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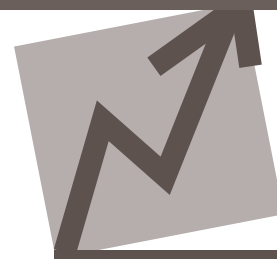

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Łukasz Ziarko
University of Łódź, Faculty of Economics and Sociology
Department of Economic and Social Statistics, Łódź, Poland
lukasz.ziarko@uni.lodz.pl

Application of Association Analysis to Detect Collusive Behaviour in Public Tenders

Abstract: The purpose of this study is to examine the conditions required for the application of association analysis in the identification of the collusive behaviour of contractors in public tenders. It also focuses on determining the values of the confidence and lift measures that will describe the rules specific to a tender cartel. Worldwide research has aimed to develop effective and easy-to-use screening tests to identify cartel cases in public procurement. The recent research focuses on price (its distribution, variance, range) and classifiers allowing for detection of contractors whose mode of operation deviates from that commonly observed. This study follows the direction of current research. The main results of the study include the confirmation of the applicability of the method for the detection of colluding entities and the determination of the value of the confidence and lift measures specific to cartel cases. The policymakers, law enforcement agencies, contracting authorities and competitors of the cartels can use the proposed method to eliminate or at least to limit the scale of the problem. The main shortcoming of the application of the results is the inability to apply them to cartels pursuing an avoidance strategy. Further research will be conducted to develop a conceptual application of association analysis to all cartel strategies.

Keywords: association analysis, bid-rigging, cartel detection

JEL: L41, C40

1. Introduction

Contractors in public tenders can adopt two primary strategies. The first is competition to win the contract. The competitive process of bidding involves offering conditions of sale of goods or services, including price or quality, which are more attractive than the competitor's offer. The implementation of this strategy entails a degree of uncertainty as to what bid the competitor will make. This uncertainty is the foundation of the competitive gameplay, providing the customer with the best possible purchase opportunity. The other form of action in the bidding market is collusive behaviour, also called a bidding cartel, bid-rigging or collusion. The essence of this strategy is to coordinate the behaviour towards the contracting authority by two or more contractors. Most often, it takes the form of a joint arrangement of the conditions of bids. As a result, the parties to such an agreement (from now on also referred to as cartelists) achieve a higher price than would result from free competitive play. A higher price translates into a higher profit for the contractor. The costs of such behaviour are passed on to buyers. In the case of public tenders – to the taxpayers. Due to the damage caused to consumer welfare, bidding collusion is prohibited by law and fought by law enforcement authorities.

The number of bidding cartels identified in Poland from January 2003 to May 2017 is around 250 cases[1], resulting in slightly more than 16 cases per year. Taking into account that the average number of public tenders during that period was 223,356[2], the fraction of detected bid riggings is less than 0.01% of the total number of tenders. In light of recent studies, such a result seems to be significantly lower than expected. Based on the data from the Finnish market, estimation shows that in a free market economy the probability of forming a cartel is somewhere between 0.2 and 0.3 (Hyytinen, Steen, Toivanen, 2018: 208). Similar conclusions can be drawn from the observation of the American public procurement market. According to the Association of Certified Fraud Examiners, about 35% of the analysed cases were affected by corruption (ACFE, 2016). Therefore, even if the studies mentioned above refer to the broader aspect of cartel and corruption phenomena within the public procurement market, the observed number of identified bid-rigging cases in Poland should be resulting in significantly more than 16 cases per year. Hence, the first factor indicating the benefit of research in this area is the higher detectability of collusion. What should be borne in mind is that bid-rigging usually leads to an increase in prices. Higher costs of supplies, services or works, are ultimately borne by the taxpayers. According to the OECD, the estimated savings from eliminating such collusion are close to 20% of the contract value (OECD,

1 Own analysis of the decisions of the antitrust authority. It should be noted that the investigations conducted by the President of the Office for Competition and Consumer Protection started on average 1,274 days later than the actual date of the collusion (with a median of 940 days).

2 Based on the annual reports of the President of the Public Procurement Office for 2007–2019.

2016). Taking into account the value of the Polish public procurement market, the taxpayers could save as much as several billion zlotys per year if bidding collusion could be successfully eliminated.

One of the main reasons for the low rate of revealed bid-rigging is the deficiency of a versatile and easy to use tool for screening the public procurement market[3]. The lack of a coherent database containing the essential parameters of bids submitted in tenders is also an area of concern (Harrington, 2008; OCCP, 2014; Fazekas, Tóth, 2016). The former constitutes the foundation of this study. The primary motivation for the analysis was to propose a practical tool that allows for identifying contractors whose actions resemble the collusive-like cooperation. Law enforcement agencies, contracting authorities, and most importantly – other market players competing with fraudulent contractors (from now on, also referred to as cartels) could use this intuitive and straightforward tool. It is also essential to ensure that the screening method is based on publicly available data. Otherwise, some of the shareholders mentioned above would not benefit from the possibility of examining questionable cases.

Given the observations above, the following research hypotheses have been adopted:

H1: association analysis allows for the identification of cases of bidding collusion.

The analysis will be carried out ex-post and based on historical data on identified bidding cartels. Due to the specific nature of association analysis, its results will allow for concretising the arrangements for tendering. Therefore, it will be possible to verify two detailed hypotheses:

H1a: The value of *confidence* is closer to 100% for the rules concerning the cartelist.

H1b: If bid-rigging occurs, and the colluding parties are active during the tender (they make an offer), the value of *lift* for the rules concerning conspirators is higher than 100%.

The analysis was performed using Statistica, version 13.3 – Data Mining, module SAL (Sequence, Association and Link Analysis).

2. Literature review

In this section, we will review the existing academic literature examining cartels. Furthermore, we will study methods used to identify bid-rigging at the moment. We will start by analysing the concept of a cartel.

3 The other are a lack of coherent and open database regarding details about contractors (including their identification), their bids and contracting authorities' decisions other than awarding the procurement, especially the decisions on excluding bidders from the procedure.

