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Intellectual Capital Disclosure in IPOs: Is It Worth It?



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Abstract

We study the association between Intellectual Capital (IC) disclosure and IPO results for a sample of firms that have listed on the Italian stock market. By making use of an in-depth content analysis of the non-financial information disclosed in the listing prospectus, we disentangle the effects of such a disclosure on the underpricing from those effects that are produced on the price adjustment. Our empirical findings suggest an overall positive effect of the IC disclosure on IPO results as the increase in the underpricing, documented by previous literature as an opportunity cost, is preceded by an upward adjustment of the offer price, which means that more money was raised. Moreover, we provide evidence that primary and secondary market investors appreciate non-financial information in different ways. Our results encourage firms that are going public to definitely engage in disclosure of IC as a means to improve IPO results.

Keywords: IPO; Underpricing; Intellectual Capital Disclosure; Price Adjustment.

JEL Codes: G12; G32; M14.

1 Introduction

For the last two decades, firms have been facing increasing worldwide competition, globalisation and technological changes. As a reaction to the new challenges, many firms have largely invested in Intellectual Capital (IC) in terms of innovation, knowledge, research and development, employee training and customer satisfaction (Meritum, 2002; Lev and Zambon, 2003). Consequently, financial statements have reduced their informative content and have been frequently sided by IC reporting (Beretta and Bozzolan, 2004; Liang and Yao, 2005). Even though a firm's evaluation is still largely dominated by quantitative financial data, additional non-financial information is expected to enable a more precise evaluation of a company's business, thus reducing the information asymmetry between the firm and its stakeholders (Buhk, 2003; Holland and Johanson, 2003; Holland, 2006; See and Rashid, 2011). The issue becomes particularly relevant 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 to the market, leading to greater uncertainty about their prospects (See and Rashid,

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2011). The disclosure of information about the intangible assets in the IPO prospectus thus provides an important opportunity to reduce this gap in information asymmetry. Notwithstanding, listing companies are often reluctant to disclose information about their non-financial assets being afraid to lose their competitive advantage or to give rise to an unnecessary cost (Mangena, Pike and Li, 2010). In other terms, IC disclosure is often perceived as a cost more than as a benefit to the listing firm.

This paper examines to what extent the IC information disclosed into the listing prospectus is associated with IPO results, in terms of the amount of money that the listing firm is able to raise. Prior research suggests that, generally speaking, increased disclosure has a positive effect on the amount of money that listing firms gather as the return required by investors' decreases with an improvement in the voluntary disclosure of value relevant information (Diamond, 1985; Diamond and Verrecchia, 1991; Handa and Linn, 1993; Aboody and Lev, 2000; Lev, 2001; Lundholm and Van Winkle, 2006). Nevertheless, such a general result has not always been confirmed by studies dealing with IPOs which have mainly found a positive association between the IC disclosure and the level of underpricing. In these studies, underpricing is viewed as an opportunity cost in terms of money that is left on the table by selling shares at a discount to the expected market price (Loughran *et al.*, 1994; Ritter and Welch, 2002; Singh and Van Der Zahn, 2007). In particular, Singh and Van der Zahn (2007) empirically examined a sample of 334 Singapore IPOs launched between 1994 and 2004. Their empirical evidence shows that a larger IC disclosure is associated with a larger underpricing and they provide possible explanations for the positive link they exhibit in terms of litigation risk, signaling theory, marketing-advertising strategy and also extensive bidding up carried out by unsophisticated traders. Hanley and Hoberg (2008), despite not specifically focusing on IC disclosure, investigate the effect that strategic information provided into the prospectus (such as risk factors and management's discussion) produces in terms of the underpricing of the IPO and also in terms of price adjustment (percentage difference between the offer price and the midpoint of the offer range). They find that a large disclosure on risk factors increases the magnitude of the offer price and of the underpricing, thus confirming the hypothesis that the greater the risk factors section, the greater the offer price and also the underpricing.

Contrasting results are obtained by Dimovski and Brooks (2006): by studying a sample of 262 Australian IPOs issued between 1994 and 1999, they find that greater disclosure about non-financial assets reduces the uncertainty of the IPO and subsequently the level of underpricing. The authors maintain that such a result is consistent with the body of literature starting from Benveniste and Spindt (1989) stating that firms that have less uncertainty surrounding the true value of the shares (i.e. firms which disclose more information in the IPO) are less likely to have revisions in their offer prices and they are also expected to trade closer to their true value on their first day of trading¹.

That being so, previous literature on IPOs is in short supply of evidence regarding the effects of IC disclosure on IPO results and such evidence has also tended to be inconclusive. Accordingly, we try to answer the following unsolved research question:

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).

should listing firms engage in disclosing formation about their non-financial assets? And if so, which information should they disclose?

