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Reinvestments in dentistry and differences between western or central and eastern European countries

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Abstract

This paper has focused on the willingness of owners to reinvest their profit back into a company. Research gaps in the investigation of financial issues in the healthcare industry are apparent in the literature. The aim of this paper is to estimate the differences in reinvestments between dentistry companies operating in western or central and eastern Europe (CEE). Annual Orbis data were obtained from financial reports from 3,711 western and 1,173 CEE companies. The generalized method of moments with panel data, currently modified by Kripfganz (2019), has been deployed as the main estimation technique. The estimated sample has been divided according to the return on assets into quartiles. The results clearly show that western owners rather reinvested their earnings back into their businesses, whereas CEE owners reinvest at a lower level. Furthermore, the willingness to reinvest, as well as the financial constraints related to that, can affect the quality of dentistry services.

1. Introduction

A conflict of interest between managers and companies' owners is generally considered the leading cause of information asymmetry within corporate finance. Despite the interest in this conflict, few studies have considered health economics. Furthermore, to our knowledge, no one has studied dentistry as a specific business industry. In general, health economics has its role in identifying research priorities (Torgerson, Donaldson & Reid, 1996). During the last decade, we have faced an expansion of private companies that provide dentistry services. The results of this study will greatly contribute to health economics by comparing the willingness of owners to reinvest their profits back into their business. This work offers one of the first investigations into the finance of dentistry.

This paper aims to estimate the differences in reinvestments between dentistry companies operating in western or central and eastern Europe (CEE). In particular, this work examines the impact of return of assets (ROA) on retained earnings. Profitability plays a crucial role for existence of all private companies, not excluding the private dentistry. To not assume that each dentistry is similar, companies will be divided according to each quartile of ROA into four categories. Annual data obtained from financial reports from 3,711 western and 1,173 CEE companies within the period from 2011 to 2018 will be used for estimation. Such data in panels are suitable for estimation using generalized method of moments (GMM). However, according to recent features in applied statistics, Kripfganz (2019) approach is applied.

The structure of this paper is as follows; even though there is small evidence, especially in dentistry, after the introduction a brief literature review is focusing on the agency theory in Section 2. Section 3 describes the data as well as the GMM approach, including its current innovative techniques. Discussion made in Section 4

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compares the results of those western and CEE dentistry companies. Finally, conclusion includes limitations of this study and offers areas for future research in this field.

2. Theoretical concept of the earnings management

Asymmetric information appears in the company within the relationship between managers and shareholders, and further between companies and creditors. Firms that do not send signals or send the wrong signals will be harmful to investors. Or an administrator who directly manages will know business information but will fully withhold it, causing adverse choices for shareholders and moral hazard for the manager. To minimize this behaviour, shareholders should align managers with the common interests of shareholders and businesses through salaries, bonuses, or partial ownership of company shares. Therefore, it is necessary to have a mechanism to monitor managers' decisions, increase their value to shareholders, and disclose information in financial statements accurately and transparently (Tran and Dang, 2021). The management causing moral hazard to the owner is described in Figure 1. The starting point for the creation of the model is the theoretical principal-agent model, constructed by Laffont and Martimort (2002) at Princeton University, who themselves state that it can also be applied to the representative conflict of shareholders vs. company management. However, in the case described below, it is not a relationship between the quantity of goods and their price, but a relationship between the profit achieved and the percentage of the profit paid out to the owners.

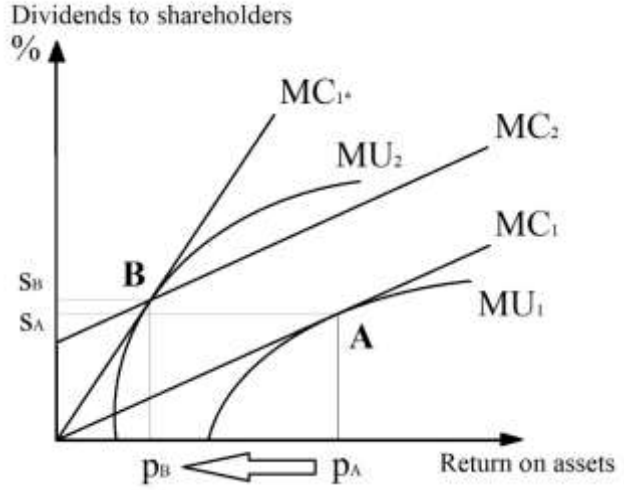

Figure 1. Theoretical scheme of the earnings management

Source: Author's illustration.

