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The Impact of Intangible Assets on the Market Value of Companies: Cross-Sector Evidence

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Abstract: The impact of corporate intangibles on a company's market value has been a widely debated topic. A large body of literature has separately examined the industry's effect- or firm-specific attributes, such as industry type, company size, company age, or indebtedness and profitability, on the motivation to disclose information on intangible assets, but without considering a comprehensive view. This paper examines the role intangible assets play in a firm's market valuation besides other firm-specific characteristics. The reduced dataset we use in this study comprises 250 publicly traded companies operating in four different business sectors in France, Germany, and Switzerland for the ten years from 2009 to 2018. Based on the panel data regression models, the study provides an extension of previous knowledge about the effect intangible assets may have on the investors' view of a company's value, where the value added of this paper is the empirical evidence of a possible link between the intangible assets' disclosure and the market value of German, French, and Swiss enterprises. The importance of our contribution lies in a comparative analysis carried out to reveal substantial differences in the impact of intangible assets and innovation activity on the market value firms in three European countries and across four industry sectors. Although the results show the positive impact of intangible assets on the companies' market value, we suggest that investors still assess companies based on their profitability rather than considering the information on intangible assets the enterprises disclose in their financial statements.

Keywords: panel data regression; information and communication technologies; intangible assets; global value chains; productivity

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1. Introduction

The growth of the knowledge economy, accompanied by rapid technical and scientific progress, has led to a reassessment of the importance of traditional sources of economic value creation at macroeconomic and microeconomic levels, as broadly discussed by Dosso and Vezzani [1]. Over the past decades, we have witnessed a sustained increase in investments towards incorporating intangible assets and research and development (R&D) projects, which has been researched by Andersson and Saiz [2]. This phenomenon occurs together with the increasing share of intangible assets market value in the global equity indices. For instance, according to Elsten and Hill [3] in 2015, the intangible assets market value accounted for almost 85% of US companies' enterprise value in the S&P 500 and nearly 71% of European companies' value in S&P 350. The Brand Finance GIFT [4] study showed that the intangible value for the S&P 500 reached a record value of US$21 trillion in 2018, which means a 128% increase compared to 2005. The leading multinational corporations', such as Pfizer, Johnson & Johnson, Microsoft, and Facebook, reported intangible assets that accounted for more than 95% of their market value in 2018. The

relevant literature often stresses corporate intangible assets' potential to positively impact a company's value creation and competitiveness [5–10]. To respond flexibly to a continuously changing market, companies should develop the skills and capabilities needed to generate new knowledge. In this context, a process of knowledge acquisition in a company closely links to a firm's investments in intangibles in the form of R&D expenditures [11,12]. It is necessary to note that performing R&D activities discovers new knowledge and creates valuable intangible assets. Although the intangibles play an unprecedented role in modern enterprises' business development, the actual value of corporate intangibles cannot be fully recognized and disclosed in financial statements due to the persistent conservatism of international accounting principles. According to IFRS IAS 38, the accounting disclosure of intangible assets is necessary to fulfil recognition criteria, such as identifiability, controllability, and guarantee of future economic benefits; although, meeting these three attributes of intangible assets from the broader definition of intangibles (including intellectual capital) is still a critical issue. The information on intangibles contained in financial statements often does not reflect the hidden intangible value of the company and, thus, makes it impossible to quantify the value of corporate intellectual capital (IC) as well as to identify the extent of the intellectual capital benefits to the firm [13]. Nevertheless, we believe that knowledge of how the investments in intangibles reported in financial statements impact the company's market value may be beneficial in a diversity of ways for potential investors and managerial decision-making at a corporate level.

The impact of corporate intangibles on a company's market value has been a widely debated topic. A large body of literature has examined the industry's effect- and firm-specific attributes, such as industry type, company size, company age, or its indebtedness and profitability, on the motivation to disclose information on intangible assets. Even though intangible assets are not physical in nature, they contribute significantly to the value of a business. However, the value of intangibles in financial statements often do not reflect the exact value of all corporate intangible assets due to the persistent accounting conservatism under IFRS. The main question is, therefore, whether the potential investors use the information about intangible assets disclosed by companies as metrics for higher company valuation.

