# The Formation of Peer Groups in the Pricing Process of Privately Held Businesses: Can Firm Size Serve as a Selection Criterion? Empirical Evidence from Europe

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## Abstract

*Business valuation professionals consider transaction multiples as an accurate method to price privately held businesses. The formation of comparable peer groups is crucial for this method. A problem arises when it comes to identify adequate peer group selection criteria. For practicability reasons industry classification is widely used but recent literature indicates that the comparability of peer groups could be increased by adding firm size as selection criterion. This paper aims at analyzing the effect of firm size as additional peer group selection criterion. More specifically, it focuses on the effect of firm size on the reliability of transaction multiples which are used to estimate transaction prices for privately held businesses.Based on literature, real transaction price data from Europe is applied to verify the influence of firm size. The results indicate the highest reliability of transaction multiples when combining industry classification with firm size in the peer group formation process.*

**Keywords:** Peer Group Selection Criteria, Transaction Multiples, Privately Held Businesses, Industry Classification, Size Effect, Business Valuation, Transaction Price

## *1 Introduction*

In a transaction of a privately held business, acquirer and vendor finally have to agree on the transaction price to close the deal. One common method to generate indications on transaction prices for privately held businesses is the Recent Acquisitions/Transaction Method (RAM/RTM), a specific method of the Market Approach (Pratt, 2005).In the RAM/RTM the indication on the transaction price is generated through a comparison with the recently realized transaction prices of comparable (i.e. similar) businesses. This means that the transaction price can be derived from the prices at which entire businesses or operating units of businesses have been sold or the prices at which significant interests in businesses have changed hands (Pratt and Niculita, 2008). Therefore, the businesses that are compared and used as surrogates must be comparable to the appraisal subject, the "target business"(Pratt, Reilly and Schweihs, 1998).As a result of this comparison a "transaction multiple "can be calculated. From the transaction multiples an individual transaction price for the target business as a multiple of a specific financial value driver can then be derived (Liu, Nissim and Thomas, 2002). In practice business appraisers mainly use financial value drivers as "sales", "earnings before interest and taxes" (EBIT)and/or "earnings before interest and taxes, depreciation and amortization"(EBITDA)to value privately held businesses by deploying transaction multiples (Pratt, 2005; Mellen and Evans, 2010;Trugman, 2012).

The main problem during the pricing process of privately held businesses is to assess the comparability between the target business and the comparable businesses. To be able to do this it is necessary to choose the relevant parameters to identify comparable businesses for the peer group. Business appraisers commonly use two different methods to overcome this problem and to find the "right" peer group with the best fit. The first is based on an analytical selection process (Damodaran, 2010; Trugman, 2012). The goal of applying this method is to add only a few – but therefore highly comparable businesses –to the peer group. The second method, the "Direct Market Data Method" (Miles, 1999), adds all businesses of the specific industry to the peer group. This method only focuses on the industry sector the business belongs to(either the target business or the comparable business).Therefore, the relevant parameters to identify comparable businesses are reduced only to one parameter, the industry classification.

The identification of the best fit of a peer group is highly relevant because the quality, the representativeness, the homogeneity and hence the reliability of the transaction multiple is highly dependent on the comparability of the businesses. To date there are no binding and internationally accepted guidelines for how to assess if a business can be considered as a comparable. The only requirement is that the businesses as a whole have to be comparable in their overall business model (Pratt and Niculita, 2008).As this is of course just a very loose framework and is therefore not very helpful in practice, business appraisers often use Porter's "Five Forces"(Porter, 2008) as a guideline in the selection process. In this process, the main selection criteria used to form a peer group are(a) the industry, (b) the size of the business, (c) the expectations of growth and profit as well as (d) the current financial situation of the business(Koller, Goedhart and Wessels, 2010; Trugman, 2012).Besides these primary selection criteria there are several other factors discussed as being worth noting in determining the comparability of the businesses. These criteria are(i) legal rights of business ownership or business equity, (ii) degree of industry specialization, (iii) past growth of sales and earnings, (iv) rate of return on the physical, functional, human capital and economic characteristics, (v) invested capital, (vi) stability of past earnings, (vii) quality of management, (viii) nature and prospects of the industry, (ix) competitive position and individual prospects of the business, (x) basic nature of the activity, (xi) general types of products produced, (xii) years in business and (xiii) geographical diversification (Houlihan and Tack, 1997; Bhojraj and Lee,2002; Pratt, 2005; Trugman, 2012).

However, there is only little knowledge about the importance of different selection criteria and their impact on the reliability of the derived transaction multiples for privately held businesses. There is only some empirical evidence from the capital market. Henschke and Homburg (2009) found out, that using financial selection criteria to form peer groups instead of solely using the industry classification lead to statistically more reliable transaction multiples. The literature also provides checklists of criteria to be considered, but these checklists neither present a reliable ranking of the criteria nor provide sufficient evidence based on empirical data (Pratt, Reilly and Schweihs, 1998). Furthermore, no procedure for selecting the comparable businesses neither for available selection criteria from the United States of America (Trugman, 2012) nor for selection criteria from European countries is reported. Against this background, the analysis presented in this paper aims at answering the following research question:

*"Does firm size as a peer group selection criterion have an influence on the reliability of transaction multiples, which are used to estimate transaction prices for privately held businesses?"*

To answer this question this paper is structured as follows. Section 2 presents the theoretical background. The materials and methods section 3 gives an overview of the sample, the data source as well as the method used to answer the research question. The results and discussion section 4 focuses on the following key findings: the results of the data analysis (i) increase the body of knowledge on primary selection criteria in the context of defining a peer group of comparable businesses and (ii) provide practical guidelines for business appraisers to help them disclosing and documenting all their criteria used in the selection process to make their decisions as reproducible and reliable as possible. The paper concludes with the final section 5 that gives some ideas for further research and addresses the limitations of the conducted study.

## *2 Theoretical Background*

### 2.1 Transaction price versus value of a business

In general, the transaction price of businesses has to be distinguished strictly from its value. The price shows the amount of money that is bargained and finally paid in the transaction and therefore represents the value expressed as an amount of money that is given for the achievement of control over the business. The value of the business, however, represents only a potential price. It just shows the price at which the business should be transacted in order to keep the property of either the acquirer or the vendor in a steady state, but it fails to say whether the business is finally really transacted at that specific price.

### 2.2 Transaction multiples and their use in RAM/RTM to estimate an individual transaction price

Transaction multiples indicate the transaction price of a target business on the basis of a comparison with recently realized prices of comparable businesses. The price of the target is therefore generated as a result of successfully closed transactions on the "free" Mergers and Acquisitions (M&A) market. The starting point of this technique is the basic thought of Jevons' "Law of One Price" that "similar assets should sell at similar prices". Consequently, the RAM/RTM follows the assumption that businesses that are comparable in terms of their essential economic parameters should also be transacted at the same prices.

The RAM/RTM is a highly market-oriented method that is based on already existing prices in the M&A market and therefore focuses on all integrated market information. The use of this method is therefore an expression of trusting in the functionality and the efficiency of the market mechanism (Herrmann and Richter, 2003; Pratt and Niculita, 2008).The individual transaction price of the target is technically calculated by a multiplication of the known financial value driver of the target business (that must be a representative indicator of its economic performance) with the multiple derived from the comparable businesses. This multiple is the quotient of the known transaction prices of the comparable businesses and their also known value drivers (Damodaran, 2012). In other words, the multiple represents the number of times the value driver was paid. By multiplying the multiple with the value driver of the target business, this relationship between the price and the value drivers of the comparable businesses is transferred directly to the target business. In addition to that it is to be assumed that there exists a linear relationship between the transaction price and the value driver (that means, for example, that the double value driver causes no more or less than the double value of the business). All components of the economic performance that have no influence on the value driver will not be regarded and consequently not be transferred to the target business. For these factors it is assumed that they are either non-existent or equal. Therefore, the value driver must contain all factors that have an influence on the economic performance of the target business.

### 2.3 Types of transaction multiples

Transaction multiples reflect the market price of the total capital and of ownership interests and therefore lead to the Deal Enterprise Value (DEV) of the business. The big advantage of DEV transaction multiples is their independency from the structure of financing, especially the debt to equity ratio. In the literature various types of transaction multiples can be found, differing on the regarded factors that have an influence on the transaction price. As mentioned in section 1, sales, EBIT and EBITDA are widely used value drivers. The basic and pragmatic reason to use them is that a statistically sufficient amount of information concerning the transaction data, especially for small and midsize businesses, is recorded and therefore available. As a result, the common DEV-Multiples used are the DEV/Sales, the DEV/EBITDA and the DEV/EBIT Multiple (Pratt, Reilly and Schweihs, 1998; Schwetzler, 2010; Trugman, 2012).

#### 2.3.1“DEV/Sales” transaction multiple

The DEV/Sales transaction multiple assumes that all businesses have an identical economic growth rate, identical investing quotes and identical profit margins. Its advantages are: (i) it is the most consistent multiple concerning the accounting policy and different tax and accounting systems, (ii) it can also be used for businesses with unknown or negative profits, (iii)it is usually less volatile than the profit multiples over the years,(iv)it cannot become negative and therefore the otherwise enforced elimination of negative transaction multiples cannot skew the averaged transaction multiple and (v)it is relatively lower in its absolute amount. Its disadvantages are, besides the above mentioned assumptions of identical economic parameters that the overall economic performance of the business and especially the structure of costs are not taken into consideration.

