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The effects of intangible investments on future OCF

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Abstract

Purpose – The main purpose of this study is to investigate the relationship between intangible investments (R&D, advertising, training, software acquisitions and quality) and the ability of firms to generate future OCF (hereafter cash-flow from operations).

Design/methodology/approach – The authors developed dynamic panel models to estimate the relationship between intangible investments and three subsequent periods cash flows. These models are estimated using generalized method of moments (GMM), on a panel of 300 observations related to 50 Tunisian manufacturing firms and six years of data (2001-2006).

Findings – The findings show a positive and significant effect of intangible investments on future operating cash flows. First, this result confirms the main hypothesis of resource based view (RBV). Second, it is found that investments in R&D, quality, and advertising have significant effects on future cash flows from operations. While the effect of R&D activities and quality persists until the third lagged period, the effect of advertising expenditures is rapid and temporary.

Practical implications – The investigation provides an empirical validation on the role of intangible investment in generating and sustaining competitive advantage. The significant effect of R&D and quality expenses indicates the role of these activities in adding value to the firm product, and hence in the creation of competitive advantage which allows the firm to manage the components of its operating cycle, especially cash received from customers, resulting in superior future cash flows from operations.

Originality/value – First, the use of cash-flow basis, as an alternative approach to accrual basis, for intangibles valuation avoids the shortcomings of accrual-based performance measures in forecasting future operating cash flows because of earnings management practices. Second, the majority of the research dealing with the valuation of intangibles has been conducted in the context of developed countries, therefore in terms of the relevance of intangible investments significantly less is known about emerging economies. The choice of Tunisia, in this regard, is a particularly important contribution to the research on emerging economies.

Keywords Intangible investments, Cash-flows from operations, Intangibles accounting treatment, Emergent economy context, Operating cycle components, GMM estimation, Cash flow, Intangible assets, Tunisia

Paper type Research paper

1. Introduction

In the context of a new economy characterized by globalisation and worldwide competition, there is a widely-held belief that intangible investments constitute the most valuable asset of a firm that determines its future viability. Therefore, firms must invest in intangible assets, as well as in tangibles, in order to be continuously innovative and to be able to sustain a competitive advantage leading to superior future performance.

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Unfortunately, current accounting standards do not recognise intangible investments as identifiable asset with a common definition and valuation. Indeed, apart from research and development expenditures and goodwill (GW), these expenditures are generally left unmeasured and confounded with operating expenses, because accounting rule makers claim that such expenditures are too difficult to identify as distinct and they are not recognized as assets. Contrary to this approach Deng and Lev (2006) argues that such an extent of intangible investment recognition is not significantly higher than the extent of the problem of other corporate investments. In fact, Lev and Zarowin (1999) finds that accountants' refusal to recognize these expenditures as assets seriously impairs the credibility and the relevance of financial reporting. Their work implies that intangible outlays generate one of the most valuable economic assets in the economy. However, Kanodia and Venugopalan (2004) shows that intangibles should be measured only when their relative importance in constituting the firm's capital stock is high and when they can be measured with sufficient precision. In all other cases, attempts to separate intangible investments from operating expenses are counterproductive.

Thus, one of the most significant issues in contemporary international accounting standards setters, and in the academic literature is why current accounting rules do not recognize intangible investments as assets, when, if fact, explosive growth in such investments during the last decade reveals their crucial role in value creation for organisations. Some of the recent research has indeed been motivated by this query. Lev and Sougiannis (1996), Aboody and Lev (1998), Lev and Zarowin (1998), Cazavan-Jeny (2004), Deng and Lev (2006), Eberhart *et al.* (2008) seek to evaluate the value-relevance of intangibles by investigating the possible effects of intangible investments on future performance.

However, most prior research evaluates intangible investments on the basis of accrual-based performance measures like operating income, ROA, ROI. Therefore, the effect of intangibles on real future cash-flows has been largely ignored in prior studies dealing with intangibles valuation. The objective of this study is to conduct an empirical investigation of the relationship between intangible investments and reported future cash flows from operations. We use cash flows from operations as an operating performance measure, as an alternative to traditional accrual-based measures such as ROA, ROS, and operating income as, for instance, in Huang and Jiu (2005), Lev and Zarowin (1998). Our choice of cash flows as a measure of operating performance is motivated by two reasons. First, cash flow information avoids the shortcomings of accrual-based performance measures in assessing the ability of a firm to generate positive cash flows from its operating cycle to meet its financial commitments as they fall due. Indeed the information content of earning based performance measures is substantially altered by earning management practices. Consequently, they do not provide relevant information on future cash-flows levels. Therefore, we argue that the use of accrual based approach for intangible valuation cannot constitute a relevant basis to estimate the effect of intangible investments on future operating cash-flows. Furthermore, the relevance of cash-flows based approach to an array of decision-making purposes has been widely demonstrated to be an acceptable approach by a plethora of prior research such as Al-Attar *et al.* (2008), Call *et al.* (2009), Orpurt and Zang (2009).

