AN ASSESSMENT OF PROFESSIONAL ACCOUNTANTS' COGNITIVE REFLECTION ABILITY

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Abstract: In this paper, we map Brazilian professional accountants' cognitive reflection abilities, exploring the demographic characteristics associated with such ability. To operationalize individuals' cognitive reflection ability, we use the Cognitive Reflection Test (CRT). Our sample consists of 4,902 Brazilian accountants who voluntarily answered an online survey. We analyze data using three ordered logistic regression (ologit) models that provide a good fit for our data set. Our exploratory analysis reveals that male Brazilian accountants tend to be more reflective than their female counterparts. We also find that professional accountants tend to become less reflective, and, consequentially, more impulsive, as they age. Besides that, we present evidence that preparers and managers working for larger companies tend to be less reflective than their counterparts working for smaller firms. Additionally, our results suggest that auditors' scores on CRT are significantly higher than preparers', analysts', managers' and professors' scores, raising interesting questions for future research. Our findings contribute not only to the literature in accounting and psychology, but also for practitioners interested in understanding how cognitive reflection abilities relate to demographic characteristics within the accounting field. Since cognitive reflection abilities significantly affect JDM quality, as reported in previous studies, the importance of our findings connects to the remarkable role that JDM plays in several fields of accounting activity. To our knowledge, our study is the first to assess how demographic individual characteristics predict CRT scores looking at professionals that share a background in a very specific area. Besides, we use the largest data set that we are aware of for studies of similar nature.

Keywords: Judgment and decision-making. Cognitive abilities. Cognitive reflection test. Professional accountants.

■ Advances in Scientific and Applied Accounting ■ ISSN 1983-8611 ■ São Paulo ■ v.9, n.2 ■ p. 224 - 239 ■ Maio. / Ago. de 2016.

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1. INTRODUCTION

We report the results of an exploratory analysis in which we map Brazilian professional accountants' cognitive reflection abilities measured through Frederick's (2005) cognitive reflection test (CRT). The CRT is a simple three questions test that arises automatic, effortless and usually wrong first-answers in mind. However, a further conscious deliberate reasoning about such questions easily conduct respondents to the correct answer. The scores in CRT have been explored in psychology and in other social sciences (e.g. Economics) as coherent predictors of behavior and decision-making. Oechssler, Roider, and Schmitz (2009) and Hoppe and Kusterer (2011), for instance, present results from laboratory experiments connecting CRT score to the tendency to follow (or not) heuristics and biases in judgment and decision-making (JDM).

While prior research on cognitive reflection abilities measured by CRT has mostly explored few data points from college students in distinct areas of knowledge (e.g. Frederick, 2005; Hoppe & Kusterer, 2011; Oechssler et al., 2009), we use the largest data set that we are aware of, looking at professionals that share a background in a very specific area, accounting.[6] The data from 4,902 Brazilian accountants (1.6% of the entire population) was collected through an electronic questionnaire nationally applied by the Brazilian institute of certified public accountants (Conselho Federal de Contabilidade, hereafter CFC). Our exploratory analysis of these data reveals that male Brazilian accountants tend to be more reflective than their female counterparts. We find that professional accountants tend to become less reflective, and, consequentially, more impulsive, as they age. We also present evidence that preparers and managers working for larger companies tend to be less reflective than their counterparts working for smaller firms. Additionally, our results suggest that auditors' scores on CRT are significantly higher than preparers', analysts', managers' and professors' scores, raising interesting questions for future research.

This paper contributes not only to the literature in accounting and psychology, but also for practitioners interested in understanding how cognitive reflection abilities relate to demographic characteristics within the accounting field. Since cognitive reflection abilities significantly affect JDM quality, as reported in previous studies, the importance of our findings connects to the remarkable role that JDM plays in several fields of accounting activity. For instance, the International Financial Reporting Standards (IFRS) require the disclosure of judgments and estimates that have significant effects on the amounts presented in the financial statements (IASB, 2016 - IAS 1, item 122). Accordingly, the training materials prepared by the IFRS Foundation Education Initiative emphasize the most significant judgments and estimates necessary for properly applying either the Full IFRSs (IASB, 2016; IFRS Foundation, 2015) or the IFRS for SMEs (IASB, 2015).[7] However, as we further discuss throughout the next section, the role of cognitive reflection on accounting JDM is not limited to the elaboration of financial reports. Rather, important managers' decisions, analysts' recommendations, auditors' reports, and professors' lessons tend to be highly influenced by cognitive reflection abilities, which, in turn, may be predicted by simple demographic characteristics, as suggested by this study.

[5] The scores are integer scales varying from zero 0 to 3 representing the number of correct answers. For further information about the CRT, please refer to section 2.2, or see Frederick (2005).

[6] Exceptions are Moritz, Hill and Donohue (2013), which address 313 American supply chain managers, and Frederick (2005) that uses a sample of 3,428 college students.

[6] Please, refer to IFRS Foundation (2015); also refer to the IFRS Foundation continuing professional development training material (available at http://www.ifrs.org/Use-a-round-the-world/Education/CPD/Pages/CPD-training-material.aspx), and the training modules on the IFRS for SMEs (available at http://www.ifrs.org/IFRS-for-SMEs/Pages/Training-material.aspx).

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2. THEORETICAL BACKGROUND

2.1 ACCOUNTING PRACTICE AND COGNITIVE REFLECTION ABILITY

Accounting research, as in many other social fields, recognizes that professionals may incur in biases and heuristics that steer them to unexpected decision-making. Consequently, there exist a growing consensus that deviations from the normative optimal choices are not necessarily driven by greed. Rather, they are often caused by human imperfections (e.g. March & Simon, 1958; Kahneman & Tversky, 1979). Not surprisingly, research on accounting JDM has acquired a notorious importance (see Birnberg, 2011; Trotman, Tan & Ang 2011 for reviews). Such research stream aims to improve JDM quality through the avoidance of the impacts of task, environmental, and person variables on accountants' performance (Bonner & Lewis, 1991; Libby & Luft, 1993; Bonner, 2008). This literature acknowledges that task com-plexity and environmental variables play a decisive role on JDM, together with knowledge, experience, memory retrieval, and abilities in general. We focus on these latter by exploring the individuals' ability to suppress the first impulse when faced with a given task to engage in deeper and abstract reflection.

