ENHANCING MARKET VALUE ESTIMATION FOR PRIVATELY HELD COMPANIES: DIFFERENTIATED MULTIPLIERS IN THE CZECH BREWING INDUSTRY

Michal Drábek[1]✉, Pavel Syrovátka[1]

[1] *Mendel University in Brno, Czech Republic*

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ABSTRACT

The paper focuses on valuation multipliers for privately held companies, with the aim of developing and applying a methodological procedure to improve the accuracy of estimating the market value. This improvement is achieved through the differentiation of an industry multiplier using financial decomposition. We applied the proposed methodology enhancements to a dataset comprising 50 Czech breweries, estimating their market value using the discounted cash flow method. Importantly, our proposed modification to the methodology is not limited to this sample of breweries; its nature makes it a generally applicable procedure. Our results demonstrate that the application of our proposed procedure significantly enhances the accuracy of market value estimation for privately held companies, yielding an increase of 40–50% compared to the use of the median value.

KEY WORDS

privately held company, valuation, industry multiplier, differentiated multipliers, Czech breweries valuation

JEL CODES

G12, G32

1 INTRODUCTION

During highly volatile times in the stock markets, there is an increasing need to estimate whether a particular stock or even an entire stock index is undervalued or overpriced, which is evident in the number of studies dedicated specifically to crisis periods (e.g. Gandré, 2020; Boubaker et al., 2022; Tzomakas et al., 2023). Estimating the market value of an asset (including companies) generally involves three approaches: income, comparative (relative), and cost approach (IVSC, 2016). When valuing publicly traded companies, the

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relative approach using multipliers is typically the most common and straightforward way to obtain indicative value information and assess potential undervaluation (Damodaran, 2010). However, applying that relative approach to privately held companies presents certain challenges in respect of the different position and risk profile reflected in the presence of a difference in the value multiple (Goetz, 2021). Addressing these challenges and illustrating the appropriate adaptation of the relative valuation approach for privately held companies serve as the primary motivations behind our article. Despite the aforementioned challenges in using this approach, its choice is obvious to the appraisers. In general, the advantage of this valuation approach lies in its simplicity. By using a comparable company's (or industry's) multiplier and the value of a reference variable (such as profit or sales) of Company X, one can assess the market value of Company X. This approach is also useful for comparing companies within an industry. One widely used multiplier is the P/E ratio, which is the product of the market price per share (P) and net earnings per share (E). However, there are various valuation multipliers used in the relative valuation approach, such as the market price per share to sales per share (P/S) ratio or the market price per share to book value of equity per share (P/BV) ratio. Additionally, there are other multipliers based on enterprise value (i.e., the gross operational value of the company) related to relevant variables like sales, EBIT, EBITDA, and more (the multiples are generally divided into two groups: Equity- and Entity-based – see e.g. Nel et al., 2013)

As mentioned earlier, employing the relative valuation approach for privately held companies necessitates certain additional adjustments to the conventional company valuation methodology. Although the option to utilize multipliers derived from the publicly traded company sector is available, this approach may introduce biases due to disparities in risk, liquidity, and other factors between the stocks of these two company types (see Chen et al., 2015). It is naturally more appropriate for these companies to employ multipliers directly derived from data sourced from privately held companies. However, such data is often inaccessible. A method for acquiring these specific multipliers, particularly within the Czech brewing industry, is demonstrated in papers such as Drábek (2022). Yet, a significant drawback of this approach is the initial necessity to evaluate the market value of numerous privately held companies, which is a time-consuming and challenging task.

Focusing on the meticulous adjustments and enhancements of the multiplier approach holds substantial potential. This is because it can lead to more precise estimates of the market value of the privately held companies. Furthermore, the relative (market) valuation approach is preferred by valuation standards (IVSC, 2016), even though it is a less accurate method in general (Fernández, 2002). A refinement of the relative valuation approach would also yield more realistic outcomes when comparing companies within the industry or its segments. These enhancements within the relative valuation approach – the multiplier methodology – would not only be advantageous to the entities and stakeholders themselves but would also prove invaluable in valuing companies mandated by various legal regulations, such as expert opinions in instances of squeeze-outs.

In this paper, we advance the development of a methodology aimed at deriving differentiated multipliers tailored for private company valuations. Our focus is on utilizing publicly available data concerning industry multipliers sourced from publicly traded companies. This data can be sourced from fee-based databases (such as Refinitiv Eikon, Bloomberg) or publicly accessible sources (e.g., Damodaran, 2020 and 2021). However, in order to utilize these multiples for valuing privately held companies, they need to be appropriately adjusted. One approach for adjustment is the inclusion of a so-called private company discount (more details can be found in the Section 2).

Despite these adjustments, the valuation multipliers still remain at an aggregate level. The value of the valuation multiplier is established within the broader context of all companies within the industry. While an ag-

gregate multiplier, whether represented as an industry average or median, imparts valuable valuation insights for a given industry, it may not accurately capture the intricacies of a specific privately held company. It is worth adding, however, that according to Dittmann and Maug (2008), the median and the geometric mean are unbiased while the arithmetic mean is biased upward as much as the harmonic mean is biased downward (based on logarithmic errors implications).

Hence, this paper proceeds to refine differentiated estimates of valuation multipliers designed for private companies within a targeted industry. The unique financial attributes of the subject company are employed to differentiate these multiplier estimates. The primary aim of this differentiation lies in achieving reduced deviations in the valuation of the particular company, compared to using the standard industry multiplier in its average or median form.

Building on the aforementioned contexts, this article centers on enhancing and expanding the application of the methodology involving differentiated industry multipliers. This refined approach can then be harnessed more effectively in the relative valuation of companies within a specific industry. In this regard, our paper builds upon the previous research (Drábek and Syrovátka, 2022) that focused on differentiating estimates of the industry P/BV ratio for privately held companies in the Czech brewing industry. In that study, authors differentiated the industry multiplier using the P/EAT ratio and return on equity (ROE), as well as the P/EAT ratio, return on assets (ROA), and financial leverage (FL). The significant effect of differences in companies' financial characteristics on the value of the multiplier is also confirmed by the results of Henschke and Homburg (2009).

Based on the aforementioned background, the objective of this paper is to develop and apply a methodological procedure for valuing privately held companies, specifically within the Czech brewing industry, by differentiating estimates of the industry P/BV multiplier. This differentiation will be achieved through the decomposition of the P/BV multiplier into P/EAT, ROA, and FL (where "P" represents the market value of equity and "EAT" refers to earnings after taxation). The proposed methodology upgrade also incorporates the application of a private company discount (PCD), which allows for a broader and more general application of the methodology by incorporating multiples derived from publicly traded company data into the valuation of privately held companies. Additionally, the inclusion of PCD within this methodology significantly streamlines the initial calculation phase for privately held companies.

In comprehensive practical testing of the proposed valuation methodology through the lens of differentiated industry multipliers, the results were ascertained for companies operating within the Czech brewing industry in 2019. Subsequently, the same valuation methodology was applied to these companies in the subsequent year, 2020. The obtained results were then compared, and the pertinent deviations were determined and assessed as indicators of "valuation accuracy."

Aligned with the aforementioned objectives, this article encompasses two significant contributions. Firstly, we introduce an enhancement to the existing valuation methodology through the incorporation of a differentiated industry multiplier. This improvement is rooted in the decomposition of the P/BV ratio, with particular attention to the application of discounts for private companies. Secondly, we test this methodology using a specific dataset spanning the years 2019 and 2020. Within this assessment, we determine the multiplier values applicable to the valuation of privately held companies. Additionally, we undertake an evaluation and analysis of the observed deviations arising from the application of both differentiated and non-differentiated multipliers.

Our findings demonstrate that the application of our proposed procedure significantly enhances the accuracy of market value estimation for privately held companies, with an average increase ranging from 20% to 80% compared to using the aggregate value for the industry, and a

40–50% increase compared to using the median value.

The paper is structured as follows: Section 2 presents the literature review of relevant studies. Section 3 provides an overview of the data and methods employed. Section 4 presents the results of our analysis. The robustness of our findings is examined in Section 5, while Section 6 discusses the results in relation to other studies and the applicability of our findings. Finally, Section 7 concludes the paper, followed by the appendices.

2 LITERATURE REVIEW

Several authors have discussed the use of P/BV valuation multipliers for various purposes. For instance, Monroy-Perdomo et al. (2022) conducted research on the Colombian market, focusing on the formalization of a new methodology for predicting stock trends based on the industry P/BV ratio. They explored the relationship between the market and book value of a stock/company's equity, along with other financial ratios (such as ROA, ROE), to predict market value creation.

