A REVIEW ON THE MULTIDIMENSIONAL ANALYSIS OF EARNINGS QUALITY

Ana Licerán-Gutiérrez
Department of Financial Economics and Accounting
University of Jaén

Manuel Cano-Rodríguez
Department of Financial Economics and Accounting
University of Jaén

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Abstract

We review the empirical research on earnings quality focusing on its multidimensional nature, showing that, despite the agreement on its multidimensional nature, research has widely adopted a single-dimension approach. Moreover, empirical research on earnings quality has been focused on earnings management and accounting conservatism, remaining the other dimensions much less studied. We also review the multidimensional measures previously used in the literature, highlighting their limitations. We conclude that further research in a multidimensional approach to earnings quality is needed, indicating as possible solution the use of more advanced statistical techniques such as Structural Equation Modelling.

KEYWORDS
Earnings quality, earnings management, earnings smoothing, predictability, conditional conservatism, unconditional conservatism, structural equation models.

1. INTRODUCTION.
Earnings quality is a common topic on accounting research, as documented by the multiple works that have reviewed the research on this topic (Dechow & Schrand, 2004; Demerjian, Lewis, Lev, & McVay, 2013; Li, Niu, Zhang, & Largay, 2011). As earnings quality is directly unobservable, empirical researchers use different empirical proxies that are expected to be associated to desirable properties of accounting information (Perotti and Wagenhofer, 2014). As none of these measures has revealed superior (Dechow, Ge, & Schrand, 2010), earnings quality is considered a multidimensional concept.

In this paper, we review the literature on earnings quality focusing on its multidimensional nature. We found that, despite the theoretical consensus about the multidimensional nature of earnings quality, most of empirical works analyze just one of the characteristics of earnings. Furthermore, the research on the relationships among the different earnings quality dimensions is scant and conclusions are mixed. Finally, only a few studies use multidimensional measures of earnings quality formed by various earnings properties. These indices, though, also have important limitations (Leuz and Wysocki, 2016).

The rest of the paper is structured as follows. Section 2 describes the bibliometric review. Section 3 presents the different dimensions of earnings quality. In Section 4, we analyze the research on earnings quality differentiating between single- and multi-dimension papers. Section 5 concludes highlighting the necessity of multidimensional measures of earnings quality and discussing how the use of Structural Equation Modelling could contribute to develop a composite measure of earnings quality.

2-) BIBLIOMETRIC REVIEW.
We reviewed the articles published in any of the eighteen accounting journals of the Journal of Citation Reports (JCR) 2014\(^1\) from 2000 to 2014. We included those


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papers whose title, abstract and/or keywords reflected earnings quality content, excluding those that did not deal specifically with earnings quality, even if they dealt with related topics such as audit quality, voluntary disclosure or quality of management accounting system.

We found 618 papers on earnings quality of a total of the 6240 articles published in the 18 accounting journals during the period of study. This high proportion of studies indicates that earnings quality is one of the most common topics in accounting research. Furthermore, the interest on this topic has grown along the analyzed period as shown in Figure 1.

Of the 618 articles, 572 are empirical works — they measure accounting quality empirically — and 46 are methodological papers. As our interest is the analysis of multidimensionality in earnings quality measuring, we focus on the 572 empirical papers.

Empirical researchers use various empirical proxies that are expected to be associated to different desirable properties of accounting information (Perotti and Wagenhofer, 2014). Consequently, earnings quality is widely considered to have a multidimensional nature by accounting researchers (Dechow et al., 2010; Dechow and Schrand, 2004; Demerjian et al., 2013; Fields et al., 2001; Francis et al., 2004; Schipper and Vincent, 2003).

Following Dechow et al.’s. (2010), we group earnings quality proxies into three categories: accounting properties of earnings, measures of the investors’ response to earnings, and other external indicators of earnings quality.

The first group comprises several characteristics of reported earnings that are expected to be related to its usefulness for decision making. Specifically: (the absence of) earnings management, earnings persistence, earnings smoothness, and conservatism.

The second group is formed by those proxies that measure investors’ reactions to reported earnings, basing upon the idea that higher quality earnings provide useful information for equity valuation (Dechow et al., 2010; Holthausen and Watts, 2001). Finally, the third group includes those proxies that represent other external indicators, such as SEC enforcement releases, restatements after negative audit opinions, and internal control weaknesses.

A sum-up of the number of papers in each one of these three groups is reported in Figure 2.

