

**NEW PERSPECTIVES ON THE RELATIONSHIP BETWEEN INTELLECTUAL CAPITAL
DISCLOSURE AND THE COST OF CAPITAL IN IPOs: THE ROLE OF PRICE ADJUSTMENT**

Abstract

For years now, increasing worldwide competition has meant that firms need to find new ways to create and maintain their competitive advantage. As such, companies are largely investing in the disclosure of the information about their Intellectual Capital (IC) in order to reduce the information asymmetry with the stakeholders thus allowing a more precise view of the firm's value. IPOs are particularly affected by information asymmetries, since companies going public are less known to investors, leading to greater uncertainty about their prospects and to a potentially higher cost of capital. Previous literature has studied the relationship between IC disclosure and the cost of capital mainly considering the underpricing as a proxy of this cost, finding inconsistent results.

This paper offers a new perspective on the relationship between the IC disclosure and the cost of capital in the IPO setting, by separating the effects of the IC disclosure on the issue price, which is fixed in the primary market, and the market price, which is produced by secondary market investors on the first day of trading. Furthermore, compared to previous literature we provide a deeper analysis of the IC information disclosed by firms.

We empirically demonstrate, that larger IC disclosure enables the issuer to keep the offer price high but that it might also have an impact on the market price, leading to an increase in underpricing. That being so, our empirical evidence suggests that IC disclosure can be used by the issuer and the underwriter to reduce the cost of capital in the IPO. Nevertheless, the awareness about the effects that IC disclosure produces is helpful to firms but it can also lead to opportunistic behaviors of the issuer and the underwriter and this claims for a urgent need of a standard regulation regarding the way IC information is disclosed.

Keywords IPO, Underpricing, Intellectual Capital, Price Adjustment, Asymmetric Information, Disclosure

1. Introduction

For the last two decades, firms have been facing increasing worldwide competition. As a reaction to the new challenges and in order to create and maintain their competitive advantage, many firms have largely invested in intellectual capital (also called intangible assets) in terms of research and development, customer base creation, staff and brand development, and so on. Intellectual capital reporting has increased over the years, despite still constituting a relatively uncommon practice (Unerman et al, 2007; Guthrie et al., 2007). In fact, even though a firm's evaluation is largely dominated by quantitative financial data, disclosing qualitative information about intangible assets is expected to enable a more precise evaluation of a company's business (Holland, 2006; Buhk, 2003; Holland and Johanson, 2003; See and Rashid, 2011), thus reducing the information asymmetry between the firm and its stakeholders. The issue is particularly relevant when information asymmetries are considered as a determinant of the cost of capital. In fact, it is commonly expected that enhanced disclosure reduces the information asymmetries between the firm and its potential investors and consequently lowers the rate of return they require (Diamond and Verrecchia, 1991). Nevertheless, empirical evidence on the topic has reached inconsistent results, partly due to the different measures of the cost of capital employed (Botosan, 2006). As a consequence, the issue remains controversial.

A setting in which the relationship between the disclosure of intangible assets and the cost of capital becomes particularly interesting is when companies go public. In fact, IPOs provide a context in which information asymmetry is abnormally high; companies issuing IPOs are less known to investors and analysts because they are still new in the market, leading to greater uncertainty about their prospects (See and Rashid, 2011). The disclosure of Intellectual Capital (IC) in an IPO prospectus thus provides an important opportunity to reduce this gap in information asymmetry potentially lowering the cost of capital. To our knowledge, very few studies have attempted to provide empirical evidence on the relationship between the IC disclosure and the IPO cost of capital, and the few studies that have been done have reached inconsistent results. In particular, some authors have studied the relationship between the IC disclosure and the IPO underpricing: Dimovski and Brooks (2006), by studying a sample of Australian IPOs issued between 1994 and 1999, found that, greater disclosure about intangible assets (apart from the goodwill variable that is non-significant) reduces the uncertainty of the IPO and reduces the cost of capital as measured by a lower underpricing. Such a result is consistent with the body of literature starting from Benveniste and Spindt (1989) which maintains that firms that have greater uncertainty surrounding the true value of the shares (i.e. firms which disclose less information in the IPO) are more likely to have revisions in their offer prices and also to trade far from their true value on their first day of trading¹. Opposite results were obtained by Singh and Van der Zahn (2007), who empirically examined a sample of 334 Singapore IPOs launched between 1994 and 2004. Contrary to their expectations, they

¹ This happens also because Underwriters, who are unsure of the price of an issue, are likely to set wider offer ranges to provide greater flexibility in setting the final offer price (Hanley, 1993).

found that a larger IC disclosure was associated with a larger underpricing and they provide possible explanations for the positive link they exhibit in terms of litigation risk, marketing-advertising strategy and also extensive bidding up carried out by unsophisticated traders.