Drábek and Syrovátka (2022) also examined this area in the context of the Czech brewing industry. They estimated the valuation multiplier for the industry using the P/BV ratio and compared its direct application with its decomposition through selected financial ratios (P/EAT, ROA, and financial leverage). Additionally, their paper outlined the potential for applying this differentiation to facilitate comparisons across industries.

The relationship between P/BV (or Tobin's Q) and financial ratios was also explored by González et al. (2020) to assess the impact of risk management implementation in listed companies.

In the context of Kuwaiti publicly traded companies, Al-Hares et al. (2012) analyzed value drivers such as book value of equity, earnings, and dividends, and their influence on the firm's market value. Essentially, they combined similar indicators to examine their effects. Furthermore, Ball et al. (2020) provided evidence that market-to-book strategies are effective, particularly through the consideration of retained earnings.

Park and Lee (2003) conducted an analysis on the accuracy of different relative valuation models and found that the P/BV ratio has the highest predictive ability. However, these conclusions are based on Japanese capital market data from almost 20 years ago. A more recent perspective on the market-to-book approach is presented by Ho et al. (2022), although their research primarily focuses on financial companies. The effectiveness of the market-to-book ratio in predicting the market value of publicly traded stocks in different markets is further supported by Cakici et al. (2015), who specifically examine the Chinese capital market.

In this paper, we will also utilize the association of the P/BV valuation multiple (or market-to-book) with other financial ratios. However, our approach differs significantly from the previously mentioned authors. Our objective is to differentiate the industry P/BV multiple in order to determine the market value of privately held companies. The main distinction arises from the lack of market value data (P) and corresponding P/BV multiple data for privately held companies. As we highlighted in the Introduction, using multiples derived from publicly traded companies is generally inappropriate due to differences in size, resource accessibility, risk levels, diversification opportunities, and other factors. This discrepancy is often referred to as the private company discount, as multiples for publicly traded companies tend to be higher than those for privately held companies.

Several studies have provided evidence supporting the existence of the private company discount. Examples include research conducted by Koeplin et al. (2005), Paglia and Harjoto (2010), and Klein and Scheibel (2012). Another valuable source of data on the private company discount is FactSet Mergerstat (2021), which compiles transaction information from both privately held and publicly traded companies

worldwide, allowing for the calculation of the private company discount based on these transactions.

From the aforementioned information, it is apparent that multiples derived from publicly traded companies can be utilized in the valuation of privately held companies, provided that a private company discount is applied. However, determining the appropriate level of discount poses a challenge due to considerable variations in the results reported by the authors cited above (ranging from 5% to 70%). Furthermore, these studies indicate that the discount level may differ between the US, the euro area, and emerging markets. Thus, we recognize the necessity of applying the private company discount when utilizing multiples derived from publicly traded company data. However, considering the specific nature of our sample data (as described in the Methods and Data section below), we opt to calculate our own multiples for privately held companies rather than relying on the wide range of figures found in existing literature.

3 METHODS AND DATA

Our initial dataset comprises 50 privately held companies operating within the brewing industry in the Czech Republic. The selection of this industry was based on the methodological procedure used, which requires an individual valuation of each company. In this regard, the chosen industry represents an ideal sample. It encompasses a sufficiently large number of companies while remaining manageable in terms of the valuation workload for each entity. Furthermore, this industry provides access to a substantial volume of analytical data, industry forecasts, and accounting information for individual companies. This abundance of data contributes to upholding the high credibility and reliability of the valuations performed. These 50 companies collectively accounting for over 99% of that industry's total turnover. However, for the purpose of the methodological procedure outlined below, it is necessary to make certain adjustments to the underlying dataset.

When analyzing the data for individual companies, we observed significant differences between the majority of medium and small breweries (44 in total) and the top 6 breweries in the industry under investigation. These top breweries, which are mostly large holding companies in terms of revenue and market capitalization, are comparable in size to publicly traded companies. Consequently, their valuation characteristics align closely with those of publicly traded companies, as indicated by their valuation multiples. Since our focus is primarily on privately held companies, especially those with distinct characteristics that differ from publicly traded companies, the inclusion of these top 6 breweries in our data sample could introduce bias. Therefore, we have excluded them from our analysis.

Another adjustment to the data was made by excluding loss-making companies, for the following reasons:

1. The use of the discounted cash flow (DCF) method to estimate market value is inappropriate for loss-making companies due to potential non-compliance with the going concern principle.
2. Loss-making companies may report a positive price-to-earnings after taxation (P/EAT) ratio as a result of multiplying two negative values. However, positive values obtained through this method do not align with the context of our calculations.
3. Publicly available databases of multiples for publicly traded companies typically include only profitable companies. To ensure comparability with these databases and facilitate the generalization of our proposed methodological upgrade, which involves the application of available multiples for publicly traded companies in conjunction with the private company discount (PCD), it is necessary to apply the same reduction to our dataset.

After excluding the top 6 brewery companies and all loss-making companies, our data sample consists of 26 companies in 2019 and 23 companies in 2020. However, we will also work with datasets that include the loss-making companies and the top 6 companies to compare the impact of our proposals on individual subsets of data. This comparison will enable us to evaluate the level of refinement achieved through the application of differentiated estimations to loss-making companies or companies that are not publicly traded but closely resemble publicly traded ones in terms of size and profile.

Following the application of the aforementioned reductions to the initial dataset of brewing companies for the years 2019 and 2020, four distinct subsamples were derived. The description and size (n) of each subsample are presented in Tab. 1. Based on the subsample sizes, adjustments were made to the Eq. 4.1, 4.2, 5.1, 5.2, 6.1, 6.2, 7.1, 7.2, 8.1, and 8.2. The descriptions of the datasets (columns) are as follows:

- "SME sample (+)" refers to the set of profitable breweries obtained by excluding the top 6 largest breweries.
- "SME sample (all)" refers to the complete set of breweries obtained by excluding the top 6 largest ones.
- "Full sample (+)" refers to the set of all profitable breweries.
- "Full sample (all)" refers to the full dataset comprising all 50 breweries.

Tab. 1: Sample size (n) and shares of the industry turnover (STR)

	SME sample (+)	**SME sample (all)**	**Full sample (+)**	**Full sample (all)**
2019	$n = 26$	$n = 44$	$n = 32$	$n = 50$
2020	$n = 23$	$n = 44$	$n = 29$	$n = 50$
STR	13.65%	15.20%	98.26%	99.65%

Note: STR represents the share of final dataset's turnover to the total turnover of the industry. Values are given as an average of both years.

Earnings (EAT), return on assets (ROA) and financial leverage (FL) data for the breweries in our sample were collected for the years 2019 and 2020 (more recent year data were not available at this time for the complete dataset of brewing companies). Since these are privately held companies, their market value of equity (P) was preliminary assessed using the discounted cash flow (DCF) method, as described in detail by Drábek (2022). These financial data are also available in the Annex (see Tab. 8).

The valuation of these privately held companies through the two-stage DCF method, focusing on the enterprise value (EV) level, employs the "entity" variant, which is represented as follows (see Damodaran, 2012):

$$\mathrm{EV} = \sum_{t=1}^{T} \frac{\mathrm{FCFF}_t}{(1+\mathrm{WACC})^t} + \frac{\mathrm{TV}}{(1+\mathrm{WACC})^T} \quad (1)$$

The variable FCFF represents the free cash flow to the firm, while TV represents the terminal value. WACC stands for the weighted average cost of capital, T represents the length of the first phase, and t represents the sequential number of years from the valuation date. The first phase of the model was set to last for 10 years, following the risk-free rate calculation method by Wenger (2003).

To compute the free cash flow to the firm, we begin with the after-tax operating profit and then deduct the net investment into invested operating capital, which includes both fixed assets and working capital components.

For the discount rate at the WACC level, we adopt Damodaran's (2012) cost of equity (re) calculation method according to Equation 2. To calculate the cost of debt, we consider either the actual negotiated rates for bank loans applicable to individual companies or refer to market data from the Czech National Bank (2021).

$$r_e = r_f + \beta \cdot (r_m - r_f) + r_c + r_{mc} \quad (2)$$

The variable r_f represents the risk-free interest rate, β reflects the coefficient indicating systematic risk, r_m denotes the expected market return, r_c stands for the country risk premium, and r_{mc} signifies the small market capitalisation premium.

To calculate the terminal value (TV), we apply a parametric formula based on the approach by Copeland et al. (1994), with modifications following Damodaran's (2012) methodology, as

shown below:

$$\mathrm{TV} = \frac{\mathrm{EBIT}_{T+1} \cdot (1 - \mathrm{RR})}{\mathrm{WACC} - g} \tag{3}$$

The variable EBIT_{T+1} denotes EBIT in the first year of the second phase, RR stands for the reinvestment rate in the second phase and g denotes the assumed free cash flow growth rate for the second phase.