Based on a content analysis that we carried out on a sample of IPO prospectuses, we build 6 Intellectual Capital disclosure indexes according to the methodology employed by Cordazzo (2007). Moreover, we propose a new interpretation of the relationship between IC disclosure and IPO underpricing, one that might also explain the inconsistencies in the results from previous studies. In particular, we move from the very basic concept of underpricing, which is the percentage difference between the price at which the IPO shares are sold to investors and the price at which the shares subsequently trade in the market (Ljungqvist, 2007). Previous studies mainly associate a large IC disclosure to a larger underpricing which is then interpreted as an opportunity cost that firms stand by selling shares at a discount to the market price. Nevertheless, as the underpricing is a linear combination of the market price and the offer price, such a conclusion might be premature unless a deep investigation of the effects on the IC disclosure on the offer price is carried out. It may happen that, despite the evidence of an extensive underpricing, a larger IC disclosure also fosters an increase in the offer price during the primary market negotiations; if this is the case, a larger IC disclosure does not only induce an opportunity cost (as measured by the underpricing) but it also brings about an increase in the offer price, thus allowing the listing firm to raise more new capital (as measured by the price adjustment). Accordingly, we hypothesise that IC disclosure impacts on both the primary market price adjustment, which informs about the revisions of the offer price to the anticipated range of offer prices during the pre-issue period (Hanley, 1993), and also on the secondary market underpricing. With regard to the IC disclosure that is considered in this paper, previous literature has emphasised the difference between the information that is available to the public and the 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 firms, we use the public content of the listing prospectus as a proxy of the information that is given to institutional investors in the primary market.

The first innovative and novel contribution of our paper therefore consists in considering the effects that a large IC disclosure produces on the IPO results as a whole, by disentangling the primary market and secondary market effects. Moreover, as a second contribution we assess IC disclosure in great depth, by taking into account 87 items grouped into six IC dimensions (as suggested by Cordazzo, 2007) that are individually used as explanatory variables for the estimated models. 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. Moreover, a disaggregated measure of IC disclosure is used to test for the possibility that primary and secondary market investors appreciate information about the intangible assets of a firm differently. If so, some IC variables could influence the bookbuilding process and the resulting offer price, while others could exert their effects on the secondary market, thus influencing the market

price. Such evidence is expected to be of great interest for firms that voluntarily disclose internally selected IC information lacking a gold standard for the IC disclosure.

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 in the IPO prospectus, but also in terms of how complete the information is that regards the specific item we are considering. This way, consistent with prior literature (Botosan, 1997; Brammer and Pavelin, 2006), we focus on the content more than on the amount of the non-financial disclosure that is provided in the prospectus. In fact, whilst some non-financial information is to be included into the listing prospectus by law, its intensity is set voluntarily by firms.

Our results suggest that larger IC disclosure enables issuers to 'leave less money on the table' as it effectively reduces the uncertainty surrounding the bookbuilding process which takes place in the primary market, as revealed by a larger price adjustment. Moreover, we find that by disclosing more information about their non-financial assets firms can set off 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. That being so we empirically demonstrate that firms should extensively communicate their intangible assets into the prospectus as a mean to improve the IPO results.

The remainder of the paper is organised as follows: in Section 2, we review the literature on the relationship between IC disclosure and IPO results; in Section 3 we describe the empirical study while a discussion of the key findings is presented in section 4. Section 5 concludes.

2 Prior Literature and Hypotheses Development

2.1 Non-Financial Information and IPO Results

Information about non-financial assets is considered of great importance when a company issues securities to the public since IPOs are characterised by abnormally high information asymmetry (Guo *et al.*, 2004; Singh and Van Der Zahn, 2007; See and Rashid, 2011). Previous literature regarding the role of IC disclosure on the IPO results have focused on underpricing² and have often found a positive association with IC disclosure, thus ascribing an opportunity cost to the disclosure of non-financial assets. For example, Singh and Van Der Zahn (2007) investigate the relationship between IC disclosure and the level of underpricing on a sample of firms listing on the Singapore exchange. Their empirical evidence suggests a positive correlation between underpricing and the disclosure of IC information. This result is more significant for companies that are more dependent on Intellectual Capital, but it remains significant across 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,

² See Ljungqvist (2007) for a review of the possible determinants of underpricing.

1995). Nevertheless they point out that litigation risk is not significant in a number of countries (including Australia, Finland, Germany, Japan and the United Kingdom). 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 (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. By setting the offer price sufficiently low to discourage low-quality firms, a high-quality firm could use IC disclosure as a strategic signaling mechanism. However, a wide range of possible signals exist that could be used instead of underpricing (firms could opt for a well-recognised underwriter, auditor or venture capitalist). Finally, Singh and Van Der Zahn (2007) consider an increase in the level of underpricing as possibly due to an increase in the secondary market price; 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 materialises. Similar results are provided by Hanley and Hoberg (2008): despite not specifically focusing on IC disclosure, they find that the strategic information provided in the prospectus (such as the risk factors and management's discussion) increases the magnitude of the offer price and of the underpricing.