Apparently, even in the given case, it is true that the profit (utility) function of management that represents the MC indifference curves in the form of increasing half-lines is equal to the marginal costs in Figure 1. Simply put, the lower the share of earnings, the higher the percentage share of the profit required by the shareholders, and *vice versa*, the higher the share of earnings, the greater the willingness of the shareholders to reinvest part of the profit back into the business. The marginal utility of the owners is represented by increasing concave MU curves, where higher utility is represented by lower indifference curves, where a lower percentage increases in absolute value. Therefore, the given model is only valid under the condition that $S_B \geq S_A$, even in absolute monetary terms. The conflict between management and owners is evident just from the fact that there is no tangent to the maximum point of shareholder utility, the top of the concave curve. The only thing is that it would be a perfectly elastic function, in which case management would not be able to perform a management function. Management of earnings represents a situation in the scheme where, due to the reluctance of the owners to reinvest the profit back into the business, the management will use the previously described techniques for accounting adjustments so that the profit is actually slightly lower, even at the cost of higher shares of dividends (shift from point A to point B). Thus, a part of the potential profit is used for other financial operations without informing the owner. However, from what has been said, it can be argued analogously that the risk of moral hazard on the part of management decreases for companies with larger accounting-recorded reinvestments of profit back into the business.

Management of earnings is an area that has already been studied by many scholars. Nevertheless, at least for now, there is still no consensus on the definition of earnings management (Beneish, 2001). According to Schipper (1989), earnings management is understood as the adjustment of earnings to achieve predetermined management goals, which is a deliberate intervention in the process of providing financial information to achieve personal goals. Levitt (1998) defines the management of the economic result as a dark area where accounting

grievances often occur because the administrator, the agent, has already adjusted the profit according to the wishes of the management. Nonetheless, the profit and loss statement reflects those wishes of the management rather than the actual financial situation of the business. In addition, Healy and Wahlen (1999) argued that earnings adjustments occur when managers use accounting estimates or internal transactions to influence financial statements to mislead some related parties about the company's business condition or to affect contracts that have obligations based on accounting targets' revenues. Akers et al. (2007) define earnings management as management's effort to influence or manipulate the profit and loss statement by means of special accounting methods (or by changing the methods themselves), such as recognizing an item at the nonrecurring level, delaying or speeding up the recording of cost or revenue transactions, slowing down or speeding up the recording of costs or revenue transactions, or other methods designed to influence short-term income. Beneish (2001) argues that profit is an intentional aspect of business to provide investors and stakeholders with useful and truthful financial information about the business situation of businesses to help them make business-related financial decisions.

The originality of this paper lies in the use of dental companies from a financial point of view. However, the principal-agent model related to dentists was described by Maryniuk (1990) already. Although a physician will seek to defend the patient's economic well-being. Nevertheless, economic well-being depends on the acceptance of recommendations and the payment of such services by a patient. Hence, the medic's own interests might be in conflict with the desire to serve the client. Do et al. (2010) investigated income-related inequality in oral health, in other words, distinguishing between quartiles of equivalized income of patients. Even though this information asymmetry means that the situation in dentistry is not so simple. Except for the quality of innovative materials that affect not just patient comfort but the price of the services due to the higher costs Rekow et al. (2013) discuss the role of health care system may having a profound influence on whether, how, and how quickly alternative restorative materials can be introduced. Where a third party is sharing the costs, it is not always an advantage. However, downward pressure to slow down or even prevent the adoption of new materials affects dentistry. The time-consuming process of incorporating new technologies into dentistry related to failure stress is another complication that often affects dentist judgment (Rees, 2013).

3. Data & Methodology

3.1. Annual data from Orbis

The annual data for dental companies was obtained from Orbis, Bureau van Dijk. In particular, data from financial reports of 3,711 western and 1,173 central and eastern European (CEE) firms have been used. On the one hand, the return earnings ratio (RER) as a difference of shareholders' funds versus capital, on the other hand, the return on assets (ROA) using earnings before interest and taxes (EBIT), both have been measured on total assets. However, negative values for EBIT, capital, or even shareholders' funds have been omitted to employ just those healthy companies. First, to estimate the effect of liquidity, the acid test (LIQ) has been examined as a difference between current assets and inventories, measured on current liabilities. Second, to compare microeconomic development with macroeconomic development, the nominal GDP per capita in local currencies obtained from the World Bank statistical database has been used among selected countries. Furthermore, to prepare robust panel data, the outliers from the first and the last percentile have been omitted amongst panels.