After assessing the enterprise value, adjustments were made to account for non-operating items, and interest-bearing liabilities were subtracted, resulting in the determination of the market value of equity.

Next, the market value of equity for each brewery in the sample was transformed into a relative representation using multipliers, with reference to either the book value of equity (BV) or the net profit (EAT).

The entire valuation process adheres to the detailed description outlined by Drábek (2022). Based on the collected financial data, we first computed the industry P/BV multiplier in two forms. We distinguished the aggregate industry level (Eq. 4.1) and industry median (4.2). The calculations 4.1 and 4.2 were performed to obtain a comprehensive understanding of the industry's valuation characteristics.

$$\mathbb{A}\left[\frac{\mathrm{P}^*}{\mathrm{BV}}\right] = \frac{\sum \mathrm{P}_i^*}{\sum \mathrm{BV}_i} \tag{4.1}$$

$$\mathbb{M}\left[\frac{\mathrm{P}^*}{\mathrm{BV}}\right] = \mathrm{med}\left[\frac{\mathrm{P}^*}{\mathrm{BV}}\right]_i \tag{4.2}$$

The symbol $\mathbb{A}$ in the Eq. 4.1 represents the aggregated industry expression of P/BV, while the symbol $\mathbb{M}$ represents the calculation of P/BV based on the industry median. P^* represents the market value of equity assessed using the DCF method, BV represents the book value of equity, and i represents the serial number of a company ranging from 1 of n (size of the samples according to Tab. 1).

Similarly, the industry P/EAT multiplier was computed using a similar approach, both at the aggregate level (Eq. 5.1) and as a median (5.2).

$$\mathbb{A}\left[\frac{\mathrm{P}^*}{\mathrm{EAT}}\right] = \frac{\sum \mathrm{P}_i^*}{\sum \mathrm{EAT}_i} \tag{5.1}$$

$$\mathbb{M}\left[\frac{\mathrm{P}^*}{\mathrm{EAT}}\right] = \mathrm{med}\left[\frac{\mathrm{P}^*}{\mathrm{EAT}}\right]_i \tag{5.2}$$

In Eq. 5.1 and 5.2, the variable EAT represents the net earnings after taxation.

The Eq. 4.1, 4.2, 5.1 and 5.2 are the standard estimates of industry multipliers commonly used for valuation purposes. In the context of this paper, these equations serve as the baseline undifferentiated industry multipliers, which will be subsequently compared to the proposed upgraded methodology using differentiated industry multiplier estimates.

In order to align the industry multiplier more closely with the economic reality of the evaluated brewing company, the initial industry multipliers (Eq. 4.1 and 4.2) underwent a transformation, resulting in the emergence of differentiated multipliers labelled as Eq. 6.1 and 6.2.

$$\begin{aligned}\mathrm{dif}\,\mathbb{A}\left[\frac{\mathrm{P}^*}{\mathrm{BV}}\right]_i &= \mathbb{A}\left[\frac{\mathrm{P}^*}{\mathrm{EAT}}\right] \cdot \mathrm{ROA}_i \cdot \mathrm{FL}_i \\ &= \mathbb{A}\left[\frac{\mathrm{P}^*}{\mathrm{EAT}}\right] \cdot \frac{\mathrm{EAT}_i}{\mathrm{A}_i} \cdot \frac{\mathrm{A}_i}{\mathrm{BV}_i}\end{aligned} \tag{6.1}$$

$$\begin{aligned}\mathrm{dif}\,\mathbb{M}\left[\frac{\mathrm{P}^*}{\mathrm{BV}}\right]_i &= \mathbb{M}\left[\frac{\mathrm{P}^*}{\mathrm{EAT}}\right] \cdot \mathrm{ROA}_i \cdot \mathrm{FL}_i \\ &= \mathbb{M}\left[\frac{\mathrm{P}^*}{\mathrm{EAT}}\right] \cdot \frac{\mathrm{EAT}_i}{\mathrm{A}_i} \cdot \frac{\mathrm{A}_i}{\mathrm{BV}_i}\end{aligned} \tag{6.2}$$

The notation "dif" is used to describe the differentiated expression of the aggregate average level of the given multiplier (Eq. 6.1) and the differentiated expression of the median value of the multiplier (6.2). The variable A in Eq. 6.1 and 6.2 represents total assets.

Through the utilization of these refined differentiated multipliers (Eq. 6.1 and 6.2), we establish a more suitable framework for valuating individual companies within a given industry, as exemplified in our case study of breweries.

To assess the effectiveness of the differentiation approach, we compare the differentiated multipliers (Eq. 6.1 and 6.2) with the undifferentiated multipliers (Eq. 4.1 and 4.2) both in relation to the actual P/BV multiplier of each brewery (for both years 2019 and 2020). This allows us to measure the extent of deviation between the differentiated and undifferentiated

estimations. We use the absolute value of the relative deviation (ARD) as the evaluation metric for both the industry median and the aggregated industry multiplier. The ARDs for the differentiated multipliers are calculated according to Eq. 7.1 and 7.2 as follows:

$$\mathrm{ARD}_i^{\mathrm{dif}\,\mathbb{A}} = \left| \frac{\left[\frac{\mathrm{P}^*}{\mathrm{BV}}\right]_i - \mathrm{dif}\,\mathbb{A}\left[\frac{\mathrm{P}^*}{\mathrm{BV}}\right]_i}{\mathrm{dif}\,\mathbb{A}\left[\frac{\mathrm{P}^*}{\mathrm{BV}}\right]_i} \right| \tag{7.1}$$

$$= \left| \frac{\left[\frac{\mathrm{P}^*}{\mathrm{BV}}\right]_i}{\mathrm{dif}\,\mathbb{A}\left[\frac{\mathrm{P}^*}{\mathrm{BV}}\right]_i} - 1 \right|$$

$$\mathrm{ARD}_i^{\mathrm{dif}\,\mathbb{M}} = \left| \frac{\left[\frac{\mathrm{P}^*}{\mathrm{BV}}\right]_i - \mathrm{dif}\,\mathbb{M}\left[\frac{\mathrm{P}^*}{\mathrm{BV}}\right]_i}{\mathrm{dif}\,\mathbb{M}\left[\frac{\mathrm{P}^*}{\mathrm{BV}}\right]_i} \right| \tag{7.2}$$

$$= \left| \frac{\left[\frac{\mathrm{P}^*}{\mathrm{BV}}\right]_i}{\mathrm{dif}\,\mathbb{M}\left[\frac{\mathrm{P}^*}{\mathrm{BV}}\right]_i} - 1 \right|$$

The ARDs for undifferentiated industry multipliers are calculated using Eq. 7.3 and 7.4:

$$\mathrm{ARD}_i^{\mathbb{A}} = \left| \frac{\left[\frac{\mathrm{P}^*}{\mathrm{BV}}\right]_i - \mathbb{A}\left[\frac{\mathrm{P}^*}{\mathrm{BV}}\right]}{\mathbb{A}\left[\frac{\mathrm{P}^*}{\mathrm{BV}}\right]} \right| \tag{7.3}$$

$$= \left| \frac{\left[\frac{\mathrm{P}^*}{\mathrm{BV}}\right]_i}{\mathbb{A}\left[\frac{\mathrm{P}^*}{\mathrm{BV}}\right]} - 1 \right|$$

$$\mathrm{ARD}_i^{\mathbb{M}} = \left| \frac{\left[\frac{\mathrm{P}^*}{\mathrm{BV}}\right]_i - \mathbb{M}\left[\frac{\mathrm{P}^*}{\mathrm{BV}}\right]}{\mathbb{M}\left[\frac{\mathrm{P}^*}{\mathrm{BV}}\right]} \right| \tag{7.4}$$

$$= \left| \frac{\left[\frac{\mathrm{P}^*}{\mathrm{BV}}\right]_i}{\mathbb{M}\left[\frac{\mathrm{P}^*}{\mathrm{BV}}\right]} - 1 \right|$$

The achieved ARD deviations from Eq. 7.1, 7.2, 7.3 and 7.4 will be summarized separately for each relationship using the simple arithmetic mean and the total sum. The resulting "accuracy rate" (Δ) for estimating the market value of a company using a differentiated multiplier instead of an undifferentiated one will be calculated according to the following Eq. 8.1 and 8.2. Specifically, the calculation will be performed at both the aggregate level (Eq. 8.1) and the median level (8.2). Since the accuracy rate calculation should yield the same outcome mathematically using either the average ARD or the sum of ARD, we present the following equations using only the total sum of ARD:

$$\Delta_{\mathbb{A}} = \left[1 - \frac{\sum_i^n \mathrm{ARD}_i^{\mathrm{dif}\,\mathbb{A}}}{\sum_i^n \mathrm{ARD}_i^{\mathbb{A}}}\right] \tag{8.1}$$

$$\Delta_{\mathbb{M}} = \left[1 - \frac{\sum_i^n \mathrm{ARD}_i^{\mathrm{dif}\,\mathbb{M}}}{\sum_i^n \mathrm{ARD}_i^{\mathbb{M}}}\right] \tag{8.2}$$

The methodological approach described above assumes the availability of an industry P/BV or P/EAT ratio that is adjusted for the valuation of privately held companies, specifically in our case for the breweries under consideration. Typically, such a multiplier can be obtained by adjusting the multiplier for publicly traded companies using the private company discount (PCD) – for more details, refer to the Literature Review section. However, in our particular dataset, the condition of using a relevant industry multiplier is satisfied, and therefore, the industry multiplier we employ – as represented by Eq. 4.1, 4.2, 5.1 and 5.2 – does not require further adjustment. The generalization of our proposed methodological upgrade for any privately held company, considering the application of PCD, will be further discussed in the Discussion and Conclusions section.