#### 2.3.2“DEV/EBITDA” transaction multiple

The DEV/EBITDA transaction multiple represents the purely operative performance of the business in view of its profit and offers various advantages: (i) it enables the appraiser to take into consideration the economic performance of the business, (ii) it is closely related to the cash flow (differences only occur according to net investments and changes in the working capital), (iii) it is independent from the policy of depreciation and the financing of the assets and (iv)it is independent from the type of economic growth (internal or external). Its disadvantages are the disregarding of different policies of depreciation and different capital structures between businesses and the enforcement of eliminating negative transaction multiples that as a result may skew the averaged transaction multiple.

#### 2.3.3“DEV/EBIT” transaction multiple

The DEV/EBIT transaction multiple shows the performance of the business in view of the profit before, i. e. independent of all financing activities. Therefore, it takes into consideration all differences between businesses concerning their policy of depreciation and economic growth. The disadvantages are the disregarding of different capital structures between businesses and again the enforcement of eliminating negative transaction multiples that as a result may skew the averaged transaction multiple.

## *3 Materials and Method*

The data used is extracted from the M&A database ZEPHYR. The ZEPHYR database gives the largest number of available transaction data for Europe. The transactions taken into consideration fulfill the following four criteria: (i) The headquarters of the transacted businesses are situated in the specified region. (ii) The transaction (merger or acquisition) was closed within the time period January 1st 2007 to December 31st 2011. (iii) The transaction either refers to the transfer of a majority stake and therefore enables the acquirer to control the target business directly or the transaction refers to the transfer of a minority stake and this stake gives the acquirer a majority stake in combination with the already existing minority stake; the transaction of minority stakes (that not even give the acquirer a majority interest in combination with eventually already existing minority stakes) are transferred to the level of a majority stake by adding a control premium on the basis of the Mergerstat/Shannon Pratt's Control Premium Study™. This study considers the median premium without negatives (Pratt, 2005; Pratt, 2009; Pratt and Niculita, 2008; Abrams 2010).The last criterion is that(iv) the EBITDA or the EBIT have to be positive. The calculated transaction multiples therefore reflect the DEV of a controlling interest of a privately held business.

The data analysis aims at answering the research question (see section 1) whether the classification of the transaction prices in view of the size of the business has an influence on the reliability of the calculated transaction multiple. In addition to that it is also examined whether the reliability of the common classification of the transaction multiples according to the industry classification can be enhanced by combining the industry classification with a size classification. To perform the data analysis, firstly, transaction multiples are calculated according to the industry classification. Following the recommendations of Schwetzler (2010), Trugman (2012) and the DVFA (2012), the results are presented in form of the median M and the harmonic meanH (see the accordingly named columns in tables 1 to 9)with eliminating outliers that may skew the average. In addition, the coefficient of variance is calculated (see also the accordingly named column in table 1 to 9). This coefficient of variance represents an indicator for the quality, the representativeness, the homogeneity and hence the reliability of the calculated transaction multiples. Secondly, the same procedure is performed according to the classification of the transacted business in view of their size following the recommended size classification of the European Union 2003/361/EG, which divides businesses into small, medium and large sized businesses. Finally, the two classifications industry and firm size are combined. Thus, the transaction multiples are calculated for each industry classified for the different firm sizes.

In order to evaluate the reliability of the derived transaction multiples, as mentioned above, the coefficient of varianceV is calculated. The lower the coefficient of variance, the higher is the reliability of the transaction multiples. The significance of the improvement of the transaction multiples is tested with a T-test at the 5% level (see the asterisk behind the coefficient of variance in tables 1 to 9).This shows the intensity of improvement of the differently classified transaction multiples compared with an aggregate calculation. The transaction multiples presented in tables 1 to 9 are calculated for all European countries that deliver a statistically sufficient number of transaction data. On the one hand, they are calculated for European aggregate and, on the other hand, for the following seven regions for which it is assumed that they are internally homogeneous although there are significant differences in the levels of the transaction multiples between them:(i) Central (Austria, Germany and Switzerland), (ii) West (Benelux countries and France), (iii) South (Italy, Portugal and Spain), (iv) North (Denmark, Finland, Iceland, Norway and Sweden), (v) Central East (Croatia, Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland, Slovakia and Slovenia), (vi) South East (Bosnia-Herzegovina, Bulgaria, Cyprus, Greece, Romania, Serbia and Turkey) and (vii) East (Russia and the Ukraine).

## *4 Results and Discussion*

### 4.1 Industry classification serving as a peer group selection criterion: its impact on the reliability of transaction multiples

In a first step the analysis was conducted for the following six industries: (i) Banking, Insurance & Financial Services,(ii) Chemicals, Petroleum, Rubber & Plastic,(iii) Computer, IT & Internet Services, (iv) Industrial, Electric & Electronic Machinery, (v) Personal, Leisure & Business Services, (vi) Retailing & Wholesaling. Additionally, the "Industry aggregate" was analyzed. This classification of the industries follows the ZEPHUS Industry classification code and represents the industries with the largest number of recorded transaction data.

The data in tables 1 to 3 (each table shows the calculation of one of the three different types of regarded transaction multiples) make evident that the classification of the transactions according to the different industries in most cases leads to a lower coefficient of variance compared to an aggregate calculation (see the "1" behind the coefficient of variance). Transaction multiples that are based on an industry classification of the comparable businesses therefore are more reliable. There is empirical evidence that justifies the industry classification as a (primary) selection criterion for the assessment of comparability of businesses. It also shows that the improvement is in many cases significant (see the asterisk behind the coefficient of variance).

**Table 1: Analysis of the reliability of "DEV/Sales" transaction multiples according to industry classification serving as peer group selection criterion (using the coefficient of variance V)**

| **European Region / Industry Classification** | N | M | H | V |
|---|---|---|---|---|
| **Central** | | | | |
| Banking, Insurance & Financial Services | 138 | 9.99 | 6.06 | 12.28 [1] |
| Chemicals, Petroleum, Rubber & Plastic | 111 | 10.33 | 1.37 | 4.63 [1] * |
| Computer, IT & Internet Services | 233 | 2.48 | 0.79 | 3.08 [1] * |
| Industrial, Electric & Electronic Machinery | 369 | 2.02 | 0.82 | 3.83 [1] * |
| Personal, Leisure & Business Services | 297 | 11.52 | 1.12 | 5.00 [1] * |
| Retailing & Wholesaling | 153 | 0.99 | 0.56 | 8.69 [1] * |
| *Industry Aggregate* | *1,301* | *3.40* | *0.94* | *15.48* |
| **West** | | | | |
| Banking, Insurance & Financial Services | 226 | 39.13 | 7.41 | 6.39 [1] * |
| Chemicals, Petroleum, Rubber & Plastic | 267 | 8.41 | 0.30 | 5.38 [1] * |
| Computer, IT & Internet Services | 788 | 2.17 | 1.32 | 6.29 [1] * |
| Industrial, Electric & Electronic Machinery | 571 | 2.10 | 0.29 | 8.75 [1] * |
| Personal, Leisure & Business Services | 916 | 3.50 | 0.84 | 5.94 [1] * |
| Retailing & Wholesaling | 661 | 2.13 | 0.85 | 14.98 [1] * |
| *Industry Aggregate* | *3,429* | *3.01* | *0.96* | *24.59* |
| **South** | | | | |
| Banking, Insurance & Financial Services | 402 | 70.08 | 6.81 | 3.93 [1] * |
| Chemicals, Petroleum, Rubber & Plastic | 303 | 4.19 | 1.84 | 10.25 |
| Computer, IT & Internet Services | 391 | 4.02 | 1.02 | 5.30 [1] * |
| Industrial, Electric & Electronic Machinery | 605 | 6.20 | 1.59 | 7.73 [1] |
| Personal, Leisure & Business Services | 766 | 10.82 | 1.85 | 6.80 [1] |
| Retailing & Wholesaling | 765 | 3.43 | 1.30 | 15.74 |
| *Industry Aggregate* | *3,232* | *7.15* | *1.62* | *10.24* |
| **North** | | | | |
| Banking, Insurance & Financial Services | 321 | 26.99 | 13.80 | 11.84 |
| Chemicals, Petroleum, Rubber & Plastic | 86 | 13.65 | 3.46 | 2.65 [1] * |
| Computer, IT & Internet Services | 817 | 4.47 | 0.48 | 4.05 [1] * |
| Industrial, Electric & Electronic Machinery | 758 | 7.98 | 3.30 | 4.59 [1] * |
| Personal, Leisure & Business Services | 1,049 | 12.45 | 0.18 | 5.85 [1] * |
| Retailing & Wholesaling | 620 | 14.81 | 0.94 | 6.04 [1] * |
| *Industry Aggregate* | *3,651* | *9.45* | *0.42* | *11.02* |
| **Central East** | | | | |
| Banking, Insurance & Financial Services | 197 | 5.45 | 2.05 | 8.49 [1] * |
| Chemicals, Petroleum, Rubber & Plastic | 179 | 1.11 | 0.02 | 3.04 [1] * |
| Computer, IT & Internet Services | 302 | 1.95 | 0.44 | 5.71 [1] * |
| Industrial, Electric & Electronic Machinery | 172 | 1.05 | 0.56 | 3.35 [1] * |
| Personal, Leisure & Business Services | 306 | 1.46 | 1.30 | 3.78 [1] * |
| Retailing & Wholesaling | 565 | 0.92 | 0.04 | 4.96 [1] * |
| *Industry Aggregate* | *1,721* | *1.46* | *0.08* | *14.22* |
| **South East** | | | | |
| Banking, Insurance & Financial Services | 187 | 6.35 | 0.15 | 4.08 [1] * |
| Chemicals, Petroleum, Rubber & Plastic | 145 | 1.13 | 0.47 | 4.42 [1] * |
| Computer, IT & Internet Services | 84 | 1.97 | 0.69 | 6.30 [1] * |
| Industrial, Electric & Electronic Machinery | 159 | 1.63 | 0.00 | 3.72 [1] * |
| Personal, Leisure & Business Services | 214 | 2.50 | 0.59 | 14.48 [1] * |
| Retailing & Wholesaling | 414 | 1.09 | 0.52 | 7.20 [1] * |