2.1. Concept of collusive behaviour

The primary objective of a cartel is to make an extra profit by increasing the price above the competitive level. For this reason, the law, both Polish and European[4], forbids such cooperation. In a competitive environment, any price increase is limited by the buyers' preferences. Assuming a high degree of substitution between the offered products, an attempt to increase the price in a competitive market will result in a shift of demand to a cheaper seller. In such conditions, increasing prices above the competitive level means a loss of sales, and as a result, a loss of a market share. Therefore, to reduce the risk of losing the market share, the profit-oriented seller has a strong incentive to agree on a market strategy with a competitor. Such an agreement will allow both to apply a high price strategy while preventing the loss of sales. The smaller the number of competitors, the more effective such action will be.

The concept of the cartel is usually linked to the markets with an oligopolistic structure (Tirole, 1988; Cabral, 2000). Let us examine the reasons for such an approach. First of all, successful collusion requires at least two entities willing to act together. Secondly, the number of market players is limited – it has been proven that the more competitors there are in the market[5], the smaller the impact on prices and output of each rival individually (Gabaix et al., 2016). What is more, any form of competition against the cartel, both actual or potential, jeopardises its aims (Harrington, 2006). So if there is a competitor who offers better conditions than the cartel (i.e. lower prices), they will be able to take over the market. In such a situation, the collusive parties will not only lose unfair profits but may also be pushed out of the market altogether. Church and Ware (2000) argue that internal competition is also a threat to the cartel. Each member of the cartel has a strong incentive to cheat the others for the same reasons described above. Therefore, for the sake of achieving its primary objective, the cartel has to supervise the activities of its members.

When it comes to protecting its interest, the cartel does so by building a network of links connecting as many aspects of its members' activities as possible (Church, Ware, 2000). McGowan (2010) argues that a typical cartel builds trust or forces dependency between cartelists[6] concerning critical elements of their daily business. Cartel management usually introduces a disciplinary mechanism based

4 See Article 101 of the Treaty and Article 6 of the Competition Protection Act.

5 This means that there are also no entry/exit barriers in the market and the goods offered are close substitutes.

6 In some types of cartels, for instance, where parties involved in the collusion are strongly interdependent (family cartels, close business, strategic or organisational relations), a lack of trust may not be an issue in terms of stability of conspiracy. In such cases, compliance with the agreed strategy is controlled and managed by the most powerful party.

on monitoring their activities. Such a mechanism provides a full range of unavoidable, severe penalties for withdrawal from the agreement. For this reason, a lack of market transparency is considered to be an incentive to creating and maintaining a conspiracy (Cabral, 2000). Collusion is sound and stable when its members are equally sensitive to the threat of punishment in the case of deviation. For this reason, colluding partners usually are comparable in terms of production capacity, market share or cost structure (Cabral, 2000).

2.2. Strategies of the collusion

According to the OECD's report, the four basic strategies adopted by bidding cartels are as follows: cover bidding, bid suppression, bid rotation, and market allocation (OECD, 2016). The cover bidding strategy (also known as courtesy bidding) relies on the agreement that a given conspirator (the designated bidder) wins the tender, while the others submit higher bids or place offers that will undoubtedly be rejected by the buyer for other reasons[7]. The second type of cartel is called bid suppression and occurs when colluding parties decide that only the designated bidder will make an offer, while others refrain from bidding or withdraw their bids before the contract is awarded. The third scenario employed by bidding cartels is called the rotation of bids and involves the winning of subsequent bids by the colluding entities following a predetermined order. The fourth game plan – the market allocation – is the strategy similar to the bid suppression, although it ties colluding parties more broadly. When implementing this form of cooperation, conspirators appoint among themselves an operator who will have the exclusive right to bid for the contract in a given geographical area or a given type of product or to apply for a contract for a particular type of authority. The examples of collusive practices mentioned above do not create an exhaustive list of possible actions taken by fraudulent bidders, but these are the ones which occur most frequently (OECD, 2016).

The strategies of collusion briefly described above show that the success of a bidding cartel requires complete cooperation between the conspiring parties. The stability of such a cartel depends on the full-scale implementation of a pre-agreed game plan. For example, if the designated bidder submits a bid, other conspirators ought to submit less attractive offers or refrain from submitting bids at all. Hence, the behaviour of the cartelists should follow a specific pattern. Such a pattern can be described, e.g. by the relation of *if* → *then*. Given the characteristics of the cartel, recurring and nonrandom winnings or losses within the group of companies are expected.

7 For example, because of the failure to comply with the procedural requirements.

2.3. Identification of bid-rigging

Due to the confidential nature of bidding collusion, its detection is not a trivial task. Firstly, the conspirators usually do not discuss their actions or strategies openly[8] and keep their agreements confidential. Secondly, it is rare for such deals to be written down in the form of a contract. Usually, it is some kind of gentleman's agreement. Hence, the contracting authorities, law enforcement agencies[9] and, most importantly, the competitors do not have any direct evidence of a bidding cartel. Therefore, signs of collusion can only be found during the analysis of the events occurring during the tender procedures. It may involve, for example, participation by a group of contractors in the same tenders, unusual frequency of winnings by a given bidder, frequent withdrawals of offers, atypical differences in bids within a group of contractors. The information obtained in this way may lead to finding particular contractors guilty of participating in collusion. The possibility of opening a case shall then be determined by the availability of the data and the possibility of claiming on the basis thereof. The standard of proof is determined by the experience of the competition authority or the court. For example, the absence of a reasonable explanation of the behaviour from two or more contractors other than collusion may be sufficient to find them guilty of an infringement (The President of the OCCP, 2017).

The research into bid-rigging cartels suggests two main methods of detection: a structural one and a behavioural one (Abrantes-Metz et al., 2006; Harrington, 2008; Imhof, Karagök, Rutz, 2016). The structural method of detection uses the characteristics of the market, its structure and dynamics, barriers to entry, as well as demand and supply characteristics. It focuses on the conditions that are conducive to the existence of a collusive arrangement identified in the first part of this study. The behavioural method of detection uses the attributes of the bidders and their behaviour in the market. It emphasises identifying the contractors' practices consistent with the behaviour of a cartel participant.