This paper examines the role intangible assets play in the market valuation of firms besides other firm-specific characteristics. The dataset we use in this study comprises 250 publicly traded companies operating in four different business sectors in France, Germany, and Switzerland for the ten years from 2009 to 2018. The original data set contained 4687 publicly traded companies in Europe. Due to the need to clean and edit the data (data preparation due to correct, impute, or remove missing and erroneous values), we had to narrow the original range of data to 250 publicly traded companies from France, Germany, and Switzerland. Only these companies had complete data for the given decade from 2009 to 2018. Based on a systematic review of previous research, we formed a set of indicators for assessing the impact of intangible assets on the market value of companies at a corporate level. A regression analysis on panel data was performed, and models with time-fixed effects were selected for each of the countries and sectors concerned.

2. Literature Review

In a contemporary knowledge-based society, the corporate assets are not made up of only tangible assets, but they also consist, to a large extent, of various intangible components representing the value of accumulated knowledge within an enterprise. Globalization, enlargement, and technological progress have led to increased recognition of intangible assets as a significant and critical resource for companies to build and maintain a competitive advantage [8,9]. Although intangible assets are assets without physical substance, many do not meet traditional accounting standards' recognition criteria, but they contribute significantly to the market value [3].

The numerous factors determining a firm's incentive to invest in generating new knowledge have been the subject of many studies on intellectual capital and intangible

assets. One of the most important aspects behind the motivation to increase a company's intangible value is the business sector in which the company operates. Industry-specific characteristics play an essential role in a company's choice to focus their business strategy on accumulating intangible assets rather than developing tangible capital. Moreover, the sectoral aspects determine how companies acquire new knowledge and develop the existing intangible assets base. For instance, Uppenberg and Strauss [14] have pointed to significant differences in how the service and non-service sectors acquire new knowledge. While manufacturing companies develop new intangible assets through substantial investments in R&D activities, the service sector firms often rely on external sources for new knowledge, most notably through their interaction with customers, sharing the experience with business partners or potential competitors. The value of intangible assets is also primarily determined by the level of concentration in the sector. Crouzet and Eberly [15] pointed out that the rise in intangibles accompanies an increase in industry concentration. However, the authors stress that the consequence of the rise in industry concentration depends on its source.

Besides industry-specific characteristics, the value of intangible assets is also affected by firm-specific attributes. Corporate governance policies significantly impact the company's choice to disclose information on intangible assets and R&D investments [16,17]. We are convinced that the more accurately intangibles are disclosed in financial statements, the lower the degree of information asymmetry between the company and third parties, such as potential investors or analysts. Consequently, more intangibles may guarantee more favorable funding terms obtained by companies due to more significant stakeholders' awareness of its risk profile. One suggests that the profitable companies whose sales are continuously growing have a higher market value associated with a higher value of intangible assets compared to those who are not able to use the growth opportunities available in the market properly [18–20].

Moreover, Omoye [21] claims that companies that achieve higher profitability should be much more encouraged to disclose information on intangible assets in their financial statements to incentivize potential investors to take investment decisions in favor of those companies. Another firm-specific characteristic, such as size, age, or debt load, may also affect the intangible assets disclosure. While company size has a positive impact on R&D intensity, meaning that larger firms are more likely to invest more in R&D, a high level of indebtedness harms R&D intensity [22].

Another attribute that affects the value of intangibles is the ownership structure. Lemmon and Lins [23] claim that corporate intangibles' value is derived from the majority of the shareholders' decisions to allocate funds for R&D projects, specifically in conditions of the financial crisis. According to Lemmon and Lins [23], contrary to theoretical expectations, the impact of intangibles on firm performance was inconsistent during the financial crisis from 2008–2009. This behavior emerges mainly because of the incapability of human capital, the main component of undisclosed intangible assets, to create value for the sample firms during financial crises. As discussed by Batrancea et al. [24], the financial crisis from 2008–2009, also referred to as The Great Recession, revealed severe shortcomings in the area of monetary policy, deregulation, financial innovation, and government policies. The roots of the world financial crisis from 2008–2009 are appropriately analyzed in Batrancea et al. [25], where the global financial crisis from 2008–2009 began with the housing market bubble, created by an extensive load of mortgage-backed securities that bundled high-risk loans. Companies acquire new knowledge and expand the existing intangible capital base by investing in R&D projects that ensure future cash inflow and increase the business's market value [11]. Although the R&D data disclosure is voluntary in most countries, the reported value of R&D expenditures in financial statements provides only a partial picture of its innovation performance. Nevertheless, according to Grandi et al. [26], potential investors tend to consider the reported value of R&D expenditures when making their investment decisions. This indicates that even the declared value of R&D activities performed by the company can hypothetically determine its market value.