Despite underpricing is the elected cost of capital measure in the narrow literature about IC disclosure in IPOs, Hanley and Hoberg (2012) also consider the price adjustment that can derive from a larger information production. Despite they do not specifically focus on the IC disclosure, they consider intangible information in the IPO prospectus such as the risk factors and management's discussion. According to the interpretative framework already discussed for Dimovski and Brooks (2006), they hypothesize that any information about the firm that is included in the IPO prospectus is likely to provide a reduction in the ex ante uncertainty surrounding the IPO; such a reduction in the information asymmetry is expected to enable offer prices to get closer to "true" value of the company (i.e. a smaller price adjustment) and allows trade price to do the same (less first-day underpricing). Nevertheless, contrary to the expectations, they find that the risk factors section increases the magnitude of the offer price and also, the larger the MD&A, the greater the price adjustment. With reference to the underpricing, they find evidence of its increase due to a large disclosure of the risk factors and no evidence regarding the management discussion.

As such, previous literature has not yet been able to solve the puzzle regarding the role of IC disclosure in the IPO cost of capital. Some authors have empirically demonstrated that larger disclosure produces a decrease in the cost of capital as measured by the underpricing and some others have maintained that larger disclosure seems to enlarge the cost of capital in terms of both the price adjustment and the underpricing.

In this present paper we propose a new interpretation of the relationship between the IC disclosure and the IPO's cost of capital, one that might also explain the inconsistencies in the results between previous studies. In particular, despite the underpricing has been extensively used as the elected cost of capital measure in IPOs, we believe it is not the most proper to be used as it is largely influenced by the market price, which is an expression of the secondary market investors' behavior. For this reasons, we enlarge the perspective by also studying the effects that IC disclosure produces in terms of the price adjustment which is the results of the demand and supply dynamics in the primary market of the IPO where institutional investors are involved. Such a distinction allows us to investigate the effects that IC disclosure produces in the primary and secondary market as a whole.

Previous literature on the intellectual capital disclosure has emphasized the difference between the information that is available to the public and information that is conveyed during private meetings to which institutional investors take part (Holland and Johanson, 2003; Garcia-Meca, Parra, Larran and Martinez, 2005). Nevertheless, academic literature has paid little attention to the private channel due to the scarcity of available data or to a misconception that private channels merely repeat information already in the public domain (Tasker, 1998a). In this paper, due to the absence of available data on the private information that is disclosed by the firms, we use the public information that is contained into the

prospectus as a proxy of the information that is given to institutional investors in the primary market.

The underpricing is here considered as an expression of the secondary market investors' behavior and, according to Hanley (1993), is well predicted by the price adjustment.

In particular, we hypothesize that the larger the IC disclosure (i.e. the lower the information asymmetry), the larger the demand coming from institutional investors. Accordingly, the underwriter is expected to revise upward the offer price both as a response to the larger demand (Hanley, 1993) and also as a consequence of the reduced costs that institutional investors incur in order to collect information about the firm (Sherman and Titman, 2002; Sherman, 2005).²

Moreover, as in Singh and Van der Zahn (2007) we hypothesize that an intense IC disclosure also induces a potential aggressive bidding up of the market price by unsophisticated traders who do not want to miss a good opportunity. This hypothesis is also consistent with the literature examining the relationship between share prices and specific intellectual capital indicators (Lev and Sougiannis, 1996; Ballester et al., 2003), which shows that share prices are positively associated with customer satisfaction (Ittner and Larcker, 1998) and estimates of R&D assets (Lev and Sougiannis, 1996). As such, we suggest that an increase in the IC disclosure reduces the cost of capital for the firm (as the offer price is revised upward) but it is also likely to generate a large underpricing due to the secondary market behavior. Moreover, we consider that the disclosure of different IC information could generate different effects on the cost of capital. In particular, some IC variables could influence the bookbuilding process, while others could exert their effects on the secondary market investors. In this sense, depending on the IC variables that a firm discloses and the extent of their disclosure, we can expect different results.

The first innovative and novel contribution of our paper therefore consists in making use of both the underpricing³ and the price adjustment⁴ (as a means to disentangle the effects that a larger disclosure of IC produces in terms of an increase in the issue price from the effects that are produced in terms of market price). Moreover, as a second contribution here we assess IC disclosure in great depth, by considering 87 items grouped into six IC dimensions (as suggested by Cordazzo, 2007) that are individually used as explanatory variables for the two IPO price dimensions (price adjustment and underpricing). This approach is different from previous papers on the topic, which have generally considered an overall indicator of IC disclosure, or just a small number of items. As a third contribution, we employ IC disclosure variables that are considered, not only in terms of a dummy variable that signals the presence of information

² In addition to this, a partial adjustment phenomenon could take place, according to Hanley (1993). This theory suggests that underwriters only partially adjust offer prices to the demand as a reward to institutional investors who reveal information about the demand in the pre-issue period. Nevertheless, as the IC disclosure is expected to adjust offer prices upward, the potential partial adjustment suggested by Hanley (1993) could be less "partial" as a result of the larger disclosure.