4 RESULTS

In this section, we introduce our proposal for differentiating the industry multiplier to enhance the estimation process of individual companies' market value. This also includes the testing of our proposed methodological upgrade. The effectiveness of the refined valuation methodology based on industry multiples was evaluated within the context of the Czech brewing industry.

We computed the P/BV and P/EAT ratios for all 50 breweries using the market value P* assessed through the DCF method. Additionally, we calculated the relevant financial ratios required for Eq. 6.1 and 6.2. A detailed breakdown of these data can be found in the Annex (see Tab. 8).

With these data, we proceeded to calculate the differentiated P/BV ratios based on the industry median and the aggregate P/EAT ratios for each brewery, as outlined in Eq. 6.1 and 6.2. Subsequently, using Eq. 7.1 and 7.2, we computed the ARDs between these differentiated multipliers and the actual P/BV ratios for individual companies. A comprehensive summary of the ARDs for each brewery is provided in the Annex (see Tab. 9, 10, 11 and 12). The results of this analysis are presented in Tab. 2 and 3.

The first set of rows represents the ARD calculations based on the aggregate P/EAT multiplier for the Czech brewing industry, as described in Eq. 7.1. The second set of rows represents the ARD calculations based on the median P/EAT multiplier, as outlined in Eq. 7.2.

Tab. 2 demonstrates that there has been a consistent year-on-year decrease in the overall ARD for individual companies. The calculations based on the reduced sample of 26 or 23 profitable breweries yielded the lowest ARD values. Interestingly, the inclusion of the largest 6 companies in the industry, even in the full sample of only profitable breweries, did not have a substantial impact on the results. Furthermore, calculations based on the aggregate P/EAT for the entire industry generally exhibited lower accuracy compared to those based on the industry median. Standard deviations are displayed in parentheses.

Tab. 2: Sum of ARD for each sample and P/EAT type in 2019 and 2020 – differentiated approach

Sum of ARD	SME sample (+)	SME sample (all)	Full sample (+)	Full sample (all)
Aggregate P/EAT				
2019	17.88	651.46	26.11	224.59
	(1.69)	(29.52)	(2.06)	(10.97)
2020	12.47	262.16	17.67	304.89
	(0.48)	(10.39)	(0.57)	(13.16)
Median P/EAT				
2019	18.22	134.04	20.95	146.25
	(1.73)	(6.83)	(1.68)	(7.02)
2020	10.39	116.73	15.01	164.11
	(0.40)	(4.84)	(0.47)	(6.83)

Note: Standard deviations are displayed in parentheses.

Turning to Tab. 3, which presents the differentiated estimates, it provides the average ARD for each sample and P/EAT type in 2019 and 2020. Notably, the reduced sample of profitable breweries in 2020 displayed significantly lower average ARD values. However, it can be observed that there was no significant difference between the reduced sample and the full sample when considering only profitable companies in both cases.

Tab. 3: Average ARD for each sample and P/EAT type in 2019 and 2020 – differentiated approach

Average ARD	SME sample (+)	SME sample (all)	Full sample (+)	Full sample (all)
Aggregate P/EAT				
2019	0.69	14.81	0.82	4.49
	(1.69)	(29.52)	(2.06)	(10.97)
2020	0.54	5.96	0.61	6.10
	(0.48)	(10.39)	(0.57)	(13.16)
Median P/EAT				
2019	0.70	3.05	0.65	2.92
	(1.73)	(6.83)	(1.68)	(7.02)
2020	0.45	2.65	0.52	3.28
	(0.40)	(4.84)	(0.47)	(6.83)

Note: Standard deviations are displayed in parentheses.

The subsequent tables, namely Tab. 4 and Tab. 5, present the calculation of ARD using the

undifferentiated estimates of each company's multipliers based on Eq. 7.3 and 7.4, along with their corresponding actual P/BV ratios. A comprehensive summary of the ARDs for individual breweries can be found in the Annex (see Tab. 9 to 12).

Tab. 4: Sum of ARD for each sample and P/BV type in 2019 and 2020 – undifferentiated approach

Sum of ARD	**SME sample (+)**	**SME sample (all)**	**Full sample (+)**	**Full sample (all)**
Aggregate P/BV				
2019	24.76 (1.45)	45.04 (1.07)	106.01 (5.36)	233.67 (5.70)
2020	16.01 (1.00)	45.49 (1.44)	79.14 (3.80)	285.74 (7.79)
Median P/BV				
2019	32.70 (2.22)	42.99 (0.99)	40.78 (2.27)	52.65 (1.14)
2020	20.90 (1.48)	49.10 (1.61)	26.76 (1.44)	55.44 (1.61)

Note: Standard deviations are displayed in parentheses.

Tab. 4 illustrates that even with undifferentiated estimates, the calculations based on a reduced sample of 26, respectively 23, profitable breweries yield the best results with the lowest sum of ARD. However, the differences between the calculations are not as significant as observed in the case of differenced estimates, as indicated in Tab. 2 and Tab. 3. Standard deviations are displayed in parentheses.

Tab. 5: Average ARD for each sample and P/BV type in 2019 and 2020 – undifferentiated approach

Average ARD	**SME sample (+)**	**SME sample (all)**	**Full sample (+)**	**Full sample (all)**
Aggregate P/BV				
2019	0.95 (1.45)	1.02 (1.07)	3.31 (5.36)	4.67 (5.70)
2020	0.70 (1.00)	1.03 (1.44)	2.73 (3.80)	5.71 (7.79)
Median P/BV				
2019	1.26 (2.22)	0.98 (0.99)	1.27 (2.27)	1.05 (1.14)
2020	0.91 (1.48)	1.12 (1.61)	0.92 (1.44)	1.11 (1.61)

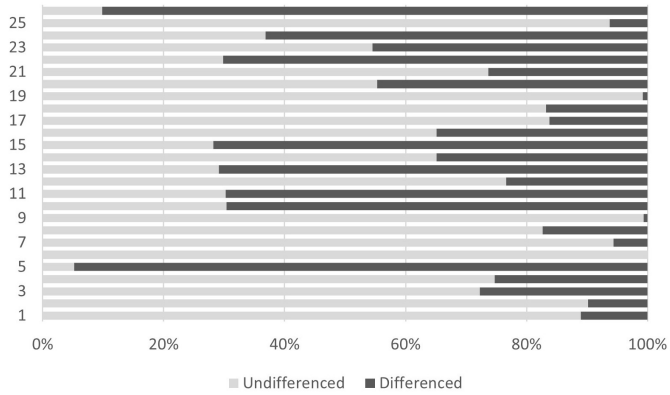
Note: Standard deviations are displayed in parentheses

Tab. 5, which pertains to undifferentiated estimates, presents the average ARD for each sample and P/BV type in 2019 and 2020. According to Tab. 5, the average ARD indicates minimal differences among the data samples in the computation of undifferenced estimates. Nonetheless, the majority of the lowest values in the first column, corresponding to the calculation based on a reduced sample of profitable companies, are notable.

Based on the information presented in Tab. 2–5, it appears that differential valuation does not consistently provide more accurate estimates of companies' market value in all cases. However, it is important to note that our research primarily focuses on a reduced sample of profitable companies – SME sample (+), as mentioned earlier in this section, and the other columns serve as supplementary information. Overall, it is evident that the ARD is higher when using datasets that include loss-making companies compared to datasets consisting only of profitable companies. This implies that in the case of loss-making companies, the use of differenced estimation would result in increased inaccuracy. It should be emphasized that our proposed approach does not consider the application of differenced estimation to loss-making companies, as the relative valuation approach typically assumes the going concern principle.