Second, as illustrated by Bharadwaj *et al.* (1999), since traditional performance measures have been based on the historical cost convention they are insensitive to the

time lags necessary for realizing the potential of capital investments. This can be problematic in the case of intangible investments valuation that may necessitate several years to become visible in bottom line performance.

UUsing a panel data related to 50 Tunisian firms that operate in the most R&D-intensive manufacturing sectors and a six-year period (2001-2006), we estimate the direct relationship between lagged intangible investments and firm cash flows. Empirical evidence provided by this study confirms our main hypothesis that intangible investments affect positively subsequent cash-flows from operations. Furthermore, our findings indicate that lagged estimation results differ depending on the specific kind of intangible investment undertaken by the firm. While R&D, quality and advertising expenditures are the most relevant intangible outlays that affect positively future operating cash flows of firms in our sample, we find that training and software expenditures do not have any significant effect of future cash-flows levels. Furthermore, the effect of R&D activities and quality persists until the third lagged period while the effect of advertising expenditures is rapid and temporary. This may be indicative of the role of the first two activities in creating competitive advantage which allows the firm to control receivables resulting in superior future cash flows from operations.

UIt is important to note that we place our interest on the Tunisian context because, as illustrated by Chen *et al.* (2005), the majority of research dealing with the valuation of intangibles has been conducted in the context of developed countries, like the USA, France, Germany, etc. Further, in terms of the relevance of intangible investments, significantly less is known about emerging economies, even though firms that operate in these countries are allowed, by law, to deduct expenses related to more resources invested in intangible areas, especially to cope with highly competitive foreign environments. The choice of Tunisia is, in this regard, a particularly an important contribution of this paper to research on emerging economies, and thus fills an important gap.

The remainder of this paper proceeds as follows: Section 2 provides a brief review of related research; In Section 3, we formulate our hypotheses and we present our methodology for estimating the effect of intangible investments on cash flow predictions. Section 4 reports our empirical results. Section 5 contains our concluding remarks.

2. Literature review and research hypothesis

USince firm market value should reflect future cash flow streams, many researchers, mainly in the context of developed countries (USA, France), have tried to examine the relationship between intangible investments and future cash flows by regressing market value on intangible items. Chauvin and Hirshey (1993) examine the cross-sectional influences of both advertising and R&D expenditures on the market value of the firm over a three-year period. They demonstrate that the traditionally recognized valuation effect of current cash flow, growth, risk, and market share increase when both advertising and R&D expenditures are considered as potentially important sources of intangible capital. This research also highlights the influence of firm size over the effectiveness of R&D and advertising expenditures. However, effects of advertising and R&D on the market value are broadly operative throughout both manufacturing and non-manufacturing, as well as in both high tech and low tech sectors. The researchers conclude that these two types of expenditures can be regarded as alternative forms of investment in intangible capital that contribute to shareholder value.

Lev and Sougiannis (1996) addressed the issue of value relevance of R&D capitalization by estimating the relationship between R&D capital and subsequent stock returns. Using data on US firms (1975-1991), they showed through a contemporaneous analysis that R&D expenditures are significantly associated with both stock price and returns. Second, by performing an inter-temporal analysis, they found a significant association between stock returns and lagged R&D capital. Taken together, these findings suggest that R&D capitalization yields statistically reliable and economically relevant information, contradicting the major premise of SFAS 2: "A direct relationship between research and development costs and specific future revenue generally has not been demonstrated".

Aboody and Lev (1998) examined the major exception in the USA to the immediate expensing of R&D such as the capitalization of software development costs as required by SFAS 86. For a sample of 163 firms belonging to the computer programming and pre-packaged software sectors, during the period of 1987-1995, they evaluate the relevance of public information on software capitalization to investors. Their contemporaneous (stock prices and returns) as well as inter-temporal (subsequent earnings) analyses indicate that the capitalization-related variables are significantly associated with capital market variables and future earnings. This result implicates that capitalized software development costs are indeed assets, a fact that confirms the FASB position in SFAS.86 and opposes the validity of the arguments advanced in the March 1996 petition of the Software Publisher Association to abolish SFAS.86.