³ Percentage difference between the market price on the first day of trading and the offer price.

⁴ Percentage difference between the offer price and the midpoint of the filing price range.

in the IPO prospectus, but also in terms of how complete the information is that regards the specific item we are considering. We expect that a deeper understanding of the IC variables disclosed by the firms in the sample will allow us to shed light on the different effects they have on the offer price and on the market price, as mentioned above.

Our results suggest that greater disclosure (particularly about the processes that firms carry out) enables issuers to 'leave less money on the table' as it effectively reduces the uncertainty surrounding the bookbuilding process, as revealed by a larger price adjustment. Moreover, we find that greater disclosure (particularly regarding research and development plans) can also be responsible for an increase in the market price as investors see a positive sign of the firm's future potential, and thus aggressively bid for the shares (as measured by an increase in the underpricing).

The remainder of the paper is organized as follows: in section 2, we review the literature on the relationship between IC disclosure and underpricing; in section 3 we describe our models and hypotheses; section 4 reports the data and methodology of the analyses performed, while a discussion of the key findings is presented in section 5. Section 6 concludes.

2. The effect of information disclosure on the cost of capital in IPOs

Previous literature has extensively analyzed the effects that a larger information disclosure produces in terms of the cost of capital for a firm in different frameworks. Some authors empirically demonstrate that an increased disclosure helps to reduce the cost of capital a firm is requested to stand (Barron and Qu, 2014; Easley and O'Hara, 2004; Hughes et al., 2007; Lambert et al., 2008; Botosan, 1997 and 2006; Barry and Brown, 1985; Handa and Linn, 1993; Coles et al., 1995; Diamond and Verrecchia, 1991, Lev 2001). Nevertheless, other authors show that a larger set of information about a firm's assets is likely to increase the cost of capital for the company (Richardson and Welker, 2001; Bushee and Noe, 2000; Botosan and Plumlee, 2002; the Financial Executives Institute, 1994; Zingh and Van der Zahn, 2007; Kristandl and Bontis, 2007)⁵.

This inconsistency may be partly due to the differences in the cost of capital measures used (George et al., 1991; Stoll, 1989). In fact, in the absence of a directly observable measure, the cost of capital has to be estimated, but academics are still debating about the best way to do this (Botosan, 2006). Moreover, empirical studies suggest that the above mentioned inconsistency may also be attributed to the different types of disclosure: aggregate disclosure (Botosan, 2007; Hail, 2002); social disclosure (Richardson and Walker, 2001); timely disclosure (Botosan and Plumlee, 2002; Gietzmann and Ireland, 2005); and the modern concept of intellectual capital disclosure (Singh and Van der Zahn, 2007; Kristandl and Bontis, 2007). As such, results are contradictory as some studies find a positive relationship, others maintain a negative link, and some cases find no relationship at all (Botosan and Plumlee, 2002). To obtain a better understanding of this debated relationship, it is first necessary to select the most appropriate measure of disclosure and the proper cost of capital to estimate.

⁵ For a review of the academic research on disclosure and cost of capital see Botosan (2006) or Mangena, Pike and Li (2010).

This present paper is focused on the IPO framework, we therefore make use of intellectual capital information as our measure of disclosure and we use underpricing and price adjustment as indicators of the cost of capital. In fact, IC information is crucial when a company decides to issue securities to the public since IPOs are characterized by abnormally high information asymmetry (Guo et al. 2004; Singh and Van Der Zahn 2007, See and Rashid, 2011). Moreover, underpricing⁶ is widely recognized as the elected measure of cost of capital in the IPO setting (Singh e Van Der Zahn, 2007) and also the, price adjustment, despite less covered by previous literature, it deserves attention as an expression of the pricing dynamics.

For the purposes of the present paper information asymmetries are considered as the most important determinants of the cost of capital in IPOs. Theories of asymmetric information are based on the existence of discrepancies of information between the players involved in an IPO (Welch, 1989; Rock, 1986). Beatty and Ritter (1986) and Shrand and Verrecchia (2002) demonstrate that greater disclosure before the IPO is linked to lower underpricing. The logic behind this view is based on the theories which suggest that enhanced disclosure reduces asymmetric information and enables the offer price to get closer to the true value of the company (Diamond and Verrecchia 1991, Kim and Verrecchia, 1994; McNichols and Trueman, 1994; Welker, 1995; Collier and Yohn, 1997; Healy et al., 1999; Levz and Verrecchia 2000, Zambon, 2003).

