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AUTOMATED EXTRACTION OF TYPICAL EXPRESSIONS DESCRIBING PRODUCT FEATURES FROM CUSTOMER REVIEWS

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ABSTRACT

The paper presents a procedure that helps in revealing topics hidden in large collections of textual documents (such as customer reviews) related to a certain group of products or services. Together with identification of the groups containing the topics the lists of important expressions is presented which helps in understanding what characterizes these aspects most typically from the semantic point of view. The procedure includes determining an appropriate number of groups representing the prevailing topics, partitioning the documents into a desired number of groups using clustering, extracting significant typical features of documents from each group with application of feature selection methods, and evaluating the outcomes with the assistance of a human expert. The results show that the presented approach, consisting mostly of automated steps, is able to separate and characterize the aspects of a certain product as discussed by the customers and be later useful, e.g., for handling customer complaints, designing promotional campaigns, or improving the products.

KEY WORDS

product aspects identification, text mining, cluster analysis, feature selection

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C38, C89

1 INTRODUCTION

Understanding how customers perceive and evaluate products and services is an important element in improving business processes and increasing competitive advantage. Besides using customer feedback to enrich marketing strategies of companies, reviews and ratings contributed by customers provide information for other consumers, thereby reducing their uncertainty about the product or service and affecting sales in various contexts (Engler et al.,

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2015). In order to exploit the information contained in customers' messages relevant aspects and their importance need to be revealed. The aspects might be known in advance (Guyon and Elisseeff, 2003) or determined automatically, for example, according to their relatedness to sentiment bearing words (Liu, 2012). Then, the aspects' characteristics might be analyzed with respect to subjectivity according to the sentiment polarity of respective expressions; alternatively, just objective facts or facts without considering their sentiment might be examined. Both approaches require understanding the content of the relevant messages and an ability of deriving useful knowledge from them.

Traditional methods often rely on surveys where customers answer to a set of predefined questions. These answers are then analyzed by application of different statistical or other techniques and then interpreted with relation to a given objective. There are many difficulties related to these traditional approaches. The responses of the customers might be influenced by method bias when the respondents cannot provide accurate responses and/or when they are unwilling to try to provide accurate responses (MacKenzie and Podsakoff, 2012). When studying how customers perceive some product features, the order of them might play an important role (Ares and Jaeger, 2013). This approach also requires a precise specification of the properties of the interviewed subject in order to ensure some representativeness and there exists a risk of some important aspect omission (Bell and Bryman, 2015). The number of processed responses is usually relatively low, typically a few hundreds (Alpu, 2015), even when using automated machine learning methods (Bafna and Toshniwal, 2013).

With the growth of volumes of electronic data, especially thanks to massive use of various on-line channels and platforms, such as social networks, discussion boards, or on-line review sites, huge collections of documents containing customers' opinions useful for decision making are available. However, manual analysis of the data by linguistic and domain experts within a reasonable time and budget is not feasible.

Mining knowledge from textual data, known as text mining (Feldman and Sanger, 2007), is a domain, which therefore has gained a lot of attention in the last decade. The Internet is indeed a good source of user generated textual data in these days while a lot of new data originates every day. Analyzing these document collections is certainly helpful and leads to interesting and sometimes unexpected findings.

This paper presents a procedure that can be used in order to reveal important aspects of a product or service and the ways of expressing these aspects. A situation when a large amount of documents containing opinions related to a product or service is available is emphasized. A significant portion of the steps that need to be performed is automated which enables to achieve desired results in a reasonable amount of time with acceptable effort.

2 FINDING TOPICS AND THEIR RELEVANT CHARACTERISTICS

Having domain knowledge, including aspects related to a product or service and the ways of evaluating these aspects, a set of relevant attributes might be constructed directly (Guyon and Elisseeff, 2003). In the opposite case, relevant features need to be extracted using a method based on some defined principles or rules. When a collection of labeled data (the labels express the membership of data elements in some groups) is available, feature selection algorithms might be applied in order to extract attributes that are relevant for particular classes. Filter methods that are based on correlation between features and target, or wrapper methods that use a learning machine in order to assess a set of features with respect to a classification algorithm might be used (Kohavi and John, 1997).

When the class labels are related to the topics the task of revealing characteristic features of topics might be realized by the application of feature selection methods. When information about the topics (their number and subject matter) is not available a different procedure needs to be performed. There exist methods for feature selection also for unsupervised learning, i.e., when no labeling for the processed data is available. Their goal is to find the smallest feature subset that best uncovers interesting groupings from data according to the chosen criterion. What is interesting and what is the criterion needs to be specified. However, no single true answer exists here (Dy and Brodley, 2004). Even when a set of important features for an unsupervised task (without known labels) is found, only the process of partitioning the data into some groups is simplified. However, the relation between these features and the topics is not obvious. Thus, a procedure combining two steps – topic separation, and extraction of relevant attributes must be performed (Žižka and Dařena, 2013).

The assumption related to every document collection is that it consists of some more or less independent topics. A topic is a probability distribution on the universe of terms; it is typically concentrated on terms that might be used when discussing a particular subject (Bingham et al., 2003). This means, that documents related to the same topic share some common words or expressions and are therefore somehow similar. This similarity might be used to cluster the documents according to their similarity using some of the clustering algorithms. Separated groups of documents, representing the topics, might be then used as classes (labels) employed by a feature selection method.

In a supervised learning task, the quality of the extracted document subsets might be easily evaluated by examining the values of standard classification performance measures. When classification is not the main goal, validation is more complicated. There doesn't exist one objective criterion measuring the result, unlike in a classification task where the outcome might be evaluated according to the correctness of label assignment. Here, the quality of results is related to the number of identified topics and topic granularity, the way the topics are characterized, and who evaluates the representative characteristics (for example, features relevant for classification don't necessarily need to have a clear semantic meaning related to a certain topic). Without detailed knowledge of the data, contained topics, and their characteristic features, such an evaluation is always subjective and might be evaluated only qualitatively in terms of usefulness.

3 FINDING A STRUCTURE IN DATA

Clustering algorithms partition a set of documents into subsets called clusters. The goal is to create the clusters that are coherent internally, but clearly different from each other. In other words, the documents within a cluster should be as similar as possible; and documents in one cluster should be as distinct as possible from documents in other clusters. When using vector document representation two basic types of clustering algorithms might be used: hierarchical, and flat (Kaufmann and Rousseeuw, 2005).

Hierarchical clustering constructs a tree like, nested structure partition of the document set where the clusters are hierarchically arranged (Xu and Wunsch, 2009). Partitioning clustering methods do not consider any explicit structure between the clusters. Their result is a set of k clusters, where k is given or automatically determined. It has been found that partitioning clustering algorithms are well suited for clustering large document data sets due to their relatively low computational requirements (Zhao and Karypis, 2001).

3.1 Evaluating the revealed clusters

Using an unsupervised approach, the perfectness of the output is usually expected to be much lower that desired. The reason is the fact that the missing labels must be assigned automatically without having any prior knowledge of the data. Thus, the labels might be finally assigned differently than a human expert would assign them because only he or she has a clear objective and can use some additional, external information (Weiss et al., 2010).

Sufficiently high quality (acceptable for a user) of clusters is essential for the success of the entire process. It is obvious that having only one cluster is unacceptable because there is no structure visible in the data. On the other hand, having the same number of clusters and instances (i.e., each cluster contains only one object) lacks any generalization although the clusters are perfect in terms of all measures of cluster quality. The task of determining the right number of clusters is thus not easy and a compromise has to be found.

There exist many approaches how to set an optimal number of clusters, see, for example Tibshirani and Walther (2005). The elbow methodology (Meyer zu Eissen and Stein, 2002) is often employed as a rule to determine the number of clusters in data set. A number of clusters is chosen such that adding another cluster doesn't give much better modeling of the data set (Morozkov et al., 2012). The quality of modeling is measured using some of the clustering evaluation measures for different numbers of clusters; when the value of these measures doesn't change significantly a good number of clusters has been found.

Because the absence of the ground truth (as opposed to a supervised learning task where class labels are known) external evaluation measures (Zhao and Karypis, 2001) couldn't be used. Instead, internal measures evaluating the clusters according to the characteristics derived from the data itself or expert-based procedures need to be applied.

Internal measures are usually based on the criteria of compactness and separation. Compactness measures how much are the objects in a cluster related to each other. Lower variance measured, e.g., in terms of pairwise or center-based distances in the cluster, signifies higher compactness. Separation evaluates how a cluster is separated from other clusters. Measures using distances between cluster centers, pairwise distances between objects from different clusters, or measures based on density might be applied (Liu et al., 2010).

Evaluation of clustering results by experts may reveal new insight into the data, but is generally very expensive and demanding. The results that are subjectively influenced are also not very well comparable (Färber et al., 2010). In order to prevent demanding analysis of the clusters and the documents in them, a procedure applying some machine learning methods might be used in order to reveal typical characteristics of the clusters (Žižka and Dařena, 2013). It is also possible to examine not all of the documents in every cluster but only some of them. There exist several approaches of how to choose the representative documents – an average document, the least typical element, or the most typical document (Gelbukh et al., 2003).

4 DATA USED IN THE EXPERIMENTS

The data was obtained from Julian McAuley, who collected reviews from Amazon (McAuley et al., 2015). The total number of all product reviews in this dataset is 143.7 million. The reviews might be classified into several categories according to the product categories in the famous e-shop. In this paper, the category of cell phones was used in order to have a sufficient number of documents available and to avoid extensive heterogeneity in the data. Products from different categories would be evaluated from different perspectives (for example, performance parameters like data processing speed or memory size are relevant for computers,

while flavor or nutrition facts are important for grocery products). Processing such diverse collections would be thus more complicated, in many cases also unreasonable, and a high number of included topics hardly interpretable. When people search for certain information their effort is usually constrained in a more detailed scope rather than unbounded in a global range.

The data set from the cell phone category contained 3,447,275 reviews from which subsets consisting of 25,000 and 50,000 were randomly selected. Our previous work (Žižka and Dařena, 2012) demonstrated that these amounts of data are relatively stable in terms of distribution of terms across included topics. The selection process and all experiments were repeated 10 times in order to confirm the usefulness of the method for different data. The longest review contained 32,384 characters, the shortest just one character, the average length was 320 characters. The smaller data set contained approximately 24K, the bigger about 30K unique words on average.

The conversion of the documents into a structured format – the vector space model (Salton and McGill, 1983) – included removing unwanted characters (e.g., digits, punctuation, and other special symbols) and breaking each document down into individual tokens (useful units for processing). The tokens were stemmed, converted to lower case, and rare terms were removed. The filtered or derived features, referred to as terms, later formed the base of structured representation of the documents. In order to prevent excessive importance of common words, known as stop words, they were removed before further analysis (the list provided by Kevin Bougé at `https://sites.google.com/site/kevinbouge/stopwords-lists` was used).

The terms derived from the documents were represented numerically using the popular method known as tf-idf (term frequency times-inverse document frequency), which is a numerical statistic that is intended to reflect how frequent a term is in a document and how rare is in the entire collection (Salton and Buckley, 1988).

5 EXPERIMENTS

In order to identify the aspects (demonstrating themselves as topics) that are relevant for a specific group of products a separation of these aspects needed to be performed. Clustering was used as the method for topics separation; the topics were expected to be isolated in the created clusters.

CLUTO software package was used to identify groups of similar documents. As the clustering algorithm, CLUTO's implementation of k-means algorithm (Manning et al., 2008) denoted here as the direct method, was used. K-means is the most widely used flat clustering algorithm. In the first step, k randomly selected cluster centers are selected (very often randomly). Then, all objects are assigned to a cluster which is the closest to the centroid. In the following step, the cluster centroids are re-computed according to the positions of the objects in the clusters. The steps of assignment of the objects to the clusters and re-computation of cluster centroids are repeated until a stopping (a fixed number of iterations or, most commonly, when the cluster centroid positions do not change between iterations) criterion has been met. As the similarity measure, cosine similarity was used (Duda et al., 2001).

To evaluate a clustering solution, internal evaluation measures were used. These measures are represented by so called criterion functions that are optimized during clustering. Internal criterion functions try to maximize the similarity of documents in individual clusters while not considering the documents in different clusters. External criterion functions focus on optimization of dissimilarity of individual clusters. Hybrid criterion functions combine both internal and external criteria, i.e., they do not focus only on intra-cluster similarity but also take similarity with documents in different clusters into account (Zhao and Karypis, 2001).

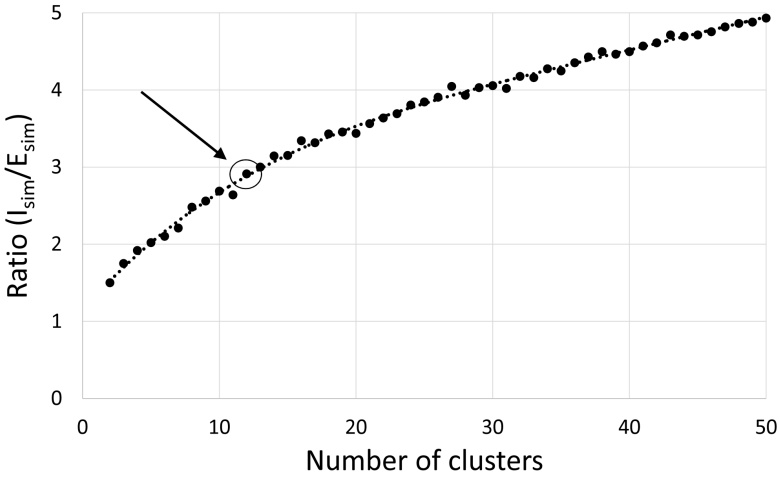

Fig. 1: Ratios of internal and external similarities for different numbers of clusters created from 25,000 reviews. The arrow shows the "elbow" of the curve approximating these points.

For each data set size, ten random selections of the desired quantity of documents were made. These data sets were clustered into $2, 3, \ldots, 50$ clusters. For each solution the values of internal and external similarity were calculated and a function approximating the ratio of internal and external similarities created. Using the elbow method (see Fig. 1) an optimal number of clusters was determined. The values were then averaged and these numbers were used later in relevant attributes extraction process.

For the data set consisting of 25,000 reviews the average cluster number was 17 (standard deviation 11) and for the larger data set with 50,000 reviews the number was 18 (standard deviation 9). The documents were thus clustered into the desired number of clusters to be prepared for relevant features extraction.

In order to identify significant attributes characterizing groups of documents, Žižka and Dařena (2013) used the C5.0 decision tree generator (Quinlan, 2015). This approach enabled extraction of the features that were important in the classification problem the solution of which was represented by an induced decision tree. The significant features were present in the tests in tree nodes and their importance was proportional to the position of the nodes in the tree (the most important feature was in the tree root, towards the leafs the importance decreased). This approach supported the reliability by providing the decision tree classification error estimates; on the other hand, this process was very demanding since the computation complexity was exponentially dependent on the number of attributes. This number is generally high in text mining tasks (Joachims, 2002).

In this paper, the chi-square (χ^2) method was used for the feature selection process. The method measures independence between a feature and a category. When a term and a category are completely independent the value of this measure is zero. The features most important with respect to a given class have thus the highest value. Computational times achieved by this method are significantly shorter than in the case of using decision trees. The identified important features are, however, very similar as demonstrated by Krupník (2014).

6 RESULTS AND DISCUSSION

The above mentioned procedure was applied to the data collection representing customer reviews of cell phones. After determining a desired number of clusters the data was clustered and a feature selection procedure was used in order to reveal the attributes characterizing these groups. For simplicity, the first ten most significant attributes for the clusters are presented in this paper. A more sophisticated approach could employ some thresholding (i.e., presenting features with their importance higher than a specified or calculated threshold); alternatively, numbers according to the requirements of a human expert might be used (even different numbers for different clusters).

The lists of important attributes for the separated groups of reviews are presented in Tab. 1. Because of relatively high number of examined clusters, only eight groups of words with derived topics are presented. The topics were determined according to reasoning of a human expert. Because of a clear relation of the words usually to one theme such decisions were often not too complicated.

Because the lists of important words are not always perfectly related to a single, clearly identifiable topic they might be combined with some representative reviews from the corresponding clusters. As representative documents, the ones residing close to cluster centers were selected, see Tab. 2 for some examples. A certain number of them might be used in order to support the process of deriving a suitable topic.

When not removing stopwords from the original documents some other interesting perspectives of the examined products emerged. For example, a group described by the words *she, her, daughter, wife, cute, mom, love, sister, gift,* and *mother* pointed to reviews that were somehow related to females (the review *I bought this cover for my daughter's blackberry phone. It fit perfectly and she was very pleased with the product.* was one of the reviews close to the cluster centroid).

Processing the data sets consisting of 25,000 and 50,000 reviews provided almost identical results in terms of identified clusters, their number, and the lists of significant words describing their semantic content. This demonstrates the fact that the amount of 25,000 documents is representative enough; with more documents some expressions are rather repeated and no (or very few) new topics and their characteristic features appear. Thus, only the results for the smaller data set are presented in this paper.

In order to support the process of determining an optimal number of clusters, the clustering solutions consisting of more and less clusters (7 and 27 for the data set consisting of 25,000 reviews) were analyzed. Having more groups, some of the topics naturally appeared more than once, like *Mobile accessory (screen protection)*. Some of the aspects spread across more groups and were more specialized compared to the situation with lower number of clusters, like *Mobile accessory (protection bumper, protection case), Mobile accessory (protection cases from silicon)*, and *Mobile accessory (protection cases)*. When processing the data partitioned into lower number of groups some topics were obviously mixed and not so particularized. For example, a group described by the words *case, color, protect, drop, cover, work, snap, rubber, cute, bumper* discussed more aspects of *mobile accessories* (cases, colors, types).

It seems that the elbow method was able to provide a reasonable number of document groups in terms of their relatedness to hidden topics (or aspects). After examination of different groupings, it can be concluded that it was generally better to partition the documents into slightly higher number of clusters in order to not loose some of the semantic information.

Because an entire review might typically address more than one aspect of a product the assignment of the review into one group will not be completely perfect (the review should in fact belong to more groups). Thus, smaller portions of the documents, such as paragraphs or sentences might be considered as meaningful elements. A few experiments with documents primitively partitioned into sentences were conducted. A significant change in the identified clusters, their important features, and derived

Tab. 1: Important attributes (stemmed) and the derived topics for the clustered data set consisting of 25,000 reviews

Important attributes	Derived topic
batteri, charg, life, mah, evo, hour, origin, oem, stock, die	Mobile accessory (battery)
signal, antenna, bar, hous, roof, booster, boost, unit, cell, feet	Mobile accessory (signal booster, antenna)
charger, cord, car, retract, plug, charg, work, wall, usb, transmitt	Mobile accessory (charger)
sound, ear, headset, hear, bluetooth, nois, comfort, music, pair, listen	Mobile accessory (headset, sound)
cabl, lg, usb, comput, transfer, data, tracfon, charg, pc, micro	Mobile accessory (cables, connectivity)
money, wast, worth, save, spend, junk, dont, buy, don, total	Customers discussing price
glare, film, anti, matt, finish, screen, mirror, protector, fingerprint, retina	Mobile accessory (screen film and protection)
color, pink, white, love, pictur, purpl, case, black, yellow, green	Customers discussing colors

Tab. 2: Examples of reviews close to the centers of the identified clusters

Mobile accessory (batteries)
After replacing my battery my phone no longer worked and I had to buy a new one so I would not recommend this.
This is a good battery. it works 90% like the original battery.If you need a replacement battery this will make a good one.
Mobile accessory (chargers)
This is a perfect charger for my car. It works great, and the price is right. I recommend this product to all.
Works well, charges phone quickly, easy to use. Would recommend to others who need a charger. I would buy again.

topics did not occur unlike in (Dařena et al., 2014). On the other hand, some of the representative documents were very short (like *best*, *awesome*, or *I love it*) and thus bringing no additional semantic insight into the data.

7 CONCLUSIONS AND FUTURE WORK

The paper demonstrated a procedure that helps in revealing topics (aspects, as perceived by customers) hidden in large collections of textual documents (customer reviews) related to a certain group of products or services. Together with identification of the groups containing the topics the lists of important expressions (here words and the entire reviews) were discovered which facilitated understanding what characterized these aspects most typically from the semantic point of view.

This procedure did not require a specific domain knowledge that could be used in feature identification process. It was also not based on linguistic information, like in (Bafna and Toshniwal, 2013) where as the features frequently appearing nouns were used, or in (Hu and Liu, 2004) where adjectives helped in identification of opinions. In this paper, no additional knowledge, like a sentiment lexicon (Maks and Vossen, 2012) was needed which made the entire proces straightforward and self-contained.

Future research will concentrate on deeper analysis of parameters of the used methods and on alternative approaches to individual steps of the proposed method. For example, a hierarchical clustering algorithm might be used instead of a partitioning one (this might support a hypothesis of hierarchical topics arrangement), different feature selection methods or their combination might be applied, a more sophisticated method of selecting representative documents and their combination with representative attributes might be employed (for example, retrieving documents containing the identified significant attributes). The major problem or deficiency of the presented procedure still lies in the absence of clear quantitative evaluating criterion; thus more attention might be paid to this direction. However, even when including more human experts, a clear uniform conclusion doesn't have to be reached (Saratlija et al., 2011).

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USING OF EYE TRACKER IN HORECA SEGMENT: VISUAL PROPOSAL OF CHOSEN COMMUNICATION TOOL ON RESTAURANT GUESTS DECISION

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ABSTRACT

In this article we evaluate three chosen restaurants in Nitra city from the perspective of visual proposal of chosen communication tool, which can be effective for influencing of restaurant's guests to visit each restaurant. It might be done through techniques and methods used in neuroscience. The consumer neuroscience is the area of marketing that studies the sensomotoric, cognitive and affective consumer's reactions on different marketing stimulus. In this article, we use Eye Tracker as one of biometric methods and we research, how restaurant's leaflets can be attractive for guests and in the conclusion we suggest some tips for marketing communication doing for three restaurants in practice. Means of biometric and neuroimaging technologies it's found out, how the consumers do the unconscious purchasing decisions and what's part of brain is responsible for these processes that 95% of human thinking and activities become just real in subconscious. This paper is a part of Scientifics project *VEGA 1/0874/14 (2014–2016): "Using of neuromarketing in the food visual merchandising"*, solved at the Department of Marketing and Trade, FEM-SUA.

KEY WORDS

consumer neuro science, emotions, HORECA segment, marketing communication, eye tracker, leaflet

JEL CODES

M30, M310

1 INTRODUCTION

In the business-to-consumer (B2C) segment of agribusiness, service quality is intended to create consumer loyalty. Many studies have suggested that quality service delivers additional value (regulatory controls on consumer safety, service quality, environmental pretention etc.) to satisfy the needs of consumers as a profit by Press et al. (2014). Šimo and

BERČÍK, Jakub, HORSKÁ, Elena, PALUCHOVÁ, Johana, and NEOMÁNIOVÁ, Katarína. 2015. Using of Eye Tracker in HORECA Segment: Visual Proposal of Chosen Communication Tool on Restaurant Guests Decision. *European Journal of Business Science and Technology,* 1 (2): 93–103. ISSN 2336-6494.

Rovný (2010) use, the agribusiness covers the supply of agricultural inputs, the production and transformation of agricultural products and their distribution to final consumers. FAO (2015) defines; the traditional production and distribution methods are being replaced by more closely coordinated and better planned linkages between agribusiness firms, farmers, retailers, services providers and others in the supply chains. Vietoris (2013) means, that agricultural intensification, which has replaced intensification as the primary response to rising consumption, is obviously still needed. Bielik et al. (2014) otherwise, edible commodities will become scared, more people will experience hunger, and more natural habitats will be destroyed. Smutka et al. (2012), it is necessary to consider the agribusiness activities in a business chain as well as in HORECA segment before considering the role of marketing in the business. These begin with the provider of the original service, and end with the final guests. It is necessary to consider the aims and objectives of each link in the restaurant in order to understand the marketing objectives and thus the role of marketing as it develops and involves through the business chain. In HORECA sector, business activities are supported by supplies from upstream levels. In this B2B segment, HORECA operators are the buyers; upstream players are the sellers. Maguire and Geiger (2015), the buyers have the right to choose their sellers and, in turn, creating a competitive platform in agribusiness markets. These include domestic farms, middlemen (wholesalers and local suppliers), and retailers (conventional retailers and modern retailers). Domestic farms offer a farm-to-plate concept to HORECA operators. Tey et al. (2014) characterize, their farm-direct supplies are generally fresher and cheaper than other options. Prokeinová (2014) introduces, middlemen provide local and foreign varieties at a competitive price range. Another intermediary group – wholesalers are centralized in cities; local suppliers serve specific suburb areas. Some local suppliers also obtain produce from wholesalers due to convenience and availability of imported produce.