The structural approach to cartel investigation can be described as a traditional way of detecting collusion (Shaik et al., 2012). Suspicious results of tenders are assessed by analysing the structure of supply and its dynamics over a given period, the countervailing power of purchasers, the substitutability of the prod-

8 Although there are cases where cartelists announce their strategy to the public. As in 2002, when Art Marketing Syndicate S.A., Europlakat Polska Sp. z o.o., Ströer Polska Sp. z o.o. and Outdoor Promocja Plakatu Sp. z o.o. announced a uniform minimum price for their services (lease of advertising space on billboards) at a press conference (see Decision of the OCCP Nº RPZ–21/2002 of 22.10.2002).

9 Cartel members can avoid sanctions under the leniency procedure. In return for providing evidence of the existence of the cartel, they are granted total or partial immunity (Competition Protection Act, 2007, para. 106)

ucts offered, the impact of entry or exit barriers on any potential competition, total production and capacity, and the life cycle phase of the product concerned (Cabral, 2000). This method can be used as a tool to identify markets which are prone to collusive behaviour.

In contrast, the behavioural method places the entrepreneur at the centre of any investigation. For this research, it is of particular interest to determine the way entrepreneurs operate. Are they an active or a passive participant in public procurement, how often do they win, with whom do they cooperate most often, and whether we can observe any other significant changes in the way they act in the market. The behavioural analysis, when used to investigate any potential bid-rigging, pays attention to several price-related statistics such as its variation, the relative difference between prices (Abrantes-Metz et al., 2006; Mena-Labarthe, 2012; Imhof, 2017), mark-ups distribution (Bajari, Ye, 2003), distribution of bids, frequency and independence in the bidding process (Porter, Zona, 1997), or intensity of competition (Fazekas, Tóth, 2016; Huber, Imhof, 2018). The primary purpose of such an examination is to determine the contractors' pattern of conduct. If a deviation from the expected behaviour occurs, it constitutes the grounds for an in-depth analysis. The example of such an application is demonstrating the existence of collusive behaviour. Based on changes in price variance in the market of pharmaceuticals in Mexico, its suppliers were charged with participation in the collusion (Mena-Labarthe, 2012). More advanced statistical methods are also used. Morozov and Podkolzina (2013) attempted to use cluster analysis to study data from road construction tenders in the Novosibirsk region of Russia. Another work worth mentioning is the study on road construction tenders in Switzerland (Imhof, 2017). In this work, the author presented the application of price distribution to reveal atypical observations in the population. Both the Swiss and Russian research focused on a relatively narrow segment of the market. Most comprehensively, the problem of screening tests is presented in the report on the effectiveness of the Swedish antitrust authority in fighting collusion (Fazekas, Tóth, 2016). The authors present several innovative ideas on the possibility of using statistical methods to examine the public procurement market across the entire contract spectrum, including the use of Benford law, analysis of cyclicality of winnings, missing contractors and network analysis.

3. Association analysis in the identification of bid-rigging

The characteristics of cartels show that conspirators prefer to act together and cooperate on multiple procurements as often as possible rather than engage in ad hoc collaboration. The *if-then* formula can be used to describe the strategies they

use (for example, if one has been appointed as the winner, the others make less attractive bids). Taking that into account, the first pattern we should expect in the case of collusion is an increased frequency of bids for the same contract by a pair (or a group) of companies. Alternatively, we can see these companies avoiding each other in subsequent proceedings. These two types of behaviour will be adequate for the four collusive bidding strategies mentioned above.

Given the above, the use of association analysis seems justified. Association analysis is a data mining technique aimed at establishing relations between items in a given set, especially in large data sets (Agrawal, Imieliński, Swami, 1993). It should be noted that a dataset used to search for the signs of collusion is likely to contain at least several hundred thousands of records. For example, in 2019, there were 141,023 contracts awarded in Poland (PPO, 2019). Therefore, the database covering two or more years will consist of proportionately more observations. The main problem that can be solved by employing association analysis is determining the links between the items in the dataset – for example, the relationships between contractors taking part in public tenders. In order to apply the method mentioned above, we assume that the database consists of tenders (a single tender is a subset), and tenders are composed of individual contractors who have submitted bids in a given tender (a contractor is then an item of the subset). In the simplest terms, each relation that happens between two contractors constitutes a rule. For example, if contractors A and B bids in a given tender, the rule is described as (A → B). Only the rules indicating the possibility of implementing one of the cartel strategies will be interesting for the analysis. The significance of the rule (its strength) will be determined by the parameters of support, confidence and lift. Parameters of support and confidence are considered fundamental for describing the strength of a rule (Hand, Mannila, Smyth, 2005; Osowski, 2013).

The value of support defines how often a given subset occurs in a set of transactions.

$$support\left(X \to Y\right) = \frac{\sigma\left(X \cup Y\right)}{N}, \tag{1}$$

where X and Y are the elements of the subset (say contractors), $\sigma(X \cup Y)$ is the number of occurrences of the subset containing both elements (contractors), and N is the total number of subsets.

The confidence parameter defines the frequency of occurrence of a given item (say X) in the subset containing already the other item of interest (contractor Y).

$$confidence\left(X \to Y\right) = \frac{\sigma\left(X \cup Y\right)}{\sigma\left(X\right)}, \tag{2}$$

where X and Y are the elements of the subset, $\sigma(X \cup Y)$ is the number of occurrences of the subset containing both elements, and $\sigma(X)$ is the total number of subsets containing X. The lift value is the third measure indicated in the literature (Tan et al., 2019). In some studies, the parameter of lift is presented as a diagnostic indicator of association – the measure of interest (Osowski, 2013)[10]. The value of lift defines the ratio of observed confidence to expected confidence.

$$lift\left(X \rightarrow Y\right) = \frac{\sigma\left(X \cup Y\right)}{\sigma\left(X\right)\sigma\left(Y\right)}. \tag{3}$$

If the numerator and denominator of this fraction are equal, then the presence of X and Y in the subset is an independent event. Otherwise, it means an increased probability of Y being in the subset if X is already there. In terms of analysis provided, the value of lift higher than 1.0 (100%) suggests that both contractors were present in the subset of tenders more often than expected. On the other hand, the value of lift less than 1.0 means that this situation occurs less frequently than expected.