The vast majority of the empirical papers (472 of the 572 articles) measure accounting quality using any of the accounting properties of earnings of the first group, 81 articles measure earnings quality through investors’ reaction measures, and only 19 articles use other external indicators. These figures reveal that earnings properties are the most common empirical proxies for earnings quality. Our analysis is focused on the empirical studies that have measured earnings quality using any of these earnings properties, for various reasons. First, as said, it is the most common method for measuring earnings quality. Second, information required for the computation of the

proxies included in this group is entirely available through the financial statements, whereas investors’ reaction measures or the other external indicators require external information to the financial statements—information about the stock market, the existence of earnings restatements, or the quality of the internal control system, for example. Third, the validity of second and third categories measures depends on the implicit assumption that the investors or the external party measure accounting quality correctly. Fourth, accounting properties represent desirable properties that would build up earnings quality (they “cause” quality), while investors’ reaction and other external measures are based on the behavior of different external parties as a consequence of the earnings quality level they observe.

3-) EARNINGS PROPERTIES

We distinguish four earnings properties: earnings management, earnings smoothing, predictability and conservatism. As shown in Figure 2, 472 papers measured earnings quality using any of these properties. Next, we describe these four properties.

3.1- Earnings management.

Earnings management is the pervasive use of financial information revealing less reliable information to influence decision-making of stakeholders, achieving benefits for managers of the firm (Cheng and Warfield, 2005; Dechow and Skinner, 2000; Healy and Wahlen, 1999). Earnings management may lead stakeholders to make decisions based on unreliable information, eventually leading to inefficiency of investment (Biddle and Hilary, 2006) and, therefore, it is expected to be inversely related to earnings quality.

Empirical research on accounting-based earnings management has followed two main approaches: the estimation of the discretionary portion of accruals, and the detection of irregularities in the distribution of earnings.

Papers that investigate discretionary accruals consider that accruals may be generated by the normal activities of the company (non-discretionary accruals) or by managers’ earnings manipulation (discretionary accruals). For estimating discretionary accruals, authors use a predictive model of non-discretionary accruals, computing discretionary accruals as the difference between actual total accruals and the estimated value of non-discretionary accruals.

Despite the generalized use of this approach (304 papers of the 472), empirical studies show a noteworthy low estimation power for these models, behaving even worse than ingenuous models of average total accruals (Thomas and Zhang, 2000) and being unable to detect cases of extreme manipulation in firms with earnings restatements (Jones et al., 2008). Then, there is much empirical evidence that questions the validity of these models.

Papers that study earnings distribution irregularities focus on the low frequency of observations with earnings below a certain target (zero earnings, prior-year earnings, and analysts’ forecasts) compared to the number of observations just beating that target (Burgstahler and Dichev, 1997; Degeorge et al., 1999). These irregularities may be indicative of earnings management because managers may have incentives to meet or beat those earnings targets, so they can manipulate the accounting numbers to meet them, thereby producing the irregularities in the distribution of earnings.

The study of earnings irregularities is not free from problems, either. Thus, those irregularities can be produced by other causes such as the effect of the normalization factor (Durtschi and Easton, 2009), or the asymmetry produced by taxes or conservatism policies (Beaver et al., 2007).

3.2- Earnings smoothing.
Earnings smoothing is the attempt of managers to reduce abnormal variations in earnings (Beidleman, 1973). The relationship between earnings smoothing and earnings quality is controversial. On one hand, a low variability earnings can be considered of high quality because they can be forecasted with a lower error (Biddle and Hillary, 2006; Burgstahler et al., 2006; Lang et al., 2003; Schipper and Vincent, 2003). On the other hand, if managers recur to earnings management to smooth earnings, these manipulations would introduce noise in accounting information, thereby reducing earnings quality (Schipper and Vincent, 2003).

The two empirical proxies of earnings smoothing more commonly used are the comparison of the variability in earnings relative to the variability of sales or operating cash flow and the correlation between changes in accruals and changes in cash flows (Dechow et al., 2010). These measures, however, present an important problem, which is that they do not discriminate between earnings smoothing consequence of earnings manipulation and earnings smoothing consequence of non-discretionary causes such as the fundamental earnings process or the application of accounting rules (Dechow et al., 2010).

3.3- Earnings predictability.
Predictability enhances the decision usefulness of earnings because sustainable earnings are expected to be a better indicator of future cash flows, improving investors' valuation (Dechow et al., 2010). Sustainability is associated with earnings persistence, defined as the extent to which earnings in a year predict future earnings in the following years (Freeman et al., 1982).

The most commonly used empirical proxy for earnings persistence is the auto-regression coefficient of earnings on lagged earnings. This model of auto-regression coefficients has also been extended by disaggregating lagged earnings into cash flows and the main components of accruals, basing on the idea that the cash flow component of earnings has a greater predictive ability than the accrual one (Sloan, 1996).