| | | | | |
|---|---|---|---|---|
| *Industry Aggregate* | *1,203* | *1.52* | *0.01* | *28.28* |
| | | | | |
| **East** | | | | |
| Banking, Insurance & Financial Services | 181 | 9.70 | 0.01 | 3.18 [1] * |
| Chemicals, Petroleum, Rubber & Plastic | 219 | 1.19 | 0.26 | 10.29 |
| Computer, IT & Internet Services | 91 | 2.19 | 0.85 | 6.28 |
| Industrial, Electric & Electronic Machinery | 168 | 0.81 | 0.25 | 2.66 [1] * |
| Personal, Leisure & Business Services | 414 | 1.28 | 0.34 | 5.37 [1] |
| Retailing & Wholesaling | 581 | 1.89 | 0.14 | 6.09 [1] |
| *Industry Aggregate* | *1,654* | *1.57* | *0.12* | *6.21* |
| **European Aggregate** | | | | |
| Banking, Insurance & Financial Services | 1,652 | 21.48 | 0.12 | 17.00 [1] * |
| Chemicals, Petroleum, Rubber & Plastic | 1,310 | 2.54 | 0.19 | 8.16 [1] * |
| Computer, IT & Internet Services | 2,706 | 2.85 | 0.67 | 5.71 [1] * |
| Industrial, Electric & Electronic Machinery | 2,802 | 2.89 | 0.03 | 8.09 [1] * |
| Personal, Leisure & Business Services | 3,962 | 4.80 | 0.42 | 38.62 [1] |
| Retailing & Wholesaling | 3,759 | 2.06 | 0.24 | 11.65 [1] * |
| *Industry Aggregate* | *16,191* | *3.51* | *0.15* | *46.26* |

1 … classification according to industry leads to a lower coefficient of variance compared to an aggregate calculation
* … improvement of the coefficient of variance is significant at the 0.05 level
N … number of analyzed transactions; M … median of transaction multiples; H … harmonic mean of transaction multiples; V … coefficient of variance

**Table 2: Analysis of the reliability of "DEV/EBITDA" transaction multiples according to industry classification serving as peer group selection criterion (using the coefficient of variance V)**

| **European Region / Industry Classification** | N | M | H | V |
|---|---|---|---|---|
| **Central** | | | | |
| Banking, Insurance & Financial Services | 51 | 17.81 | 7.42 | 6.09 [1] * |
| Chemicals, Petroleum, Rubber & Plastic | 55 | 15.57 | 12.24 | 2.60 [1] * |
| Computer, IT & Internet Services | 103 | 15.10 | 20.01 | 1.40 [1] * |
| Industrial, Electric & Electronic Machinery | 213 | 16.48 | 10.06 | 4.16 [1] * |
| Personal, Leisure & Business Services | 93 | 13.74 | 9.41 | 2.31 [1] * |
| Retailing & Wholesaling | 90 | 8.56 | 11.44 | 6.68 [1] * |
| *Industry Aggregate* | *605* | *14.75* | *10.91* | *15.99* |
| **West** | | | | |
| Banking, Insurance & Financial Services | 66 | 23.31 | 11.21 | 5.11 [1] * |
| Chemicals, Petroleum, Rubber & Plastic | 173 | 35.64 | 90.17 | 3.51 [1] * |
| Computer, IT & Internet Services | 551 | 22.42 | 9.70 | 5.08 [1] * |
| Industrial, Electric & Electronic Machinery | 378 | 14.68 | 0.76 | 10.30 [1] * |
| Personal, Leisure & Business Services | 579 | 17.61 | 9.28 | 3.89 [1] * |
| Retailing & Wholesaling | 443 | 11.91 | 4.85 | 16.66 [1] |
| *Industry Aggregate* | *2,190* | *17.70* | *3.08* | *21.06* |
| **South** | | | | |
| Banking, Insurance & Financial Services | 129 | 14.02 | 9.04 | 2.70 [1] * |
| Chemicals, Petroleum, Rubber & Plastic | 211 | 41.32 | 18.36 | 2.21 [1] * |
| Computer, IT & Internet Services | 271 | 22.36 | 18.83 | 1.54 [1] * |
| Industrial, Electric & Electronic Machinery | 352 | 20.61 | 8.58 | 4.48 [1] |
| Personal, Leisure & Business Services | 519 | 22.88 | 10.38 | 6.85 |
| Retailing & Wholesaling | 496 | 20.61 | 13.61 | 3.33 [1] |
| *Industry Aggregate* | *1,978* | *21.50* | *11.80* | *6.04* |
| **North** | | | | |
| Banking, Insurance & Financial Services | 85 | 33.53 | 5.25 | 1.73 [1] * |
| Chemicals, Petroleum, Rubber & Plastic | 38 | 20.15 | 13.47 | 1.20 [1] * |
| Computer, IT & Internet Services | 350 | 19.45 | 1.63 | 11.37 |
| Industrial, Electric & Electronic Machinery | 227 | 25.05 | 17.89 | 3.87 [1] * |
| Personal, Leisure & Business Services | 278 | 23.79 | 0.35 | 9.79 |
| Retailing & Wholesaling | 217 | 15.43 | 5.98 | 6.08 [1] |
| *Industry Aggregate* | *1,195* | *21.05* | *1.15* | *8.76* |

| | | | | |
|---|---|---|---|---|
| **Central East** | | | | |
| Banking, Insurance & Financial Services | 53 | 17.02 | 10.94 | 1.90 [1] |
| Chemicals, Petroleum, Rubber & Plastic | 43 | 8.66 | 0.05 | 2.04 [1] |
| Computer, IT & Internet Services | 99 | 8.38 | 1.55 | 2.38 [1] |
| Industrial, Electric & Electronic Machinery | 45 | 10.95 | 5.28 | 1.32 [1] * |
| Personal, Leisure & Business Services | 101 | 11.31 | 7.68 | 3.23 [1] |
| Retailing & Wholesaling | 155 | 11.55 | 0.08 | 3.68 [1] |
| *Industry Aggregate* | *496* | *11.39* | *0.17* | *3.72* |
| **South East** | | | | |
| Banking, Insurance & Financial Services | 69 | 14.98 | 6.83 | 6.10 |
| Chemicals, Petroleum, Rubber & Plastic | 96 | 11.49 | 8.27 | 1.46 [1] * |
| Computer, IT & Internet Services | 46 | 9.57 | 4.50 | 2.23 [1] * |
| Industrial, Electric & Electronic Machinery | 97 | 14.23 | 7.20 | 2.49 [1] |
| Personal, Leisure & Business Services | 131 | 10.13 | 3.31 | 3.15 [1] |
| Retailing & Wholesaling | 240 | 12.11 | 2.61 | 3.13 [1] |
| *Industry Aggregate* | *679* | *11.34* | *3.84* | *4.72* |
| **East** | | | | |
| Banking, Insurance & Financial Services | 11 | 15.58 | 55.07 | 2.24 [1] |
| Chemicals, Petroleum, Rubber & Plastic | 7 | 20.58 | 16.57 | 1.69 [1] |
| Computer, IT & Internet Services | 6 | 13.49 | 14.53 | 1.70 [1] |
| Industrial, Electric & Electronic Machinery | 13 | 3.89 | 4.36 | 3.00 [1] |
| Personal, Leisure & Business Services | 7 | 5.94 | 6.78 | 2.36 [1] |
| Retailing & Wholesaling | 28 | 9.27 | 8.60 | 2.03 [1] |
| *Industry Aggregate* | *72* | *9.38* | *8.64* | *3.70* |
| **European Aggregate** | | | | |
| Banking, Insurance & Financial Services | 464 | 17.18 | 18.14 | 6.04 [1] * |
| Chemicals, Petroleum, Rubber & Plastic | 623 | 20.58 | 0.67 | 3.44 [1] * |
| Computer, IT & Internet Services | 1,424 | 17.84 | 5.98 | 11.95 [1] * |
| Industrial, Electric & Electronic Machinery | 1,327 | 17.22 | 2.22 | 8.34 [1] * |
| Personal, Leisure & Business Services | 1,708 | 16.99 | 1.77 | 9.93 [1] * |
| Retailing & Wholesaling | 1,669 | 14.38 | 1.02 | 18.43 |
| *Industry Aggregate* | *7,215* | *16.66* | *9.69* | *18.35* |

