TAXONOMY OF HOLDING STRUCTURES OPERATING IN CONSTRUCTION INDUSTRY - A CASE OF THE CZECH REPUBLIC

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Abstract

The aim of this paper is to provide taxonomy of the holding structures of multinational companies operating in the construction industry (NACE 41-43) where the parent company is based in the Czech Republic and identify the holding structure platforms depending on the economic performance and scope and variability of the holding structure. A partial objective is to determine the extent to which the scope and variability of the holding structure are distinctive features. Based on literary research, a selection of suitable economic indicators is made. These are rating criteria for the classification of individual companies. Relevant data was subsequently arranged in a multidimensional matrix in which redundant variables were eliminated using appropriate methods with the aim to eliminate multiple collinearity in the data. The newly created matrix was then subjected to cluster analysis. The obtained results indicate that economic performance varies in companies with different scope and variability of holding structure.

Key words

Construction Industry, Economic Performance, Holding Structure, Multinationals Enterprises

I. Introduction

In the past, the globalisation was considered as an economic process typical of an increased deregulation of trade, electronic communication and capital mobility. As Owens (1993) aptly points out, the world has become smaller thanks to globalisation. Despite a certain shift in the perception of globalisation and contradictory trends (see e.g. Zeleny, 2012), globalisation is still perceived as a complex phenomenon, „ *... that is shaped by a multitude of factors and events, and that is reshaping our society rapidly; it encompasses not only economic, political, and technological forces, but also socialcultural and environmental aspects*." (Martens et al., 2010) Das (2010) asserts that, „ ... *globalization is neither good nor bad in itself; in the long-run it is a step towards efficiency*". The study by Olimpia and Stela (2017) supports this view saying that globalisation contributes to the growth of gross domestic product; the study by Padhy (2013) points to an increase in foreign direct investment (hereinafter referred to as „FDI" only). FDI can be defined as investments thanks to which a company reaches, „ ... *a majority or at very least a controlling interest in foreign firm*" (Markusen, 2009). Firms making FDI are referred to, according to Markusen (2009), as multinational enterprises. Other authors, e. g. Sluyterman and Wubs (2010), define multinational companies as companies that carry out their activities abroad. The term multinational enterprises immanently refers to the term of holding structure which is generally understood as the capital or other connection of two or more companies. However, the definition of this frequently used term is not embedded in any legal systems in the world (Gajewski, 2013). As pointed out by Kessler (1996, in Gajewski, 2013), „ ... *an important feature of holding that distinguishes it from similar forms is the fact that the parent company does not run the business itself; it only holds shares in subsidiaries and uses its rights on these grounds (e.g., in international tax treaties, the reduction or even exemption from tax on dividends paid in the source country).*"

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As Ng (2013) states, multinational corporations form holding structures not only for the purpose of tax burden reduction but also to ensure a diversification of risks and to obtain a greater legal certainty. Other reasons worth noting are the increase in efficiency in general and the possibility to use business opportunities in a faster fashion. An appropriate holding structure can also create better „gates" for penetrating other markets or improve the position and credibility in countries where the companies will operate. Therefore, it can be concluded that the creation of appropriate holding structures is a topic worth interest and further research which fact is also documented by the growing number of professional publications focusing on this topic (for some aspects see Cohn (2010), Buss, et al. (2007), Buss, et al. (2005)).

II. Aim and methodology

The purpose of this paper is to contribute to the discussion on holding structures. Its goal is to provide taxonomy of holding structures of multinational corporations operating in Construction Industry (NACE code 41-43) having a parent company with its seat in the Czech Republic. The research questions have been defined as follows:

- What platforms (models) of holding structures can be identified according to the economic performance and scope and variability of the holding structure?
- To what extent is the scope and variability of holding structure a distinguishing characteristic?

According to the authors, the scope and variability of the holding structure means the number of subsidiaries and their location (country where the subsidiary is based). The definitions of parent companies and subsidiaries for the purpose of this paper are based on the rules stipulated in the *Council Directive 2011/96/EU of 30 November 2011 on the common system of taxation applicable in the case of parent companies and subsidiaries of different Member States* as amended, namely the rule pertaining to 10 % as the minimum share in the registered capital is taken over.