A second common proxy for earnings predictability is the variance of earnings: A higher variance is indicative of lower earnings predictability (Clubb and Wu, 2014).

Predictability proxies have also been criticized. Thus, observed predictability can be due to earnings management, eventually leading to a lower predictability of non-manipulated earnings (Dechow et al., 2010; Kothari et al., 2005; Schipper and Vincent, 2003). Additionally, predictability is a conjunctive variable of both the quality of financial reporting and the quality of the accounting system that measures it (Barth, 2000; Dechow et al., 2010; Dechow and Ge, 2006). Then, predictability influences the quality of financial reporting, which determines the quality of the accounting system but, at the same time, the quality of the accounting system also determines financial reporting quality.

3.4- Conservatism.
Accounting research literature has distinguished between two types of conservatism: Conditional and Unconditional.

Conditional conservatism is the requirement of a higher degree of verification for recognizing good news than for bad news (Basu, 1997). This type of conservatism is expected to increase earnings quality because it helps to reduce the overinvestment problem (Mora and Walker, 2015), to constrain income-increasing accruals manipulation (Garca Lara et al., 2013), and to enhance debt-contracting efficiency (Beatty et al., 2012; Wittenberg-Moerman, 2008; Zhang, 2008).

The most common measures of conditional conservatism are based on the loss differential timeliness concept developed by Basu (1997): Under conditional conservatism, the requirements for recognizing good news (gains) are stricter than

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2 Some authors refer to conditional conservatism as earnings conservatism, ex-post conservatism or information-driven conservatism (Mora and Walker, 2015).
those for recognizing bad news (losses), so losses will be recorded more timely than gains. Using market returns as the proxy for good and bad news, Basu (1997) showed that the correlation between negative market returns (proxy for bad news) and earnings is higher than that of positive market returns (proxy for good news) and earnings, being the differential timeliness coefficient the indicator of conditional conservatism. Despite its popularity, the reliability of Basu’s differential timeliness has been widely questioned (Cano-Rodríguez and Nunez-Nickel, 2015; Dietrich et al., 2007; Givoly et al., 2007; Patatoukas and Thomas, 2011, 2014). Besides, Basu’s differential timeliness coefficient is not measured at the firm-year level, what motivated other authors to develop firm-year specific measures of conditional conservatism basing on the Basu (1997) differential timeliness, as the C-Score model by Khan and Watts (2009), the conservatism ratio model by Callen, Segal and Hope (2010), or Barth et al. (2014).

Another limitation of Basu’s differential timeliness coefficient is that its computation requires information on market returns, so it is not applicable when this information is not available, as in the case of private companies. Various researchers have developed measures of conditional conservatism based exclusively on financial reported information to overcome this limitation. The most common measures are the reversals of the transitory components of earnings (Basu, 1997), the asymmetric contemporaneous correlation between accruals and cash-flows (Ball and Shivakumar, 2005), or the asymmetry of earnings compared to cash-flows (Gassen et al., 2006; Givoly and Hayn, 2000).

Unconditional conservatism[^3] is the choice of a lower (higher) than expected value in the estimation of assets or revenue (liabilities or expenses) valuation under uncertainty (Ball and Shivakumar, 2005). Unconditional conservatism is associated to a lower earnings quality level, and various empirical studies have shown that it can lead to inefficient investments (Jackson, 2008; Jackson and Cechinni, 2009), and it provides more opportunities for earnings manipulation (Jackson and Liu, 2010).

Unconditional conservatism is less prevalent than conditional conservatism in accounting research (Ruch and Taylor, 2015). The most common empirical measures for unconditional conservatism are the market-to-book ratio (Beaver and Ryan, 2000; Feltham and Ohlson, 1995; Givoly and Hayn, 2000; Watts, 2003), the accumulation of negative accruals (Givoly and Hayn, 2000), and the existence of hidden reserves (Penman and Zhang, 2002).

3.5- A summary of the review on accounting properties.

Our first conclusion is that there is no clear consensus in the literature about how to measure empirically any of the four accounting properties, for there are various empirical proxies for each property, but all of them present limitations that condition their validity.

Additionally, the studies on earnings quality are not evenly distributed among the four properties. Most of the studies analyze earnings management (351 of the 472 earnings-properties articles) and, to a lesser extent, conservatism (139 articles). The number of articles analyzing earnings smoothing or predictability is noteworthy lower (67 and 80, respectively). Thus, although none of the measures of earnings quality can be considered as superior for all decisions (Dechow et al., 2010), previous research is much more focused on earnings management and conservatism measures than on the other two properties.

4- ANALYSIS OF THE EMPIRICAL RESEARCH ON THE MULTIDIMENSIONAL NATURE OF EARNINGS.