A strong rule distinguishes contractors whose behaviour (acting together or avoiding each other) will differ from the expected. Therefore, these rules should allow for the contractors linked by bid-rigging-like relations to be identified.

The search for rules of interest takes place in two main stages (Osowski, 2013). In the beginning, it is required to search for sufficiently frequent rules. Then, the set of such rules is limited to those that have the expected levels of confidence and lift. The cut-off value of these parameters is adopted based on data characteristics and the nature of the examined phenomenon. It should be noted that in large sets, the number of potential rules can be high ($2^k - 1$ possible subsets, given k for the number of elements in a dataset). It is therefore required to limit the number of subsets that will be subject to further classification. This problem is usually solved by identifying frequent sets first, and then building association rules on that basis (Hand, Mannila, Smyth, 2005).

The concept of the use of association analysis to detect collusion has so far been examined to a limited extent. A research gap exists when it comes to applying association analysis to the study of collusive behaviour in a broadly defined public procurement market. The author has found only three studies on the application of this method in the scenario outlined above. In 2016, Ziarko explored solely the theoretical possibility of applying association analysis to detect collusive behaviour in the public procurement market (Ziarko, 2016). In the study conducted by Foremny and Anysz, the use of association analysis was described as a marker of collusion in the road construction sector (Foremny, Anysz, 2018). Finally, in their 2019 research, Anysz and Foremny used association analysis to build a classifier based

10 In the context of this study, it is not crucial to define precisely the role of this indicator.

on a neural network (Anysz, Foremny, 2019). They aimed to identify contractors displaying characteristics of collusive behaviour. Fazekas and Tóth also studied the concept of using network analysis to assess the risk of collusive bidding in Sweden (Fazekas, Tóth, 2016). The analysis presented in their report is conceptually similar to the one which is proposed in this article.

4. Analysis of Polish bid-rigging cases

In this section, we will present the source of the data used and provide the results of the analysis.

4.1. Data

The data used in this analysis were collected from the 67 publicly available administrative decisions of the President of the Office for Competition and Consumer Protection (from now on also referred to as the OCCP). The analysis involved 323 tenders conducted from January 2003 to May 2017, spread across about 30 different categories[11] of the subject of the contract. If a given contract was divided into lots, each lot was considered as a separate tender (subset). Two decisions[12] were excluded from the study due to the secrecy of relevant information in their content (details of offers) or a lack of information allowing for the reconstruction of essential elements of the process. The tenders under examination involved 589 contractors, 191 of whom were suspected of participating in bid-rigging. As a result of the OCCP's investigations, 137 of them were found guilty. The charges against the remaining 54 contractors were dismissed.

The primary purpose of the analysis is to verify whether association analysis is an appropriate method for identifying bid-rigging to be applied to a diverse range of tenders, without limitation to a single market segment. If the answer to the first question is positive, the value for each measure of a strong rule has to be determined. This result will enable us to deduce the contractors whose activities were collusive.

11 For example: winter roads and bridges maintenance services, cleaning services for institutional customers, construction and renovation of residential buildings, roads and paths, transport services, running the Road Information Point, supply of rabies vaccines, forest management services, solid waste disposal services.

12 The decision of the President of the OCCP Nº RKT–46/2013 of 16.12.2013 and the decision of the President of the OCCP Nº RLU–30/2007 of 17.07.2007.

4.2. Results

The process of developing the model was divided into two stages. The first stage of analysis aimed to check whether the tested method generated rules that could be used as a foundation for further analysis (H1 hypothesis). After that, the H1a and H1b hypotheses were verified.

The first stage was to check whether it would be possible to generate rules consisting of only members of bidding cartels. For this purpose, the minimum values of the support (*support* $(X \rightarrow Y) \geq 0.3\%$) and confidence (*confidence* $(X \rightarrow Y) \geq 10\%$) were adopted. It should be noted that the software imposed a minimum value of the support, taking into account the processing capabilities of hardware used in the analysis.

With these assumptions, the model generated 51,118 rules, out of which, 12,041 rules included only the entrepreneurs who were found guilty of bid-rigging. That group covered 60.6% of all cartelists in the database. The remaining 39.4% of 12,041 were the contractors who formed a cartel in only one tender (the value of support for these rules was below the adopted level) or who pursued a single bidding strategy or who colluded in a very sophisticated way (via consortium or through controlling the cartel without participating directly in its operations). The results presented above argue in favour of the primary research hypothesis (H1).

In order to verify the detailed hypotheses (H1a and H1b), the rules are divided into two groups – the first one includes rules consisting of contractors that were not involved in cartel behaviour (G1)[13], and the other includes rules concerning at least one cartelist (G0). After the split, 10,185 rules fall into G1, while G0 contains 40,933 rules. Both groups differ in terms of distribution. The minimum confidence level in both groups is similar (11.11–11.54), and the maximum value of it (100.00) is the same in both cases. The differences between the groups are noticeable concerning the mean value and the first and second quantile. The mean value for G0 (85.90) was 25% higher than for G1 (68.58). The first 25% of observations and the median in both groups also differ significantly (G1: Q1 = 40.00, Me = 66.67; G0: Q1 = 66,67, Me = 100.00). The value of confidence for the majority of rules in G0 is 100.00. In both cases, the dominant value was 100, with 47% of observations in G0 and 72% in G1. The details on the distribution of the confidence in both groups are shown in the table below (Table 1).

13 This group also includes entrepreneurs suspected of participating in the collusion but cleared of charges in the course of the investigation conducted by the President of the OCCP.