Nevertheless, as we mentioned before, results are not always consistent across the literature: Dimovski and Brooks (2004 and 2006), who examined 262 Australian IPOs issued between 1994 and 1999, find a negative correlation between underpricing and the information reported about a set of intangible variables. As such, they maintain that a larger disclosure of IC reduces the ex-ante uncertainty of the IPO and allows shares to be traded closer to the true value of the firm.

Despite the fact that underpricing has been the elected measure for IPO results in the previous literature, a few authors have tried to analyse IPO results also in terms of price adjustment. In particular, Hanley and Hoberg (2010) examined a sample of 2112 US IPOs issued between 1996 and 2005 and maintain that offers with greater informative content in the pre-market period have more accurate and narrow initial filing price ranges and, as a consequence, lower price adjustments and lower underpricing. That being so they maintain that the informative content of the listing prospectus decreases the issuing firm's reliance on bookbuilding to price the issue.

2.2 Association between the IC Disclosure and IPO Results: Hypotheses Development

In spite of prior research being largely diversified both in terms of the IC information that is considered and also in terms of the evidence that is provided, it comprehensively suggests that non-financial information disclosed by listing firms might influence IPO

results at different stages of the IPO process: it is expected to play a role in the pre-market by influencing the level of ex-ante uncertainty (as in Hanley and Hoberg, 2010), it is likely to drive the demand coming from institutional investors during the bookbuilding (Bushee and Noe, 2000; Sherman and Titman, 2002; Sherman, 2005) and it also tunes the secondary market demand coming from unsophisticated traders (as in Singh and Van Der Zahn, 2007). That being so, in order to study the effects that IC disclosure produces on the IPO results as a whole, all of the IPO stages should be analysed.

What we hypothesise in this paper is that non-financial information that flows in the pre-market is likely to reduce the uncertainty regarding the correct IPO price thus allowing the underwriter to fix a smaller price range. In this case, the price adjustment and the subsequent underpricing are expected to be restrained as suggested by Hanley and Hoberg (2010). Nevertheless, we are also persuaded that the demand coming from institutional investors during bookbuilding is largely influenced by the disclosure of IC about the listing firm, which definitively signals the good quality of the IPO, thus potentially pushing the offer price upward and increasing the price adjustment according to demand pressure (Bushee and Noe, 2000). Moreover, a larger IC disclosure reduces the uncertainty that funds suffer from and also the costs they should endure in order to collect information, according to Sherman and Titman (2002) and Sherman (2005): the issuer and the underwriter will then keep the offer price relatively high, thus generating a positive price adjustment.

Finally, the same disclosure is expected to be considerable to unsophisticated secondary market traders who aggressively bid for shares when the good quality of the IPO is further certified by a large disclosure of IC information (as maintained by Singh and Van Der Zahn, 2007).

That being so, our hypotheses are:

H1: IC information disclosed into the IPO prospectus is positively associated with the price adjustment

The first hypothesis that we test deals with the price adjustment as an expression of the consultations that occur in the primary market between the issuer, the underwriter, and the funds that take part in the pre-issue period. In particular we maintain that a larger IC disclosure at this point of the pricing process reduces the uncertainty that funds suffer from and also the costs they should incur in order to collect information, according to Sherman and Titman (2002) and Sherman (2005); this is expected to enable the issuer and the underwriter to keep the offer price relatively high thus generating a positive relationship between the price adjustment and the IC disclosure.

More specifically, we hypothesise that the price adjustment is influenced by the IC variables that are more technical and difficult to understand, like ones related to company processes, human resources and information technology, because primary market investors are supposed to be able to appreciate this information more than secondary market investors.

H2: IC information disclosed into the IPO prospectus is positively associated with underpricing

Despite the upward revision of the offer price, IC disclosure is expected to produce a sizeable underpricing due to an increase in the market price. Consistent with Singh and Van der Zahn (2007), we hypothesise that an intense IC disclosure potential induces an

aggressive bidding up of the market price by unsophisticated secondary market traders who do not want to miss a good opportunity. This hypothesis is also consistent with the literature that examines 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).

In other terms, what we expect is that a generous IC disclosure enables the issuer to keep the offer price high (thus increasing the amount of money that is raised) but it also drives the market price up, partially producing an opportunity cost in terms of money that is left on the table.

More specifically, we expect that secondary market investors are able to appreciate IC variables that are more communicative and easier to understand, such as those concerning research and development activity, relationship with customers and firms' future strategies.

3 Research Design

3.1 Measurements of IPO Results and IC Disclosure

With this paper we investigate to what degree listing firms should engage in the disclosure of their non-financial assets in the listing prospectus. To do this, we disentangle the effects of IC disclosure on the primary and secondary market dynamics by employing the following two pricing measures:

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

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

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

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 that the listing firm generates by selling shares at a discount on the expected market price, net of the market performance on the same day³; *MP* is the first day closing market price.

With reference to the IC disclosure, for each of the listing prospectuses included in the analysis, we carried out a content analysis based on Cordazzo (2007). We then considered 87 indicators grouped into the following 6 dimensions:

- 1) Human resources (29 items),
- 2) Customers (16 items),
- 3) Information technology (5 items),
- 4) Processes (8 items),

³ We make use of the FTSE MIB index to calculate the market performance.