Bharadwaj *et al.* (1999) studied the link between IT investment and long-run firm performance. They estimate least-square regression between Tobin's Q in the one hand and IT expenditures on the other while controlling for other firm and industry specific explanatory variables. The firm-level controls included in this study are market share, advertising and R&D expenditures, extent of related diversification, and firm size. Results from a sample of 631 US firms with five years data indicates that, in all five years, the coefficients for the IT ratio are positive and significant, although their magnitude drops in more recent years. According to researchers, this result is due to rapid technological changes. Investments in IT tend to depreciate rather quickly. Furthermore, they found that advertising expenditures were positively associated with Tobin's Q in four of five years, while R&D expenditures produced mixed results. The negative effect of R&D on Tobin's Q seems to be surprising. However according to researchers, this result might reflect the true American market valuation of R&D capital since it is consistent with the findings of prior empirical efforts that attempted to estimate the relationship between R&D expenditures and market value.

Rogers (2002) analysed the relationship between innovation proxied by R&D, patent and trade mark activities, and profitability in a panel of Australian firms (1995-1998). The main contribution of his study is the specific focus on the nature of competitive conditions faced by the firms in the empirical analysis of the value of R&D. Since the market value of the firm should reflect expected future profits, it is used as dependant variable in order to check the lagged effect of innovative activities. The results from regression analysis of market value showed that the magnitude and significance of coefficients varies across the sub-sample formed on the basis of the analysis of competitive conditions. Indeed this study demonstrates that the highest returns of R&D are in industries that have profit persistence but common profitability.

Moreover only under those competitive conditions, the analysis showed that patenting activity and trade market assets may raise profits for firms.

Cazavan-Jeny (2004) investigated the possible explanations for differences between a company's market value and book value. The main assumption behind this study is that this difference can be attributed to the invisible value of intangible assets omitted from financial statements. The sample of this study is composed by 63 French industrial firms observed over six years (1994-1999). All firms are listed on the Paris Stock Exchange. The intangible related variables included in this research model are activated intangible assets and GW (presented on the balance sheet) as well as expenditures in R&D, advertising, software, royalties and others. These variables were gathered by means of a questionnaire. To meet her research objective, the researcher regressed the Market-to-Book ratio on these intangible variables, after controlling for the possible effects of other factors that might influence firm market value such as, size, growth, risk, and firm profitability (ROE ratio). The result of cross-section regression estimation showed a statistical link between the capitalised GW and Market-to-Book ratio, but does not indicated any association neither with the expensed intangibles' intensity nor with the capitalised intangibles' intensity.

Chen *et al.* (2005) examined the relationship between intellectual capital and the firm's current and future financial performance by using data over 11 years from listed companies in Taiwan. Innovative and relational capital as well as advertising expenditures are included in performance estimation models as ones of the constituents of intellectual capital. Regression results using lagged independent variables showed that the coefficient of R&D remained positively associated with future profitability and revenue growth in all three lagged period models. Advertising expenditures are negatively associated with future performance measures.

Cazavan-Jeny and Jeanjean's (2006) study deals with the value relevance of R&D capitalization in the French context, since French standard setters allow two accounting treatments of R&D costs (expensing or capitalization). In contrast with previous literature, they found that capitalized R&D costs are negatively related to stock prices and that change in capitalized R&D costs is negatively related to stock returns. The researchers explain this surprising negative effect of R&D costs by the fact that investors believe firms manage earnings by capitalizing R&D.

Deng and Lev (2006) examined whether in-process R&D (IPRD) is an asset worthy of capitalization as requested by the FASB, or an expense as reclaimed by corporate executives. Since the defining characteristic of an asset is that it generates future cash-flows, the researchers regressed subsequent cash-flows from operations on current cash-flows and in-process R&D variable. With the exception of next year's cash-flows, the IPRD coefficient is significant at the 1 per cent level in all the future cash-flow regressions. Therefore, Deng and Lev conclude that IPRD is, on average, associated with the firm's cash flows over at least three subsequent years. This evidence supports the general recognition of acquired IPRD as an asset.

