothing: cross-country evidence. Working paper University of Chicago, Graduate School of Business.

Raza, S. H., Zahaar, M., Hafeez, M. (2009). The Ownership Structure and Dividend Payout Policy in Pakistan: Evidence from KSE-100 index Non-financial Firms. Pakistan Journal of Education 26(1): 173-188.

Renneboog, L., Szilagyi, P.G. (2015). How Relevant is Dividend Policy under Low Shareholder Protection. Journal of International Financial Markets, Institutions and Money. Advance online publication. DOI: 10.1016/j.intfin.2015.01.006.

Renneboog, L., Trojanowski, G. (2007). Control structures and payout policy. Managerial Finance 27(3): 180-194.

Rusnak, M., Havranek, T., Horvath, R. (2013). How to Solve the Price Puzzle? A Meta-Analysis. Journal of Money, Credit and Banking 45(1): 37-70.

Sembenelli, A. (1993). Signalling, Financial Hierarchy and Agency Theory as Explanations for Dividend Behavior: Evidence from Italian Firm Data. Managerial and Decision 14(1): 37-45.

Shinozaki, S., Uchida, K. (2015). Ownership structure and dividend smoothing: International evidence. Working paper Faculty of Economics, Kyushu University.

Short, H., Zhang, H., Keasey, K. (2002). The link between dividend policy and institutional ownership. Journal of Corporate Finance 8(2): 105-122.

Simegen, M. (2013). Determinants of Dividend Policy of Banks in Ethiopia. Master thesis Addis Ababa University, College of Accounting and Finance School of Graduate Studies.

Skinner, D. (2008). The evolving relation between earnings, dividends, and stock repurchases. Journal of Financial Economics 87(3): 582-609.

Stanley, T.D. (2001). Wheat from Chaff: Meta-Analysis as Quantitative Literature Review. Journal of Economic Perspectives 15(3): 131-150.

Stanley, T.D. (2005). Beyond Publication Bias. Journal of Economic Surveys 19(3): 309-345.

Stanley, T.D. (2008). Meta-Regression Methods for Detecting and Estimating Empirical Effects in the Presence of Publication Selection. Oxford Bulletin of Economics and Statistics 70(1): 103-127.

Stanley, T.D., Doucouliagos, H. (2010). Picture This: A Simple Graph That Reveals Much Ado About Research. Journal of Economic Surveys 24(1): 170-191.

Stanley, T.D., Doucouliagos, H. (2012). *Meta-regression Analysis in Economics and Business*. Oxford, UK: Routledge.

Stanley, T.D., Doucouliagos, H. (2013). Better than Random: Weighted Least Squares Meta Regression Analysis. University of Australia, School of Accounting, Economics and Finance, Economics Series Working Paper SWP 2013/2.

Stanley, T.D., Doucouliagos, H. (2015). Neither fixed nor random: weighted least squares meta-analysis. Statistics in Medicine 34: 2116-2127.

Stanley, T.D., Jarrell, B. (1989). Meta-Regression Analysis: A Quantitative Method of Literature. Journal of Economic Surveys 3(2): 161-170.

Stanley, T.D., Doucouliagos, H., Giles, M., Heckemeyer, J.H., Johnston, R.J., Laroche, P., Nelson, J.P., Paldam, M., Poot, J., Pugh, G., Rosenberger, R.S., Rost, K. (2013). Meta-Analysis of Economics Research Reporting Guidelines. Journal of Economic Surveys 27(2): 390-394.

Sudhahar, M., Saroja, T. (2010). Determinants of Dividend Policy in Indian Banks: An Empirical Analysis. Journal of Bank Management 9(3): 63-75.

Sura, J.S., Pal, K., Bodla, B.S. (2006). Factors Influencing Dividend Policy Decisions in Banking Sector: An Indian Evidence. Amity Business Review 7(2): 64-75.

Tran, Q.T., Nguyen, T.T.H. (2014). Dividend Policy Behavior in Emerging Stock Markets: Evidence from Vietnamese Stock Market. International Journal of Financial Research 5(4): 85-89.

Trojanowski, G. (2004). Ownership structure and payout policy in the UK. Working paper University of Exeter Business School.

Trotman, K.T., Wood, R. (1991). A Meta-Analysis of Studies on Internal Control Judgements. Journal of Accounting Research 29(1): 180-192.

Turnovsky, S.J. (1967). The Allocation of Corporate Profits between Dividends and Retained Earnings. Review of Economics and Statistics 49(4): 583-589.

Valickova, P., Havranek, T., Horvath, R. (2015). Financial Development and Economic Growth: A Meta-Analysis. Journal of Economic Surveys 29(3): 506-526.

Vasiliou, D., Eriotis, N. (2002). The Determinants of Dividend policy: some Greek data. European Journal of Management and Public Policy 1(2): 46-56.

Wang, K., Shailer, G. (2015). Ownership concentration and firm performance in emerging markets: a meta-analysis. Journal of Economic Surveys 29(2): 199-229.

Wang, X., Manry, D., Wandler, S. (2011). The impact of government ownership on dividend policy in China. Advances in Accounting, incorporating Advances in International Accounting 27(2): 366-372.

Watts, R. (1973). The Information Content of Dividends. Journal of Business 46(2): 191-211.

Weber, S. (2010). bacon: An effective way to detect outliers in multivariate data using Stata (and Mata). The Stata Journal 10(3): 331-338.