Table 1. Distribution of confidence – groups G0 and G1 (in %)

Group	N	Minimum	Q1	Mean	Median	Q3	Maximum
G1 no cartelists	10,185	11.54	40.00	68.58	66.67	100.00	100.00
G0 at least one cartelist	40,933	11.11	66.67	85.90	100.00	100.00	100.00

Source: own elaboration

Regarding the results described above, it can be assumed that the distribution of the value of confidence in both groups G0 and G1 supports the H1a hypothesis. The parameter of confidence reaches a higher value regarding rules containing one or more cartelists than in the case of rules consisting exclusively of fair playing contractors. It proves that this measure can be used as an indicator of the risk of collusive behaviour in public tenders. Such an indicator can prove especially useful to identify contractors for further in-depth analysis.

The hypothesis H1b was verified similarly. While the value of lift reaches the same maximum value of 235.00 in both G1 and G0 groups, differences are noticeable in terms of the minimum and average values. The lowest value of lift in group G0 is more than twice as high as in group G1. Almost 80% of rules in G0 have the value of lift higher than 100.00. While in G1, that is the case for only 44.1% of them. The other distribution measures are presented in the table below (Table 2).

Table 2. Distribution of lift – groups G0 and G1 (in %)

Group	N	Minimum	Q1	Mean	Median	Q3	Maximum
G1 no cartelists	10,185	3.16	18.08	95.68	44.76	156.67	235.00
G0 at least one cartelist	40,933	8.25	117.50	168.01	156.67	235.00	235.00

Source: own elaboration

The results have shown that the rules with high values of the lift parameter indicate the collusion. This result supports the second research hypothesis (H1b) – the measure of lift can be used to identify companies whose behaviour is consistent with the theory of collusive bidding.

5. Discussion and conclusions

There is a widespread demand for a method to detect tender conspiracies. The low detectability of collusive behaviour in procurement contracts in Poland and the demands formulated in scientific studies from other countries point to the need to develop a practical and easy-to-apply method to detect cartels. The first part of this study looked at the results of the Polish competition authority's efforts to detect collusive behaviour. Amongst a number of studies looking into collusive behaviour in the public procurement market, it is worth highlighting research carried out

in Russia, Switzerland and Sweden (Morozow, Podklozina, 2013; Fazekas, Tóth, 2016; Imhof, 2017). These studies all argue in favour of a universal tool for identifying bidding cartels. Furthermore, this research paper discusses the first empirical work, conducted by Anysz and Foremny (2019) on the application of association analysis to identify collusive behaviour. The results of the study presented in this work allow us to conclude that the set of methods for the identification of tender collusion can be enriched with the analysis of associations. The aim of this work has been achieved – conditions for the use of association analysis have been examined and the research hypotheses have been confirmed.

One of the limitations of the association analysis method is the small number of interactions between contractors, for example, in the case of the first tender in which the cartel operates. Due to a lack of relevant data, it was also not possible to analyse the strategies of avoiding direct competition. However, it should be assumed that in this type of cooperation, the analytical framework adopted in this work will have to be fundamentally changed. The challenge for using the method of association analysis, as well as other methods used for comprehensive analysis, will be employing them in sectors with a high concentration of competition (two or three competitors). The method discussed in this article may then give false-positive results – it may signal the risk of a cartel, while the intensification of relations between competitors results from the specific structure of the market.

It is planned to continue with the research on the subject. In particular, in areas where the withdrawal strategy (or avoidance strategy) is employed. It is also interesting to take into account the analysis of other variables, in particular, those characterising the contracting authority, the conduct of the contractor during the tender (a refusal to sign the contract and a direct or indirect withdrawal of the offer), and the case when cooperation takes place within the consortium. A potential new direction of analysis may also be to estimate the impact of bidding cartels on prices in other tenders within the same category.

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Zastosowanie analizy asocjacji w wykrywaniu zmów w przetargach publicznych

Streszczenie: Celem niniejszego artykułu jest zbadanie warunków niezbędnych do zastosowania analizy asocjacji w wykrywaniu zmów zawieranych przez wykonawców zamówień publicznych. Koncentruje się ono na określeniu wartości parametrów zaufania (*confidence*) oraz podniesienia (*lift*), charakteryzujących reguły asocjacyjne właściwe dla zachowania się uczestników zmowy przetargowej. Aktualnie prowadzone na świecie badania ukierunkowane są na opracowanie względnie łatwych w użyciu narzędzi, pozwalających na skuteczne ujawnianie przypadków karteli przetargowych. Podejmowane dotychczas próby ich opracowania skupiały się na analizie cen (rozkład, wariancja, rozstęp) oraz klasyfikatorach pozwalających na wykrycie wykonawców, których zachowanie w procedurze przetargowej odbiega od powszechnie obserwowanego. Analiza prezentowana w niniejszym artykule wpisuje się w ten kierunek badań. Do głównych wniosków z przeprowadzonej analizy zalicza się: potwierdzenie możliwości zastosowania analizy asocjacji do wykrywania zmów przetargowych oraz określenie wartości miar zaufania i podniesienia do identyfikacji podmiotów działających w sposób typowy dla karteli. Zaproponowana metoda może zostać zastosowana przez organy ochrony prawa, zamawiających oraz konkurentów, w celu wyeliminowania lub przynajmniej ograniczenia skali występowania porozumień przetargowych. Główną, zidentyfikowaną wadą proponowanej metody jest brak możliwości zastosowania do karteli realizujących strategię unikania konkurencji. Planowane jest prowadzenie badań ukierunkowanych na rozwinięcie użyteczności proponowanej metody na wszystkie strategie możliwe do zastosowania przez uczestników zmowy.

