# Organization capital and modified audit opinion

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**Abstract**

**Purpose** – *This study aims to explore the effects of intellectual capital (IC) on the occurrence of a modified audit opinion decision. The authors expect that high IC intensive firms are positively associated with the occurrence of a modified audit opinion since they are associated with an increased business risk and are more likely to exhibit issues concerning their financial health and stability.*

**Design/methodology/approach** – *Using a data sample of 423 listed firms from Greece, Italy, Spain and Portugal over a 10-year period, the authors estimated a logistic regression model to examine the effects of IC on the probability that a modified audit opinion is issued. The authors used organizational capital as a measure of a firm's intensity on IC.*

**Findings** – *Empirical findings indicate a significant and positive relationship between the IC and the likelihood of a firm receiving a modified audit opinion decision.*

**Originality/value** – *This study expands prior literature by exploring the predictive ability of IC on the likelihood of a firm receiving a modified audit opinion decision.*

**Keywords** *Organizational capital, Listed firms, Audit opinion*

**Paper type** *Research paper*

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## 1. Introduction

This study explores the effects of intellectual capital (IC) on the occurrence of a modified audit opinion decision. Various firm idiosyncratic factors affect the likelihood that an auditor will issue a modified audit opinion. Past literature has provided empirical evidence that the level of abnormal accruals, business risk, leverage and firm size may affect the likelihood of the occurrence of a modified auditing opinion (Bartov *et al.*, 2000; Bradshaw *et al.*, 2001; Chen *et al.*, 2011). However, current literature has still to examine the relation of a firm's intensity on IC, with it being defined as its organizational knowledge (i.e. incorporated within organizational structures, networks, human resources, etc.) and its collective ability to translate such knowledge to action by leveraging organizational learning (Martín-de-Castro *et al.*, 2011; Swart, 2006).

Several reasons indicate that high IC intensive firms, (organizational capital, labeled OC, is a part of IC) are positively associated with the occurrence of a modified audit opinion decision (Habib, 2013). First, IC increases business risk (de Matos Pedro *et al.*, 2018; Dženopoljac *et al.*, 2016; Nimtrakoon, 2015; Sardo and Serrasqueiro, 2018; Zéghal and Maaloul, 2010) which critically not only affects any audit effort and planning but also increases the risk that an unqualified audit opinion will be issued (Bentley *et al.*, 2013; Johnstone, 2000; Shen *et al.*, 2023). Second, a high IC intensive firm may require auditors to develop superior knowledge when auditing IC intensive firms, thus indicating that these auditors have invested resources to develop a relevant reputation which may increase the perceived potential reputational risk (Mayhew and Wilkins, 2003; Reichelt and Wang, 2010). Increased reputational risk increases the likelihood of the occurrence of a modified audit opinion (MAO, labeled M_O). Third, a high IC intensive firm is expected to have increased but more volatile financial results and greater

growth opportunities than a low IC intensive firm (Sardo and Serrasqueiro, 2018) and prior literature indicates that financial irregularities increase with the presence of incentive factors such as rapid economic growth, compensation incentives and stock options compensations (AICPA, 2002; Hogan and Wilkins, 2008). In addition, the presence of a high business risk, as in the case of high IC intensive firms, increases the cost of capital especially in time periods when a firm's requirements to obtain additional debt or equity financing is more pressing. Greater requirements for external financing increase the incentives for firms to misreport (AICPA, 2002).

We used OC, as calculated by Lev *et al.* (2009), to proxy a firm's intensity on IC. Analyzing a sample of 423 listed firms from Greece, Italy, Spain and Portugal over a 10-year period, this study uses a logistic regression model to test the association between the discretionary accruals (a proxy of the audit quality, DeAngelo (1981) and the OC, as independent variables, on the probability that a modified audit opinion is issued. The findings show a positive and significant relationship between the two independent variables and the probability that a modified audit opinion is issued. These findings show how auditors report misreporting even though a firm has invested in OC components. Additional robustness test indicates the validity of our empirical results.

The paper is organized as follows. Section 2 presents the theory and hypothesis of this study. Section 3 discusses the data and methodology. Section 4 reports the empirical results of this study. Finally, Section 5 makes some possible conclusions.

## 2. Background

Auditing has an important role in mitigating both agency problems and asymmetry information between the manager, on the one hand, and insider and outsider stakeholders, on the other. It provides an independent verification that financial statements fairly show a firm's true financial position and its results (Alareeni, 2019). Auditing has both an informative and information security role (Francis, 2023; Francis and Yu, 2009; Xiao *et al.*, 2020), since it secures investors by providing reasonable assurance that the audited financial statements are prepared according to the accounting standards (Blackwell *et al.*, 1998). However, auditing adds value to stakeholders if the auditor is independent from the audited firm to shape and report any errors, deficiency and misstatements in the audited financial statements (DeAngelo, 1981; Piot and Janin, 2007; Xiao *et al.*, 2020).

Prior literature has considered the key economic determinants of auditing quality as the insurance rationale and the reputation rationale (Liao and Radhakrishnan, 2016; Weber *et al.*, 2008). According to the insurance rationale, an auditor has incentives to carry out high-quality audits to avoid possible litigation losses (Dye, 1995). For example, environments attributed with a low level of litigation risk and inefficient disciplinary mechanisms might promote auditors' opportunistic behavior and undermine audit quality (Kim *et al.*, 2013; Tsipouridou and Spathis, 2014). The reputation rationale assumes auditors are motivated to perform high-quality audits to preserve future business opportunities (DeAngelo, 1981) as well as to save their reputation from the occurrence of an inaccurate audit report (Lennox, 1999). The insurance rationale has been documented as the primary factor underlying the provision of high-quality audits in the U.S. market (Weber *et al.*, 2008), whereas for non-U.S. markets, the reputation rationale serves as a potential discipline (Hope and Langli, 2010).

The output of an audit is the audit report, a document presenting the judgment of the auditor on the audited financial statements. To formulate an audit opinion, an auditor must become familiar with the clients' business (the analysis and evaluation of its inherent risks), carry out internal control checks (the analysis and evaluation of the control risk) and obtain substantive evidence about accounting assertions (Habib, 2013). At the last stage of the auditor work, an auditor can issue a standard, non-modified audit opinion but can also issue a modified audit opinion. This is the two-dimensional definition of audit quality (DeAngelo, 1981), according to

which an auditor must detect any anomalies (errors or fraud) in the financial statements and report them in the audit report.

Prior literature has recognized two broad categories of determinants of a M_O: (i) auditor and audit-specific variables and (ii) firm-specific variables. The primary auditor and audit-specific characteristics that affect auditing quality are: auditor size, audit firm industry specialization, audit firm and partner tenure, level of non-audit fees and audit report lag (Habib, 2013). Prior literature has associated top-tier firms positively with auditing quality and the likelihood of expressing a M_O for several reasons, such as their ability to adopt more audit efforts, improved auditing ability and increased litigation risk (Becker *et al.*, 1998; Francis and Krishnan, 1999; Francis and Yu, 2009; Krishnan, 2003; Reichelt and Wang, 2010). Industry specialist auditors have greater knowledge of their client's industries and invest a substantial proportion of resources to develop a relevant reputation (Mayhew and Wilkins, 2003; Reichelt and Wang, 2010). For these reasons, industry specialization is expected to increase the likelihood of the occurrence of a M_O (Pham, 2022). Long auditing tenure is expected to increase auditing quality since auditors increase their client- and industry-specific knowledge (Myers *et al.*, 2003) without compromising their independence (Carcello and Nagy, 2004; Geiger and Raghunandan, 2002). There are different views on the relationship between non-audit fees and auditing independence. A high level of fees from non-audit fees may diminish the auditor's independence (DeAngelo, 1981) or increase the overall quality of services provided by an auditor (Arruñada, 1999; Becker *et al.*, 1998; Simunic, 1984). Finally, it seems that there is a positive association between audit report lag and the likelihood of the occurrence of a modified audit opinion (Ireland, 2003).