- 5) Research and Development (10 items),
- 6) Strategies (19 items),

The method proposed by Cordazzo (2007) is appropriate for the present context because some indicators are added to the model introduced by Bukh et al. (2001b) and AIAF (2002) that are important in the Italian framework that we also analyse, such as the role of trade union organizations. We focus on Italy for two main reasons: on the one hand, the Italian economy is largely built on IC assets and represents an interesting market to study⁴; on the other hand, as the content analysis that we carry out on the listing prospectuses can be largely affected by linguistic misunderstandings, by examining Italian contents we are able to guarantee the highest level of reliability in our results with reference to this issue. We assigned a score ranging from 0 to 3 to each of the 87 items, depending on the degree of detail that an item is discussed. A score of 3 was given for items that were described in depth, a score of 2 when the item was described specifically, and a score of 1 when it was discussed in general (Orens, Aerts and Cormier, 2010). While such an evaluation is more subjective than one based upon the volume or frequency of information, it ensures that irrelevant or redundant generalities are not considered as strategic disclosure (Botosan, 1997; Brammer and Pavelin, 2006). Moreover, an in-depth analysis of the prospectuses is of great importance as, while some non-financial information is to be included into the listing prospectus by law, its intensity is voluntarily set by firms. Both the data collection and the coding process were carried out by the authors. Coding instructions and a standardised coding worksheet were jointly created by the authors with the main disagreements occurring and being solved at the beginning of the coding process. Internal consistency estimates show that the variance on the single disclosure indexes is quite systematic (Cronbach's alpha = 0.83)⁵.

Once all of the evaluations for each of the 87 items were collected, we built a normalised IC disclosure index for each of the 6 k-dimensions included into the analysis as follows:

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

Where:

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

⁴ Cerisola *et al.* (2013) report data on European intellectual property right adoption and product innovation showing that Italian firms are on average ahead of other EU countries. Such evidence could be explained by several Italian government initiatives that have been in place since 1999 to promote Italian organisations investment in IC, particularly with regard to R&D projects (Bozzolan, Favotto and Ricceri, 2003).

⁵ Previous papers have identified 0.7 as an acceptable threshold for the scale reliability coefficient (Nunnally, 1978) but have also accepted values of 0.64 (Botosan, 1997).

⁶ $ICDI_{RD}$ (Research and development); $ICDI_{IT}$ (Information technology); $ICDI_{PROC}$ (processes); $ICDI_{HR}$ (human resources); $ICDI_{CUST}$ (customers); $ICDI_{STRAT}$ (strategies).

3.2 Sample Selection

Our sample is made up of 74 firms that went public on the Italian Stock Exchange (Borsa Italiana) for the first time between 2004 and 2014. For each of the firms included in the sample, we obtained the IPO prospectus from Borsa Italiana. Additional information about the economic characteristics of the firms included in the sample and also about the details of each IPO were collected from Thomson DataStream, from Borsa Italiana and from a proprietary database obtained from Universoft (Bergamo University) that has been already employed by previous authors (See Vismara *et al.*, 2012 for a detailed description of the database). Table 1 provides a description of the variables. Due to some missing values, the sample is reduced to 70 firms for the price adjustment model and 66 for the underpricing equations.

3.3 Empirical Models

To test the impact of the IC disclosure on the pricing process that takes place during bookbuilding, we estimated the regressions⁷ reported in equation (4):

$$(4) \quad PA = \alpha + \beta IPO + \gamma FIRM + \chi IC DI_k + \varepsilon$$

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 are divided into three groups. The first and second groups (*IPO* and *FIRM*) include a set of control variables that have commonly been used in the IPO literature and respectively inform about the characteristics of the IPO and the characteristics of the listing firm (as described in Table 1). Among the IPO characteristics that we include into the analysis, *DUMMY_YEAR* is a dummy variable taking value 1 in years with a number of IPOs higher than the average number for the whole sample period and thus signals hot IPO periods as suggested by Lowry and Murphy (2007). *SIZE* is calculated as the number of shares offered in the IPO divided by the shares outstanding and is expected to be negatively related to the price adjustment due to the lower probability of rationing (Hanley, 1993). The reputation of the underwriter (*UW_REP*) is expected to influence the way the offer price is set: underwriters are rewarded as a percentage on the total amount of money raised, so the better their reputation is, the stronger their market power in pricing IPOs far away from their intrinsic value is likely to be (Chemmanur and Krishnan, 2012). The underwriter's reputation has also been found to increase first day returns (Carter *et al.*, 1999; Liu and Ritter, 2011). Nevertheless, given the exclusion of national underwriters in any comprehensive international list of underwriter's ranking (Boreiko and Lombardo, 2011) we use the number of IPOs managed by each underwriter divided by the total number of IPOs issued over the sample period (2004-2014) as a proxy of the underwriter's reputation, as suggested

⁷ Equation (4) gives rise to 6 different models, one for each of the 6 IC-dimensions that are considered into this analysis.