[^3]: Also known as balance sheet conservatism or ex-antes conservatism (Mora and Walker, 2015).
In this section, we analyze how the reviewed papers address the multidimensional nature of earnings. The result of this analysis is shown on Figure 3, distributing the papers among four categories: (1) Papers that analyze just one property of earnings; (2) Papers that analyze various earnings properties separately; (3) Papers that analyze the inter-relationships among earnings properties; and (4) papers that use a multidimensional measure of earnings quality. Table 1 provides more details about such distribution.

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Next, we analyze each group and present our conclusions on the multidimensionality of earnings quality measurement.

4.1- Single-dimension approach.
Under this category, we classify those papers that do not consider the multidimensional nature of earnings in their approach. These studies measure earnings quality using just one of the four properties (earnings management, earnings smoothing, predictability or conservatism). Two types of works are considered: (1) Papers that represent earnings quality using only one of the accounting properties. These papers clearly do not control for the existence of the other dimensions of earnings quality and are focused just on that property. (2) Papers with two or more earnings properties as proxies for earnings quality, but analyzed in separate models. Although it can be argued that these papers consider the multidimensional nature of earnings quality because they analyze various dimensions, the inter-relationships among the different earnings properties is not considered, so these papers simply provide various single-dimension analyses, and not a multidimensional one.

One property studies.
Most of the reviewed papers (334 of 472) use only one of the earnings properties for measuring earnings quality. Among these papers, the property most commonly used is earnings management (235 papers), followed by conditional conservatism (49). The popularity of the other three properties (predictability, 23; unconditional conservatism, 14, smoothing, 13) is much lower.

These results reveal that the great majority of papers do not take into account the multidimensional nature of earnings quality: More than 70 per cent of the reviewed papers dealt with just one single property. Therefore, the research on earnings quality to date is mainly based on unidimensional studies. Additionally, this unidimensional research is concentrated on earnings management (235 papers of the 334 unidimensional papers study earnings management) and, in a lower proportion, conditional conservatism (49 papers). Earnings predictability (23 papers), unconditional conservatism (14 papers) and earnings smoothing (13 papers) are much less studied by empirical researchers.

Studies that analyze various properties in separate models.
In this group, we include those studies that analyzed two or more earnings properties in separate models, with no analysis of the possible inter-relationships among them\(^4\).

The number of studies in this group is 107 of a total of 472 (22.67%). Table 1 reports the number of studies for each combination of earnings properties. The most used property is earnings management (83 of 107 papers), followed by conditional conservatism (51 of 107). Analyzing the combination of properties, the most commonly one is earnings quality in addition to market reactions (36 papers), to earnings smoothing (29 papers), to predictability (27 papers) and to conditional conservatism (25 papers). Unconditional conservatism has been few times analyzed (30 of 107 papers) and most of the times in addition to conditional conservatism (24 of 30 papers), being scant the studies of unconditional conservatism in addition to any of the other properties. Finally, it is also noteworthy the low number of papers that include in these studies other external indicators proxies (only 7 of 107 papers).

4.2- Multiple-dimension approach.

We classified in this group those papers that analyzed the relationship among the different earnings properties or that synthetized a composite measure of earnings quality using empirical proxies from various properties.

Papers that study the empirical relationships among earnings properties.

Only 17 papers of the 472 focus on the study of the relationships among the different earnings properties (in addition to those 17 papers, there were 2 papers analyzing the correlation between one of the properties and market reaction). Table 2 lists these 17 papers. On broad terms, the empirical research on this issue has found non-zero correlations among these properties, although the results are mixed.

4 We have also included in this category those papers that analyze, in separate models, one earnings property and other measures of earnings quality that could be included in the market reactions or the other indicators groups.
Earnings management – Smoothing.
Panel B of Table 2 reports the reviewed papers on the correlation between earnings management and smoothing. Theoretically, it can be expected that lower earnings variability can be artificially achieved through earnings manipulation (Schipper and Vincent, 2003; Wilson, 2011). In this regard, empirical evidence has mainly analyzed the influence of earnings management on earnings smoothing, showing that managers deliberately manipulate earnings to smooth earnings (Boterenbrood, 2014; Guan and Pourjalali, 2010; Yeo et al., 2002). Empirical evidences are consistent with this expectation, as the three reviewed papers found a positive relationship between earnings management and income smoothing.

Earnings management – Conservatism.
Panel C of Table 1 reports the papers that addressed the relationship between these two properties. The expected relationship between earnings management and conservatism depends on the type of conservatism considered.