Kotler and Keller (2013) define, the marketing communication is a tool, by which the company can develop the relationships with their consumers. The technologies and other factors fundamentally change the ways such the consumers perceive the marketing communication and even whether they choose to handle it all. Vysekalová and Komárková (2002) mean, the advertising is one of the communication tools, which can present a product in interesting form with using of all elements that cause on the emotions. In the ad, it can be interesting headline, type of script, color, in radio and TV ad, the voice and music accompaniment. In this paper, we take measure an observation on ad media, whether print or outdoor medias. Chebeň (2010) writes, the main advantage of posters is the option of high communication frequency with target segment. On the contrary, the disadvantage of outdoor ad is its static nature. Šrédl and Mikhalkina (2014), the consumers are also weary of this kind of advertising, and because it's necessity to find the original way how to attract the viewer's attention. Karlíček and Král (2011) introduce the creativity in today outdoor and indoor medias is not limited and the outdoor ad may use some voice equipment, then the equipment's that propagate the fragrances and other techniques. Chebeň (2010) means, for the posters, their structure should be simple, concise, and should include more images than text. If it's used a text, it has to be large enough and concise. Světlík (2012), since man is daily exposed by hundreds and thousands of these advertising messages, be found new and unconventional directions that lead to understanding the functioning principles of advertising and to increasing the effectiveness of its existing. One of the new is neuromarketing.

Ohme et al. (2010), marketers are more and more skeptical of using only verbal measures in market research because of their limitations in providing an effective measure of internal reaction to external stimuli. Plassmann et al. (2012), the application of neuroscience to consumer psychology and in particular to marketing, has gained popularity over the past decade in academic research and business practice. The

Tab. 1: The sample of respondents by gender

	Absolute frequency	Relative frequency
Male	28	41%
Female	41	59%
Together	**69**	**100%**

authors Vashishta and Balaji (2012) define, neuroscience enables marketing researches to have a better understanding of the excellent of such abstractions held in customer's minds and the role of emotions in decision making, and further in developing more effective methods of triggering those emotions. Ramsøy (2014) simply, the neuromarketing could be defined as the new area of marketing that studies the effect of marketing stimulus on cognitive, sensomotoric (sensory, motoric) and affective (emotional) reactions of customers and consumers too. Nagyová et al. (2014) write, the research tools and techniques of neuromarketing can be divided into two major categories: (1) the approaches that measure the body reactions (biometric measurements) on influencing marketing stimulus and approaches, and (2) the approaches that measure the brain reactions on influencing marketing stimulus.

The most widely used biometric measurements in terms of consumer neuroscience belongs the cardiac and respiratory activity, eye movements, winking, galvanic skin resistance (GSR), facial expression and body movements as well as. Pradeep (2010), Eye tracking, measurement of eye movement and dilated pupils by object or scene looking has got in neuromarketing wide used both as a stand-alone tool, but also as an important complement to other indicators. The speed and direction's changes of view provide the valuable indicators of attention, of interest and of attraction. Berčík et al. (2014), the appliance for eye tracking measurement is called "Eye tracking", while the mobile and stationary version of this equipment exists depending on the nature of the research.

2 METHODOLOGY AND DATA

The research object in this paper was an attractiveness of outdoor communication tools of three different restaurants. After first visual selection of created communication tools were created for each restaurant two posters that were tested by the statistic eye camera (so-called, Eye tracker). In simulated conditions, the audiovisual pictures of restaurant visual posters were replayed in accidental order in ten-second intervals to 69 respondents from 22 to 52 years old. The Tab. 1 illustrates the sample of respondents by gender.

In order to identification of the most engaging posters, each picture of restaurant was divided into two half that they are made by two posters which illustrate the same restaurant. The respondents looked at 6 pictures together. In pursuit to eliminate the distortion of results were the right and left pictures arbitrarily varied?

The identification of consumer interest, attention and preferences was done by monitoring of eye movements. In simulated conditions, the fixed Eye tracker from Gazepoint Company fixed to LED monitor with screen diagonal 22" was used for monitoring of eye movements. This equipment uses the eye-tracker technique based on light reflection from eye retina back to the camera, so-called Bright pupil, while it is the binocular system with sampling frequency 60 Hz too and with the tolerance of head movement to subject 25 cm × 11 cm (horizontal × vertical) movement, and the depth range of movement is ±15 cm with the precision of 0.5–1 degree viewing angle.

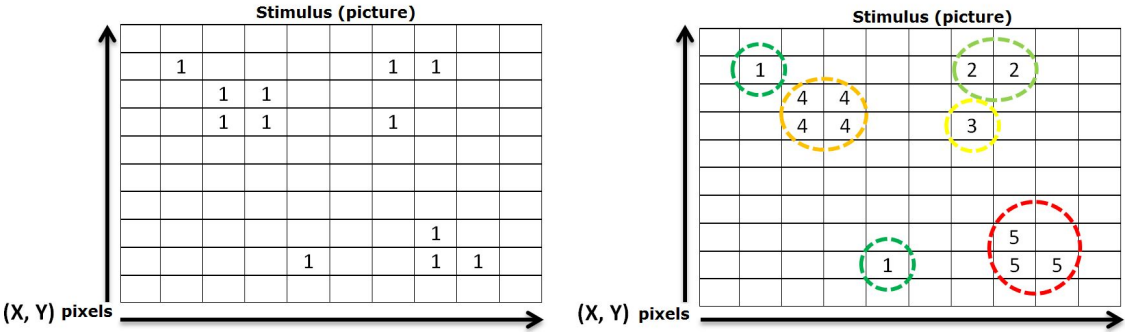

Fig. 1: Creation of heat maps based on software manual of Tobii Company (2015)

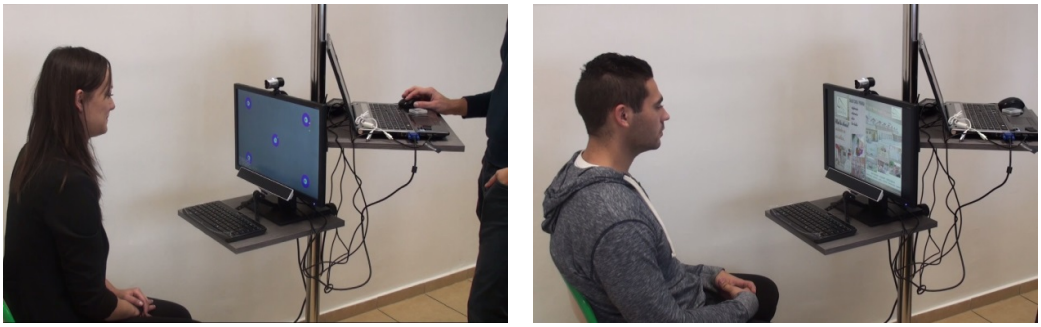

Fig. 2: Calibration and biometric testing of respondents in laboratory conditions

The acquired data about eye movements done by respondents were evaluated in program environment of *Gazepoint Analysis* and then the heat maps were created that present the consumer preferences on tested communication medias.

Bojko (2009), *heat maps* are two-dimensional graphic data representation, in which are the values of variable illustrated by colors. They are particularly conclusive for two reasons. Firstly, the intuitive disposition of the color scale related to temperature minimizes the amount of learning that is needed for their right understanding. We have experiences that yellow is warmer than the green, orange is warmer too and red is hot. It is not difficult then to find out that the amount of heat is direct proportion to level represented by variable. Secondly, the heat maps directly mean data in measured stimulus. In view of the fact that data can be related to concerned elements, it is necessary only little mental effort to the heat map interpretation.

The first step to the heat maps' creation (see Fig. 1) is the view division on stimulus. It is step by step done by realization through all fixations from all chosen records and then in following by the supplementing of their values whenever the fixation that shares the same X and Y pixels' location as others.

If we select a number, then we add the number of fixation at the same position. In the case of absolute period, it is added the length of each fixation. By relative period, firstly it is the length of each fixation divided according to imaging time of present media (video, picture) and then added one.

After assigning of fixation's values, the color values are added to all places with the hottest color represented the highest values. Tobii (2015), the heat maps are important statistical indicator who's the representativeness is conditional by the minimum of sample size – 40 respondents.

Before the testing realization, every respondent filled the form with biometric testing, evaluation and with protecting of acquired data. After notified of respondents with testing explaining, the 5-points calibration was realized (see Fig. 2).

3 RESULTS AND DISCUSSION

During the testing, we have evaluated the communication visuals of 3 different businesses and category restaurants.

The restaurant *"Zlatý Kľúčik"* represents the segment of luxury service provider not only in terms of localization, interior design, as well as the professional cooking and serving of gourmet dishes too. It is located in Nitra city on the Zobor hill with amazing view on all part of Nitra city. After first visual choice from all created posters, two different from each other types of communication medias were used for the purpose of biometric testing.

The left side of picture is made as the luxury leaflet on black-brown colored base and with interior elements in the middle part. In this case, a restaurant's name is done by four stars, logo and by short slogan. In the bottom, there is the contact information done by internet web page and opening hours. On the right side, there is a poster in dominant white color. The upper part is done from selected gourmet specialties and from the slogan. The dominant term in the middle of the poster is creating by luxury characters, and it is completed by information, this is a restaurant. At the bottom, there is a cook and key information about the benefits and pluses of the restaurant, which are on the light green background. As well as, in this case the lowermost part is the contact information, including website.

The Fig. 3, based on heat maps, the most consumer insights across from the representative sample was concentrated to cook on the right side of the picture (see the right poster of Fig. 3). Approximately on the same level, on the left poster, the photos of the interior attracted the consumers and then on the right poster, the photos of gourmet specialties attracted them. In terms of information, the left poster was more interested for respondents, in addition to the poster; the consumers looked at stars, logo and slogan too. It is interesting that in the case of this poster, the respondents take notice as well as the contact information and opening hours.

To compare the perception of men and women, we generated the separate exports of consumer interest in the category of gender. The main differences were in the perception of cook, where a heat map dominates in the case of women gender as well as, a heat map dominates in the area of gourmet specialties and key information on green background too. In male category, the highest concentration of views is on information on the upper part of poster, as well as, the men looked more on contact information on the left visual, while the women on the right. The difference could be seen on Fig. 4, in the case of interior. While the women looked most on first photo of interior, then the men looked more on the second and third photo.

The *"Salaš/Chalet Cabaj"* Restaurant is located in the Nitra city's periphery in traditional Slovak style with prices more accessible to a wider range of the population. This restaurant offers home cuisine. The both tested communication tools are in brown background, while the left poster contents a photo of restaurant interior and one view on food serving. The right poster contents more photos from restaurant exterior, table setting, food and different attractions. The placement of logo restaurant and information are different placed on these posters. While on the left poster, the big logo is in the left corner, then on the right poster, the half logo (in the comparison of the left poster) is on the right side of poster. On the left poster, the contact information is supplemented by QR code. On the left poster, the slogan is placed in the middle, but on the right poster, it's placed on the top part. The difference in the concept of these posters can be seen in the case of information about a portfolio of services providing, because on the right poster, they are incorporated in the bottom and on the left poster, they are incorporated on the top of poster.

On the base of heat map from Fig. 5 can be seen, that the highest concentration of consumer views in the case of both posters are oriented into food, serving, as well as into setting. On the left side, the consumer orientation is to the information about a portfolio

Fig. 3: Heat maps of restaurant visuals testing: Zlatý Kľúčik Restaurant, export from Program Gazepoint (2015)

Fig. 4: Comparison of preferences by men and women: Zlatý Kľúčik Restaurant, export from Program Gazepoint Analysis (2015)

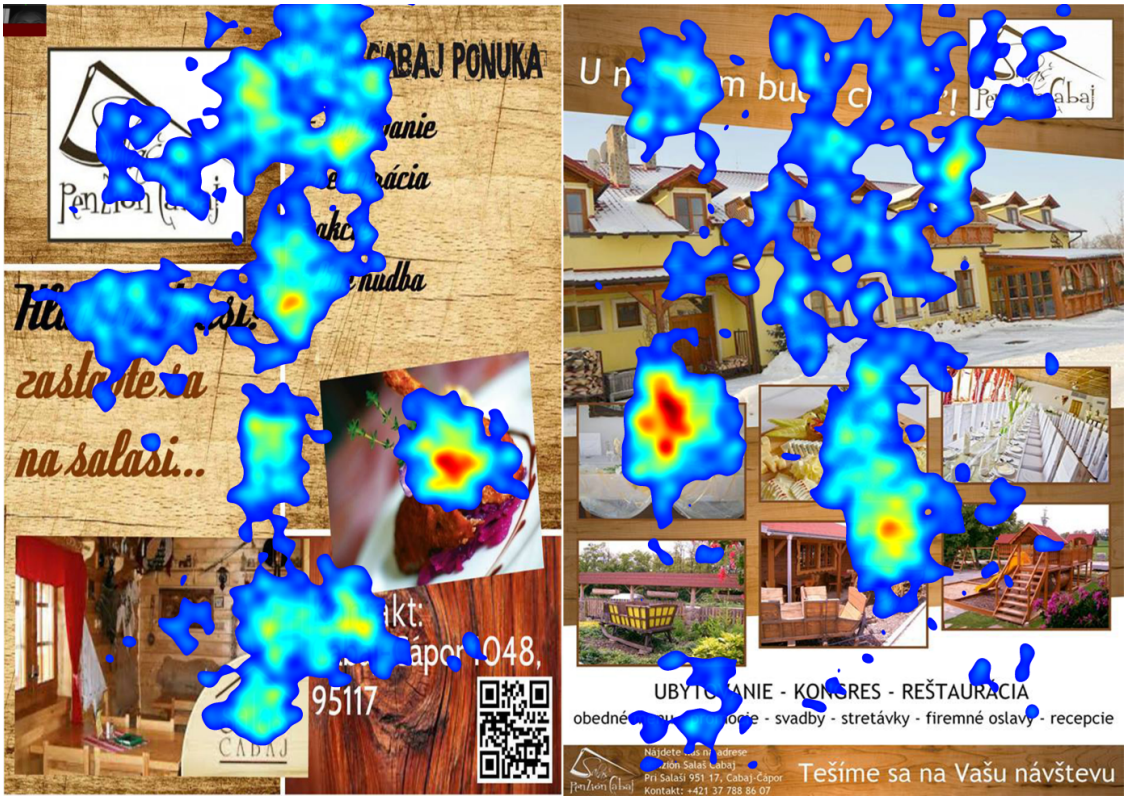

Fig. 5: Heat map of restaurant visuals testing: Salaš/Chalet Cabaj Restaurant, export from Program Gazepoint Analysis (2015)

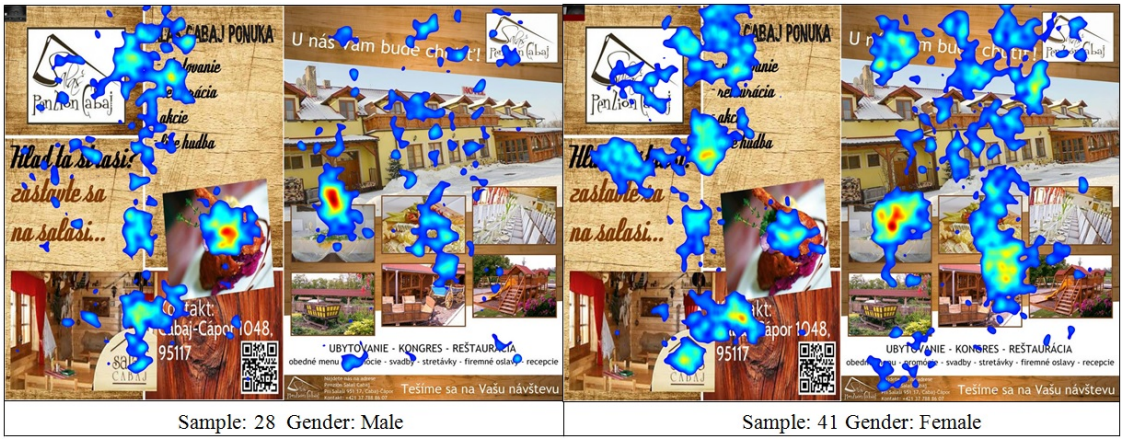

Fig. 6: Comparison of preferences between men and women: Salaš/Chalet Cabaj Restaurant, export from Program Gazepoint Analysis (2015)

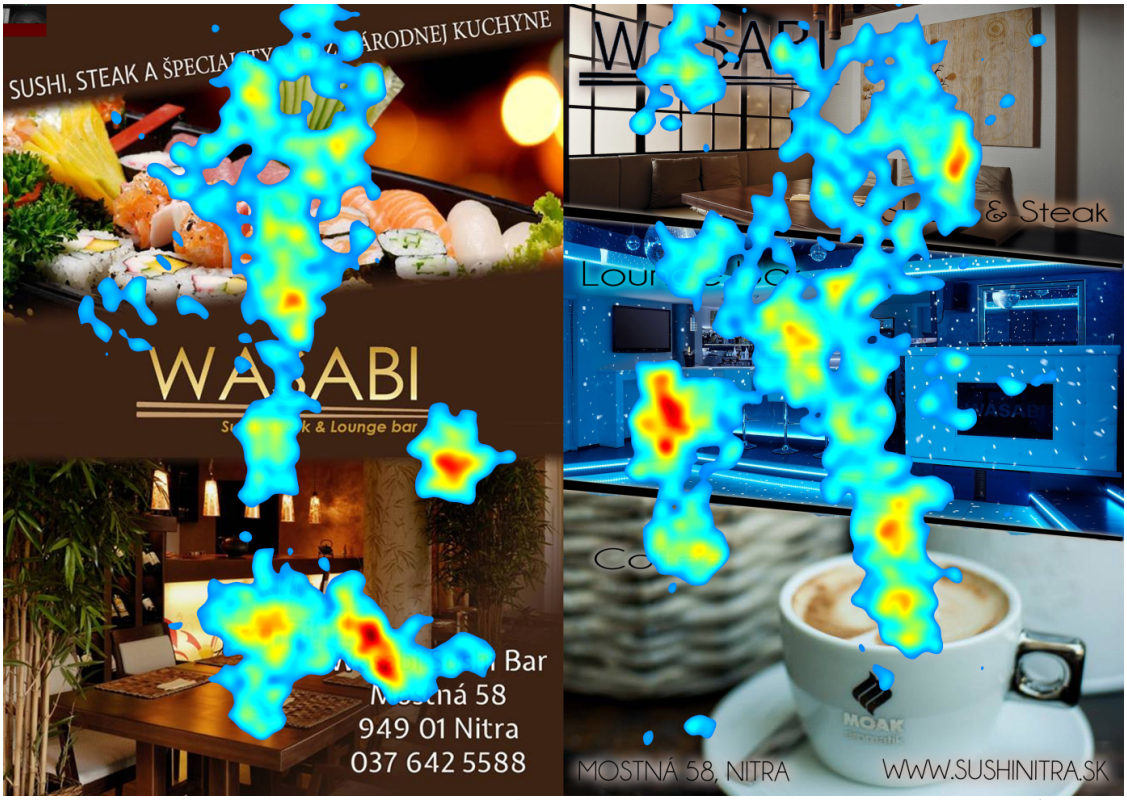

Fig. 7: Heat map of restaurant visuals testing: Wasabi Sushi Bar Restaurant, export from Program Gazepoint Analysis (2015)

Fig. 8: Comparison of preferences between men and women: Wasabi Sushi Bar Restaurant, export from Program Gazepoint Analysis (2015)

of services providing, into slogan and contact information. The object of interest on the right side of poster is a photo of restaurant exterior and a slogan. For both of them, there is the relatively small amount of views on the logo of the company.

On the Fig. 6 it can be seen the differences in the perception between men and women. The male part of sample was most looking in the case of left poster on the food, but in the case of right poster on the setting and restaurant exterior too. The female part of sample was most looking in the case of left poster on information about a portfolio of services providing, slogan and contact data, and in the case of right poster on the food, setting and other attractions. A significant difference can be considered for the female part of sample compared to men, the raised number of views of the restaurant exterior.

"Wasabi Sushi" Bar and Restaurant is one of the first and favorite Japanese restaurants in the center of Nitra city with the offer of different Asian specialties, Japanese sushi, steaks and other meals. This restaurant looks luxury with beautiful interior and wide range of teas. In this case, the biometric communication tools with less amount overlapping elements were selected.

The left poster has brown background with photo documentation of food and restaurant interior. The right poster is divided into three key sections, which are not different only by nature but by colored background too. By both promotion Medias are used the terms that correspond to the color design of both visuals.

On base of heat map, on the Fig. 7 it can be seen, that on the left poster, the respondents looked longer at restaurant interior and shorter at food (sushi). On the right poster, the consumer looked more at the middle part of poster, where is lounge bar of this restaurant. Similarly, on the right poster, the consumers perceive a cup of coffee, as well as restaurant interior. The respondent's didn't look at contact information and website. The object of their interest on both posters was the name of restaurant.

The comparison of perception and preferences by gender, it can be seen (Fig. 8) the results, that in the case of left poster, there are not significant differences with the exception of the name (Wasabi), which dominates by male part of sample. Contrarily, in the case of right communication media, it can be seen more significant amount and length of fixations by women. While the men didn't nearly look at a cup of coffee and at interior, the women more intensive looked at these promotion tools.

4 DISCUSSION AND CONCLUSION

On the basis of realized measurements made by the biometric, we identified the consumer preferences and their interest, which in many cases isn't possible to identify through traditional methods, because these processes greater occur in the unconscious. In this paper, we use the neuromarketing measurement with the chosen marketing communication tool – leaflets. The goal was to obtain data, how this tool influences the potential guests to visit each of chosen restaurants. We tried to highlight the attractiveness of leaflets as the cheap and still used tool for consumer taking of attention. By means of heat maps, that represent important and summary statistical indicator, by which we identified the points of consumer interest. As well as, we demonstrated that exist the differences in perception and preferences between men and women. Accordingly, it can be pronounced, that biometric methods of eye movement's measurement is important by feedback gaining from the target segment and in food services sector providing – in agribusiness. Even if the case, that equipment's of consumer neuroscience will be more developed and improved, it's needed to perceive them as research progress that will be still needed to integrate with more methods including traditional. The integration and combination of information leads to the more faithful image of the examined reality and of the future estimate. It will be important to identify and include into wider

context the values, that are not actual measured (emotional response/feedback).

One of the most important aspect of neuro visual and biometric surveys is, that react on the question, "what's going on" and they can detailed describe physical reactions on current behavior, but they cannot answer on the question, "why does consumer do it". In practice they are other research methods, mainly qualitative.

The main contribution of Eye tracking methods in agribusiness is principally in detailed rendering of preferred points/ areas of consumer interest that consumers are not able to assess the conscious level, identification of place with the highest consumer interest, creation of more effective and more logical visuals in agribusiness, finding of non-effective (free) places in term of consumer attention, and detailed identification of the rank' consumer insights.

In Slovakia, HORECA segment is less reviewed in theory as well as in practice from the view of neuromarketing techniques using. Because, the authors would like to raise these research area and develop this measurement into other part of HORECA segment. This area of research also coud be combine with the traditional marketing research method – questionnaire and the modern one – mobile eye tracking or EEG methods. First, the questionnaire can be sometimes not so exact, but the combination with eye tracking and EEG can identify also the reactions and emotions of respondents and detailed describe their actually perception.

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DEFAULT PROBABILITY PREDICTION WITH STATIC MERTON-D-VINE COPULA MODEL

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ABSTRACT

We apply standard Merton and enhanced Merton-D-Vine copula model for the measurement of credit risk on the basis of accounting and stock market data for 4 companies from Prague Stock Exchange, in the midterm horizon of 4 years. Basic Merton structural credit model is based on assumption that firm equity is European option on company assets. Consequently enhanced Merton model take in account market data, dependence between daily returns and its volatility and helps to evaluate and project the credit quality of selected companies, i.e. correlation between assets trajectories through copulas. From our and previous results it is obvious that basic Merton model significantly underestimates actual level, i.e. offers low probabilities of default. Enhanced model support us with higher simulated probability rates which mean that capturing of market risk and transferring it to credit risk estimates is probably a good way or basic step in enhancing Merton methodology.

KEY WORDS

Merton model, default risk, d-vine copula, probability, ARMA-GARCH

JEL CODES

C15, C53

1 INTRODUCTION

For the purpose of the quantification of the probability of the debtor's settlement of payment obligations in course of time, the following probabilities can be quantified: the particular default probabilities, the defaults for debt instruments in portfolios and defaults depending on the default of another subject. Basic models, which were created for the purpose of measurement of the risk of bankruptcy and financial health of companies, include the models based purely on accounting data and statistical methods.