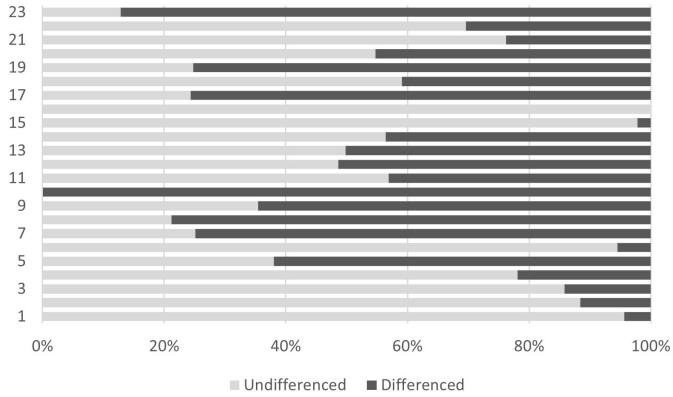
Fig. 1 and Fig. 2 provide a comparison of the ARD for each brewery (represented on the y-axis) between differenced and undifferenced estimates. The stacked graphs, presented as percentages, are used for the comparison. Fig. 1 illustrates the results at the median level of the applied industry multiplier for 2019, while Fig. 2 depicts analogous results for 2020. A comparison of ARDs at the aggregate level of the industry multiplier can be found in the Annex (see Fig. 3).

Fig. 1 illustrates that the ARD is significantly higher when undifferenced estimation is used for the majority of breweries. Interestingly, the application of differenced estimation yields an almost perfect match with the actual P/BV multiplier. Fig. 2 shows that for most breweries the ARD is higher when undifferenced estimation is employed. In two cases, the use of



Note: The y-axis represents the serial number of each brewery "i" within the data sample. The dark bars in the graph represent the ARDs for the differenced estimates, while the light bars represent the undifferenced estimates. The data presented in the graph are based on the median level of the applied industry multiplier for 2019.

Fig. 1: A comparison of the ARD of each brewery in 2019 for the differenced and undifferenced estimates



The y-axis represents the serial number of each brewery "i" within the data sample. Dark bars indicate the ARDs for differenced estimates, while light bars represent undifferenced estimates. The data presented in the figure correspond to the median level of the applied industry multiplier for 2020.

Fig. 2: A comparison of the ARD of each brewery in 2020 for the differenced and undifferenced estimates

differenced estimation even leads to an almost perfect match with the actual P/BV multiplier. Conversely, in one instance, the adoption of differenced estimation results in an increase in the inaccuracy of an initially precise estimate.

The final comparison and evaluation of the aforementioned calculations, along with the extent of improvement in market value estimation using our proposed differentiated multipliers, are displayed in Tab. 6. The ultimate assessment is conducted based on Eq. 8.1 and 8.2. We solely present the outcomes for profitable breweries, considering two reduced samples (with and without the top 6 largest breweries), as the application of these results is meaningful only if the going concern principle is upheld.

Tab. 6: The degree of refinement of the market value estimates of individual companies using differentiated industry multipliers

	SME sample (+)	**Full sample (+)**
Aggregated level:		
2019	27.77%	75.37%
2020	22.15%	77.68%
Median level:		
2019	44.28%	48.62%
2020	50.29%	43.92%

Tab. 6 presents the refinement of market value estimates for individual breweries using differentiated industry multipliers, based on the median values. The results indicate a refinement ranging from approximately 44% to 50% for both studied years. This refinement is almost comparable between the full and reduced samples of profitable SME companies. On an aggregate basis of industry multiplier, the refinement rate is 27.77% in 2019 and 22.15% in 2020 for the reduced sample of profitable SME companies. However, when the top 6 companies are included, the refinement rate increases significantly to 75–78%.

5 ROBUSTNESS ANALYSIS

In this section, we examine the robustness of the results by applying our proposed differentiation to the valuation multiples of publicly traded European companies in several other industries. The results of this analysis are presented in Tab. 7.

Tab. 7 demonstrates that implementing our industry multiplier differentiation on publicly traded company data leads also to a more precise estimation of market value when using the industry multiplier method. In contrast to the findings from the analysis of 50 unlisted Czech breweries, we do not segregate the sample into companies with positive and negative market values in this case, as all publicly traded companies included in the robustness analysis exhibit positive market values. Additionally, the classification into small, medium-sized, and similar publicly traded ones is irrelevant for this analysis.

The results in Tab. 7 indicate that the application of our proposed differentiation method to the given samples of publicly traded companies achieves some level of refinement in both years included. The results exhibit significant variation, both across different industries and over different years. However, it's important to note that the primary aim here is not to derive exact industry-specific values or to draw specific conclusions about relative differences between these industries. Instead, our objective is to validate the general applicability of the proposed methodology, a goal that has been successfully achieved based on the presented data.

It's important to acknowledge that all our results are derived solely from reported values of the reference variables, which may inherently contain various biases. However, in practical applications, it's common to apply normalization or adjustments to these reference variables. In our perspective, such normalization or adjustments should further enhance the connection between the differenced multiplier and the financial variables used. This enhancement is expected to result in even greater levels of refinement. Nevertheless, implementing these adjustments could potentially compromise the objectivity of the research, and it would also entail a substantial amount of time and effort, given that it would need to be executed for both the 50 Czech breweries and the hundreds publicly traded companies involved in the robustness analysis.

Tab. 7: The degree of refinement using differentiated industry multipliers for publicly traded companies (Damodaran, 2020 and 2021)

	Auto & Truck	**Beverage (alcoholic)**	**Building Materials**	**Electrical Equipment**	**Retail (distributors)**	**Utility (water)**
2019	69.95%	43.26%	11.04%	12.19%	30.11%	32.10%
2020	50.26%	63.93%	31.90%	35.65%	14.21%	85.02%

Note: Calculations performed at the median level, excluding values of P/E ratio < 1 and > 500.

6 DISCUSSION

Based on our findings, it is evident that the proposed methodological upgrade significantly enhances the accuracy of equity market value estimates. However, we must acknowledge that our results are not entirely generalizable, as the differentiation method does not lead to increased accuracy for loss-making firms or those with negative equity. It is important to emphasize that companies failing to meet the going concern principle should be valued using the liquidation method rather than the DCF method or the industry multiple approach. Consequently, considering these non-going concern companies when attempting to improve the methodology would be futile. Conversely, our results can be applied universally to any industry, regardless of size or stock market exposure.

This approach offers a distinct advantage as it involves objective adjustments of the original industry multiplier based on the financial ratios of each individual company (refer to Eq. 6.1 and 6.2). These financial ratios are derived solely from the accounting data of each company, allowing for the application of this procedure to all privately held companies lacking market value data. However, it is crucial to have an initial industry multiplier, which can be obtained from fee-based or freely available databases predominantly comprising data from publicly traded companies.

As mentioned in earlier sections, directly applying an industry valuation multiplier derived from publicly traded company data is generally inappropriate for privately held companies, particularly those that are small or medium-sized. In such cases, it is recommended to incorporate a private company discount during the valuation process. As discussed in the Literature Review section, the magnitude of this discount varies between 5% and 70% based on different studies. For our sample of profitable breweries, excluding the six largest ones, the private company discount values are determined as 55.62% in 2019 and 59.94% in 2020, employing the Drábek and Pastorek (2023) methodology. These values align with the aggregated industry P/BV ratio. Detailed information on the inputs used to calculate the private company discount can be found in the Annex (see Tab. 13) of this paper.

Our proposed differentiation of the industry valuation multiplier is inherently effective even without the aforementioned modification. However, to achieve the highest accuracy and applicability for privately held companies, we suggest an additional step. In the case of using the multiplier calculated from publicly traded company values in Eq. 5.1 and 5.2, we propose reducing this industry multiplier by the private company discount (PCD) and subsequently applying our differentiated approach according to Eq. 6.1 and 6.2.

It is important to note that the private company discount values mentioned earlier are specific to the Czech brewing industry. The discount amount may vary across different industries or countries. Therefore, we recommend validating the calculated private company discount values before applying them to other industries. This can be done by estimating the market value of random companies in a given industry using alternative methods like the discounted cash flow (DCF) approach or by considering actual transactions involving companies. However, exploring the applicability of these values to other markets and industries falls beyond the scope of this paper.

It should be acknowledged that private company discount values are typically reported broadly across industries, often with a geographic focus, if any. This implies that the private company discount may not vary significantly across industries, which theoretically contradicts the essence of the discount as it arises from the disparities between publicly traded and privately held companies.