Altogether, the literature review has shown that a company's market value refers not only to the total value of all corporate assets but also reflects a wide range of exogenous and endogenous factors which have been the subject of many empirical studies [27,28]. In general, Tobin's Q has been often used as a proxy variable for firm value in studies focused on the relationship between intangible assets and the market value of the business. For instance, Hall et al. [29] and Kohli et al. [30] are convinced that Tobin's Q is the most appropriate indicator of a company's market value because the Q ratio considers the future value of the company as well as expected growth associated with the R&D investments. Traditionally, it has been argued that expenditures on research and development are closely linked to corporate intellectual capital since they are a crucial source of intangible assets [30–34] and one of the major drivers behind a company's performance [35–37]. Although from the short-term perspective, the R&D investments are likely to cause a decrease in cash flow, it must be pointed out that the main objective of spending on R&D is not to make profits in the short term but to increase the value of the company and ensure its sustainable development in the long run [38]. An interesting view can also be found in Batrancea et al. [39], where the significant driver of the country's sustainable growth, from a macroeconomic point of view, is the ratio of the market value of the bank's capital to assets. Considering other characteristics such as fiscal pressure [40,41] or liquidity and solvency [42] might also be beneficial.

An increasing number of studies have found that rising intangible capital in the form of R&D expenditures has a consistently positive impact on an enterprise's market value across diverse industries and countries [43–46]. Based on the evidence from Balzer et al. [47], considering publicly traded companies listed in S&P 500, R&D was identified as the key driver in the value creation of a company. However, it is essential to note that the intensity of R&D spending varies noticeably between different sectors and industries. In general, the pharmaceutical and manufacturing sectors have been proven to be the most R&D intensive industries, among others [12]. Conversely, companies operating, for instance, in the real estate services sector or performing its substantial business activity in the energy supply and distribution services related sectors are considered less intensive in undertaking R&D. Ciftci and Zhou [48] have pointed out that the R&D expenditure disclosure in the financial statements reflects the presence of innovation activities within the enterprise. In studies conducted by Chang and Su [49] and Lee and Yang [50], the authors have suggested that there may be a verifiable positive impact of R&D expenditures on long-term sustainability and growth in future income and cash flows. Similarly, Han and Chuang [51] and Chen et al. [52] have reached the conclusion that R&D expenditures positively affect innovation and the financial performance of the firms. However, not all the studies support the claim of the unambiguously positive effect of the R&D intensity on corporate performance and its market value. A broader review of the literature has shown that the impact of R&D investments on a firm's market value is quite different depending on a wide range of industry- and business-specific factors. Pindado et al. [53] analyzed the data of European companies to examine a relationship between R&D intensity and the market value of the business, concluding that the relationship between R&D intensity and the market value may be considerably affected by such factors as the company size, firm's market share, cash flows, as well as managerial decisions on the investments in R&D projects, among others. Connolly and Hirschey's [32] comparative study found that the company size, as well as the type of industry, play an essential role in the R&D intensity effect on market value expressed as Tobin's Q. Authors showed that the impact of R&D spending on Tobin's Q is more significant for larger firms, regardless of whether the firm belongs to the manufacturing or non-manufacturing sector. At the same time, their findings suggest that one dollar spent in R&D has a more significant effect on the market value for manufacturing firms than for the non-manufacturing companies.

Other aspects that may potentially impact the relationship between the company's intangible assets, R&D intensity, and its market value have been discussed by a significant number of authors in the literature and may include intangible assets intensity, long-

term debt, profitability, and short-term liquidity, among many others. The firm-specific characteristics, as mentioned above, often act as control variables in econometric models aimed to estimate the effect of R&D intensity on the market value. According to Clausen and Hirth [54], cash holdings and profitability have a positive impact on a company's market value since both can be viewed as the key indicators of opportunities for future growth and sustainable development. Moreover, the R&D projects that have been successfully implemented within the firm often result in intangible assets, which can be recognized in the balance sheet and, consequently, may increase the total market value of the company. Intangible assets, which the company can have ownership of, often refer to intangible property, such as patents and trademarks, among others. Dosso and Vezzani [1] are convinced that patents and trademarks reflect the total value of innovation and market assets. The positive impact of patents, together with R&D expenditure on Tobin's Q, was demonstrated in a study conducted by Hall et al. [55]. However, some authors stress that the impact of intangible assets on a company's market valuation also depends upon other factors, as it has been mentioned above, and can be more decisive in firms with the lower book value of intangible assets and vice versa; the lower market valuation could be observed in firms with the higher book value of intangible assets, as emphasized by Park [56].