KLEPÁČ, Václav. 2015. Default Probability Prediction with Static Merton-D-Vine Copula Model. *European Journal of Business Science and Technology,* 1 (2): 104–113. ISSN 2336-6494.

One of the first authors who used basic statistical techniques in financial distress, e.g. bankruptcy prediction were Beaver (1966) with univariate analysis and Altman (1968) who used Multiple discriminant analysis (MDA), in that he computed an individual firm's discriminant score using a set of financial and economic ratios. Probably due to the huge demand coming from the financial sector in the beginning of 1980s more advanced estimation methods, such as Ohlson's logit (1980) and Zmijewski's probit (1984), were employed. Compared to the MDA the logit model was easier to understand since the logistic score, taking a value between 0 and 1, was interpretable in a probabilistic way.

Credit authorities need to estimate the probability of return of money lent (Credit risk). According to Míšek (2006), methods for quantification of so-called defaults (inability to repay obligations, bankruptcy) were formed. Another branches to statistical or data mining models are reduced type models (based on market data: bond and credit default swap prices etc.) and structural risk models (Merton model, 1973; Longstaff and Schwartz, 1995 etc.). Without any doubt these models are included among the influential methods for the credit risks measurement, which is used even in rating agencies (like KMV Moody's methodology).

Based on results from Klepáč (2014) and above stated authors we have realized that the structural models use the approaches based on option assessment. In these models, the value of assets (of the company) – after having exceeded given level – will cause the default of the company. The default probabilities can be measured on the basis of the distance between the market value of the company and the level of maximally financially manageable debts (non-leading to defaults). The knowledge of the probability of default enables in further applications estimation of credit spread (i.e. surcharge on risk-free interest rate) which will compensate the creditor's possible financial loss connected with the run default risk.

Therefore, the crucially important characteristic of credit models is the barrier which determines the default limit. Any change of expectations of a company's future means that especially the shares will react intensively to these changes. It is given by the fact that shareholders are the last subjects who claims will be discharged out of the company's remaining value in case of the company's default. That is why the latest information on company's fundaments are theoretically reflected both in the shares traded on the stock exchange and in the asset value which is generated via the above mentioned shares. Therefore, the market asset value includes both the future prospects of the company and the relevant information on the sector and economy, in which the company operates. Volatility in the sense of time-varying standard deviation of market price reflects the company's trade risk and the relevant sector risk.

Contribution of the article lies in comparison of the different ways of probability of default estimation. That is proposed by standard Merton model. We propose the novel methodological generalization of Merton model by high dimensional copulae for capturing market risk and transferring its character to default risk estimates with correlation of the traded equity in mind. Thus we partly continue, thereby with enhanced models, on the basis of results presented in Klepáč (2014).

2 THEORETICAL BACKGROUND: MERTON MODEL

Financial theory and risk management uses many Lévy procesess for modelling of asset returns and either for credit risk measurement. Probably the most famous is geometric Brownian motion used in Merton model as driving process of assets, which holds this form as stated in Schoutens and Cariboni (2009) or in Klepáč (2014):

$$dV_t = \mu V_t dt + \sigma V_t dW_t, \quad V_0 > 0, \qquad (1)$$

where $W = \{W_t, t > 0\}$ is standard Brownian motion, μ is the so-called drift parameter (mean

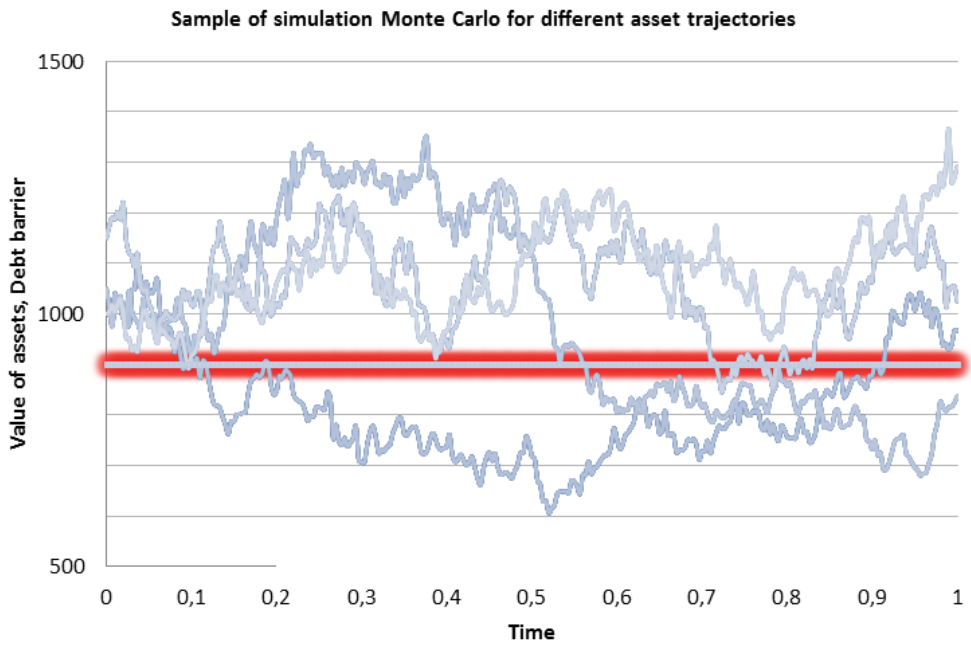

Fig. 1: Draw from Monte Carlo asset trajectories for company assets of one business entity (trajectories ending under the red barrier in time 1 signs default scenario).

process), and $\sigma > 0$ is the volatility (standard deviation), V holds for firm asset value. The related log-returns of asset values are then

$$\log V_t - \log V_0 = \left(\mu - \frac{\sigma^2}{2}\right) t + \sigma W_t, \qquad (2)$$

which follow a Normal distribution, $N\left((\mu - \sigma^2/2)\, t, \sigma^2 t\right)$. Thus V has a Lognormal distribution.

As stated in Klepáč (2014), Merton model is used for estimate the survival probability of chosen entity. In this model the company assts include equities and liabilities. Asset value of the entity $V = \{V_t, 0 < t < T\}$ is the sum of the equity value, $E = \{E_t, 0 < t < T\}$ and the value of a zero-coupon bond $z^t = \{z^t, 0 < t < T\}$ with maturity T and face value L: $V_t = E_t + z_t^T$. Default occurs if, at maturity, the asset value is not enough to pay back the face value L, see Fig. 1 for a better recognizance.

In this case the beholders take control of the firm and the shareholders do not receive anything. If at point of maturity $V_t > L$, default does not occur and the shareholders receive $V_t - L$. These assumptions allow us to treat the company equity as a European call option with inducted pay-off structure

$$\begin{aligned} E_t &= \max\left(V_t - L, 0\right) = \qquad (3) \\ &= \begin{cases} V_t - L, & \text{if } V_t > L \text{ (no default)}, \\ 0, & \text{if } V_t < L \text{ (default)}. \end{cases} \end{aligned}$$

As mentioned above the equity can be seen as a European call option, thus we can use standard Black–Scholes partial differential equation as modelling tool

$$S_t = V_t N(d^+) - e^{-r(T-t)} K N(d^-), \qquad (4)$$

where $N(d^\pm)$ are distribution functions of a Standard Normal random variable, r is risk-free rate, K is nominal value of debt. We could calculate values for $d^\pm$ as probability metrics, that asset path trajectories would end under default debt level

$$d^\pm = \frac{\ln \frac{A_t}{K} + \left(r \pm \frac{\sigma^2}{2}\right)(T-t)}{\sigma\sqrt{T-t}}. \qquad (5)$$

At selected time $0 < t < T$, the conditional probability that no default will occur in (t, T) corresponds to the probability of finishing in

the money for the virtual call option held by shareholders. From further investigations we know that the survival probability for entity equals to $N(d^-)$.

Part of the empirical studies, e.g. Leland and Toft (1996), verified that Merton's model or common structural models underestimate the prices of credit derivatives, thus also the default risk compared with empirical data in short-term period. Hillegeist et al. (2002) state, that results obtained via a Merton-based model provide up to 14 times higher information value (statistically) when a bankruptcy is determined than both Altman Z-score and Ohlson O-score – these scores can offer mostly additional information. These results were obtained in developed markets from the extensive files of data of several hundred or thousands companies.

In the conditions of the Czech Republic, similar studies are lately scarce, similar methodology is used in Míšek (2006). This scarcity is due to the low level of financial market development and low number of traded non-financial companies.

3 METHODOLOGY AND DATA

We deal with annual accounting data from yearly reports and Patria Online databases for market data (time series of closing stock prices, transformed into log returns). Data consists of four traded nonfinancial companies from Prague Stock exchange (PSE). Due to the potential use of presented methodology and its generalization is not necessary to fully mention the companies.

3.1 Estimation of default probabilities by Merton model

The main aim of this contribution is to test the possibility and compare results of default probabilities of the use of the basic Merton and enhanced Merton models of credit risk on the data of above stated companies. In this context, the risk of credit situation in three years (from 2011 to 2014), will be estimated and the results of obtained risk indicator (default probability) will be evaluated. The analysis proceeds from the medium term risk of credit situation, for the 4 year ahead estimate. With regard to the permanent financial market off, it will be considered if these models can point out the quality and changes in companies' financial structure – whether there have been more distinct changes and whether the values of estimates match the values of issued bonds at least approximately. At first instance we have to derive parameters:

- volatility of equity from stock daily returns;
- market value of equity which equals to market capitalization;
- risk-free interest rate from EU;
- time of debt settlement;
- liabilities – there exists many possible methods for estimate, but we use KMV's methodology. So the default level at maturity equals short-term + one half of long-term debts.

Volatility estimation based on combined conditional mean and variance leverage model ARMA(1,1)-GARCH(1,1)-GJR with Student-t distribution of innovation process was performed for time period from January 2007 to December 2011 are presented, then we took estimated equity volatility for calculation in Merton model, see below. This specific model setting performed best from in-sample testing in our previous work, e.g. see Klepáč and Hampel (2015) for more details about techniques for models selections. The estimation of time-varying equity volatility and solving of simultaneous system (to get asset volatility and its market value) of equations were performed in software (SW) package R 3.1.1. (2015) and SW Matlab 2014b (MathWorks, 2014). Specifically, we followed these steps:

- Calculation of the company's market asset value, market value of debt, quantification of the theoretical default level of bankruptcy

when we use KMV methodology for default level selection.

- The volatility of asset value and market asset value is determined via calculation of system of non-linear equations (full market capitalization, historical yearly volatility mean estimate, the risk-free interest, which depend on the face value of debt, equity capital value on financial market rate – from EU countries yield curve), and other possible factors depending on the model complexity. For exact solutions of chosen factors see Merton (1973) or Míšek (2006).

- Calculation of the probability of default for chosen time periods and model settings.

3.2 Copulas and D-Vine copulas

Copulas were firstly introduced in mathematical context by Sklar (1959) through his famous theorem. Any multivariate joint distribution can be written in terms of univariate marginal distribution functions and a copula describes the dependence structure between the variables. Continuous development of the copula theory supports us with solutions for elliptical and non-elliptical distributions, see Joe (1996) for mathematical reference about these copulas. For estimations we use maximum-likelihood estimation (MLE) – where particular copulas have one or two parameters. For high dimensionality treatment many authors proposed pair-copula constructions (PCCs) class which structures partly shown in Fig. 2.

Among the specific types within this class are Vine copulas, which are a flexible class of n-dimensional dependency models when we use bivariate copulas as building blocks. Due to Aas et al. (2009) who described statistical inference techniques, we can create multi-tier structure (according to dependence intensity between variables) between one central variable (i.e. market index) and underlying variables (companies in this index). D-Vines in contrast to its "sibling" offer another view: we propose modelling of the inner structure without selection of one explicit dependence driver.

3.3 Construction of Merton-D-Vine copula model

The theoretical assumption is that the credit quality of a company, which is expressed via the trend of development of the company's assets, is developing together with the development of its shares in a certain way. The next assumption is the possibility that the development of the company's assets is making a progress within the framework of an exact system, where the relationship between the returns within the framework of defined groups can be measured.

Based on these assumptions, a prediction model can be defined which projects the dependences among companies on the financial market into the development of their assets. The aim of the model suggested here is to show the probability of default which can be used as the variable in default and classification models, because of illustration of dependence between data on stock market.

Specifically, the behaviour of the basic Merton model is simulated, based on the numerical solution of the model of European call option with parameters which are routinely used here while estimating default. The difference is that the value of assets is directed by Brown movement whose component, which usually matches the Wiener process with normal distribution, is replaced by D-Vine copula component with Student-t or Normal distribution. Thus the above mentioned relation as in (2) is used

$$dV_t = \mu V_t dt + \sigma V_t dW_t, \tag{6}$$

which is generalized to the form of univariate asset trajectory model by D-Vine copula innovations

$$dV_t = \mu V_t dt + \sigma V_t dt \,(\text{D-Vine copula}_t), \tag{7}$$

and generalization for i companies

$$dV_t^i = \mu^i V_t dt + \sigma_i V_t dt \,(\text{D-Vine copula}_t^i), \tag{8}$$

where σ_i signs annualized asset volatility, which is a constant until debt settlement. D-Vine copula is a random draw from normalized D-Vine copula distribution, for capturing returns correlations. Mean of assets value process is

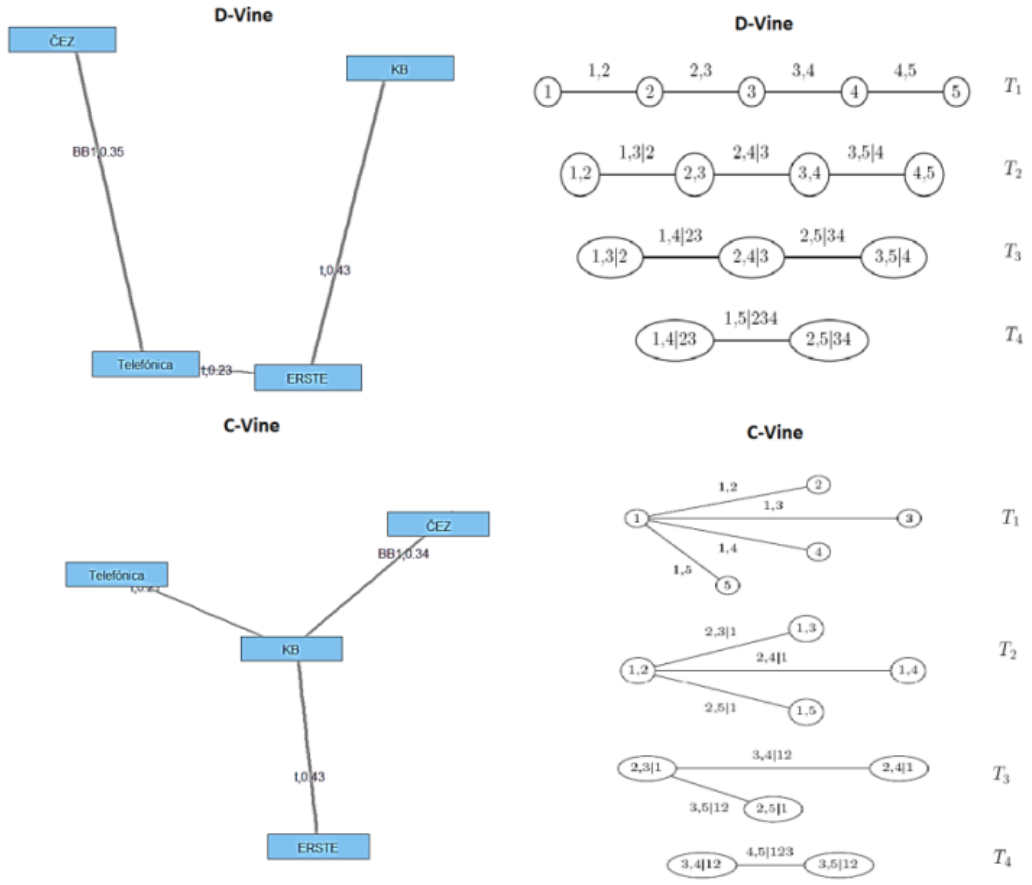

Fig. 2: Examples of D-Vine tree (right upper panel) and C-Vine tree (right panel bellow) specification on five variables, on the left panels are samples from four-dimensional D-Vine (left upper panel) and C-Vine copula (left down panel). The both left panels show example of the first structure. Based on Klepáč and Hampel (2015).

driven by process described by Campbell et al. (2008), where $\mu = r + 0.06$, and r is risk free rate.

The diversion from the standard Merton process lies in the fact that the innovations of the process contain the inner correlation structure and will be generated by non-normal division. Technically, it is inverse transformation performed through the *tcdf* algorithm in the Matlab 2014b, where the input is formed with the data from the D-Vine copula simulation, which is governed by uniform distribution on the interval $[0; 1]$. In the case of numerical option pricing we use steps described by Goddard Consulting (2011):

1. The calculation of the future development of the value of underlying asset – the output is formed by hundreds of trajectories of development, based on the determined function of the development of the asset, when the development is divided into small discrete intervals.
2. Calculation of terminal values of options for each of the potential trajectories.
3. Calculation of the average of all terminal values of options and their discounting in order to achieve the present value.

Thus the aim is to determine the frequency of intersections of the default barrier in the time of bond maturity, which can be – according to the

option theory – understood as the probability that the company will default at the concrete moment of time. That is why only the first steps from the above mentioned are used.

To estimate D-Vine copula on market data we should proceed in steps provided by Aas et al. (2009). At the first preparatory stage we filter (fit) raw data with ARMA(1,1) model, standardize residuals by GARCH (1,1) volatility – with the best fitting univariate models, in our case by GJR. Then we transform the residuals into uniformly distributed data from $[0;1]$ interval, we use algorithm *tcdf* in Matlab for this purpose. With the data in this form we could proceed according to Aas et al. (2009) and conduct:

- Structure selection to assess the intensity and structure of dependence.
- Copula selection for the most appropriate fit of the tail dependence characteristics with Vuong-Clark test.
- Estimation of copula parameters with maximum-likelihood estimation (MLE), when we use copulas with one or two parameters.
- Model evaluation by Vuong test and subsequently by information criteria.
- Simulation from D-Vine copulas to get at least 10,000 times n-asset of uniformly distributed numbers.
- Simulation based credit risk evaluation with Merton-D-Vine copula model.

4 RESULTS

In Tab. 1 there are presented basic returns statistics from which is obvious that median and mean values were around zero.

On Fig. 3 are visualized time-varying standard deviations (volatility) fits for capturing higher oscillations in time. According to previous results, see Klepáč and Hampel (2015), we preferred fits based on ARMA(1,1)-GARCH(1,1)-GJR which offers better quality in terms of information criteria due to the ability to measure non-linear data pattern in opposition to standard GARCH model. The highest daily oscillations lasted from 2008 to 2009 depending to global financial market crisis, see Fig. 3. Monitoring other higher daily returns we see breaks in 2011 and 2012 and in the summer of 2015.

4.1 Estimation of D-Vine copula models

For the Vine copula function estimates, first the dependence between magnitudes and the character of their distribution must be clarified and specified in detail, although not fully reported. From exploratory data analysis and the statistical inference procedures we have drawn more specific conclusions about copula type which we have further used. More detailed testing provides us with the families of the copula models, which expresses this structure of dependence in the most appropriate way: we should deal with BB1, BB7 or Student-t copula families. After that we let the D-Vine algorithm separate the residuals into 3 trees. We recognized from "upper" into "bottom level" dependence intensity for these copula pairs (sign t denotes Student-t distribution, BB7 and BB1 are other copula types, number quantifies Kendall's tau correlation coefficient), see Fig. 4 where at first simple dependence structure is used. Therefor the more complex structure with weighted densities between return streams and lesser correlation is visualized in the case of Tree 2 and 3. The highest dependence is between the Companies 1 and 2, so the leading variable – dependence driver is Company 1, what manifests into the second dependence tier in Tree 2.

From this multivariate copula, visualized by the branch structure, we generate simulated uniformly distributed numbers from interval $[0;1]$ for transformation with inverse cumulative distributions from simulated probabilities.

Tab. 1: Basic statistics for returns data set

Statistics	Company 1	Company 2	Company 3	Company 4
Minimum	−0.2337	−0.1240	−0.1670	−0.1530
1st Quartile	−0.0066	−0.0066	−0.0077	−0.0090
Median	0.0000	0.0000	0.0000	0.0001
Mean	0.0001	0.0000	−0.0002	−0.0002
3rd Quartile	0.0070	0.0070	0.0081	0.0092
Maximum	0.1300	0.1480	0.2640	0.1951

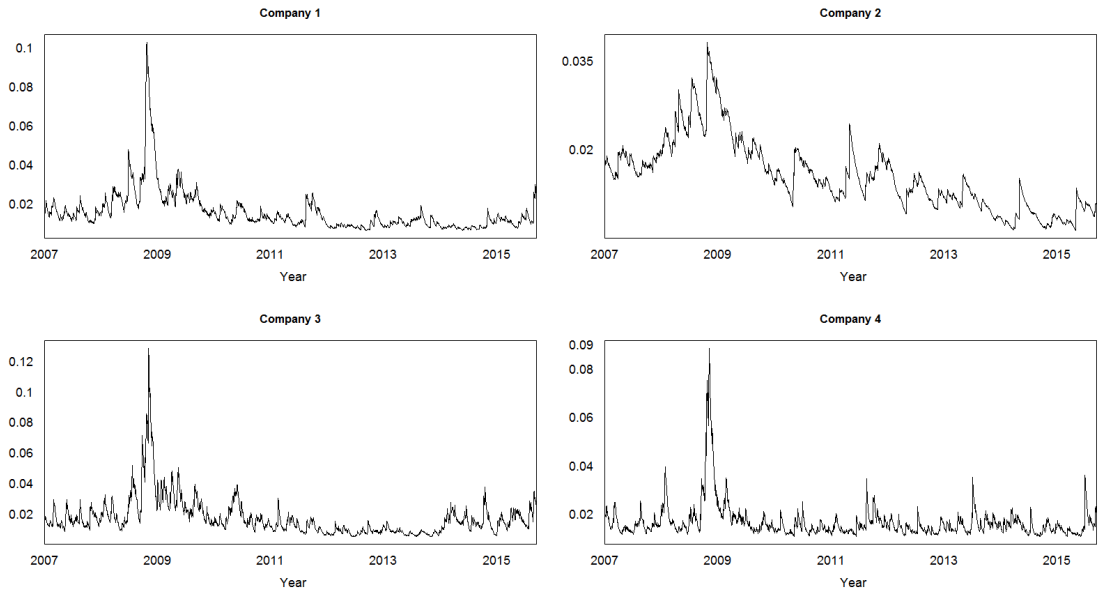

Fig. 3: Daily volatility estimated for analyzed companies – with ARMA(1,1)-GARCH(1,1)-GJR model

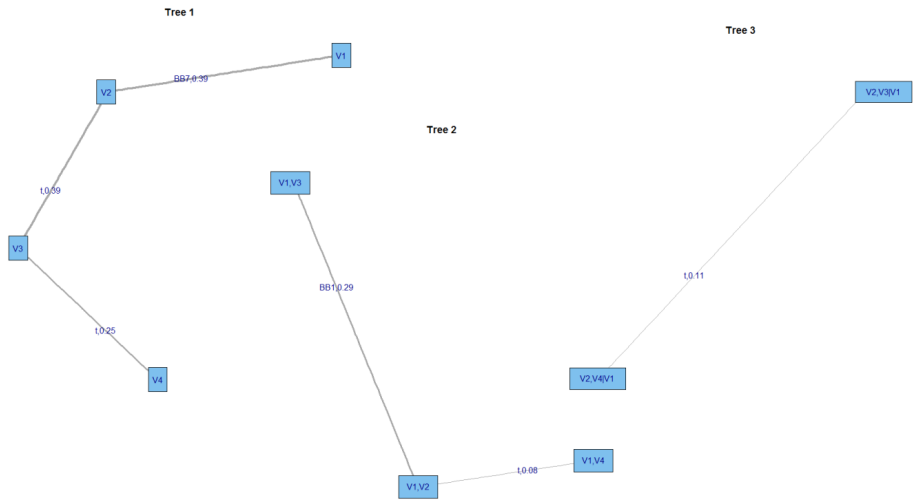

Fig. 4: D-Vine copula trees (V1–V4 sign companies, first expression is copula family, second evaluates Kendall tau value)

Tab. 2: Inputs for risk computation (in CZK) for 2007–2011 and 2011–2014 risk prediction

Input values	Company 1	Company 2	Company 3	Company 4
Market capitalization (Equity)	4,365,506,200	28,002,937,200	36,085,618,036	$4.30392 \cdot 10^{11}$
Debt barrier at maturity	1,730,643,600	6,564,000,000	$1.85 \cdot 10^{10}$	$1.01071 \cdot 10^{11}$
Annualized stock mean volatility	33.52%	33.27%	38.13%	29.54%
Market value of debt	1,640,493,800	6,227,062,800	$1.746938 \cdot 10^{10}$	$9.5908 \cdot 10^{10}$
Market value of assets	$6.006 \cdot 10^{9}$	$3.423 \cdot 10^{10}$	$5.355 \cdot 10^{10}$	$5.263 \cdot 10^{11}$
Annualized assets volatility	24.41%	27.27%	25.89%	24.16%
3-year EU27 risk-free rate	1.31%	1.31%	1.31%	1.31%

Tab. 3: Output for risk computation (in CZK) for 2007–2011 and 2011–2014 risk prediction

Calculation outputs	Company 1	Company 2	Company 3	Company 4
Expected Loss	0.0011	0.0003	0.0049	0.0001
Probability of Default – 4 year ahead	0.0079	0.0022	0.0291	0.0005
Distance to Default	2.9777	2.9999	2.6019	3.3850
Yield Spread (basis pts)	2.7855	0.7577	12.3032	0.1469
Probability of Default Merton-Copula	0.0781	0.0468	0	0

4.2 Estimation of default probabilities

Initial information resulting from calculation and used for risk estimation are offered in Tab. 2, where are input values of high importance: market value of assets and its volatility, Debt barrier at maturity, Equity value, EU27 3-year risk-free rate.