1 … classification according to industry leads to a lower coefficient of variance compared to an aggregate calculation
* … improvement of the coefficient of variance is significant at the 0.05 level
N … number of analyzed transactions; M … median of transaction multiples; H … harmonic mean of transaction multiples; V … coefficient of variance

**Table 3: Analysis of the reliability of "DEV/EBIT" transaction multiples according to industry classification serving as peer group selection criterion (using the coefficient of variance V)**

| **European Region / Industry Classification** | N | M | H | V |
|---|---|---|---|---|
| **Central** | | | | |
| Banking, Insurance & Financial Services | 62 | 19.39 | 7.63 | 5.76 [1] * |
| Chemicals, Petroleum, Rubber & Plastic | 48 | 27.11 | 19.75 | 1.27 [1] * |
| Computer, IT & Internet Services | 89 | 22.27 | 32.70 | 1.33 [1] * |
| Industrial, Electric & Electronic Machinery | 196 | 22.07 | 14.07 | 5.56 [1] * |
| Personal, Leisure & Business Services | 86 | 21.04 | 13.58 | 2.67 [1] * |
| Retailing & Wholesaling | 85 | 12.28 | 23.42 | 6.48 [1] * |
| *Industry Aggregate* | *566* | *20.93* | *15.23* | *13.35* |
| **West** | | | | |
| Banking, Insurance & Financial Services | 100 | 17.85 | 12.84 | 6.73 [1] * |
| Chemicals, Petroleum, Rubber & Plastic | 158 | 43.70 | 53.78 | 5.33 [1] * |
| Computer, IT & Internet Services | 474 | 38.46 | 13.95 | 6.06 [1] * |
| Industrial, Electric & Electronic Machinery | 372 | 21.72 | 0.83 | 6.58 [1] * |
| Personal, Leisure & Business Services | 547 | 26.11 | 14.61 | 7.82 [1] * |
| Retailing & Wholesaling | 410 | 14.05 | 6.00 | 3.21 [1] * |
| *Industry Aggregate* | *2,061* | *24.71* | *3.48* | *14.24* |
| **South** | | | | |

| | | | | |
|---|---|---|---|---|
| Banking, Insurance & Financial Services | 123 | 14.31 | 13.06 | 4.15 [1] |
| Chemicals, Petroleum, Rubber & Plastic | 150 | 29.67 | 18.77 | 1.20 [1] * |
| Computer, IT & Internet Services | 232 | 44.67 | 16.48 | 3.31 [1] |
| Industrial, Electric & Electronic Machinery | 317 | 29.06 | 10.55 | 4.22 [1] |
| Personal, Leisure & Business Services | 444 | 25.73 | 14.74 | 3.64 [1] |
| Retailing & Wholesaling | 423 | 24.03 | 14.83 | 3.85 [1] |
| *Industry Aggregate* | *1,689* | *25.14* | *14.05* | *4.24* |
| **North** | | | | |
| Banking, Insurance & Financial Services | 110 | 17.19 | 6.85 | 2.14 [1] * |
| Chemicals, Petroleum, Rubber & Plastic | 38 | 30.15 | 17.14 | 4.06 [1] |
| Computer, IT & Internet Services | 311 | 22.03 | 1.60 | 3.06 [1] |
| Industrial, Electric & Electronic Machinery | 236 | 33.28 | 14.66 | 3.42 [1] |
| Personal, Leisure & Business Services | 287 | 27.20 | 13.14 | 3.65 [1] |
| Retailing & Wholesaling | 233 | 19.98 | 7.16 | 4.46 [1] |
| *Industry Aggregate* | *1,215* | *25.12* | *4.83* | *4.78* |
| **Central East** | | | | |
| Banking, Insurance & Financial Services | 90 | 20.05 | 8.52 | 4.32 [1] * |
| Chemicals, Petroleum, Rubber & Plastic | 122 | 14.26 | 0.17 | 1.65 [1] * |
| Computer, IT & Internet Services | 189 | 13.07 | 3.55 | 3.27 [1] * |
| Industrial, Electric & Electronic Machinery | 100 | 15.71 | 1.73 | 3.94 [1] * |
| Personal, Leisure & Business Services | 187 | 12.32 | 9.58 | 2.32 [1] * |
| Retailing & Wholesaling | 345 | 16.07 | 0.25 | 3.03 [1] * |
| *Industry Aggregate* | *1,033* | *15.10* | *0.50* | *8.42* |
| **South East** | | | | |
| Banking, Insurance & Financial Services | 92 | 12.18 | 5.70 | 3.46 [1] |
| Chemicals, Petroleum, Rubber & Plastic | 94 | 12.63 | 6.10 | 1.93 [1] * |
| Computer, IT & Internet Services | 50 | 17.97 | 2.80 | 4.64 [1] |
| Industrial, Electric & Electronic Machinery | 102 | 19.97 | 8.19 | 3.60 [1] |
| Personal, Leisure & Business Services | 148 | 13.74 | 3.99 | 3.86 [1] |
| Retailing & Wholesaling | 243 | 12.36 | 2.44 | 6.21 |
| *Industry Aggregate* | *729* | *13.56* | *3.67* | *5.27* |
| **East** | | | | |
| Banking, Insurance & Financial Services | 91 | 252.49 | 8.85 | 1.70 [1] * |
| Chemicals, Petroleum, Rubber & Plastic | 195 | 9.14 | 1.09 | 10.85 [1] |
| Computer, IT & Internet Services | 79 | 14.04 | 4.22 | 8.37 [1] |
| Industrial, Electric & Electronic Machinery | 125 | 9.63 | 2.28 | 3.41 [1] * |
| Personal, Leisure & Business Services | 289 | 10.15 | 3.33 | 14.98 |
| Retailing & Wholesaling | 471 | 18.55 | 6.02 | 11.77 |
| *Industry Aggregate* | *1,250* | *13.76* | *2.38* | *11.56* |
| **European Aggregate** | | | | |
| Banking, Insurance & Financial Services | 668 | 18.16 | 4.65 | 5.00 [1] * |
| Chemicals, Petroleum, Rubber & Plastic | 805 | 17.49 | 1.55 | 8.21 [1] * |
| Computer, IT & Internet Services | 1,424 | 25.19 | 8.22 | 29.35 |
| Industrial, Electric & Electronic Machinery | 1,448 | 21.42 | 2.30 | 11.45 [1] * |
| Personal, Leisure & Business Services | 1,988 | 20.16 | 8.32 | 32.71 |
| Retailing & Wholesaling | 2,210 | 17.07 | 2.06 | 18.66 [1] |
| *Industry Aggregate* | *8,543* | *19.37* | *24.28* | *18.82* |

1 … classification according to industry leads to a lower coefficient of variance compared to an aggregate calculation

* … improvement of the coefficient of variance is significant at the 0.05 level

N … number of analyzed transactions; M … median of transaction multiples; H … harmonic mean of transaction multiples; V … coefficient of variance

### 4.2 Firm size serving as a peer group selection criterion: its impact on the reliability of transaction multiples

Some business appraisers apply the firm size as another primary selection criterion. The classification of the size of a privately held business itself can be based on different criteria, especially the (operating) sales, the sum of the balance sheet or the number of employees. In doing so, it is usually found helpful to place a size restriction of no more than 10 to 25 times the sales volume of the target business (Trugman, 2012). In the analysis shown in tables 4 to 6(each table again shows the calculation of one of the three different types of regarded transaction multiples) the classification is based on the operating sales following the recommended size classification of the European Union 2003/361/EG, dividing businesses into small, medium and large sized businesses. The T-test shows the intensity of improvement of the firm size-related transaction multiples instead of an aggregate calculation.

Moreover, the analysis indicates that the classification of the transaction multiples according to the firm size in most cases leads to a lower coefficient of variance (see the "1" behind the coefficient of variance). Transaction multiples that are based on a firm size classification of the comparable businesses therefore are more reliable. This is empirical evidence that also justifies the size classification as a (primary) selection criterion for the assessment of comparability. The same was found in an analysis conducted by Grbenic and Zunk (2012)for the Central European countries Austria, Germany and Switzerland. The results also show that the improvement in many cases is significant (marked with an asterisk behind the coefficient of variance).