Conditional conservatism is expected to reduce income increasing earnings management, because it delays the recognition of good news and encourages the timely recognition of bad news (Ball et al., 2000; Ball and Shivakumar, 2005; García Lara et al., 2009; Mora and Walker, 2015; Shivakumar, 2013) Although it could be argued that conditional conservatism could facilitate big bath earnings management (Ruch and Taylor, 2015; Mora and Walker, 2015), no empirical study has explored this possibility.

Various empirical studies show the existence of a negative influence of conditional conservatism on earnings management (Ashbaugh et al., 2008; Dechow et al., 2010). Pae (2007) and Houmes and Skantz (2010), however, found a positive relationship between conditional conservatism and discretionary accruals, what indicates that managers may use their discretion to expedite the recognition of bad news, thereby producing a positive correlation between earnings management and conditional conservatism.

Unconditional conservatism is expected to increase the opportunities for earnings management (Ruch and Taylor, 2015), because it creates hidden reserves that can be used to increase earnings when the conservatism is reversed (Penman and Zhang, 2002). This relationship, therefore, depends on the firms' possibilities to reverse past unconditional conservatism (Mora and Walker, 2015). Empirical works that have related unconditional conservatism and earnings management proxies have typically found a positive correlation between them (García Lara et al., 2005; Jackson and Liu, 2010).

Predictability – Smoothing.
These properties are expected to be positively linked: A lower variance of earnings would make earnings more predictable (Schipper and Vincent, 2003). This positive relationship has been supported by empirical findings, evidencing that smoothed earnings that are maintained for long time are more predictable (Tucker and Zarowin, 2006). Dechow et al. (2010), however, reported a negative correlation between earnings smoothing and earnings persistence, but provided no theoretical explanation for it.

Panel D of Table 2 reports the studies that have analyzed empirically this relationship.

Predictability – Conservatism.
The relationship between conservatism and predictability also depends on the type of conservatism. Basu (1997) argued that losses are less persistent than gains because they have to be recognized earlier and more completely. The relationship between conditional conservatism and conservatism would be then asymmetric: conservatism reduces persistence in the reporting of bad news and increases
persistence in the reporting of good news (Chen et al., 2014). The main effect of conditional conservatism on persistence, therefore, would be an empirical issue.

Unconditional conservatism, on the other hand, increases earnings persistence because it is continually implemented, making its recognition more predictable and correlated through time (Chen et al., 2014).

Panel E of Table 2 lists the papers that have studied the relationship between conservatism and predictability. The empirical results on the main effect of conditional conservatism on predictability are mixed: Whereas Chen et al. (2014) found that conditional conservatism reduces persistence, Dechow et al. (2010) observed a positive correlation between these two properties. Regarding unconditional conservatism, empirical results generally support that it is related to an increased predictability, but with some caveats: Chen et al. (2014) evidenced that unconditional conservatism increases earnings persistence; Bandyopadhyay et al. (2010) results corroborate the greater ability for forecasting future cash flows, but they also show that unconditional conservatism reduces current earnings ability for forecasting future earnings.

-li-smoothing – Conservatism.

Similar to the smoothing-persistence relationship, previous literature distinguishes between the effects of conservatism on smoothing in the presence of good versus bad news. Gassen et al. (2006) analyzed the relationships between conditional conservatism, unconditional conservatism and earnings smoothing, finding weak negative correlations of earnings smoothing with the two types of conservatism. Panel F of Table 2 reports the works that have analyzed this relationship.

Our analysis of the works on the inter-relationships among the four earnings properties reveals two relevant features. First, only a few papers have tried to analyze the inter-dependence between the different quality-related earnings properties. Second, some empirical results are contradictory, showing both positive and negative empirical correlations.

4.3- Composite-measure studies.

Table 3 reports the 12 papers (2.54% of the total) that use a composite measure of earnings quality by combining proxies of different properties.

Table 3 here

The analysis of these papers show that all of them follow a similar methodology: They use multivariable indices of various proxies of earnings properties. These indices are built by aggregating the ranking of each proxy or by applying principal components analysis to the different proxies. The result is, then, a composite variable that attempts to represent the construct of earnings quality.

The main difference among these papers is which earnings properties are included in the composite measure. Only one of the reviewed papers (Gaio and Raposo, 2011) includes proxies for the four earnings properties; five papers included proxies for three earnings properties and the remaining six included only two properties. It is also noteworthy that, consistent with the predominance of earnings management in earnings quality research, this property is included in all the papers. Earnings smoothing is the second most used property in these indices, being included in 9 papers. Conservatism and predictability, on the other hand, are used only in 5 papers each.
Leuz and Wysocki (2016) argue that these composite measures are also under various limitations. The first limitation is that the selection of proxies is subjective. As we have previously shown, only one of the papers that used this type of measures included proxies for the four earnings properties. The other papers, therefore, may be also affected by the omitted variables bias indicated for the single-dimension approach studies.