The resulting values of default probabilities for the 4 years ahead are visible in Tab. 3. Merton model usually underestimates realized level of risk for shorter maturities, which holds true in our case either, but adjusted Merton D-Vine copula model performs better – proposed probabilities based on Monte Carlo simulations are much higher, especially for Company 1 (which is most risky according to enhanced Merton model) and 2.

5 DISCUSSION AND CONCLUSIONS

Presented contribution concentrated on measurement of credit risk, probability of default in time in case of four traded nonfinancial companies from Prague market exchange. We analysed default probabilities of these companies and took in account the most renowned structural model of default – Merton model and proposed novel static Merton-D-vine copula model, which transforms market risk dependence to credit dependence with capturing nonlinear and high dimensional attributes.

Although Merton structural model usually underestimates realized level of risk for shorter maturities (like 1 or 3 years), but adjusted Merton model performs better – proposed probabilities are much higher. Definitely, standard Brownian asset process in Merton model suffers with many weaknesses connected to Gaussian process property, that means we adjusted distribution of process too – instead of Gaussian distributions we propose Student-t distribution as a better choice because of its heavier tails. For a better understanding it is useful to compare these results in the future with models based on accounting data or data mining methods with bankruptcy prediction in mind or set obtained default probabilities as predictors in comparison to standard financial ratios.

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INFORMALITY, TAX EVASION AND THE QUALITY OF BUSINESS ENVIRONMENT: EVIDENCE FROM SOUTH CAUCASIAN COUNTRIES

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ABSTRACT

In many transition countries, a considerable part of economic activity takes place in the informal sector. On the other hand, tax evasion constitutes a major problem and causes improvements to all levels of the informal sector in which the volume of the informal sector in transition countries is much higher than in developed countries. Previous works have examined separately both the determinants of the size of the informal sector and the determinants of tax evasion for transition countries. But, this paper complements these significant works by examining cross sectional analysis based on firm-level data for South Caucasian countries. In addition, our paper has a new contribution to previous works by providing some empirical evidence for informality and tax evasion with the quality of business environment. Building on a simple analytical framework, we test the channels affecting the degree of informality in South Caucasian countries and vice versa, the channels affecting the degree of tax evasion. We use instrumental variable OLS and find that the extent of informality is determined by tax evasion, as well as the extent of tax evasion is determined by the informality for these countries. In addition, we find that the business environment has implications for both informal economy and tax evasion. These results suggest generally ameliorating the business environment in South Caucasian countries, while strengthening an access to land and financial sources, adequate provision of public capital such as telecommunication, transport and electricity infrastructure will reduce informality, reigning the corruption, tax administration and labor regulation will reduce tax evasion and ultimately lead to increasing government revenue collections.

KEY WORDS

tax evasion, informality, the quality of business environment, South Caucasian countries

JEL CODES

D22, H26, O17, H32

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1 INTRODUCTION

In transition countries tax evasion constitutes a major problem and causes improvements to all levels of the *informal sector* in which the volume of the informal sector in transition countries is much higher than in developed countries (Grgić and Terzić, 2014). Because of the concerns about tax evasion effects on economic growth and the government's ability to raise revenues, and hence provide sufficient public services, our recent work has focused on the quality of business environemt. The computation of the size and development of the informal economy in the transition countries has been undertaken since the late 80s starting with the work of Kaufmann and Kaliberda (1996), Johnson et al. (1997) and Lackó (2000). In this paper, *South Caucasian countries – Armenia, Azerbaijan and Georgia – will be examined as a part of transition countries.* Schneider (2006) predicted the size of Azerbaijan's informal economy at 61.3 percent of gross national income in 2003. The size of Armenia's and Georgia's informal economy at 49.1 and 68.0 percent of gross national income, respectively in the same year. More recent study such as Buehn and Schneider (2012) estimated the size of Azerbaijan's shadow economy to be 52 percent of gross national income. Armenia and Georgia are in the 41.1 and 62.1 percent of gross national income, respectively. It can be seen that, there are many obstacles to come up with the size of the shadow economy in all three countries. But, as this paper shows, some progress can be made for all three countries after our research and it will bring new light to the economy of *South Caucasian countries.*

According to the State Statistics Committee of the Republic of Azerbaijan, 93 percent of individual entrepreneurs in Azerbaijan operate mainly in the fields of retail trade and transportation. Only 2 percent of the individual entrepreneurs are doing business activity in the industrial sector. One of the explanations proposed for this is the impact of oppressive taxes (Nadirov and Aliyev, 2015). Also, this claim can be exemplified by Armenia and Georgia. In addition, the empirical literature relates the size of the informal sector to the tax burden (e.g., Cebula, 1997; Giles and Tedds, 2002). Moreover, we can add that the main problem apparent in the tax system of transition countries is about having weak tax administration procedures and pronounced tax exemptions. These weaknesses, in turn, encourage widespread tax evasion (Andrew and Jean, 2000).

According to Fig. 1, Azerbaijan is ranked 33 on the ease of operation of the attractiveness of business environment and in comparison with other two South Caucasian countries we are placed in the highest position. Armenia and Georgia are in the 41 and 38 ranking position, respectively. While the informal sector has implications for tax effort, there is limited research on the microeconomic level determinants of informality and tax evasion in South Caucasian economies. For these reasons, informality, tax evasion and the quality of business environment have now received renewed attention in policy debates. The main questions to this study are 'Does the quality of business environment encourage South Caucasian countries firms to operate informally and evade taxes?', 'If yes, how it differs among the three countries?'.

This paper follows the work of Dabla-Norris et al. (2008) and Mawajje (2013) who modelled informality as the failure by economic agents to fully comply with government determined regulations and taxes. This framework generates several predictions. In particular, we obtain that both the tax evasion and the quality of business environment are important determinants of informality. We also test adverse relationship that both an informality and the quality of business environment leads to tax evasion.

We test these predictions using data a 2013 Enterprise Survey compiled by World Bank for a South Caucauses countries. This data set enables us to make a contribution to the empirical literature about the different channels of informality, tax evasion and the business environment. Previous papers along these lines has only been done in Dabla-Norris et al. (2008) and Mawajje (2013), the former primarily using

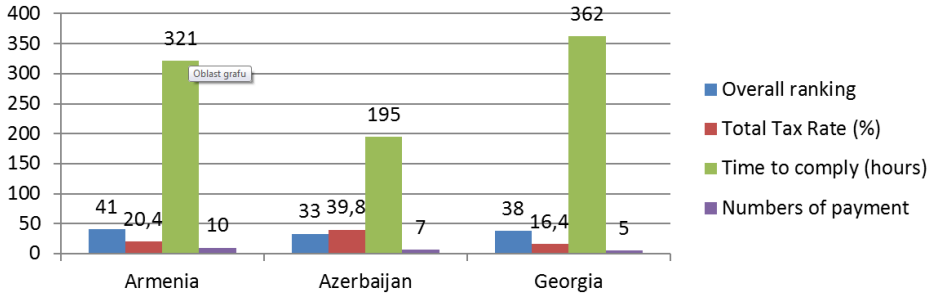

Fig. 1: The data tables. Overall Paying Taxes ranking, Tax Payments, Time to comply and Total Tax Rate
Source: PWC (2015)

much larger micro-sample which includes firms from many developing countries, and the latter in the context of firm-level data for Uganda. Our paper complements this significant work by examining cross sectional analysis based on firm-level data for South Caucasian countries.

Firstly, we find that the quality of business environment and the tax evasion plays a crucial role in determining the size of the informal sector, consistent with the presented all models. This reveals the fact that the desire of entrepreneurs to avoid taxes leads to higher informality. With Azerbaijan as the basis group condition, the research reveals that Armenia is the most informal country compared to Azerbaijan while Georgia is the least informal. However, informality differences between Georgia and Azerbaijan is not significantly strong. Secondly, we tested also adverse relation that the informality plays an important role in the spreading of tax evasion process. In this test, again Azerbaijan is the basis group, tax evasion attempts in Georgia and Armenia is lower in comparison with Azerbaian. However, the difference is statistically and economically significant for Georgia-Azerbaijan comparison, but for Armenia-Azerbaijan comparison, the difference is small and statistically insignificant. Overall, our results reinforce the view that tax evasion is the primary determinant of informality, and vice versa informality is the primary determinant of tax evasion in all three South Caucasus countries.

The rest of the paper is organised as follows: section two discusses the literature survey and analytical framework are discussed in section three while data and estimation strategy and empirical results are presented in section four and five, respectively. Lastly, the conclusions are presented section six.

2 LITERATURE REVIEW

In recent years, domestic revenue generation in developing countries has been gaining prominence in the policy debate. Especially in South Caucasus region Armenia, Azerbaijan and Georgia has experienced a range of political and economical conflicts about the ways of collecting more domestic revenue. In all the developing countries, the major problems of collection domestic revenue is large untaxed informal sector. While such studies hepled to understand the extent of tax evasion in an economy, they cannot describe explicitly the reasons behind a firm's decision to operate informally and evade taxes Mawajje (2013). For these reasons, issues of tax evasion, informality, and the quality of business environment have now received renewed attention in policy debates. The significance of a good business environment for firm performance has been well investigated in the literature. Reinikka and Svensson (2002) provided that firms crucially reduce investments in productive capacity when faced with insufficient provision of complementary public capital. Following papers has shown

investment climate has implications for firm level productivity (Dollar et al., 2002; Ingram et al., 2007) and growth (Dollar et al., 2003).

Djankov et al. (2002) suggest in his research that many activities that now take place in the informal or semi-formal economy in transition countries will be legalized if entrepreneurs see the costs of informality rising and its benefits falling. He indicate that the tax base is increased, as firms at the margin of the informal economy see their benefits of formality increase and current tax-payers become more compliant.

Dabla-Norris et al. (2008) test this prediction using data for a large number of developing and developed countries. They indicate that tax burden, excessive regulations, financial constraints, and weaknesses of the legal framework has a large effect on the tendency to operate informally for both small and large firms. They found that the quality of the legal framework is significantly important in determining the size of the informal sector, whereas the significance of taxes, regulations and financial constraints is reduced in the context of a well functioning legal system.

Recently, the literature identifies tax evasion as one of the worst determinant for making poor business environment in every developed and developing countries. Mawajje (2013) provided some emirical evidence on how a poor business environment causes tax evasion in Uganda. He found that the extent of tax evasion is determined by the quality and efficiency of legal systems, bureaucratic bribery and inadequate provision of public capital.

Altogether, while this literature contains a relatively rich offering of the potential determinants of informality for developing and developed countries, very few studies have tested them for South Caucasian countries. To the best of our knowledge, about this issue there has been no research directly focused on the economies of South Caucasian countries. In this paper, therefore, we take a fresh look at the causes of informality by employing a comprehensive firm-level dataset that includes information on various potential determinants of informality for South Caucasian countries. For this reason, we use a simple general equilibrium model developed by Mawajje (2013). This simple general model will be explained more fully in the next section.

3 THEORETICAL FRAMEWORK

The theoretical framework of our analysis is adopted from Rauch (1991), Dabla-Norris et al. (2008) and Mawajje (2013). The production function is expressed as below:

$$y_i = a_i f(L, K, G). \tag{1}$$

Variable a_i denotes firm's productivity form other sources L, K and G denotes the amount of labour employed, private capital investment and public capital, respectively. Here, labour earns a wage w and private investment earns a return r.

As you know, the quality of business environment depends on provision of public capital by government that is complimentary to private capital. Provided public capital is anticipated to help on the development of private firms. Mawajje (2013) assumed in his production function that governments can only provide the public good by imposing a taxation rate t on the firm's output and labour. All collected taxes can be demonstrated by T, while the efficient provision of complimentary public capital G is equal to T ($G = T$), because we mentioned above that government public capital can be funded by imposing tax to firm's output and labour. In the first i period firms notice government's commitment to provide public good and make a decision to operate formally or informally (evade tax) in the second $i+1$ period. Normally, firms choose to do their business activity formally in period $i+1$ if their perceptions of government's commitment to providing complementary capital is satisfactory. If not, firms will do their business activity informally or will be reluctant to reveal their

actual output. To be unwilling to reveal actual outuput in that case, it means that firms will avoid a proportion of taxes. On the other hand, employees will choose to engage in informal employment, if their work in firms does not make any economic sense for them. Employees in the informal sector earn a wage w which is not taxed, but employees in the formal sector earn a wage w_f and pay a tax t_f such that their net wage is $w_f - t_f$.

In the same way, firms do their business activity formally if they expect government to provide public complementary capital to at least a minimum level g_f, otherwise firms will do their business activity informal sector or avoid paying taxes. Nevertheless, doing business activity formally is also costly because it includes a cost τ that is associated with meeting government regulatory requirements. The high regulatory requirements can change the strategy of firms and it will lead to operate informally their business activity. Firms that doing business activity in the formal sector earn a profit

$$\pi_f = af(L,K,G) - wL - rK - \tau - C,$$

while those that doing their business activity in the informal sector earn a profit equivalent to

$$\pi_{nf} = af(L,K,G) - wL - rK - C.$$

Letting C denotes the cost of complying with regulatory requirement and bribes in the formal sector.

The formula mentioned above just only shows us informal sector without risks or penalties. But in reality, we know that firms can face penalties by government if they hide output or under declare their tax obligations. If the firms chooses to operate informally, it avoids the direct cost of regulatory requirements but faces a likelihood of being caught and punished as shown by Dabla-Norris et al. (2008). Here, p will denote us the probability of being caught when operating informally. We assume that, when caught, the firms is fined by the full amount of their profits. For this reason, the supposition above insinuate that the profits of an informally operating firm can be expressed as follows:

$$\begin{aligned} \pi_{nf}\,(\text{not caught}) &= af(L,K,G) - wL - \\ &\quad - rK - C, \end{aligned} \tag{2}$$

with probability $1-p$,

$$\pi_{nf}\,(\text{caught}) = 0, \tag{3}$$

with probability p, so that expected profits for a firm operating informally are given as:

$$\begin{aligned} \pi_{nf} &= \big[af(L,K,G) - wL - \\ &\quad - rK - C\big](1-p). \end{aligned} \tag{4}$$

4 DATA AND ESTIMATION STRATEGY

4.1 The data

The study uses data from the World Bank Enterprise Surveys (2013) for South Caucasus economies. The data for our research was selected from three countries namely; Armenia, Azerbaijan and Georgia involved 360, 390 and 360 firms, repectively. The data contains information on South Caucasus firms' perceptions of the quality of government provision of public services, the strength of the legal framework and tax evasion as well as other constraints in doing business. It is often said that firms make unofficial payments/gifts, private payments or other benefits to public officials to gain advantages in the drafting of laws, decrees, regulations, and other binding government decisions. About the informality, we use this following statement and question as a proxy: It is common for firms in my line of business to have to pay some irregular "additional payments or gifts" to get things done with regard to customs, taxes, licenses, regulations, services etc. Would you say the following statement is always, usually, frequently, sometimes, seldom or never true?

Additionally, the survey questionnaires have the following question that we use as a proxy for tax evasion: "How often would firms make payments/gifts for the dealing with taxes and tax collection?"

Of equal importance, the survey asked questions about the specific components of the business environment and on a scale of 0–4 where 0 represents no obstacle and 4 represents very severe obstacle, entrepreneurs or the business managers were required to specify whether the stated factors presented any obstacles to the operations of the establishment. The evaluated factors included: functioning of the courts; practices of competitors in the informal sector; corruption; macroeconomic instability; access to finance; access to land; business licensing and permits; crime, theft and disorder; customs and trade regulations; labor regulations; political instability; inadequately educated workforce; tax administration; tax rates; transportation and electricity.

Tab. 3 (in Annex) includes descriptive statistics of the variables of interest to this paper. It covers a measure of informality and tax evasion; the constraints in doing business; as well as various firm and industry level characteristics. The data indicates that more than 64 percent of all firms are part of informal sector and 66 percent of all firms are engaged in some degree of tax evasion.

The empirical analysis laid special emphasis on the effects of tax evasion on informal sector and vice versa the effects of informal sector on tax evasion, as well as the current situtation of quality of business environment and the functioning of firm size and industrial distinctions. In our paper, tax evasion is considered as a part of informal sector. However, informality is thought as an affect for tax evasion cases. Determining a valid casual relationship between informality and tax evasion requires that our econometric model satisfies these two conditions. In the next section, our econometric model and its empirical analysis will be described very comprehensively.

4.2 The estimation strategy

This is a cross sectional analysis based on the survey data for South Caucasian economies, namely Georgia, Azerbaijan, and Armenia. Ordinary Least Squares (OLS) method is used to estimate multiply regression models for each country individually, and pooled data covering whole observations of all three region countries.

Two distinct regression equation is estimated here. In the first case, all independent variables including *tax evasion* are regressed against the variable of *informality*. In the second case, tax evasion is taken as the dependent variables with *informality* and the same group of independent variables as the explanatory variables. Each regression model is estimated for Georgia, Azerbaijan, and Armenia as separate estimations, and additionally for pooled data including all.

Individual OLS models

Quick view to the equations for the modelling presented below with details. Equation 5 shows the model equation for the first case where the dependent variable (Y) is informality. Variable x_1 denotes *tax evasion*:

$$Y_{j,i} = \beta_0 + \beta_1 x_{1j,i} + \beta_k \sum_{k=2}^{15} Q_{j,i} + \\ + \beta_k \sum_{k=16}^{19} C_{j,i} + u_{j,i}. \quad (5)$$

Q encompasses the group of independent variables measuring quality of business environment, numbered by $k \in \{2, 3, \ldots, 15\}$ sequenced as the following: *outage, court, infrastructure, tradecustom, competitors, access, crime, tax rate, tax administration, license, political instability, labor regulations, corruption, workforce*. To reveal if the informality differs across firm size and industrial distinctions, C covers dummy variables demonstrating firm characteristics, namely firm size dummies (*small*, and *medium* where *large* is the base group) and industrial dummies (*retail*, and *core* where *manufacturing* is the base group) numbered by $k \in \{16, 17, 18, 19\}$ sequenced as *small, medium, retail*, and *core*. All β are coefficients. J indicates for which country the estimated regression is belonging, covering

Georgia, Azerbaijan, and Armenia, and i means each single observation. And u is the error term in the model.

In the second case where the dependent variable is *tax evasion*, the model is represented in equation 6. To avoid confusion, coding of the variables is kept the same as in equation 5. Only the tax evasion (coded as X_1) and informality (coded as Y) are replaced. Thus, informality is included to the model as an independent variable in equation 6:

$$\begin{aligned} Y_{1j,i} &= \gamma_0 + \gamma_1 y_{j,i} + \gamma_k \sum_{k=2}^{15} Q_{j,i} + \\ &+ \gamma_k \sum_{k=16}^{19} C_{j,i} + u_{j,i}. \end{aligned} \tag{6}$$

Note that Q, C, J, i and u denote the same meanings with the equation 5, above. Here, coefficients are presented by using γ.

Pooled OLS models

In these models, whole estimable observation from Georgia, Azerbaijan, and Armenia are pooled and estimated within one pooled cross sectional OLS model separately for each case of mentioned above.

For the each case, equation 7 and 8 represents, respectively the first case with informality as the dependent variable, and second case with tax evasion as the dependent variable:

$$\begin{aligned} Y_i &= \beta_0 + \beta_1 x_1 + \beta_k \sum_{k=2}^{15} Q_{j,i} + \\ &+ \beta_k \sum_{k=16}^{19} C_{j,i} + \beta_{20} D_1 + \\ &+ \beta_{21} D_2 + u_i, \end{aligned} \tag{7}$$

$$\begin{aligned} X_{1i} &= \gamma_0 + \gamma_1 y_1 + \gamma_k \sum_{k=2}^{15} Q_{j,i} + \\ &+ \gamma_k \sum_{k=16}^{19} C_{j,i} + \gamma_{20} D_1 + \\ &+ \gamma_{21} D_2 + u_{j,i}. \end{aligned} \tag{8}$$

In these models, all codes are identical of equation 5 and 6, respectively except country dummies D_1 and D_2. An additional contribution of pooled OLS models is the possibility of comparing the situation of informality and tax evasion among the case countries. For this purpose, country dummies are added to the models. D_1 is the dummy variable equals 1 if the observed entrepreneurship object is from Georgia, otherwise 0. With the same logic, the dummy variable (D_2) equals 1 if the observed entrepreneurship object is from Armenia, otherwise 0. Azerbaijan is left as the basis group for comparison.

It is noteworthy to mention that in all regressions, HAC standard errors & covariance (Bartlett kernel, Newey-West fixed bandwidth = 5.0000) standard errors is used which is robusted against heteroscedasticity and autocorrelation problems. Residuals are tested and found normally distributed.

5 EMPIRICAL RESULTS

Determinants of *informality* and *tax evasion* are presented below as a matter of fact from OLS multiply regression and pooled OLS multiple regression model results. Tab. 1 and 2 embodies those empirical findings. While the Tab. 1 presents findings related to factors affecting informality (equation 5 and 7), the second table provides evidence about the associations of interest related to tax evasion (equation 6 and 8).

As expected, there is a significant positive impact of tax evasion over the informality

attempts in all models. This reveals the fact that desire of entrepreneurs to avoid taxes leads to higher informality. The outage is a significant determinant towards a positive direction in Azerbaijan and Armenia, and a result in pooled case as well. In the case of Georgia, the impact is negative and statistically insignificant.

Perception of entrepreneurs about the efficiency of how the courts working, trade and customs regulations, attitudes of competitors, and corruption is not found as the significant factors affecting informality attempts in all models. Infrastructure (electricity, telecommunication, and transport) has a significant effect only in case of Azerbaijan, and in pooled cars. Access to land and financial sources is a key significant factor in Azerbaijan. More precisely, if an entrepreneur object faces with obstacles to access land and finance tends to higher informal attitudes. The interesting finding is about the role of the criminal situation in informality attempts which is only significant in Azerbaijan, but the impact is unexpectedly negative. Moreover, only licensing and permits an obstacle to the informality in Georgia.

According to the research findings, the tax rates push entrepreneur objects in Azerbaijan toward the higher informal actions. This influence is only statistically significant in the case of Azerbaijan. In contrast, tax administration and labor regulation issues are the significant factors in Armenia increases informality.

The role of firm size and the field of industry the object is operating in do not lead significant differences in informality issue. The coefficients provides that the most informal attitudes belongs to large firms in Georgia, small and medium enterprises in Azerbaijan and Armenia, and as a result in pooled model. However the firm size differences impact is not statistically significant.

Similarly, industry dummies also provide insignificant differences among firms across the sectoral distinctions. Only in Azerbaijan, core sector is significantly less informal in comparison with manufacturing. The most informal sectors are retail in Georgia, manufacturing in Azerbaijan, and core in Armenia.

Country dummies ensure informality comparison among the region countries. With Azerbaijan as the basis group condition, the research reveals that Armenia is the most informal country with significant positive coefficient of difference compared with Azerbaijan while Georgia is the least informal one with negative coefficient. However, the coefficient is statistically insignificant demonstrates not strong informality differences between Georgia and Azerbaijan.

What about tax evasion's determinants? This is even more interesting than the previous one. Estimation of equation 6 and 8 provides evidence about several determinants of tax evasion in these countries individually, and as pooled cross sectional data analysis. Regression outputs are given in Tab. 2.