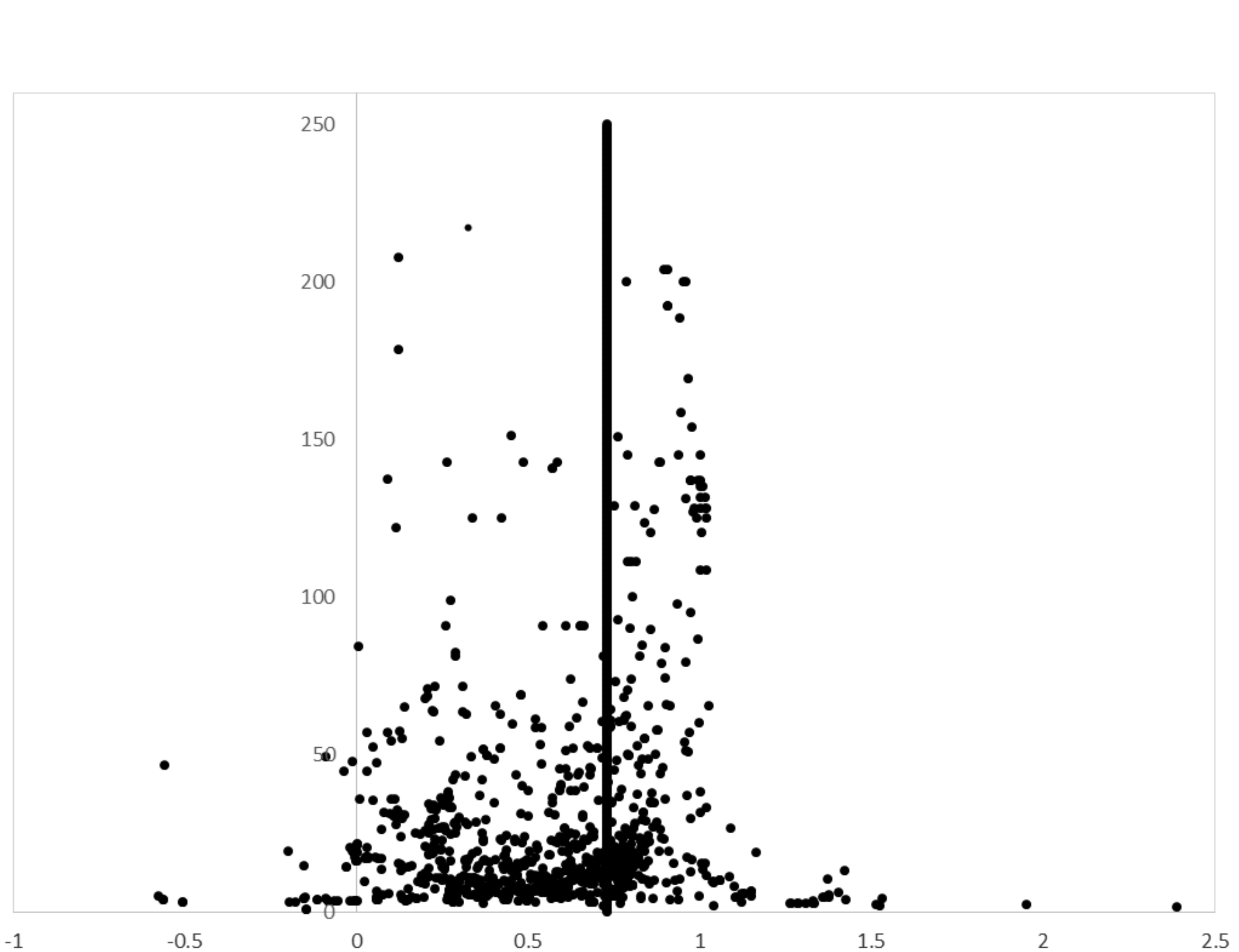
Younis, D., Javid, A.Y. (2014). Market Imperfections and Dividend Policy Decisions of Manufacturing Sector of Pakistan. PIDE Working Papers 2014:99.

Zameer, H., Rasool, S., Iqbal, S., Arshad, U. (2013). Determinants of Dividend Policy: A Case of Banking Sector in Pakistan. Middle-East Journal of Scientific Research 18(3): 410-424.

Zigraiova, D., Havranek, T. (2016). Bank Competition and Financial Stability: Much Ado about Nothing. Journal of Economic Surveys 30(5): 944-981.

Tables and Figures

Figure 1: **Funnel plot for the dividend smoothing coefficients**



Note: The dividend smoothing is measured on the x-axis while the y-axis represents precision calculated as the inverse standard error. The vertical line at 0.728 indicates the "true" dividend smoothing as the mean of the 10% most precise smoothing coefficients.

Table 1: Summary statistics of meta data

Variable label	Definition	Mean	Standard deviation
Dependent Variable			
Dividend smoothing (d)	Dividend smoothing coefficient	0.562	0.325
Precision			
Standard error (se)	Standard error of the dividend smoothing coefficient	0.093	0.102
Study design characteristics			
Working Paper	The study is a working paper older than 5 years = 1, 0 otherwise	0.112	0.316
Post 1998	The mean year of estimation period >1998 = 1, 0 otherwise	0.470	0.499
No. of years	Length of the analyzed time series dimension	12.526	11.524
Debt	Estimation controls for firm debt = 1, 0 otherwise	0.104	0.306
Ownership	Estimation controls for ownership = 1, 0 otherwise	0.166	0.373
Size	Estimation controls for firm size =1, 0 otherwise	0.139	0.346
Other	Estimation controls for other firm factors =1, 0 otherwise	0.419	0.494
Lintner classical	Estimation does not include variables in addition to contemporaneous earnings and lagged dividends as independent variables =1, 0 otherwise	0.420	0.494
Cash flow	The estimation uses a cash flow measure =1, 0 if earnings measure	0.113	0.317
OLS	The estimation is based on OLS =1, 0 otherwise	0.553	0.497
GMM	The estimation is based on GMM=1, 0 otherwise	0.147	0.354
Fixed effects	The estimation is based on fixed effects = 1, 0 otherwise	0.157	0.364
Other estimators	The estimation is based on other methods = 1, 0 otherwise	0.143	0.350
Service and Consumer Goods	Study analyzes service/consumer goods firms =1, 0 otherwise	0.015	0.123
Financial firms	Study analyzes financial firms =1, 0 otherwise	0.150	0.357
Industry firms	Study analyzes industry sector firms =1, 0 otherwise	0.061	0.240
EU	Study analyzes a country or several countries from the EU =1, 0 otherwise	0.174	0.379
Developing	Study analyzes a developing country or several developing countries =1, 0 otherwise.	0.344	0.475
US	Study analyzes the US =1, 0 otherwise	0.114	0.318
UK	Study analyzes the UK =1, 0 otherwise	0.083	0.276
Other countries	Study focuses on other countries =1, 0 otherwise	0.277	0.447

Note: We use the following reference categories in the MRA: classical Lintner model for pre 1998 US data, estimated with OLS.