A second limitation pointed by Leuz and Wysocki (2016) is the assignation of ponderations to each proxy. The most common method is to assign equal weights, implicitly assuming that all of them have equal importance, or to apply principal component analysis. In any case, there is no guarantee that those weights represent faithfully the relative importance of each earnings property on the earnings quality construct.

Another limitation pointed by Leuz and Wysocki (2016) is that these composite measures do not control for the correlations among the different proxies, implying that the different proxies may be complements or substitutes.

Finally, Leuz and Wysocki (2016) indicate that the mere addition of the proxies does not necessarily solve the measurement problems, and that there is no evidence that these combined measures are superior to the single-property measures.

4-) CONCLUSIONS AND SUGGESTIONS FOR FUTURE RESEARCH.

Earnings literature broadly accept that earnings quality is a multidimensional concept. We have reviewed the empirical research on earnings quality focusing on this multidimensional nature. Following Dechow et al. (2010), we differentiate between those proxies that represent various accounting properties that are related to earnings quality (earnings properties) and those other proxies that are based on the evaluation of earnings quality by external parties (market reactions and other measures). Focusing on the first group, we categorized the different empirical proxies into four groups, representing the four properties that configure earnings quality: earnings management, earnings smoothing, earnings predictability and conservatism.

Our analysis reveals that, despite the theoretical consensus on the multidimensional nature of earnings quality, empirical research on this topic has widely adopted a unidimensional approach: More than 90% of the papers analyzed just one of the four earnings properties, or analyzed various properties separately. Additionally, our revision shows that the research on earnings quality is heavily oriented towards earnings management and, in a lesser extent, to conservatism. Research on earnings smoothing and earnings predictability is much less prevalent.

We detected only 31 papers that adopted a multidimensional approach in earnings quality empirical research. 17 papers analyzed the inter-relationships among the four earnings properties and 2 that analyzed the inter-relationships among the properties and market reactions. The low number of papers that investigate these relationships and the mixed results reported by them make necessary to increase the research on this topic. Finally, 12 papers used a composite measure of earnings quality, specifically composite indices formed by the aggregation of the ranks of different proxies of the earnings properties. This solution, however, has some important limitations, as the absence of some properties in most of these papers, the subjective selection of the proxies and their weights, or the lack of control for the correlations among the proxies.

In summary, there is a gap between the theoretical concept of earnings quality (a multidimensional construct) and the empirical literature that tries to measure it. To close this gap, empirical researchers should adopt multidimensional earnings quality measures taking into account the correlations among the different properties and optimal weights for all of these proxies.

A potential way of research would be the application of structural estimation to the estimation of earnings quality measures (Leuz and Wysocki, 2016). Structural
Equation Modelling (SEM) works with a multivariate analysis simultaneously examining several hypothesized relationships between one or more independent and dependent variables (Tabachnick and Fidell, 1996). Given that earnings quality is an unobservable concept, this technique is suitable for its measurement because it analyzes both the relationships between directly observable and/or non-directly observable variables while incorporating potential measurement errors (Henri, 2007; Lee et al., 2011). Moreover, earnings quality has been measured with multiple proxies, most of them correlated to each other. The omission of correlated variables leads to biases in the estimation but, if variables are correlated and measure the same concept, their inclusion causes multicollinearity problems. For that reason, SEM is more appropriate than OLS technique for earnings quality measurement given that it allows for the inclusion of as many indicators as needed to explain unobservable concepts, even if these indicators are correlated to each other (Gefen et al., 2011; Reinartz et al., 2009), solving the multicollinearity problem. Furthermore, the estimation of SEM models explicitly incorporates the correlation between variables for the mathematical calculation (Wold, 1980), thereby solving the problem of not considering the correlation between the properties. Finally, about the optimal weights in composite measures of earnings quality, SEM may solve this problem because it offers optimal weights for all the indicators, assigning greater weights for those proxies that better explain the variable (Ullman, 2006).
REFERENCES
124.


FIGURE 1. EVOLUTION OF EARNINGS QUALITY RESEARCH (2000-2014)

PANEL A: NUMBER OF STUDIES

PANEL B: PERCENTAGE OF STUDIES
Figure 2: Distribution of the sample according to the analyzed proxies.