According to the Tab. 2, *informality* is one of the main causes that encourages entrepreneurs to perform some kind of informal actions for tax evasion purpose. The impact is positive, statistically significant at 5% level of significance. The influence is also economically significant as the coefficients are very large. However, it is fairly small in case of Georgia, almost 3 times in comparison with Azerbaijan and Armenia. Someone can argue how this evidence is reliable. Nevertheless, to go some deeper, it is acceptable that if an entrepreneurship object evaluates an economy as high informal based on previous experience or experience of others in the market, then the entrepreneur will be encouraged to present gifts or something different due to conceal taxes.

Most indicators of the quality of business environment have statistically and economically insignificant influence over the tax evasion. Thus coefficients are both very small and statistically insignificant at conventionally adopted significance levels. There are several exceptions but not as much as considerable level.

Two indicators of quality of business environment – *tax administration* and *corruption* are revealed to be very influential factors leading to much more tax evasion purposed attempts. In all models, an increase the amount of obstacles from tax administration system affect the tax evasion positively and statistically and

Tab. 1: OLS results: Informality as the dependent variable

	Model 1	Model 2	Model 3	Model 4
Variables	**Georgia**	**Azerbaijan**	**Armenia**	**Pooled**
Tax evasion	0.241105**	0.498354***	0.553357***	0.549550***
Quality of business environment indicators				
Outage	−0.052987	0.246721**	0.184577**	0.116463**
Court	−0.000643	−0.001798	0.029307	0.012020
Infrastructure	0.000339	−0.055061*	−0.024755	−0.021791**
Trade & custom	0.022605	−0.056636	0.035543	0.022213
Competitors	0.014773	−0.028969	0.057220	0.019163
Access	−0.016066*	0.059745***	−0.010292	−0.000173
Crime	−0.013817	−0.275382***	0.097222	0.039360
Tax rate	0.008002	0.204536***	−0.014959	0.037771
Tax administration	0.017653	−0.011140	0.101044**	0.062194**
Licensing & permits	0.323513***	−0.060473	0.003609	0.005606
Political instability	−0.013808	0.007426	−0.009503	−0.029502*
Labor regulation	−0.054251	−0.072998	0.167507**	0.089472*
Corruption	0.013865	−0.004335	0.004622	0.031560
Workforce	0.034619	−0.038354	−0.084762*	−0.021877
Firm size and industrial dummies				
Small	−0.049451	0.041132	0.124517	0.069994
Medium	−0.078382	0.056817	0.140982	0.047599
Large	*Base group*	*Base group*	*Base group*	*Base group*
Retail	0.023015	−0.014835	−0.013649	0.031886
Core	−0.077413	−0.201738**	0.131681	−0.018886
Manufacturing	*Base group*	*Base group*	*Base group*	*Base group*
Country specific dummies				
D_1	–	–	–	−0.073138
D_2	–	–	–	0.191008***
C	0.132432	0.125357	0.049687	0.015174
R-squared	0.521880	0.572983	0.539875	0.558451
Included observations	265	310	337	912

Note: ***, **, and * denotes statistical significance level at 1%, 5%, and 10%, respectively.

economically significant. Again, lowest impact of tax administration belongs to Georgia, and the highest belongs to Azerbaijan. The role of corruption related obstacles faced by entrepreneurship objects in increasing tax evasion is also economically and statistically significant. In Georgia and Azerbaijan, the significance is comparatively weak in comparison with Armenia. Size of coefficients also confirm this finding. The lowest coefficient belongs to again Georgia, and the highest one belongs to Armenia.

When tax evasion attempts considered, the research discovers that there is not any significant difference due to the firm size and industrial distinctions among entrepreneurship objects. All coefficients are statistically and economically insignificant. However, country dummies are matter to an interesting discussion. Again Azerbaijan is the basis group. Tax evasion attempts in Georgia and Armenia is lower in comparison with Azerbaian. However, the difference is statistically and economically significant for Georgia-Azerbaijan comparison.

Tab. 2: OLS results: Tax evasion as the dependent variable

	Model 1	Model 2	Model 3	Model 4
Variables	**Georgia**	**Azerbaijan**	**Armenia**	**Pooled**
Informality	0.232813**	0.682958***	0.618216***	0.575872***
Quality of business environment indicators				
Outage	−0.015605	−0.114271	0.007842	−0.018664
Court	0.006350	−0.028416**	0.014499	−0.010468
Infrastructure	−0.004439	−0.026531	−0.024308	−0.018956*
Trade & custom	0.028430	0.016859	−0.036221	−0.039193*
Competitors	0.020628	−0.007773	−0.062222	−0.024655
Access	0.002398	−0.014829	0.008027	0.010001
Crime	−0.022922	0.154462	−0.053739	−0.020407
Tax rate	0.008007	0.010252	0.009143	0.023782
Tax administration	0.075963**	0.188770**	0.129095***	0.153136***
Licensing & permits	−0.103309	0.080534	0.003637	0.036727
Political instability	0.034686*	0.073917	−0.019527	0.011518
Labor regulation	0.024681	0.129624	−0.148771**	−0.094678*
Corruption	0.098788*	0.134096*	0.156053***	0.132332***
Workforce	−0.019396	0.007322	0.009023	−0.020223
Firm size and industrial dummies				
Small	−0.064340	0.017447	−0.134092	−0.058012
Medium	−0.100637	−0.036930	−0.143579	−0.056469
Large	*Base group*	*Base group*	*Base group*	*Base group*
Retail	−0.082450	−0.083965	−0.085919	−0.095141
Core	−0.095306	−0.061990	−0.044001	−0.081082
Manufacturing	*Base group*	*Base group*	*Base group*	*Base group*
Country specific dummies				
D_1	–	–	–	−0.238640***
D_2	–	–	–	−0.062141
C	0.091459	0.308839	0.368566	0.380413
R-squared	0.190483	0.556670	0.545029	0.579558
Included observations	265	310	337	912

Note: ***, **, and * denotes statistical significance level at 1%, 5%, and 10%, respectively.

For Armenia-Azerbaijan comparison, the coefficient shows less tax evasion attempts in Armenia but the difference is small and statistically insignificant.

6 CONCLUDING REMARKS

Using a rich 2013 World Bank Enterprise Survey data set on a cross section of South Caucasian firms, we examine the causes of business environemt, tax evasion and informality. The firm-level survey we employ elicits explicit responses about the obstacles the firms view as most restraining. As predicted in the theoretical part, the tax evasion is found to be an important factor for informality. Therefore, we examine whether tax evasion are associated with informality. We employ ordinary least square method to estimate two predictions:

both the effect of the business environment and tax evasion on informality, and vice versa, both the effect of the busines environment and informality on tax evasion. These empirical results are consistent with our simple general equilibrium model. Former result indicates that: While an access to land and financial sources, insufficient provision of complementary public capital (outage) and infrastructure such as electricity, telecommunication and transport are associated with informal economy in Azerbaijan, the tax administration and labor regulation is the most problematic causes for informal economy in Armenia. In addition, firm sizes and industrial sectors are much less concentrated to informal economy in all three countries. On the other hand, latter result indicates that the tax administration and corruption is very influential factors leading to much more tax evasion purposed attempts. Again, the latter result discovers that there is not any significant difference due to the firm size and industrial distinctions among entrepreneurship objects. Finally, we find some very preliminary evidence that the quality of business environment and the tax evasion plays a crucial role in determining the size of the informal sector and vice versa the informality and the quality of business environment plays an important role in the spreading of tax evasion process as well. Firstly, with Azerbaijan as the basis group condition, the research reveals that Armenia is the most informal country compared to Azerbaijan while Georgia is the least informal. However, informality differences between Georgia and Azerbaijan is not significantly strong. Secondly, again Azerbaijan is the basis group, tax evasion attempts in Georgia and Armenia is lower in comparison with Azerbaian. However, the difference is statistically and economically significant for Georgia-Azerbaijan comparison, but for Armenia-Azerbaijan comparison, the difference is small and statistically insignificant.

For policy recommendation our results have some implications and it suggests for South Caucasian countries to take determinative steps to deal with informal sector and tax evasion. First, governments in South Caucasian countries should provide sufficient public capital such as telecommunication, transport and electricity infrastructure for strengthening the legal environment. Second, diverse government intervention such as prevailing the corruption, tax administration and labor regulation in those countries will reduce tax evasion.

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8 ANNEX

Tab. 3: Variables and sources

Variable	Definition
(Informality.) It is common for firms in my line of business to have to pay some irregular "additional payments or gifts" to get things done with regard to customs, taxes, licenses, regulations, services etc.	(0) never, (1) seldom, (2) sometimes, (3) frequently, (4) very frequently, (5) always
(Tax evasion.) To deal with taxes and tax collection	(0) never, (1) seldom, (2) sometimes, (3) frequently, (4) very frequently, (5) always
(Outage.) Over fiscal year, did this establishment experience power outages?	Yes = 1, No = 0
Firm size dummies	A firm is defined as micro size less than 5 employee, small if it has between 5 and 19 employees, medium size if it has between 20 and 99 employees and large if it has more than 100 employees.
Industry level dummies	manufacturing, retail, core
General constraint – infrastructure (electricity/ telecommunication/transport)	To what degree is electricity/telecommunication/transport an obstacle to the current operations of this establishment: (0) no obstacle, (1) a minor obstacle, (2) a moderate obstacle, (3) a major obstacle, (4) very severe obstacle
General constraint – customs and trade regulation	To what degree is customs and trade regulation an obstacle to the current operations of this establishment: (0) no obstacle, (1) a minor obstacle, (2) a moderate obstacle, (3) a major obstacle, (4) very severe obstacle
General constraint – practices of competitors in the informal sector	To what degree is practices of competitors in the informal sector an obstacle to the current operations of this establishment: (0) no obstacle, (1) a minor obstacle, (2) a moderate obstacle, (3) a major obstacle, (4) very severe obstacle

(to be continued on the next page)

Variable	Definition
General constraint – access to land and finance	To what degree is access to land and finance in the informal sector an obstacle to the current operations of this establishment: (0) no obstacle, (1) a minor obstacle, (2) a moderate obstacle, (3) a major obstacle, (4) very severe obstacle
General constraint – crime, theft and disoder	To what degree is crime, theft and disorder an obstacle to the current operations of this establishment: (0) no obstacle, (1) a minor obstacle, (2) a moderate obstacle, (3) a major obstacle, (4) very severe obstacle
General constraint – tax rate	To what degree is tax rate an obstacle to the current operations of this establishment: (0) no obstacle, (1) a minor obstacle, (2) a moderate obstacle, (3) a major obstacle, (4) very severe obstacle
General constraint – tax administration	To what degree is tax administration an obstacle to the current operations of this establishment: (0) no obstacle, (1) a minor obstacle, (2) a moderate obstacle, (3) a major obstacle, (4) very severe obstacle
General constraint – license	To what degree is business licensing and permits an obstacle to the current operations of this establishment: (0) no obstacle, (1) a minor obstacle, (2) a moderate obstacle, (3) a major obstacle, (4) very severe obstacle
General constraint – political instability	To what degree is political instability an obstacle to the current operations of this establishment: (0) no obstacle, (1) a minor obstacle, (2) a moderate obstacle, (3) a major obstacle, (4) very severe obstacle
General constraint – corruption	To what degree is corruption an obstacle to the current operations of this establishment: (0) no obstacle, (1) a minor obstacle, (2) a moderate obstacle, (3) a major obstacle, (4) very severe obstacle
General constraint – courts	To what degree is courts an obstacle to the current operations of this establishment: (0) no obstacle, (1) a minor obstacle, (2) a moderate obstacle, (3) a major obstacle, (4) very severe obstacle
General constraint – labor regulations	To what degree is labor regulations an obstacle to the current operations of this establishment: (0) no obstacle, (1) a minor obstacle, (2) a moderate obstacle, (3) a major obstacle, (4) very severe obstacle
General constraint – workforce	To what degree is an inadequately educated workforce an obstacle to the current operations of this establishment: (0) no obstacle, (1) a minor obstacle, (2) a moderate obstacle, (3) a major obstacle, (4) very severe obstacle

Tab. 5: Summary statistics of variables to be used in estimation

Variable names	*N*	Mean	Standard deviation	Min	Max
(Informality.) It is common for firms in my line of business to have to pay some irregular "additional payments or gifts" to get things done with regard to customs, taxes, licenses, regulations, services etc.	1031	0.644035	0.927655	0.000	5.000
(Tax evasion.) To deal with taxes and tax collection	968	0.665289	0.964496	0.000	5.000
(Outage.) Over fiscal year, did this establishment experience power outages?	1029	0.257532	0.437487	0.000	1.000
Firm size dummies					
Small	1031	0.563531	0.496188	0.000	1.000
Medium	1031	0.357905	0.479617	0.000	1.000
Large	1031	0.078565	0.269188	0.000	1.000
Industry level dummies					
Retail	1031	0.329777	0.470360	0.000	1.000
Core	1031	0.355965	0.479037	0.000	1.000
Manufacturing	1031	0.315228	0.464832	0.000	1.000
General constraint – infrastructure (electricity/telecommunication/transport)	1027	1.398247	2.213312	0.000	12.000
General constraint – customs and trade regulation	1025	0.495610	1.066276	0.000	4.000

(to be continued on the next page)

Variable names	*N*	Mean	Standard deviation	Min	Max
General constraint – practices of competitors in the informal sector	1012	0.753953	1.164822	0.000	4.000
General constraint – access to land and finance	1019	1.754661	1.741853	0.000	8.000
General constraint – crime, theft and disoder	1031	0.178468	0.682060	0.000	4.000
General constraint – tax rate	1029	1.310982	1.318267	0.000	4.000
General constraint – tax administration	1030	0.766990	1.204977	0.000	4.000
General constraint – license	1023	0.218964	0.675944	0.000	4.000
General constraint – political instability	1026	0.994152	1.384219	0.000	4.000
General constraint – corruption	1027	0.456670	0.996496	0.000	4.000
General constraint – courts	1030	3.386408	1.980029	0.000	6.000
General constraint – labor regulations	1028	0.149805	0.559010	0.000	4.000
General constraint – workforce	1030	0.341748	0.872707	0.000	4.000

Source: Author's calculations based on the 2013 World Bank Enterprise Surveys for Armenia, Azerbaijan and Georgia.

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SELECTED PERSONALITY CHARACTERISTICS AS PREDICTORS OF EMOTIONAL CONSUMER BEHAVIOUR

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ABSTRACT

Many consumers believe that choices they make result from rational analysis of available alternatives. In reality, however, emotions greatly influence and determine our behaviour and decision-making also on the market of products and services. The main aim of this paper is to show the relationship between selected personality traits and emotional consumer behaviour. We used two psychological tests (Eysenck personality questionnaire and author's scale of emotionality) and tested several factors that might have influenced emotional consumer reactions. We found out that two of three tested personality predictors are significant – extroversion and neuroticism. The higher the score that respondents reach in the scales of extroversion and neuroticism was, the more emotional was their behaviour and decision making. In that connection, there are also differences between individual temperaments. Cholerics and melancholics react more emotionally than other two temperaments.

KEY WORDS

personality of consumer, personality characteristics, personality traits, consumer behaviour, emotional consumer behaviour, emotions, temperament

JEL CODES

M31, M37

1 INTRODUCTION

Consumer behaviour and decision-making is one of the main objects of marketing research. For a long time it was assumed that consumers behave, decide and act rationally. Today, we know that it is not completely truth. Consumers are individual human beings with specific needs, driven by emotions. Emotions greatly influence and also determine consumer behaviour. That is why psychology and neuroscience are nowadays an inseparable part of marketing and

economics. If we want to predict consumer behaviour and understand why consumers behave emotionally, we have to consider also the personality of consumer and the uniqueness of human mental and emotional processes.

Defining the concept of personality is not a simple task. There are so many different approaches that try to explain the concept of personality the most accurate. Proponents of Engel's biopsychosocial model define the personality as a complex of cognitive processes and affective states (Skorodenský, 2012). Raymond B. Cattell believed that personality can determine human behaviour in a given situation. Hans J. Eysenck understands the personality as more or less stable and lasting organisation of character, temperament, intellect and body, which determines its unique adaptation to the environment (Kubáni, 2010).

The personality characteristics represent a complex of very important variables which determine who a person really is, how he behaves, thinks, reacts, makes decisions and how he acts in all areas of his life. The personality factors do not affect only the final consumer behaviour and buying decisions, but they affect all other groups of factors. On the personality of consumer depends how he perceives his culture, family, world around him, and of course, how he perceives the marketing stimuli and motives and how he responds to them. Human personality has typical patterns of thinking, feeling and behaving that define an individual way of interacting with the physical and social environment (Atkinson, 2003). The personality has its own structure that is a composition of individual psychological characteristics.

Hans Eysenck's theory of personality is based primarily on physiology and genetics. Although he was a behaviorist who considered learned habits of great importance, he believed that personality differences grow out of our genetic inheritance. He is, therefore, primarily interested in what is usually called temperament.

Temperament represents the dimensions of an individual's personality that are largely present at birth, exist in most historical ages and most societies, and are stable as the individual develops. Temperament is an individual variation that is biological or constitutional, remains with the individual, and is linked to differences in behavioral or expressive style (Bauer and Shea, 1998).

Temperament represents the characteristics of mental dynamics that are applied in the human behaviour and experiencing. The oldest structure of temperament is known since Hippocrates, who named four types of temperament (sanguine type, choleric type, phlegmatic type and melancholic type) according to the amount of four body fluids that are circulating in human bodies (blood, phlegm, gall and black gall). The ratio of these fluids affects human responses to the external stimuli. Carl G. Jung divided persons according to their temperament into two types depending on what is their attitude to the environment in which they are located. A person who is closer to the outside world is an extrovert and a person who has well developed inner world is an introvert. Hans J. Eysenck built his personality model on the above mentioned theories. He has supplemented the Jung's model with another two characteristics – emotional stability and emotional lability. Emotional stability refers to the stable mental balance of a person, lability, on the contrary, is characterized by the irritability, or agitation (Slamka, 2008). Temperamental traits are moderately stable across an individual's lifetime, thought their expression might be mitigated by environmental and developmental variables (Genova-Latham, 2010). Humans are, however, in some measure able to learn how to control expressions of the temperament. According to Eysenck's typology, the two dimensions or axes, extroversion-introversion and neuroticism (emotional stability-lability) define four quadrants. These are made up of: stable extroverts, unstable extroverts, stable introverts and unstable introverts. Stable extrovert is a sanguine, stable introvert is a phlegmatic, unstable extrovert is a choleric and unstable introvert is a melancholic (Fig. 1).

For marketers and consumer psychologists it is very important to know individual types of temperament, because each temperament is convenient with different approach.

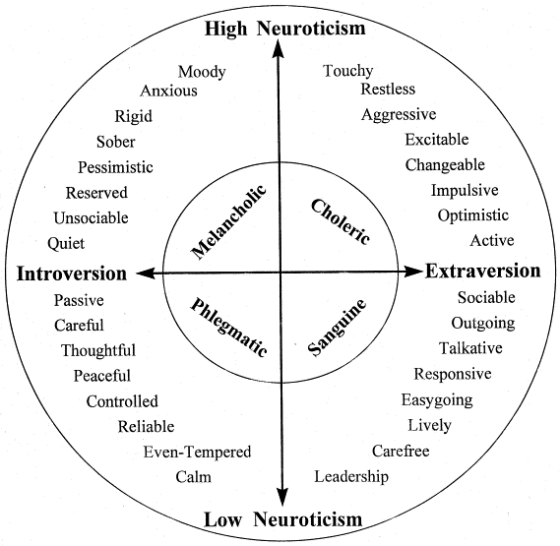

Fig. 1: Eysenck's model of personality

2 EMOTIONAL CONSUMER BEHAVIOUR

The impact of emotions on judgements, evaluations and decisions has long been important for marketing and consumer psychology. The field's focus has progressed from demonstrations that emotions, like cognitions, have an impact on consumer behaviour, to more nuanced understandings of what drives the experience of discrete emotional states, how those discrete emotions uniquely affect decision making and the motivations that consumers might have to regulate their emotional states over time (Williams, 2013).

An emotions represents an important psychological phenomenon. Emotions are the result of not only phylogenetic but also of ontological evolution of individuals and are dealt with a variety of disciplines, such as psychology, sociology, neurophysiology, as well as economics and marketing (Vysekalová et al., 2014). An understanding of consumer behaviour have to be based on the knowledge of human emotions and include the paramount influence that emotions have on consumer decision-making.

An emotion is defined as a state of psychological arousal with cognitive aspects that is a consequence of specific context (Plutchik, 1997). Nakonečný (2012) characterizes emotions according to their experiencing, as a mental state which is sometimes accompanied or followed by bodily changes, expressional demonstrations and specific behaviour. Emotions are subjective, the same stimulus can evoke different reactions in different individuals (Vysekalová et al., 2014).

We distinguish simple and complex emotions. Simple emotions are the same for all people, without regard to gender, age, race, culture, etc. We call them universal emotions. Ekman (2007) places among them six basic emotions – joy, anger, sadness, fear, surprise and disgust. Complex emotions represent different combinations of primary emotions (Histeroza and James, 2014). Most of emotions that influence consumer behaviour and decision-making are complex emotions. Nakonečný (2012) states that emotions integrate and organise the mental processes and they motivate human behaviour.

Emotions help to decide which information is relevant and which is not. Therefore, they also participate on decisions whether the information is remembered and under what circumstances it will be call out by an individual (Vysekalová et al., 2014). Most people believe that the choices they make result from a

rational analysis of available alternatives. In reality, however, emotions greatly influence and, in many cases, even determine our decisions. Emotion is a necessary ingredient to every decision. When we are confronted with a decision, emotions from previous, related experiences affix values to the options we are considering. These emotions create preferences which lead to our decision (Murray, 2013).

The influential role of emotion in consumer behaviour is well documented: fMRI neuroimagery shows that when evaluating brands, consumers primarily use emotions (personal feelings and experiences) rather than factual information. Advertising research reveals that emotional response to a commercial has far greater influence on a consumer's reported intent to buy a product than does the ad's content. Studies also show that positive emotions toward a brand have far greater influence on consumer loyalty than trust and other judgments which are based on a brand's attributes (Murray, 2013).

Emotions are the primary reason why consumers prefer some products. These products can create an emotional connection to the consumer. A brand is nothing more than a mental representation of a product in the consumer's mind. If the representation consists only of the product's attributes, features, and other information, there are no emotional links to influence consumer preference and action. The richer is the emotional content of a brand's mental representation, the more likely the consumer will be a loyal user (Lindstrom, 2011).

Emotions result from sensory information. In the past 20 years, much research about human emotions were realised. Many researchers have explored sensory processes because they are convinced that sensory stimuli evoke different emotions and cause that consumers decide more emotionally (Bagozzi and Gopinath, 1999; Barsalou, 2008; Krishna and Raghubir, 1999; Krishna, 2006, 2012; Krishna and Schwarz, 2014; Lindstrom, 2011 and others). Mentioned studies indicate that the more sensory stimuli affect consumer, the more emotional is consumer's reaction on some product or brand. Emotions are, however, different in different people. Even though they are triggered by environmental (sensory) stimuli, the question remains how are emotions related to inherited characteristics of human personality. The term "emotionality" encompasses several variables, including predominance of an emotion in one's overall affect (mood), ability to regulate emotional responses (emotional self-regulation), and emotional responses themselves as elicited by specific situations (reactivity), see Genova-Latham (2010).

3 METHODOLOGY AND DATA

The main aim of this paper is to show the relationship between selected personality traits and emotional consumer behaviour on the market of products and services. We used two psychological tests (Eysenck personality questionnaire and author's scale of emotionality) and tested several factors that might have influenced emotional consumer reactions.

For the needs of the research Eysenck personality questionnaire revised – short form (EPQR-S) was used to assess the personality traits of a person, with the result sometimes referred to as the Eysenck's personality Inventory. It is a self-reported questionnaire that measures three dimensions of personality – extroversion, neuroticism and psychoticism. The questionnaire consists of 48 items, 12 for each dimension (extroversion, neuroticism and psychoticism), and 12 for the lie scale. Each one of questions has a binary response (yes or no). Each dichotomous item is scored 1 or 0, and each scale has maximum possible score of 12 and minimum of 0.

The author's scale of emotionality is focused on the evaluation of emotional consumers' reactions and it also detects attitudes of consumers to emotional behaviour. It contains 11 items in which respondents express the degree of their acceptance of particular statements on the classic Likert-type scale, where 1 means

"strongly disagree" and 5 means "strongly agree". The scale is a result of a factor analysis and its validity was verified on the sample of 70 probands (35 males and 35 females aged from 20 to 60 years). Every respondent gains a raw score from this scale (11–55 points). The higher is the gained score, the more emotional is the consumer. The reliability of the questionnaire was also verified on the pre-test sample. Cronbach's alpha coefficient is 0.65.