Eberhart *et al.* (2008) presumed that the benefit of R&D to shareholders that previous studies report may just reveal the effect of a wealth transfer from bondholders to shareholders, not any benefit to the entire firm value. Therefore, their objective is to investigate the effect of R&D increase on bondholder wealth. They find that a higher R&D intensity is beneficial to bondholders on average. Their results also show a positive abnormal stock, bond, and firm returns around R&D increases suggesting that

the market views R&D increases as beneficial to all firm's investors, on average; in fact, the positive long-term abnormal returns suggest that R&D increases are even better investments than the market expects at the time of the increase.

In summary, while normative presumptions claim that intangible investments are beneficial for generating future cash flows, little evidence exists addressing this claim since nearly all previous studies examining the benefit of intangible investments focus on accrual based models. We should note that there is an extensive literature arguing that accrual based information does not provide a reliable basis to estimate future operating cash flows by confirming superior predictive power of cash flows from operations as compared to accruals in predicting future cash flows, Finger (1994), Francis and Shipper (1999), Al-Attar *et al.* (2008), Orpurt and Zang (2009), Call *et al.* (2009). Consequently we presume that accrual based models do not constitute a relevant approach to evaluate the ability of intangible investments to generate future operating cash-flows. So the main contribution of our study is to examine the relationship between intangible investments and future cash flow from operations. Therefore, we expect that intangible investments may affect positively the future firm viability as it is reflected by the cash flows from operations. Thus, our theoretical assumption is formalized by the following hypothesis:

H_A. Intangible investments affect positively subsequent cash flows from operations.

Because intangible investments are a heterogeneous concept that assembles expenditures in different areas which may affect future performance in different ways, we conduct a deeper investigation by disaggregating intangible investments into their components. In this study, we are interested in five kinds of intangible investments such as R&D expenditures, training expenditures, advertising expenditures, software acquisition expenditures and quality control expenditures. Therefore five additional hypotheses are formalized to test the effect of each kind of intangible investment. We presume a positive effect of each intangible outlay on future cash flows, as expressed by the following hypotheses:

H_{A1}. Investment in R&D has a positive effect on future operating cash flow.

H_{A2}. Investment in advertising has a positive effect on future operating cash flow.

H_{A3}. Investment in training has a positive effect on future operating cash flow.

H_{A4}. Investment in software acquisition has a positive effect on future operating cash flow.

H_{A5}. Investment in quality has a positive effect on future operating cash flow.

These hypotheses will be validated using the following methodology.

3. Research methodology

Our methodology is composed of three parts. First, we develop our research models that relate intangible investments to future cash flow from operations. Second, we define our research site and finally we describe our sample and data collection procedure.

3.1 Models development

We examine the relevance of intangible investments from their fundamental benefits such as the future cash flows that they may induce. While several previous studies used market value as a better proxy of future cash-flows, Bharadwaj *et al.* (1999), Cazavan-Jeny and Jeanjean (2006), Eberhart *et al.* (2008), we use reported cash-flows from operations. This choice is motivated by the fact that Lev and Sougiannis (1996) affirm that the use of fundamental relationships to evaluate intangible investments avoid the notorious circularity in the use of market prices to estimate the assets values. This circularity arises from the general presumption that market prices are determined by reported financial variables and therefore such prices cannot be logically used to determine the value of financial variables. Furthermore, Lev and Zarowin (1998) demonstrate that the market valuation of intangible investments is meaningfully related to the fundamental value of intangible expenditures such as future earning that they can produce.

Furthermore, in order to evaluate the effect of intangible investment on cash flows, we must isolate this potential effect by controlling for other factors that might influence cash flows. According to Chauvin and Hirshey (1993) and Finger (1994), current cash flow is taken as the best available indicator of a firm's ability to generate cash flows in future periods. Chauvin and Hirshey (1993) argue that once the valuation effect attributable to current cash flows is controlled, any incremental valuation effects of current intangible expenditures represent evidence of intangible capital influences. Recently, Deng and Lev (2006) have used the same modelling approach in order to evaluate the relevance of in-process R&D costs.

Hence, to meet our research objective, and in line with Cazavan-Jeny (2004), we construct model (1) by adding to the first lagged value of operating cash flow an intangible investment variable that represents the sum of five kinds of intangible expenditures, such as: R&D, training, advertising, software acquisition, and quality control expenditures. The use of this variable is further motivated by Huang and Jiuapos;s (2005) work, which demonstrates the interaction and the synergy between investments in different intangible areas. Indeed, they empirically confirm that business should not invest in the individual component of intellectual capital, but should strategically integrate all perspectives of intellectual capital to create their maximum business value.