Słowa kluczowe: analiza asocjacji, zmowa przetargowa, wykrywanie karteli

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Oluwole Jacob Adeyemi
Chrisland University in Abeokuta, Department of Economics, wolejadeyemi@gmail.com

Isiaq O. Oseni
Olabisi Onabanjo University in Ago-Iwoye, Department of Economics
Isiaq.oseni@oouagoiwoye.edu.ng

Sheriffdeen A. Tella
Olabisi Onabanjo University in Ago-Iwoye, Department of Economics, satellang@gmail.com

Effects of Money Demand on Trade Balance in Nigeria

Abstract: Previous studies appear to have concentrated on the effects of currency depreciation on trade balance and macroeconomic policy, while the relationship between money demand and trade balance is scantly documented in the literature. This paper therefore examines the effects of money demand on trade balance in Nigeria. For the analysis conducted, annual time series data covering the period ranging from 1986 to 2018 were used along with the Autoregressive Distributed Lag (ARDL) estimation technique. The long-run coefficient of money demand was positively signed and statistically significant at 5% level. The positive relationship exhibited by the coefficient of money demand in the long run had a significant influence on trade balance. Thus, this implied that a unit percent increase in money demand would lead to a 1.57% significant increase in trade balance. The implication of this finding was that money demand had significantly influenced trade balance, enhancing the production of goods and fostering investment, which had led to increased growth. The paper recommends that the Central Bank of Nigeria through the Monetary Policy Committee should amend qualitative and quantitative credit control policies with the aim of improving lending to enhance the flow of credit to the real and exporting sector of the economy in order to bring about the desired effect on trade balance. However, the study is limited to an analysis of the existence of the relationship between money demand and trade balance using the Nigerian data set.

Keywords: money demand, trade balance, money stock, domestic credit, ARDL

JEL: E41, E42, E51, E52, F14, F43

1. Introduction

Trade remains a crucial element needed for economic growth and sustainable development of a country. Trade balance is the net sum of trade accrued (a difference in monetary value between export and import) to a country in a year or at a particular point in time. It can be characterised by either trade surplus or trade deficit. Trade surplus occurs when the total revenue inflow from export of goods and services exceeds the total monetary outflow from import of goods and services, while trade deficit occurs when the outflow of domestic currency from import is more than the revenue inflow from export of goods and services.

The monetary approach to trade balance suggests that trade imbalances are essentially an adjustment mechanism which at equilibrium equates the money stock in existence to the quantity of money demanded in an open economy (Edet, Udo, Etim, 2017). When desire to hold money or demand for money increases, there will be an increase in the domestic money supply through increased domestic credit creation, by either the central bank or other financial institutions, which could lead to larger trade deficits. Currency depreciation occasioned by trade deficit, however, raises production costs along with domestic prices, and increases the demand for money, thereby leading to a temporary improvement in the balance of payments via increased trade balance (Cooper, 1971; Daniels, Vanhoose, 2005).

Studies on the relationship between money demand and trade balance are specifically important for many emerging and developing countries such as Nigeria, where trade flows continue to drive the balance of payments accounts due to the developing nature of its capital markets. In addition, changes in the stock of money and the demand for money, whether determined by exogenous or endogenous shocks, have been a common but controversial issue in most developing countries. Several governments of these countries have repeatedly used a stable money demand function as a means of correcting price instability, trade deficits or overvaluation of their exchange rates to increase trade competitiveness and revenue from exports (Rincón, 1999).

Decades leading to the 1980s witnessed an increase in government policies and academic research on the assessment of the impact of currency depreciation on trade balance, the "TATOO" debate on the stability of money demand function, and the examination of successes of competitive depreciations to solve trade imbalance (Momodu, Akani, 2016). The Nigerian economy has experienced structural changes since independence with the country battling with a series of economic problems such as external imbalance and double digit inflation rates with evidence showing rapid trade imbalance in the federal government current account (Sulaimon, Omotunde, Haorayah, 2017). The policy of recapitalisation in some sectors of the economy, growing government expenditure and cost of governance have increased the demand for money. The increased money demand means that

money demand variables can no longer be ignored in the models of trade balance in Nigeria. In attempt to solve the problem of external balance, the government has had severely embarked on currency devaluation, which is a sort of government intervention, with the expectation of improving trade balance.

The following previous studies have investigated the stability of money demand function: Tule et al. (2018), El-Rasheed, Abdulah, and Dahalan (2017), Iyoboyi and Pedro (2013) and Nduka, Chukwu, and Nwakaire (2013) who found stable money demand functions. Studies by Odior and Alenoghena (2016) found partial money demand functions. Some found mixed significant determinants and insignificant determinants of demand functions (Bitrus, 2011; Aiyedogbon et al., 2013; Farazmand, Ansari, Moradi, 2016). Despite the conflicting empirical evidence, studies on the effects of money demand on trade balance are sparse. The research question for this paper is: what effect does money demand have on trade balance in Nigeria? The paper aims to examine the effects of money demand on trade balance in Nigeria.

To estimate the model formulated for this study, the Autoregressive Distributed Lag (ARDL) estimation technique was used. The ARDL technique was developed by Pesaran, Shin, and Smith (2001) to investigate the short-run and long-run relationship among variables. The choice of this technique stems from the fact that it allowed for joint estimation of relationships between money demand and the trade balance induced movement in Nigeria. Thus, the model made a clear cut distinction between the long-run and short-run effects. Another justification for this technique was due to the fact that the result of the unit root test conducted indicated that the variables had a mixture of integration of order zero I(0) and one I(1). This technique also had advantages over the conventional cointegration techniques, being more efficient. The ARDL technique provided unbiased estimation of the long-run model, even in the presence of endogeneity resulting from the reverse causality that might exist among the variables.

The study has contributed to knowledge by filling the empirical gap identified from the existing literature through examining the effect of money demand on trade balance. Particularly, the interaction between money demand and trade balance has received little focus in the literature, especially in the case of Nigeria. This study, therefore, has contributed to the literature by investigating the effects of money demand and its transmission to trade balance, and has revealed a positive link between money demand and trade balance.

The rest of the paper is structured as follows: section two reviews the literature on money demand and trade balance, section three reports research methodology, section four presents the empirical analysis and results, and section five provides the discussion and conclusions, while section six gives recommendations.

2. Brief review of the literature

According to the Monetarist view, increases in money supply propel real money balance above levels considered optimal by economic agents, resulting in increased expenditure out of a given income, thus stimulating imports, increasing money demand and causing trade balance to deteriorate (Anoke, Odo, Ogbonna, 2016). The approach emphasises that disequilibrium in trade balance is associated with disequilibrium between the demand for and supply of money, which are determined by variables such as income, the interest rate, the price level (both domestic and foreign), and the exchange rate.