Table 2: **WLS FAT-PET meta-regression analysis results**

Variable	**Robust se** (1)	**Robust se** (2)	**Robust se** (3)	**Study cluster robust se** (4)	**Study cluster robust se** (5)	**Study cluster robust se** (6)	**Wild bootstrap se clustered by study** (7)	**Wild bootstrap se clustered by study** (8)	**Wild bootstrap se clustered by study** **(9)**
Constant	0.755*** (20.35)	0.732*** (21.47)	0.707*** (24.81)	0.755*** (7.12)	0.732*** (7.60)	0.707*** (7.77)	0.755*** [0.000]	0.732*** [0.000]	0.707*** [0.000]
SE	-3.613*** (-4.82)	-		-3.613** (-2.00)			-3.613 [0.216]	-	
SE (smoothing≤0.5)		-11.30*** (-17.24)			-11.30*** (-4.81)			-11.30*** [0.002]	
SE (smoothing>0.5)		2.526*** (2.64)			2.526 (1.48)			2.526 [0.246]	
SE² (smoothing≤0.5)	-		-17.412** (-3.85)	-		-17.412** (-2.61)	-		-17.412 [0.148]
SE²(smoothing>0.5)			4.746** (2.37)			4.746 (0.87)			4.746 [0.596]
F	23.27	22.73	12.70	3.98	22.73	5.58			
p(F)	0.000	0.000	0.000	0.049	0.000	0.005			
R^2	0.043	0.284	0.018	0.042	0.284	0.018	0.043	0.284	0.018
Adj. R^2							0.042	0.283	0.016
Observations	979	979	979	979	979	979	978	978	978

Notes: Dependent variable is dividend smoothing coefficient; t-values in parentheses; p values in brackets; ***,**,* significance at the 1, 5, 10% level; Squared standard errors of adjustment coefficients are used as weights.

Table 3: WLS estimation results of models (8), (9), and (10)

Panel A

Variable	**Robust se** **(1)**	**Cluster robust se by study** **(2)**	**Wild bootstrap se clustered by study** **(3)**
Constant	0.678***	0.678***	0.678*
	(8.23)	(4.14)	[0.072]
se	-1.536**	-1.536	-1.536
	(-2.44)	(-1.62)	[0.172]
Working paper	0.157**	0.157*	0.157*
	(2.20)	(1.93)	[0.284]
Post 1998	-0.085*	-0.085	-0.085
	(-1.65)	(-1.29)	[-0.372]
No. of years	-0.004	-0.004	-0.004
	(-1.60)	(-0.92)	[0.594]
Debt	-0.035	-0.035	-0.035
	(-0.39)	(-0.35)	[-0.830]
Ownership	0.077**	0.077**	0.077***
	(2.45)	(2.06)	[0.000]
Size	0.025	0.025	0.025
	(0.037)	(0.024)	[0.868]
Other	0.024	0.024	0.024
	(0.83)	(0.72)	[0.484]
Cash Flow	0.371***	0.371***	0.371***
	(5.48)	(3.67)	[0.010]
GMM	-0.219***	-0.219**	-0.219*
	(-3.19)	(-2.32)	[0.078]
Fixed effects	-0.205***	-0.205***	-0.205**
	(-3.22)	(-2.75)	[0.036]
Other estimators	-0.083	-0.083	-0.083
	(-1.06)	(-0.89)	[0.610]
Service & consumer goods	-0.381	-0.381	-0.381
	(-1.60)	(-1.54)	[0.452]
Financial firms	0.250***	0.250**	0.250*
	(2.85)	(2.49)	[0.052]
Industry firms	0.078	0.078	0.078
	(1.09)	(0.97)	[0.422]
EU	-0.092	-0.092	-0.092
	(-1.13)	(-0.60)	[-0.696]
Developing	0.050	0.050	0.050
	(0.64)	(0.41)	[0.786]
UK	0.058	0.058	0.058
	(0.66)	(0.43)	[0.722]
Other countries	0.086	0.086	0.086
	(0.95)	(0.68)	[0.714]
F	75.02	19.77	19.77
p(F)	0.000	0.000	
R^2	0.473	0.473	0.473
Adj. R^2			0.462
Observations	979	979	979

Notes: All variables are as defined as in table 1. Dependent variable is dividend smoothing coefficient. This panel contains specifications with the standard error of the estimated dividend smoothing as independent variable. In Panel B, the (squared) standard error is interacted with a dummy variable equal to 1 for dividend smoothing coefficients higher or lower or equal than 0.5, respectively. t-values in parentheses; p values in brackets; ***,**,* significance at the 1, 5, 10% level; Squared standard errors of adjustment coefficients are used as weights.
Reference category: classical Lintner model for pre 1998 US data, estimated with OLS.