Therefore, our first model is formalised by the following equation:

$$\mathrm{OCF}_{\mathrm{it}} = \alpha_0 + \alpha_1 \mathrm{OCF}_{\mathrm{i,t-1}} + \sum \beta_{\mathrm{k}} \prod_{\mathrm{i,t-k}} \tag{1}$$

where:

t = represents current period.

I = represents firm "*i* " in the sample.

OCF = operating cash flow.

II = intangible investment that is equal to the sum of R&D, training, advertising, software acquisition, and quality control expenditures.

k. = lag period.

The main advantage of this modelling procedure is to allow us to isolate the possible effect of intangible investment on cash flows. Evaluating the relation between future cash flows and lagged intangible expenditures within this model resolves the bias of omitted variables since future levels of cash flows are regressed on theirs historical values. Furthermore, Greene (2005) affirms that this kind of econometric modelling which is a dynamic panel model, allows us to evaluate the relevance of any additional information after having in mind all historical of the dependant variable.

However, equation (1) suffers from two econometric problems. First, as it is by definition a dynamic panel model, there is a correlation between the lagged endogenous variable and the residual, Greene (2005). This problem makes estimation with the OLS method invalid. To resolve this problem, we use the "Arellano-Bover/Blundell-Bond linear dynamic panel data estimation", which is an estimation procedure with System GMM. This method includes the lagged differences of the dependent variable as instruments in the level equation. This estimator is designed for datasets with many panels and few periods.

The second econometric problem in the estimation of equation (1) is due to the high autocorrelation between intangible investment's lagged values. Therefore, we introduce "II" lagged values individually in the model in order to avoid autocorrelation problem.

To gain more comprehensive results on the effect of intangible investment on cash flows, we reran model (1) by splitting up each intangible investment term in this model into its five components, such as, R&D, advertising, training, software acquisition, and quality control expenditures. Then we hold the following additional model:

$$\begin{aligned} OCF_{it} = {} & \alpha_0 + \alpha_1 OCF_{i,t-1} + \beta_1 RD_{i,t-k} + \beta_2 Advertising_{i,t-k} \\ & + \beta_3 Training_{i,t-k} + \beta_4\ Software_{i,t-k} + \beta_5 Quality_{i,t-k} \end{aligned} \tag{2}$$

This in-depth analysis will allow us first to discover which kind of intangible investment should be the most efficient to the entity in terms of generating cash flows from operation. Second, it indicates the effect of timing lag between the intangible investment and resulting operating cash-flow.

3.2 Research site choice

Studies investigating R&D and other intangible expenditures returns are generally interesting to high tech industries that are more oriented toward technological activities. However, in the context of emergent economies, R&D efforts are more likely to be applied rather than basic as it is typical of a developed context. Therefore, there are far from enough high tech firms to conduct this kind of research in emergent economies like Tunisia.

In order to investigate R&D and advertising return, Chauvin and Hirshey (1993) study's sample is constituted on the basis of spending patterns in order to select only industries that are representative of R&D-intensive sectors. In this study, we adopt the same approach in determining the research site. Hence, we base our choice on our previous work (Boujelben and Fedhila, 2010) that analyses the national survey data on R&D of Tunisian firms' spending, available at the Tunisian Ministry of Higher Education and Scientific Research. In this previous study, we compared the amounts of R&D expenditures engaged by firms between industries. We proceeded to this

comparison in order to obtain homogeneous groups in terms of R&D expenditures. Then, we consider that firms belonging to the same group are involved in similar industry technological level, and have the same possibilities for advances, that is, of the same technological opportunity conditions. By performing one-way ANOVA analysis, we discover that sectors which are considered as having a high level of technological opportunity (more R&D-intensive) are chemical, agro-alimentary and, mechanical and metallic ones. Those sectors constitute the research site for this study.

3.3 Sample and data collection

Tunisian accounting standards require the expensing of intangible expenditures when they occur. Indeed, apart from several R&D costs that can be capitalized after having passed certain pre-specified feasibility conditions, all intangible outlays are commingled with operating expenses in the income statement. Therefore, to collect data related to our research variables, such as Tunisian firms' intangible outlays and the level of their cash flows over a six-year period (2001-2006), we sent a questionnaire to a number of 130 initial firms. All those firms belonged to the initial chosen sectors (see the previous section), such as chemical, agro-alimentary and, mechanical and metallic. The questionnaire was delivered to the financial manager of the enterprises. A total of 76 responses were received with 26 invalid ones because of missing value problems. Thus, our final sample is composed of 300 observations related to 50 Tunisian industrial firms observed over six years (2001-2006). The sample distribution by industry is given in Table I.