The monetary approach proposes that in a monetised economy the money demand function and the money supply process should play a central role in the balance of payments analysis and, hence, in the determination of its trade flow components, particularly in the long-run (Mussa, 1974). Paganelli (2006) argues that money is not the cause of trade in general but excess money demand and supply can change the trade pattern through changes in the price level which make domestic goods less attractive compared to foreign goods. The effect of this is the deterioration of trade balance with depreciation of domestic currency, which means that the domestic supply of money decreases (Tang, 2018).

This approach also projects the balance of payments as regards the international reserve in relation to imbalances prevailing in the money market. Simply because an increase in money supply in a fixed exchange rate system will cause an increase in expenditure and consumption in the form of increased purchases of foreign goods and services by domestic residents. To finance such purchases, a great deal of the foreign reserve will be used up, thereby depleting the balance of payments. As the foreign reserve flows out, money supply will continue to diminish until it equals money demand, at which point, monetary equilibrium is restored and the outflow of foreign exchange reserve is stopped.

In their study, Hassan and Suryadi (1993) examined the effects of foreign interest rates, the domestic rate depreciation, and the credit constraint of the demand for money in Indonesia. They found that M_0 (currency) and M_1 (currency plus demand deposits) money demand equations were significantly related to expected currency depreciation but were unrelated to foreign interest rates. Fielding (1994) investigated money demand in four African Countries – Cameroon, Nigeria, Ivory Coast, and Kenya. The study used cointegration techniques and the extension of the classical money demand function to include terms reflecting the variability of real rates of return and to facilitate the construction of dynamic models which successfully explain the evolution of money demand over 15 years. Variability terms were significant in all of the four countries investigated.

Bahmani and Kutan (2010) examined how stable the demand for money was in emerging economies. They considered the experiences of Armenia, Bulgaria,

the Czech Republic, Hungary, Poland, Russia, and the Slovak Republic using quarterly data covering the period between 1993: Q1 and 2006: Q4. The bounds testing approach to Error-Correction Modeling (ECM) and Cointegration was confirmed in all countries under study with the application of CUSUM. They concluded that money demand was stable in those countries. Iyoboyi and Pedro (2013) estimated the narrow money demand function of Nigeria from 1970 to 2010 using the Autoregressive Distributed Lag (ARDL) bounds test approach to cointegration for the analysis. They found cointegration relations among the narrow money demand, real income, short-term interest rate (STIR), real expected exchange rate devaluation (REER), expected inflation rate (EIR), and foreign real interest rate (FRIR). In the period under investigation, the real income and interest rate were significant variables explaining the demand for narrow money in Nigeria, although the real income was a more significant factor in both the short and long term.

Also, Odior and Alenoghena (2016) investigated the relationship between real money balances (demand for money) and real income, bonds, equities, stocks, interest rates, and the inflation rate in Nigeria with annual time series spanning 32 years, from 1981–2013. Methodologically, the study modelled a standard money demand function and employed the ADF-Fisher Chi-square and Phillips-Perron test statistic to test for the unit root, the Engle-Granger single-equation to test for the cointegration, and the Generalised Linear Model (GLM). The study found that the money demand function was partially stable in Nigeria for the sample period and that real money demand positively responded to an increase in real income after real depreciation, inflation and past real money demand, but negatively to a rise in interest rate spreads.

Furthermore, El-Rasheed, Abdulah, and Dahalan (2017) investigated the effect of monetary uncertainty (MUC) on the stability of money demand function in Nigeria using the Autoregressive Distributed Lag (ADL) Cointegration technique for the period of 1980–2014. The demand for money in Nigeria was specified as a function of income, the domestic interest rate, inflation, the nominal exchange rate, and MUC. The results from the bounds testing indicated that MUC, income, the domestic interest rate, inflation, the exchange rate, and broad money (M2) were co-integrated. Tule et al. (2018) examined broad money (M2) demand and its stability in Nigeria using quarterly time series data from 1985: Q1–2016: Q4. The study used the Autoregressive Distributed Lag (ARDL) bounds testing procedure. The results indicated that a stable long-run relationship existed between M2 and its determinants including GDP, stock prices, foreign interest rates, and the real exchange rate.

Empirically, the reviewed studies focused mainly on depreciation effect, substitution effect on trade balance, money demand function and money demand stability without due regard for the effect of money demand on trade balance, a variable which this study intends to consider and incorporate to test the level of their

relationship with the Nigerian economy. Methodologically, this study discovered that the Autoregressive Distributed Lag (ARDL) model, due to its advantages over simple regression models, had not been really utilised using the Nigeria dataset and the variables of interest we incorporated. Few of the studies that used this method, such as Iyoboyi and Pedro (2013), Tule et al. (2018), only estimated the money demand function and examined money demand stability respectively. This obvious omission justifies a critical empirical investigation of the actual effect of money demand on trade balance in Nigeria. Hence, the study answers the question: what effect does money demand have on trade balance in Nigeria? The null hypothesis states that: money demand has no significant effect on trade balance in Nigeria. However, the study only tests the existence of the relationship and not the direction of the relationship which is outside of the scope of this study. Therefore, the study expects a positive relationship between money demand and trade balance.

(Hypothesis: there is no significant relationship between money demand and trade balance in Nigeria.)

3. Theoretical framework/methodology

The disequilibrium framework was originally put forth by the seminal papers of Fleming (1962) and Mundell (1963) and later by Dornbusch (1976). It has become a conventional answer to currency depreciation that is usually analysed within the Mundell-Fleming model.

Further extension of the Mundell-Fleming model, which is otherwise known as the IS-LM-BOP model, is an extension of the Keynes's IS-LM model. Hence, this study adopts the Keynesian IS-LM (monetary) theory. The traditional IS-LM model deals with autarky, while the modern Mundell-Fleming model describes a small open economy. The formal monetary approach to the balance of payments model based on Johnson (1977) and Dhliwayo (1996) specifies a money demand function, a money supply identity, and an equilibrium condition.