Several firm-specific factors have been associated with the likelihood of the occurrence of a M_O (Habib, 2013). Firm size seems to be negatively associated with the probability of receiving a modified auditing opinion, probably because larger firms are both less sensitive than smaller firms to corporate governance issues (Averio, 2020) and have more negotiating power with auditors (DeAngelo, 1981). Business risk, measured as the frequency of negative earnings, firm leverage, default status or the probability of bankruptcy, increases the likelihood that a firm may receive a modified audit opinion. Finally, market-based performance measures and prior audit opinions seem to be associated with the auditing decision-making processes (Habib, 2013).

## 3. Research motivation and hypothesis development

Prior literature has associated the likelihood of a firm receiving a M_O with several firm-specific factors, such as firm size, business risk, market performance measures and prior audit opinions (Habib, 2013). These firm-specific factors highlight the firm's financial and quantitative dimensions rather than the qualitative characteristics that shape the enterprise ontology. However, an essential part of formulating an audit opinion is that an auditor must become familiar with the clients' business (Habib, 2013).

An essential dimension of contemporary business models are unreported intangible assets, which are usually referred to as IC. Developing IC is associated with the expenditures that the current accounting regulatory framework dictates to be expensed and thus are not reported as assets on the balance sheet. Within the context of this study, a firm's IC is defined as its organizational knowledge (i.e. incorporated within organizational structures, networks, human resources, etc.) and its collective ability to translate such knowledge to action by leveraging organizational learning (Martín-de-Castro *et al.*, 2011).

The research motivation of this study is to expand prior research on firm-specific determinants of a M_O by focusing on the qualitative characteristics of enterprise ontology and more specifically on IC. IC and its components represent a strategic resource that shapes managerial behavior, directs critical economic decisions and affects a variety of firm qualitative characteristics. In addition, a firm's intensity on IC is associated with an

increased financial and market performance (Eberhart *et al.*, 2008; Eberhart *et al.*, 2004; Lajili and Zéghal, 2006; Pantzalis and Park, 2009).

Several reasons indicate that high IC intensive firms are positively associated with the occurrence of a M_O (Habib, 2013). First, IC increases the level of business risk, which, as mentioned in the background section, is positively associated with the likelihood of a firm receiving a M_O (Shen *et al.*, 2023). Several studies (Nimtrakoon, 2015; Sardo and Serrasqueiro, 2018; Zéghal and Maaloul, 2010) documented a positive relation of IC with financial performance, but this relation is not linear (de Matos Pedro *et al.*, 2018; Dženopoljac *et al.*, 2016; Nimtrakoon, 2015; Sardo and Serrasqueiro, 2018). The presence of nonlinear effects of IC on a firm's financial performance indicates that high IC intensive firms have an increased business risk. For example, Kothari *et al.* (2002) provided evidence that intangible investments (i.e. R&D investments) generate future benefits that are far more uncertain than benefits from investments in tangible assets (i.e. plant, property and equipment). Thus, high IC intensive firms are associated with an increased business risk, which critically not only affects any audit effort and planning but also increases the risk that an unqualified audit opinion will be issued (Bentley *et al.*, 2013; Johnstone, 2000).

Second, a high IC intensive firm may require auditors with specialized industry and firm-specific knowledge. However, the development of greater knowledge for auditing IC intensive firms indicates that these auditors have invested in resources to develop a relevant reputation, which may increase the perceived potential reputation risk (Mayhew and Wilkins, 2003; Reichelt and Wang, 2010). Increased reputation risk increases the likelihood for the occurrence of a M_O.

Third, a high IC intensive firm may have increased motives to contact a misreport than a low IC intensive firm. A high IC intensive firm is expected to have increased but more volatile financial results and greater growth opportunities than a low IC intensive firm (Sardo and Serrasqueiro, 2018), with literature highlighting how financial irregularities increase with the presence of incentive factors such as rapid economic growth, compensation incentives and stock option compensations (AICPA, 2002; Hogan and Wilkins, 2008). In addition, the presence of a high business risk, as in the case of high IC intensive firms, increases the cost of capital, especially in time periods when a firm's requirements to obtain additional debt or equity financing are more pressing. Greater requirements for external financing increase the incentives for firms to misreport (AICPA, 2002).

Based on the above analysis, we will examine the following hypothesis:

*H1.* A high IC intensive firm is positively associated with the occurrence of a modified audit opinion decision.

## 4. Data and methods

### *4.1 Data*

We will examine our research hypothesis using a data sample of Mediterranean listed firms from Italy, Greece, Spain and Portugal that was obtained from the Bureau van Dijk Orbis Database for the period 2013–2022. Focusing on the context of Mediterranean EU countries has the methodological benefit that allows to explore the effects of IC on the likelihood of the occurrence of a modified audit opinion decision between firms operating within different countries that share common cultural characteristics and macroeconomic profiles. We can increase the size of our data sample, reducing the cross-country variations on managerial characteristics and incentives to manage earnings.

Our initial data sample included 851 firms, representing all those firms listed in 2023 in Spain, Greece, Italy and Portugal. Firms with insufficient data were removed from our sample, with a final balanced panel data set of 4,230 firm-year observations (423 firms). Within our sample, 22.46% are Spanish firms (95 out of 423), 23.40% (93 out of 423)

are Greek, 45.63% (193 out of 423) are Italian and 8.51% (36 out of 423) are Portuguese (see Table 1).

### 4.2 Measuring the intensity of intellectual capital

The primary variable of our research design for quantifying the level of IC is the variable organizational capital (Lev *et al.*, 2009). The organizational capital $\left(\mathrm{OrC}^{j}_{i,t}\right)$ of firm *i* classified in industry *j* in year *t* is the level of its abnormal profits capitalized and amortized over the last five years, scaled by the total assets of the firm. The level of abnormal profits is the sum of the abnormal revenues ($\mathrm{Ab\_R}^{j}_{i,t}$) and the cost containment ($\mathrm{Ab\_C}^{j}_{i,t}$). The level of a firm's abnormal revenues (cost containment) is the difference between a firm's actual (predicted) and predicted (actual) revenues (costs) according to the average efficiency without the organizational capital (Lev *et al.*, 2009). The revenues (costs) are modeled as:

$$\mathrm{Rv}^{j}_{i,t} = \mathrm{b}^{j}_{0,i,t}\mathrm{E}^{j}_{i,t}{}^{\mathrm{b}^{j}_{2,i,t}}\mathrm{PPE}^{j}_{i,t}{}^{\mathrm{b}^{j}_{3,i,t}}\mathrm{e}^{j}_{i,t} \tag{1a}$$

$$\mathrm{C}^{j}_{i,t} = \mathrm{b}^{j}_{0,i,t}\mathrm{E}^{j}_{i,t}{}^{\mathrm{b}^{j}_{2,i,t}}\mathrm{PPE}^{j}_{i,t}{}^{\mathrm{b}^{j}_{3,i,t}}\mathrm{e}^{j}_{i,t} \tag{1b}$$

where $\mathrm{Rv}^{j}_{i,t}$ is level of the annual revenue; $\mathrm{C}^{j}_{i,t}$ is level of the annual costs; $\mathrm{E}^{j}_{i,t}$ is the number of employees; and $\mathrm{PPE}^{j}_{i,t}$ is the level of net plant, property and equipment of firm i operating in the *j* industry in year *t* of firm *i*, which is classified in the *j* industry sector in year *t*. The coefficients $\mathrm{b}^{j}_{0,i,t}$, $\mathrm{b}^{j}_{2,i,t}$ and $\mathrm{b}^{j}_{3,i,t}$ of equation 1(a) and (b) are obtained by estimating the following regression models:

$$\log\left(\frac{\mathrm{Rv}^{j}_{i,t}}{\mathrm{Rv}^{j}_{i,t-1}}\right) = \mathrm{b}^{j}_{0,i,t} + \mathrm{b}^{j}_{1,i,t}\log\left(\frac{\mathrm{SG\&A\_C}^{j}_{i,t}}{\mathrm{SG\&A\_C}^{j}_{i,t-1}}\right) + \mathrm{b}^{j}_{2,i,t}\log\left(\frac{\mathrm{E}^{j}_{i,t}}{\mathrm{E}^{j}_{i,t-1}}\right) + \mathrm{b}^{j}_{3,i,t}\log\left(\frac{\mathrm{PPE}^{j}_{i,t}}{\mathrm{PPE}^{j}_{i,t-1}}\right) + \log\left(\frac{\mathrm{e}^{j}_{i,t}}{\mathrm{e}^{j}_{i,t-1}}\right) \tag{2a}$$

$$\log\left(\frac{\mathrm{C}^{j}_{i,t}}{\mathrm{C}^{j}_{i,t-1}}\right) = \mathrm{b}^{j}_{0,i,t} + \mathrm{b}^{j}_{1,i,t}\log\left(\frac{\mathrm{SG\&A\_C}^{j}_{i,t}}{\mathrm{SG\&A\_C}^{j}_{i,t-1}}\right) + \mathrm{b}^{j}_{2,i,t}\log\left(\frac{\mathrm{E}^{j}_{i,t}}{\mathrm{E}^{j}_{i,t-1}}\right) + \mathrm{b}^{j}_{3,i,t}\log\left(\frac{\mathrm{PPE}^{j}_{i,t}}{\mathrm{PPE}^{j}_{i,t-1}}\right) + \log\left(\frac{\mathrm{e}^{j}_{i,t}}{\mathrm{e}^{j}_{i,t-1}}\right) \tag{2b}$$

**Table 1** Sample firms by industry (firm-year observations over the period 2013–2022)

| *NACE10* | *Freq.* | *%* | *The NACE nomenclature (2 digit)* |
|---|---|---|---|
| 1 | 20 | 0.47 | Agriculture, forestry and fishing |
| 2 | 390 | 9.22 | Manufacturing, mining and quarrying and other industry |
| 3 | 1,580 | 37.35 | Manufacturing |
| 4 | 190 | 4.49 | Construction |
| 5 | 550 | 13.00 | Wholesale and retail trade, transportation and storage, accommodation and food service activities |
| 6 | 590 | 13.95 | Information and communication |
| 7 | 390 | 9.22 | Real estate activities |
| 8 | 370 | 8.75 | Professional, scientific, technical, administration and support service activities |
| 9 | 50 | 1.18 | Public administration, defence, education, human health and social work activities |
| 10 | 100 | 2.36 | Other services |
| *Total* | *4,230* | *100.00* | |

**Notes:** The following table shows the "high-level SNA/ISIC aggregation A. *10 / 11" "ISIC Rev. 4/NACE Rev. 2" (Excepted financial and insurance activities)
**Source:** Authors' own creation

where $SG\&A\_C^{j}_{i,t}$ is the annual level of the SG&A expenses capitalized and amortized over the last three years. The regression models of equation 2(a) and (b) will be estimated using the econometric approach proposed by Petersen *et al.* (2009).

### 4.3 Auditor independence and opinions

The relation between the intensity of OC and the likelihood of the occurrence of a modified audit opinion decision will be examined by estimating the binary logistic panel regression models of equation (3):

$$M\_O^{j}_{i,t} = \beta_0 + \beta_1 OrC^{j}_{i,t} + \beta_2 A\_AC^{j}_{i,t} + \beta_3 B4^{j}_{i,t} + \beta_4 ROA^{j}_{i,t} + \beta_5 SIZE^{j}_{i,t} + \beta_6 LEV^{j}_{i,t} + \beta_7 INVREC^{j}_{i,t} + \beta_8 ZSCORE^{j}_{i,t} + \beta_9 LS^{j}_{i,t} + \beta_{10} GDP^{j}_{i,t} + e^{j}_{i,t} \quad (3)$$

The dependent variable of the binary logistic regression model of equation (3) is the variable $M\_O^{j}_{i,t}$. The dependent variable receives the value 1 in the case that a modified audit opinion for any reason is issued for firm i classified in industry j in year t. Otherwise, the variable $M\_O^{j}_{i,t}$ equals to 0.

The binary logistic panel regression model of equation (3) includes the variable $OrC^{j}_{i,t}$ to test the hypothesis that a high IC intensive firm is positively associated with the occurrence of a modified audit opinion decision. The variable $OrC^{j}_{i,t}$ is the level of organizational capital of firm i classified in industry j in year *t* estimated as in Lev *et al.* (2009). The independent variable $A\_AC^{j}_{i,t}$ is the level of the estimated discretionary accruals of firm i classified in industry j in year t. The level of the discretionary accruals ($A\_AC^{j}_{i,t}$) is estimated using the cross-sectional modified Jones model (Charitou *et al.*, 2007). The ability to reduce the magnitude of the discretionary accruals and the intensity of accrual earnings management has been used in literature as a measure of the first dimension of audit quality, which is an auditor's technical ability to detect a misstatement in a firm's financial statements (Alareeni, 2019; Chen *et al.*, 2011; Chen *et al.*, 2005; Liao and Radhakrishnan, 2016; Rusmin, 2010; Soroushyar, 2023). In contrast, prior literature (Bradshaw *et al.*, 2001; Butler *et al.*, 2004) also provides evidence that auditors are less likely to issue modified opinions for earnings-management reasons.

The remaining control variables capture the effects of various factors that past literature has associated with the occurrence of a modified opinion. We introduced the variable $B4^{j}_{i,t}$ as a dummy variable indicating if the auditor of firm i classified in industry j in year *t* is a Big-x auditing firm ($B4^{j}_{i,t} = 1$). It is used to capture the superior ability of Big-x auditors to constrain the intensity of accrual earnings management (Kharuddin *et al.*, 2021; Piot and Janin, 2007; Viana *et al.*, 2022). Consistent with previous literature (Tsipouridou and Spathis, 2014), we introduced the inventory and accounts receivables scaled by the total assets ($INVREC^{j}_{i,t}$), the leverage ($LEV^{j}_{i,t}$), proxied by the total assets scaled by the total equity ($TLE^{j}_{i,t}$), the return on the assets ($ROA^{j}_{i,t}$) of firm i classified in industry j in year t. The dummy variable $LS^{j}_{i,t}$ indicates if the firm reported a loss in the previous year ($LS^{j}_{i,t} = 1$) and the firm size ($SIZE^{j}_{i,t}$) proxied by the natural logarithm of the total assets of firm i classified in industry j in year t. We also add the control variable ($ZSCORE^{j}_{i,t}$), proxying the Altman's Z-SCORE (Altman *et al.*, 2017; DeFond and Zhang, 2014). The variable is categorical and assumes the value 0 for firms in the safe zone, the value 1 for firms in the gray zone and the value 2 for firms in the distress zone. Finally, to capture the effects of the macroeconomic environment on the likelihood of the occurrence of a modified opinion, we introduced the variable ($GDP^{j}_{i,t}$) which is the pro-capital gross domestic product (World Bank, 2024). Table 2 summarizes the description and the definition of the variables included in equation (3).