The Amadeus database was used as the source of data (software version: 15.05.; data update 15/06/2018 (No. 2851); exported as of 22 June 2018). For the purpose of the analysis the paper authors carried out a literature research in order to select suitable indicators and, subsequently, defined five framework areas for which partial criteria were set. Category one presents a general description (characteristic) of the parent company, the following three categories evaluate the economic performance (the definition of suitable indicators for the given area is based on knowledge and recommendations stated in literature (Renald et al. (2013), Kotane (2015), Krivka and Stonkutė (2015), Mohamad et al. (2014)); the last category describes the number and location of subsidiaries. The criteria are summarised in Table 1 below.

Table 1 Criteria followed

Category	Particular indicators
General description of a parent company	Legal form
	Category of the company
	Operation revenue (turnover) [EUR]
	Total assets [EUR]
	Number of employees
	Working capital [EUR]
Profitability rations	ROE using P/L before tax [%]
	ROCE using P/L before tax [%]
	ROA using P/L before tax [%]
	ROE using Net income [%]
	ROA using net income [%]
	Profit margin [%]
	EBITDA Margin [%]
	EBIT Margin [%]
	Cash flow /Operating revenue [%]
Structure rations	Current ratio
	Liquidity ratio
	Shareholders liquidity ratio
	Solvency ratio (Asset based) [%]
Per employee rations	Profit per employee [EUR]
	Operating revenue per employee [EUR]
	Costs of employees / Operating revenue [%]
	Average cost of employee [EUR]
	Working capital per employee [EUR]
	Total assets per employee [EUR]
Subsidiaries	Number of subsidiaries in total
	Number of subsidiaries in particular countries

Source: Own elaboration using (Renald et al. (2013), Kotane (2015), Krivka and Stonkutė (2015), Mohamad et al. (2014))

The paper which in a way is a case study or a discussion paper serves as the point of departure for subsequent more extensive research. For this reason, from the 2012 – 2018 period, the year 2016 was selected and further scrutinised due to best availability of data. The original sample of 177 parent companies operating in construction industry (NACE code 41-43) was gradually reduced to those companies whose complete data were published. Subsidiaries for which information on the share held by the parent company was not published were not included in the analysis either. Ultimately, 38 companies were subject to research. The basis for the analysis was a multidimensional matrix with the scope 38x42 which contained both numerical and category variables.

The authors used the multidimensional analysis method to process the created multidimensional matrix, namely cluster analysis with respect to the goal to find the dependence between the variables within one set of variables (see (Hendl, 2012b)). One of the assumptions stated for the use of cluster analysis, or for the achievement of better results, is the absence of multi-collinearity – however, this was present in the analysed sample. The literature (see, e.g. (Sambandam, 2003)) points to the fact that the existence of multi-collinearity can affect the results – in the case of

the collinearity among the variables used in the cluster analysis some variables get more weight than others. There are several ways to eliminate the shortfall caused by the collinearity of data, including the removal of redundant (or duplicate) variables (Ketche and Shook, 1996). For this purpose, the authors of the paper used a factor analysis that was performed for each group with the aim to reduce the observed variables so that the newly created data matrix contained variables without mutual multi-collinearity within the category. This newly created data matrix was subsequently processed using the Statistica software (version 13.3) applying *K-means clustering* (*maximization of initial between-cluster distances used for setting initial cluster centers*). The number of clusters was determined based on the relation: $k = \sqrt{n/2}$ (see Vintilă et al., 2014), where *n* correspond to the number of subjects (38 companies in this case). The number of cluster was 4.

For the description of clusters authors used verbal description (evaluation) which is the projection of the comparison of clusters among themselves. Where possible and rational, authors divided the interval of the existing values in the followed parameters (indicators) into three equal parts based on 33.3 % and 66,7 % percentile. The percentiles set were used as basic boundaries among categories described as *low*, *medium* and *high*. The resulting cluster evaluation (description) was then determined by prevailing values. In case of high variety in companies included in the cluster the description *variable* was used.

Authors also tested the robustness of the results reached while using different types of methods/ways established for cluster analysis.

III. Results and discussion

Prior to the actual cluster analysis, the authors, using data from the Amadeus database (data update 18/05/2018, exported day 21.05.2018) determined the number of active parent companies operating in the industry NACE 41-43 and meeting the aforementioned criterion of at least 10% ownership of the registered capital in at least one company. As follows from the Figure 1 below, the number of such companies is not evenly distributed within the EU and, on the basis of the primary assessment of presented data, it is impossible to even identify a direct connection between the size of the country and the number of companies operating in it.