Categories of earnings quality proxies:
- Market reactions: 126
- Accounting properties: 472
- Other external indicators: 19

Accounting properties of earnings:
- Earnings management: 350
- Earnings smoothing: 67
- Earnings predictability: 79
- Conditional conservatism: 109
- Unconditional conservatism: 50

Empirical proxies:
- ERC
- Timeliness ($R^2$)
- Discretionary accruals: 304
- Earnings irregularities: 75
- Deviation of earnings/Deviation of cash flows: 60
- Correlation of accruals and cash flows: 10
- Earnings persistence: 58
- Disaggregated persistence: 33
- Variance of earnings: 22
- Differential timeliness
- Skewness of earnings
- Accounting models
- Market to Book (MTB) ratio: 31
- Large negative accruals: 29
- Hidden reserves: 13
- Restatements: 17
FIGURE 3: COMPOSITION OF THE SAMPLE

- One property: 334 (70.76%)
- Various properties, separate models: 107 (22.67%)
- Various properties, correlation: 17 (3.60%)
- Correlation properties-market reaction: 12 (2.54%)
- Various properties, indices: 2 (0.42%)
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<td>2 1 5</td>
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<tr>
<td>Predictability (79)</td>
<td>23</td>
<td>27 15 9 3</td>
<td>42</td>
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<tr>
<td></td>
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<td>9 2 3 3 3</td>
<td>5 1 10</td>
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<tr>
<td></td>
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<td>11</td>
<td></td>
</tr>
<tr>
<td>Conditional conservatism (109)</td>
<td>49</td>
<td>25 10 9 24</td>
<td>91</td>
</tr>
<tr>
<td></td>
<td></td>
<td>4 2 3 0 0</td>
<td>3 1 7</td>
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<tr>
<td></td>
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<td>24</td>
<td></td>
</tr>
<tr>
<td>Unconditional conservatism (50)</td>
<td>62</td>
<td>6 5 3 24</td>
<td>30</td>
</tr>
<tr>
<td></td>
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<td>4 2 3 0 0</td>
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## TABLE 2: PAPERS EMPIRICALLY ANALYZING THE CORRELATIONS BETWEEN EARNINGS PROPERTIES

<table>
<thead>
<tr>
<th>Author</th>
<th>Explained variable</th>
<th>Explanatory variable</th>
<th>Relationship</th>
<th>Theoretical Justification</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>PANEL A: EARNINGS MANAGEMENT AND PREDICTABILITY</strong></td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Dechow and Dichev (2002)</td>
<td>Predictability</td>
<td>Earnings management</td>
<td>Negative</td>
<td>A high level of accruals implies earnings better reflect underlying cash flows. However, this benefit comes at the cost of incurring estimation errors.</td>
</tr>
<tr>
<td>Yeo et al. (2002)</td>
<td>Earnings management</td>
<td>Predictability</td>
<td>Positive</td>
<td>Managers in their choice of accepted accounting procedures reflect accounting numbers for personal benefit, influencing the informativeness of earnings with apparent more predictable earnings.</td>
</tr>
<tr>
<td>Dechow et al. (2010)</td>
<td>Earnings management/Predictability</td>
<td>Earnings management/Predictability</td>
<td>Negative</td>
<td>Not provided.</td>
</tr>
<tr>
<td>Wang et al. (2011)</td>
<td>Predictability</td>
<td>Earnings management</td>
<td>Positive</td>
<td>Managers engaged in empire building avoid attracting attention to low growth segments making earnings artificially less volatile.</td>
</tr>
<tr>
<td>Chang et al. (2012)</td>
<td>Predictability</td>
<td>Earnings management</td>
<td>Negative</td>
<td>If managers decrease discretionary reporting of reliable information, information asymmetry between management and investors will increase, lowering predictability.</td>
</tr>
<tr>
<td>Huang et al. (2014)</td>
<td>Predictability</td>
<td>Earnings management</td>
<td>Negative</td>
<td>Firms with lower earnings have less readable annual reports, and readability increases with earnings persistence. Managers report tone strategically, trying to lower persistence of earnings.</td>
</tr>
<tr>
<td><strong>PANEL B: EARNINGS MANAGEMENT AND SMOOTHING</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Guan and Pourjolali (2010)</td>
<td>Earnings management</td>
<td>Smoothing</td>
<td>Positive</td>
<td>The higher earnings smoothing, which is strongly influenced by the culture of a country, the higher extent of earnings management is expected.</td>
</tr>
<tr>
<td>Boterenbrood (2014)</td>
<td>Smoothing</td>
<td>Earnings management</td>
<td>Positive</td>
<td>Managers manipulate earnings so as to smooth reported earnings because of contracting incentives.</td>
</tr>
<tr>
<td><strong>PANEL C: EARNINGS MANAGEMENT AND CONSERVATISM</strong></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>Garcia Lara et al. (2005)</td>
<td>Earnings management</td>
<td>Unconditional conservatism</td>
<td>Positive</td>
<td>When managers have incentives to reduce or delay the recognition of earnings, they take additional income-decreasing measures beyond investor protection objectives (unconditional conservatism). This increases reflected discretionary accruals.</td>
</tr>
<tr>
<td>Hae (2007)</td>
<td>Conditional conservatism</td>
<td>Earnings management</td>
<td>Positive</td>
<td>Managers have incentives to perversely expedite the recognition of bad news than good news (increasing earnings management) to lower litigation risk.</td>
</tr>
<tr>
<td>Ashbaugh et al. (2009)</td>
<td>Earnings management</td>
<td>Conditional conservatism</td>
<td>Negative</td>
<td>By requiring that only verifiable information is reported in accounting, conservatism improves accruals quality, reducing earnings management.</td>
</tr>
<tr>
<td>Authors</td>
<td>Earnings management</td>
<td>Concept</td>
<td>Sign</td>
<td>Notes</td>
</tr>
<tr>
<td>---------</td>
<td>---------------------</td>
<td>---------</td>
<td>------</td>
<td>-------</td>
</tr>
<tr>
<td>Houmes and Skantz (2010)</td>
<td>Earnings management</td>
<td>Conditional conservatism</td>
<td>Positive</td>
<td>Highly-valued firms are more likely than others to report low future stock return and have incentives to recognize negative accruals to report bad news and reduce litigation risk.</td>
</tr>
<tr>
<td>Jackson and Liu (2010)</td>
<td>Earnings management</td>
<td>Unconditional conservatism</td>
<td>Positive</td>
<td>Income-increasing bad debt expense (earnings management) is more readily recorded when the allowance is conservative because there are more previously recorded over-accruals of bad debt expense that have accumulated on the balance sheet.</td>
</tr>
</tbody>
</table>