When we compare the descriptive statistics in Table 1, the profitability of dental companies appears to be higher among CEE within all quartiles. However, it could be due to a different structure or even the quality of the equipment. The lower level of total assets then leads to higher profitability ROA. In the first two quartiles, the RER also seems to be higher in the CEE. On the other hand, the levels of reinvestments are closer to each other, comparing the variability of the data through a standard deviation. The LIQ liquidity acid test appears to be slightly higher among the first two quartiles in western Europe. The question is whether a higher level of retained earnings RER would be caused by a lower level of liquidity LIQ simultaneously increasing profitability ROA.

Table 1. Descriptive statistics of selected variables

	WESTERN EUROPE			*CENTRAL & EASTERN EUROPE*		
	ROA	***RER***	***LIQ***	***ROA***	***RER***	***LIQ***
Q1 (25%)	6.6135	15.5896	0.7024	8.8636	21.2125	0.5321
Q2 (median)	13.2945	37.9476	1.2733	19.0303	43.6648	1.2134
Q3 (75%)	24.8873	65.1922	2.7304	36.5522	65.8772	2.8922
Std. dev.	16.4720	28.9468	4.8741	22.3181	27.0880	3.6760
Obs.	10,681	13,544	14,342	3,553	3,564	3,719

Source: Author's calculation in STATA 17

The final issue related to data description is obvious from Figure 2 where we can see selected western as well as central and eastern European countries in particular. Positive changes of logarithmic GDP equal the economic growth, whereas negative changes decreasing of GDP in estimated years. The sovereign debt crisis in the Eurozone apparently affected the economic downturn in 2012 in western Europe (especially in ES, IT, and PT). The delayed impact of the global financial crisis frequently discussed in the literature is evident in the economic downturn among CEE countries in 2011, 2012 and even 2013 (e.g. BG, CZ, HR, and SI). Economic development could affect especially these more profitable dentistry companies. Either a patient would postpone already planned procedures, or cheaper services would be prioritized. On the other hand, patients would rather focus on expensive procedures that do not belong to the emergency if economic wealth increases.

Figure 2: Logarithmic changes of the nominal GDP inside the panels

Source: Author's calculation in STATA 17

3.2. Generalized method of moments with dynamic panel data

To estimate differences in reinvestments between dentistry companies operating in western or central and eastern Europe (CEE), a generalized method of moments is used. In particular, the Arellano-Bover/Blundell-Bond system GMM, a two-step differenced estimator with dynamic panel data, has been constructed according to the following equation (1):

$$y_{it} = \sum_{j=1}^{p} \alpha_j y_{i,t-j} + x_{it}\beta_1 + w_{it}\beta_2 + v_i + \epsilon_{it} \qquad i = 1,\ldots,N \qquad t = 1,\ldots,T_i \tag{1}$$

where:

α_j indicates the total number of *p* parameters for the estimation of the endogenous variable RER,

x_{it} creates $1 \times k_1$ vector of the other endogenous variable ROA,

β_1 is $k_1 \times 1$ vector of parameters to be estimated,

w_{it} creates $1 \times k_2$ vector of predetermined variables, either LIQ or GDP,

β_2 is $k_2 \times 1$ vector of parameters to be estimated,

v_i represents panel effects that can be correlated with regressors,

and ϵ_{it} as residuals, through the panel of idiosyncratic errors having variance σ_ϵ^2.

, while for two-step GMM models for estimating period 2010-2018 is $T_i = 7$. An assumption for the functionality of the model is non-correlation between v_i and ϵ_{it}. Endogeneity tests developed by Kiviet (2020, 2022) are a significant contribution to the application of GMM with panel data, when it is already possible to decide which regressors to introduce into the model, as endogenous or predetermined variables, both in the event that the strict exogeneity of the given variable cannot be confirmed. However, the assumption of these tests is the condition of homoscedastic residuals.