**Table 2** Variable description and measurement

| *Label* | *Variable description* | *Exp. sign* |
|---|---|---|
| $M\_O^j_{i,t}$ | The modified audit opinion of firm i, proxied by a dummy variable taking the value 1 if a firm received a not clear audit opinion in the year t, the value zero otherwise | |
| *Testing variable* | | |
| $OrC^j_{i,t}$ | The level of organizational capital of firm i classified in industry j in year t, estimated as in Lev *et al.* (2009) | + |
| *Control variables* | | |
| $A\_AC^j_{i,t}$ | The absolute value of accrual-based earnings management for firm j in year t, proxied by the absolute value of discretionary accruals accounted as in Dechow *et al.* (1995) | + |
| $B4^j_{i,t}$ | The type of auditor, proxied by a dummy indicator taking the value 1 in the case of a Big4 audit company (the PwC, the Deloitte, the KPMG and the Ernst & Young), audits a company, and the value zero otherwise | + |
| $ROA^j_{i,t}$ | Firm profitability of firm i measured as the return on assets ratio | − |
| $SIZE^j_{i,t}$ | Firm size, measured as the natural logarithm of total assets for firm i in year t | − |
| $LEV_{i,t}$ | Firm's financial leverage, proxied by total assets scaled by total assets for firm i in year t | + |
| $INVREC^j_{i,t}$ | The level of inventory and accounts receivable of firm i at year t scaled by the total assets of the same year | + |
| $ZSCORE^j_{i,t}$ | The firms' financial problems proxied by the Altman Z′ score, which is developed for both manufacturing and non-manufacturing firms and private and public firms. It is a categorical variable taking the value 0 for firms in the safe zone (showing a Z″ score index above 2.60), that identify non-bankrupt firms; the value 1 for firms in the gray zone (showing a Z′ score index between 1.10 and 2.60) and the value 2 for firms in the distress zone (showing a Z″ score below 1.10), indicating firms with a high risk of bankruptcy. This index was estimated according to Altman *et al.* (2017) | + |
| $LS^j_{i,t}$ | Negative net income, proxied by a dummy variable taking the value 1 if the net income of firm i at year t is less than zero, while the variable takes the value zero otherwise | + |
| $GDP^j_{i,t}$ | The gross domestic product per capita (in current US$), proxied by the GDP divided by midyear population for each country in year t (World Bank, 2024) | ? |

**Note:** This table reports the variable description and measurement
**Source:** Authors' own creation

## 5. Results

### 5.1 Descriptive statistics

Table 3 (Panel A and Panel B) illustrates the descriptive statistics for the continuous (panel A), dummy and categorical variables (panel B) in equation (3), distinguishing two subsamples according to whether or not there is a modified opinion. The average level of organization capital is higher for firms that received a modified opinion than those that did not (9.278 and 0.374, respectively). Similarly, the average value of accrual-based earnings management is higher in companies that have had a modified opinion (0.106) than in companies that have had a clear opinion (0.094). In addition, companies that have had a modified opinion have higher average values of indebtedness and worse values regarding the firm profitability.

Regarding the categorical variables, it seems that the percentage of companies that have a modified opinion decreases when the financial problems of the companies (proxied by the Altman's Z score) increase. A non-tabulated t-test between the dependent variable M_O and the testing variable $OrC_{i,t}$ shows that firms receiving a modified audit opinion have invested heavily in organization capital (mean = 3,069), more than other firms (mean = 1,360). The difference between means is significant at 1% level. The Chi-square test shows a strong and significant correlation (at 1% level) between the dependent variable $OrC_{i,t}$ and the categorical control variable ZSCORE.

### 5.2 Correlation analysis

Table 4 presents the Pearson correlations between the variables of equation (3). The Pearson index is calculated on dichotomous variables since it corresponds to the correlation coefficient phi, which, like the tetrachoric correlation, evaluates the association between two dichotomous variables.

**Table 3** Descriptive statistics of continuous and binary variables (4,230 firm-year observations)

| | *Mean* $MAO^{j}_{i,t}$ | | *Median* $MAO^{j}_{i,t}$ | | *Minimum* $MAO^{j}_{i,t}$ | | *Maximum* $MAO^{j}_{i,t}$ | |
|---|---|---|---|---|---|---|---|---|
| | *0* | *1* | *0* | *1* | *0* | *1* | *0* | *1* |
| *Panel A – Descriptive statistics for continuous variables* | | | | | | | | |
| OrC | 0.374 | 9.278 | 0.000 | 0.002 | −4.134 | −0.023 | 29.926 | 34.718 |
| A_ac | 0.094 | 0.106 | 0.053 | 0.061 | 0.000 | 0.000 | 2.443 | 1.279 |
| Roa | 0.010 | 0.187 | 0.020 | 0.010 | −3.000 | −16.378 | 6.060 | 29.200 |
| Size | 12.759 | 11.791 | 12.640 | 12.110 | 0.000 | 0.000 | 19.270 | 19.040 |
| Lev | 0.116 | 0.302 | 0.060 | 0.080 | −0.010 | 0.000 | 2.120 | 13.400 |
| Invrec | 0.240 | 0.200 | 0.210 | 0.160 | −0.080 | −0.210 | 1.000 | 0.960 |
| Ls | 0.318 | 0.420 | 0.000 | 0.000 | 0.000 | 0.000 | 1.000 | 1.000 |
| Gdp | 28,167 | 29,364 | 29,674 | 30,724 | 17,617 | 17,617 | 36,449 | 36,449 |

*Panel B – Descriptive statistics of dummy and categorical variables*

| | | $MAO^{j}_{i,t}$ | | | |
|---|---|---|---|---|---|
| $MAO^{j}_{i,t}$ | | 0 | % | 1 | % |
| | | 3,966 | 93.75 | 264 | 6.25 |
| $ZSCORE^{j}_{i,t}$ | 0 | 1,937 | 95.75 | 86 | 4.25 |
| | 1 | 927 | 95.27 | 46 | 4.73 |
| | 2 | 1,102 | 89.30 | 132 | 10.70 |
| $B4^{j}_{i,t}$ | 0 | 1,938 | 93.31 | 139 | 6.69 |
| | 1 | 2,028 | 94.20 | 125 | 5.80 |

**Note:** This table reports the descriptive statistics for continuous variables (Panel A) and dummy and categorical variables (Panel B) in equation (3). In Panel B, the cumulative frequency is on the row
**Source:** Authors' own creation

**Table 4** Correlation analysis (4,230 firm-year observations)

| *Variable* | *M_O* | *OrC* | *A_AC* | *ROA* | *ZSCORE* | *SIZE* | *LEV* | *BIG4* | *INVREC* | *GDP* |
|---|---|---|---|---|---|---|---|---|---|---|
| M_o | – | 0.26*** | 0.01 | −0.06*** | 0.1*** | −0.07*** | 0.03** | −0.02 | −0.07*** | 0.05*** |
| OrC | 0.48*** | – | 0.0 | 0.01 | −0.01 | −0.02 | −0.03* | −0.01 | −0.11*** | 0.07*** |
| A_ac | 0.02 | −0.04*** | – | −0.1*** | 0.11*** | −0.13*** | 0.13*** | −0.05*** | 0.0 | −0.05*** |
| ROA | 0.05*** | −0.01 | 0.06*** | – | −0.46*** | 0.24*** | −0.25*** | 0.19*** | 0.06*** | −0.01 |
| ZSCORE | 0.11*** | 0.03** | 0.14*** | −0.03* | – | −0.09*** | 0.3*** | −0.11*** | −0.09*** | −0.04** |
| SIZE | −0.09*** | 0.06*** | −0.14*** | −0.03* | −0.11*** | – | −0.2*** | 0.49*** | −0.18*** | 0.13*** |
| LEV | 0.11*** | −0.01 | 0.16*** | 0.79*** | 0.18*** | −0.15*** | – | −0.14*** | 0.27*** | −0.05*** |
| BIG4 | −0.02 | 0.04** | −0.07*** | 0.0 | −0.12*** | 0.46*** | −0.09*** | – | −0.11*** | 0.32*** |
| INVREC | −0.05*** | −0.04*** | −0.0 | −0.02 | −0.08*** | −0.17*** | 0.04** | −0.12*** | – | −0.01 |
| GDP | 0.05*** | 0.03* | −0.04*** | 0.01 | −0.05*** | 0.12*** | −0.03** | 0.33*** | −0.02 | – |

**Notes:** This table reports the Pearson (below the diagonal) and the Spearman correlation (above the diagonal) for all variables in equation (3)
**Source:** Authors' own creation

We find a positive and significant (at 1% level) correlation between the dependent variable $M\_O_{i,t}$ and the independent variable $OrC_{i,t}$ (0.48). It seems that there is a positive association between firms with an increased investment in IC and the likelihood for these firms to receive a modified audit opinion. The correlation between $A\_AC_{i,t}$ and $M\_O_{i,t}$ is positive, even though it is not significant. This finding indicates that auditors, on average, tolerate accrual-based earnings management initiatives. On the contrary, there is no significant correlation between $M\_O_{i,t}$ and $B4_{i,t}$ which indicates that the presence of Big-4 does not affect the likelihood of the company having a modified audit opinion. There is a positive and significant relationship between the categorical variable M_O and Z-score, suggesting that firms in the distress area are likely to get a M_O. There is also a positive and significant (at 1% level) relationship between M_O and the leverage ratio (LEV), suggesting that highly leveraged firms are under the scrutiny of auditors.