With specific reference to the disclosure of IC in IPOs, Dimovski and Brooks (2004 and 2006) were the first to investigate its role in the level of underpricing. They examined 262 Australian IPOs issued between 1994 and 1999 and found that the underpricing could in part be explained by market sentiment, forecast dividend per share yields, underwriter options, and share options. But the study also revealed a negative correlation between the underpricing and the information reported about a set of other intangible variables. As such, they maintain that a larger disclosure of IC variables reduces the ex ante uncertainty of the IPO and allows shares to be traded closer to the true value of the firm.

To the best of our knowledge, the only other study dealing with the link between IC disclosure and underpricing is that by Singh and Van Der Zahn (2007). The aim of their study was to investigate the expected negative relationship between IC variables and the level of underpricing on the Singapore exchange, bearing in mind the concepts of asymmetric information and ex-ante uncertainty previously supported by the studies on the topic. Still, their empirical evidence revealed the opposite, i.e. that a positive correlation exists between underpricing and the disclosure of IC information. This result was more significant for companies that are more dependent on Intellectual Capital, but it remained significant across

⁶ In his 2007 review article, Ljungqvist examines the papers that have tried to identify the possible determinants of underpricing. Ljungqvist identifies the most important theories that relate to information asymmetry (Rock, 1986; Benveniste and Spindt, 1989; Benveniste and Wilhelm, 1990; Spatt and Srivastava, 1991; Ibbotson, 1975), institutional reasons (Hugues and Thakor, 1992; Benveniste, Busaba, and Wilhelm, 1996; Taranto, 2003), control issues (Brennan and Franks 1997), and behavioral approaches (Welch, 1992; Ljungqvist, Nanda and Singh, 2006; Loughran and Ritter, 2002).

all sectors. The authors offer a number of explanations for their findings. The first one is related to litigation risk and based on the idea that companies deliberately absorb the cost of lower issue profits, keeping the price low, in order to reduce the possibility of future litigations and loss of reputation due to the risk of not obtaining the expected benefits linked to IC (Tinic, 1988; Hughes and Thakor, 1992; Hensler, 1995). Nevertheless litigation risk is not significant in a number of countries, including Australia (Lee, Taylor and Walter, 1996), Finland (Keloharju, 1993), Germany (Ljungqvist, 1997), Japan (Beller, Terai and Levine, 1992), and the United Kingdom (Jenkinson, 1990). Furthermore Intellectual Capital is considered a key variable in competitive advantage (Barney, 1991); thus the company would not give this kind of information if it were not sure to obtain a given advantage. The second approach Singh and Van Der Zahn offer is linked to the hypothesis put forward by Demers and Lewellen (2003), which states that the issuer keeps the price low in order to attract media attention and, in turn, benefit from the subsequent advertising about the firm's products. However, a major problem with this explanation relates to the unknown influence that the IC information actually has on the media.

The third potential explanation is based on signaling theory (e.g. Allen and Faulhaber, 1989; Grinblatt and Hwang, 1989; Welch, 1989). As for the marketing view, the issuer is expected to fix a lower offer price, foregoing higher returns in the future through the equity market.

When the issuer has more information about a company's value and about the risk linked to cash flow volatility, underpricing should be a signal of the real "high-quality" of the firm. "Low-quality" firms, meanwhile, have an incentive to mimic the signals made by high-quality firms. However, due to fears of being punished if "cheating" is detected, low-quality firms are unlikely to use all of the same signaling mechanisms as their high-quality equivalents. By setting the offer price sufficiently low to discourage low-quality firms, a high-quality firm could use IC disclosures as a strategic signaling mechanism. Lacking the IC superiority of high-quality firms, a low-quality firm is unlikely to respond with high IC disclosure levels if unsolicited statements about the firm's IC capabilities fail to materialize.

However, a wide range of possible signals exist that could be used instead of underpricing. For example, to signal their high quality, firms could opt for a well-recognized underwriter (Booth and Smith, 1986), auditor (Titman and Trueman, 1986), or venture capitalist (Megginson and Weiss, 1991; Lee and Wahal, 2003). Nevertheless, Singh and Van Der Zahn (2007) also consider an increase in the underpricing as possibly due to an increase in the secondary market price. In fact, unsophisticated traders could aggressively bid up the market price as a reaction to the large IC disclosure and due to the fear of missing a good opportunity if the potential that is enclosed in the IC disclosure materializes.

With reference to the further IPO pricing measure that is involved in this study, Hanley and Hoberg (2012) provide an empirical analysis on the relationship that exists between the IPO prospectus disclosure and the price adjustment. Despite they do not focus on the IC disclosure, they consider different information that are provided into the prospectus such as the risk factors section and the management discussion and analysis section that can be considered as indirect measures of the intellectual capital. The authors find that the risk factors section

increases the magnitude of the offer price and also, the larger the MD&A, the greater the price adjustment. With reference to the underpricing, they find evidence of its increase due to a large disclosure of the risk factors and no evidence regarding the management discussion. In other terms, contrary to their expectations, they find that an increased IC disclosure is likely to reduce the cost of capital for the listing firm in terms of a larger price adjustment but it is also feasible to produce a significant underpricing.