The timeline for the research stream devoted to such cognitive capacities shows that previous studies had already pointed out impulsivity as a cause for low performance in JDM (Stanovich & West, 2000; Kahneman, 2003; Hogarth, 2005). However, it seems that scholars bumped in the lack of a relia-ble metric for reflection ability. In an attempt to overcome this issue, Frederick (2005) proposed the three simple questions test named 'cognitive reflection test' (CRT), which has been treated as a potent predictor for the tendency of miserly processing information (Hoppe & Kusterer, 2011; Toplak, West & Stanovich, 2011; West, Meserve & Stanovich, 2012).

The CRT scores are interpreted in light of the dual process theories, which differentiate Types 1 and 2 of cognition when we, human beings, process information (Epstein, Lipson, Holstein, & Huh, 1992; Sloman, 1996; Stanovich & West, 2000). [8] The CRT is designed to raise in respondents' minds an impulsive, fast and effortless first-answer for each question, which is usually wrong. Then, it allows us to measure the frequency in which individuals overcome such wrong tempting first-answers and engage in logical, slow, and conscious deliberate reasoning. We refer to the number of times that Type 2 prevails. i.e., the sum of correct answers, as CRT score.

Despite the appliance of simple numeric questions, CRT explains decision-making because of its capacity to measure the individuals' ability to override heuristic processes and not because of its cor-relation with numeracy and general knowledge (Campitelli & Labollita, 2010; Toplak et al., 2011; Moritz et al., 2013). CRT score has been largely applied in studies in psychology, economics, and in other social fields interested in JDM (e.g. Cokely & Kelley, 2009; Bergman, Ellingsen, Johannesson & Svensson, 2010; West et al. 2012).

Notably, accounting research preceding Frederick's (2005) CRT applied scores on selected elements from Graduate Record Examination (GRE) as proxy for problem-solving ability (e.g. Bonner & Lewis, 1990; Bonner, Davis & Jackson, 1992; Bonner & Walker, 1994; Libby & Tan, 1994; Tan & Libby, 1997; Dearman & Shields, 2005). In turn, Choo (1996) used repeated exposure to a specific audit task as a proxy for

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[8] The dual process theories comprise the influential Epstein's cognitive-experiential self-theory (CEST) and other frameworks. Epstein (1994) presents a review of former approaches. Notice that Type 1 is also called System 1, experiential, automatic, intuitive, narrative, and natural; whereas Type 2 is also called System 2, rational, analytical, deliberative, propositional, and extensional.

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the establishment of cognitive scripts. From this literature, one may plausibly infer that the cognitive mechanisms of interest are intrinsically related to the thinking disposition predicted by CRT. Besides this set of studies from the 1990's and early 2000's, recent studies also provide support to accounting research on CRT and, consequently, to the mapping of professional accountants' cognitive abilities proposed by this study.

Farrell, Goh, and White (2014) used functional magnetic resonance imaging (fMRI) to provide evidence that brain regions associated with Type 1 of reasoning are more responsive when managers have affective reactions to decision contexts than when they do not. They also show that performance-based contracts do not suppress affective reactions. Actually, they activate additional brain regions associated with Type 2. In turn, Viator, Bagley, Barnes, and Harp (2014) presented experimental evidence that more reflective MBA students (CRT score greater than or equal to 2) are more likely to benefit from feedback than more impulsive participants. Motivated by recent developments in JDM research Griffith, Kadous and Young (2016) propose dual-process theories as a promising framework to examine and improve auditors' judgments. In addition, a number of other recent studies published in top accounting outlets suggest that the ability to override first impulsive responses before exerting JDM is determinant in different areas of accounting profession (e.g. Brown, 2014; Capps, Koonce & Petroni, 2016).

In sum, this discussion suggests that reflectivity may exert a significant explanatory power for judgment and decision-making in accounting setting. The cognitive abilities measured by CRT become even more remarkable when considering the current scenario of global trend towards the adoption of the IFRS.[9] The implementation of the IFRS requires a large portion of judgment from accountants due to its principles-based approach (e.g. Schipper, 2003; Alexander & Jermakovitz, 2006). It represents a significant change if compared to the rules-based accounting standards previously enforced in many of the adopters' jurisdictions, so that the incremental importance of judgment seems critical in countries remarked by the code law system, such as Brazil.

In Brazil and in many code law jurisdictions, listed companies used to be required to prepare general purpose financial statements in compliance with rules-based accounting standards, which were often biased by fiscal rules (Nobes, 1998; Gray, 1988). In such an environment, accountants were not trained to reflect deeply about judgments and estimates when performing their tasks, probably because more important than faithfully represent the substance of transactions was the compliance with detailed codes (Arden, 1997; Colasse, 1997; Hulle, 1997). In this sense, this paper provides evidence on how this historical lack of extensive demand for judgment impacts Brazilian professional accountants cognitive abilities.

2.2 COGNITIVE REFLECTION TEST

Frederick's (2005) CRT is a criterion to measure how impulsively or reflectively people make decisions. The CRT consists of the three following questions:

• A bat and a ball cost $110. The bat costs $10 more than the ball. How much does the ball cost?

• If it takes 5 machines 5 minutes to make 5 widgets, how long would it take 100 machines to make 100 widgets?

[9] In fact, approximately 120 countries require or permit the adoption of the IFRS for domestic entities, among them European Union's nations and the majority of the Latin-American, Asian and Oceania countries. The United States has signaled a potential adoption through, for instance, the Concept Release on Allowing U.S. Issuers to Prepare Financial Statements in Accordance with International Financial Reporting Standards (SEC 2007). Nevertheless, the Work Plan for the Consideration of Incorporating International Financial Reporting Standards into the Financial Reporting System for U.S. Issuers (SEC 2012) gave no specific course of action and there is no estimated date for SEC's decision. Due to the joint efforts maid by the FASB and IASB to reduce the differences between USGAAP and IFRS, the USGAAP has also become more principle oriented.

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• In a lake, there is a patch of lily pads. Every day, patch doubles in size. If it takes 48 days for the patch to cover the entire lake, how long would it take for the patch to cover half of the lake?

The impulsive and correct answers are:
• Bat & ball: Impulsive answer: $100; correct answer: $50. [10]
• Widgets: Impulsive answer: 100 minutes; correct answer: 5 minutes.
• Lily pads: Impulsive answer: 24 days; correct answer: 47 days.