To summarize, it is important to emphasize that the considerations regarding private company discount do not impact the conclusions of this paper regarding the methodological improvement achieved through differential estimations.

Regrettably, we could not find any relevant studies that directly addressed the refinement of the industry multiplier methodology, making direct comparisons challenging. The differentiation of the industry P/BV multiplier as mentioned in Drábek and Syrovátka (2022) was solely used by those authors as an alternative means of determining the P/BV multiplier and for cross-sectoral comparisons. Its applicability to privately held companies using private company discount was not a focus of their research. Our study, on the other hand, use that financial decomposition to differentiate the industry multiplier for the purpose of refining the estimation of the market value of any firm (with an emphasis on unlisted ones) and work in addition with a doubly large dataset enabling dynamic insights.

The literature review revealed that other studies mainly focus on the P/BV ratio in general and do not offer relevant comparisons with our specific findings. Therefore, our research represents a unique contribution in the field. When comparing our proposed methodological approach with the conventional valuation methodology that employs multipliers at the level of a specific mean value (as discussed by Mařík et al., 2018; Damodaran 2012; Dittmann and Maug, 2008; and others), our contribution, in terms of enhanced estimation accuracy, aligns with the results presented in Tab. 6.

As we mentioned in the introduction to the Discussion, our proposed methodological upgrade is not suitable for application in the case of loss-making companies. This is because the relative valuation approach requires compliance with the going concern principle. Furthermore, since the primary multipliers (P/BV and P/E) are derived from publicly traded companies' data and thus achieve positive values, their application to companies with negative reference variables is not possible. Mathematically, it would always lead to a negative value. However, this may not be the correct approach, as, for example, start-ups, even in their initial phase of incurring losses, often have a certain (positive) market value. This fact is a limitation of our research. It must be added, though, that our proposal could find application in the valuation of start-ups within the DCF method. One variant of valuing start-ups is the combination of the standard DCF method with a perpetuity phase determined by a valuation multiplier, known as the venture capital method (see e.g. Puca, 2020). In this method, after a stabilization period, for which a financial plan is created and cash flow is generated (usually partially negative), the stabilized reference variable (positive) is multiplied by the industry multiplier, determining the value of the second phase. Typically, in these cases, the value of the second phase constitutes a large majority of the total market value. To determine the value within this second phase, the application of our proposed methodological improvement, which could enhance the accuracy of market value estimation, is considered. This could be especially relevant for start-ups. However, this is a consideration that we do not have evidence to support and would require additional research.

7 CONCLUSIONS

The objective of this paper was to develop and apply a methodological procedure for valuing privately held companies, specifically within the Czech brewing industry. This was achieved by differentiating estimates of the industry P/BV multiplier through the decomposition of the P/BV multiplier into P/EAT, ROA, and FL.

Based on the findings presented in the Results section, we can conclude that the application of a differentiated industry multiplier leads to significantly more accurate estimations of the market value of an equity compared to using the median or aggregate value for a given industry.

Our proposed methodological approach can be applied generally to any sample of companies meeting the going concern, achieving a positive market value of equity respectively, regardless of size and stock market location. This has been supported by the robustness analysis (Section 5).

By applying our proposed differentiation, the valuation method of industry multipliers becomes significantly more accurate in estimating the market value of a company; not only publicly traded companies but especially unlisted ones. This improvement is further enabled by incorporating the application of a private company discount (PCD), which allows for a broader and more general application of the methodology by incorporating multiples derived from publicly traded company data into the valuation of privately held companies.

In conclusion, our research demonstrates that implementing a differentiated approach to assess a company's market value using industry multipliers significantly enhances the accuracy of the estimate. The improvement ranges from 40% to 50% when using the median industry multiplier and approximately 22% to 78% when using the aggregate industry multiplier. We believe this contribution is of great significance to all involved in the methodological and practical aspects of business valuation.

8 ACKNOWLEDGEMENT

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10 ANNEX

Tab. 8: Financial data of the companies in the sample (th. EUR, ROA and FL dimensionless)

No.	P* 2019	P* 2020	EAT 2019	EAT 2020	ROA 2019	ROA 2020	FL 2019	FL 2020
1.	4,171,922	3,707,163	187,682	145,780	0.32	0.26	2.18	5.79
2.	666,393	607,198	25,659	30,749	0.03	0.03	1.12	1.11
3.	291,301	256,714	13,226	4,393	0.12	0.05	2.83	3.25
4.	311,130	317,988	10,943	11,621	0.05	0.05	1.14	1.14
5.	150,088	139,732	5,811	3,520	0.12	0.06	3.15	3.08
6.	168,111	151,335	6,467	3,777	0.13	0.07	1.35	1.31
7.	7,543	9,494	−118	537	0.00	0.02	1.76	1.52
8.	10,675	12,254	734	777	0.03	0.04	1.20	1.13
9.	4,448	7,044	309	311	0.02	0.02	1.67	1.51
10.	6,747	4,560	−428	−415	−0.04	−0.04	1.89	1.69
11.	9,184	11,168	280	728	0.02	0.05	1.15	1.16
12.	3,369	3,340	208	243	0.05	0.06	2.65	2.44
13.	8,623	7,482	623	395	0.08	0.05	1.41	1.38
14.	21,595	20,087	1,208	346	0.10	0.03	1.18	1.15
15.	15,725	13,318	888	546	0.09	0.05	1.27	1.26
16.	3,240	2,506	143	−367	0.03	−0.08	1.32	1.37
17.	−1,664	−2,531	−1,283	−766	−0.14	−0.09	4.94	8.08
18.	−76	641	−199	−47	−0.09	−0.02	5.62	5.44
19.	3,439	2,516	−83	−550	−0.01	−0.08	1.28	1.28
20.	−21,011	−22,478	−2,840	−2,585	−0.16	−0.15	1.45	1.78
21.	−1,186	−2,482	−1,561	−1,159	−0.19	−0.14	3.94	1.80
22.	2,071	1,125	113	−1,886	0.01	−0.19	2.01	2.41
23.	2,591	350	150	−62	0.03	−0.01	3.04	3.07
24.	3,472	3,211	257	42	0.06	0.01	1.86	1.64
25.	1,946	1,217	18	−44	0.00	−0.01	1.21	1.16
26.	3,397	2,797	104	114	0.02	0.03	2.77	2.49
27.	2,186	2,201	−73	−70	−0.01	−0.01	1.24	1.21
28.	1,638	1,462	37	4	0.01	0.00	1.20	1.24
29.	−433	−174	−160	−248	−0.06	−0.10	27.71	−16.24
30.	1,175	1,042	−988	−956	−0.14	−0.20	1.77	1.21
31.	1,015	595	1	−89	0.00	−0.08	1.48	1.53
32.	2,887	2,675	123	85	0.04	0.02	3.30	3.29
33.	934	272	54	36	0.04	0.03	2.51	2.89
34.	4,359	4,079	220	146	0.08	0.05	2.04	1.83
35.	382	223	−580	−562	−0.20	−0.25	3.41	2.66
36.	1,463	721	80	−169	0.02	−0.05	1.25	1.16
37.	244	321	137	20	0.06	0.01	1.24	1.19
38.	2,502	1,955	−1	−33	0.00	−0.01	1.40	1.34
39.	4,660	4,898	309	261	0.20	0.15	1.08	1.07
40.	1,349	1,261	−91	−105	−0.03	−0.03	1.05	1.04
41.	1,201	887	16	37	0.03	0.05	1.24	1.56
42.	−1,683	−1,660	−156	−151	−0.26	−0.26	15.53	15.53
43.	422	957	−3	93	0.00	0.06	1.15	1.14
44.	498	56	69	67	0.12	0.12	−0.92	−0.92
45.	1,352	947	71	0	0.06	0.00	1.36	1.54
46.	3,768	3,979	313	260	0.19	0.14	0.99	1.01
47.	450	1,367	29	93	0.08	0.20	−20.31	6.33
48.	1,756	1,452	92	101	0.10	0.10	10.30	4.00
49.	524	588	101	71	0.23	0.14	1.88	1.65
50.	−175	−131	−44	−42	−0.05	−0.05	1.12	1.10

Tab. 9: Summary of the ARDs for individual breweries using differentiated and undifferentiated multipliers for full sample (all)