3. Empirical study

In order to shed light on the inconsistencies previously mentioned we test the effects of the IC disclosure on the two different measures of IPO price:

- i) price adjustment, PA (equation [1]), and
- ii) underpricing, UP (equation [2]).

$$PA = (OP - MFP) / MFP \quad [1]$$

$$UP = (MP - OP) / OP \quad [2]$$

where: PA is the price adjustment; OP is the final offer price of the IPO; MFP is the midpoint of the initial filing price range [i.e. (higher price + lower price) / 2]; UP is the underpricing; and MP is the first day closing market price. We then empirically test the following hypotheses :

Hypotheses

The first hypothesis deals with the price adjustment as an expression of the negotiations that occur between the issuer, the underwriter, and the funds that take part in the pre-issue period. In particular we hypothesize that a larger IC disclosure at this point of the pricing process reduces the uncertainty that funds suffer and also the costs they should stand in order to collect information and that this enables the issuer and the underwriter to keep the offer price relatively high. In this sense, what we expect to find is a positive relationship between the price adjustment and the IC disclosure. Specifically, we hypothesize that the price adjustment is influenced by the IC variables that are more difficult to understand, like the one relative to the company processes, human resources, strategies and information technology, because the primary market investors are supposed to be able to appreciate this information more than secondary market investors.

The second hypothesis concerns the effects that the IC disclosure produces on the underpricing, as an expression of the market price reaction. In accordance with the literature about the link between IC disclosure and market price, we hypothesize that a larger disclosure produces greater underpricing. Particularly, we expect that secondary market investors consider IC variables that are more easy to understand such as those concerning to the research and development activity and relationship with customers.

4. Research design

Our sample is made up of the 74 firms that went public on the Italian Stock Exchange (Borsa Italiana) for the first time between 2004 and 2014⁷. For each of the firms included in the sample, we obtained the IPO prospectus from Borsa Italiana and we analyzed its content in order to build an IC disclosure index, according to the method proposed by Cordazzo (2007). We carried out a content analysis based on 87 indicators grouped into the following 6 dimensions:

1. Human resources
2. Customers
3. Information technology
4. Processes
5. R&D
6. Strategies

The method proposed by Cordazzo (2007) is appropriate for the current context because she adds to the model introduced by Bukh et al. (2001) and AIAF (2002) some indicators that are important in the context of the Italian firms belonging to our sample, such as the role of trade union organizations. For each of the 87 indicators, we assigned a score to each of the items ranging from 0 to 3, depending on the depth of the information provided. Once all of the evaluations for each of the 87 items were collected, we built an IC disclosure index for each of the 6 k-dimensions included into the analysis as follows:

$$ICDI_k = \frac{\sum_{i=1}^n SC_i}{n * 3} \quad [3]$$

Where:

$ICDI_k$ is the disclosure index for each of the 6 dimensions we are considering ($ICDI_{RD}$; $ICDI_{IT}$; $ICDI_{PROC}$; $ICDI_{HR}$; $ICDI_{CUSTOM}$; $ICDI_{STRAT}$)⁸;

i is the item we are considering among those belonging to each of the 6 dimensions;

and SC_i is the score we attributed to the specific item (which ranges from 0 to 3).

We also collected data on the control variables from the Universoft database and from Thomson DataStream. Table 1 provides a description of the control variables we derived from the literature on underpricing and price adjustment. In particular, we consider control

⁷ 80 firms originally listed on Borsa Italiana, but due to some missing data the sample is reduced to 74.

⁸ $ICDI_{RD}$ (Research and development); $ICDI_{IT}$ (Information technology); $ICDI_{PROC}$ (processes); $ICDI_{HR}$ (human resources); $ICDI_{CUSTOM}$ (customers); $ICDI_{STRAT}$ (strategies).

variables referring to the characteristics of the IPO (IPO) and variables that describe the economic condition of the firm that is going public(FIRM).

Table 1 – List of control variables

To test the impact of the IC disclosure on the pricing process that takes place during the bookbuilding, we estimated the regression reported in equation [4]:

$$PA = \alpha + \beta_k ICDI_k + \gamma Controls + \varepsilon \quad [4]$$

The dependent variable is the price adjustment (PA), which measures (as shown in Equation [1]) the percentage difference between the final offer price and the midpoint of the price range. Independent variables were divided into two groups. The first group contains the core explanatory variables for this study, which are those describing the degree of IC disclosure in terms of the six dimensions suggested by Cordazzo (2007), as described by equation [3]. The second group (*controls*) includes a set of the control variables that have commonly been used in the IPO literature on the price adjustment (Hanley, 1993 and Hanley and Hoberg, 2012) (as described in table 1).