The impulsive answers for CRT are attributed to the Type 1 of cognitive processing because it is the first answer that respondents' minds suggest. Thus, if this immediate tempting answer is not identified being wrong, the Type 2 is not activated. However, if respondent reflectively tests whether the first answer is wrong, the correct answer is very likely to emerge (Toplak et al., 2011). Importantly, the usage of Type 1 or Type 2 of reasoning cannot be considered bad or good. Rather, the quality of judgment and decision-making mostly depends on the context in which each type of cognitive processing is applied. For instance, athletes, cab and bus drivers, and other professionals in jobs requiring fast and repetitive patterns of decision-making are likely to develop accurate usages for their Type 1 of reasoning. On the other hand, workers devoted to professions involving few repetition and high responsibility are likely to thrive whenever they exert Type 2 of reasoning. Biases are likely to emerge from flipping this around.

2.3 RESEARCH QUESTIONS

In this section, we develop research questions for each of the five professional accountants' demographic characteristics examined in this study. Our preference for research questions over directional hypotheses reflects, in most cases, the exploratory nature of this study, as well as the contradictory pieces of evidence from prior research.

Gender

On the one hand, previous studies provide evidence that men score significantly higher than women on CRT (Frederick, 2005; Hoppe & Kusterer, 2011; Oechssler et al., 2009). On the other hand, none of these studies was performed on participants sharing similar backgrounds, working environments, routines, etc. Moreover, as suggested by Croson and Gneezy (2009), males and females who are similar in terms of cognitive reflection abilities may jump into accounting career driving a selection effect (see also Johnson & Powell, 1994; Birley, 1989). In light of this, we raise the following research question:

RQ1: Do male and female professional accountants differ in terms of cognitive reflection abilities measured by CRT?

[10] Frederick's originally worded the bat & ball question as follows: "A bat and a ball cost 110 cents. The bat costs 100 cents more than the ball. How much does the ball cost?". Therefore, the impulsive answer is 10 cents and the correct answer is 5 cents (Frederick, 2005). Silva (2005), who first submitted the CRT questions to Brazilian respondents, adapted the values to became more realistic in comparison to the general prices in the Brazilian market, but the gist were keep in the way that do not influence on the result. We decided to apply the Silva (2005) version.

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Age

Kahneman (2011) points out that performing similar tasks over the years is likely to stimulate individuals to sharpen their impulsive systems, leading these individuals to put aside their reflective systems. This is in line with cognitive aging research, which has systematically documented that human fluid cognitive abilities (reasoning, memory and other novel problem-solving capacities) start decaying from early adulthood (Salthouse, 2012; Verhaeghen & Salthouse, 1997). It takes place while the crystallized cognitive abilities, i.e., knowledge acquired through experience, culture, and education, increase (Sal-thouse, 2004). It is an adaptive rational response of human body in order to save energy. However, we have found previous empirical findings neither on the aging of cognitive reflection abilities nor on the cognitive aging of very specialized professionals such as accountants. From this, we state our second research question.

RQ2: Do professional accountants' cognitive reflection abilities measured by CRT decrease with age?

Education and income levels

Prior studies suggest that CRT scores are uncorrelated with numeracy and general knowledge (Campitelli & Labollita, 2010; Toplak et al., 2011; Moritz et al., 2013). From this, one would straightforwardly infer that educational level is unrelated to professional accountants' cognitive reflection abilities. However, we expect income level to be an important mediator of the relationship between educational level and cognitive reflection abilities. First, a relationship between income and education is likely to exist for obvious reasons. Second, income is likely to affect cognitive reflection ability (or vice-versa) to the extent that high-income professionals are likely to have a higher level of responsibilities and, consequently, are more likely than low-income professionals to reflect deeply before making a decision. Finally, it is likely that education affects cognitive reflection abilities through income when both are present in the model. However, we lack both theoretical support for such prediction and identification strategies to better address this sort mediation. That is, we face not only the mutual causality between income, education, and cognitive reflection ability, but also the fact that the independent variable (CRT score) is an ordered categorical variable.[11] In this sense, we raise the following research questions. RQ3: Do educational and income levels affect professional accountants' cognitive reflection abilities?RQ4: Does the effect of educational level on professional accountants' cognitive reflection abilities remain after including income level in the model?

Larger Companies' Professional

Although we have a limited theoretical background to support a hypothesis on the directional effect of laboring for larger companies on cognitive reflection abilities, one may consistently argue that laboring for large, and, consequently, highly departmentalized, companies may lead accountant professionals to be less required in terms of cognitive reflection abilities. The reasoning is that, within very specialized administrative structures of large companies, professional accountants tend to routinely perform very repetitive duties. According to psychology research on cognitive aging, such specialized and repetitive labor routine leads people to adapt their information processing strategies accordingly to the demand for cognitive abilities (Mata & Nunes, 2010; Queen & Hess, 2010).

[11] To our knowledge, neither Sobel's test nor other statistical method available is proper to test this sort of mediation effect.

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On the other hand, we expect that accountants from small-sized companies to work in an environment completely different. Specifically, the lower number of employees must force them to develop activities connected to the entire administrative process, which requires cognitive reflection on a more comprehensive set of tasks.

RQ5: Do accountants who labor for large-sized companies differ from accountants who labor for small-sized companies in terms of cognitive reflection abilities measured by CRT?

3. METHODOLOGY

In order to map the cognitive reflection abilities of the professional accountants, we collected CRT scores and demographic characteristics from 4,902 Brazilian accountants. In this section, we describe the data collection and the sample and present the regression model that we use in our analysis.

3.1 Data collection and sample description

We collect data via a questionnaire applied by Brazilian Accounting Association (Conselho Federal de Contabilidade, hereafter CFC). [12] Beyond the Frederick's (2005) CRT questions, the participants answered demographic questions such as age, gender, formal instruction level, income, detailed information about the professional segment and firm in which they labor. The target participants constitute the entire population of Brazilian professional accountants, which, in June 2012, was around 302,697 individuals.

A total of 9,355 bachelor professional accountants answered the questionnaire. As a check against random responses, we eliminated observations containing unreasonable answers for the CRT question, as well as those containing incomplete answers for the demographic questions. As a result, the final sample comprises 4,902 professional accountants (See Table 1), corresponding to 1.6% of the Brazilian professional accountants' population. Although it is not statistically representative, to our knowledge, ours is the biggest sample in the CRT literature. For instance, Frederick (2005) himself surveyed 3,428 individuals. [13]

Table 1 – Sample selection.