The sample consists of 182 respondents – 76 males and 106 females. All respondents are aged from 20 to 62 years. We selected this age group because we wanted to compare younger and older adults. All respondents are from Slovak republic, have Slovak nationality, live in Slovak republic and have minimally secondary education. 72 respondents have secondary education, 110 respondents have university education. 71 respondents live in the countryside, 111 respondents live in towns. Another characteristics of respondents are not important for our research.

With the use of Eysenck personality questionnaire we found out following personality traits of our respondents (Tab. 1–4).

The psychoticism dimension do not indicate any psychopathology, it just signals specific behavioral demonstrations such as higher aggression, egocentrism, inclinations to manipulating others, etc. The neuroticism very often assume borderline values, so the categorization of temperaments is approximate but sufficient for our study.

Several statistical methods were used in this study. For testing differences between individual groups of respondents, the one-way ANOVA and independent samples t-test (Student t-test) were used. For determining the relationship between emotional consumer behaviour and selected personality characteristics, we used multiple hierarchical linear regression, the stepwise method.

Tab. 1: Temperament of respondents

Temperament	**Frequency**	**%**
Sanguine	79	43.4
Choleric	59	32.4
Phlegmatic	17	9.4
Melancholic	27	14.8
Total	**182**	**100.0**

Tab. 2: Extroversion/Introversion

E/I	**Frequency**	**%**
Extrovert	138	75.8
Introvert	44	24.2
Total	**182**	**100.0**

Tab. 3: Emotional stability/Emotional lability

Neuroticism	**Frequency**	**%**
High (lability)	114	62.6
Low (stability)	68	37.4
Total	**182**	**100.0**

Tab. 4: Psychoticism

Psychoticism	**Frequency**	**%**
High	0	0.0
Low	182	100.0
Total	**182**	**100.0**

4 RESULTS

To find out if there is a difference in emotional behaviour between four groups of respondents based on their temperament (sanguine, choleric, phlegmatic, melancholic) we used one-way ANOVA (Tab. 5). Emotional reactions were discovered with the author's scale of emotionality. Every respondent gained a score in the interval of 11–55 points. The higher is the gained score, the more emotional is the consumer (the more emotional are his self-reported reactions).

There was a statistically significant difference between groups as determined by one-way ANOVA: $F(3, 178) = 31.516$, $p = 0.000$. We found out that there is a statistically significant difference in emotional behaviour among individual temperaments. A Scheffe post-hoc

Tab. 5: The result of ANOVA for emotionality as a dependent variable and temperament as a factor

Emotionality	**Sum of squares**	**df**	F	p
Between Groups	1,737.411	3	31.516	0.000
Within Groups	3,270.896	178		
Total	**5,008.308**	**181**		

Tab. 6: The difference in emotionality between males and females

	N	**Mean**	**Standard deviation**	t	**df**	p
Males	76	33.8	3.86	−7.292	180	0.000
Females	106	38.6	5.36	−7.292	180	0.000
Total	**182**					

test revealed that melancholics and cholerics are more emotional than sanguines and all other temperament types are more emotional than phlegmatics. These results correspond with characteristics of individual temperaments.

To find out if there is a difference in emotionality between males and females, between older and younger adults and between respondents according to their residence, the independent samples t-tests were used (Tab. 6). The tested factors were chosen on the basis of previous psychological research.

We found out a statistically significant difference in emotionality between men and women. It can be assumed that females react more emotionally because of the evolution. Schmitt, Realo et al. (2008) claim that due to different evolutionary pressures, men may have evolved to be more risk taking and socially dominant, whereas women evolved to be more cautious and nurturant. Much research shows that women are more emotional and that their emotions work a little bit different than those in men. A cross-cultural research has shown gender differences on the domains and facets of the Big Five personality traits. For example, women consistently report higher neuroticism and openness to feelings, and men often report higher assertiveness (Costa et al., 2001). Women are more emotional in every sphere of life, so we can assume that female customers are more emotional, as well.

We also tested differences in emotionality according to respondents' age. Some psychological studies show differences in emotions of younger and older adults. Older adults use more passive emotion-regulation strategies because of their motivation and experiences (Blanchard-Fields et al., 2004). We supposed older adults could have also more experiences on the market, so that they could be more rational. We found out that there is not a statistically significant difference between age groups of respondents. It can be assumed that age and experiences with purchasing goods on the market has no influence on consumers' emotional reactions mainly because there are always some new and exciting tools of marketing communication that can catch consumers' attention and emotions.

There is also no difference in emotional reactions between respondents according to their residence. Some psychological studies shows that introverts are more content in the countryside, while extroverts are more content in bigger cities which can lead to changes in the demographic structure. Our study did not prove that there are more extroverts in bigger towns and more introverts in the countryside, so there are also no differences in emotionality (joined with the temperament) among respondents.

For determining the relationship between emotional consumer behaviour and selected personality characteristics, we used multiple hierarchical linear regression (Tab. 7).

The multiple hierarchical linear regression, stepwise method, shows that two of three tested predictors of emotional behaviour are significant – extroversion and neuroticism. Neuroticism explains 17.6% of variance and extroversion 24.9% of variance of emotionality. The more respondents are emotionally unstable ($b = 0.827$) and the more they are extroverted

Tab. 7: Regression models for neuroticism, extroversion and psychoticism as predictors and emotionality as dependent variable (criterion)

Predictor	R	R^2**-change**	b	T	p
Neuroticism	0.419	0.176**	0.827	7.590	0.000
Extroversion	0.499	0.249**	0.419	4.170	0.000
Psychoticism			−0.138	−0.444	0.658
(Constant)			28.168		

Emotionality: $F_{\text{total}}(2, 179) = 29.656$; $p < 0.000$

($b = 0.419$), the more emotional is their behaviour on the market of products and services. Psychoticism is a dimension of personality that do not indicate any psychopathology, so we can assume that specific behavioral demonstrations can be present in every temperament type.

These findings also correspond with the characteristics of individual temperaments and with our results of ANOVA. A Scheffe post-hoc test revealed that melancholics and cholerics are more emotional than other temperament types. These two temperament types, of which one is extroverted and one is introverted, are emotionally unstable and emotional in many life spheres and situations. It follows from their basic characteristics. Cholerics are more impulsive than other temperaments and melancholics are more sensitive. We also found out that all temperament types are more emotional than phlegmatics, so we consider our results of regression analysis as reliable.

5 DISCUSSION AND CONCLUSIONS

We found out that two of three tested personality predictors are significant – extroversion and neuroticism. The higher the score that respondents reach in the scales of extroversion and neuroticism was, the more emotional was their behaviour and decision making. In that connection, there are also differences between individual temperaments. Cholerics and melancholics react more emotionally than other two temperaments. Phlegmatics react and behave the least emotionally. Another probed factors do not have influence on emotional consumer behaviour.

We confirmed the results of our previous research, when we found out, on the sample of 100 respondents, that personality traits and temperament are related with emotional behaviour. Emotions help to decide which information is relevant and which is not. Despite some terminological dispute, emotional behaviour can be considered in many cases also as irrational. The strongest are the emotions, the less rational is consumer behaviour (Rybanská et al., 2015).

This paper follows some previous studies that reached similar results. Fossum and Barrett (2000) researched the relationship between personality and emotions. Personality characteristics and emotional experiences contain both descriptive and evaluative aspects. These authors found out that there is a relationship between neuroticism and negative affect and also a relationship between extroversion and positive affect. Matzler, Faullant et al. (2005) examined the relationship between personality traits, emotions and consumer self-satisfaction. The demonstrated relationships among personality, consumption-based emotions and satisfaction offer insight into fundamental and stable differences in how consumers process consumption experiences. They not only confirm previous findings that emotions play a crucial role in satisfaction, but also reveal their dependence on customers' individual predisposition. This study evidences that a direct relationship between personality and self-satisfaction does exist, over the mediating system of emotions. Mogilner et al. (2013) researched the relation-

ship between particular emotion (happiness) and consumer behaviour. They found out that emotions, such as happiness, can have a powerful influence on choice.

All above mentioned papers suggest that there is a strong bond between personality of consumer, emotions and particular behaviour on the market. Our research suggests that every consumer have some specific emotional reactions depended on his personality traits, or temperament. That is why it is very important for marketers to know more about human personality. If we can understand how human emotions based on personality works, we can get closer to our customers. Furthermore research should be addressed to investigate whether people, based on personality traits, also share common value patterns which would allow a segmentation approach on personality traits.

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MULTIPLE DIRECTORSHIPS AND RELATED PARTIES TRANSACTIONS: THE WEAKNESS OF NUMBERS

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ABSTRACT

We examine whether the presence of outside directors with multiple boards seats influence firms related-parties transactions. These non-executive directors with vast skill, experience, knowledge, prestige and shared networks are part of major Boards Committees responsible for key corporate policies, strategy and management. Subsequently, it remains an untested assumption whether the outcome of related parties' transactions are influenced by the presence of this class of 'busy directors'. We obtain data from 142 companies across five sectors between 2009 and 2014 and conduct analysis using a two-stage multiple regression. The results reveal that the existence of multiple directorships on boards failed to evolve as predictors for related parties' transactions. We thus conclude that the presence of these 'busy directors' on boards does not alter a firm's related parties' transactions significantly. Overall, this may suggest that the influence of executive directors and other outside directors and key management personnel do play an important role in explaining organizationally complex strategic decisions in this regard.

KEY WORDS

multiple boards seats, board committees, related parties' transactions

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1 INTRODUCTION

Prior literature on corporate boards highlights a number of the most important features of boards of directors, such as board composition and board size. A substantial body of evidence detailing the potential advisory benefits associated with experienced directors who serve on multiple boards. There is also extensive research on the limit of multiple directorships allowable by publicly traded firms (see, for example, Holmstrom and Milgrom,

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1991; Fich and Shivdasani, 2007). Thus far, however, corporate governance research has not explored why and how the presence of multiple directorships on boards, which has attracted a great deal of attention, affects industry-specific strategies. In this study, we focus on this interesting class of directors whose unique characteristics can either enhance or weaken strategic boards' decision making. Specifically, we examine multiple directorships (MuDs) in Nigerian corporations. We present an empirical evidence on the relationship between MuDs and related parties transactions (RpTs). The literature on multiple directorship in corporate governance has dramatically strengthened in recent years due to a number of propositions. First, the "Reputation Hypothesis" (Fama and Jensen, 1983) which signal director reputation suggests that directors with more outside board seats contribute a valuable set of resources and bring experience to the firm, thus, have greater influence on corporate decision. These outside directors comprise affiliated and grey directors constituting about 10 percent of board membership (Hermalin and Weisbach, 2003). They often have potential or existing business ties with the firms, either as former manager, solicitors, business consultants, commercial or investment bankers and insurance executives. By virtue of being more networked, they can influence the direction of related parties transactions to third party companies (in which they also hold seats) because their holding of multiple board seats is necessitated by being good as directors (Jiraporn et al., 2008). If this is the case, an increase in their proportion may have implications for the structure of corporate third parties related transactions portfolio. As such we predict that multiple directorships on corporate boards could evolve as a good predictor for third parties related transactions. The "Busyness Hypothesis", however, holds that directors with too many outside board appointments have limited attention, capacities, and time constraints and are less likely to monitor managers effectively (Ferris et al., 2003). In Nigeria, more of these directors are less likely to engage in key operational decision. As such, we contend that their presence is unlikely to have significant impact on related-parties transactions, frequently classified in annual reports as "related parties".

There are mixed empirical evidence on the theoretical opinion of the "busyness hypothesis". These literature suggests different directions of causality in the relation between multiple directorships and firm performance. One line of literature argues that multiple directorships can increase the chances of corporate fraud (Beasley, 1996), lead to excessive CEOs remuneration (Core et al., 1999), and ultimately affect firm's performance adversely (Fich and Shivdasani, 2006). A variant of this argument is that multiple directorships commit to more transparent maximization of shareholders wealth through the offering of large premiums in tender offers (Cotter et al., 1997) and superior returns from acquisitions (Brown and Maloney, 1999). These suggestions however remain inconclusive as others find no relations between multiple directorships and firm performance (see, for example, Kiel and Nicholson, 2006). Arguably, one of the most important roles of the board is the decision to retain or replace top managers, which may be influenced by the desire to secure existing business ties. Accordingly, directors with multiple outside boards' appointments might favor internal management successors through whom they can sustain current business arrangements, even when such candidates are less qualified replacements (Borokhovich et al., 2014). To this end, we analyze how and to what extent multiple boards' directorships and multiple committee memberships on boards influence related parties transactions.

The current study offers a thorough examination of the nature of multiple directorships influence in the light of multiplicity of codes of corporate governance in Nigeria. Specifically, we emphasize that the role of outside directors is to evaluate rather than facilitate related parties transactions. To the knowledge of the authors, it is the foremost empirical study documenting the incentives of multiple directorships alongside related parties transactions across quoted companies in Nigeria. A better understanding of the motives of these connected

board membership is important because the section on "related parties transactions" is increasingly becoming a part of annual report and accounts, given the recent direction and attention of codes of corporate governance in general, and in the light of the call for increased disclosure by listed entities in particular. Second, we provide evidence to suggest that board members with multiple director appointments should be classified separately from other outside directors in the annual reports. This is particularly essential, given the continous emphasis on directors' independence.

The remainder of the current study proceeds as follows. Section 2 discusses multiple directors incentives and related literature. Section 3 describes empirical method and data. Section 4 presents the results while the fifth section concludes the study.

2 RELATED LITERATURE AND HYPOTHESIS

The concept of multiple directorships in corporate governance is far from a new issue. There is a well established stream of research devoted to the analysis of multiple directorships. It has long been a matter of interest to stakeholders in academics and practice. Proof of this is the intense literature developed in this area and we refer below.

2.1 Prior evidence on multiple directorships

Multiple directorships is a crucial issue in corporate governance. We connect two separate literature that examines the relations between multiple directorships and firm performance and the relations with influence on corporate strategy. Early contributions point to a picture with value-enhancing capabilitties of multiple directorships. Outside directors on multiple boards established through networks and business relations (Mace, 1986) have exposure to learning different management styles and strategies that influence their decision making skills (Booth and Deli, 1996). Serving on multiple boards also signal director competence (Kaplan and Reischus, 1990) and quality (Brickley et al., 1994). Interestingly and contrary to a good number of findings, directors who serve on multiple boards also present firms with lower probability of receiving qualified audit opinion and are better negotiators for CEOs and external auditors remuneration (Méndez et al., 2015).

In contrast to the above findings some studies however notes the negative effect of overcommitment when holding multiple board seats (Core et al., 1999; Fich and Shivdasani, 2006; Falato et al., 2014). For example, Fich and Shivdasani (2006) report that representation on multiple boards result in weak governance, lowers profitability, reduces market-to-book ratios and lower sensitivity of CEO turnover to firm performance. Contrary to Sarkar and Sarkar (2009), such directors are often absent from board meetings (Jiraporn et al., 2009). In addition, their "busyness" encourages them to recommend excessive CEO remuneration as monitoring decreases, serving as an incentive for earnings management in addition to increased agency costs (Faleye et al., 2011). The main finding of Falato et al. (2014) is that multiple board seats weaken their monitoring quality and erodes shareholder value. In the seminal paper, the authors report that the adverse effect of attention shocks on firm value persists over time leading to reduced board monitoring, i.e., higher CEO rent extraction and reduced earnings quality. In a related empirical analysis presented by Ahn et al. (2010), the authors note that firms with busy directors allow value-destroying acquisitions, although this adverse effect does not, nonetheless extend across the entire range of multiple directorships examined.

2.2 Corporate governance regulation in Nigeria

In addition to individual industry guidelines, listed firms regulation in Nigeria are, of course primarily imposed by the Securities and Exchange Commission (SEC) and the Nigerian Stock Exchange (NSE). In response to the global corporate governance crisis in the early 2000s, many stock exchanges and securities regulators around the world issued coporate governance codes. Nigeria was no exception. The "Code of Corporate Governance for Listed Companies" was issues in 2003, by SEC. The codes share similarity with most others around the world, serving as mere guiding principles, rather than explicit regulations. Further, subsequent reforms into corporate governance in Nigeria saw the emergence of other codes, often times conflicting and encouraging non-compliance (Adegbite, 2014). For instance, the Nigerian Insurance Commission (NICOM) Codes of Corporate Governance for Insurance Companies, 2006 mandatory codes of Corporate Governance for Nigerian Banks post consolidation (Central Bank of Nigeria, 2014); the 2007 Code of Conduct for Shareholders Association of Nigeria; the Codes of Corporate Governance for Pension Funds, and the National Code of Corporate Governance (in-progress).

2.3 Corporate governance and regulation of multiple directorships

The Nigerian Securities and Exchange Commission (SEC) code of corporate governance for public companie makes no specific disclosure on the limit of concurrent directorships a company may hold (Securities and Exchange Commission, 2008a). According to the revised guidelines (Securities and Exchange Commission, 2008b, p. 8):

"There shall be no limit on the number of concurrent directorships a director of a company may hold. However, concurrent service on too many boards may interfere with an individual's ability to discharge his responsibilities. The Board and the shareholders should therefore give careful consideration to other obligations and commitments of nominees in assessing their suitabilityfor appointment into the board."

In developed markets however, a large number of publicly listed firms have consistently limited the number of multiple directorships held by board members (Falato et al., 2014). These measures may be associated with reasons highlighted in earlier section. Banks are vital institutions in any society as they contribute significantly to economic development through facilitation of business (Moi, 2014). Given its role, prestige and greater visibility, bank directors are highly likely to obtain additional directorships than others. Consistent with this perspective, directors are less likely to resign from high performing firms with high prestige and greater rewards (Fahlenbrach et al., 2010), even when they already hold other outside board appointments.

There is a long history of economic liberalization strategy in Nigeria giving rise to four main groupings of corporate enterprising (Ahunwan, 2002). These corporations, including publicly listed entities are characterized by weak and unimpressive corporate governance. Adegbite (2014) summarizes the rationale behind the poor state, hinged on weak institutional and regulatory climate: weak board governance; weak executive monitoring and accountability; corporate (private) corruption; and public-private corruption. Although *"there are not that many highly experienced executives, such that you have to appoint the same people on different boards"* (Adegbite, 2014), the author argue that placing a limit on multiple directorships may hinder board performance. While this may sound plausible, the behaviour of directors with existing or potential business affiliations with the banks they govern becomes increasingly "interest-centered" as they hold other boards seat. Moreso, as those other firms may belong to other industries and essentially active bank clients who continously seek credit facilities for operational and strategic reasons.

2.4 Related parties transactions

International Accounting Standards (IAS) 24: Related Party Disclosures states that "a related party transaction is a transfer of resources, services or obligations between a reporting entity and a related party, regardless of whether a price is charged". This standard also describe a related party as any person(s) and/or entity(ies) that is related to the reporting entity. This definition include any such person(s) or group of persons who may be expected to influence, or be influenced by, that person in their dealings with the entity. The membership of the board of directors expressly and impliedly qualify as related parties within this context. In particular, the standard notes that:

"... if an entity has had related party transactions during the periods covered by the financial statements, it shall disclose the nature of the related party relationship as well as information about those transactions and outstanding balances, including commitments, necessary for users to understand the potential effect of the relationship on the financial statements. In particular, such entity shall disclose at a minimum, the amount of the transactions; the amount of outstanding balances, including commitments (their terms and conditions, including whether they are secured, and thenature of theconsideration to be provided in settlement; and details of any guarantess given or received); provisions for doubtful debts related to the amount of oytstanding balances; and the expense recognized during the period in respect of bad or doubtful debts due from related parties." (International Accounting Standards Board, 2012)

In Nigeria, disclosure on the consideration of related parties include the parent company, directors, their close family members and any employee who is able to exert a significant influence on the operating policies of the company. Hence, we expect directors with multiple boards seats to fall within this category.

2.5 Board committess, outside directors and related parties transactions

Traditionally in corporate governance literature, corporate Boards, the highest decision making body responsible for governance often hold primary responsibility for corporate strategy. They ensure that the company's activities are executed within the relevant regulatory framework. Through well-developed committees, the Board retains effective control, holding primary responsibility for strategic decision and deal more effectively with complex and specialized issues. The committees who are active members of the Boards provides in-depth focus on governance responsibilities by making recommendations, usually through quarterly meetings to the Boards. As such, their influence may constitute an important indicator of corporate performance. Prominent amongst the matters usually reserved for the Board of Directors include strategy and management; structure and capital; financial reporting and control; internal controls; contracts; and other corporate governance matters. Thus the role of directors characterized by multiple boards seats could be significant on entities related parties transactions given their knowledge, experience, expertise, networks and consequently their overall influence which emanates therefrom.

Our study builds upon prior corporate governance literature on the influence of outside directors, in particular, multiple directorships by empirically examining how this class of directors influence the level of related parties transactions. Based on the findings documented in the prior literature, we postulate that related parties transactions is associated with corporate characteristics of multiple directorships. In other words, we analyze what the precense of directors with multiple boards seats portends for companies related parties transactions:

H_1: Multiple directorships on boards have a negative association with related parties transactions.

3 METHODOLOGY

3.1 Sample selection and data

In order to test the hypothesis proposed, our sample selection starts with data from the Nigerian listed companies excluding service companies. Service companies were dropped, due to the differences in regulatory standards, financial reporting standards and compliance requirements (Manzaneque and Chamisa, 2008; Muller and Whiteman, 2008). The study period is between 2009 to 2014, a period which coincide with the revision of the code of corporate governance for listed companies, Second, we found more companies being experiencing more regulatory sanctions. We exclude completely, foreign and state-owned banks for two reasons. First, the motivation for third parties transaction in government banks is complex. Second, related parties transactions in foreign banks is likely to be motivated by other factors, regardless of the existence of multiple boards representation. In specific instances, we also exclude some companies based on the initial data obtained, when it was discovered that in some cases such companies do not make specific disclosure of the class of directors. Consequently, we draw from information made available through official information disclosed on individual websites and press releases. The final sample is made of 142 companies across five sectors (namely consumer goods, healthcare, industrial goods, oiland gas, and natural resources), representing 86 per cent of non service firms listed in the NSE daily summary (Hermalin and Weisbach, 2003).

3.2 Description of measures

3.2.1 Dependent variables

In line with extant studies (see, for example, Bikker and Metzemakers, 2005; Fonseca and Gonzalez, 2008; Kanagaretnam et al., 2009), we made use of factor-proportions. Accordingly, we introduce three elements as indepedndent variables: *related parties transactions* (RpTs), *the ratio of RpTs to assets* and *the ratio of RpTs to profits*. We note that RpTs include exposure to all categories, i.e., key management personnel having authority and responsibility for planning, directing and controlling the activities of the enties, directly oridirectly (whether executive or otherwise). We use the dummy variable RpTs to measure the existence of this class of transaction during each accounting period. If it does exist, RpTs is coded one, otherwise zero. The ratio of RpTs is defined as the amount the company reports as transactions in which these group ofpersons has direct or indirect interest in each financial year. While controlling for directors tenure (subject to re-election, exit and replacement), we use two ratios of director-related transactions measures, where the *ratio of RpTs to assets* equals the log-transformed (ratio of naira value of related parties transactions to total assets $\times$ 100 + 1) and *ratio of RpTs to profit* equals the log-transformed (ratio of naira value of related parties transactions to net profits + 1).

3.2.2 Independent variable

We use the ratio of directors with multiple board seats as the measure of MuDs. This is consistent with prior studies in the use of magnitudes (see, for example, Adams and Ferreira, 2009; Campbell and Mínguez-Vera, 2013).

3.2.3 Control variables

We include a number of control variables in the analysis. The *ratio of Director RpTs to net current assets* is measured to control for corporate exposure to directors. Director RpTs is specificed in the model as a control variable because it is found to have direct relationship with related parties transactions due to its size relative to other class of RpTs in individual sectors. We also include *relationship type* to control for director-class effects. If a director RpTs is not related to outside directors, the type is coded one, otherwise zero.