Panel B

Variable	Robust se (1)	Robust se (2)	Cluster robust se by study (3)	Cluster robust se by study (4)	Wild bootstrap se clustered by study (5)	Wild bootstrap se clustered by study (6)
Constant	0.675***	0.657***	0.675***	0.657***	0.675**	0.657*
	(9.25)	(8.12)	(4.78)	(4.00)	[0.042]	[0.072]
SE (smoothing≤0.5)	-7.499***		-7.499***		-7.499***	
	(-13.07)		(-6.73)		[0.002]	
SE (smoothing>0.5)	3.591***		3.591***		3.591***	
	(3.75)		(2.57)		[0.004]	
SE^2 (smoothing≤0.5)		-11.997***		-11.997***		-11.997*
		(-3.82)		(-3.44)		[0.086]
SE^2(smoothing>0.5)		8.195***		8.195**		8.195**
		(3.84)		(2.46)		[0.022]
Working paper	0.160***	0.161**	0.160**	0.161**	0.160	0.161
	(2.70)	(2.35)	(2.45)	(2.03)	[0.164]	[0.276]
Post 1998	-0.081*	-0.094*	-0.081	-0.094	-0.081	-0.094
	(-1.91)	(-1.85)	(-1.51)	(-1.42)	[0.258]	[0.344]
No. of years	-0.006**	-0.004*	-0.006	-0.004	-0.006	-0.004
	(-2.40)	(-1.74)	(-1.44)	(-0.99)	[0.386]	[0.578]
Debt	-0.019	-0.028	-0.019	-0.028	-0.019	-0.028
	(-0.27)	(-0.30)	(-0.24)	(-0.27)	[0.938]	[0.888]
Ownership	0.082***	0.080**	0.082***	0.080**	0.082***	0.080***
	(3.03)	(2.55)	(2.66)	(2.10)	[0.000]	[0.000]
Size	0.018	0.029	0.018	0.029	0.018	0.029
	(0.33)	(0.41)	(0.23)	(0.41)	[0.922]	[0.874]
Other	0.017	0.015	0.017	0.015	0.017	0.015
	(0.71)	(0.49)	(0.64)	(0.42)	[0.610]	[0.710]
Cash Flow	0.272***	0.350***	0.272***	0.350***	0.272***	0.350
	(4.31)	(4.94)	(2.95)	(3.16)	[0.154]	[0.104]
GMM	-0.092	-0.193***	-0.092	-0.193**	-0.092	-0.193
	(-1.36)	(-2.83)	(-1.06)	(-2.06)	[0.468]	[0.120]
Fixed effects	-0.111*	-0.187***	-0.111*	-0.187**	-0.111*	-0.187*
	(-1.91)	(-2.98)	(-1.69)	(-2.56)	[0.190]	[0.062]
Other estimators	-0.017	-0.067	-0.017	-0.067	-0.017	-0.067
	(-0.25)	(-0.87)	(-0.25)	(-0.73)	[0.902]	[-0.640]
Service & consumer goods	-0.281	-0.412*	-0.281	-0.412*	-0.281	-0.412
	(-1.40)	(-1.88)	(-1.45)	(-1.84)	[0.434]	[0.390]
Financial firms	0.209***	0.235***	0.209**	0.235**	0.209*	0.235*
	(2.71)	(2.59)	(2.51)	(2.26)	[0.038]	[0.082]
Industry firms	-0.011	0.026	-0.011	0.026	-0.011	0.026
	(-0.20)	(0.34)	(-0.17)	(0.28)	[-0.916]	[0.776]
EU	-0.131*	-0.135*	-0.131	-0.135	-0.131	-0.135
	(-1.84)	(-1.67)	(-1.09)	(-0.89)	[-0.476]	[0.570]
Developing	-0.001	0.037	-0.001	0.037	-0.001	0.037
	(-0.01)	(0.48)	(-0.01)	(0.30)	[-0.986]	[0.810]
UK	0.032	0.065	0.032	0.065	0.032	0.065
	(0.39)	(0.75)	(0.27)	(0.48)	[0.890]	[0.722]
Other countries	0.061	0.093	0.061	0.093	0.061	0.093
	(0.78)	(1.04)	(0.59)	(0.73)	[0.740]	[0.630]
F	93.32	34.75	93.32	15.88		
p(F)	0.000	0.000	0.000	0.000		
R^2	0.608	0.478	0.478	0.478	0.608	0.478
Adj. R^2					0.600	0.467
Observations	979	979	979	979	979	979

.

Appendix

Table A1: **Overview of studies estimating dividend smoothing coefficients**

Authors	Countries	Time span	No. of firms	No. of estimates	Method	Mean ($\hat{d}$)	Median ($\hat{d}$)
Darling (1957)	US	1921-1954	34	2	OLS	0.495	0.495
Brittain (1964)	US	1920-1960	41	4	OLS	0.716	0.776
Mueller (1967)	US	1957-1960	67	5	OLS & other method	0.877	0.837
Turnovsky (1967)	US	1948-1962	15	3	OLS	0.594	0.590
Feldstein (1970)	UK	1953-1964	12	18	OLS & other method	0.567	0.603
Mcdonald & Nussenbaum (1975)	France	1967-1968	2	7	OLS	0.791	0.802
Nakamura (1985)	Japan US	1964-1981	18	24	OLS	0.680	0.756
Mcdonald & Soderstrom (1986)	US	1965-1984	20	1	Fixed effects	0.840	0.840
Dharan (1988)	US	1981-1983	3	6	OLS	0.933	0.947
Nakamura (1989)	US	1960-1982	23	48	OLS	0.701	0.779
Mookerjee (1992)	India	1950-1981	32	8	Other method	0.255	0.240
Behm & Zimmermann (1993)	Germany	1962-1988	32	8	OLS	0.813	0.812
Sembenelli (1993)	Italy	1962-1988	27	6	OLS & GMM	0.703	0.733
Hines (1996)	US	1984-1989	6	5	OLS	0.596	0.569
DeAngelo & DeAngelo (2000)	US	1958-1979	22	4	Other method	0.268	0.270
Garrett & Priestley (2000)	US	1876-1997	122	3	Other method	0.691	0.670
Desai et al. (2001)	US	1982-1997	16	24	OLS, Fixed effects, & other method	0.282	0.279
Esteban & Pérez (2001)	22 European countries	1991-1998	8	1	GMM	0.342	0.342
Rahman (2002)	28	1992-1999	8	57	OLS	0.900	0.945

	countries						
Short et al. (2002)	UK	1988-1992	5	3	OLS	0.556	0.622
Vasiliou & Eriotis (2002)	Greece	1996-2001	6	4	OLS & Fixed effects	0.530	0.530
Adelegan (2003)	Nigeria	1984-1997	14	5	OLS	1.358	1.405
Gugler & Yurtoglu (2003)	Germany	1992-1998	7	6	Fixed effects	0.400	0.414
Kumar (2003)	India	1994-2000	7	28	OLS & Fixed effects	0.500	0.729
Pandey (2003)	Malaysia	1993-2000	8	7	Fixed effects	0.391	0.432
Perez-Gonzalez (2003)	US	1980-1999	20	2	Fixed effects	0.503	0.503
Benzinho (2004)	Portugal	1990-2002	34	1	Other method	0.352	0.352
Correia da Silva et al. (2004)	Germany	1984-1993	10	24	OLS, Fixed effects, GMM, & other method	0.641	0.684
Omet (2004)	Jordania	1985-1999	15	3	OLS, Fixed effects, & other method	0.631	0.681
Powell et al. (2004)	US	1927-1996	70	2	OLS	0.788	0.788
Trojanowski (2004)	UK	1992-1998	7	11	GMM	0.253	0.270
Karathanassis & Chrysanthopoulou (2005)	Greece	1996-1998	3	32	Fixed effects & other method	0.265	0.266
Aivazian et al. (2006)	US	1981-1999	19	1	Fixed effects	0.089	0.089
Foerster & Sapp (2006)	Canada	1871-2003	133	4	OLS	0.787	0.785
Khan (2006)	UK	1985-1997	330	6	OLS & GMM	0.674	0.677
Naceur et al. (2006)	Tunisia	1996-2002	7	24	OLS, Fixed effects, GMM, & other method	0.334	0.264
Sura et al. (2006)	India	2003-2004	2	43	OLS	0.475	0.503
Ameer (2007)	Malaysia	1995-2005	11	3	OLS	0.633	0.595
Benhamouda (2007)	UK	2000-2004	5	20	OLS & Fixed effects	0.127	0.031
Bodla et al. (2007)	India	1996-2006	11	32	OLS	0.485	0.506
Dai (2007)	Norway	1989-1998	10	5	Other method	0.763	0.764
Hines et al. (2007)	US	1982-2002	21	29	OLS, Fixed effects, & other method	0.241	0.239
Pal & Goyal (2007)	India	1997-1998	2	9	OLS	0.920	0.852
Pandey & Bhat (2007)	India	1989-1997	9	8	GMM	0.259	0.258