4. Discussion on empirical results

Apparently, the lagged dependent variable of the retained earnings ratio (RER) is significant among all the cases in Table 2 and Table 3. Therefore, due to dynamic panel data, the need for the generalized method of moments (GMM) is evident for both western and CEE companies in dentistry. To distinguish between the types of companies depending on the asset structure, four groups of models have been estimated according to the quantiles of the return on assets (ROA). The important thing is that only companies with positive capital and further positive earnings before interest and taxes (EBIT) are included in the sample. Technically, ROA has been treated as endogenous, whereas liquidity acid test (LIQ) and the natural logarithm of nominal GDP per capita have been treated as predetermined within the GMM system. Furthermore, according to Sargan-Hansen techniques, the Q3 CEE model with LIQ and the Q4 CEE model with GDP, both suffer from overidentification. Hence, the estimates could have given just false significant estimates. However, based on techniques suggested by Kripfganz (2019), neither over- or underidentification has been evident among the rest of GMM models. Arellano-Bond serial correlations have also not been significant at the second or third order in all cases.

Table 2. GMM modelling with the liquidity acid-test (retained earnings ratio as explained variable)

	WESTERN EUROPE				*CENTRAL & EASTERN EUROPE*			
Variable	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
RER(1)	2.4200[a]	1.7139[a]	2.0703[a]	2.4880[a]	1.6892[a]	1.5964[a]	1.3620[a]	1.6472[a]
ROA	2.5436[c]	16.1043[a]	3.0688[a]	1.3354[a]	12.3129[a]	7.1350[a]	2.6747[c]	1.7776[a]
LIQ	1.0682	1.0221	1.0068	1.0000[a]	1.0658[b]	2.2226[c]	37.5368[b]	1.1360
Obs.	2,158	2,181	2,189	2,064	521	628	617	587
Groups	873	973	998	763	260	292	281	243

Note: Arellano-Bover/Blundell-Bond system GMM two-step estimator with linear moments; diagnostic tests for over- and underidentification, and cross correlations deployed from Kripfganz (2019).
Souce: Author's calculation in STATA 17

If the estimated means of the lagged RER are compared in both groups, western and CEE dentistry companies, a higher level of willingness to reinvest the earnings back into their business is evident among those western firms. There is a lower level of estimates within the CEE. Nevertheless, an interesting finding is that pressure on profitability is apparent not only amongst Q1 and Q2 CEE cases with liquidity. According to reinvestments, some pressure is evident even in western Europe Q2 within the modelling with liquidity in Table 2. Although employing the logarithms of GDP makes ROA insignificant in almost all cases, less profitable dentistry companies in the CEE have apparently been focusing on their profitability in Table 3. Not surprisingly, the impact of LIQ as well as of GDP is not significant in all cases. LIQ is obviously significant only for those more profitable dentistry companies in western Europe, whereas among CEE companies, in contrast, LIQ is significant for those less profitable. Simultaneously, only these more profitable western companies are sensitive to GDP, whereas these less profitable CEE companies tend to be less sensitive.

Table 3. GMM modelling with the GDP (retained earnings ratio as explained variable)

	WESTERN EUROPE				*CENTRAL & EASTERN EUROPE*			
Variable	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
RER(1)	2.2424[a]	2.3029[a]	2.3464[a]	2.1430[a]	1.5184[a]	1.7609[a]	1.5821[a]	1.5324[a]
ROA	1.6202	2.1278	1.0693	0.7689	3.9174[a]	1.4686	1.3752	1.0215
lnGDP	1.5671	1.2319	2.6919	10.7361[a]	2.8715[b]	3.0263	6.7372[c]	31.7894[a]
Obs.	2,170	2,190	2,196	2,072	659	673	700	668
Groups	875	975	1,000	763	271	310	312	266

Note: Arellano-Bover/Blundell-Bond system GMM two-step estimator with linear moments; diagnostic tests for over- and underidentification, and cross correlations deployed from Kripfganz (2019).
Souce: Author's calculation in STATA 17

5. Conclusion

The aim of this paper was to estimate the differences in reinvestments between dentistry companies operating in western or central and eastern Europe (CEE). To avoid overidentification of the GMM models with retained earnings as the dependent variable, two groups of models were constructed. The first employed only microeconomic variables, including the profitability and liquidity of western and CEE companies. The second group of models employed only profitability as a microeconomic variable and then GDP as a macroeconomic variable. Among both groups of models, they were distinguished according to the quartiles of the dependent variable, retained earnings. The positive impact of profit reinvestments was significant among all models. Although two groups of models were constructed, a higher level of willingness to reinvest profits back into the business was evident in both cases for those western dentistry companies.

Although already discussed in the literature addressed to dentistry (Doherty & Crakes, 1985; Maryniuk, 1990; Tilley et al., 2005), future research should focus more on the comparison of those fixed and variable costs. As the statistical tools has significantly increased in last decade, especially within the cross-section and panel data, there is still a huge research gap in the literature, though.

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