**Table 4: Analysis of the reliability of "DEV/Sales" transaction multiples according to firm size serving as peer group selection criterion (using the coefficient of variance V)**

| European Region / Firm Size | N | M | H | V |
|---|---|---|---|---|
| **Central** | | | | |
| Small Sized Enterprises | 448 | 20.41 | 1.57 | 9.48 [1] * |
| Medium Sized Enterprises | 301 | 4.65 | 4.08 | 2.03 [1] * |
| Large Sized Enterprises | 552 | 1.32 | 0.54 | 2.96 [1] * |
| *Firm Size Aggregate* | *1,301* | *3.40* | *0.94* | *15.48* |
| **West** | | | | |
| Small Sized Enterprises | 940 | 17.04 | 2.11 | 12.93 [1] * |
| Medium Sized Enterprises | 828 | 4.09 | 1.38 | 18.62 [1] |
| Large Sized Enterprises | 1,661 | 1.46 | 0.66 | 2.87 [1] * |
| *Firm Size Aggregate* | *3,429* | *3.01* | *0.96* | *24.59* |
| **South** | | | | |
| Small Sized Enterprises | 1,025 | 47.50 | 2.92 | 6.08 [1] * |
| Medium Sized Enterprises | 570 | 3.21 | 0.95 | 2.60 [1] * |
| Large Sized Enterprises | 1,637 | 3.76 | 1.57 | 2.99 [1] * |
| *Firm Size Aggregate* | *3,232* | *7.15* | *1.62* | *10.24* |
| **North** | | | | |
| Small Sized Enterprises | 2,182 | 22.67 | 1.30 | 8.80 [1] |
| Medium Sized Enterprises | 642 | 5.68 | 0.11 | 9.25 [1] |
| Large Sized Enterprises | 827 | 2.47 | 0.86 | 3.83 [1] * |
| *Firm Size Aggregate* | *3,651* | *9.45* | *0.42* | *11.02* |
| **Central East** | | | | |
| Small Sized Enterprises | 841 | 3.24 | 2.33 | 10.33 [1] |
| Medium Sized Enterprises | 442 | 0.99 | 0.25 | 3.94 [1] * |
| Large Sized Enterprises | 438 | 0.89 | 0.02 | 1.11 [1] * |
| *Firm Size Aggregate* | *1,721* | *1.46* | *0.08* | *14.22* |
| **South East** | | | | |
| Small Sized Enterprises | 634 | 3.41 | 0.87 | 20.54 [1] * |
| Medium Sized Enterprises | 184 | 1.08 | 0.01 | 2.09 [1] * |
| Large Sized Enterprises | 385 | 0.74 | 1.36 | 3.23 [1] * |
| *Firm Size Aggregate* | *1,203* | *1.52* | *0.01* | *28.28* |
| **East** | | | | |
| Small Sized Enterprises | 635 | 4.18 | 0.29 | 3.99 [1] |
| Medium Sized Enterprises | 304 | 1.18 | 1.60 | 2.83 [1] * |
| Large Sized Enterprises | 715 | 1.26 | 0.06 | 2.02 [1] * |
| *Firm Size Aggregate* | *1,654* | *1.57* | *0.12* | *6.21* |
| **European Aggregate** | | | | |
| Small Sized Enterprises | 6,705 | 13.48 | 1.11 | 30.06 [1] * |
| Medium Sized Enterprises | 3,271 | 2.59 | 0.03 | 24.02 [1] * |
| Large Sized Enterprises | 6,215 | 1.73 | 1.01 | 3.47 [1] * |
| *Firm Size Aggregate* | *16,191* | *3.51* | *0.15* | *46.26* |

1 … classification according to size of the business leads to a lower coefficient of variance compared to an aggregate calculation

* … improvement of the coefficient of variance is significant at the 0.05 level

N … number of analyzed transactions; M … median of transaction multiples; H … harmonic mean of transaction multiples; V … coefficient of variance

**Table 5: Analysis of the reliability of "DEV/EBITDA" transaction multiples according to firm size serving as peer group selection criterion (using the coefficient of variance V)**

| European Region / Firm Size | N | M | H | V |
|---|---|---|---|---|
| **Central** | | | | |
| Small Sized Enterprises | 74 | 33.45 | 17.41 | 5.81 [1] * |
| Medium Sized Enterprises | 122 | 15.50 | 16.61 | 2.88 [1] * |
| Large Sized Enterprises | 409 | 12.56 | 9.33 | 1.65 [1] * |
| *Firm Size Aggregate* | *605* | *14.75* | *10.91* | *15.99* |
| **West** | | | | |
| Small Sized Enterprises | 295 | 34.10 | 13.61 | 10.06 [1] * |
| Medium Sized Enterprises | 474 | 25.99 | 6.90 | 3.02 [1] * |
| Large Sized Enterprises | 1,421 | 13.85 | 2.29 | 3.55 [1] * |
| *Firm Size Aggregate* | *2,190* | *17.70* | *3.08* | *21.06* |
| **South** | | | | |
| Small Sized Enterprises | 333 | 46.66 | 10.78 | 3.13 [1] * |
| Medium Sized Enterprises | 433 | 21.04 | 10.91 | 1.68 [1] * |
| Large Sized Enterprises | 1,212 | 19.54 | 12.49 | 6.98 |
| *Firm Size Aggregate* | *1,978* | *21.50* | *11.80* | *6.04* |
| **North** | | | | |
| Small Sized Enterprises | 437 | 26.69 | 2.29 | 6.04 [1] |
| Medium Sized Enterprises | 306 | 23.50 | 0.39 | 2.93 [1] * |
| Large Sized Enterprises | 452 | 17.79 | 7.65 | 1.72 [1] * |
| *Firm Size Aggregate* | *1,195* | *21.05* | *1.15* | *8.76* |
| **Central East** | | | | |
| Small Sized Enterprises | 216 | 14.27 | 4.47 | 3.41 [1] |
| Medium Sized Enterprises | 118 | 11.03 | 6.78 | 2.20 [1] |
| Large Sized Enterprises | 162 | 10.51 | 0.06 | 2.85 [1] |
| *Firm Size Aggregate* | *496* | *11.39* | *0.17* | *3.72* |
| **South East** | | | | |
| Small Sized Enterprises | 343 | 11.39 | 3.11 | 6.18 |
| Medium Sized Enterprises | 119 | 10.34 | 3.93 | 2.36 [1] |
| Large Sized Enterprises | 217 | 12.01 | 5.98 | 3.36 [1] |
| *Firm Size Aggregate* | *679* | *11.34* | *3.84* | *4.72* |
| **East** | | | | |
| Small Sized Enterprises | 29 | 41.33 | 17.62 | 2.64 [1] |
| Medium Sized Enterprises | 15 | 15.58 | 10.64 | 3.26 [1] |
| Large Sized Enterprises | 28 | 6.95 | 5.31 | 0.90 [1] * |
| *Firm Size Aggregate* | *72* | *9.38* | *8.64* | *3.70* |
| **European Aggregate** | | | | |
| Small Sized Enterprises | 1,727 | 22.69 | 5.55 | 12.33 [1] * |
| Medium Sized Enterprises | 1,587 | 19.00 | 1.66 | 3.23 [1] * |
| Large Sized Enterprises | 3,901 | 14.81 | 1.94 | 8.03 [1] * |
| *Firm Size Aggregate* | *7,215* | *16.66* | *9.69* | *18.35* |

1 … classification according to size of the business leads to a lower coefficient of variance compared to an aggregate calculation

* … improvement of the coefficient of variance is significant at the 0.05 level

N … number of analyzed transactions; M … median of transaction multiples; H … harmonic mean of transaction multiples; V … coefficient of variance

**Table 6: Analysis of the reliability (coefficient of variance) of "DEV/EBIT" transaction multiples according to firm size serving as peer group selection criterion (using the coefficient of variance V)**

| **European Region / Firm Size** | N | M | H | V |
|---|---|---|---|---|
| **Central** | | | | |
| Small Sized Enterprises | 69 | 51.63 | 17.14 | 5.63 [1] * |
| Medium Sized Enterprises | 114 | 18.97 | 20.26 | 2.60 [1] * |
| Large Sized Enterprises | 383 | 17.44 | 13.92 | 7.43 [1] * |
| *Firm Size Aggregate* | *566* | *20.93* | *15.23* | *13.35* |
| **West** | | | | |
| Small Sized Enterprises | 260 | 47.58 | 18.72 | 5.38 [1] * |
| Medium Sized Enterprises | 448 | 33.23 | 8.89 | 7.16 [1] * |
| Large Sized Enterprises | 1,353 | 19.91 | 2.56 | 4.11 [1] * |
| *Firm Size Aggregate* | *2,061* | *24.71* | *3.48* | *14.24* |
| **South** | | | | |
| Small Sized Enterprises | 291 | 66.89 | 14.11 | 3.11 [1] |
| Medium Sized Enterprises | 389 | 40.40 | 16.30 | 3.29 [1] |
| Large Sized Enterprises | 1,009 | 20.14 | 13.33 | 4.86 |
| *Firm Size Aggregate* | *1,689* | *25.14* | *14.05* | *4.24* |
| **North** | | | | |
| Small Sized Enterprises | 414 | 37.03 | 2.40 | 4.08 [1] |
| Medium Sized Enterprises | 274 | 25.09 | 13.67 | 3.13 [1] |
| Large Sized Enterprises | 527 | 21.84 | 8.89 | 3.86 [1] |
| *Firm Size Aggregate* | *1,215* | *25.12* | *4.83* | *4.78* |
| **Central East** | | | | |
| Small Sized Enterprises | 328 | 18.09 | 12.68 | 3.74 [1] * |
| Medium Sized Enterprises | 316 | 14.69 | 2.48 | 3.02 [1] * |
| Large Sized Enterprises | 389 | 14.97 | 0.18 | 8.44 |
| *Firm Size Aggregate* | *1,033* | *15.10* | *0.50* | *8.42* |
| **South East** | | | | |
| Small Sized Enterprises | 342 | 16.75 | 3.20 | 4.44 [1] |
| Medium Sized Enterprises | 135 | 12.05 | 6.87 | 2.01 [1] * |
| Large Sized Enterprises | 252 | 10.66 | 3.50 | 6.92 |
| *Firm Size Aggregate* | *729* | *13.56* | *3.67* | *5.27* |
| **East** | | | | |
| Small Sized Enterprises | 375 | 33.46 | 2.16 | 11.14 [1] |
| Medium Sized Enterprises | 201 | 17.76 | 31.43 | 2.81 [1] * |
| Large Sized Enterprises | 674 | 9.85 | 1.93 | 4.53 [1] * |
| *Firm Size Aggregate* | *1,250* | *13.76* | *2.38* | *11.56* |
| **European Aggregate** | | | | |
| Small Sized Enterprises | 2,079 | 28.53 | 4.47 | 19.30 |
| Medium Sized Enterprises | 1,877 | 21.61 | 7.58 | 8.87 [1] * |
| Large Sized Enterprises | 4,587 | 16.37 | 4.31 | 7.16 [1] * |
| *Firm Size Aggregate* | *8,543* | *19.37* | *24.28* | *18.82* |

1 … classification according to size of the business leads to a lower coefficient of variance compared to an aggregate calculation

* … improvement of the coefficient of variance is significant at the 0.05 level

N … number of analyzed transactions; M … median of transaction multiples; H … harmonic mean of transaction multiples; V … coefficient of variance

In addition to the finding that the classification of the businesses according to their size can improve the reliability of the transaction multiples, the data analysis also shows that smaller businesses are regularly sold at higher transaction multiples than larger businesses. This is remarkable in so far as both the valuation theorists and business appraisers are trying to find any size-related empirical evidence that would allow for a data based reduction of the (fair) market value of small and medium sized enterprises.