Figure 1 Number of Parents Companies in EU by industry classifications NACE 41-43

Source: Own elaboration using database Amadeus (2018) [data update 18/05/2018, export date 21.05.2018]

On the basis of available data, the Czech Republic is ranked 9th in the EU in terms of the number of active parent companies (177). However, due to the limited availability of all relevant data, 38 companies were subject to further scrutiny. The companies were assessed by the following criteria:

- operation revenue (turnover) [EUR];
- working capital [EUR];
- EBIT Margin [%];
- solvency ratio (Asset based) [%];
- profit per employee [EUR] and
- average costs of employee.

The verbal description of individual clusters is provided in Table 2 below; the following Table 3 shows other characteristics pertaining to the defined clusters.

Table 2 Results of cluster analysis

	Cluster			
	I	II	III	IV
Number of cases	2	29	6	1
Characteristics				
Operation revenue (turnover) [EUR]	High	Variable	Variable	High
Working capital [EUR]	High	Variable	Variable	High
EBIT Margin [%]	Variable	Variable	Low to Medium	Low
Solvency ratio (Asset based) [%]	Variable	Variable	Variable	Medium
Profit per employee [EUR]	High	Variable	Variable	Low
Average costs of employee	High	Variable	Medium to High	High

Source: Own Elaboration

Table 3 Other aspects of the companies included in particular clusters

	Cluster			
	I	II	III	IV
Legal form				
Joint-stock Company	1	17	4	x
Limited Liability Company	1	12	1	1
Special Limited Partnership	x	x	1	x
Category of company				
Very large	2	x	2	1
Large	x	18	4	x
Medium sized	x	11	x	x
Subsidiaries				
No of subsidiaries	3 or 11	1 or 2	up to 10	38
Location of subsidiaries	Croatia Belgium Czech Republic Hungary Serbia Slovakia	Austria Croatia Czech Republic Germany Great Britain Poland Russia Serbia Slovakia	Cyprus Czech Republic Germany Slovakia	Czech Republic Slovakia

Source: Own elaboration

It seems that for the companies included in *cluster 1* high operation revenue, high working capital, high profit per employee as well as high costs of employee are typical. The solvency ratio does not seem to play a role of a distinguishing feature: there is as a rule a high variability inside the clusters.

When all other aspects were considered (see the summaries in Table 3 above) it transpired that companies included in *cluster 1* are large and medium sized companies with a typical broader holding structure – i.e. these companies hold a large number of subsidiaries: their subsidiaries are mostly located in the Czech Republic and in EU countries (excluding Serbia). As for companies included in *cluster 1*, the inclusion of companies without a specified portion of ownership had an impact on increasing the number of countries in which the companies are located. Specifically, this was Sweden. It can be assumed that a wider holding structure allows a diversification of risks and also an easier expansion to other markets. A targeted effort to reduce the tax burden is also worth noting as one of the reasons for creating holding structures with an international element (see Desai et al., 2006 in Schanz et al., 2017). However, the results obtained do not prove the existence of significantly better results. An important economic feature distinguishing the companies in *cluster 1* from the remaining clusters is the existence of high working capital. This may be connected with the organisation of the parent company and its subsidiaries or, rather, what functions are performed by the parent company and its subsidiaries.

Cluster 2 has a noteworthy specific – high variability in all followed indicators within particular clusters. The companies included in *cluster 2* are large and medium sized companies. Subsidiaries in which the parent companies hold shares are located in the EU countries. When subsidiaries without an identified share are included, the number of companies in which the company had the defined share grew up to 10.

Cluster 3 can also be described as one with high variability inside the cluster. EBIT margin is up to medium; average cost of employee reaches from medium to high. The *cluster 3* companies are very large and large; they hold shares up to ten subsidiaries in four different countries. One of the subsidiaries is always located in Cyprus: this fact can be seen an interesting attribute - Cyprus is considered one of the so-called tax havens with regard to its preferential regimes (see Botis (2014)). In the case of the inclusion of the countries in which the subsidiary is located without an identified share, these countries will be extended to include Poland, Russia, Hungary and Serbia.