No.	Differentiated				Undifferentiated			
	Median 2019	Median 2020	Aggregated 2019	Aggregated 2020	Median 2019	Median 2020	Aggregated 2019	Aggregated 2020
1.	0.31	0.45	0.07	0.07	0.95	0.98	0.76	0.90
2.	0.41	0.29	0.09	0.37	0.00	0.09	3.76	4.31
3.	0.31	0.76	0.08	0.54	0.89	0.91	0.49	0.56
4.	0.46	0.49	0.17	0.01	0.52	0.52	1.30	1.34
5.	0.41	0.65	0.08	0.32	0.92	0.89	0.60	0.49
6.	0.41	0.65	0.09	0.32	0.82	0.79	0.14	0.04
7.	1.24	0.21	1.37	0.53	0.49	0.19	6.10	4.79
8.	0.05	0.11	0.63	0.72	0.42	0.24	5.74	5.03
9.	0.06	0.38	0.65	0.20	0.60	0.02	6.63	3.95
10.	1.97	2.28	2.50	3.47	0.32	0.04	2.23	3.69
11.	0.53	0.08	0.28	0.77	0.09	0.09	4.16	3.41
12.	0.06	0.02	0.46	0.97	0.66	0.61	0.63	0.89
13.	0.10	0.26	0.71	0.43	0.51	0.43	1.32	1.78
14.	0.14	0.76	0.33	0.53	0.63	0.61	0.77	0.89
15.	0.14	0.42	0.34	0.11	0.58	0.53	0.99	1.29
16.	0.33	3.06	0.04	4.98	0.00	0.11	3.76	4.43
17.	10.78	3.26	17.27	7.21	1.89	1.32	5.23	2.56
18.	38.99	2.03	61.00	2.98	5.26	0.58	21.28	1.07
19.	1.37	4.07	1.57	6.93	0.37	0.62	5.52	6.87
20.	1.07	0.62	2.20	2.12	1.48	1.34	3.27	2.64
21.	19.12	5.56	30.19	11.67	2.42	2.44	7.76	8.00
22.	0.17	24.57	0.29	46.49	1.58	1.87	11.27	12.97
23.	0.11	3.50	0.38	5.83	0.50	2.68	1.40	16.94
24.	0.13	0.82	0.76	0.64	0.43	0.29	1.70	2.45
25.	0.86	1.50	0.79	1.97	0.86	1.82	7.86	12.75
26.	0.53	0.43	0.28	0.10	0.60	0.50	0.92	1.44
27.	1.51	1.45	1.79	1.87	1.41	1.29	10.46	10.16
28.	0.66	0.96	0.47	0.93	0.05	0.13	4.00	4.50
29.	4.65	19.07	7.75	37.73	1.18	0.30	1.85	2.41
30.	13.85	13.90	20.92	25.90	1.79	2.01	12.27	13.66
31.	0.99	3.11	0.98	5.07	0.31	0.01	2.27	3.90
32.	0.35	0.55	0.01	0.14	0.72	0.69	0.31	0.51
33.	0.12	0.86	0.37	2.58	0.59	0.24	0.97	5.04
34.	0.23	0.50	0.20	0.03	0.74	0.71	0.22	0.41
35.	24.19	36.33	36.96	69.20	0.82	1.98	7.65	13.51
36.	0.16	4.30	0.30	7.37	0.62	1.96	6.70	13.42
37.	7.56	0.13	12.27	0.68	5.03	3.24	27.70	19.68
38.	1.01	1.24	1.01	1.46	0.18	0.01	2.92	3.85
39.	0.01	0.25	0.57	0.44	0.76	0.74	0.14	0.27
40.	2.03	2.17	2.60	3.25	0.83	0.81	7.70	7.80
41.	0.80	0.41	0.69	0.14	0.67	0.53	0.59	1.28
42.	0.42	0.28	1.20	1.47	1.02	1.02	1.09	1.09
43.	1.09	0.37	1.15	1.64	1.43	0.10	10.57	4.37
44.	1.11	15.65	2.27	31.14	2.03	9.75	5.91	43.66
45.	0.20	1.00	0.25	1.00	0.47	0.33	1.53	2.24
46.	0.27	0.08	0.97	0.77	0.64	0.64	0.69	0.77
47.	0.01	0.04	0.53	0.85	1.03	0.96	1.16	0.79
48.	0.20	0.02	0.24	0.89	0.96	0.86	0.80	0.30
49.	1.96	0.71	3.58	2.29	0.64	0.59	0.73	0.98
50.	2.81	3.54	4.91	7.76	4.96	6.06	19.82	25.66

Tab. 10: Summary of the ARDs for individual breweries using differentiated and undifferentiated multipliers for full sample (+)

No.	Differentiated				Undifferentiated			
	Median 2019	Median 2020	Aggregated 2019	Aggregated 2020	Median 2019	Median 2020	Aggregated 2019	Aggregated 2020
1.	0.14	0.11	0.03	0.02	0.89	0.96	0.75	0.90
2.	0.27	0.15	0.12	0.31	1.23	1.32	3.95	4.56
3.	0.14	0.61	0.04	0.56	0.76	0.81	0.47	0.54
4.	0.33	0.17	0.19	0.06	0.08	0.02	1.40	1.45
5.	0.26	0.43	0.11	0.35	0.81	0.78	0.59	0.46
6.	0.27	0.44	0.12	0.36	0.60	0.54	0.11	0.09
7.		0.28		0.46		1.53		5.07
8.	0.31	0.43	0.57	0.64	2.16	1.63	6.02	5.31
9.	0.32	0.00	0.59	0.14	2.58	1.16	6.95	4.19
10.								
11.	0.42	0.48	0.30	0.68	1.42	0.92	4.38	3.62
12.	0.17	0.64	0.42	0.88	0.23	0.17	0.70	0.98
13.	0.37	0.19	0.65	0.36	0.09	0.21	1.42	1.91
14.	0.06	0.61	0.28	0.56	0.17	0.18	0.85	0.98
15.	0.07	0.07	0.29	0.06	0.07	0.00	1.07	1.40
16.	0.16		0.01		1.23		3.96	
17.								
18.								
19.								
20.								
21.								
22.	0.03		0.25		4.76		11.79	
23.	0.10		0.33		0.13		1.50	
24.	0.41	0.70	0.70	0.66	0.26	0.51	1.81	2.62
25.	0.83		0.79		3.16		8.23	
26.	0.42	0.08	0.30	0.05	0.10	0.07	1.00	1.56
27.								
28.	0.57	0.94	0.48	0.93	1.34	1.40	4.21	4.76
29.								
30.								
31.	0.98		0.98		0.54		2.41	
32.	0.19	0.28	0.02	0.18	0.38	0.34	0.37	0.58
33.	0.10	1.99	0.32	2.41	0.07	1.64	1.05	5.33
34.	0.04	0.19	0.16	0.07	0.43	0.38	0.27	0.48
35.								
36.	0.04		0.26		2.61		7.02	
37.	9.65	0.40	11.83	0.60	12.46	8.02	28.90	20.66
38.								
39.	0.26	0.20	0.52	0.37	0.46	0.45	0.19	0.33
40.								
41.	0.75	0.05	0.70	0.08	0.25	0.01	0.66	1.38
42.								
43.		1.20		1.51		1.34		4.62
44.								
45.	0.00	1.00	0.20	1.00	0.19	0.42	1.64	2.40
46.	0.58	0.48	0.90	0.69	0.21	0.23	0.76	0.85
47.		0.55		0.76		0.91		0.78
48.	0.00	0.58	0.20	0.80	0.91	0.69	0.79	0.26
49.	2.68	1.75	3.43	2.13	0.19	0.14	0.80	1.07
50.								

Tab. 11: Summary of the ARDs for individual breweries using differentiated and undifferentiated multipliers for SME sample (all)