Table 1: List of control variables for the PA and UP models

	Variable	Label	Description	Source	Model
IPO	IPO year	DUMMY_YEAR	Dummy variable (value 1 for years with a number of IPOs higher than the average number for the whole sample period)	Universoft	UP
	Size of offer	SIZE	Number of shares offered in the IPO divided by the number of shares outstanding	Universoft	PA & UP
	Underwriter's reputation	UW_REP	Number of IPOs led by the underwriter divided by total number of IPOs in the whole sample period	Universoft	PA & UP
	Institutional demand	INST_DEM	Percentage of shares asked by institutional investors divided by the total number of shares asked by retail, institutional and employees investors.	Universoft	PA & UP
	Interval	INT	Number of days from prospectus registration to listing date	Borsa Italiana	PA & UP
	Venture Capital backed	VC	Dummy variable (value 1 if at least one VC is involved in the IPO)	Universoft	PA& UP
	% range	RANGE	Bookbuilding price range divided by the range midpoint	Universoft	PA
FIRM	Return on equity	ROE	Return on equity of the company as an average of the last 3 years	Thomson Datastream	PA
	Volatility of earnings	CVEARN	Standard deviation of earnings in the three years before the IPO	Universoft	UP
	Debt ratio	DEBT	Debt ratio of the company as an average of the last 3 years	Thomson Datastream	PA& UP
	Years of activity	AGE	Number of years the company has been operating in the market	Thomson Datastream	PA& UP
	IC intensive sectors	IC_INT	Dummy to identify IC intensive sectors.	Universoft	PA& UP
	Technology Based Sector	TECH	Dummy variable (value 1 if the firms belongs to a technology based sector)	Universoft	PA& UP
	Market Share	MRKTSHR	Firm's total assets divided by the sum of total assets for firms belonging to the same industrial sector	Universoft	PA& UP

Note: The tables above reports the names, label, description and source of the control variables describing the *IPO* and the *FIRM* characteristics. The last right column provides information about where the variables was included as a control variable: *PA* is the Price Adjustment model (4) and *UP* is the Underpricing model (5).

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).

by Signori, Meoli and Vismara (2013)⁸. The interest of institutional investors is also considered in terms of both the demand coming from funds, as a percentage of the total demand also coming from retail investors and employees (*INST_DEM*) and in terms of the interval from prospectus registration to listing date (*INT*) (Wyatt, 2014); what we expect is obviously a positive link with the *PA* for the first and a negative link for the second variable. Finally, some variables informing about the uncertainty surrounding the *IPO* are considered; in particular, the presence of venture capitalists in the listing firm (*VC*) is likely to produce a positive effect on the price adjustment as investors are

⁸ According to the same authors, in order to control for potential reputation effects deriving from the inclusion of international investment banks into the syndicate we have added a dummy variable taking value 1 if the list of underwriters includes a foreign bank. Nevertheless, the variable is not significant in any of the models, thus we erased it for the sake of brevity.

more willing to accept higher offer prices if less uncertainty affects the IPO (Guo *et al.*, 2005). At the same time, the magnitude of the filing price range (RANGE) is expected to be negatively related to the PA; larger filing ranges are usually associated to greater uncertainty in the IPO results (Hanley, 1993). Moving on to the variables related to the firm's characteristics (FIRM), we control for firms belonging to IC intensive sectors according to the classification proposed by Mangena, Pike and Li (2010) (IC_INT) and we also include the age of the firm (AGE) which has been previously documented to signal the uncertainty of the IPO (Hanley and Hoberg, 2008): AGE is here expected to be negatively related to the price adjustment as 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.

We then add a series of control variables which inform about the quality of the listing firm in order to avoid any possible endogeneity problems: as the amount of IC information is disclosed at the issuing firm's discretion, better quality firms may be more likely to disclose IC information, as Barton and Waymire (2004) suggest. The Return On Equity (ROE) is one of the quality variables we include into the analysis; a positive sign is expected relating to the ROE because managers are more likely to disclose information voluntarily when their firms exhibit good performance (Dye, 2001; Miller, 2002). Furthermore, managers' incentives to supply higher information increases with the level of shareholder-debtholder agency conflicts. Agency conflicts potentially increase with the amount of leverage (DEBT) in the firm's capital structure, so we predict that managers of more indebted firms will issue higher quality reports (as in Barton and Waymire, 2004).

Moreover, according to Barton and Waymire (2004) we also add a tech dummy (TECH) and the market share (MKTSHR). TECH is a dummy variable with value 1 for firms belonging to technology based sectors and MRKSHR is a firm's total assets divided by the sum of total assets for firms belonging to the same industrial sector.

The third group of explanatory variables (ICDI) describes the degree of IC disclosure in terms of the 6 dimensions suggested by Cordazzo (2007), as mentioned in equation (3).