3.4 Descriptive statistics analysis: the main sample firms' characteristics

There are two interesting statements that can be drawn from our sample profile analysis on the basis of descriptive statistics in Table II.

First, Table II shows that the firms of our sample spend on average 3 per cent of theirs yearly sales revenue in intangible areas (Intangible investments mean = 0.0331). This percentage represents nearly half of the percentage of intangible investment spent by French companies (Intangible investments = 0.061), as found by Cazavan-Jeny (2004). This statement reveals the difference between firms' behaviour in developed countries and those in emergent economies in terms of resources allowed to the most prized assets in a new economy, such as intangibles assets.

Second, the last column of Table II allows us to make a comparison between expenditures means devoted to each kind of intangible areas. Indeed, the results indicate that R&D and advertising are the most favoured activities because they have the greatest percentage of annual sales revenue (respectively, 1.17 per cent for R&D and 1.4 per cent to advertising) as compared to quality and software acquisition's intensity (0.2 per cent). Then, we note the growing recognition by Tunisian industrial

Table I.
Sample distribution by industry

	Firms	Observations	Percentage of obs
Chemical industry	24	144	48
Agro-Alimentary	15	90	30
Mechanical	11	66	22
Final sample	50	300	100

	2001	2002	2003	2004	2005	2006	Mean over six-year period
IInt	0.0323	0.035	0.033	0.034	0.0314	0.0331	0.0331
IR&D	0.0112	0.013	0.0112	0.0123	0.0117	0.11	0.0117
ITraining	0.0032	0.0033	0.0032	0.0026	0.0028	0.0024	0.003
IAdvertising	0.0136	0.0141	0.0137	0.0151	0.0137	0.016	0.0144
ISoftw	0.002	0.0017	0.002	0.0017	0.0016	0.0017	0.0019
IQuality	0.0022	0.003	0.0031	0.002	0.0017	0.0021	0.0023

Notes: IInt = Intangible intensity = (R&D + Training + Advertising + Software + Quality) expenditures/Annual sales revenue; IR&D = R&D intensity = R&D expenditures/Annual sales revenue; ITraining = Training intensity = Training expenditures/Annual sales revenue; IAdvertising = Advertising intensity = Advertising expenditures/Annual sales revenue; ISoftw = Software acquisition intensity = Software acquisition costs/Annual sales revenue; IQuality = Quality intensity = Quality expenditures/Annual sales revenue

Table II. Sample firm's profile: means of intangible investment intensity per year

firms that R&D and advertising activities are nowadays the most strategic ones because they consolidate their innovative and relational capital as it is demonstrated by Lev and Sougiannis (1996) and by Chen *et al.* (2005).

4. Empirical results for testing hypothesis

As shown by Tables III and IV, the intangible investment valuation model based on cash flow information provides significant explanatory power over the three lagged

	Model (1): $OCF_{it} = \alpha_0 + \alpha_1 OCF_{i,t-1} + \Sigma \beta_k II_{i,t-k}$		
	Lag = 1 250 observations SYS GMM estimation	Lag = 2 200 observations SYSGMM estimation	Lag = 3 150 observations SYSGMM estimation
OCF (−1)	0.121**	0.385**	0.417**
II	0.373*	0.209*	0.355
Wald statistic	14.76**	34.18**	11.09**

Notes: * Significance at a level of 5 per cent; ** Significance at a level of 1 per cent

Table III. Effect of intangible investments on future cash flow using an aggregated measure

	Model (1): $OCF_{it} = \alpha_0 + \alpha_1 OCF_{i,t-1} + \Sigma \beta_k II_{i,t-k}$					
	Lag = 1 250 observations SYS GMM estimation		Lag = 2 200 observations SYSGMM estimation		Lag = 3 150 observations SYSGMM estimation	
Post-estimation tests	Z	Prob > Z	Z	Prob > Z	Z	Prob > Z
Sargan test	24.23 (0.291)		20.53 (0.176)		12.33 (0.1948)	
Arellano-Bond test for autocorrelation in first differenced error						
ord						
1	−2.139	0.0324	−2.173	0.0298	−1.8497	0.0644
2	−0.326	0.744	−1.8	0.171		

Table IV. Effect of intangible investments on future cash flow using an aggregated measure

periods since related Wald-statistics are significant at a level of 1 per cent. Furthermore, results from Sargan test estimation confirm the instrument validity hypothesis due to a high level of probabilities' values associated with Sargan-statistics for the three periods studied.