Total CRT survey answers:[a]				9,355
(-)		CRT inconsistent answers (A1 U A2 U A3)[c]:		(516)
	(-)	Lower than 10 or higher than 110 for Question 1 (bat and ball) (A1):	(228)	
	(-)	Lower than 2 or higher than 96 for Question 2 (lily pads) (A2):	(222)	
	(-)	Lower than 1 or higher than 500 for Question 3 (machines) (A3):	(210)	
(-)		Respondents who did not answer the income question:		(49)
(-)		Respondents who did not fit in any of the professional segments:		(3,888)
(=)		Total of answers considered:		4,902[b]

a. The initial number of respondents was 13,084, but we had to exclude 3,142 answers from accounting technicians and other 587 inconsistent answers.
b. The population of interest was 302,697 in June 2012, according to CFC database. It means that final sample is comprised by 1.6% of the population (CFC, 2013).
c. A1 U A2 U A3 represents the union of inconsistent answers, once some respondents answered inconsistently more than one question.

[12] The CFC and two of the authors agreed that they would update the Brazilian Accountant's Profile, a report published originally by the CFC in 1995/1996 and lately in 2009. In exchange for updating the profile, authors did not earn any money; instead they were allowed to include additional questions related to their research interests in the Profile's questionnaire. A CFC's committee reviewed, evaluated and approved the additional questions. In this sense, the authors have exclusive permission from the CFC to use the aggregated data in their research interests.

[13] Notice that in Brazil professional accountants are required by law to register themselves at the CFC in order to properly provide accounting services.

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3.2 THE MODEL AND VARIABLES DESCRIPTION

To map the cognitive reflection abilities of the Brazilian professional accountants, we explore a number of participants' individual characteristics besides their cognitive reflection abilities measured by the CRT. Table 2 presents detailed information on each of the variables of interest for this study.

Table 2 – Variables descriptions.

Variable	Measure
Cognitive Score	Sum of Cognitive Reflection Test (CRT) scores, where each correct answer add one point in a scale that varies from 0 to 3. This is our dependent variable.
Gender	Categorical (independent) variable which assumes 1 (one) if the participant is a female and 0 (zero) if the participant is a male.
Age	Age of the participants in years.
Highest Education Level	Categorical variable that assumes 1 (one) if the participant completed a MBA or a Ph.D. and 0 (zero) otherwise, i.e., if participant completed only the bachelor level.
Annual income intervals	Categorical variable with seven levels (until 10.6; 10.6 – 17.7, 17.7 – 35.3; 35.3 – 70.6; 70.6 – 105.9; 105.9 – 176.6, more than 176.6) in USD thousands . For each level we apply a dummy variable assuming 1 (one) if the respondent belongs to that category, and 0 (zero) otherwise.
Professional Segment	Categorical variable with five levels: (i) Preparers of financial statements: professionals devoted to the elaboration of financial reports (active participation) in private or public owned firms, as well as in governmental institutions. (ii) Auditors: external and internal auditors working for private or public institutions; (iii) Analysts: investment, financial and credit advisors and tax consultants; (iv) Managers: operational managers, as well as managers in planning and budgeting areas working for private or public owned firms, or for governmental institutions; (v) Accounting professors. For each level we apply a dummy variable assuming 1 (one) if the respondent belongs to that category, and 0 (zero) otherwise.
Larger Companies' Professional	Categorical variable that assumes 1 (one) if the respondent works for a company that meets at least one of the requirements: (i) is listed; (ii) has total assets book value higher than BRL 240 million or annual revenue higher than BRL 300 million; or (iii) whose financial statements are audited by independent auditors. The variable assumes 0 (zero) otherwise.

We first analyze simple descriptive statistics and, then, we estimate three different regression models aiming to better grasp how the CRT score correlates with the accountants' demographic characteristics. Given the nature of our data, we use ordered logistic regression (ologit) models. Although the interpretation is not as straightforward as for simple linear models, the odds ratio analysis[15] combined with the margins analysis provides an informative approach.

Following the intuition borrowed from prior studies on human cognitive abilities, we first estimate a simplistic model (Model 1) including only gender, age, and education level. Then, we deepen our analysis by including, in Model 2, the variables shaped for accountant professionals, i.e., professional segment and large company, as well as income intervals. Finally, in order to further explore how accountants' cognitive abilities relate to demographic characteristics contingent on professional segment, we run Model 3 separately for preparers, auditors, analysts, managers, and professors.

Cognitive Score = $\alpha 0 + \alpha 1$Gender $+ \alpha 2$Age $+ \alpha 3$Formal Education Level $+ \varepsilon$ (Model 1)

Cognitive Score = $\alpha 0 + \alpha 1$Gender $+ \alpha 2$Age $+ \alpha 3$Formal Education Level $+ \alpha 4$Income intervals $+ \alpha 5$Professional segment $+ \alpha 6$Larger Company's Professional $+ \varepsilon$ (Model 2)

Cognitive Score = $\alpha 0 + \alpha 1$Gender $+ \alpha 2$Age $+ \alpha 3$Formal Education Level $+ \alpha 4$Income intervals $+ \alpha 5$Larger Company's Professional $+ \varepsilon$ (Model 3)

[14] As at July 2012 the exchange rate was USD 1 = BRL 2.29.

[15] Odds ratio = ec, where e is the base of the natural logarithm and c is the variable coefficient. In our specific case, the probability of getting the highest score (i.e., 3) versus lower (i.e., 0) is meant to be higher (if the odds ratio is greater than 1) or lower (if the odds ratio is smaller than 1) by a factor equivalent to the odds ratio value. For instance, an odds ratio of 0.5 for the variable gender would mean Conversely, an odds ratio of 1.5 would mean that the probability of a professional accountant score 3 in the CRT test is 1.5 times higher if the professional is a female.

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4. RESULTS

4.1 DESCRIPTIVE STATISTICS

Table 3 presents CRT score mean, standard deviation, and frequency of right responses according to the demographic classifications of interest. Interestingly, the mean CRT score of Brazilian professional accountants (1.55) is slightly higher than the mean CRT score of 313 American supply chain managers employed at Fortune 500 supply-chain-intensive firms from the U.S.A (1.51), as reported by Moritz et al. (2013). However, except for Moritz et al., prior research mostly reports CRT scores from college students (Frederick, 2005; Hoppe & Kusterer, 2011; Oechssler et al., 2009; Toplak et al., 2011). Surprisingly, the Brazilian professional accountants had higher mean CRT scores than the 3,428 individuals reported by Frederick (2005, Table 1). That is, of the eleven sample populations in Frederick's (2005) study, only the student population from MIT and Princeton University had higher average CRT scores than Brazilian professional accountants. In turn, Oechssler et al. (2009) found a striking 2.05 CRT mean for 1,250 individuals (90% of college students) whose mean age was 24 years. Importantly, the mean age of the professionals in our sample is 40 years old and, obviously, none of them is a college student.