As we have already discussed in Section 2, we expect a positive link between the price adjustment and the most communicative and understandable Intellectual Capital dimensions (ICDI_RD, ICDI_CUST and ICDI_STRAT).

The effect of the IC disclosure on the market price was then studied by running a second series of regressions⁹ (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 day¹⁰. The groups of explanatory variables are almost the same of equation [4], apart from the PA which is added in order to take into account bookbuilding results, according to Hanley (1993). Only some slight differences in the variables are observable due to the specific dependent variable we are considering:

⁹ Again, as already mentioned for the PA models, we run 6 different equations, one for each of the 6 IC-dimensions that are considered in this analysis; we make use of the FTSE MIB index to calculate the market performance.

¹⁰ The market performance is calculated by making use of the FTSE/MIB index.

$$(5) \quad UP = \alpha + \beta_k PA + \gamma IPO + \delta FIRM + \chi ICDI_k + \varepsilon$$

In particular, we add the earnings volatility (CVEARN) as a quality variable, as suggested by Barton and Waymire (2004) and we remove the ROE (which would be a further quality variable similar to CVEARN) and the RANGE (which is already considered into the PA). CVEARN is calculated as the standard deviation of earnings in the three years before the IPO.

As far as the core variables are concerned, we expect underpricing to be positively linked to the most technical Intellectual Capital dimensions (ICDI_HR, ICDI_PROC and ICDI_IT) as already discussed in the second hypothesis in section 2.

As multicollinearity represents a substantial problem in multivariate regressions we systematically computed and checked the VIF coefficients in the regression models, obtaining results that warranted no further control action.

4 Results

4.1 Descriptive Statistics for IC Disclosure

Below, we present some descriptive statistics about our sample. In particular, Table 2 and Table 3 show how IPOs are distributed across years and industries.

In particular, Table 2 shows that the period from 2005 to 2007 that represents a hot IPO period, with the number of IPOs higher than the average number for the whole sample period (2004-2014). Table 3 shows that the largest number of IPOs in the period 2004-2014 took place in the household goods and home construction sector, financial services, and personal goods. Table 4 splits the sample into firms disclosing above vs below the median amount of IC information and presents univariate tests comparing the level of IC information with the demand of institutional investors (INST_DEM), the bookbuilding price range (RANGE), the number of years the company has been operating in the market (AGE) and the return on equity of the company (ROE).

In particular, firms disclosing a level of IC information above the median show a higher level of demand coming from institutional investors, providing further support to our hypotheses. Moreover, 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 compared to younger firms. Finally, better quality firms (as revealed by ROE) tend to disclose more IC information and this suggests the need to include quality variables into the models in order to avoid possible self-selection biases.

The descriptive statistics regarding RANGE shows that the level of IC disclosure has little effect of the width of the offer price range: such evidence shows sufficient ground for our hypotheses and for the different results we find compared to other previous studies within the literature (Hanley and Hoberg, 2010).

Table 2: IPOs by year

Listing Date	N° of firms
2004	7
2005	12
2006	20
2007	23
2008	5
2009	1
2010	2
2011	1
2012	1
2013	2
2014	0
Total number of IPOs	74
Average number of IPOs	6.7

Note: This table presents descriptive statistics of IPOs in the sample by year.

Table 3: IPOs by Industry Sector

Industry	N° of firms
Automobiles & Parts	4
Construction & Materials	2
Electricity	3
Electronic & Electrical Equipment	2
Financial Services	8
Food & Drug Retailers_Producers	4
Gas, Water & Multiutilities	2
General Industrials	2
General Retailers	2
Health Care Equipment & Services	2
Household Goods & Home Construction	7
Industrial Engineering	4
Industrial Transportation	3
Leisure Goods	3
Media	2
Oil & Gas Producers_Oil Equipment & Services	3
Personal Goods	7
Pharmaceuticals & Biotechnology	3
Software & Computer Services	3
Support Services	4
Technology Hardware & Equipment	4
Total	74

Note: This table presents descriptive statistics IPOs in the sample by Industry.

Table 4: Firms disclosing information at above vs below median amounts

Level of IC information disclosed	INST_DEM	RANGE	AGE	ROE
Above median	0.822	0.221	31.054	21.311
Below median	0.768	0.223	23.621	19.685

Note: This table presents univariate tests by splitting the sample into firms that disclose information above the median level amount vs firms that disclose below median amount.