The results from Tables III and IV show that intangible investments in a period has a positive and significant effect on the operating cash flows of the two subsequent years after controlling for the lagged value of cash flow. This finding confirms the main hypotheses of the resource-based view which postulates that intangible investment induces a superior future financial performance of the firm, Wernerfelt (1984), Barney (1991).

Furthermore, over the three studied periods, coefficients values of intangible investment-related variables decrease from the first to the third lagged period, suggesting a decreasing curve of the effect of intangible investment on future operating performance. As argued by Lev and Zarowin (1998), this result is in conformity with the nature of intangible investment consequences that rise and then decline rapidly, due to rapid technological changes, that make the innovative and technological firm's effort rapidly obsolete, necessitating a continuous search for more newly and up to date endeavours related to intangible assets.

As noted by Cazavan-Jeny (2004), since an aggregated measure of intangible investments may be meaningless by assembling several expenditures sorts, we estimate model (2) for a thorough investigation of intangible investments' effects.

Tables V and VI show that model (2) has significant explanatory power over the three lagged periods since Wald-statistics are significant at a level of 1 per cent and with regard to the Sargan test, estimation results in Table VI confirm the instrument validity hypothesis.

Furthermore, we can note from the estimation of model (2) that there are differences between the individual effects of the studied types of intangible outlays. Differences exist in sign, as well as in significance. In that, first the effect of R&D expenditures is positive and significant for the three studied periods. This result confirms the role of these technological activities to create and sustain competitive advantage, which allows the firm to control its relationship with customers. This may affect positively receivables

Model(2): $OCF_{it} = \alpha_0 + \alpha_1\, OCF_{i,t-1} + \beta_1\, RD_{i,t-k} + \beta_2\, Advertising_{i,t-k} + \beta_3\, Training_{i,t-k} + \beta_4\, Quality_{I,t-k} + \beta_5\, Software_{i,t-k}$

	Lag = 1 250 observations SYS GMM estimation	Lag = 2 200 observations SYS GMM estimation	Lag = 3 150 observations SYS GMM estimation
OCF (−1)	0.121***	0.342***	0.361***
RD	3.746***	2.908***	7.13***
Advertising	14.97***	19.560***	9.705
Training	0.176	0.0375	0.086
Software	0.855	2.295	0.699
Quality	0.504	3.3068*	6.712**

Notes: * Significance at a level of 10 per cent; ** significance at a level of 5 percent; *** significance at a level of 1 per cent

Table V.
Effect of intangible investments on future cash flows using a disaggregated measure

Model(2): $OCF_{it} = \alpha_0 + \alpha_1 OCF_{i,t-1} + \beta_1 RD_{i,t-k} + \beta_2 Advertising_{i,t-k} + \beta_3 Training_{i,t-k} + \beta_4 Quality_{i,t-k} + \beta_5 Software_{i,t-k}$

Post-estimation tests	Lag = 1 250 observations SYS GMM estimation Z	Prob > Z	Lag = 2 200 observations SYS GMM estimation Z	Prob > Z	Lag = 3 150 observations SYS GMM estimation Z	Prob > Z
Wald-statistic	36.10**		47.85***		52.03***	
Sargan test	22.909		18.75		13.622	
	(0.1428)		(0.1246)		(0.1364)	
Arellano-Bond test for autocorrelation in first differenced error						
ord						
1	−2.0472	0.0406	−2.1267	0.0334	−2.112	0.0347
2	−0.62215	0.5338	−1.9519	0.6510		

Notes: ** Significance at a level of 5 per cent; *** significance at a level of 1 per cent

Table VI. Effect of intangible investments on future cash flows using a disaggregated measure

and hence induce a superior cash flow from operations. Therefore, H_{A1} assuming that investment in R&D has a positive effect on future operating cash flow is confirmed.

Second, Table V shows that advertising expenditures have a positive and significant coefficient on the two subsequent periods which means that the firm efforts to promote its products by advertising contribute to generating superior future cash flows. In line with Chauvin and Hirshey (1993), our result confirms that advertising should sustain customer capital by reinforcing the firm's market position.

We can also note from Table V that the effect of advertising expenses declines in the third lagged period. This result confirms the findings of Graham and Frankenberger (2000) suggesting that the effect of advertising on future financial performance is temporary and disappears after an average period of two subsequent years. Furthermore this finding implicates that advertising may affect temporarily sales and gross margin but in order to guarantee a positive effect on operating cash flows, it must affect receivables by creating a sustainable competitive advantage. Indeed, this competitive advantage allows the firm to impose terms of payments on its customers, which are likely to guarantee a reasonable level of operating cash flows. Therefore, hypotheses H_{A2} suggesting that investment in advertising has a positive effect on future operating cash flows is confirmed for one and two lagged periods.