### 5.3 Results and discussion

Table 5 reports the estimation results of the two binary logistic regression models of equation (3): the basic and extended models. We use the maximum likelihood estimation (MLE) in our regression model because its purpose is to find a set of parameter values maximizing the likelihood function, which measures the probability of observing the given data under the assumed model. The basic models regress only the variable $OrC_{i,t}$ over the dummy dependent variable $M\_O_{i,t}$. The extended model also adds some control variables, taken from literature, impacting the occurrence of a modified audit opinion.

In our empirical model, the dependent variable is the modified audit opinion ($M\_O_{i,t}$), a dummy variable proxying the occurrence of a modified audit opinion. These auditor judgments were drawn from the Orbis and Datastream databases, to improve the data selection procedure. When this data is not available in the database (it shows the value "n. a."), we have set this value with zero. The univariate analysis (Table 3) shows that 47.83% (2,023 out of 4,230 firm-year observations) are in the health zone (the Z″- score shows an index above 2.60), that is are less likely to fail. 23% (973 out of 4,230 firm-year observations) are in the gray zone (the Z″ – score shows falls in the range between 1.10 and 2.60). Finally, only 29.17% of the sample firm (1,234 out of 4,230 firm-year observations) are in the distress zone (the Z″ – score shows an index below 1.10), indicating a high bankruptcy risk.

The basic model in Table 5 shows a log-likelihood ratio (LLR) significant at 1% level and a pseudo-R square of 21.3%. The extended model shows a LLR significant at 1% level and a pseudo-R square of 29.1%. Due to firm and industry effects, we apply the Petersen *et al.* (2009) methodology to select the estimation procedure for the binary regression models of

**Table 5** Logistic regression model measuring the impact of OC on the probability of receiving a M_O

| | | | *Coefficients (robust std. errors clustered per firm– Petersen (2009)* | | | |
|---|---|---|---|---|---|---|
| *Variable* | | *Exp. Sign* | *Basic* | *Rob. Std. errors* | *Extended* | *Rob. Std. errors* |
| $\beta_0$ | Const | | −3.325*** | (0.273) | 2.376 | (4.481) |
| $\beta_1$ | $OrC_{i,t}$ | + | 0.169*** | (0.013) | 0.185*** | (0.013) |
| $\beta_2$ | $A\_AC_{i,t}$ | + | | | 0.282 | (0.487) |
| $\beta_3$ | B4 | + | | | −0.019 | (0.278) |
| $\beta_4$ | ROA | − | | | −0.351** | (0.137) |
| $\beta_5$ | SIZE | − | | | −0.204*** | (0.049) |
| $\beta_6$ | LEV | + | | | 0.988** | (0.300) |
| $\beta_7$ | INVREC | + | | | −1.155 | (0.726) |
| $\beta_8$ | ZSCORE | + | | | 0.351** | (0.146) |
| $\beta_9$ | LS | + | | | −0.103 | (0.221) |
| $\beta_{10}$ | GDP | ? | | | −0.001 | (0.000) |
| Sample firms (balanced): | | Basic's model diagnostic: | | | Extended's model diagnostic: | |
| N° firms: 423 | | LLR *p*-value = 0.000** | | | LLR *p*-value = 0.000*** | |
| N° obs.: 4,230 | | Pseudo *R*-sq. = 21.3% | | | Pseudo *R*-sq. = 29.1% | |
| VIF < 5 for all variables | | Aic: 1,576.28 | | | Aic: 1,446.53 | |
| | | Bic: 1,646.13 | | | Bic: 1,592.57 | |
| | | Year control: yes | | | Year control: yes | |
| | | Industry control: yes | | | Industry control: yes | |
| | | Country control: yes | | | Country control: yes | |

**Notes:** The table shows findings for the binary regression. We use the maximum likelihood estimation (MLE) that aims to find the values of coefficients that maximize the likelihood of the observed data. The dependent variable is M_O, the modified audit opinion issued by an auditor. The testing variable is OrC, proxying the measure of the organizational capital estimated as in Lev *et al.* (2009). The basic model only investigates the relationship between the dependent variable M_O and the test variable OrC. The extended model also includes some control variables impacting the probability that a modified audit opinion will be used. Several control variables impacting the probability that a modified audit opinion is issued are added in the model extended. To avoid heteroscedasticity and multicollinearity problems, the model in equation (3) is estimated using Petersen *et al.* (2009). In brackets, the standard errors are shown. Variable descriptions and measurements are provided in Table 2. ***indicates a significance of 1% and **indicates a significance of 5%
**Source:** Authors' own creation

equation (3). The models are also the control for industry and country. The VIF is under the value 2 for all the variables, excepted for ROA and TLE that show a VIF $< 5$. The AIC and BIC information criteria are 1,576.28 and 1,646.13 for the basic model, while they are 1,446.53 and 1,592.57 for the extended model. This indicates that the latter model is better than the former.

The estimated value of the coefficient $\beta_1$ of the test variable $OrC_{i,t}$ is positive and significant, consistent with our expectations, and significant at 1% level in both the basic and the extended models. These findings provide evidence that firms investing in IC (proxied by OC, as in Lev *et al.*, 2009) are likely to receive a modified audit opinion. This result may be explained by the fact that these firms are more likely than other firms to misreport their performance in the short term, since firms investing in IC are associated with an increased business risk (Bentley *et al.*, 2013; Stanley, 2011), even though OC is able to increase the firm's economic efficiency by combining human skills and physical capital to produce profitable goods and services for the market (Evenson and Westphal, 1995). However, since short- and middle-term investments in OC are recognized as expenses, this may create ambiguity among the investors, thus reducing their confidence in the firm's performances. This situation, according to Hogan and Wilkins (2008), is an incentive for managers to report irregularities to improve the poor performances in the short term as well as increase their creditworthiness and show a financial stability (Cenciarelli *et al.*, 2018). A non-tabulated descriptive statistic shows how the mean of the discretionary accruals for highly intensive OC firms (mean = 0.096 for 852 firm-year observations in the fifth decile of OC distribution) is higher than the mean of the discretionary accruals shown by low intensive OC firms (mean = 0.094 for 3,378 firm-year observations in the first decile of OC distribution). Therefore, this increases the probability that an auditor may detect and report on the audit report any misstatement in the financial statements they audit to protect the stakeholders against earnings management initiatives. Our hypothesis is therefore accepted.

Subsequently, we comment on the impact of the control variables in the extended model on the probability of receiving a modified audit opinion. The coefficient $\beta_2$ of the control variable $A\_AC_{i,t}$, proxying the absolute value of the discretionary accruals, shows a positive sign, as expected, though it is not significant. This finding, consistent with previous literature (Abid *et al.*, 2018; Bradshaw *et al.*, 2001; Butler *et al.*, 2004; Duong Thi, 2023), indicates that accrual-based earnings management initiatives do not drive the probability of receiving a modified audit opinion. The coefficient $\beta_3$ of the control variable $B4_{i,t}$, a dummy variable proxying the engagement of a Big-N auditor, shows a negative but not significant sign, contrary to our expectations. This finding, not consistent with previous literature (DeFond and Zhang, 2014; Habib, 2013), suggests that Big-N auditors are not associated with the occurrence of a M_O. This finding indicates that the engagement of a high-quality auditor does not drive the issuance of a modified audit opinion.