4.2 IC Disclosure and Price Adjustment

After controlling for a set of variables that might explain the price adjustment generated during the pre-issue period, we find that the dimensions of IC disclosure that impacts the way the offer price is fixed is the description of the processes (ICDI_PROC) that

Table 5: The effects of IC disclosure on the Price Adjustment (PA)

	ICDI_STRAT	0.060					
		0.073					
	ICDI_RD		0.029				
			0.055				
ICDI	ICDI_PROC			0.115 **			
				0.055			
	ICDI_IT				0.073 *		
					0.039		
	ICDI_HR					0.173	
						0.108	
	ICDI_CUST						0.020
							0.056
	DUMMY_YEAR	0.056 ***	0.056**	0.060 ***	0.056 ***	0.060 ***	0.054 **
		0.020	0.021	0.021	0.020	0.020	0.021
	SIZE	0.000	0.000	0.000	0.000	0.000	0.000
		0.000	0.000	0.000	0.000	0.000	0.000
	UW_REP	0.210 *	0.219*	0.221 **	0.202 *	0.225 **	0.217 **
		0.108	0.107	0.101	0.105	0.106	0.107
IPO	INST_DEM	0.045	0.050	0.021	0.044	0.044	0.047
		0.041	0.043	0.045	0.044	0.043	0.042
	INT	-0.001	-0.001	-0.001	-0.001	-0.001	-0.001
		0.001	0.001	0.001	0.001	0.001	0.001
	VC	0.035	0.033	0.041 *	0.037	0.030	0.032
		0.025	0.025	0.022	0.023	0.023	0.024
	RANGE	-0.090	-0.094	-0.121	-0.146	-0.123	-0.103
		0.169	0.162	0.176	0.169	0.163	0.166
	ROE	0.001 ***	0.001***	0.001 ***	0.001 ***	0.001 ***	0.001 **
		0.000	0.000	0.000	0.000	0.000	0.000
	DEBT	-0.001 *	-0.001**	-0.001 **	-0.001 **	-0.001 *	-0.001 *
		0.000	0.000	0.000	0.000	0.000	0.000
	AGE	0.000	0.000	0.000	0.000	0.000	0.000
		0.000	0.000	0.000	0.000	0.000	0.000
FIRM	IC_INT	0.015	0.022	0.020	0.005	0.017	0.021
		0.029	0.026	0.025	0.026	0.026	0.027
	TECH	0.008	0.004	0.007	0.005	0.006	0.005
		0.024	0.023	0.023	0.022	0.024	0.023
	MKTSHR	-0.091 **	-0.093**	-0.088	-0.080 **	-0.091 **	-0.092 **
		0.040	0.040	0.039	0.039	0.038	0.041
	const	-0.018	-0.0111	-0.011	-0.012	-0.037	-0.005
		0.779	0.064	0.053	0.057	0.058	0.061
	n obs	70	70	70	70	70	70
	r squared	0.422	0.420	0.4592	0.4499	0.4388	0.418

Notes: This table contains the multivariate regression results of the price adjustment models described in equation (4) (the standard error is the number below the coefficient). ***, ** and * indicates statistical significance at the 1%, 5% and 10% levels respectively. VIF scores are all lower than 2.0.

the firm carries out during its activity and the information and technology (ICDI_IT), as shown in Table 5. The positive sign of the relationships 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 listing firms to raise more capital. Moreover, as the investors taking part to the primary market are usually investment managers, they particularly appreciate IC variables that describe in deep the way the firms' work, such as information concerning company processes and information technology. These results are consistent with Garcia-Meca *et al.* (2011) who maintain that information about the processes carried

out by firms is the piece of information most reported to financial analysts in private meetings prior to IPOs.

With reference to the control variables of the IPO characteristics, the DUMMY_YEAR is significant and positive across all of the models, suggesting that PA tends to be higher during hot IPO periods. The reputation of the underwriter (UW_REP) also significantly and positively influences the price adjustment, as expected. As far as FIRM characteristics are concerned, the return on equity (ROE), the debt-ratio (DEBT) and quality variables influence the pricing process during bookbuilding, in line with what we hypothesised. Moreover, market share (MKTSHR) is significant and negatively linked to the price adjustment thus informing that shareholders would prefer managers to restrain the disclosure of information that would be used adversely by competitors, considering that a firm's market share is a measure of its exposure to such threats (Barton and Waymire, 2004).

4.3 IC Disclosure and Underpricing (UP)

Moving on to the determinants of underpricing, the first variable that deserves attention as an explanatory variable is price adjustment (PA). The positive and significant sign of PA on UP indicates that any effects that are revealed on the level of underpricing is linked to what has already occurred during the bookbuilding phase.

Moreover, PA is able to explain around the 70% of the underpricing that takes place in the secondary market (see the PA coefficients in Table 6).

In other words, as largely maintained by previous literature, 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 (ICDI_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 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 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 and Development expenses) more relevant for share evaluation.

As far as the control variables are concerned, only the number of days from prospectus registration to listing date (INT) is significantly related to the level of underpricing and, as expected, with a negative sign¹¹.

¹¹ Such evidence suggests that underpricing models might be better specified by adding further variables, although their R squared figures suggest that we are able to explain around the 40% of the dependent variable.