For the company (only one) included in *cluster 4*, there is high operation revenue, high working capital and high average costs of employees. On the other hand, the company included in *cluster 4* reached low EBIT margin and low profit per employee. The company is categorized as very large and has a lot of subsidiaries both in the Czech Republic and Slovakia. In this respect it can be considered as a company with a local operation. However, in the case of the inclusion of the countries in which the subsidiary is located without an identified share, these countries will be extended to include Germany, Hungary, Romania and Austria.

A rather clear view can be taken as for the legal form of business – in the profile there is a prevalence of capital companies (joint-stock companies and limited liability companies). To sum it up, the results reached are not convincing in respect of identification of the platforms of holding structures according to the economic performance. Paradoxically, it seems that it is the scope and variability of the holding structure that make up the most distinctive factor.

To verify the results and to test the robustness of the results, other methods of cluster analysis were used. Table 4 (see below) specifies the content of particular clusters depending on the method used. All the results were described in the way as it was done for the results for *K-means clustering* (*initial cluster centers: maximization of initial between-cluster distances*) – see Table 2 and Table 3 above. The conclusion remained valid even after carrying out multi-stage cluster analysis: this analysis began with a cluster analysis realized for continuous variables as included in particular categories. The results reached was then used for the classification of particular companies (cases) from the view point of their inclusion in one of the four identified clusters. Created matrix containing categorical

variables was subsequently processed using tree clustering (Ward´s method) and EM algorithm – for the results see Table 5 below.

Thus, in relation to the summary of answers to the research questions it cannot be stated that the platforms (models) of holding structures were identified in dependence on the economic performance while using cluster analysis. On the other hand, existing results indicate the following:

- Economic performance (in terms of EBIT margin and profit per employee) is different in companies with a varying scope and variability of the holding structure.
- Certain patterns (platforms) can be identified varying in the scope and variability of the holding structure depending on the companies' integration in the cluster. Paradoxically, it seems that it is the scope and variability of the holding structure that make up one of the most distinctive factor in identification of possible platforms.
- Parent companies having their seat in the Czech Republic have their subsidiaries above all in the Czech Republic and other EU countries.

Table 4 Companies (cases) included in particular clusters – results of the standard cluster analysis

	Cluster			
	I	II	III	IV
Tree clustering (Ward method)	1 5 4	2 3 6 12 28 16 14 29 8 13 15 27 11 10 32	7 21 31 18 22 34 19 26	9 17 38 36 33 20 25 35 37 24 23 30
Tree clustering (complete linkage)	1 5	4 32	2 3 6 12 28 16 18 22 34 19 26 8 15 27 13 11 10 7 21 31	9 14 20 25 29 35 37 23 30 17 38 36 33 24
K-means clustering (general)	9 17 20 23 24 25 29 30 33 35 36 37 38	1 4 5	2 3 6 8 10 11, 12 13 14 15 16 19 26 27 28 32	7 18 21 22 31 34
K-means clustering (maximization of initial between-cluster distances)	1 5	6 7 8 10 12, 13 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 33 34 35 36 37 38	2 3 9 11 14 32	4
Cluster analysis: EM algorithm (without categorical variables)	4 32	1 2 3 5	6 7 8 9 10 11 12 13 14	15 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 33 34 35 36 27 38
Cluster analysis: EM algorithm (including categorical variables)	1 9 32	1 2 3 5	6 7 8 10 11 12 13 14 21 31	15 16 17 18 19 20 22 23 24 25 26 27 28 29 30 33 34 35 36 37 38

Source: Own elaboration

Table 5 Companies (cases) included in particular clusters (multi-stage cluster analysis)

	Cluster			
	I	II	III	IV
Tree clustering (Ward method)	1 3 2 5 6 8	7 13 15 19 17 36 27 26 28 38	9 20 11 12 14 16 23 35 37 25 29 30	4 31 32 10 24 18 33 21 22 34
K-means clustering (general)	1 2 3 4 5 6 7 8 9	10 18 21 22 24 31 33 34	13 17 26 28 32 36 38	11 12 14 15 16 19 20 23 25 27 29 30 35 37
Cluster analysis: EM algorithm (without categorical variables describing general characteristics of the company)	26 28 31 32 38	1 2 3 4 5 6 11 12 14 15 16 17 19 20	7 8 10 13 18 21 22 24 27 34 36	9 23 25 29 30 33 35 37

Source: Own elaboration

The results reached suffer from limits resulting from the unavailability of necessary data. From the original sample of 177 companies meeting the primary condition, only 38 companies were left for analysis. In order to eliminate multiple collinearity the authors of the article applied the procedures (see Chapter II, Objectives and Methodology) which led to the elimination of redundant variables. The subsequent revision of the original sample of 177 can be reconsidered in view of the newly determined variables in question.