Exemplarily, the Morningstar Studies and the Duff & Phelps Studies conducted with data from the US stock market provide empirical evidence (Pratt and Grabowski, 2010). Therein the proposed methods are (i) the adjustment of the beta, in view of the weaker or even lacking capability of the owner of a smaller business to diversify his investment, in the form of the total beta or in the form of a combination of the standard and the total beta (Kerins, Smith and Smith, 2004; Damodaran, 2006; Balz and Bordemann, 2007), (ii) the modification of the Capital Asset Pricing Model by integrating a size premium to take into consideration the higher risk of smaller businesses (Schulz, 2009) or(iii) to raise the market risk premium as a result of the reduced leverage of the owner of a smaller business and/or as a result of the higher cost of equity (Knoll, 2010). The justification of all these efforts is said to be found in the facts that (i) different sizes of businesses lead to different growth rates and as a result of that regularly to higher risks for smaller business, that (ii) smaller businesses usually show a poorer cost structure, that (iii) the management of smaller businesses is less professional and effective, that(iv) smaller businesses face a poorer diversification of products and markets and that (v) larger businesses often diversify by doing their business in several markets and/or industries (Pratt, 2005;Damodaran, 2010).

The finding that smaller businesses sell at higher transaction multiples than larger businesses leads to the conclusion that the transaction prices and hence also the transaction multiples generated for smaller businesses reflect a larger number of effects on the transaction price than there are reflected for larger businesses. Compared to the United States of America where it is believed that smaller companies in most industries tend to sell at lower transaction multiples of most financial value drivers than larger companies, this is an interesting finding (Pratt, 2005). While the transaction multiples of larger businesses especially reflect financial effects covered by the cash flow, the transaction multiples of smaller businesses also reflect non-financial factors. This empirical evidence leads to further conclusions: (i) the (fair) market values calculated in accordance with the nowadays used valuation methods provide a far poorer validity for smaller businesses than for larger businesses, (ii) the size of the business has to be taken into consideration when forming the peer group and (iii) the target business and the comparable businesses have to belong at least to the same sizeclass.

### 4.3 Improvement of the reliability of transaction multiples through a combination of industry classification and firm size as peer group selection criteria

On the basis of the presented results either the industry classification or the size classification of the business can improve the reliability of the calculated transaction multiples. For that reason, it is also tested if the combination of the two classification criteria leads to the highest reliability of the transaction multiples. The results for the six specified industries presented for small sized enterprises(table 7), medium sized enterprises(table 8), for large sized enterprises (table 9) and additionally for the “firm size aggregate” (in tables 7 to 9) show the median, the harmonic mean and the coefficient of variance of the calculated transaction multiples (solely for the DEV/Sales Multiple). The results of the T-test indicate whether the improvement of the coefficient of variance is significant on the 5 % level of significance. The analysis shows that the combination of the industry classification and the size classification can - in most cases - improve the reliability of the calculated transaction multiples. The coefficient of variance marked with a “3” shows an improvement compared with both classification criteria, a “2” shows an improvement compared with the size classification solely and a “1” shows an improvement compared with the industry classification solely. Transaction multiples that are based on both industry classification and size classification of the comparable businesses in these cases are most reliable. There is empirical evidence that both the industry classification and the size classification have to be used in combination as (primary) selection criteria for the comparable businesses.

When using both selection criteria - industry classification and firm size - simultaneously the improvement of the reliability of the transaction multiple is in many cases significant (marked with a triple asterisk behind the coefficient of variance) than either using only the industry classification (marked with an asterisk behind the coefficient of variance) or only the firm size as classification criterion (marked with a double asterisk behind the coefficient of variance).

**Table 7: Analysis of the reliability of "DEV/Sales" transaction multiples according to the combination of industry classification and firm size serving as peer group selection criteria for small sized enterprises (using the coefficient of variance V)**

[5]

| European Region / Industry Classification | N | M | H | V |
|---|---|---|---|---|
| **Central** | | | | |
| Banking, Insurance & Financial Services | 73 | 16.82 | 14.95 | 10.17 [1] |
| Chemicals, Petroleum, Rubber & Plastic | 30 | 229.45 | 21.24 | 2.95 [3] ** |
| Computer, IT & Internet Services | 92 | 14.20 | 0.42 | 2.14 [3] ** |
| Industrial, Electric & Electronic Machinery | 80 | 14.05 | 2.90 | 2.21 [3] ** |
| Personal, Leisure & Business Services | 150 | 38.32 | 4.98 | 3.62 [3] ** |
| Retailing & Wholesaling | 23 | 5.57 | 1.65 | 3.27 [3] *** |
| *Industry Aggregate* | *448* | *20.41* | *1.57* | *9.48* |
| **West** | | | | |
| Banking, Insurance & Financial Services | 119 | 98.54 | 23.88 | 4.59 [1] ** |
| Chemicals, Petroleum, Rubber & Plastic | 43 | 42.41 | 2.46 | 2.40 [3] *** |
| Computer, IT & Internet Services | 275 | 5.75 | 2.06 | 3.97 [3] ** |
| Industrial, Electric & Electronic Machinery | 130 | 11.87 | 5.48 | 4.47 [3] *** |
| Personal, Leisure & Business Services | 232 | 18.65 | 1.05 | 15.04 |
| Retailing & Wholesaling | 142 | 28.36 | 2.90 | 3.16 [3] *** |
| *Industry Aggregate* | *940* | *17.04* | *2.11* | *12.93* |
| **South** | | | | |
| Banking, Insurance & Financial Services | 229 | 76.45 | 10.49 | 2.99 [3] ** |
| Chemicals, Petroleum, Rubber & Plastic | 43 | 13.06 | 61.05 | 5.30 [3] * |
| Computer, IT & Internet Services | 168 | 11.63 | 1.87 | 4.67 [3] |
| Industrial, Electric & Electronic Machinery | 133 | 40.41 | 4.70 | 4.68 [3] |
| Personal, Leisure & Business Services | 241 | 26.35 | 2.38 | 4.25 [3] |
| Retailing & Wholesaling | 211 | 147.13 | 1.92 | 8.44 [3] * |
| *Industry Aggregate* | *1,025* | *47.50* | *2.92* | *6.08* |
| **North** | | | | |
| Banking, Insurance & Financial Services | 245 | 44.73 | 27.10 | 10.46 [1] |
| Chemicals, Petroleum, Rubber & Plastic | 44 | 67.96 | 4.10 | 1.95 [3] ** |
| Computer, IT & Internet Services | 497 | 9.17 | 0.41 | 3.45 [3] ** |
| Industrial, Electric & Electronic Machinery | 411 | 34.06 | 4.38 | 3.50 [3] ** |
| Personal, Leisure & Business Services | 697 | 22.12 | 4.35 | 5.05 [3] ** |
| Retailing & Wholesaling | 288 | 35.42 | 1.33 | 4.08 [3] ** |
| *Industry Aggregate* | *2,182* | *22.67* | *1.30* | *8.80* |
| **Central East** | | | | |
| Banking, Insurance & Financial Services | 130 | 14.53 | 2.33 | 7.04 [3] |
| Chemicals, Petroleum, Rubber & Plastic | 52 | 4.35 | 0.90 | 2.27 [3] ** |
| Computer, IT & Internet Services | 191 | 2.90 | 0.66 | 4.58 [3] ** |
| Industrial, Electric & Electronic Machinery | 74 | 2.97 | 0.79 | 2.12 [3] ** |
| Personal, Leisure & Business Services | 200 | 2.05 | 2.17 | 3.08 [3] ** |
| Retailing & Wholesaling | 194 | 2.32 | 0.55 | 3.37 [3] ** |
| *Industry Aggregate* | *841* | *3.24* | *2.33* | *10.33* |
| **South East** | | | | |
| Banking, Insurance & Financial Services | 101 | 26.38 | 28.93 | 2.94 [3] ** |
| Chemicals, Petroleum, Rubber & Plastic | 51 | 2.46 | 1.50 | 2.85 [3] ** |
| Computer, IT & Internet Services | 40 | 4.00 | 0.95 | 4.41 [3] ** |
| Industrial, Electric & Electronic Machinery | 104 | 2.97 | 1.14 | 2.98 [3] ** |
| Personal, Leisure & Business Services | 146 | 3.23 | 0.82 | 11.95 [3] ** |
| Retailing & Wholesaling | 192 | 1.79 | 0.51 | 4.87 [3] ** |
| *Industry Aggregate* | *634* | *3.41* | *0.87* | *20.54* |
| **East** | | | | |
| Banking, Insurance & Financial Services | 89 | 74.16 | 0.29 | 2.40 [3] |
| Chemicals, Petroleum, Rubber & Plastic | 25 | 8.48 | 1.20 | 3.47 [3] * |
| Computer, IT & Internet Services | 33 | 5.05 | 0.75 | 3.77 [3] |
| Industrial, Electric & Electronic Machinery | 56 | 1.14 | 0.18 | 2.19 [3] |
| Personal, Leisure & Business Services | 217 | 3.86 | 0.32 | 3.90 [3] |