3. Research Methodology

The aim of this paper is to determine the impact of intangible corporate assets on a company's market valuation approximated by Tobin's Q. Referring to this aim, the following research hypotheses were proposed:

H1. *There is a statistically significant positive impact of the intangible assets' intensity on companies' market valuation.*

H2. *There is a statistically significant positive impact of corporate R&D activities on companies' market valuation.*

H3. *There is a statistically significant positive impact of corporate patents and trademarks on companies' market valuation.*

We analyzed the data obtained from the "Orbis" database, which is a database of comparable financial and business information on European public and private companies. Initially, retrieved data included 4687 enterprises representing 18 European countries (Austria, Germany, France, Finland, Belgium, Denmark, Sweden, Switzerland, Great Britain, the Netherlands, Italy, Portugal, Liechtenstein, Luxembourg, Lithuania, Ireland, Estonia, and Norway) for the ten-year period from 2009 to 2018. After inaccurate and missing records were removed from the extracted data set initially, the data sample was reduced to only 250 companies representing different sectors and included, in particular, a piece of information on investments in intangible assets for the period from 2009 to 2018. The geographical coverage of the final data set was Germany, France, and Switzerland. It accounted for 16.66% of the geographical structure of the initially obtained data and only 5.33% of the originally delivered number of observations. The fact that these specific countries covered our final data sample may be caused partly by the long-term evidence that proved that Germany and France were the European leaders with the most innovative companies according to the number of patents and trademarks applications [57]. After cleaning data, we arranged them in a long-balanced panel with a total number of 2500 observations, of which French companies represented approximately 84.40% of data (2110 observations), German companies accounted for 12.00% of data (300 data points), and Switzerland companies made up only 3.60% of data (90 data points).

The sectoral structure of our final dataset consisted of five groups representing different areas of business sectors. The percentage of individual sectors in our dataset varied from 36.40% to 12.80%. The most represented sector was professional, scientific, and technical activities, as covered by NACE Rev.2 Section M, which accounted for 36.40% of

our dataset's total number of observations. The second-largest group of companies fell under the manufacturing sector, as covered by NACE Rev.2 Section C. The companies operating in Sector C accounted for 17.60% of the total number of observations. The next sector was information and communication services, as covered by NACE Rev.2 Section J. Section J accounted for 13.60% of the analyzed data. The fourth sector in our dataset was finance and insurance activities, as covered by NACE Rev.2 Section K, which accounted for 12.80% of the total number of observations. The last sector was other customer-related services. We decided to form Sector S by merging the weakest represented sectors in the dataset, and it accounted for 19.60% of the total number of observations. Due to the fact that Sector S consisted of very different industries, this sector was not analyzed and interpreted separately. However, we decided to include the data covered by Sector S in our analysis to maintain the number of observations. The dependent and independent variables in use are presented in Table 1.

Table 1. Dependent and independent variables.

Dependent Variable	
MV	Tobin's Q = market capitalization/book value of total assets.
Independent Variables	
IABV	Intangible assets intensity = book value of intangible assets/book value of total assets [58].
TABV	Tangible assets intensity = book value of tangible assets/book value of total assets.
Control Variables	
CashBV	Cash holdings intensity = book value of cash holdings/book value of total assets [54,59].
EBITDABV	Profitability = EBITDA/book value of total assets [54,60].
LEV	Leverage = long-term debt/book value of total assets [58,61].
SIZE	Company size expressed as the natural logarithm of the total number of employees [62].
AGE	Firm age expressed as the number of years of incorporation of the company [63].
Dummy Variables	
R&D_dummy	Dummy variable, which takes the value 0 or 1 to indicate the absence or presence of R&D expenditures for the corresponding year.
PATRADE_dummy	Dummy variable, which takes the value 0 or 1 to indicate the absence or presence of registered patents and trademarks in the company.
Other dummy Variables	
Country_Sector	The categorical variable referring to the individual country or sector.

With the aim to describe the basic features of the data used in our analysis, we proposed a descriptive statistics summary, as shown below Table 2.