We then went on to study the effect of the IC disclosure on the market price by running a second regression (Equation [5]), whose dependent variable is the underpricing (UP), as measured by the percentage difference between the closing price at the end of the first trading day and the IPO offer price, net of the market performance on the same day. The set of explanatory variables is partially different from the one used in Equation [4], as it includes the explanatory variables that have been proposed in the literature on IPO underpricing (Leone, Rock and Willenborg, 2007; Guo, 2006; Wyatt, 2008 and 2014) (as we discussed in the note to table 1). The PA is then added in order to take into account the bookbuilding results, according to Hanley (1993):

$$UP = \alpha + \beta_k ICDI_k + \chi PA + \gamma Controls + \varepsilon \quad [5]$$

As multicollinearity can be a serious concern in the OLS regression analysis, we built a correlation matrix before running equation [4] and equation [5]. Significant correlations were observed both within the core explanatory variables (IC disclosure dimensions) and in the control variables; the variables showing a Pearson (Spearman) correlation higher than plus or minus 0.5 were then dropped from the database, as table 2 shows⁹.

Table 2 – correlations between core explanatory variables

⁹ In particular, with reference to the core variables, the Relationship with customers, Strategies and IT variables have been dropped because of their large correlations with the other three core variables.

Below, we present some descriptive statistics about our sample in terms of both firm and IPO characteristics.

Table 3 - Average IC disclosure values for firms belonging to IC intensive vs. IC non intensive sectors

Table 3 shows, as expected, that firms belonging to IC intensive sectors disclose more IC about their intangible assets than observed for our sample of firms operating in IC non intensive sectors. Moreover, as table 4 shows, the disclosure of IC increases with firm age. This might suggest that firms that have been working in the market for more years are more inclined to inform their stakeholders about their intangible assets in order to compensate for the lower growth perspectives they can offer.

Table 4 - Average IC disclosure values according to firm age

5. Results

After controlling for a set of variables that might explain the price adjustment generated during the pre-issue period, we find that the only dimension of IC disclosure that impacts the way the offer price is fixed is the description of the processes (QDSI_PROC) that the firm carries out during its activity, as shown in table 5. The positive sign of the relationship reveals that, as expected in hypothesis 1, when institutional investors have a wide range of IC information available to them for free, they are more willing to accept a higher offer price and this in turn, allows the quoting firms to reduce the cost of capital. Moreover, as the investors taking part to the primary market are usually investment managers, they generally have plenty of resources which enable them to particularly appreciate IC variables that describe in deep the way the firms works, such as the information concerning company processes. This results is consistent with Garcia-meca et al. (2011) who maintain that information about the processes carried out by firms is the most reported to financial analysts in private meetings prior to IPOs ,together with information about strategies and customers.

With reference to the control variables, of the IPO characteristics, the number of underwriters (UW) and the demand coming from institutional investors (INST_DEM) both significantly influence the price adjustment. In particular, a larger number of underwriters determines a higher offer price, in line with Dimovski and Brooks (2004 and 2006). In fact, underwriters receive their compensation proportional to the IPO proceeds, but their slice is also proportional to the total number of underwriters involved. As such, in order to obtain a proper commission, they have to increase the offer price as much as they can. The relationship of the price adjustment with institutional demand (INST_DEM) is also positive. In this case, the explanation is even more deductive as it is founded on the basic market operating principle: the larger the demand coming from funds, the higher the offer price is set.

Finally, the debt ratio (DEBT) and the return on equity (ROE) are the two economic characteristics of the firm that can influence the pricing process in the bookbuilding. In

particular, and as expected, firms with less debt and firms that produce a larger return for their equity investors are sold at a higher price thanks to their good economic situation. Moreover, although the variable that deals with the age of the firm (AGE) is border line (as its significance is the 10.7% level), its negative sign could suggest that although new companies bear a certain degree of uncertainty and information asymmetry, mature firms that have been operating in the market for many years may be less appealing in terms of future growth and, as a consequence, their offer price has to be kept low in order to induce investors to negotiate. This last evidence is also consistent with Hanley and Hoberg (2008).

Table 5 – The effects of IC disclosure on price adjustment

Moving on to the determinants of underpricing, the first variable that deserves attention as an explanatory variable is the price adjustment (PA). The positive and significant sign of the PA on UP indicates that any effects that is revealed on the underpricing is linked to what has already occurred during the bookbuilding. In other words, the price adjustment is a good predictor of the IPO initial return (Hanley, 1993) As far as the core variables are concerned, we find a positive and significant relationship between the disclosure of research and development (QDSI_RD) and the underpricing, as expected in hypothesis 2. We suggest that enhanced disclosure about research and development activities could encourage secondary market investors to bid up aggressively due to their positive expectations about the firm's creation of future value (Bontis, 2001; Garcia-Meca et al., 2005). Furthermore investors might be afraid about losing a good opportunity to buy profitable stocks. Thus, we can suggest that the fear of the regret of losing the potential value linked to the intellectual capital, should it occur, represents an additional incentive to bid the market price up. This result confirms the previous literature (Amir and Lev, 1996; Ballester et al., 2003; Mangena, Pike and Li, 2010) and indicates that unsophisticated investors find IC variables that are easier to understand (such as Research & Development expenses) more relevant for share evaluation.