Table 3 – Descriptive Statistics: CRT Scores for each group of accountants.

| Accountants groups | | CRT Score | | Percentage Scoring 0, 1, 2 or 3 | | | | | |
| | | | | Low | | High | | | |
		Mean	St. Dev.	0	1	2	3		N
Gender	Male	1.66	0.98	11.79	35.46	27.38	25.36		3,367
	Female	1.31	0.92	17.59	47.10	21.63	13.68		1,535
Age intervals (years old)[a]	18 - 35	1.59	0.98	12.67	38.65	25.84	22.84		2,202
	36 - 50	1.55	0.98	13.66	39.49	24.82	22.02		1,998
	51 - 88	1.45	0.96	16.38	39.46	26.92	17.24		702
Highest education level	Bachelor	1.50	0.94	14.60	40.76	24.61	20.02		2,068
	MBA/PhD	1.59	0.98	12.88	37.90	26.29	22.94		2,834
Annual income intervals (USD 1,000)	until 10.6	1.37	1.00	20.24	41.50	19.64	18.62		494
	10.6 – 17.7	1.39	0.96	17.87	41.32	24.69	16.12		968
	17.7 – 35.3	1.52	0.93	11.92	43.02	25.88	19.18		1,611
	35.3 – 70.6	1.70	0.98	10.71	35.08	27.91	26.31		1,186
	70.6 – 105.9	1.74	1.01	11.28	32.83	25.81	30.08		399
	105.9 – 176.6	1.80	1.01	11.11	28.89	28.89	31.11		180
	> 176.6	1.67	1.07	15.63	31.25	23.44	29.69		64
Segment	Preparers	1.50	0.97	14.00	42.22	23.68	20.11		1,850
	Auditors	1.67	1.02	13.41	33.45	25.78	27.35		574
	Analysts	1.54	0.97	13.81	39.02	26.15	21.03		956
	Managers	1.59	0.97	12.54	38.15	27.06	22.25		1,308
	Professors	1.54	0.99	16.36	33.64	29.91	20.09		214
Larger Company's	No	1.57	0.97	12.90	39.10	26.53	21.47		2,767
	Yes	1.54	0.99	14.52	39.11	24.36	22.01		2,135
Total		1.55	0.98	13.61	39.11	25.58	21.71		4,902

a. Although the age intervals were applied in this table using a range format, we apply age is a quantitative variable to estimate the ordered logistic model.

4.2 MULTIVARIATE ANALYSIS

Table 4 presents the results for the estimation of the three models we propose. The margin analysis for all predictors set at the mean values suggests that the probability of a hypothetical average

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professional accountant scores zero on the CRT is 13%, while the probability of scoring 1 is 40%, the proba-bility of scoring 2 is 26%, and the probability of scoring 3 is 21%. The estimations of the three models do not violate the proportional odds assumption, except the Model 2. We estimate Model 2 using the generalized ordered logistic approach and find similar results. In order to facilitate the interpretation, we report only the ologit results.

Table 4 – Coefficients estimated for ordered logistic regression models from Equations 1, 2 and 3.

		Model 1	Model 2	Model 3 Preparers	Model 3 Auditors	Model 3 Analysts	Model 3 Managers	Model 3 Professors
Controls								
Gender		0.49***	0.54***	0.60***	0.44***	0.47***	0.56***	0.66
Age		0.98***	0.97***	0.97***	0.96***	0.98***	0.98***	0.97**
Education level		1.17***	1.01	1.03	0.77	0.97	1.22*	0.72
Main effects								
Larger Co's worker			0.85***	0.80**	1.04	0.97	0.81**	0.51
Income[a]								
	10.6 – 17.7		1.13	1.28	0.46**	0.67*	1.86**	1.80
	17.7 – 35.3		1.50***	1.63***	0.88	0.86	2.05***	4.87***
	35.3 – 70.6		2.22***	2.33***	1.36	1.51*	2.97***	5.56***
	70.6 – 105.9		2.47***	2.68***	2.01*	1.76*	2.69***	13.33***
	105.9 – 176.6		3.05***	2.02**	2.79**	2.61**	4.21***	-
	> 176.6		2.51***	2.48**	3.58*	2.55*	1.13	-
Profess. Segment								
	Auditors		1.19**					
	Analysts		1.03					
	Managers		1.03					
	Professors		1.13					
Likelihood Ratio X2		180.0***	302.7***	92.8***	69.6***	79.7***	77.2***	29.5***
Pseudo R-square		0.01	0.02	0.02	0.05	0.03	0.02	0.05
N		4,902	4,902	1,850	574	956	1,308	214

*** $p < 0.01$; ** $p < 0.05$; * $p < 0.10$.
a. Annual income in thousands of USD.

Gender (RQ1)

In line with previous research (Frederick, 2005; Hoppe & Kusterer, 2011; Oechssler et al., 2009), the results suggest that men score significantly higher than women on CRT. The apparent large average difference between males (1.66) and females (1.31) is found significant in the estimation of the ordered logistic regression models. The odds ratio in Model 2 indicates that the probability of an individual reaching the higher CRT score is 0.54 times lower if it is a woman, holding constant all other variables. We find a slight variation across the model estimations, except for the group of professors, for which, in spite of the large average difference (1.64 and 1.37 for males and females, respectively), the statistical results indicate that such difference may be only by chance in the sampling process.

Further, the margin analysis suggests that the probability of getting a score zero is 18.1% if the average professional accountant is a female, and 10.7% if the professional accountant is a male. The probabilities of scoring 1, 2, and 3 on CRT are 44.9, 22.3, and 14.7% for females, while 37.3, 27.9, and 24.1% for males, respectively. Hence, female professional accountants are more likely than male professional accountants to score zero or 1 on CRT, and this pattern reverts for scores 2 or 3, which are the highest ones.

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These results are in line with Frederick's (2005) findings. Particularly, Frederick found a mean CRT score of 1.47 for males versus 1.03 for females even after controlling for sampling problems, differences in attention, effort expended to answer, and mathematical ability. Supplementary to Frederick, our findings suggest that sharing the same background, work environment, age, and educational and income levels are not enough to equalize females and males accountant professionals in terms of cognitive reflection abilities.