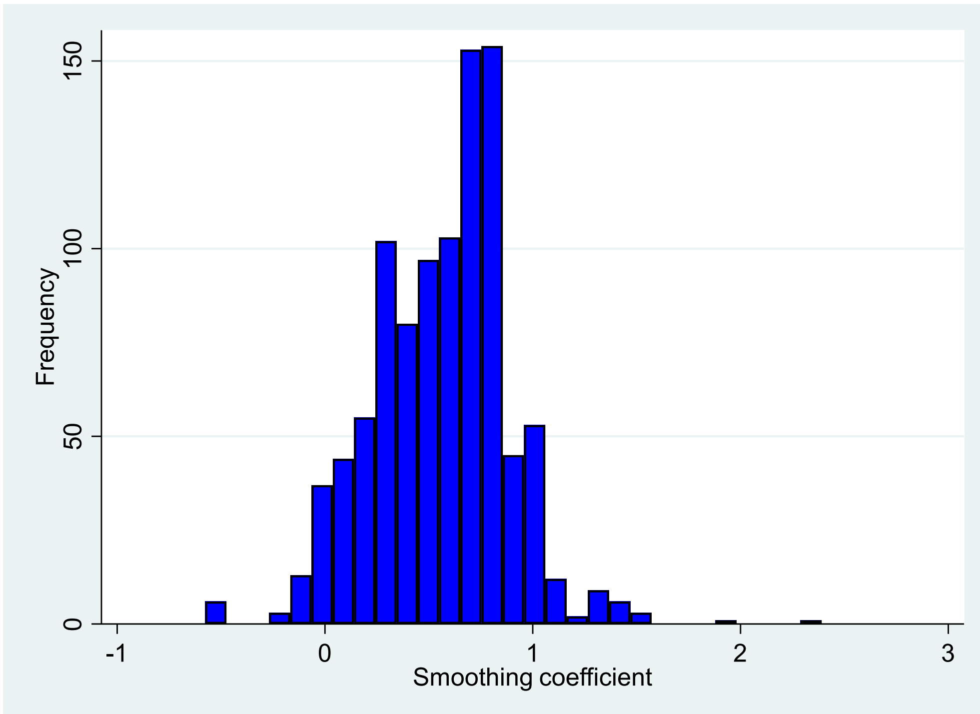
Renneboog & Trojanowski (2007)	UK	1992-1998	7	6	GMM	0.313	0.305
Ahmed & Javid (2008)	Pakistan	2001-2006	6	16	OLS, Fixed effects, GMM, & other method	0.549	0.705
Ameer (2008)	Malaysia	1995-2005	11	7	OLS	0.525	0.576
Baba & Ueno (2008)	Japan	1990-2003	14	1	GMM	0.657	0.657
Haddad et al. (2008)	Jordania	1996-2002	7	6	OLS & GMM	0.409	0.373
Ahmed & Javid (2009)	Pakistan	2001-2006	6	12	OLS, Fixed effects, GMM, & other method	0.532	0.500
Al-Najjar (2009)	Jordania	1994-2003	10	3	OLS, Fixed effects, & other method	0.495	0.561
Alzahrani & Lasfer (2009)	24 OECD countries	2000-2007	8	12	Fixed effects & GMM	0.240	0.236
Andres et al. (2009)	Germany	1984-2005	22	20	OLS, Fixed effects, & GMM	0.683	0.697
Hayunga & Stephens (2009)	UK	1992-2003	12	9	OLS & other method	0.663	0.621
Mollah (2009)	Bnagladesh	1988-2003	16	15	OLS	0.730	0.741
Raza et al. (2009)	Pakistan	2001-2006	6	1	OLS	0.771	0.771
Al-Ajmi (2010)	Qatar	1997-2006	10	14	OLS	0.873	0.808
Al-Yahyaee et al. (2010)	Oman	1989-2004	16	1	Other method	0.747	0.747
Chemmanur et al. (2010)	Hong Kong US	1984-2002	19	8	OLS	0.623	0513
Korkeamaki et al. (2010)	Finland	2003-2006	4	10	OLS, Fixed effects, & other method	0.072	0.110
Sudhahar & Saroja (2010)	India	1997-2007	11	3	OLS	0.680	0.715
Al-Yahyaee et al. (2011)	Oman	1989-2004	16	1	Other method	0.059	0.059
Baiyao (2011)	US	1991-2007	17	1	OLS	0.450	0.450
Goncharov & Triest (2011)	Russia	2003-2006	4	7	OLS	0.546	0.377
Haleem & Javid (2011)	Pakistan	2007-2009	3	21	OLS	0.898	0.803
Hussain (2011)	Saudia Arabia	1990-2006	17	9	Fixed effects & other method	0.546	0.377
Kinfe (2011)	Ethiopia	2006-2010	5	1	OLS	0.191	0.191
Mohsin & Ashraf (2011)	Pakistan	2001-2009	9	3	Fixed effects & GMM & other method	0.568	0.626