No.	Differentiated				Undifferentiated			
	Median 2019	Median 2020	Aggregated 2019	Aggregated 2020	Median 2019	Median 2020	Aggregated 2019	Aggregated 2020
1.								
2.								
3.								
4.								
5.								
6.								
7.	1.22	0.46	0.05	2.19	0.23	0.12	0.33	0.00
8.	0.03	0.40	5.17	2.34	0.17	0.17	0.26	0.05
9.	0.02	0.58	5.22	1.93	0.32	0.04	0.43	0.14
10.	1.90	1.86	2.85	0.92	0.44	0.09	0.39	0.19
11.	0.57	0.38	2.85	2.38	0.10	0.14	0.03	0.23
12.	0.13	0.31	4.75	2.54	0.72	0.63	0.69	0.67
13.	0.02	0.50	5.38	2.12	0.60	0.46	0.56	0.52
14.	0.21	0.84	4.39	1.36	0.69	0.63	0.67	0.67
15.	0.20	0.61	4.43	1.87	0.66	0.56	0.63	0.60
16.	0.38	2.39	3.67	2.10	0.17	0.05	0.11	0.06
17.	9.88	1.87	47.76	7.40	1.73	1.30	1.79	1.27
18.	35.92	1.69	159.69	0.54	4.52	0.60	4.81	0.64
19.	1.34	3.07	0.46	3.62	0.13	0.53	0.22	0.37
20.	0.91	0.09	9.20	3.43	1.39	1.32	1.43	1.28
21.	17.57	3.43	80.83	10.87	2.17	2.36	2.27	2.21
22.	0.23	16.90	4.30	34.45	1.13	1.71	1.30	1.42
23.	0.18	2.69	4.52	2.77	0.58	2.48	0.55	2.11
24.	0.05	0.88	5.50	1.28	0.53	0.33	0.49	0.40
25.	0.87	1.34	1.55	0.24	0.54	1.67	0.66	1.38
26.	0.57	0.61	2.85	1.86	0.67	0.53	0.64	0.58
27.	1.47	1.30	1.02	0.32	0.99	1.17	1.15	0.93
28.	0.68	0.97	2.37	1.06	0.13	0.07	0.06	0.05
29.	4.21	12.54	23.41	31.18	1.15	0.34	1.16	0.41
30.	12.86	9.71	49.99	18.41	1.30	1.85	1.49	1.54
31.	0.99	2.42	1.06	2.17	0.43	0.05	0.39	0.15
32.	0.40	0.70	3.59	1.67	0.77	0.71	0.75	0.74
33.	0.19	0.25	4.50	3.79	0.66	0.17	0.63	0.05
34.	0.29	0.66	4.06	1.76	0.79	0.73	0.77	0.76
35.	22.41	24.84	91.03	52.15	0.50	1.82	0.62	1.52
36.	0.22	3.23	4.33	3.96	0.34	1.80	0.45	1.50
37.	6.90	0.41	34.97	2.31	3.98	3.01	4.39	2.59
38.	1.00	1.16	0.98	0.64	0.32	0.06	0.26	0.16
39.	0.07	0.50	5.02	2.12	0.80	0.75	0.79	0.78
40.	1.95	1.79	3.10	0.76	0.51	0.71	0.63	0.53
41.	0.82	0.60	1.79	1.89	0.72	0.56	0.70	0.61
42.	0.31	0.14	6.64	2.93	1.02	1.02	1.02	1.01
43.	1.09	0.08	0.63	3.06	1.01	0.04	1.17	0.07
44.	0.95	10.24	9.38	26.05	1.85	9.28	1.92	8.40
45.	0.26	1.00	4.19	1.00	0.56	0.37	0.52	0.44
46.	0.17	0.38	6.04	2.38	0.71	0.66	0.68	0.69
47.	0.09	0.35	4.92	2.45	1.03	0.96	1.03	0.96
48.	0.26	0.34	4.19	2.47	0.97	0.86	0.96	0.88
49.	1.73	0.15	12.73	3.57	0.70	0.62	0.68	0.66
50.	2.52	2.06	16.13	7.83	4.26	5.79	4.53	5.28

Tab. 12: Summary of the ARDs for individual breweries using differentiated and undifferentiated multipliers for SME sample (+)

No.	Differentiated				Undifferentiated			
	Median 2019	Median 2020	Aggregated 2019	Aggregated 2020	Median 2019	Median 2020	Aggregated 2019	Aggregated 2020
1.								
2.								
3.								
4.								
5.								
6.								
7.		0.06		0.23		1.37		0.75
8.	0.23	0.19	0.20	0.38	1.85	1.47	1.04	0.82
9.	0.24	0.17	0.21	0.04	2.23	1.03	1.31	0.49
10.								
11.	0.45	0.23	0.47	0.42	1.19	0.81	0.56	0.33
12.	0.10	0.37	0.08	0.58	0.31	0.22	0.51	0.43
13.	0.29	0.01	0.26	0.15	0.02	0.14	0.30	0.16
14.	0.00	0.68	0.02	0.63	0.25	0.23	0.46	0.43
15.	0.01	0.23	0.01	0.11	0.16	0.06	0.40	0.31
16.	0.21		0.23		1.01		0.44	
17.								
18.								
19.								
20.								
21.								
22.	0.03		0.05		4.20		2.71	
23.	0.04		0.01		0.02		0.27	
24.	0.33	0.75	0.30	0.72	0.14	0.41	0.18	0.04
25.	0.84		0.84		2.75		1.68	
26.	0.45	0.24	0.47	0.12	0.19	0.00	0.42	0.26
27.								
28.	0.60	0.95	0.61	0.94	1.12	1.25	0.51	0.66
29.								
30.								
31.	0.98		0.98		0.39		0.01	
32.	0.24	0.40	0.26	0.31	0.44	0.38	0.60	0.54
33.	0.03	1.48	0.01	1.87	0.17	1.47	0.40	0.82
34.	0.10	0.33	0.12	0.22	0.49	0.42	0.63	0.58
35.								
36.	0.02		0.04		2.26		1.33	
37.	9.01	0.16	8.79	0.35	11.15	7.47	7.68	5.23
38.								
39.	0.18	0.00	0.16	0.16	0.52	0.48	0.65	0.62
40.								
41.	0.77	0.21	0.77	0.09	0.33	0.07	0.52	0.31
42.								
43.		0.83		1.12		1.20		0.62
44.								
45.	0.06	1.00	0.08	1.00	0.07	0.33	0.23	0.02
46.	0.49	0.23	0.45	0.42	0.28	0.28	0.49	0.47
47.		0.28		0.49		0.91		0.94
48.	0.06	0.31	0.08	0.52	0.92	0.71	0.94	0.79
49.	2.46	1.28	2.38	1.64	0.27	0.19	0.48	0.40
50.								

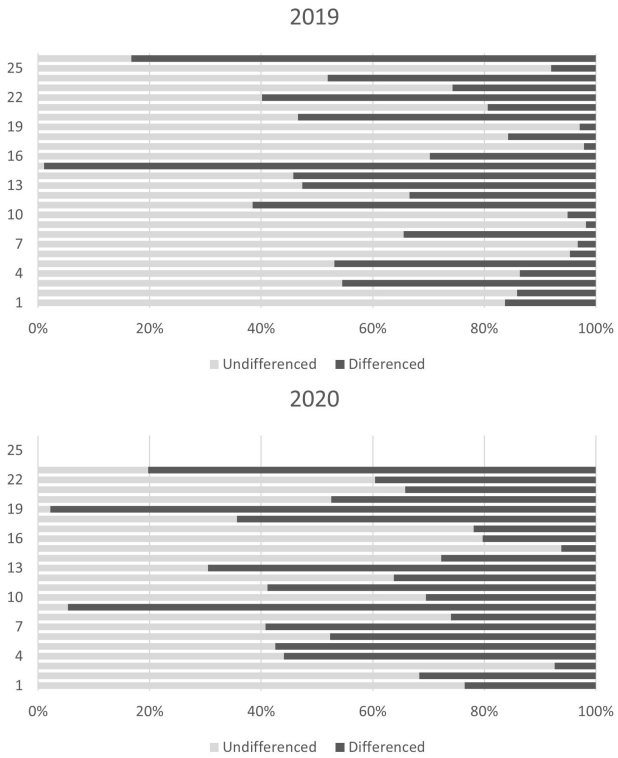

Fig. 3: A comparison of the ARD of each brewery (one per line) for the differenced (dark) and undifferenced (light) estimates at the aggregate industry multiplier level in 2019 and 2020 using a stacked graph to 100%

Tab. 13: Inputs to the calculation of private company discount (dimensionless)

	2019 median	**2019 aggr.**	**2020 median**	**2020 aggr.**	**FW2020 median**	**FW2020 aggr.**	**FW2021 median**	**W2021 aggr.**
EU public traded								
P/EAT	25.75	19.79	26.30	21.64	19.95	19.52	23.72	25.05
P/BV	2.05	2.20	2.70	2.36				
CZ privately held								
P/EAT	16.19	21.37	15.55	25.42	14.91	16.01	14.32	16.56
P/BV	1.16	0.98	0.81	0.94				
PCD								
P/EAT	37.13%	−7.96%	40.87%	−17.48%	25.29%	17.99%	39.61%	33.90%
P/BV	43.30%	55.62%	70.08%	59.94%				

Source: Damodaran (2020 and 2021), Drábek and Pastorek (2023).
Notes: Aggr. means aggregated, FW means forward and PCD represents private company discount.

AUTHOR'S ADDRESS

Michal Drábek, Department of Business Economics, Faculty of Business and Economics, Mendel University in Brno, Zemědělská 1, 613 00 Brno, Czech Republic, e-mail: xdrabek1@mendelu.cz (corresponding author)

Pavel Syrovátka, Department of Business Economics, Faculty of Business and Economics, Mendel University in Brno, Zemědělská 1, 613 00 Brno, Czech Republic, e-mail: pavel.syrovatka@mendelu.cz