The variable MV refers to the company's market value expressed as Tobin's Q. If Tobin's coefficient (Q Ratio) takes the values greater than 1, it signals that a company is worth investing in. However, greater Q Ratios also indicate the presence of such components of intellectual capital, in other words, intangible assets, which may not appear on the company's balance sheet, but they contribute to the prevailing gap between the firm's market and book value. Given that an average Q Ratio is approximately 0.80, it can be concluded that companies from our dataset have been relatively undervalued, which also implies that the companies' replacement cost of total assets exceeded their market capitalization on average during the period considered.

Table 2. Descriptive statistics.

Variable	Average	Std.Dev.	Min.	1Q	Median	3Q	Max.
R&D*	0.02	0.04	0.00	0.00	0.00	0.02	0.42
MV	0.80	0.99	0.02	0.33	0.55	0.94	21.84
IABV	0.22	0.17	0.00	0.08	0.19	0.33	0.83
TABV	0.18	0.17	0.00	0.05	0.13	0.27	0.94
SIZE	7.88	2.18	0.69	6.27	7.67	9.37	13.07
LEV	0.14	0.12	0.00	0.04	0.12	0.22	0.62
CashBV	0.13	0.11	0.00	0.06	0.10	0.17	0.84
EBITDABV	0.10	0.08	-0.86	0.06	0.10	0.14	0.47
AGE	46.42	27.33	13.00	28.00	40.00	61.00	201.00
PATRADE*	867.39	5324.50	0.00	0.00	9.00	64.00	57,441.00

R&D* is research and development intensity expressed as R&D expenditures divided by the book value of total assets. PATRADE* is the total number of patents and trademarks registered in the company.

The data selection method resulted from the data's quality and nature. It is necessary to be aware of the original size of the data set (5686 publicly traded companies), where the R&D values were so low that they were close to zero after rounding. When choosing any ratio indicator, the result would be zero, significantly distorting the results. For this reason, R&D was chosen as a dummy variable. It was the same with the number of patents and trademarks. It is also necessary to point out the substantial differences in the number of patents and trademarks being registered among companies we analyzed. These outliers had the potential to affect the precision of the methods we used; thus, we decided to treat the variable PATRADE as a dummy variable in order to improve the accuracy of models proposed in this study. The same approach was applied to variable R&D, which indicated the R&D intensity of a company. However, the median values of the R&D variable led us to believe the companies may not perform any activity aimed at research and development, or they simply do not disclose the information on the real value of R&D expenses.

Using the data, as described in the section above, we examined and discussed the impact of intangible corporate assets along with diverse firm-specific characteristics on the firms' market valuation. A regression analysis of panel data was performed to find the most suitable model for describing the relationship between independent and dependent variables. It was confirmed that in each tested model, it is more appropriate to apply a panel regression model instead of a pooled one. Subsequently, the Hausman specification test was used, based on which a decision was made to prioritize models with fixed effects (p-value < 0.000 in each tested model). Analogously, individual, temporal, and combined effects were tested in each model. The most appropriate alternative, a model with time-fixed effects, was chosen in all cases. Similar to the study conducted by Clausen and Hirth [54], the model with time-fixed effects has been also chosen to estimate the unknown parameters of a regression model. In order to take into account the heterogeneity of different countries and sectors, we created several partial models with time-fixed effects for each of the countries and sectors concerned. According to Greene [64], heterogeneity across cross-sectional units is an integral part of panel data. Indeed, the basic framework for our analysis is a regression model of the form:

$$y_{it} = x\prime_{it}\beta + z\prime it\alpha + \varepsilon_{it}$$

where $x\prime_{it}$ contains K regressors without a constant term, $z\prime_{it}\alpha$ includes heterogeneity or individual effects, and it also contains a constant term along with a set of individual or group-specific variables, which may be observed or unobserved, but they are taken to be constant over time t. Greene [64] pointed out that the model with fixed effects embodies all the observable effects and takes $z\prime_{it}\alpha$ to be a group-specific constant term in the regression model. However, Greene [64] stresses that the term "fixed" here is used in relation to the correlation between the unobserved constant term $z\prime_{it}$ and $x\prime_{it}$, meaning that the term does not vary over time and should not be interpreted that these effects are not nonstochastic.