As far as the control variables are concerned, of the IPO characteristics, the percentage of insiders (INS) has a negative and significant influence on underpricing. This means that the larger the number of pre-IPO owners selling in the IPO, the smaller the underpricing. In other terms, we could argue that secondary market investors do not appreciate a large amount of shares being sold by pre-IPO shareholders and that this prevents them from aggressively bidding the price up.

With reference to the economic characteristics of the listing firm, the total amount of assets that a firm owns prior to the IPO (ASSET) is positively linked to the underpricing. Once again, this evidence suggests that positive information about the firm is likely to drive the market price up as a result of secondary market investor confidence in the firm's future prospects.

Table 6 – The effects of IC disclosure on underpricing

6. Concluding remarks

Our study contributes to the recent debate regarding the effects that IC disclosure produces in terms of IPO cost of capital. Previous studies fail in providing a consistent interpretation of the above mentioned relationship, probably due to the specific focus on a single IPO pricing measure (underpricing), which thus fails to consider the IPO pricing process as a whole. In particular, previous studies have not been able to disentangle the effects that IC disclosure produces in terms of the offer price (which is the very expression of the cost of capital for the firm) from the effects that are revealed in the secondary market by means of the market price. In fact, the evidence of a larger underpricing induced by a considerable IC disclosure cannot univocally be associated to an increase cost of capital, unless the origin of the same underpricing is deeply investigated. As such, the first innovative contribution of this paper comes from the fact that we consider the IPO pricing process by examining the effects that IC disclosure produces on both the price adjustment, during the pre-issue period, and on the underpricing, as revealed on the first day of trading. Moreover, we enrich our analysis by considering a detailed measure of IC disclosure: 87 items grouped into six IC dimensions (Cordazzo, 2007), evaluated both in terms of their inclusion in the IPO prospectus and in terms of how complete the information provided is. The analysis is based on data collected from 74 Italian firms that went public between 2004 and 2014. Our findings suggest that greater IC disclosure influences the bookbuilding pricing process in terms of an increase in the issue price as a consequence of reduced information asymmetry. In particular, information about the processes employed by the firm to perform its activities are appreciated by institutional investors, who take part in primary market negotiations. At the same time, information about the firm's intangible assets are glad to secondary market investors, who bid the market price up when in-depth information is disclosed about the firm's research and development activities.

Both of these new findings have practical implications for the various players involved. As far as the issuer is concerned, awareness about institutional investors' enthusiasm for information about processes should help issuers put together a good IPO prospectus that prevents money from being left on the table unnecessarily, thus reducing the cost of capital. Moreover, as the market price is also used as a marketing tool for firms, the issuer should also direct attention toward research and development information in order to please secondary market investors. Nevertheless, this knowledge could also lead issuers to adopt opportunistic behaviors towards both primary and secondary market investors, inducing them to buy shares under conditions that are largely favorable for the issuer. Such an evidence claims for an urgent need of a standard regulation regarding the way IC information is disclosed.

Future improvements of this research might deal with the long-run performance of the firms listed on the Borsa Italiana. Such an analysis would enable us to investigate whether the IC information disclosed actually rewards the interests of both primary and secondary market investors in terms of a good long-run performance of the shares they bought. Moreover, further research should be performed to investigate whether the results presented here can be IC classification dependent.

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Table 1 – List of control variables

	Variable	Label	Description
IPO characteristics (IPO)	IPO year	YEAR	Year in which the IPO took place
	Size of offer	SIZE	Number of shares that were offered to investors
	Bookbuilding	BB	Dummy variable (value is 1 if the IPO is offered through a bookbuilding)
	% range	RANGE	Bookbuilding price range divided by the range midpoint
	% insiders	INS	Amount offered by pre-IPO shareholders divided by IPO proceeds
	Number of UW	UW	Number of underwriters taking part in the IPO
	Exchange	EXCH	Dummy variable (value is 1 if the IPO is in MTA)
	IPO proceeds	PROC	Money raised in the IPO
	Institutional demand	INST_DEM	Number of shares asked by institutional investors
Firm's main features (FIRM)	Debt ratio	DEBT	Debt ratio of the company as an average of the last 3 years
	Return on equity	ROE	Return on equity of the company as an average of the last 3 years
	Free cash flow	FCF	Free cash flow of the company as an average of the last 3 years
	Revenues	REV	Revenues of the company as an average of the last 3 years
	Assets	ASSET	Total assets of the company as an average of the last 3 years
	Sector dummy	SECT	Dummy to identify IC intensive sectors. IC intensive sectors are: banks, financial sector, health care, media, software components, support service, technological equipment and pharmaceuticals, according to Mangena, Pike and Li (2010).
	Years of activity	AGE	Number of years the company has been operating in the market