The coefficient $\beta_4$ of the control variable $ROA_{i,t}$ is negative, as expected, and significant at 5% level. This finding is consistent with Tsipouridou and Spathis (2014) and suggests that firm profitability is likely to reduce the probability of receiving a modified audit opinion. The coefficient $\beta_5$ of the control variable $SIZE_{i,t}$ is negative, consistent with our expectations, and significant at 1% level. This finding suggests that larger firms reduce the occurrence of a M_O since these client-firms could compromise auditor independence due to the pressure on the audit fee (DeAngelo, 1981), or because larger firms may have a better negotiation initiative with the auditors about the issuance of a M_O (P. F. Chen *et al.*, 2016). The coefficient $\beta_6$ of the control variable $TLE_{i,t}$, proxying for firm indebtedness, shows a positive sign, as expected, significant at 5% level. Our finding is consistent with prior literature (Habib, 2013) and suggests that indebtedness impacts the probability of receiving a modified audit opinion.

The coefficient $\beta_7$ of the control variable $INVREC_{i,t}$, proxying for risky financial statement components, shows a negative sign, contrary to expectation, though it is not significant. This finding indicates that inventories and receivables, requiring observation and confirmation by

auditors, do not drive the probability of a modified audit opinion being issued. The coefficient $\beta_8$ of the categorical control variable $ZSCORE_{i,t}$, proxied by the Altman Z″-Score, shows a positive sign, as expected, significant at 5% level. This finding is consistent with previous literature (Habib, 2013), providing evidence that firms experimenting with financial problems are likely to receive a modified audit opinion. This finding also indicates that when a firm is exposed to increased financial risks, auditors have incentives to be more attentive in their assessment. The coefficient $\beta_9$ of the dummy control variable $LS_{i,t}$, proxying for negative net income, shows a negative sign, contrary to our expectation, even though it is not significant. This finding, not consistent with Habib (2013), shows that the occurrence of a negative net income does not drive a M_O. The coefficient $\beta_{10}$ of the categorical control variable $GDP_{i,t}$, proxied by the natural logarithm of the country's gross domestic product per capita (in current US$), shows a negative but not significant sign. We introduced this variable to consider the differences among the countries. The not-significant sign shows that GDP does not drive the probability of receiving a M_O.

A non-tabulated two-sample t-test was used for the significance of the difference between the sub sample firm receiving a modified audit opinion (the mean of the organization capital in these firms is 3,069) and the subsample firm receiving a clean audit opinion (the mean of the organization capital in these firms is 1,360, indicating a statistical significance of 1% level). The Chi-square test shows strong and significant correlations (at 1% level) between the dependent variable and the categorical control variable ZSCORE.

### 5.4 Robustness tests

We performed a battery of robustness tests to address possible endogeneity issues. More specifically, we focused on OC and attempted to examine its reliability as a measure of a firm's intensity of IC investments. For this reason, we performed a difference-in-difference analysis to examine how a change in a firm's investment on the level of OC may affect the likelihood of receiving a modified opinion. Furthermore, we tested the validity of our empirical evidence using alternative specifications of the OC. Finally, we tested whether our results are driven by country specific effects.

*5.4.1 Difference-in-differences analysis.* We examined the validity of our empirical findings that the IC has positive and significant effects on the likelihood of a firm receiving a modified audit opinion decision by drawing a difference-in-differences (DD) analysis for testing causality (Armstrong and Kepler, 2018; Lechner, 2011). A DD analysis compares changes over time in a group of subjects affected by a policy change (treatment group) to changes in a group of subjects unaffected by the policy change (control group). In the context of our study, we highlight any changes on the level of OC. We formulated two groups of firms. The first consists of firms with low levels of OC over the time horizon of our research design (control group), and the second consists of firms that initially had a low level of OC, but at a specific point in time, their level of OC has changed from low to high and has remained unchanged for the remedial time frame of our study. We classify a firm as a low (high) OC intensive if its level of OC is within the first (fifth) quantile of OC distribution of the firms operating in the same fiscal year.

Within the context of DD analysis, we estimated the binary logistic panel regression models of equation (4):

$$\begin{aligned} M\_O^{j}_{i,t} = {} & \beta_0 + \beta_{1.1}LOWOrC^{j}_{i,t} + \beta_{1.2}TIME^{j}_{i,t} + \beta_{1.3}TIME^{j}_{i,t} \times HIGHOrC^{j}_{i,t} + \beta_2 A\_AC^{j}_{i,t} + \beta_3 B4^{j}_{i,t} \\ & + \beta_4 ROA^{j}_{i,t} + \beta_5 SIZE^{j}_{i,t} + \beta_6 LEV^{j}_{i,t} + \beta_7 INVREC^{j}_{i,t} + \beta_8 ZSCORE^{j}_{i,t} + \beta_9 LS^{j}_{i,t} \\ & + \beta_{10} GDP^{j}_{i,t} + e^{j}_{i,t} \end{aligned} \quad (4)$$

where $LOWOrC^{j}_{i,t}$ is a dummy variable that equals 1 for firms with low levels of OC through the time horizon of our research design, and $TIME^{j}_{i,t}$ is a dummy variable that equals 1 for

the time period from the fiscal year that the change in the level of OC has occurred and for the remedial time frame of our study. Finally, $HIGHOrC^{j}_{i,t}$ a dummy variable that equals 1 for firms that initially had a low level of OC but at a specific point in time their level of OC has changed from low (the first decile of OC distribution) to high (the fifth decile of OC distribution) and has remained unchanged for the remedial time frame of our study. The coefficient $\beta_{1.3}$ of the interaction of the variables $TIME^{j}_{i,t}$ and $HIGHOrC^{j}_{i,t}$ is the DD estimator. We expect that the estimated value of the DD estimator is positive and significant.

The basic and extended models in Table 6 show a pseudo-R-square of 8.9% and 9.93%, respectively. The VIF is under the value 2 for all the variables, except for ROA and LEV, which show a VIF $< 5$ in Table 6. Due to firm and industry effects, in the robustness regression models, we apply the Petersen *et al.* (2009) methodology to select the estimation procedure for the binary regression models of equation (4).

Consistent with expectation, the interacting variable $TIMExHIGHOrC_{i,t}$ shows a positive sign, as expected, significant at 1% level, in both the basic and extended models. These findings indicate that the increase of OC investments made by a firm in a fiscal year increases the probability of receiving a modified audit opinion. The interacting variable LOWOrC shows a negative sign, significant at 1% level, in both the basic and extended models, with these findings suggesting that the firms showing a lower level of OC investment are less likely to receive a modified audit opinion, therefore confirming our

**Table 6** Logistic regression model measuring the impact of OC on the probability of receiving a M_O – Difference-in-differences analysis

| *Variable* | | *Exp. Sign* | *Coefficients (robust std. errors clustered for firm – Petersen et al. (2009)* *Basic* | *Rob. Std. errors* | *Extended* | *Rob. Std. errors* |
|---|---|---|---|---|---|---|
| $\beta_0$ | Const | | −3.310*** | (0.319) | 3.604 | (3.862) |
| $\beta_{1.1}$ | $LOWOrC_{i,t}$ | − | −0.940*** | (0.310) | −0.961*** | (0.312) |
| $\beta_{1.2}$ | $TIME_{i,t}$ | + | −0.308 | (0.331) | −0.492 | (0.312) |
| $\beta_{1.3}$ | $TIMExHIGHOrC_{i,t}$ | + | 1.586*** | (0.314) | 1.713*** | (0.287) |
| $\beta_2$ | $A\_AC_{i,t}$ | + | | | −0.336 | (0.566) |
| $\beta_3$ | B4 | + | | | 0.002 | (0.283) |
| $\beta_4$ | ROA | − | | | −0.301*** | (0.117) |
| $\beta_5$ | SIZE | − | | | −0.142*** | (0.047) |
| $\beta_6$ | LEV | + | | | 0.869*** | (0.286) |
| $\beta_7$ | INVREC | + | | | −0.886 | (0.679) |
| $\beta_8$ | ZSCORE | + | | | 0.399*** | (0.133) |
| $\beta_9$ | LS | + | | | −0.056 | (0.190) |
| $\beta_{10}$ | GDP | ? | | | −0.000 | (0.000) |