| | | | | |
|---|---|---|---|---|
| Retailing & Wholesaling | 215 | 2.43 | 0.26 | 3.85 [3] |
| *Industry Aggregate* | *635* | *4.18* | *0.29* | *3.99* |
| **European Aggregate** | | | | |
| Banking, Insurance & Financial Services | 986 | 66.56 | 2.61 | 13.13 [3] ** |
| Chemicals, Petroleum, Rubber & Plastic | 288 | 11.85 | 2.04 | 4.47 [3] * |
| Computer, IT & Internet Services | 1,296 | 7.33 | 0.90 | 4.36 [3] ** |
| Industrial, Electric & Electronic Machinery | 988 | 14.83 | 1.49 | 5.20 [3] ** |
| Personal, Leisure & Business Services | 1,882 | 12.80 | 1.29 | 28.11 [3] * |
| Retailing & Wholesaling | 1,265 | 7.12 | 0.64 | 6.97 [3] ** |
| *Industry Aggregate* | *6,705* | *13.48* | *1.11* | *30.06* |

1 … improvement compared with the industry classification only; 2 … improvement compared with the size classification only; 3 … improvement compared with both classification
* … improvement compared with the industry classification is only significant at a 0.05 level; ** … improvement compared with the size classification is only significant at the 0.05 level; *** … improvement compared with both industry and size classification is significant at the 0.05 level
N … number of analyzed transactions; M … median of transaction multiples; H … harmonic mean of transaction multiples; V … coefficient of variance

**Table 8: Analysis of the reliability of "DEV/Sales" transaction multiples according to the combination of industry classification and firm size serving as peer group classification criteria for medium sized enterprises (using the coefficient of variance V)**

| European Region / Industry Classification | N | M | H | V |
|---|---|---|---|---|
| **Central** | | | | |
| Banking, Insurance & Financial Services | 35 | 15.44 | 6.30 | 1.21 [3] * |
| Chemicals, Petroleum, Rubber & Plastic | 13 | 2.46 | 1.48 | 1.57 [3] * |
| Computer, IT & Internet Services | 76 | 2.27 | 1.67 | 2.49 [1] |
| Industrial, Electric & Electronic Machinery | 77 | 2.95 | 1.47 | 2.09 [1] |
| Personal, Leisure & Business Services | 71 | 6.02 | 1.97 | 1.93 [3] * |
| Retailing & Wholesaling | 29 | 35.72 | 0.39 | 0.75 [3] * |
| *Industry Aggregate* | *301* | *4.65* | *4.08* | *2.03* |
| **West** | | | | |
| Banking, Insurance & Financial Services | 44 | 22.56 | 7.43 | 2.36 [3] *** |
| Chemicals, Petroleum, Rubber & Plastic | 74 | 23.09 | 2.04 | 1.35 [3] *** |
| Computer, IT & Internet Services | 179 | 2.48 | 1.35 | 2.61 [3] *** |
| Industrial, Electric & Electronic Machinery | 148 | 2.99 | 1.20 | 1.90 [3] *** |
| Personal, Leisure & Business Services | 221 | 6.34 | 1.29 | 2.08 [3] *** |
| Retailing & Wholesaling | 162 | 3.59 | 1.22 | 11.57 [3] ** |
| *Industry Aggregate* | *828* | *4.09* | *1.38* | *18.62* |
| **South** | | | | |
| Banking, Insurance & Financial Services | 59 | 10.68 | 3.44 | 2.66 [1] |
| Chemicals, Petroleum, Rubber & Plastic | 29 | 3.12 | 1.86 | 2.16 [3] * |
| Computer, IT & Internet Services | 98 | 5.69 | 0.71 | 1.33 [3] * |
| Industrial, Electric & Electronic Machinery | 126 | 2.50 | 1.04 | 2.74 [1] * |
| Personal, Leisure & Business Services | 128 | 2.76 | 0.61 | 2.13 [3] * |
| Retailing & Wholesaling | 130 | 1.46 | 1.31 | 3.47 [1] * |
| *Industry Aggregate* | *570* | *3.21* | *0.95* | *2.60* |
| **North** | | | | |
| Banking, Insurance & Financial Services | 39 | 11.76 | 1.44 | 1.87 [3] *** |
| Chemicals, Petroleum, Rubber & Plastic | 16 | 11.62 | 6.75 | 1.19 [3] ** |
| Computer, IT & Internet Services | 159 | 3.42 | 1.40 | 2.20 [3] ** |
| Industrial, Electric & Electronic Machinery | 84 | 2.62 | 1.08 | 3.06 [3] ** |
| Personal, Leisure & Business Services | 219 | 5.32 | 0.04 | 7.13 [2] |
| Retailing & Wholesaling | 125 | 11.61 | 0.86 | 1.31 [3] ** |
| *Industry Aggregate* | *642* | *5.68* | *0.11* | *9.25* |
| **Central East** | | | | |
| Banking, Insurance & Financial Services | 40 | 4.22 | 1.82 | 2.46 [3] * |
| Chemicals, Petroleum, Rubber & Plastic | 58 | 0.70 | 0.85 | 2.67 [3] |

| | | | | |
|---|---|---|---|---|
| Computer, IT & Internet Services | 68 | 1.18 | 0.07 | 1.11 [3] *** |
| Industrial, Electric & Electronic Machinery | 68 | 0.83 | 0.51 | 2.07 [3] |
| Personal, Leisure & Business Services | 60 | 0.71 | 0.65 | 1.22 [3] *** |
| Retailing & Wholesaling | 148 | 1.05 | 0.31 | 2.16 [3] * |
| *Industry Aggregate* | *442* | *0.99* | *0.25* | *3.94* |
| **South East** | | | | |
| Banking, Insurance & Financial Services | 26 | 19.38 | 0.11 | 0.82 [3] * |
| Chemicals, Petroleum, Rubber & Plastic | 21 | 0.72 | 0.48 | 1.96 [3] * |
| Computer, IT & Internet Services | 13 | 1.69 | 0.30 | 0.93 [3] * |
| Industrial, Electric & Electronic Machinery | 35 | 0.93 | 0.01 | 1.79 [3] |
| Personal, Leisure & Business Services | 35 | 1.80 | 0.85 | 0.93 [3] * |
| Retailing & Wholesaling | 54 | 0.70 | 0.45 | 2.59 [1] * |
| *Industry Aggregate* | *184* | *1.08* | *0.01* | *2.09* |
| **East** | | | | |
| Banking, Insurance & Financial Services | 72 | 1.45 | 1.28 | 1.69 [3] |
| Chemicals, Petroleum, Rubber & Plastic | 36 | 0.53 | 0.57 | 1.48 [3] * |
| Computer, IT & Internet Services | 12 | 2.16 | 29.15 | 1.52 [3] * |
| Industrial, Electric & Electronic Machinery | 44 | 0.87 | 0.50 | 2.72 [2] |
| Personal, Leisure & Business Services | 65 | 2.16 | 1.05 | 1.41 [3] * |
| Retailing & Wholesaling | 75 | 0.80 | 0.95 | 2.61 [3] * |
| *Industry Aggregate* | *304* | *1.18* | *1.60* | *2.83* |
| **European Aggregate** | | | | |
| Banking, Insurance & Financial Services | 315 | 10.68 | 2.96 | 3.02 [3] *** |
| Chemicals, Petroleum, Rubber & Plastic | 247 | 1.62 | 1.04 | 2.34 [3] *** |
| Computer, IT & Internet Services | 605 | 2.29 | 0.42 | 2.36 [3] *** |
| Industrial, Electric & Electronic Machinery | 582 | 1.74 | 0.01 | 3.35 [3] *** |
| Personal, Leisure & Business Services | 799 | 3.64 | 0.13 | 9.01 [3] *** |
| Retailing & Wholesaling | 723 | 1.71 | 0.88 | 22.96 [1] |
| *Industry Aggregate* | *3,271* | *2.59* | *0.03* | *24.02* |

1 … improvement compared with the industry classification only; 2 … improvement compared with the size classification only; 3 … improvement compared with both classification

* … improvement compared with the industry classification is only significant at a 0.05 level; ** … improvement compared with the size classification is only significant at the 0.05 level; *** … improvement compared with both industry classification and firm sizeis significant at the 0.05 level

N … number of analyzed transactions; M … median of transaction multiples; H … harmonic mean of transaction multiples; V … coefficient of variance