Table 6: The effects of IC disclosure on underpricing

	ICDI_STRAT	0.143					
		0.116					
	ICDI_RD		0.135 *				
			0.075				
	ICDI_PROC			-0.137			
ICDI				0.111			
	ICDI_IT				-0.033		
					0.066		
	ICDI_HR					0.040	
						0.182	
	ICDI_CUST						0.039
							0.083
	PA	0.681 ***	0.675 ***	0.814 ***	0.744 ***	0.704 ***	0.702 ***
		0.240	0.246	0.267	0.266	0.250	0.243
	DUMMY_YEAR	0.044	0.051	0.016	0.031	0.038	0.036
		0.031	0.031	0.039	0.035	0.035	0.031
	SIZE	0.000	0.000	0.000	0.000	0.000	0.000
		0.030	0.031	0.030	0.031	0.031	0.031
IPO	UW_REP	0.102	0.127	0.095	0.116	0.118	0.124
		0.158	0.151	0.150	0.158	0.160	0.160
	INST_DEM	0.093	0.121	0.143	0.113	0.107	0.105
		0.088	0.086	0.089	0.089	0.090	0.090
	INT	-0.008 ***	-0.007 ***	-0.006 **	-0.007 **	-0.007 **	-0.007 ***
		0.003	0.003	0.003	0.003	0.003	0.003
	VC	0.021	0.021	0.002	0.009	0.012	0.016
		0.035	0.034	0.032	0.033	0.033	0.034
	CVEARN	0.000	0.000	0.000	0.000	0.000	0.000
		0.000	0.000	0.000	0.000	0.000	0.000
	DEBT	0.000	0.000	0.000	0.000	0.000	0.000
		0.001	0.001	0.001	0.001	0.001	0.001
	AGE	0.000	0.000	0.000	0.000	0.000	0.000
FIRM		0.001	0.001	0.001	0.001	0.001	0.001
	IC_INT	-0.028	-0.007	-0.016	-0.009	-0.014	-0.015
		0.023	0.025	0.026	0.024	0.024	0.024
	TECH	-0.014	-0.032	-0.029	-0.023	-0.024	-0.025
		0.035	0.028	0.034	0.033	0.033	0.032
	MKTSHR	-0.013	-0.025	-0.015	-0.019	-0.017	-0.013
		0.037	0.037	0.045	0.042	0.039	0.041
	const	0.094	0.070	0.141	0.135	0.119	0.117
		0.084	0.082	0.084	0.084	0.094	0.083
	n obs	66	66	66	66	66	66
	r squared	0.427	0.448	0.360	0.4135	0.411	0.413

Notes: This table contains the multivariate regression results of the underpricing models described in equation (5) (the standard error is the number below the coefficient). ***, ** and * indicates statistical significance at the 1%, 5% and 10% levels respectively. VIF scores are all lower than 2.0.

5 Conclusion

Our study contributes to the recent debate regarding the effects that IC disclosure produces in terms of IPO results. Previous studies fail in to provide a consistent interpretation of the above mentioned effects, thus leaving the following question unanswered: should

listing firms engage in the disclosure of their non-financial assets? In particular, part of the literature which has focused on the link between IC disclosure and underpricing provides evidence of a positive relationship between them; authors interpret such evidence as an opportunity cost that listing firms stand by leaving money on the table, and thus this implicitly suggests that it is not worth for firms to disclose information about their non-financial assets. Nevertheless, other authors have found opposite results. With this paper we try to shed light on this point by disentangling the effects that IC disclosure produces on the primary market offer price from the effects that are revealed in the secondary market underpricing. That being so, as a first innovative contribution of this paper, we consider the effects of IC disclosure on the IPO pricing process as a whole. Moreover, we enrich our analysis by considering a detailed measure of IC disclosure: 87 items grouped into 6 IC dimensions (Cordazzo, 2007) evaluated in terms of their content more than in terms of volume or frequency. 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 carried out by the firm to perform its activities and about the information and technology that is employed, is appreciated by institutional investors, who take part in primary market negotiations. At the same time, information about the firm's intangible assets is gladly received by secondary market investors, who bid the market price up when in-depth information is disclosed about the firm's research and development activities. Such evidence shows that IC disclosure does generate an opportunity cost as previously documented by Singh and Van Der Zahn (2007) and Hanley and Hoberg (2008). Nevertheless, the money that is left on the table is compensated by a larger offer price that is set in the primary market when more IC information is disclosed. Therefore, we empirically demonstrate for the first time that the increase in underpricing that is revealed by a larger IC disclosure is preceded by an increase in the offer price, thus allowing the listing firm to raise more new capital. Such evidence strongly supports the opportunity for firms going public to disclose information about their non-financial assets in the listing prospectus as a means to improve IPO results.

These new findings have practical implications for the different players involved in an IPO. As far as the issuer is concerned, awareness about institutional investors' enthusiasm for information about processes and technologies that are employed should help issuers to put together a good IPO prospectus that prevents money from being left on the table unnecessarily. 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 behaviours towards both primary and secondary market investors, inducing them to buy shares under conditions that are largely favourable for the issuer. Future improvements on 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 good long-run performance of the shares they bought or, on the contrary, whether the IC information actually disclosed is used by firms as a marketing tool in the short-run.

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