Age (RQ2)

The descriptive statistics in Table 3, supported by the estimations in Table 4, suggest that older professional accountants perform significantly worse than young professional accountants. The odds ratios in Table 4 indicate that, for each additional year old, the CRT scores of Brazilian accountants tend to decrease by 0.03, if all other variables are kept constant. There is only a slight variation in the magnitude of the coefficients across the models, and, in all cases, the age variable is statistically significant. The margin analysis suggests that, for each incremental year old, the probability of an average professional accountant achieving the maximum score decreases by 0.46%, while the probability of achieving the minimum score increases 0.3% each year added to professional accountants age.

Hence, our findings are aligned to Kahneman (2011), as well as to the cognitive aging literature. Notice, however, that one should exert caution with such inference since research on cognitive aging lacks investigations on cognitive reflection abilities measured by CRT.

Education and income levels (RQ3 and RQ4)

The results for Model 1 estimation suggest that graduated professional accountants (MBA and/or PhD) are significantly more likely to achieve high CRT scores. However, the estimations of Models 2 and 3 reveal that the education variable is significant only for estimations disregarding income level. As previously discussed in the section devoted to the research question, we believe it is a plausible pattern of results. However, we must be caution while analyzing and making inferences on these results, since we face technical limitations that impair us of presenting conclusive findings on the supposed mediation effect of income level on the relationship between education and CRT.

Furthermore, an alternative explanation for these results is that the low differences in CRT scores across educational levels are due to the fact that education tends to become insignificant for professional accountants after a number of training programs within companies. Such programs probably make education abilities more homogeneous over the years, since academic knowledge tends to be forgotten, prevailing what is learned and repeated over the daily work.

Surprisingly, education level remains marginally significant for managers (Model 3) even after including income variables. Our guess is that this result may indicate that MBA programs may impact managers differently since such programs are often tailored for them.

The findings for income level suggest that high-income professional accountants tend to make reflective decisions more frequently than the low-income professionals. Even though we have no theoretical support, we conjecture that these results are influenced by the fact that positions of greater responsibility tend to be better rewarded. Hence, since more complex judgments and decisions are likely to be demanded from professionals in high-responsibility levels, professionals in such jobs tend to be more required to further exert their cognitive reflection abilities. In contrast, accountants

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in the lower income levels, and, consequently, hold less intensive responsibilities, must develop less complex activi-ties, so that they are likely to be less demanded to exert deep reflection while performing their duties.

Larger Companies' Professional (RQ5)

We find evidence that the probability of scoring the highest CRT score is around 0.80 times lower if the accountant works for a larger firm, holding constant the other variables (see Table 4, Model 2). Analyses for professional segments (Model 3) present analogous results for preparers and for managers. For the 1,850 preparers in the subsample, 730 work for larger companies and 1,120 preparers do not, the probability of scoring 3 on CRT is 0.80 times lower if the professional accountant works for a large company. Similarly, for the 1,308 managers, 642 work for larger companies and 666 managers do not, the probability of getting the highest cognitive reflection score is 0.81 times lower for professional accountants who work for large companies, holding constant all other variables in these analyses. The margin analysis suggests that the probability of getting a score zero is 11.9% if the average professional accountant does not work for a large company, but such probability is 13.7% if the professional accoun-tant does work for a large company. This pattern flips when performing a similar analysis for the highest CRT score. That is, the probabilities of scoring 3 on CRT for professional accountants who do not work for large companies and do work for such companies are 22.0 and 19.2%, respectively. The results are similar for margin analyses performed for the preparers' and managers' subsamples.

This pattern of results is coherent with the idea that laboring for large (and, consequently, highly departmentalized) companies may lead accounting professionals to be less required in terms of cogni-tive reflection abilities. Nevertheless, as we previously adverted, one should exert caution while making such inferences, since cognitive aging research has not applied CRT as a predictor so far. In spite of this, notice that the results for the professional segments analysis provide further support for the foregoing rationale. That is, preparers and managers seem to be more exposed to the effect of high detailed and repetitive duties, once the work assignments of auditors, analysts, and professors tend to have broader scope even within larger companies.

Professional segment results and future research

An interesting piece of information in our results is that auditors present the highest average CRT score followed by managers, professors, analysts, and preparers (see Table 3). Besides, inferential outputs from Model 2 depicted in Table 4 point out that, holding the preparers as the reference level (omitted dummy variable), the only statistically significant coefficient is for auditors. The odds ratio analysis indicates that the probability of scoring 3 on CRT is 1.20 times higher if the professional accountant is an auditor, holding constant all other variables. No other professional category differs significantly from the baseline constituted by preparers (see Table 4, Model 2). Additionally, the CRT score seems less sensitive to income level for auditors than for other professional categories (Model 3).

Several questions arise from these findings. Is it possible that selection processes for audit jobs are able to pick the most skilled professionals in terms of cognitive reflection test? Is it possible that age and gender affect cognitive reflection abilities differently according to the professional category in which the accountant labors? How does it affect professional judgments? The exploratory results reported in this paper are expected to shed light not only on these and other important research questions, but also in other determinants of human decision-making.

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5. CONCLUSIONS

This paper maps the Brazilian professional accountants' cognitive reflection abilities measured by Frederick's (2005) CRT. To our knowledge, our study is the first to assess how demographic individual characteristics predict CRT scores looking at professionals that share a background in a very specific area. Besides, we use the largest data set that we are aware of for studies of similar nature.

In spite of the expectation that selection into career together with similar background could lead male and female accountants to neutralize the gender differences found by previous studies, our findings suggest that male accountants are more reflective than female accountants. That is, male accountants outperform female accountants in terms of CRT score. We also present evidence that, aligned with prior research on cognitive aging, professional accountants become less reflective as they age. In addition, the results suggest that educational and income levels are positively associated with cognitive reflection abilities, and that income mediates the relationship between educational level and cognitive reflection abilities. However, given the difficulties to set a suitable identification strategy, one should exert caution to make inferences based on such analysis. Interestingly, we find that preparers and managers working for larger companies tend to be less reflective than their counterparts working for smaller firms. As expected, this pattern of results does not hold for auditors, analysts, and professors. Finally, our results suggest that auditors' scores on CRT are significantly higher than preparers', analysts', managers' and professors' scores, raising interesting questions for future research.