There remains the critical question of the applied method – the results obtained may be prone to using individual cluster analysis methods as proven above. In this respect, in the future the authors plan to test the robustness of the results obtained depending on the method of analysis used. The subject of their interest will be to verify the results achieved in comparison with the results achieved by other instruments/procedures/statistical methods.

As for the second conclusion stated above, the results can be considered as more convincing. That is to say, only the economic indicators were taken into account in the cluster analysis and only after that the data on the existing holding structure were included in the evaluation. Clusters created on the basis of economic variables evaluation show differences in the scope and variability of the holding structure. This indicates the scope and variability of the holding structure to be a significant factor which is worth to be focused in the following research.

The focus on a single year is also a limiting factor for the conclusions. In future research it would be appropriate to extend the observed period and subject the relevant indicators to panel data analysis. Another factor that needs to be taken into account in the follow-up research is that the parent companies under review do not have to be (and usually are not) at the top of the holding structure: the parent company and, therefore, its subsidiaries are only a part of a much larger holding group. Moreover, there could be duplicities in the data: a parent company could be at the same time a subsidiary to another company. That is also a significant reason for which the authors are of the opinion that for the future research the multiple case study (see, for example, (Hendl, 2012a)) focusing on the representatives of the individual clusters is of vital importance. The use of a multiple case study will make deeper and better understanding of this issue in question. At the same time it will eliminate a loss of important pieces of information (such e. g. specialization of the companies in particular sectors/types of contracts, specific operations realized during the year, existence or non-existence of public procurements).

IV. Conclusion

The construction industry is considered to be an important sector in the European Union, both in terms of its share in GDP and the number of jobs connected with this industry (European Commission, 2018). The aim of this paper was to contribute to the discussion about holding structures and to provide their taxonomy in multinational companies operating in this industry where the parent

company is based in the Czech Republic. Based on literary research, a selection of suitable economic indicators was made, which represented the evaluation criteria for the categorisation of companies into individual clusters. Other parameters, namely those evaluating the scope and variability of the holding structure, were subsequently assigned to the defined clusters. The results, however, have not demonstrably proven the existence of unambiguous platforms (models) of holding structures depending on economic performance while using cluster analysis. Nevertheless, there are some indications that economic performance (in terms of EBIT margin and profit per employee) is different in companies with a varying scope and variability of the holding structure. At the same time it seems that just the scope and variability of the holding structures are one of the most distinguishing features for identified clusters.

The results reached suggest that to identify platforms (types) of holding structures operating in the construction industry the use of multivariate statistical analysis does not seem to be a suitable tool. First of all, there is a big problem residing in unavailability of the relevant data, which diminishes the number of entities included in the sample that is/could be the subject to analysis. This fact creates an obstacle also for using panel data analysis. In this respect one can consider the imputation of missing values to eliminate this obstacle. However, there is a need to take account of limited number of total entities in the used database (which is still relatively low for the imputation of missing data) and other missing information that cannot be imputed. Another aspect that is worth mentioning is the complexity of the relations between the subjects (a company considered can play a several roles – it can be a parent company to several subsidiaries and at the same time it could be a subsidiary to several other companies). The complexity creating obstacles in using multivariate statistical analysis in the construction industry in the Czech Republic can be deduced also from the case study realized by Halabrinová and Brychta (2018). This study being focused on developer companies in the construction industry in the Czech Republic confirms the existence of complex holding structures operating in this area of economics. Besides, one can see, in many cases, a narrower specialization of the companies operating in the construction industry – so one can deduce that the economic situation and other aspects will differ thanks to this attribute as well. According to the opinion of the authors of the paper using a multiple case study as described by e. g. Hendl (2012a) can be utilized in the following phase of the research. There are many specific factors that can play its role, e. g. specialization of companies in particular sectors/types of contracts, type of holding structure, participation in public supplies and public works, etc. These all aspects could be understood and comprehended better while using methods of qualitative research; the specification of research questions and hypothesis could be of higher quality then. To sum it up, despite some disadvantages of qualitative research, this way of following research could help to understand the investigated phenomenon better and to create a good base for research in taxonomy of holding structures operating in construction industry in the Czech Republic.

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