Third, the training-related variable is not significant over the three lagged periods after controlling for lagged value of cash flows. While this finding is somewhat surprising because it is in contrast with the intuitive assumption that training should sustain human capital and sculpt human competences, it may reflect the inefficiency of the employee training programs undertaken by our firms. Moreover, it incites them to revise these programs in order to allow employees to acquire up-to-date knowledge and competences in the new economic context. Consequently, H_{A3} for testing whether investment in training has a positive effect on future operating cash flow is not confirmed by our study.

For the fourth intangible outlay such as software acquisition, results relating to the corresponding coefficient confirm once again (like advertising and R&D) the decreasing curve found with the aggregated measure. However, this effect is insignificant. This

result is in line with the statement drawn by the above statistics descriptive analysis which indicates that the software acquisition intensity is the lowest one compared with the one of other intangible expenditures. Also, it can be intuitively related to the specificity of the information systems within Tunisian firms that are not technologically very up to date. Thus, H_{A4} postulating that investment in software acquisition has a positive effect on future operating cash flows is not confirmed.

Eventually, Table V shows that there is a significant effect of the quality-related variable which appears in the second lagged period and persists in the third subsequent year. Contrary to the advertising effect which is rapid but temporary, the positive effect of quality is visible only two years after its occurrence which means that customers need time to perceive the value of these activities on products' quality. This result confirms the core competencies approach (Prahalad and Hamel, 1990) which postulates that quality is one of the firm's distinctive competencies since it allows firms to provide products with superior value as compared to those of rivals and consequently creates a competitive advantage. The role of quality expenditures in creating competitive advantage should explain its positive effect on future cash flows from operations. Therefore, our fifth hypothesis is accepted.

In summary, our main hypothesis presuming that intangible investments affect positively subsequent cash flows from operations is partially confirmed. Indeed, by using the aggregated measure of intangible investments, we find a positive and significant effect of those investments on operating cash flows one and two years after their occurrence. This effect vanishes on the third lagged period. By disaggregating this variable, interesting results were drawn from our analysis. Particularly, our findings give evidence of the important role played by firm's endeavours in promoting its innovation ability by R&D activities and in enhancing its product quality in the creation of a competitive advantage. This competitive advantage enables the firm to manage its operating cycle components, such as sales and gross margin and to control its receivables. This results in superior future operating cash flows.

5. Conclusion

We investigate whether intangible investments may be indicative of future streams of cash flows from operations. The following major conclusions can be drawn from the evidence presented in this study. First, our main hypothesis is confirmed in the sense that investment in R&D, quality, and advertising may affect future cash flows from operations after controlling for the lagged value of cash flows. However, investing in training and software acquisition does not affect the future firm's ability to generate cash flows. On the one hand, this finding is in line with Lev and Sougiannis (1996) and Deng and Lev (2006), who gave evidence of the lagged positive effect of intangible investments as measured by advertising, R&D, and quality expenditures on future cash flows. On the other hand, our results related to the effect of software and quality costs does not confirm those found by Aboody and Lev (1998) and Hendricks and Singhal (2001).

Second, in line with Cazavan-Jeny's (2004) study, which is, to our knowledge the only previous research on different kinds of intangible investments, our study shows that results do not change with the change in the measure of intangible investments. However, while Cazavan-Jeny (2004) does not find association between intangible investments and French firms financial performance, our study implicates that, Tunisian

firms' endeavours in intangible areas, mainly, in R&D activities, quality, and advertising may enhance their ability to generate future cash flows at least in the short run.

Finally, by investigating the relationship between intangible investments and firms' cash flows in the Tunisian context, we hope this study will extend the understanding of the role intangible investment has in sustaining the firm's viability in emerging economies where different technological advancement may bring different implications for the valuation of intangible investments, as illustrated by Chen *et al.* (2005). Furthermore, since rational managers would not invest in intangibles unless they believe that intangible investments will provide positive returns in terms of performance, we hope this study gives interesting insights to executive managers in emergent economies' enterprises regarding intangible investment valuation. Indeed, we demonstrate that current R&D, quality, and advertising costs may be indicative of future cash flows from operations and consequently they contribute to maintain firm viability.

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