In the panel-data model, as shown above, ε_{it} is a set of idiosyncratic error terms, whereas a serial correlation in the idiosyncratic error terms is a very frequent phenomenon in the panel-data analysis, as noted by Wooldridge [65].

Several diagnostic tests subsequently supported the resulting models to verify the validity of the linear model's assumptions concerning the data set's panel structure. Diagnostic tests detected rank correlation, cross-sectional dependence, or heteroscedasticity of random components in each of the mentioned models. For this reason, the standard error estimation approach was implemented. We performed several diagnostics tests to test regression assumptions for panel data, which revealed the presence of serial correlation (Breusch–Godfrey/Wooldridge test: $\chi^2 = 1321.9$; p-value = 0.000) heteroskedasticity (Studentized Breusch–Pagan tests: BP = 2846.5; p-value = 0.000) and cross-sectional dependence (Pesaran CD test: $Z = 10.688$; p-value = 0.000) of residuals. We also performed the Maddala–Wu unit root test ($\chi^2 = 1428$; p-value = 0.000) to test panel stationarity, which showed that all panels are stationary and they do not contain unit roots. According to Croissant and Millo [66], the implications of heteroscedasticity and serial correlation in panel models can be alleviated by applying a standard clustering errors estimation method, as described by Arellano [67]. This approach was implemented for all the panel models in our study. Our panel data analysis was carried out using the software program R Studio and the corresponding package "plm".

We want to note that we also worked with lagged values of our variables. However, the models did not give any economically interpretable conclusions in this case. Therefore, we abandoned it and worked only with variables in the same time intervals.

4. Results

This study aims to examine the relationship between intangible corporate assets and the market value expressed through Tobin's Q. Referring to the empirical studies as discussed in the literature review, we performed regression analysis on panel data, as described in the preceding section. The central assumption was that there is a statistically significant impact of the intangible corporate assets on the companies' market valuation. Our findings point out important differences that may exist among different business sectors and countries analysed. Table 3 shows the estimates of the time-fixed effects model parameters. Table 3 demonstrates the summary results of the analysis carried out for the whole dataset (Complex model) as well as for each of the countries and sectors concerned (Germany, France, Switzerland). Estimates of the parameters of the Complex model shown in the table indicate the existence of a positive effect of the intensity of intangible corporate assets (IABV) on Tobin's Q of the analyzed sample of companies. However, it should be noted that this relationship is not statistically significant. Therefore, it is not possible to confirm the assumption that there is a statistically significant positive effect of the reported intangible assets on the companies' market valuation. This result was most likely caused by the individual characteristics of the specific companies that had been included in the dataset. With respect to the existing differences between companies operating in different sectors and countries, besides the complex model, we decided to construct partial models for each country and business sector separately.

Table 3. Panel regression results of the impact of particular variables on market value in the selected countries.