Tab. 1: Variable definitions

Type of variable	Name of variable	Description	Source
Explained	RpTs	If the company has RpTs during the accounting year, this variable is coded 1, otherwise 0.	Ahn et al., 2010
	Value of RpTs	The naira value of RpTs during the accounting year.	*
	Ratio of RpTs to assets	Logarithm of (ratio of naira value of RpTs to total assets × 100 + 1).	***
	Ratio of RpTs to profits	Logarithm of (ratio of naira value of RpTs to net profit + 1).	***
Main explanatory	Ratio of MuDs	The proportion of multiple directorships on Boards of directors.	Brickley et al., 1994
Endogeneity	Board experience	Dummy variable that equals 1 if the number of years as a director prior to the current firm is in the top quartile of the sample distribution of director industry tenure [available only for a sub-sample of hand-matched directors whose complete employment histories were disclosed on Boards profiles).	Falato et al., 2014
	Relationshop networking	Directors networking coded as 1 if director is an alumni of any Ivy League or International Business school, a member of any recognized professional body and/or top social club, and 0 otherwise.	Moi, 2014
Control	Director RpTs to NCA	Ratio of Director RpTs to net current Assets.	***
	Net profit	Profits excluding costs.	*
	Director related transactions	Naira value of director related transactions.	*
	Relationship type	Relationship type coded 1 if the credit is Executive director-related, and 0 otherwise.	*
	Total assets	Company assets including all debt and equity.	*

Notes: * = annual reports; ** = listed firms other sources disclosure; *** = authors computation from annual reports (Access Bank, 2012; FBN Holdings, 2014; Guaranty Trust Bank Nigeria, 2012).

3.3 Endogeneity correction

In the current study, we anticipate that MuDs on boards have a negative association with companies' RpTs. However, it is probable that regulatory requirements for board positions in terms of experience, knowledge, skill and expertise influence the pattern of MuDs. If a director has more Board experience, chances exists that he gets multiple appointments. Further more, if a director has a good relationship networking with executives in the industry or elsewhere, then he will have a chance of gaining multiple board seats. To control for potential endogeneity, we introduce outside directors cummulative experience and networking as instrumental variables. This is included to lend credence to the requirement of efficient instrumental variables. Tab. 1 presents definitions and sources of data.

Our analysis is conducted in two stages. First, we model the influence of instrumental variables on the ratio of MuDs. To test the hypothesis, we employ ordinary regressions. To model the probability that a board is expected to comprise of directors with multiple seats, the endogeneity correction variables are included and a binomial logistic regression is used. Further, Tobit regression models is used to analyze ratios of specific values. Given that a large number of the dependent variable of interest, RpTs is only observable under certain conditions, i.e. not all RpTs is traceable to outside directors, the censorship regression is appropriate.

4 EMPIRICAL ANALYSIS

The descriptive statistics for variables used in the empirical analysis are presented in Tab. 2. It can be noted from the descriptive statistics in Tab. 2 that variables from the firms included in the sample are very heterogenous. Tab. 3 reports the regression results indicating the effectiveness of the instrumental variables. It can be noted from the table that all of the *instrumental variables* are significantly related to the *ratio of MuDs*. As described earlier, we control for endogeneity using a two-stage regression. We create a variable to measure the *residual of the ratio of MuDs on the board*, and include this in the following regression models.

We performed a two-step regression model and the results for RpTs revealed in Tab. 4. The significant coefficients of the residual of the ratio of MuDs confirm the endogeneity problem for MuDs, hence the basis for the two-stage regression method. The second-stage regression includes model 1, 2 and 3. The control and independent variables are includedin the dependent variables *RpTs*, the *ratio of RpTs to assets* and the *ratio of RpTs to profits*. Thus, when model 1 predicts RpTs probability, the coefficient for the ratio of MuDs returns significant ($\beta = -8.217$, $p < 0.05$). Further, when models 2 and 3 predicts the *RpTs* ratio, the coefficients are both significant at the *ratio of RpTs* to assets ($\beta = -29.561$, $p < 0.10$) and the *ratio of RpTs to profits* ($\beta = -27.384$, $p < 0.10$) respectively for both model. These results support our Hypothesis.

5 DISCUSSION

We examine the implications of multiple directorships on related parties transactions across 142 companies in the real sector. We use a 1,216 firm year observations with specific disclosures on various related parties transactions with companies whose directors are also directors in the respective firms, in particular, at values and terms comparable to other related parties trsnasctions across all the sectors. Previous studies has not studied the relationship between these variables or considered the ways in which individual firm characteristics moderate the existence of outside directors with multiple board seats. Using a data sets covering the period 2009 to 2014, the current study provides convincing evidence that RpTs is negatively related to the ratio of MuDs. We can conclude that the existence of multiple directorships on boards do not influence corporate related parties transactions.

The study makes several contributions to the literature on corporate governance. First it extends the corporate governance literature that multiple boards directorships affect related parties transactions. We promote an increased understanding of the impact of director-class, director-related transactions, social networking, and experience on related parties transactions. Second, our study depicts an understanding of multiple directorships function as evaluators of the agency costs, which challenges the notion that the precense of outside directors with multiple board seats increases the adverse effect of attention shocks on firm value and persists over time leading to reduced board monitoring, i.e., higher CEO rent extraction and reduced earnings quality.

The results are also nuanced by our findings that the relation between multiple board seats holding and director related transactions is influenced by whether the firm: (i) has high director related transactions; (ii) has outside directors with fairly long cummulative directorship experience; and (iii) has gray directors on board with expanded cross-industry clouts network.

Tab. 2: Descriptive statistics

Variable	Mean	Std.	1	2	3	4	5	6	7	8	9	10	11
RpTs	0.47	0.62											
Ratio of RpTs to assets[a,b]	0.0091	0.0112	0.011										
Ratio of RpTs to profits[a,c]	0.0023	0.0031	0.003	0.0001									
Ratio of MuDs	0.12	0.11	−0.06	−0.04	−0.03								
Board experience	7.97	8.62	0.29	0.26	0.23	0.19							
Relationship networking	0.23	0.4	−0.06	−0.06	0.13	0.02	0.001						
RpTs to total assets	3.91	0.72	−0.23	−0.21	−0.2	−0.19	−0.16	−0.13					
Net profit	32.8	0.49	0.36	0.28	0.22	0.19	0.14	0.12	0.14				
Director related TpTs	0.97	0.86	0.64	0.57	0.49	0.32	−0.04	−0.07	−0.04	−0.33			
Relationship type	0.12	0.4	−0.07	−0.06	−0.06	0.21	−0.04	0.01	−0.31	−0.19	−0.32		
Total assets[a]	41.19	6.17	1.37	0.51	0.48	−0.15	−0.38	−0.41	−0.53	−0.03	−0.05	−0.12	
Earnings per share[a]	1.55	0.15	0.16	0.16	0.03	−0.06	−0.06	−0.06	0.19	0.16	0.17	0.14	0.12

Notes: $N = 9$; correlations ≥ 0.33 are significant at the $p < 0.05$.
[a]Logarithm; [b]$N = 7$ due to missing data; [c]$N = 6$ due to missing data.
Source: SPSS Output

Tab. 3: First-stage regression analysis for the ratio of MuDs on BODs

Variable	Coefficient (t-value)	Standard error
Ratio of multiple seats directors on boards	0.016***	0.01
Board experience	0.082***	0.02
Relationships networking	0.036***	0.01
Total assets[a]	−0.011*	0.01
Ratio of RpTs to total assets[a]	0.004	0.01
Net profit[a]	−0.023	0.02
Net current assets	−0.023	0.02
EPS[a]	0.041	0.05
Director RpTs	−0.020	0.02
Relationship type	0.000	0.00
Constant	0.571	0.47
R-squared	0.16	
N	9	

Notes: [a]Logarithm; * $p < 0.1$ for tw-tailed tests; *** $p < 0.01$ for two-tailed tests.
Source: SPSS Output

Our study also supports the presumed, but generally untested assumption that is common in corporate risk management literature that directors with multiple boards representation can and do influence related parties transactions.

Overall these results provide an empirical estimate of the extent of positive contributions that outside directors bear for corporate risk management. These results are useful for outside directors to assess their extent of exposure, given that academic researchers continually follow the trend of corporate strategies and departure from disclosure, transparency and accountability. While the proportion of multiple directorships is small compared with the overall population of directors, individual outside directors who occupy multiple seats can weigh their risks differently. Finally, our results serves as a policy directive on the influence played of multiple boards in corporate strategy.

Our research has some noteworthy implications for firm leaders and policmakers. The latter should be aware that outside directors on supervisory roles with multiple boards seats may not have a significant influence on a firm's related parties transactions. The incumbent management, other outside directors as well as other executive directors might therefore

Tab. 4: Second-stage regression results predicting the relationship between director-related RpTs and multiple directorships on BODs (standard errors in parentheses)

	Model 1	Model 2	Model 3
Independent variables	**RpTs**	**Ratio of RpTs to assets**	**Ratio of RpTs to profits**
Ratio of RpTs to Total assets[a]	−0.076	−0.802	−0.794
	(0.16)	(1.43)	(1.47)
Net profit[a]	2.671***	12.671***	12.592***
	(0.84)	(3.21)	(3.20)
Net current assets	0.102	0.629	−0.007
	(0.47)	(2.86)	(2.88)
EPS[a]	0.862	5.692	6.526
	(1.67)	(4.82)	(4.84)
Ratio of RpTs to NCA[a]	−0.756	7.621	7.619
	(1.44)	(3.82)	(3.71)
Director RpTs	2.367***	11.278***	12.653***
	(0.87)	(2.71)	(2.63)
Relationship type	−0.136***	−0.902***	−0.911***
	(0.03)	(0.21)	(0.21)
Residual ratio of MuDs	9.356***	38.815***	38.159***
	(2.361)	(22.671)	(22.504)
Board experience	0.067	0.821	0.822
	(0.55)	(3.18)	(3.19)
Relationships networking	−0.671***	−2.897***	−2.795***
	(0.03)	(0.22)	(0.23)
Ratio of MuDs	−8.217**	−29.561*	−27.384*
	(3.81)	(20.91)	(21.81)
Constant	−71.89***	−203.511***	−200.239***
	(11.78)	(62.97)	(60.52)
log Likelihood	−208.682	−672.981	−598.451
χ^2	109.715	112.782	114.023
N	9	7	6

Notes: [a]Logarithm; * $p < 0.1$ for two-tailed tests; ** $p < 0.05$ for two-tailed tests; *** $p < 0.01$ for two-tailed tests.

benefit from an intensified exchange of business transactions with their former employers and other firms with which they are networked. Policy makers should consider that corporate networks via board connections might provide an effective mechanism to allocate scare specific related parties transactions in favour of executive directors than do outside directors with multiple boards seats.

A justification for the regulation of simultaneous board memberships in the new Nigerian corporate governance framework might been seen in potential positive effects on public firms. At the sametime these outside directors seem to provde an efffective mechanism to transfer external knowledge to other supervisory board members.

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CAN UPPSALA MODEL EXPLAIN THE INTERNATIONALISATION OF CENTRAL EUROPEAN SMES?

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ABSTRACT

The aim of this paper is to scrutinize some aspects of the Uppsala model whose applicability for SMEs' internationalisation is often questioned. This model explains internationalisation as a sequential process based on learning in which an enterprise increases its international commitment in incremental steps (Johanson and Vahlne, 1977). The assumptions of Uppsala model are discussed in conditions of SMEs from different countries, namely the Czech Republic, Slovakia, Poland, Austria and Germany. The paper is based on primary data obtained by questionnaire survey performed in 2014. Respondents were small and medium-sized firms from the above mentioned countries. Following assumptions are scrutinized: SMEs start internationalisation by exporting to neighbouring markets, SMEs behave in internationalisation according to the establishment chain, SMEs' risk perception regarding foreign markets with different psychic distance changes with the obtained knowledge and SMEs' risk perception regarding particular foreign markets differs depending on the country which the enterprise comes from.

KEY WORDS

Uppsala model, risk perception, psychic distance, SMEs, internationalisation

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1 INTRODUCTION

Many different models of internationalisation have already been developed, however, they were more often focused on explaining the internationalisation process of big multinational enterprises and therefore their suitability to explain the internationalisation behaviour of resource-constrained SMEs is often questioned. The traditional and most often discussed model is the Uppsala model which belongs among the stage models of internationalisation. This

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model explains internationalisation as a sequential process based on learning in which an enterprise increases its international commitment in incremental and successive steps while shift between individual steps is driven by the knowledge obtained in the previous step (Johanson and Vahlne, 1977). Therefore the question arises whether it is possible to explain the internationalisation of Czech SMEs and SMEs from other Central European countries by this traditional internationalisation model which is considered as one of the most suitable models for explanation of internationalisation behaviour of smaller firms.

Thus, the aim of this paper is to scrutinize some aspects of one of the traditional stage models of internationalisation, namely the Uppsala model, whose applicability for the specific conditions of SMEs is often an often discussed topic in the international business literature. First, some assumptions were formulated based on the literature review and these are then discussed in conditions of SMEs from 5 different countries (the Czech Republic, Slovakia, Poland, Austria and Germany).

Recently, many studies (see for example Child and Hsieh, 2014; Laufs and Schwens, 2014; Fernández-Ortiz et al., 2015; Beleska-Spasova and Glaister, 2011) in the field of internationalisation dealt with SMEs while they discussed primarily SMEs' ability to engage in internationalisation process regarding their specific features. In comparison with large enterprises, SMEs are more flexible, thus their reaction to changes in their environment can be faster (Gunasekaran et al., 2011; Stanculescu et al., 2010). Nevertheless, they have limited information access, lack of financial or personnel resources and individualised leadership (Fernández-Ortiz et al., 2015), whereas also their organizational hierarchy is simpler and they tend to easily create networks with suitable enterprises (Paunovič and Prebežac, 2010; Svetličič et al., 2007). Therefore, these specific features can influence their internationalisation behaviour as well as the suitable model for its explanation.

For example D'Angelo et al. (2013) and Majocchi et al. (2005) explained that exporting to foreign countries is a frequently used mode of entry by SMEs because it is the quickest, simplest and least resource-demanding entry mode. However, it is also connected with a level of uncertainty and therefore it presents a risk-taking activity for which SMEs need some resources that are necessary to overcome the constraints to their international development. In this context, Cui et al. (2011) found out that although SMEs focus rather on countries that are similar (from the cultural, social and economic point of view) to their home country in order to minimise such risks, it is not automatically successful. Authors suppose that markets in such 'similar' countries may be saturated and pressure of competition may be quite intense for resource-limited SMEs. Still, the selection of a target country represents an important decision for SMEs (Cui et al., 2014).

2 THEORETICAL FRAMEWORK

The internationalisation theory of SMEs has its roots in 1970s when the first models emerged. In the beginning, stage models were considered appropriate to explain a firm's behaviour when crossing the borders of its home market, i.e. when internationalising. Stage models considered the overall internationalisation process of a firm as the gradual learning process in which the firms increases its international commitment in incremental and successive steps. The most cited stage models include Uppsala model, which has its roots in 1975 when Johanson and Wiedersheim-Paul presented its basic assumptions and whose mechanism was introduced two years later, in 1977, by Johanson and Vahlne, and so called I-models elaborated for example by Bilkey and Tesar (1977) or Cavusgil (1980). The difference between the Uppsala model and the I-models lies in the driver of the subsequent step in internationalisation. Whereas I-models see each step as a new innovation decision, Uppsala model states that

each step in internationalisation is driven by the knowledge obtained in the previous step. However, both types correspond to each other in the gradual increasing commitment of firm's resources in the internationalisation.

Later, in 1980s, another type of internationalisation models emerged, namely the network approach. Johanson and Mattsson (1987) presented their thoughts that in order to enter new markets, i.e. to internationalise, a firm needs to establish new relationships within the network of partners in that market and that these relationships secure the access to the required resources for the firm to sell its products. That means that the firm's position in the new market depends not solely on the firm's abilities but also on the obtained position within the network and that new business relationships must be built in internationalising. Johanson and Mattsson (1988) introduced four different positions in the internationalisation that a firm can take depending on the internationalisation level of a network, member of which the firm is, and on the current level of the internationalisation of the firm itself. Also Johanson and Vahlne (1990) later incorporated the network relationships in the light of changes in the business environment into the Uppsala model.

Apart from the network approach, another internationalisation theory can be found in literature, such as the resource based view (RBV) of a firm which was elaborated mainly in 1990s, or the eclectic paradigm as a theory of different firm advantages that influence the course of its internationalisation elaborated by Dunning (1980). As opposed to the traditional stage models, a theory of rapid internationalisation arose in 1990s. This theory is connected with terms such as international new ventures or Born Global firms. In 1994, Oviatt and McDougall defined international new venture as a firm that tries to obtain a competitive advantage and sell its products in foreign markets from its very foundation (Oviatt and McDougall, 1994). According to Armario et al. (2008), Moen and Servais (2002), Camison and Villar-Lopez (2010), BGs are seen as enterprises which begin their international activities right from their foundation or very soon after that. This theory is thus in total contradiction to the traditional Uppsala model, because Born Globals do not undergo any successive incremental steps in internationalisation, they enter the foreign market without any previous experience, i.e. acquired knowledge. Frynas and Mellahi (2012) distinguished three characteristic features of Born Globals: in most cases they are small to medium-sized companies, usually they are specialized hi-tech issues, and they are managed by a person with international experience or contacts to international networks.

2.1 Development and Mechanism of Uppsala Model

The first assumptions about internationalisation, as described later by the Uppsala model, were mentioned by Johanson and Wiedersheim-Paul (1975) who performed a research study on internationalisation using four Swedish companies. They assumed that the process of internationalisation occurs gradually and the commitment of firm's resources increases with gradual learning about foreign markets. As the biggest barrier to the firm's internationalisation they identified lack of resources and knowledge and assumed that firms begin with exporting to neighbouring countries that are connected with lower perceived risk, lower psychic distance and with exporting via representatives, which is connected with lower resource commitment, and only after obtaining knowledge about such market, they enter also into more distant markets in terms of psychic distance. The psychic distance involves factors such as language, culture, political systems, etc. and in most cases it is associated with geographic distance. They also presented an establishment chain, the four successive stages in internationalisation of a firm which are connected with gradually increasing commitment of firm's resources and increasing knowledge about the market. The establishment chain consists of (1) no regular export activities, (2) export via independent representatives, (3) establishment of a sales subsidiary in the foreign market and (4) pro-

duction in the foreign market (Johanson and Wiedersheim-Paul (1975).

These assumptions were the precursor of the basic mechanism of Uppsala model presented by Johanson and Vahlne (1977). The mechanism consists of two kinds of aspects – state (1) and change (2) aspects – which influence each other. The model builds on the statement that the current state of firm's internationalisation influences the successive actions performed by the firm in internationalisation. The state aspects involve the current commitment of firm's resources to foreign market and the knowledge about foreign market that the firm currently has. The change aspects comprise current activities of the firm in internationalisation and decisions about commitment of firm's resources to foreign market. Decisions about market commitments are influenced also by the propensity to keep risks at a low level. The mechanism is presented as follows: firm's current knowledge of the foreign market (both objective and experiential) influences its market commitment (amount and degree of investment committed in such market) which leads again to deepening the market knowledge and thus again increasing the firm's market commitment. Current activities of the firm also influence its market commitment and the level of foreign market knowledge affects the decisions about its particular market commitment. Furthermore, acquiring market knowledge through experience decreases the uncertainty perceived about such foreign market, thus the market risk is reduced, as mentioned by Forsgren (2002) with regard to the Uppsala model. However, a firm wants to keep the risk at a specific tolerable level, thus it commits more resources to the foreign market only after the uncertainty about the market is reduced (Johanson and Vahlne, 1977). Figueira-de-Lemos et al. (2011) dealt deeply with the risk formula and propensity to risk-avoidance from the original Uppsala model and provided a graphical explanation of the Uppsala model mechanism in terms of firm's risk, uncertainty and market commitment.

Nevertheless, with the changes in business environment, also the basic mechanism has to be adjusted. Thus, Johanson and Vahlne (2009) presented an adaption of the Uppsala model which takes into account also the network relationships as the vital factor influencing the internationalisation behaviour of a firm. In this revision of Uppsala model, authors stressed the importance of the obtained market knowledge and the firm's effort to enhance its position within the network of relationships, i.e. within the market, even more, being the driving force of internationalisation.

2.2 Aspects possibly affecting the firm internationalisation

Although internationalisation models, such as the Uppsala model, have been emerging for some five decades, their general applicability is rather vague as much evidence has been found that also other variables, apart from market knowledge and market commitment, influence the course of internationalisation of SMEs. Many studies focused on the export propensity or export performance of SMEs with regard to the country or industry specifics. For example, Noorderhaven (2012) dealt with country specifics that probably influence the export and concluded that the specifics of countries strongly influence firms getting involved in exporting or not. Majocchi et al. (2005) dealt with industry specifics that influence export performance of a firm, as she has found out. For manufacturing firms, she also concluded that not only the age of the firm but also the industry experience play a significant role in export performance. Another outcome of her study was that SMEs' export performance is much more volatile than that of large companies as it is highly influenced by the occurrence and unexpected disappearance of unsolicited orders from foreign customers. Industry specifics were scrutinized also by Reis and Forte (2014) who concluded that enterprises from industries with higher productivity export to a greater extent than enterprises from industries with lower productivity. In mature industries, where the environmental change is minimal, the stage perspective on internationalisation is appropriate. Contrarily, in growing industries the born global model is rather applicable (Ar-

mario et al., 2008). Conclusions of Zaclicever (2015) also weaken the general applicability of internationalisation models, as she stated that internationalisation differs among enterprises of different sizes. That implies that the same model cannot explain internationalisation of both large and small enterprises. Arteaga-Ortiz (2009) made a similar conclusion as he pointed out that there is a significant relation between company size and level of its exports.

The core variable in the Uppsala model, as introduced by Johanson and Wiedersheim-Paul (1975), is the psychic distance. Impact of psychic distance on the SMEs' behaviour in internationalisation was scrutinized in more depth by Ojala and Tyrväinen (2009) who concluded that traditional influence of psychic distance on internationalisation, as described in the Uppsala model, cannot be applied to knowledge-intensive SMEs which can obtain knowledge not only by experience (learning) but also by recruiting. However, study by Child and Wong (2002) conducted using a sample of Hong-Kong companies confirmed the traditional impact of psychic distance, as described in the Uppsala model, although they pointed out that the importance of national culture in the psychic distance concept is overestimated.

Forsgren (2002) mentioned that the Uppsala model advantage is its simplicity because it manages to explain internationalisation behaviour of a considerable number of firms by applying only few variables. However, he argues that the model has certain limitations, for example in terms of explanation of organizational learning in internationalisation. Forsgren (2002) stated that learning can occur also through other means than by obtaining experience.

2.3 Studies on Uppsala Model Applicability

Many research studies discuss validity of the Uppsala model (see for example Moen and Servais, 2002; Kubíčková, 2013; Barkema and Drogendijk, 2007; Ocampo Figueroa et al., 2014). Study conducted by Moen and Servais (2002) dealt with examination of the key assumption of the Uppsala model, e.g. gradual development pattern in internationalisation process of an enterprise. They focused on SMEs from three European countries, namely France, Norway and Denmark. They found out that their results are not in line with the assumption of the Uppsala model but their data rather supported the existence of Born Global enterprises. Therefore they questioned general applicability of the Uppsala model and its ability to explain internationalisation behaviour of all enterprises and they rather supposed that new theories should be developed.

These results are in contrast to findings of research conducted by Barkema and Drogendijk (2007) using a sample of Dutch enterprises. Their study also dealt with verifying validity of the Uppsala model and they realised that the stage model of internationalisation is still valid. They mainly dealt with the entry modes in internationalisation (from the theoretical point of view, the entry mode is connected with market commitment). Barkema and Drogendijk (2007) found out that performance of using more resource-demanding modes (such as foreign direct investments) is higher when enterprises already have some experience gained from exploiting less resource-demanding modes, such as contractual modes (e.g. sales agent, franchising, licensing), i.e. their findings supported the fact that internationalisation happens in incremental steps. Moreover, they also highlighted the importance of understanding the foreign cultural environment as a significant condition for success in internationalisation. A comprehensive review of literature on foreign market entry mode choice was performed by Laufs and Schwens (2014) who, regarding the relation between entry mode choice and the psychic distance, pointed out that SMEs tend to prefer less resource-demanding modes when psychic distance is high, because they want to reduce the risk and avoid resources loss in case of failure.

Another research performed by Musso and Francioni (2012) was focused on analysing the internationalisation process in relation to international market choice. This study was conducted among SMEs from Italy and it revealed that geographic and cultural/psychic

distance did not play such significant role in selecting the international market as implied by other studies (see for example Johanson and Vahlne, 1977). Musso and Francioni (2012) supposed that the reason for their findings may be the fact that Italian SMEs use indirect entry modes when expanding abroad and therefore the distance and culture differences become their external partner's problem. Regarding the psychic distance, Nordman and Tolstoy (2014) added (based on their research conducted among Swedish SMEs) that psychic distance plays an important role in enterprise's ongoing foreign operations rather than in their decisions about market selection. They also highlighted the importance of knowledge about foreign environment in which the enterprise operates and also the importance of manager's international experience, because when management lacks this international experience, they can undervalue the psychic distance between home and foreign settings of business operations.