Wang et al. (2011)	China	1998-2008	11	13	OLS & other method	0.448	0.450
Abdullah et al. (2012)	Malaysia	2009-2010	2	1	OLS	0.889	0.889
Al-Najjar & Belghitar (2012)	UK	1991-2007	17	8	Fixed effects & GMM & other method	0.552	0.568
Bawa & Kaur (2012)	India	2006-2006	1	24	OLS & Fixed effects	0.898	0.847
Kamat & Kamat (2012)	India	1971-2007	37	9	GMM	0.476	0.401
Kumar & Kumar Jha (2012)	India	2007-2011	5	3	OLS	0.039	0.077
Baker et al. (2013)	Canada	1988-1999	12	2	OLS	0.550	0.550
Hutagalung et al. (2013)	Malaysia	2001-2010	10	1	Fixed effects	0.856	0.856
Kamat & Kamat (2013)	India	1975-1992	18	3	GMM	0.534	0.571
Kanoja & Bhatia (2013)	India	2007-2012	6	5	OLS	0.587	0.682
Persson (2013)	Sweden	2005-2011	7	6	Fixed effects	0.378	0.225
Simegen (2013)	Ethiopia	2002-2011	10	2	Fixed effects	0.203	0.203
Zameer et al. (2013)	Pakistan	2003-2009	7	1	OLS	0.699	0.699
Al-Malkawi et al. (2014)	Oman	2001-2010	10	2	Other method	0.744	0.744
Andres et al. (2014)	Germany	1984-2005	22	19	OLS & GMM	0.592	0.501
Arko et al. (2014)	Sub-Saharan African countries	1997-2007	11	9	OLS	0.677	0.662
Boţoc & Pirtea (2014)	16 emerging countries	2003-2011	9	16	OLS & GMM	0.474	0.487
Gunathilaka (2014)	Sri Lanka	2006-2010	5	7	GMM	0.273	0.350
Tran & Nguyen (2014)	Vietnam	2006-2011	6	2	Fixed effects	0.122	0.122
Younis & Javid (2014)	Pakistan	2003-2011	9	6	Fixed effects & other method	0.512	0.570
Al-Attar et al. (2015)	Jordania	2006-2011	6	7	OLS	0.506	0.487
Andres et al. (2015)	Germany	1988-2008	21	3	OLS, Fixed effects, & GMM	0.716	0.681
Kim & Jeon (2015)	Korea	2000-2010	11	8	OLS, Fixed effects, & other method	0.614	0.722

Renneboog & Szilagyi (2015)	Netherlands	1996-2004	9	8	GMM	0.996	0.825
Shinozaki & Uchida (2015)	44 countries	2003-2013	11	1	Fixed effects	0.788	0.788
Athari et al. (2016)	7 Arabian countries	2003-2012	10	4	GMM	0.404	0.407
Benavides et al. (2016)	Argentina Brazil Chile Columbia Mexico Peru	1995-2013	19	45	OLS	0.650	0.660
Bremberger et al. (2016)	14 EU countries	1986-2010	25	11	OLS, Fixed effects, & GMM	0.510	0.506
Chan et al. (2016)	US	1927-2013	87	2	OLS	0.742	0.742
Chen & Sinha (2016)	US	1996-2001	6	4	OLS	0.739	0.738
Naceur et al. (2016)	Tunisia	1996-2002	7	14	OLS, Fixed effects, GMM, & other method	0.160	0.165

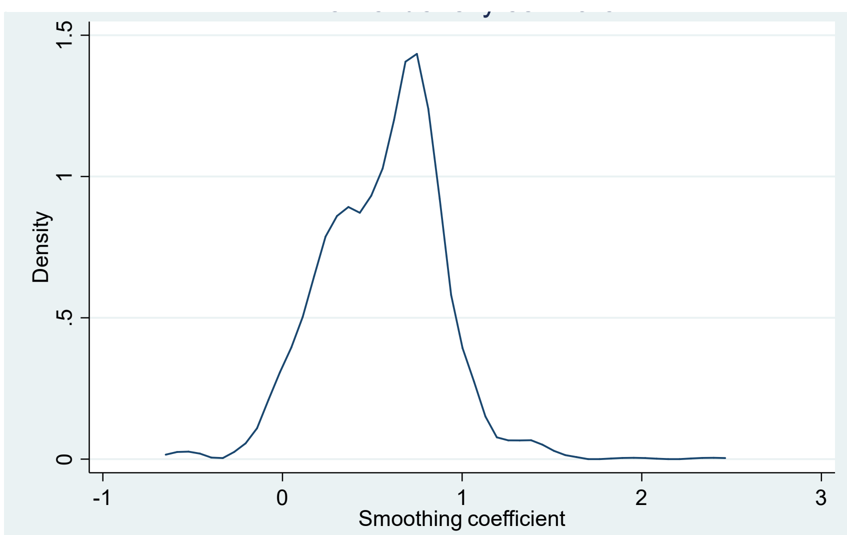
Source: Authors literature search

***Figure A1*: Frequency distribution of dividend smoothing coefficients**



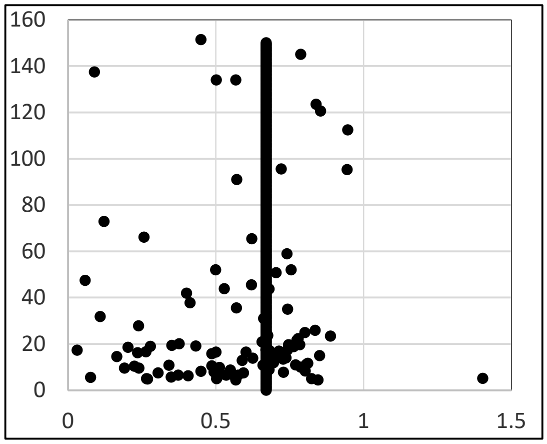
Note: The dividend smoothing is measured on the x-axis while the y-axis represents the frequency of dividend smoothing coefficients within the respective interval.

***Figure A2*: Kernel density of dividend smoothing coefficients**



Note: The dividend smoothing is measured on the x-axis while the y-axis represents the density of dividend smoothing coefficients estimated by Kernel density estimation.