**Panel D: Predictability and Smoothing**

<table>
<thead>
<tr>
<th>Authors</th>
<th>Concept</th>
<th>Concept</th>
<th>Sign</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tucker and Zarowin (2006)</td>
<td>Predictability</td>
<td>Smoothing</td>
<td>Positive</td>
<td>If earnings are more smoothed and maintained in time, earnings will be more predictable and useful for investors.</td>
</tr>
</tbody>
</table>

**Panel E: Predictability and Conservatism**

<table>
<thead>
<tr>
<th>Authors</th>
<th>Concept</th>
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<th>Sign</th>
<th>Notes</th>
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</thead>
<tbody>
<tr>
<td>Bandyopadhyay et al. (2010)</td>
<td>Predictability</td>
<td>Unconditional conservatism</td>
<td>Mixed</td>
<td>Increasing conservatism during the last years has led to an increase in the ability of current earnings to predict future cash-flows, but to a decrease in its ability to predict future earnings.</td>
</tr>
<tr>
<td>Chen et al. (2014)</td>
<td>Predictability</td>
<td>Conditional and unconditional conservatism</td>
<td>Negative for conditional conservatism, positive for unconditional conservatism</td>
<td>Conditional conservatism decreases persistence during bad news periods and increases persistence during good news periods. Unconditional conservatism is expected to increase earnings persistence because it is continually implemented.</td>
</tr>
</tbody>
</table>

**Panel F: Smoothing and Conservatism**

<table>
<thead>
<tr>
<th>Authors</th>
<th>Concept</th>
<th>Concept</th>
<th>Sign</th>
<th>Notes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gassen et al. (2006)</td>
<td>Conditional and unconditional conservatism</td>
<td>Smoothing</td>
<td>Earnings smoothing is negatively correlated with both conditional and unconditional conservatism</td>
<td>The correlation between income smoothing and conditional conservatism depends on the difference between the variance-increasing effect of timelier loss recognition and the variance-decreasing effect of less timely gains recognition.</td>
</tr>
<tr>
<td>Author</td>
<td>Properties included in the composite measure</td>
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<tr>
<td></td>
<td>Earnings management</td>
<td>Earnings smoothing</td>
<td>Earnings predictability</td>
<td>Conservatism</td>
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<td>Bhattacharya et al. (2003)</td>
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<td>Biddle and Hilary (2006)</td>
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<td>Burgstahler et al. (2006)</td>
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<td>Doupnik (2008)</td>
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<td>Francis et al. (2008)</td>
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<td>VanTendeloo and Vanstraelen (2008)</td>
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<td>Boulton et al. (2011)</td>
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<td>Gaio and Raposo (2011)</td>
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<td>Bhattacharya et al. (2012)</td>
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<td>Brown et al. (2014)</td>
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<td>Healy et al. (2014)</td>
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<td>Jung et al. (2014)</td>
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