Note: Some of the above listed variables are used as possible determinants of both the price adjustment and the underpricing (year, age, sector, insiders, number of underwriters, and IC disclosure variables). Others are specific to one of the two pricing measures and are thus used as determinants for that measure only. In particular, as far as the economic characteristics of the firms are concerned, we make use of debt-ratio, ROE, and FCF for the price adjustment, which involves more sophisticated investors; while we use assets and revenues for the underpricing, thus taking into account that secondary market investors might be less skilled in examining the economics of a firm. With reference to the IPO characteristics, exchange and IPO proceeds are considered as more appropriate for the underpricing as they are of interest to secondary market investors, while the institutional demand, the bookbuilding procedure, the size of the offer, and the percentage range are likely to be more influential for primary market investors.

Table 2 – Correlations between core explanatory variables

	QDSI_HR	QDSI_RD	QDSI_PROC	QDSI_CUST	QDSI_STRAT	QDSI_IT
QDSI_HR	1					
QDSI_RD	0.2684	1				
QDSI_PROC	0.3676	0.3776	1			
QDSI_CUST	0.4891	0.4834	0.5969	1		
QDSI_STRAT	0.5029	0.6221	0.5619	0.6441	1	
QDSI_IT	0.3398	0.462	0.5712	0.5784	0.5128	1

Note: In order to decide which variables were to be cut from the analysis, we built 3 conceptual categories: QDSI_CUST and QDSI_HR inform about the relationships the firm is able to create and maintain with its employees and with its customers; as QDSI_CUST was most problematic in terms of the number of variables it correlated with, it was removed from the analysis. Both QDSI_STRAT and QDSI_RD provide information about the firm's future plans, but QDSI_STRAT presented a higher number of correlations, which would need to be managed, and was thus cut from the analysis. For the same reasons, we also cut QDSI_IT that, together with QDSI_PROC, provides information about the firm's activity.

Table 3 - Average IC disclosure values for firms belonging to IC intensive vs. IC non intensive sectors

	Number	QDSI
Avg IC intensive	25	0.6512
Avg IC non intensive	49	0.3032
Avg all	74	0.4208

Table 4 - Average IC disclosure values according to firm age

	Number	QDSI
< 10 y	21	0.2595
< 25 y	23	0.3054
> 25 y	30	0.6221
Avg all	74	0.4208

Table 5 – The effects of IC disclosure on price adjustment

	Coeff.	SE	P>t	
YEAR	-0.0021164	0.007040	0.765	
SIZE	-2.65E-11	2.29E-11	0.253	
BB	-0.0053947	0.018293	0.769	
RANGE	-0.0523037	0.124505	0.676	
INS	-0.0227801	0.024245	0.352	
UW	0.0261187	0.011865	0.032	**
INST_DEM	0.0102481	0.002302	0.000	***
DEBT	-0.0009161	0.000406	0.028	**

ROE	0.0007779	0.000324	0.020	**
FCF	-0.0004403	0.001582	0.782	
SECT	0.0159915	0.021683	0.464	
AGE	-0.0005186	0.000316	0.107	
QDSI_RD	-0.0074620	0.058642	0.899	
QDSI_PROC	0.1524832	0.059423	0.013	**
QDSI_HR	-0.2073285	0.128260	0.112	
cons	4.2136560	14.12032	0.767	

Number of obs = 67

R-squared = 0.5836

Root MSE = 0.06662

Note: the first group of variables refer to the characteristics of the IPO; the second group deals with the characteristics of the listing firms, and the third group is made up of the core variables regarding the IC disclosure.

Table 6 – The effects of IC disclosure on underpricing

	Coeff	SE	P>t	
PA	0.704506	0.224639	0.003	***
YEAR	0.015596	0.017355	0.373	
INS	-0.068250	0.037948	0.077	*
UW	0.020946	0.024993	0.406	
EXCH	0.010778	0.029685	0.718	
PROC	-4.27E-11	1.46E-10	0.771	
ASSET	9.41E-09	4.99E-09	0.064	**
REV	-2.02E-08	1.57E-08	0.205	
SECT	-0.007440	0.033735	0.826	
AGE	-0.000120	0.000584	0.834	
QDSI_RU	-0.167000	0.176573	0.348	
QDSI_RS	0.159652	0.084642	0.064	*
QDSI_PROC	-0.082840	0.114754	0.473	
cons	-31.18780	34.81743	0.374	

Number of obs = 70

R-squared = 0.3499

Root MSE = 0.11469

Note: the variables in the first group refer to the characteristics of the IPO; the second group deals with the characteristics of the listing firms; and the third group is made up of the core variables regarding IC disclosure.