**Table 9: Analysis of the reliability of "DEV/Sales" transaction multiples according to the combination of industry classification and firm size serving as peer group classification criteria for large sized enterprises (using the coefficient of variance V)**

| **European Region / Industry Classification** | N | M | H | V |
|---|---|---|---|---|
| **Central** | | | | |
| Banking, Insurance & Financial Services | 30 | 2.06 | 1.36 | 2.48 [1] * |
| Chemicals, Petroleum, Rubber & Plastic | 68 | 4.93 | 0.96 | 1.42 [3] * |
| Computer, IT & Internet Services | 65 | 1.81 | 1.93 | 0.97 [3] *** |
| Industrial, Electric & Electronic Machinery | 212 | 1.32 | 0.58 | 3.90 |
| Personal, Leisure & Business Services | 76 | 1.30 | 0.38 | 1.47 [3] * |
| Retailing & Wholesaling | 101 | 0.66 | 0.30 | 2.19 [3] * |
| *Industry Aggregate* | *552* | *1.32* | *0.54* | *2.96* |
| **West** | | | | |
| Banking, Insurance & Financial Services | 63 | 11.25 | 2.62 | 1.95 [3] * |
| Chemicals, Petroleum, Rubber & Plastic | 150 | 2.72 | 0.16 | 2.09 [3] * |
| Computer, IT & Internet Services | 334 | 1.46 | 1.01 | 1.89 [3] * |
| Industrial, Electric & Electronic Machinery | 293 | 1.32 | 0.16 | 2.26 [3] * |
| Personal, Leisure & Business Services | 464 | 1.52 | 0.66 | 2.39 [3] * |
| Retailing & Wholesaling | 357 | 1.02 | 0.60 | 2.46 [3] * |
| *Industry Aggregate* | *1,661* | *1.46* | *0.66* | *2.87* |

| | | | | |
|---|---|---|---|---|
| **South** | | | | |
| Banking, Insurance & Financial Services | 114 | 20.27 | 5.70 | 1.33 [3] * |
| Chemicals, Petroleum, Rubber & Plastic | 231 | 4.19 | 1.54 | 1.31 [3] * |
| Computer, IT & Internet Services | 125 | 1.93 | 0.79 | 1.52 [3] * |
| Industrial, Electric & Electronic Machinery | 346 | 3.74 | 1.50 | 2.25 [3] * |
| Personal, Leisure & Business Services | 397 | 9.97 | 3.92 | 3.62 [1] * |
| Retailing & Wholesaling | 424 | 2.80 | 1.12 | 1.73 [3] * |
| *Industry Aggregate* | *1,637* | *3.76* | *1.57* | *2.99* |
| **North** | | | | |
| Banking, Insurance & Financial Services | 37 | 4.97 | 7.08 | 0.71 [3] *** |
| Chemicals, Petroleum, Rubber & Plastic | 26 | 2.48 | 2.21 | 1.77 [3] |
| Computer, IT & Internet Services | 161 | 1.14 | 0.32 | 7.52 |
| Industrial, Electric & Electronic Machinery | 263 | 2.93 | 4.48 | 1.79 [3] * |
| Personal, Leisure & Business Services | 133 | 1.98 | 1.64 | 1.46 [3] *** |
| Retailing & Wholesaling | 207 | 2.27 | 0.70 | 1.99 [3] * |
| *Industry Aggregate* | *827* | *2.47* | *0.86* | *3.83* |
| **Central East** | | | | |
| Banking, Insurance & Financial Services | 27 | 2.89 | 1.46 | 0.50 [3] * |
| Chemicals, Petroleum, Rubber & Plastic | 69 | 0.78 | 0.01 | 1.39 [1] |
| Computer, IT & Internet Services | 43 | 1.67 | 21.31 | 0.69 * |
| Industrial, Electric & Electronic Machinery | 30 | 0.93 | 0.37 | 0.63 [3] * |
| Personal, Leisure & Business Services | 46 | 1.35 | 0.91 | 1.05 [3] * |
| Retailing & Wholesaling | 223 | 0.79 | 0.01 | 1.25 [1] * |
| *Industry Aggregate* | *438* | *0.89* | *0.02* | *1.11* |
| **South East** | | | | |
| Banking, Insurance & Financial Services | 60 | 0.01 | 0.06 | 2.48 [3] |
| Chemicals, Petroleum, Rubber & Plastic | 73 | 0.49 | 0.32 | 1.25 [3] *** |
| Computer, IT & Internet Services | 31 | 1.24 | 0.82 | 1.01 [3] *** |
| Industrial, Electric & Electronic Machinery | 20 | 1.11 | 3.11 | 0.99 [3] *** |
| Personal, Leisure & Business Services | 33 | 1.43 | 0.23 | 1.09 [3] *** |
| Retailing & Wholesaling | 168 | 0.77 | 0.57 | 4.17 [1] |
| *Industry Aggregate* | *385* | *0.74* | *1.36* | *3.23* |
| **East** | | | | |
| Banking, Insurance & Financial Services | 20 | 1.69 | 0.01 | 0.91 [3] * |
| Chemicals, Petroleum, Rubber & Plastic | 158 | 1.22 | 0.21 | 1.27 [3] * |
| Computer, IT & Internet Services | 46 | 1.89 | 0.72 | 1.42 [3] * |
| Industrial, Electric & Electronic Machinery | 68 | 0.65 | 0.24 | 1.99 [3] |
| Personal, Leisure & Business Services | 132 | 0.86 | 0.28 | 1.91 [3] * |
| Retailing & Wholesaling | 291 | 1.95 | 0.06 | 1.78 [3] * |
| *Industry Aggregate* | *715* | *1.26* | *0.06* | *2.02* |
| **European Aggregate** | | | | |
| Banking, Insurance & Financial Services | 351 | 3.77 | 0.03 | 2.23 [3] * |
| Chemicals, Petroleum, Rubber & Plastic | 775 | 2.10 | 0.10 | 2.45 [3] * |
| Computer, IT & Internet Services | 805 | 1.49 | 0.71 | 8.73 |
| Industrial, Electric & Electronic Machinery | 1,232 | 1.88 | 0.43 | 2.81 [3] * |
| Personal, Leisure & Business Services | 1,281 | 1.91 | 0.73 | 3.31 [3] * |
| Retailing & Wholesaling | 1,771 | 1.42 | 0.10 | 3.18 [3] * |
| *Industry Aggregate* | *6,215* | *1.73* | *1.01* | *3.47* |

1 … improvement compared with the industry classification only; 2 … improvement compared with the size classification only; 3 … improvement compared with both classification

* … improvement compared with the industry classification is only significant at a 0.05 level; ** … improvement compared with the size classification is only significant at the 0.05 level; *** … improvement compared with both industry classification and firm size is significant at the 0.05 level

N … number of analyzed transactions; M … median of transaction multiples; H … harmonic mean of transaction multiples; V … coefficient of variance

## *5. Conclusion*

As far as the formation of comparable peer groups is concerned, the results presented in this paper provide insights into the influence of the peer group selection criterion firm size on the reliability of transaction multiples, which are used to value privately held businesses. To contribute to the existing knowledge about the influence of peer group selection criteria on the reliability of the widely applied transaction multiples "DEV/Sales", "DEV/EBITDA" and "DEV/EBIT", three different cases were studied. Therefore, real data from European countries that deliver a statistically sufficient number of transaction data were analyzed (tables 1 to 9). In the first case, the influence that industry classification as single peer group selection criterion has on the reliability of the selected transaction multiples (table 1, 2 and 3) was analyzed. Then, the influence that the single peer group selection criterion firm size has on the reliability of the amount of the value of the transaction multiples "DEV/Sales", "DEV/EBITDA" and "DEV/EBIT" was investigated (table 4, 5 and 6). The results of the analysis in the third case were derived from a combination of the single criteria industry classification and firm size and were presented separately for small (table 7), medium (table 8) and large sized enterprises (table 9).

The findings indicate that using the peer group selection criterion firm size has an impact on the reliability of the transaction multiples. Furthermore, the results demonstrate that the combination of the peer group selection criteria industry classification and firm size lead to the most reliable transaction multiples to value privately held businesses. According to the results of this study, business valuation professionals as well as business appraisers should take the industry classification and firm size into account when they want to optimize the reliability of the calculated transaction multiples.

However, the presented study clearly has some limitations. Since there is no public centralized mechanism for collecting and making transaction price information available, the results of the analysis depend on the quality of the transaction data registered in mergers and acquisitions data bases. These circumstances especially have an influence on the dispersion of the calculated transaction multiples as well as on the skewness of the distribution presented in tables 1 to 9. Furthermore, it is noteworthy that this paper's calculation of the presented transaction multiples "DEV/Sales", "DEV/EBITDA" and DEV/EBIT" are based on present day data from ZEPHYR data base. The future validity of this analysis may therefore need an annual revision.

This paves the road for future research. Future studies should especially examine the impact of additional single peer group selection criteria and of their interdependencies. This could further improve the reliability of the calculated transaction multiples and subsequently the valuation of privately held businesses. Moreover, an extension of the peer group selection criteria base (i.e. the use of criteria in addition to the industry classification and the firm size) could be a promising contribution to the literature, particularly as far as knowledge about their impact on the reliability of the calculated transaction multiples is concerned. These transaction multiples could be made publicly available in a quantitative data base. Such a contribution would eventually allow for the creation of a computerized method that measures the degree of comparability of businesses. Thus it would help to answer the question if businesses should be added to the peer group or not.

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