	Complex	GERMANY				FRANCE						SWITZERLAND
	Model	DE	DE_C	DE_J	DE_M	FR	FR_C	FR_S	FR_J	FR_K	FR_M	CH
IABV	0.717	0.287	−0.559	1.565 *	−1.743	0.788	1.065 **	0.108	2.500	0.060	0.758 *	3.733 ***
	(0.427)	(0.513)	(1.212)	(0.732)	(1.109)	(0.453)	(0.410)	(0.241)	(1.775)	(0.323)	(0.320)	(0.923)
TABV	0.123	−1.016	0.475	3.139 **	−7.939 **	0.183	0.057	−0.051	0.246	−0.264	0.238	2.311
	(0.207)	(1.355)	(2.381)	(0.988)	(2.537)	(0.226)	(0.359)	(0.256)	(1.688)	(0.227)	(0.351)	(1.439)
EBITDABV	3.926 ***	10.594 ***	12.158 **	1.323	12.009 ***	1.924	3.334 ***	2.927 ***	3.095 **	0.789	1.426	11.891 ***
	(1.441)	(2.762)	(3.830)	(1.116)	(2.746)	(1.070)	(0.780)	(0.644)	(1.095)	(0.410)	(1.731)	(1.111)
LEV	−0.874 *	0.095	−0.914	−1.848	2.095	−0.860	−0.875 *	−0.048	−2.850	0.098	−0.835	−1.292 *
	(0.413)	(1.069)	(1.856)	(1.766)	(1.587)	(0.483)	(0.427)	(0.297)	(1.653)	(0.296)	(0.473)	(0.516)
CashBV	1.604 *	4.168 ***	4.902 **	2.039	−0.002	1.041	1.026 **	0.547	−0.961	−0.028	1.934 ***	3.999 **
	(0.686)	(1.264)	(1.723)	(1.405)	(1.429)	(0.589)	(0.334)	(0.419)	(2.445)	(0.326)	(0.569)	(1.408)
SIZE	−0.055	−0.036	−0.045	0.944 *	−0.100 *	−0.048	0.053	−0.022	−0.176	−0.021	−0.033	−0.110
	(0.034)	(0.063)	(0.083)	(0.383)	(0.040)	(0.036)	(0.043)	(0.018)	(0.160)	(0.018)	(0.024)	(0.112)
AGE	−0.002	−0.001	−0.003	−0.162	0.000	−0.002	−0.004	0.000	−0.019	0.004	−0.001	−0.002
	(0.001)	(0.001)	(0.002)	(0.101)	(0.001)	(0.002)	(0.003)	(0.002)	(0.012)	(0.004)	(0.003)	(0.002)
R&D	0.328 ***						0.129 *	0.110	0.005	−0.305	0.030	0.208
	(0.083)						(0.065)	(0.086)	(0.092)	(0.352)	(0.081)	(0.107)
PATRADE	0.230 *	0.088				0.752 ***	0.274 *	0.131	0.122	1.305	0.097	0.247 *
	(0.109)	(0.221)				(0.201)	(0.111)	(0.092)	(0.088)	(0.800)	(0.099)	(0.106)
SEKTOR C	0.114	0.497					−0.026					1.229 *
	(0.135)	(0.312)					(0.090)					(0.532)
Clustering of random errors:	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes	yes
The number of observations:	2500	300	130	40	100	2110	300	470	300	290	750	90
R^2	0.248	0.647	0.676	0.857	0.815	0.144	0.502	0.346	0.189	0.148	0.273	0.864
Adjusted R^2	0.242	0.624	0.630	0.757	0.776	0.136	0.470	0.320	0.137	0.091	0.256	0.832

Note: The stars flag levels of significance. If a *p*-value is less than 0.05 (*); if a *p*-value is less than 0.01 (**); and if a *p*-value is less than 0.001 (***).

In the partial models made up for the specific countries, there was no change observed in the trend of the impact of the set of explanatory variables on the explained Tobin's Q rate. However, the market valuation of the intensity of the tangible assets appeared to be negative in German companies (DE). The main difference between the complex model and the Germany model (DE) was a significant loss in the parameters of some variables in the Germany model. There were three sectors in Germany's partial models, which were manufacturing (DE_C), information and communication (DE_J), and professional scientific and technical activities (DE_M). It should be noted that merged sector other customer services (DE_S) were represented by only two companies (20 observations), so we did not consider it in the representative sample. Our analysis revealed that the market valuation of German companies is highly determined by their profitability. Moreover, the intensity of the intangible assets positively affects companies' market valuation only in the sector related to information and communication services (DE_J). The most striking result to emerge from the data is that the investors may react differently to accounting information disclosed by companies in different sectors. While the increase in intangible assets intensity (TABV) and company size (SIZE) positively affects the market value of companies operating in the technology-intensive sector (DE_J), the growing number of employees who can theoretically create more value along with a growing share of tangible capital has not resulted in a higher market valuation of companies from the knowledge-intensive industry (DE_M). Similarly, the market valuation of French companies is higher if the companies achieve higher profitability, regardless of the business sector they operate. The statistically significant impact of intangible assets intensity on Tobin's Q was observed only in the sectors of manufacturing (FR_C) and professional scientific and technical activities (FR_M). Additionally, the presence of patents and trademarks in the knowledge-intensive sector (FR_M) has a statistically significant and positive effect on companies' value in the case of German companies operating in the same intensity of the intangible assets; moreover, the intensity of the intangible assets on firms' market value was also demonstrated in models constructed for Swiss companies (CH). Results from the Swiss model reveal that the market may overvalue the companies operating in the manufacturing sector. However, it is necessary to point out the limitation of this model caused by the very small number of companies included in the Swiss dataset. Due to this matter, it is not possible to make generally valid conclusions about the market valuation of Swiss firms. Nevertheless, we believe that the analysis performed on a larger sample of Swiss companies would confirm these results.