Sample firms (balanced):
N° firms: 423
N° obs.: 4,230
VIF $< 5$ for all variables

Basic's model diagnostic:
LLR p-value = 0.000**
Pseudo *R*-sq. = 8.9%
Aic: 1,832.898
Bic: 1,934.50
Year control: yes
Industry control: yes
Country control: yes

Extended's model diagnostic:
LLR *p*-value = 0.000***
Pseudo R-sq. = 9.93%
Aic: 1,739.276
Bic: 1,898.025
Year control: yes
Industry control: yes
Country control: yes

**Notes:** The table shows findings for the binary regression. We use the maximum likelihood estimation (MLE) that aims to find the values of coefficients that maximize the likelihood of the observed data. The dependent variable is M_O, the modified audit opinion issued by an auditor. The testing variable is OrC, proxying the measure of the organizational capital estimated as in Lev *et al.* (2009). The basic model only investigates the relationship between the dependent variable M_O and the test variable OrC. The extended model also includes some control variables impacting the probability that a modified audit opinion will be used. Several control variables impacting the probability that a modified audit opinion is issued are added in the model extended. To avoid heteroscedasticity and multicollinearity problems, the model in equation (3) is estimated by using Petersen *et al.* (2009). In brackets the error standard errors are shown. Variable descriptions and measurement are provided in Table 2. ***indicates a significance of 1% and **indicates a significance of 5%
**Source:** Authors' own creation

hypothesis. The other control variables in the extended model of Table 6, show the same sign and significance that these variables have in the main model in Table 5. Only the control variable ROA increases its statistical significance from 5% to 1% level in the DD analysis.

*5.4.2 Alternative specification of OC.* We undertook additional tests to determine the sensitivity of our findings that the IC has positive and significant effects on the likelihood of a firm receiving a modified audit opinion decision. More specifically, we focused on an alternative measure of a firm's level of OC. We follow Eisfeldt and Papanikolaou (2013) to capture the level of OC based on SG&A expenses:

$$OrC^{j}_{i,t} = (1 - d_0)OrC^{j}_{i,t-1} + SGA^{j}_{i,t}/CPI^{j}_{i,t} \tag{5a}$$

where $OrC^{j}_{i,t}$ denotes the end of the period stock of OC; $d_0$ represents the depreciation rate equals to 15%; $CPI^{j}_{i,t}$ is the consumer price index. The consumer price indexes were drawn from OECD (2023). Following prior studies (B. Francis *et al.*, 2021; H. D. Kim *et al.*, 2021; Li *et al.*, 2018), we treated the missing values of SG&A expenses as 0. The initial stock of organization capital is captured using the following formula:

$$OrC^{j}_{i,0} = SGA^{j}_{i,1}/(g + d_0) \tag{5b}$$

where the variable $SGA^{j}_{i,1}$ corresponds to the first non-missing selling, general and administrative (SGA) expenses, g is the average real growth rate of firm-level SGA expenses and is assumed to be 10%. The empirical results are shown in Table 7.

The basic and extended models in Table 7 show equation (3), in which the testing variable is proxied by OC, estimated according to Eisfeldt and Papanikolaou (2013). The LLR is significant at 1% level in both the basic and extended models. The pseudo-R square is 6.29% in the basic model and 9.93% in the extended model. Due to firm and industry effects, in the robustness regression models, we apply the Petersen *et al.* (2009) methodology to select the estimation procedure for the binary regression models of equation (3). The models also control for industry and country. The VIF is under the value 2 for all variables in our models, except for the variables ROA and LEV, which show a VIF $< 5$. The AIC and BIC information criteria are 1,873.49 and 1,943.34 for the basic model, while they are 1,825.60 and 1,971.65 for the extended model.

The testing variable OC, estimated according to Eisfeldt and Papanikolaou (2013), shows a positive and significant sign at 1% level with the dependent variable M_O, consistent with our expectations, in both the basic and extended models. These findings indicate that the increase in OC investments made by a firm in a fiscal year increases the probability of receiving a modified audit opinion. These findings provide empirical evidence that, when we use a stock of organizational capital based on SG&A, auditors are likely to issue a modified audit opinion. This may be explained by the circumstance that auditors classify firms investing in SG&A as risky firms because these expenses are recognized in the firm's net income statement, therefore impacting on the firm's performance.

The other control variables in the extended model of Table 7 show the same sign and significance that these variables have in the main model in Table 5, except for the following variables. The significance of SIZE decreases from 1% level in the main model to the 10% level in Table 7. The variable INVREC shows a negative sign, as in the main model, but is it significant at 5% level in Table 7.

*5.4.3 Country effect.* We separate our data sample into groups of firms operating in large economies versus firms operating in small economies. Italy and Spain are considered as large economies, whereas Greece and Portugal are not. For this reason, we estimated the following logistic panel regression MODEL:

**Table 7** Logistic regression model measuring the impact of OC on the probability of receiving a M_O – an alternative measure for OC

| Variable | | Exp. Sign | Coefficients (robust std. errors clustered for firm – Petersen et al. (2009)) Basic | Rob. Std. errors | Extended | Rob. Std. errors |
|---|---|---|---|---|---|---|
| $\beta_0$ | Const | | −3.191*** | (0.228) | 1.106 | (3.622) |
| $\beta_1$ | $OrC_{i,t}$ | + | 0.262*** | (0.039) | 0.237*** | (0.047) |
| $\beta_2$ | $A\_AC_{i,t}$ | + | | | −0.805 | (0.610) |
| $\beta_3$ | B4 | + | | | −0.161 | (0.243) |
| $\beta_4$ | ROA | − | | | −0.294** | (0.142) |
| $\beta_5$ | SIZE | − | | | −0.084* | (0.044) |
| $\beta_6$ | LEV | + | | | 0.429 | (0.311) |
| $\beta_7$ | INVREC | + | | | −1.636** | (0.774) |
| $\beta_8$ | ZSCORE | + | | | 0.323** | (0.129) |
| $\beta_9$ | LS | + | | | −0.167 | (0.204) |
| $\beta_{10}$ | GDP | ? | | | −0.000 | (0.000) |

Sample firms (balanced):
N° firms: 423
N° obs.: 4,230
VIF < 5 for all variables

Basic's model diagnostic:
LLR *p*-value = 0.000**
Pseudo *R*-sq. = 6.29%
Aic: 1,873.49
Bic: 1,943.34
Year control: yes
Industry control: yes
Country control: yes

Extended's model diagnostic:
LLR *p*-value = 0.000***
Pseudo *R*-sq. = 9.93%
Aic: 1,825.60
Bic: 1,971.65
Year control: yes
Industry control: yes
Country control: yes

**Notes:** The table shows findings for the binary regression. We use the maximum likelihood estimation (MLE) that aims to find the values of coefficients that maximize the likelihood of the observed data. The dependent variable is M_O, the modified audit opinion issued by an auditor. The testing variable is OrC, proxying the measure of the organizational capital estimated as in Eisfeldt and Papanikolaou (2013). The basic model only investigates the relationship between the dependent variable M_O and the test variable OrC. The extended model also includes some control variables impacting the probability that a modified audit opinion will be used. Several control variables impacting the probability that a modified audit opinion is issued are added in the model extended. To avoid heteroscedasticity and multicollinearity problems, the model in equation (3) is estimated by using Petersen *et al.* (2009). In brackets the error standard errors are shown. Variables description and measurement are provided in Table 2. ***indicates a significance of 1%; **indicates a significance of 5%; and *indicates a significance of 10%

**Source:** Authors' own creation

$$M\_O^j_{i,t} = \beta_0 + \beta_{1.1} OrC^j_{i,t} + \beta_{1.2} BIG^j_{i,t} \, X \, OrC^j_{i,t} + \beta_2 A\_AC^j_{i,t} + \beta_3 B4^j_{i,t} + \beta_4 ROA^j_{i,t} + \beta_5 SIZE^j_{i,t} + \beta_6 LEV^j_{i,t} + \beta_7 INVREC^j_{i,t} + \beta_8 ZSCORE^j_{i,t} + \beta_9 LS^j_{i,t} + \beta_{10} GDP^j_{i,t} + e^j_{i,t} \quad (6)$$

where $BIG^j_{i,t}$ is a dummy variable that equals 1 for firms operating in Italy or Spain (see Table 8).