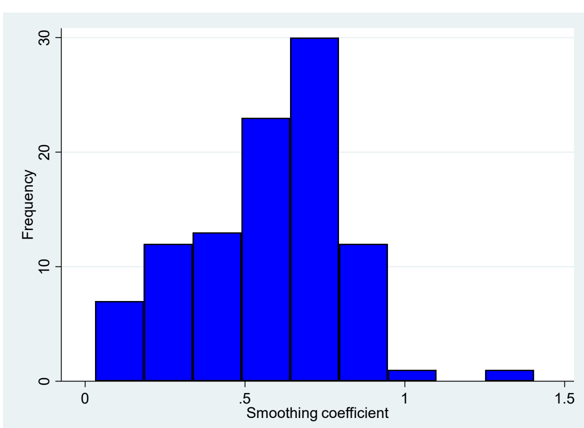
Figure A3: **Funnel plot for the dividend smoothing coefficients (median)**

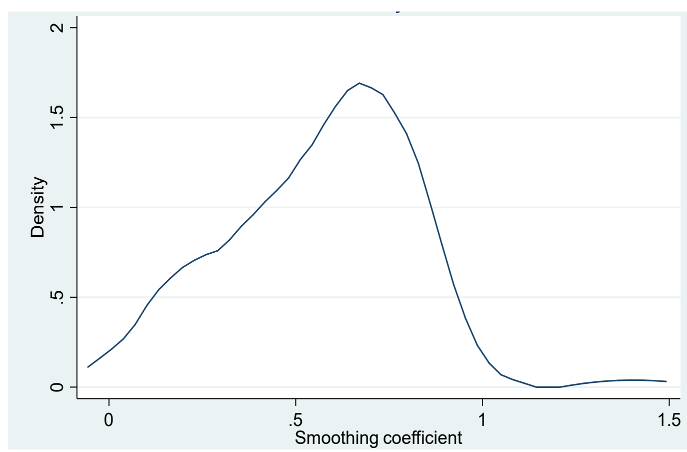


Note: The dividend smoothing is measured on the x-axis while the y-axis represents precision calculated as the inverse standard error. The vertical line at 0.671 indicates the "true" dividend smoothing as the mean of the 10% most precise smoothing coefficients. The plot is based on median values of the dividend smoothing coefficients and precision per study.

Figure A4**: Frequency distribution of dividend smoothing coefficients (median)**

Figure A5**: Kernel density of dividend smoothing coefficients (median)**





Note Figure A4 (left-hand side): The dividend smoothing is measured on the x-axis while the y-axis represents the frequency of dividend smoothing coefficients within the respective interval. The figure is based on median values of the dividend smoothing coefficients and precision per study.

Note Figure A5 (right-hand side): The dividend smoothing is measured on the x-axis while the y-axis represents the density of dividend smoothing coefficients estimated by Kernel density estimation. The figure is based on median values of the dividend smoothing coefficients and precision per study.

Table A2: Bayesian averaging of models (8), (9), and (10)

Variable	Post mean (Post SE)	PIP	Robust se	Post mean (Post SE)	PIP	Robust se	Post mean (Post SE)	PIP	Robust se
Constant	0.682	1.00	0.705***	0.583	1.00	0.579***	0.641	1.00	0.654***
	(19.98)		(14.08)	(25.55)		(8.18)	(20.16)		(11.53)
SE	-0.264	0.84	-2.379***						
	(-1.81)		(-4.30)						
SE (smoothing≤0.5)				-1.150	1.00	-7.390***			
				(-14.41)		(-10.27)			
SE (smoothing>0.5)				1.701	1.00	3.568***			
				(15.91)		(3.51)			
SE² (smoothing≤0.5)							-0.678	1.00	-12.513***
							(-7.08)		(-3.85)
SE²(smoothing>0.5)							3.941	1.00	5.238**
							(12.59)		(2.17)
Working paper	0.043	0.50		0.102	1.00	0.239***	0.110	0.98	0.271***
	(0.89)			(4.02)		(3.37)	(3.28)		(4.87)
Post 1998	-0.087	0.99	-0.077**	-0.119	1.00	-0.088*	-0.101	1.00	-0.064
	(-3.31)		(-1.97)	(-6.46)		(-1.86)	(-4.47)		(-1.14)
No. of years	0.000	0.04		0.000	0.04		0.000	0.11	
	(0.07)			(0.04)			(0.29)		
Debt	-0.000	0.03		0.000	0.04		-0.002	0.03	
	(-0.04)			(0.11)			(-0.04)		
Ownership	0.000	0.03		0.006	0.38		0.000	0.03	
	(0.00)			(0.38)			(0.04)		
Size	0.001	0.05		0.000	0.03		0.000	0.04	
	(0.14)			(0.03)			(0.04)		
Other	-0.000	0.03		-0.004	0.15		-0.001	0.05	
	(-0.05)			(-0.36)			(-0.15)		
Cash Flow	0.168	1.00	0.370***	0.095	0.99	0.219***	0.125	1.00	0.329***
	(5.51)		(5.25)	(3.76)		(3.03)	(4.47)		(4.33)
GMM	-0.241	1.00	-0.269***	-0.136	1.00	-0.159***	-0.223	1.00	-0.220***
	(-8.38)		(-5.33)	(-6.17)		(-2.60)	(-8.72)		(-3.54)
Fixed effects	-0.379	1.00	-0.256***	-0.239	1.00	-0.121*	-0.349	1.00	-0.232
	(-13.22)		(-4.21)	(-10.78)		(-1.85)	(-13.68)		(-3.34)
Other estimators	-0.146	1.00	-0.149**	-0.089	0.99	0.005	-0.137	1.00	-0.099
	(-4.97)		(-2.32)	(-3.83)		(0.07)	(-5.20)		(-1.17)
Service & consumer goods	0.128	0.61	-0.415	0.004	0.06		0.004	0.06	
	(1.08)		(-1.52)	(0.19)			(0.18)		
Financial firms	-0.067	0.75	0.276***	-0.004	0.12		-0.035	0.51	0.271***
	(-1.45)		(3.40)	(-0.31)			(-0.90)		(3.10)
Industry firms	0.208	1.00	0.007	0.021	0.30		0.084	0.76	0.032
	(4.98)		(0.13)	(0.58)			(1.48)		(0.51)
EU	0.014	0.20		0.009	0.18		0.013	0.19	
	(0.44)			(0.40)			(0.42)		
Developing	0.045	0.55	0.048	0.064	0.90	0.067	0.035	0.47	
	(0.94)		(1.05)	(2.16)		(0.99)	(0.81)		
UK	-0.003	0.08		0.001	0.04		-0.004	0.09	
	(-0.17)			(0.06)			(-0.21)		
Other countries	0.056	0.61	0.167***	0.080	0.95	0.087	0.030	0.39	
	(1.06)		(3.15)	(2.73)		(1.06)	(0.70)		
n	979		979	979		979	979		979