5. Discussion

Based on the results of our analysis, we were able to partially confirm the hypotheses proposed for this study. The H1 hypothesis on the statistically significant positive effect of the intangible assets' intensity on the companies' market value was not confirmed within the complex model. However, hypotheses H2 and H3 were confirmed in the complex model. Therefore, it can be concluded that investors respond positively to the presence of innovation-related activities in companies. Our findings are consistent with the study proposed by Hall and Oriani [68], who analyzed a set of 2156 publicly traded manufacturing companies for the period between 1989 and 1998, including German and French firms, and demonstrated that the market positively assesses the presence of R&D expenses, especially in German and French companies. From the perspective of intellectual capital development, it is necessary to note that the average market value of companies in the dataset we used (MV = 0.80) suggests that firms did not tend to use intellectual capital as a tool to identify those types of intangible assets, which due to persisting conservatism in accounting practices, could not be recognized in the balance sheet. However, it should be pointed to out that companies operating in the manufacturing sector as well as in the sector related to the information and communication activities proved to have Q Ratios greater than 1. At the same time, the two sectors mentioned proved to have the highest average levels of R&D intensity among business industries from our dataset. In terms

of innovation performance, it must be noted that the average R&D intensity level was extremely low. Even the median R&D intensity in the dataset was zero. The findings from the data description analysis potentially point out the following issues: (1) the companies may not perform R&D related activities, or (2) they may not disclose the information about R&D activities performed within the company. Uppenberg [69] seemed to be convinced that the low R&D intensity is the main reason why the European countries are lagging behind the USA in terms of economic growth. When looking at the innovation output represented by the total numbers of patents and trademarks registered by the company, descriptive analysis shows large discrepancies between the companies concerned. The highest number of registered patents and trademarks was recorded in the manufacturing sector. The presence of patents and trademarks in companies is often a result of successfully implemented R&D projects in the past. However, it must be stressed that there is not a clear causality between the total number of registered patents and R&D expenditures incurred in association with R&D activities. Our results show that the market responds positively to the R&D activities performed by the company, and conversely, does not consider the reported book value of companies' intangible assets. These findings reflect those of Grandi et al. [26], Hall and Oriani [68], and Clausen and Hirth [54], who also found that market value is greater when companies disclose information about the amount spent on R&D related projects. Unlike other research carried out in this area by Saif-Alyousfi et al. [70], we did not find a significant effect of a company's age on their motivation to invest more into intangibles, which should potentially be reflected in the increase in the market value.

6. Conclusions

The main goal of our study was to investigate the relationship between the book value of corporate intangibles on the market value of publicly traded companies. We carried out a regression analysis on panel data of publicly traded companies operating in four different industries in Germany, France, and Switzerland. With regard to some drawbacks of generally used regression methodology, we proposed to apply a standard clustering errors estimation method as described by Arellano [67] with the aim to improve the accuracy of the analysis. The models we discussed in this paper were focused on identifying differences between individual countries and across analyzed industries. We have found that an increase in intangible assets along with innovation activities performed by companies may have a positive effect on a firm's market value. However, our study revealed some interesting facts behind the relationship between intangibles and companies' market valuation. Firstly, the potential investors respond differently to the information on intangible assets disclosed in companies' financial statements in different industries. Secondly, extremely low intensity of R&D expenses is visible among companies in various business sectors. Therefore, we believe that companies are still not motivated enough to disclose the actual value of R&D expenses in their financial statements due to the persistent conservatism of accounting standards they follow. Given that the conclusions presented in this paper use a limited number of companies concerned, our analysis results need to be treated with considerable caution. Although our work has some limitations, it is the first empirical study that aims to examine the role that intangible assets play in a firm's market valuation besides other firm-specific characteristics. The research demonstrates that investors still assess companies based on their profitability rather than considering the information on intangible assets the enterprises disclose in their financial disclose in their financial statements. The results reveal the positive impact of intangible assets on the value of companies.

Our study provides an extension of previous knowledge about the effect intangible assets may have on the investors' view of a company's value. The value added of this paper is the empirical evidence of a possible link between the intangible assets' disclosure and the market value of German, French, and Swiss enterprises. The importance of our contribution lies in a comparative analysis carried out to reveal substantial differences in the impact of intangible assets and innovation activity on firms' market value in three

European countries and across four industry sectors. Although the results show the positive impact of intangible assets on companies' market value, we suggest that investors still assess companies based on their profitability rather than considering the information on intangible assets the enterprises disclose in their financial statements.

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