This paper contributes not only to the literature in accounting and psychology, but also to practitioners interested in understanding how cognitive reflection abilities relate to demographic charac-teristics within the accounting field. Since cognitive reflection abilities significantly affect JDM quality, as reported in previous studies, the importance of our findings connects to the remarkable role that JDM plays in several fields of accounting activity.

Further research should investigate whether the findings of this paper are contingent on culture or other human individual characteristics. Moreover, future research should investigate whether cognitive reflection ability constitutes a relevant predictor for heuristics and biases in accounting JDM. Compelling empirical research questions arise from this, for instance: How is the interpretation of verbal probabilities (Doupnik & Richter, 2003, 2004; Doupnik & Riccio, 2006) associated with accountants' cognitive reflection abilities? Is the classification of items in accordance with vague standards (Penno, 2008; Cardoso & Aquino, 2009) contingent on accountants' CRT scores? Is the ability to interpret graphical information (Cardoso, Leite & Aquino, 2016) associated with cognitive reflection abilities? Is time consumed to perform CRT task associated with CRT scores?

REFERENCES

Arden, J. (1997). True and fair view: a European perspective. European Accounting Review, 6(4), 675–679.

Alexander, D., & Jermakowicz, E. V. A. (2006). True and Fair View of the Principles/Rules Debate. Abacus, 42(2), 132–164. doi:10.1111/j.1468-4497.2006.00195.x

Bergman, O., Ellingsen, T., Johannesson, M., & Svensson, C. (2010). Anchoring and cognitive ability. Economics Letters, 107(1), 66–68. doi:10.1016/j.econlet.2009.12.028

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Birley, S. (1989). Female Entrepreneurs: Are They Really Any Different? Journal of Small Business Management, 27, 32–37.

Birnberg, J. G. (2011). A proposed framework for behavioral accounting research. Behavioral Research in Accounting, 23(1), 1–43. doi:10.2308/bria.2011.23.1.1

Bonner, S. E. (2008). Judgment and Decision Making in Accounting. New Jersey: Prentice Hall. ISBN 978-0-138-63895-5.

Bonner, S. E., & Lewis, B. L. (1990). Determinants of Auditor Expertise. Journal of Accounting Research 28(1), 1–21.

Bonner, S. E., Davis, J. R., & Jackson, B. (1992). Expertise in corporate tax planning: The issue identification stage. Journal of Accounting Research 30(1), 1-28.

Bonner, S. E., & Walker, P. L. (1994). The effects of instruction and experience on the acquisition of auditing knowledge. The Accounting Review 69(1), 157-178.

Brown, T. J. (2014). Advantageous comparison and rationalization of earnings management. Journal of Accounting Research, 52(4), 849–876. doi:10.1111/1475-679X.12054

Campitelli, G., & Labollita, M. (2010). Correlations of cognitive reflection with judgments and choices. Judgment and Decision Making, 5(3), 182–191.

Cardoso, R. L., & Aquino, A. C. B. de. (2009). An Experimental Investigation of Vagueness on the Left Side of Balance Sheet. Brazilian Business Review, 6(2), 198–216.

Cardoso, R. L.; Leite, R. O.; Aquino, A. C.B. (2016). A Graph is Worth a Thousand Words: How Overconfidence and Graphical Disclosure of Numerical Information Influence Financial Analysts Accuracy on Decision Making. PLoS ONE, 11(8). doi:10.1371/journal.pone.0160443

Capps, G., Koonce, L., & Petroni, K. R. (2016). Natural Optimism in Financial Reporting: A State of Mind. Accounting Horizons, 30(1), 79–91. doi:10.2308/acch-51277

Choo, F. (1996). Auditors' knowledge content and judgment performance: A cognitive script approach. Accounting, Organizations and Society, 21(4), 339–359. doi:10.1016/0361-3682(95)00048-8

Cokely, E. T., & Kelley, C. M. (2009). Cognitive abilities and superior decision making under risk : A protocol analysis and process model evaluation. Judgment and Decision Making, 4(1), 20–33.

Colasse, B. (1997). The French Notion of the Image Fidele: The Power of Words. European Accounting Review, 6(4), 681–691.

Conselho Federal de Contabilidade (2013). Pesquisa Perfil do Profissional da Contabilidade 2012/13. Brasília: CFC. 86p. CDU 657: 331.543(81).

Croson, R., & Gneezy, U. (2009). Gender Differences in Preferences, 448–474.

Dalton, D. R.; Hill, J. W.; Ramsay, R. J. (1997). Women as managers and partners: context specific predictors of turnover in international public accounting firms. Auditing: A Journal of Practice and Theory, 16(1), 29-50.

Dearman, D. T., & Shields, M. D. (2005). Avoiding Accountitig Fixation: Determitiants of Cognitive Adaptation to Differences in Accounting Method. Contemporary Accounting Research, 22(2), 351–384.

Doupnik, T. S.; Richter, M. (2003). Interpretation of uncertainty expressions: a cross-national study. Accounting, Organizations and Society, 28,15-35.

Doupnik, T. S.; Richter, M. (2004). The impact of culture on the interpretation of 'in context' verbal probability expressions. Journal of International Accounting Research, 3 (1), 1-20.

■ Advances in Scientific and Applied Accounting ■ ISSN 1983-8611 ■ São Paulo ■ v.9, n.2 ■ p. 224 - 239 ■ Maio. / Ago. de 2016.

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Doupnik, T. S.; Riccio, E. L. (2006) The influence of conservatism and secrecy on the interpretation of verbal probability expressions in the Anglo and Latin cultural areas. The International Journal of Accounting, 41, 237-261.

Epstein, S. (1994). Integration of the cognitive and the psychodynamic unconscious. American Psychologist, 49(8), 709–724. doi:10.1037//0003-066X.49.8.709

Farrell, A. M., Goh, J. O., & White, B. J. (2014). The Effect of Performance-Based Incentive Contracts on System 1 and System 2 Processing in Affective Decision Contexts: fMRI and Behavioral Evidence. The Accounting Review, 89(6), 1979–2010. doi:10.2308/accr-50852

Frederick, S. (2005). Cognitive Reflection and Decision Making. Journal of Economic Perspectives, 19(4), 25–42.

Gray, S. J. (1988). Towards a theory of cultural influence in the development of accounting systems internationally. Abacus, 24 (1),1-15.