Other findings brought by Ocampo Figueroa et al. (2014) revealed that internationalisation of Mexican SMEs can be explained by the sequential internationalisation model rather than by the born global model. Differences which can affect how an enterprise internationalises, e.g. whether the enterprise undertakes the sequential process of internationalisation or the accelerated one (born global), were the key point of the study conducted by Petersen and Pedersen (1999). They distinguished six factors which can influence the way of an enterprise internationalising. These factors include (1) production of the enterprise – physical (manufactures) or services, (2) motives to foreign market entry, (3) size of the enterprise, (4) stability of foreign market, (5) experience with foreign markets which are similar to the to-be-entered one, (6) degree of industry globalization. Based on their research, they confirmed that almost every one of the mentioned factors plays a role except for the previous experience with similar markets. They suggest that enterprises which are rather large, provide services (not physical products), operate in a global industry, are motivated to go abroad by motives other than market seeking, and whose target market is stable, follow rather the fast/accelerated model of internationalisation.

3 METHODOLOGY AND DATA

This paper is based mainly on primary data. The data were obtained by electronic questionnaire survey that took place in 2014. Respondents were enterprises from the Czech Republic, Slovakia, Germany, Austria and Poland, whereas only small and medium-sized enterprises were involved in the survey. We included these countries because they are our neighbouring countries and thus many Czech SMEs do business with enterprises from there. Therefore we suppose that the business environment in these countries would be more similar to Czech conditions than in more remote countries. Moreover, the research began by questioning SMEs from neighbouring countries (thus this data are now available) but in future research also other countries are about to be included. Thus, the questionnaire was translated into four different languages in order to obtain responses also from enterprises established in our neighbouring countries. The response rates for individual countries differ, however, the overall average response rate was approximately 1%. The low response rate can be explained by the fact that enterprises outside the Czech Republic were not willing to participate in a survey for a Czech university, moreover, many e-mails returned as undelivered due to antispam filters of recipients' e-mails. Likewise, the problem could be the electronic form of the questionnaire which is not so expensive and time-consuming as a paper copy, but it neither enables to attract as high attention of the respondent as for example personal filling in a questionnaire. The total numbers of respondents from each country are presented in Tab. 1. The differences in number of respondents from particular countries could be explained by the

Tab. 1: Numbers of respondents from selected countries

Category of respondents	Czech Republic	Slovakia	Poland	Austria	Germany
Micro enterprises	21	39	22	41	10
Small enterprises	72	53	38	33	8
Medium enterprises	109	30	29	9	26
Total number of SMEs	**202**	**122**	**89**	**83**	**44**

different number of contacts in each country available in the database Amadeus which collect data on business entities from Europe. It means that in each country not the same number of potential respondents were contacted.

To process the data acquired, relative frequencies, arithmetic average and contingency tables, which clearly illustrate the relationship between two statistical features, were applied. Moreover, other conclusions are drawn on the basis of hypothesis testing. In order to find out whether there is a relation between two statistical features, the Chi-square test was intended to be applied. However, the contingency tables did not enable to apply this test as not all fields contained at least 5 respondents. In order to identify the differences between groups of respondents, Kruskal-Wallis test was applied. The null hypothesis says that there do not exist any differences in means between the groups we want to compare (Dodge, 2010). The null hypothesis was rejected when the calculated p-value was lower than the significance level. The level of significance was set to 0.05, or 0.1 in some cases. To identify which groups of respondents differ, multiple p-values were used.

The following assumptions connected with the Uppsala model mechanism were set prior to data processing and addressed in this paper:

(a) SMEs start internationalisation by exporting to neighbouring markets.

(b) In internationalisation, SMEs behave according to the establishment chain.

(c) SMEs' risk perception regarding foreign markets with different psychic distance changes with the obtained knowledge in internationalisation.

(d) SMEs' risk perception regarding particular foreign markets differs depending on the country which the enterprise comes from.

4 RESULTS

The first set assumption that we wanted to analyse using our data was that *SMEs start internationalisation by exporting to neighbouring markets (a)*. For the selected countries involved in our survey, the most important exporting partners are the neighbouring countries (with a slight exception of German SMEs). Majority of SMEs from the Czech Republic export to Germany (nearly 30%) or Slovakia (almost 20%). Majority of Slovak SMEs export to the Czech Republic (about 40%). For both, Polish and Austrian SMEs involved in the survey, the most important export country is Germany (almost 30% and about 43% respectively). Finally, for German SMEs, the most important export markets are Netherlands (12%), France (almost 10%) and China (almost 10%). Although these results do not enable us to definitely decide whether the assumption is valid for SMEs from the selected countries, it indicates that the psychic distance matters to some extent in the internationalisation.

The basic assumption of the Uppsala model was that firms behave in internationalisation in accordance with the establishment chain introduced by Johanson and Wiedersheim-Paul (1975), meaning, with the rise in knowledge about foreign markets they tend to apply more capital demanding forms of market entry. In order to verify the assumption for SMEs from 5 countries of Central Europe, the relation between their market knowledge and form of

market entry applied in their internationalisation was scrutinized. We wanted to test the assumption: *In internationalisation, SMEs behave in accordance with the establishment chain (b).* We set the corresponding hypotheses as follows:

- H_{0b}*: There is no relation between the market knowledge and the applied form of market entry.*
- H_{1b}*: There is a relation between the market knowledge and the applied form of market entry.*

Because market knowledge increases with experience obtained in such foreign market, we assumed that the length of enterprise's activities in foreign markets can be considered the obtained experience. We divided the respondents into 5 groups by their foreign market experience. The lowest experience, i.e. market knowledge, was connected to enterprises which operate in foreign markets under 5 years, better levels of experience were assigned to enterprises which operate in foreign markets for 6–10 years, 11–15 years, 16–20 years and the highest experience about foreign market, thus market knowledge, was attributed to enterprises which operate in foreign markets for more than 20 years. Regarding the form of market entry, respondents were divided into three groups: enterprises which use exporting, enterprises which enter foreign markets via licencing and enterprises which apply more capital demanding form – foreign direct investments.

However, as the contingency tables (see Tab. 2) show, for SMEs from all the selected countries it is impossible to apply the Chi-square test to test the independence between market knowledge and form of market entry, as not all fields in the tables contain at least 5 respondents. Yet, it can be pointed out that SMEs from all countries prefer exporting (either indirect or direct) to other more capital demanding forms of entry regardless of the level of their experience with foreign market. Therefore the basic Uppsala model assumption cannot be verified and the H_{0b} hypothesis cannot be rejected.

Apart from the above mentioned basic Uppsala model assumption, also the other assumption was addressed: *SMEs' risk perception regarding foreign markets with different psychic distance changes with the obtained knowledge in internationalisation (c).* According to the concept of psychic distance, as described in the Uppsala model, the perceived risk of a foreign market is in general connected with lack of information and knowledge about this market, which means that there is a negative correlation between knowledge and uncertainty which the enterprise faces in the internationalisation process. In other words, the higher market knowledge and information an enterprise has, the lower the uncertainty and risk it perceives.

Based on this assumption, we expected that there will be a difference in the perception of risks connected with particular geographical areas between enterprises with different levels of market knowledge (level of experience gained from foreign trade operation), which means the more international experience by the enterprise obtained, the less risky a particular geographical area perceived.

In order to verify the above mentioned assumption, we asked SMEs from the selected Central European countries, namely from the Czech Republic, Slovakia, Poland, Austria and Germany, with different levels of international experience how risky they perceive doing business in particular geographical areas. SMEs assessed their risk perception regarding different countries using a 6 point scale, where 0 meant the least risky area and 5 meant the most risky area. Kruskal-Wallis test was applied in order to identify differences in risk perception of a particular geographical area between SMEs with different market knowledge levels (measured by the level of international experience). The hypotheses for Kruskal-Wallis test was set as follows:

- H_{0c}*: There are no differences in risk perception of particular territories between groups of SMEs with different international experience.*
- H_{1c}*: There are differences in risk perception of particular territories between groups of*

Tab. 2: Contingency tables: relation between market knowledge and form of market entry

Experience (CZ)	Export	Licencing	FDI	Total
1–5 years	16	2	2	**20**
6–10 years	35	6	3	**44**
11–15 years	50	2	0	**52**
16–20 years	57	2	0	**59**
> 20 years	26	1	0	**27**
Total	**184**	**13**	**5**	

Experience (SK)	Export	Licencing	FDI	Total
1–5 years	18	4	3	**25**
6–10 years	31	3	0	**34**
11–15 years	24	6	3	**33**
16–20 years	15	2	2	**19**
> 20 years	7	1	1	**9**
Total	**95**	**16**	**9**	

Experience (AT)	Export	Licencing	FDI	Total
1–5 years	11	0	2	**13**
6–10 years	16	1	2	**19**
11–15 years	8	1	0	**9**
16–20 years	12	1	0	**13**
> 20 years	28	0	1	**29**
Total	**75**	**3**	**5**	

Experience (DE)	Export	Licencing	FDI	Total
1–5 years	6	2	1	**9**
6–10 years	7	0	0	**7**
11–15 years	5	0	0	**5**
16–20 years	9	0	1	**10**
> 20 years	11	1	1	**13**
Total	**38**	**3**	**3**	

Experience (PL)	Export	Licencing	FDI	Total
1–5 years	21	0	0	**21**
6–10 years	15	0	1	**16**
11–15 years	19	2	0	**21**
16–20 years	7	4	1	**12**
> 20 years	18	1	0	**19**
Total	**80**	**7**	**2**	

Note:
CZ = Czech Republic
SK = Slovakia
PL = Poland
AT = Austria
DE = Germany

Tab. 3: Kruskal-Wallis test: differences in perception of risks connected with particular foreign markets depending on the level of international experience

Addressed SMEs from selected countries	Geographical area	p-value	Groups in which the differences appeared	Multiple p-value
Czech Republic	Northern Europe	0.0362**	5–10 years × more than 20 years	0.036562**
($n = 202$)	Western Europe	0.0019**	5–10 years × more than 20 years	0.002949**
			11–15 years × more than 20 years	0.036087**
Slovakia	Eastern Europe	0.0198**	5–10 years × 11–15 years	0.056197*
($n = 113$)	South-Eastern Europe	0.0266**	5–10 years × more than 20 years	0.098771*
Austria	Russia	0.0118**	1–5 years × 5–10 years	0.061792*
($n = 77$)			5–10 years × more than 20 years	0.081377*
Germany	Northern Europe	0.0168**	No statistically significant result	
($n = 31$)	Africa	0.0341**	11–15 years × 16–20 years	0.033770**
Poland	No statistically significant result			
($n = 62$)				

Notes: * significant at $\alpha = 0.10$, ** significant at $\alpha = 0.05$.

SMEs with different international experience.

The hypothesis was tested for SMEs from different Central European countries separately. Results thereof revealed some differences which are shown in Tab. 3. We supposed that SMEs with less international experience (e.g. with 1 to 5 years, 5 to 10 years or 11 to 15 years) would perceive particular geographical areas as more risky than SMEs with greater international experience (e.g. 16 to 20 years or more than 20 years of experience). However, this assumption could not be proved.

According to results shown in Tab. 3, Czech SMEs perceived differently the risks connected with operating in markets of Northern Europe (p-value = 0.0362) and Western Europe (p-value = 0.0019), with regard to their international experience. Interestingly, the more international experience these SMEs have, the more risky these areas are perceived. For example SMEs with international experience 5 to 10 years perceived Northern Europe as less risky than SMEs with international experience longer than 20 years. The same situation is in case of Western Europe, SMEs with less international experience perceived doing business in this territory as less risky than SMEs with greater international experience. These findings are totally in contrast to our assumption. This may be explained by the fact, that the more experience an enterprise has, the more aware it is of various risks influencing their doing business abroad and therefore the enterprise could be more perceptive to risks which may emerge.

Regarding Slovak SMEs and their perception of risks connected with doing business in particular countries, the differences appeared in the case of Eastern Europe (p-value = 0.0198), where SMEs with shorter experience (5 to 10 years) perceived this area as more risky than SMEs with longer experience (11 to 15 years). Other differences appeared regarding the South-Eastern Europe (p-value = 0.0266), where SMEs with shorter international experience (5–10 years) perceived this area as more risky than SMEs with experience longer than 20 years. Although these results indicate, that our assumption could be valid in case of Slovak SMEs, a deeper analysis of result indicates that with higher international experience the perception of risks connected with these countries is not decreasing, therefore even in this case the Uppsala model assumption about risk perception could not be applied.

Moreover, Kruskal-Wallis test did not prove any differences regarding the perception of risks connected with particular geographical areas in case of SMEs from Poland, e.g. their international experience does not play any significant role in their risk perception of particular foreign markets.

With regard to Austrian SMEs, differences in risk perception of enterprises with different international experience appeared in case of Russia (p-value = 0.0118). Results indicate that the more international experience an enterprise has, the less risky is Russia perceived, e.g. SMEs with more than 20 years of experience perceived this area as less risky than SMEs with 5–10 years of experience. The only exception is the group of SMEs with less than 5 years of international experience which perceived Russia as the least risky compared to perception of other groups of SMEs.

The last group of respondents, German SMEs, perceived differently Northern Europe (p-value = 0.0168) and Africa (p-value = 0.0341). The risk perception of Africa is different regarding SMEs with 11–15 years (they perceived Africa as less risky) and SMEs with 16–20 years of experience (they perceive Africa as more risky). It means that not even in this case any conclusions concerning this assumption could be drawn.

To sum up, the above results indicate that the Uppsala model assumption regarding its concept of risk perception is not valid in case of Czech, Slovak, German and even Polish SMEs. Only with small exception, the Uppsala model assumption could be applied in case of Austrian SMEs and their risk perception of Russia, e.g. the more international experience Austrian SMEs have, the less risky Russia is perceived by them. Therefore trying to create a uniform model that would be applicable in general to all countries without any modifications is not

desirable. It is more appropriate to observe a particular country separately and try to modify the model at least according to the conditions of that particular country because each country is specific concerning its political, economic and social framework, business practice and even cultural traditions.

Moreover, we tried to prove that there are some differences in risk perception of particular geographical areas depending on the country from which the enterprise comes, thus we dealt with the assumption that *SMEs' risk perception regarding particular foreign markets differs depending on the country which the enterprise comes from (d).*

We supposed, for example, that Eastern Europe will be perceived differently by SMEs from the Czech Republic and by German SMEs. In order to find out the differences between SMEs from particular countries, Kruskal-Wallis test was used. Its results are shown in Tab. 4 (statistically significant differences only are shown in the table). We set the hypotheses as follows:

- H_{0d}*: There are no differences in risk perception of particular territories between SMEs from different countries.*
- H_{1d}*: There are differences in risk perception of particular territories between SMEs from different countries.*

To sum up, the above results indicate that the perception of risk connected with particular foreign markets really differs between SMEs from the selected Central European countries. Moreover, it supports our previous findings that each country has its unique business environment and conditions and therefore it is more appropriate to take these differences into account and focus more on the specific conditions in each country and adjust the models of internationalisation to these specific business environments than creating generally applicable models of internationalisation.

Differences which can be considered statistically significant according to Kruskal-Wallis test are also shown in Fig. 1 and 2. Fig. 1 depicts the differences in risk perception of European areas and Fig. 2 depicts the risk perception of other geographical areas such as Africa, Middle East, India, China and Russia.

With regard to the results shown in Fig. 1 and Fig. 2, it can be also assumed that there are territories which are perceived as more risky by respondents in general, for example Middle East, Africa, India, China, Russia (see Fig. 2) or even some parts of Europe, in particular Eastern Europe and South-Eastern Europe (see Fig. 1). On the contrary, there are also territories which are perceived generally as less risky, these are mainly the areas in Europe, for example Northern Europe, Western Europe or Central Europe (see Fig. 1).

Nevertheless, with slight simplifications, the results also indicate that SMEs from the Czech Republic, Slovakia, Poland and even Austria tend to be more similar in their perception of the level of risks connected with particular territories than SMEs from Germany. German SMEs perceived all geographical areas as less risky compared to SMEs from other Central European countries. It could be caused by the fact, that German SMEs have stronger bargaining power or greater financial capacity and therefore they manage to negotiate better terms in their contracts with foreign customers. Moreover, they also tend to use various forms of securing their international business transaction (such as insurance of international risks, various banking products, etc.) to a greater extent than SMEs from other selected countries. Hence they could perceive the lower level of risks connected with particular geographical areas, because they are experienced in doing business and therefore they could be also more 'confident' in their entrepreneurship.

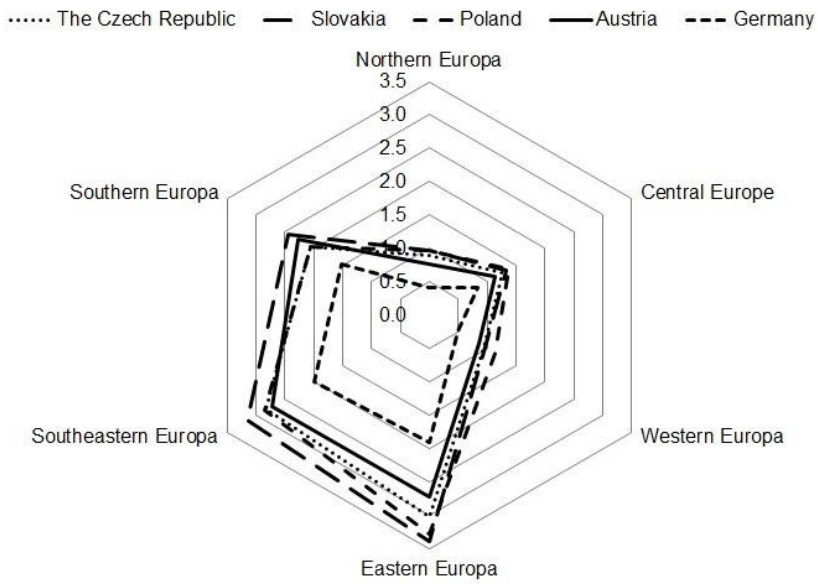

Fig. 1: Risk perception of particular European areas depending on the country of respondents' origin (SMEs)

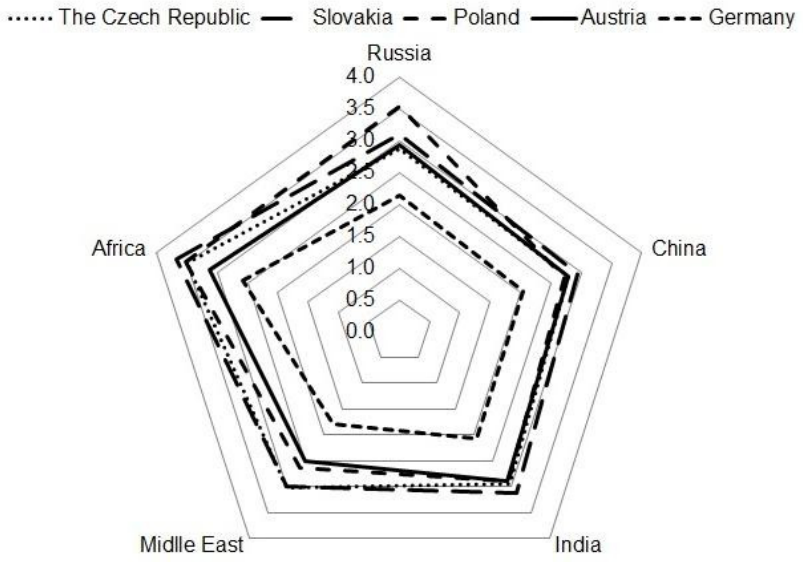

Fig. 2: Risk perception of other geographical areas depending on the country of respondents' origin

Tab. 4: Kruskal-Wallis test: differences in perception of risk connected with particular foreign markets depending on the country which the enterprise comes from

Risk perception of geographical areas	***p*-value**	**Groups in which the differences appeared**	**Multiple *p*-value**
Northern Europe	0.0218**	CZ × DE	0.0354**
		SK × DE	0.0417**
		PL × DE	0.0514*
Central Europe	0.0277**	CZ × DE	0.0623*
		SK × DE	0.0526*
		PL × DE	0.0670*
Western Europe	0.0308**	CZ × DE	0.0561*
		PL × DE	0.0398**
Eastern Europe	0.0000**	CZ × DE	0.0025**
		SK × DE	0.0000**
		PL × DE	0.0002**
		SK × AT	0.0198**
South-Eastern Europe	0.0010**	CZ × DE	0.0284**
		SK × DE	0.0005**
		PL × DE	0.0615*
Southern Europe	0.0039**	SK × DE	0.0038**
		AT × DE	0.0661*
Russia	0.0001**	CZ × PL	0.0070**
		CZ × DE	0.0789*
		SK × DE	0.0088**
		PL × DE	0.0001**
		AT × DE	0.0680*
China	0.0655*	SK × DE	0.0390**
India	0.0153**	CZ × DE	0.0289**
		SK × DE	0.0062**
		AT × DE	0.0999*
Middle East	0.0002**	CZ × DE	0.0006**
		CZ × DE	0.0017**
Africa	0.0014**	CZ × DE	0.0334**
		SK × AT	0.0974*
		SK × DE	0.0087**
		PL × DE	0.0297**

Notes: * significant at $\alpha = 0.10$, ** significant at $\alpha = 0.05$, CZ = SMEs from the Czech Republic, SK = SMEs from Slovakia, AT = SMEs from Austria, PL = SMEs from Poland, DE = SMEs from Germany.

5 DISCUSSION AND CONCLUSIONS

The aim of this paper was to scrutinize some aspects of one of the traditional internationalisation stage models, namely the Uppsala model, which is very often discussed in literature on international business of SMEs. Although the advantage of the Uppsala model is its simplicity and ability to explain internationalisation of a considerable number of firms, as stated for

example by Forsgren (2002), on the contrary many studies found that its assumptions are either in valid in case of some SMEs, or could be valid after with some modifications. We dealt with some basic assumptions of this model and verified them using a sample of SMEs from 5 selected European countries as we supposed that also some country specifics would emerge.

The first assumption that SMEs start their internationalisation by exporting to neighbouring markets, however, could not be clearly verified because the data enabled us to find the most important foreign markets of the addressed SMEs only. Nevertheless, it can be summarized that the most important export markets for SMEs from all the selected countries are their neighbouring countries, with the exception of German SMEs for which a more distant market, such as China, also plays its role.

The second assumption that SMEs behave in internationalisation depending on the establishment chain was not found true in case of SMEs from all the selected countries, as only a small percentage of the addressed SMEs also applied more resource-demanding modes of entry than exporting in connection with the rise in international experience (market knowledge). This conclusion is contrary to the establishment chain, as explained by Johanson and Vahlne (1975), and to Barkema and Drogendijk (2007) who verified the SMEs behaviour in internationalisation according to the establishment chain. However our conclusion is in compliance for example with Majocchi et al. (2005) or D'Angelo et al. (2013) who stated that exporting belongs among the most often used entry modes by SMEs because of its low demand on financial sources and time, e.g. it is the quickest and simplest entry mode.

The third assumption that the SMEs' risk perception regarding foreign markets with different psychic distance changes with the obtained knowledge in internationalisation was transformed into a hypothesis that there are no differences in means between groups of respondents with different international experience (thus market knowledge). Although some differences were detected, they did not indicate that the higher the international experience obtained, the lower the perception of market risk connected with particular foreign territories. That means that the obtained market knowledge via experience does not influence the level of market risk perceived by SMEs. Only in case of Austrian SMEs, this assumption could be applied with some approximations regarding their risk perception of Russian market. The results indicate that the more international experience Austrian SMEs have, the less risky is Russia perceived by them.

The last assumption that the SMEs' risk perception regarding particular foreign markets differs depending on the country which the enterprise comes from was set because we supposed that the psychic distance plays a significant role in perception of market risks. The conclusions indicate that the perception of risks connected with particular foreign markets really differs between SMEs from different countries. That may be explained by the fact that each country has specific business, cultural, social and economic environment that influences the SMEs' perception from that country. Therefore SMEs from individual countries have different perspectives on doing business in a specific territory. It can be summarized that SMEs from the Czech Republic, Slovakia, Poland and Austria are more similar in their perception of market risks connected with particular territories than SMEs from Germany. German SMEs perceived all geographical areas as less risky compared to SMEs from the other Central European countries.

The key findings suggest that the Uppsala model is not able to describe the internationalisation of SMEs from each country properly. Only some of its assumptions can be applied to the internationalisation process. Moreover, differences between SMEs from the selected countries indicate that it is rather appropriate to adjust models to the specific business conditions in each country than to create a generally applicable model of internationalisation. It supports the conclusions of Moen and Servais (2002) who questioned the general applicability of the Uppsala model and stated that new theories of internationalisation should be developed in order to correspond to current business conditions.

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