The pseudo-*R*-square of the basic and extended models is 21.1% and 28.8%, respectively. The LLR significance is significant at 1% for both models. Due to firm and industry effects, in the robustness regression models, we apply the Petersen *et al.* (2009) methodology to select the estimation procedure for the binary regression models of equation (6).

The result for the testing variable OrC in the basic model is positive, as expected, though it is not significant. The testing variable OrC is positive, consistent with expectation, and significant at 1% level in the extended model. The testing variable Big x OrC shows a positive sign, as expected, though it is not significant. Jointly, these results suggest that OrC investments drive the probability of receiving a modified audit opinion, but not only in large economies. These results suggest that auditors are likely to signal firm risks associated with OrC investments in all economies, not only in large ones. As in the other models (Tables 5–7) a modified audit opinion is driven by the financial status (the variable ZSCORE), as well as by the leverage ratio (the variable LEV). This also indicates that auditors have their reputation to save (Bergner *et al.*, 2020), therefore they carry out the audit work accurately, according to the International (or domestic) Standards of Auditing.

**Table 8** Logistic regression model measuring the impact of OC on the probability of receiving a M_O – firms operating in large economies (Italy and Spain)

| Variable | | Exp. Sign | Coefficients (robust std. errors clustered for firm – Petersen et al. (2009)) Basic | Rob. std. errors | Extended | Rob. std. errors |
|---|---|---|---|---|---|---|
| $\beta_0$ | Const | | −3.181*** | (0.142) | −2.695*** | (1.029) |
| $\beta_{1.1}$ | $OrC_{i,t}$ | + | 0.027 | (0.024) | 0.170*** | (0.020) |
| $\beta_{1.2}$ | Big x $OrC_{i,t}$ | | | | 0.020 | (0.023) |
| $\beta_2$ | $A\_AC_{i,t}$ | + | | | 0.247 | (0.480) |
| $\beta_3$ | B4 | + | | | 0.068 | (0.270) |
| $\beta_4$ | ROA | − | | | −0.331** | (0.138) |
| $\beta_5$ | SIZE | − | | | −0.205*** | (0.047) |
| $\beta_6$ | LEV | + | | | 0.948*** | (0.329) |
| $\beta_7$ | INVREC | + | | | −1.222* | (0.726) |
| $\beta_8$ | ZSCORE | + | | | 0.404*** | (0.218) |
| $\beta_9$ | LS | + | | | −0.115 | (0.204) |
| $\beta_{10}$ | GDP | ? | | | 0.000 | (0.000) |

Sample firms (balanced):
N° firms: 423
N° obs.: 4,230
VIF < 5 for all variables

Basic's model diagnostic:
LLR *p*-value = 0.000**
Pseudo *R*-sq. = 21.1%
Aic: 1,565.76
Bic: 1,584.81
Year control: yes
Industry control: yes
Country control: yes

Extended's model diagnostic:
LLR *p*-value = 0.000***
Pseudo *R*-sq. = 28.8%
Aic: 1,447.85
Bic: 1,581.20
Year control: yes
Industry control: yes
Country control: yes

**Notes:** The table shows findings for the binary regression. We use the maximum likelihood estimation (MLE) that aims to find the values of coefficients that maximize the likelihood of the observed data. The dependent variable is M_O, the modified audit opinion issued by an auditor. The testing variable is OrC, proxying the measure of the organizational capital estimated as in Lev *et al.* (2009). The basic model only investigates the relationship between the dependent variable M_O and the test variable OrC. The variable Big x OrC captures the impact of OC investments on firms operating in large economies (Italy and Spain), according to the mean of yearly GDP. The extended model also includes some control variables impacting the probability that a modified audit opinion will be used. Several control variables impacting the probability that a modified audit opinion is issued are added in the model extended. To avoid heteroscedasticity and multicollinearity problems, the model in equation (6) is estimated by using Petersen *et al.* (2009). In brackets the error standard errors are shown. Variable descriptions and measurement are provided in Table 2. ***indicates a significance of 1%; **indicates a significance of 5%; and *indicates a significance of 10%
**Source:** Authors' own creation

## 6. Conclusions

This study explores whether firms investing in IC are positively associated with the occurrence of a modified audit opinion decision. We used the level of OC as a measure of a firm's intensity of IC investments. Organizational capital is an intangible fixed asset, distinct from physical capital, whose value increases over time and should generate future economic benefits. However, these investments in OC are treated as expenses, impacting the actual firm's performance (Alwert *et al.*, 2009; Cenciarelli *et al.*, 2018).

Analyzing a sample of 423 listed firms from Greece, Italy, Spain and Portugal over a 10-year period, this research uses a logistic regression model to test the association between the testing variable OC and the discretionary accruals (as control variable) on the probability that a modified audit opinion is issued. The findings show a positive and significant relationship between the testing variable and the dependent M_O, while there is no significant relationship between the dependent variable and the control variable proxying for the discretionary accruals. Our empirical findings are confirmed within the context of several robustness tests.

There are several reasons that explain the observed positive relationship of IC with the occurrence of a modified audit opinion decision. First, high IC intensive firms are associated with an increased business risk, which not only critically affects any audit effort and planning but also the risk that an unqualified audit opinion will be issued (Johnstone, 2000;

Bentley *et al.*, 2013). Second, previous literature indicates that financial irregularities increase with the presence of incentive factors such as rapid economic growth, compensation incentives and stock option compensations (AICPA, 2002; Hogan and Wilkins, 2008). A high IC intensive firm is expected to have improved financial results and greater growth opportunities than a low IC intensive firm (Sardo and Serrasqueiro, 2018). Finally, financing IC intensive projects increases the creditor's concerns of a firm's financial health and stability. Greater requirements for external financing could increase the incentives for firms to misreport (AICPA, 2002).

The not-significant relationship between the dependent M_O and the control variable A_AC may be explained by the circumstance that external auditors are likely to constrain accrual-based earnings management initiatives (Francis and Yu, 2009) due to their independence and the need to save their reputation (DeAngelo, 1981).

In addition, our results also provide evidence that external auditors are likely to signal the risks associated with OC investments in all economies, therefore signaling their independence and efforts in reducing the audit expectation gap.

This paper has at least two research implications. First, it provides evidence that both Big-X and non-Big-X auditors maintain their independence from their clients since they issue a modified audit opinion when misreporting as well as when misstatements in the financial statements are detected. Second, it is arguable that the disclosure of OC investments could improve the reliability of financial statements, reducing the information asymmetry with the stakeholders. Therefore, standard setters may incentive preparers to disclose investments in OC and IC. This provides evidence that an external auditing serves as a corporate governance mechanism in reducing agency problems.

This paper has at least two limitations. First, we used the audit opinion collected by the database, which is either a positive or negative judgment. The result could be improved by both analyzing the audit report individually as well as collecting the concerns of managers in issuing a modified audit opinion. The ISA 701 (Key Auditing Matters), but also a related section in the notes in which managers could disclose investments in organizational components to inform stakeholders about these investments. Second, the empirical model could be improved by adding the audit fee (separated in the basic and additional audit fees), since it helps to understand the audit risk perceived by the auditor.

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