Notes: All variables are as defined as in table 1. Dependent variable is dividend smoothing coefficient.. t-values in parentheses; p values in brackets; All models estimated with robust standard errors ***,**,* significance at the 1, 5, 10% level; Squared standard errors of adjustment coefficients are used as weights. PIP refers to the posterior inclusion probability of the variables estimated by Bayesian modeling averaging.
Reference category: classical Lintner model for pre 1998 US data, estimated with OLS

Table A3: WLS FAT-PET meta-regression robustness checks

Variable	Robust 0.5-quantile estimation			WLS coefficients per study		
Constant	0.659*** (29.55)	0.573*** (47.79)	0.564*** (30.30)	0.663*** (44.68)	0.581*** (24.92)	0.566*** (42.44)
SE	-0.628*** (-3.59)			-0.752*** (-5.57)		
SE (smoothing≤0.5)		-1.960*** (-13.36)			-1.381*** (-4.03)	
SE (smoothing>0.5)		1.585*** (11.72)			1.497*** (7.62)	
SE^2 (smoothing≤0.5)			-4.534 (-1.52)			-0.636*** (-3.51)
SE^2(smoothing>0.5)			5.283*** (8.01)			4.899*** (9.80)
F				31.00	98.02	55.61
p(F)				0.000	0.000	0.000
R^2	0.020	0.262	0.090	0.065	0.390	0.149
n	998	998	998	979	979	979

Note: Dependent variable is dividend smoothing coefficient; All models estimated with robust standard errors. t-values in parentheses; p values in brackets; ***,**,* significance at the 1, 5, 10% level;

Table A4: robustness checks of models (8), (9), and (10)

Variable	Robust 0.5-quantile estimation			WLS coefficients per study		
Constant	0.702***	0.555***	0.569***	0.565***	0.460***	0.436***
	(20.93)	(17.04)	(17.61)	(13.78)	(11.98)	(11.53)
SE	-0.619***			-0.663***		
	(-6.92)			(-6.92)		
SE (smoothing≤0.5)		-1.404***			-0.979***	
		(-12.74)			(-4.05)	
SE (smoothing>0.5)		1.397***			1.672***	
		(8.46)			(7.64)	
SE^2 (smoothing≤0.5)			-2.258			-0.526***
			(-0.93)			(-4.25)
SE^2(smoothing>0.5)			3.791***			4.682***
			(5.47)			(8.08)
Working paper	0.078***	0.075**	0.112***	0.106***	0.157***	0.175***
	(2.67)	(2.21)	(3.67)	(3.57)	(5.48)	(6.07)
Post 1998	-0.134***	-0.151***	-0.156***	-0.112***	-0.125***	-0126***
	(-7.10)	(-10.21)	(-8.93)	(-3.79)	(-5.17)	(-4.41)
No. of years	0.001**	0.001**	0.002***	-0.000	0.002	0.003***
	(2.34)	(2.44)	(2.68)	(-0.14)	(1.50)	(3.14)
Debt	-0.027	0.038	-0.045	-0.088**	-0.042	-0.061*
	(-0.69)	(1.20)	(-1.43)	(-2.30)	(-1.35)	(-1.78)
Ownership	-0.042	0.001	-0.040	0.032	0.072***	0.041*
	(-1.15)	(0.03)	(-1.65)	(1.36)	(3.77)	(1.82)
Size	0.014	0.009	0.023	0.026	0.024	0.030
	(0.39)	(0.52)	(0.71)	(0.68)	(0.79)	(0.86)
Other	-0.008	-0.034**	-0.010	0.026	-0.012	0.011
	(-0.38)	(-2.19)	(-0.61)	(1.12)	(-0.69)	(0.51)
Cash Flow	0.071**	0.041*	0.077***	0.136***	0.065*	0.098**
	(2.58)	(1.83)	(4.59)	(3.05)	(1.75)	(2.26)
GMM	-0.281***	-0.170***	-0.258***	-0.238***	-0.169***	-0.230***
	(-10.26)	(-9.42)	(-11.60)	(-7.94)	(-6.78)	(-8.47)
Fixed effects	-0.450***	-0.256***	-0.366***	-0.402***	-0.279***	-0.366***
	(-18.07)	(-11.39)	(-18.47)	(-14.10)	(-11.61)	(-13.32)
Other estimators	-0.159***	-0.097***	-0.147***	-0.138***	-0.085***	-0.114***
	(-5.36)	(-6.00)	(-7.04)	(-5.48)	(-4.33)	(-5.04)
Service & consumer goods	0.166**	0.050	0.079	0.524***	0.274***	0.327***
	(2.11)	(0.84)	(0.66)	(3.97)	(2.68)	(2.93)
Financial firms	-0.037	-0.033	-0.053*	-0.073*	-0.058*	-0.110***
	(-1.20)	(-1.41)	(-1.84)	(-1.87)	(-1.77)	(-3.00)
Industry firms	0.163***	0.065**	0.122***	0.313***	0.075**	0.098***
	(5.79)	(2.50)	(7.76)	(6.20)	(2.21)	(2.90)
EU	0.079**	0.117***	0.107***	0.159***	0.103***	0.151***
	(2.14)	(3.61)	(3.87)	(4.52)	(3.53)	(4.44)
Developing	0.116***	0.169***	0.171***	0.214***	0.176***	0.224***
	(3.71)	(6.07)	(5.95)	(5.11)	(5.37)	(5.64)
UK	0.002	0.079**	0.084**	0.072*	0.072**	0.084**
	(0.05)	(2.21)	(2.48)	(1.79)	(2.17)	(2.17)
Other countries	0.111***	0.187***	0.162***	0.191***	0.178***	0.202***
	(3.71)	(6.07)	(6.01)	(5.05)	(5.72)	(5.67)
F				51.35	71.86	57.98
p(F)				0.000	0.000	0.000
R^2	0.251	0.389	0.297	0.417	0.627	0.489
n	998	998	998	979	979	979

Notes: All variables are as defined as in table 1. Dependent variable is dividend smoothing coefficient. All models estimated with robust standard errors. t-values in parentheses; p values in brackets; ***,**,* significance at the 1, 5, 10% level; Squared standard errors of adjustment coefficients are used as weights. Reference category: classical Lintner model for pre 1998 US data, estimated with OLS.