Griffith, E. E., Kadous, K., & Young, D. (2016). How Insights from the " New " JDM Research Can Improve Auditor Judgment: Fundamental Research Questions and Methodological Advice. Auditing: A Journal of Practice & Theory, 35(2), 1–22. doi:10.2308/ajpt-51347

Hoppe, E. I., & Kusterer, D. J. (2011). Behavioral biases and cognitive reflection. Economics Letters, 110(2), 97–100. doi:10.1016/j.econlet.2010.11.015

Hulle, K. V. (1997). The true and fair view override in the European Accounting Directives. European Accounting Review, 6(4), 711–720.

International Accounting Standard Board (IASB). (2015). International Financial Reporting Standard (IFRS) for Small and Medium-sized Entities. London: IFRS Foundation. ISBN 978-1-911040-07-1.

IASB. (2016). A Guide through IFRS. London: IFRS Foundation. ISBN 978-1-911040-31-6.

International Financial Reporting Standards Foundation (IFRS Foundation). (2015). A Briefing for Chief Executives, Audit Committees & Boards of Directors. London: IFRS Foundation. ISBN 978-1-909704-80-0.

Johnson, J. E. V., & Powell P. L. (1994). Decision Making, Risk and Gender: Are Managers Diffferent? British Journal of Management, 5(2), 123–38.

Kahneman, D. (2003). A perspective on judgment and choice: mapping bounded rationality. The American Psychologist, 58(9), 697–720. doi:10.1037/0003-066X.58.9.697

Kahneman, D. (2011). Thinking, fast and slow. New York: Farrar, Straus and Giroux. 499p.

Kahneman, D.; & Frederick, S. (2002). Representativeness revisited: attribute substitution in intuitive judgment. In T. Gilovich, D. Griffin & D. Kahneman (Eds.), Heuristics and biases: The psychology of intuitive judgment, 49-81. New York: Cambridge University Press.

Kahneman, D., & A. Tversky. (1979). Prospect Theory: An analysis of decision under risk. Econometrica, 47(2), 263-292.

Libby, R., & Luft, J. (1993). Determinants of judgment performance in accounting settings: ability, knowledge, motivation and environment. Accounting, Organizations and Society, 18(5), 425–450.

Libby, R.; & Tan, H-T. (1994). Modeling the determinants of audit expertise. Accounting, Organizations and Society. 19 (8), 701–716.

March, J. G., & Simon H. A. (1958). Organizations. New York: Wiley.

Mata, R., & Nunes, L. (2010). When less is enough: Cognitive aging, information search, and decision quality in consumer choice. Psychology and Aging, 25(2), 289–298. doi:10.1037/a0017927

Moritz, B. B., Hill, A. V., & Donohue, K. L. (2013). Individual differences in the newsvendor problem: Behavior and cognitive reflection. Journal of Operations Management, 31(1-2), 72–85. doi:10.1016/j.jom.2012.11.006

■ Advances in Scientific and Applied Accounting ■ ISSN 1983-8611 ■ São Paulo ■ v.9, n.2 ■ p. 224 - 239 ■ Maio. / Ago. de 2016.

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Nobes, C. (1998). Towards a general model of the reasons for international differences in financial reporting. Abacus, 34 (2), 162-187.

Oechssler, J., Roider, A., & Schmitz, P. W. (2009). Cognitive abilities and behavioral biases. Journal of Economic Behavior and Organization, 72(1), 147–152. doi:10.1016/j.jebo.2009.04.018

Penno, M. C. (2008). Rules and Accounting: Vagueness in Conceptual Frameworks. Accounting Horizons, 22(3), 339–351. doi:10.2308/acch.2008.22.3.339

Queen, T. L., Hess, T. M., Ennis, G. E., Dowd, K., & Grühn, D. (2012). Information Search and Decision Making: Effects of Age and Complexity on Strategy Use. Psychology and Aging, 27(4), 817–824. doi:10.1037/a0028744

Salthouse, T. A. (2004). What and When of Cognitive Aging. Current Directions in Psychological Science, 13(4), 140–144.

Salthouse, T. A. (2012). Aging of Thought. Lifespan Cognition: Mechanisms of Change. doi:10.1093/acprof:oso/9780195169539.003.0019

Schipper, K. (2003). Principles-Based Accounting Standards. Accounting Horizons, 17(1), 61–72.

Securities and Exchange Commission (SEC). (2007). Concept Release on Allowing U.S. Issuers to Prepare Financial Statements in Accordance with International Financial Reporting Standards.

Securities and Exchange Commission (SEC). (2012). Work Plan for the Consideration of Incorporating International Financial Reporting Standards into the Financial Reporting System for U.S. Issuers.

Silva, J. S. (2005). Se um taco e uma bola custam R$110, e o taco custa R$100 a mais do que a bola, quanto custa a bola? Thesis. Master in Administration, Fundação Getulio Vargas. Rio de Janeiro: FGV. 72 p.

Sloman, S. A. (1996). The empirical case for two systems of reasoning. Psychological Bulletin, 119(1), 3–22. doi:10.1037/0033-2909.119.1.3

Stanovich, K. E., & West, R. F. (2000). Individual differences in reasoning: Implications for the rationality debate? Behavioral and Brain Sciences, 23(1), 645–726.

Tan, H., & Libby, R. (1997). Tacit Managerial versus Technical Knowledge as Determinants of Audit Expertise in the Field. Journal of Accounting Research, 35(1), 97–113.

Toplak, M. E., West, R. F., & Stanovich, K. E. (2011). The Cognitive Reflection Test as a predictor of performance on heuristics-and-biases tasks. Memory & Cognition, 39(7), 1275–1289. doi:10.3758/s13421-011-0104-1

Trotman, K. T., Tan, H. C., & Ang, N. (2011). Fifty-year overview of judgment and decision-making research in accounting. Accounting and Finance, 51(December 2010), 278–360.

Verhaeghen, P., & Salthouse, T. A. (1997). Meta-Analyses of Age-Cognition Relations in Adulthood: Estimates of Linear and Nonlinear Age Effects and Structural Models. Psychological Bulletin, 122(3), 231–249.

Viator, R. E., Bagley, P. L., Barnes, B. G., & Harp, N. (2014). Measuring Reflective Cognitive Capacity: A Methodological Recommendation for Accounting Research of Feedback Effects. Behavioral Research in Accounting, 26(2), 140428160445002. doi:10.2308/bria-50803

West, R. F., Meserve, R. J., & Stanovich, K. E. (2012). Cognitive sophistication does not attenuate the bias blind spot. Journal of Personality and Social Psychology, 103(3), 506–19. doi:10.1037/a0028857

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