The model consists of the following set of equations:

$$M^S = \left(R + DC\right), \tag{3.1}$$

$$M^d = L\left(Y, P, I\right), \tag{3.2}$$

$$M^S = M = M^d, \tag{3.3}$$

where M^s = money supply (aggregate money stock); M^d = money demand; Y = level of real domestic income; P = price level; I = rate of interest; and M = equilibrium stock of money; DC = domestic credit; IR = international reserves; CU = currency; R = bank reserves; MB = monetary base; m = money multiplier; D = depos-

its. Following the theoretical framework and in line with the work of Dhilwayo (1996), Agbola (2004) and Alawattage (2009), this study postulates trade balances as a function of money demand, Nigeria's international reserve, and lending rate, its degree of openness, domestic income, domestic price level, and interest rate.

$$\ln TB_{it} = \beta_i + \beta_1 \ln MD_{it} + \beta_2 RES_{it} + \beta_3 RL_{it} + \beta_4 \text{OPEN} + \beta_5 \ln Y_t + \beta_6 P + \beta_7 IR + \varepsilon_{it}, \tag{3.4}$$

where the variables log*TB* is the logarithm of trade balance to capture the effects of transactions and precautionary demand for money on the external sector; log*MD* is the logarithm of money demand (the stock of nominal money), i.e. the value of total money in circulation in the Nigerian economy in a given period; *RES* is the Nigerian international reserves; *IR* is the deposit interest rate (the interest rate on money itself), *RL* is the lending interest rate (a proxy for the rate of return on assets outside of money); *OPEN* is the degree of openness to international trade, measured as (Export + Import)/GDP; log*Y* is the real GDP as a proxy to capture transactions and precautionary demand for money; *P* is the domestic price level (Apergis, 2015).

The study used the Autoregressive Distributed Lag (ARDL) estimation technique owing to the fact that the preliminary test conducted showed that the variables had a mixture of integration of order zero I(0) and I(1).

Secondary annual time series data used in the study were subjected to preliminary econometric tests for heteroscedasticity, serial correlation, normality and stability before applying the Bounds Test for cointegration using the Autoregressive Distributed Lag (ARDL) model. The use of the bounds testing technique is predicated on three validations. Firstly, Pesaran, Shin, and Smith (2001) advocate the use of the ARDL model for the estimation of level relationships because the model suggests that if the order of the ARDL has been identified, the relationship may be estimated by the OLS method. Secondly, the bounds test for cointegration permits a mixture of I(1) and I(0) variables as regressors. In other words, the order of integration of appropriate variables may not necessarily be the same, hence the ARDL technique has the advantage of not requiring a specific identification of the order of the underlying data. Thirdly, the technique is fit for small or finite sample sizes (Pesaran, Shin, Smith, 2001). In such a situation, the application of the ARDL approach to cointegration will give realistic and efficient estimates because the ARDL is a dynamic single model equation and of the same form with the ECM.

The paper used an ARDL framework of order:

$$\ln(TB)_t = \beta_0 + \sum_{i=1}^{P_1} \beta_i \Delta \ln(TB)_{t-1} + \sum_{i=1}^{P_2} \beta_i \Delta \ln(MD)_{t-1} + \sum_{i=1}^{P_3} \beta_i \Delta RES_{t-1} + \sum_{i=1}^{P_4} \beta_i \Delta LR_{t-1} + \sum_{i=1}^{P_5} \beta_i OPEN_{t-1} + \sum_{i=1}^{P_6} \beta_i \Delta \ln Y_{t-1} + \sum_{i=1}^{P_2} \beta_i \Delta P_{t-1} + \sum_{i=1}^{P_2} \beta_i \Delta IR_{t-1} + \lambda_1 TB_{t-1} + \lambda_2 MD_{t-1} + \lambda_3 RES_{t-1} + \lambda_4 LR_{t-1} + \lambda_5 OPEN_{t-1} + \lambda_6 Y_{t-1} + \lambda_7 P_{t-1} + \lambda_8 IR_{t-1} + \varepsilon_t, \quad (3.5)$$

where Δ is a first difference operator and ε_t is an identically and independently distributed white noise error term. In equation (3.5), the term with the summation sign represents the error correction dynamics while the second part (the term with λ_s in the equation) corresponds to the long-run relationship. The null hypothesis in equation (3.5) exists when $\lambda_1 = \lambda_2 = \lambda_3 = \lambda_4 = \lambda_5 = \lambda_6 = 0$, which indicates the non-existence of the long-run relationship.

The ARDL method estimated $(P + 1)^k$ number of regressions in order to obtain the optimal lags for each variable, where P is the maximum number of lags to be used and k is the number of variables in the equation. The paper makes use of secondary data, which are annual time-series. The data covered a period of 33 years, 1986 to 2018. Data were sourced from Central Bank of Nigeria (CBN) various statistical bulletins, National Bureau of Statistics (NBS) Annual Reports and International Financial Statistic (IFS) data. The variables that were used in the study were selected on the basis of their theoretical importance, usefulness as a measure of the key construct of the study, namely, currency depreciation, money demand and trade balance, and findings from their usage in the existing empirical literature. The E-views 10 econometric software package was used to analyse the data.

4. Empirical analysis

Table 1 presents the descriptive analysis of the time series properties of the variables included in the models. The table shows that the mean values of interest rate (*IR*), money demand (*MD*), degree of openness (*OPEN*), domestic price level (*P*), Nigerian international reserves (*RES*), lending rate (*RL*), trade balance (*TB*) and domestic income (*Y*) stood at 7.40 percent, ₦5,755.584 billion, 5259.31 percent, ₦58.52, ₦18,398.79 billion, 18.76 percent, ₦8,474.284 billion, ₦35,965.39 billion respectively.

The standard deviation of interest rate (*IR*), money demand (*MD*), degree of openness (*OPEN*), domestic price level (*P*), Nigerian international reserves

(*RES*), lending rate (*RL*), trade balance (*TB*) and domestic income (*Y*) from their respective long-term mean values every year point stood at, 5.42 percent, ₦7,600.335 billion, 1189.55 percent, ₦57.91, ₦16,731.78 billion, 3.80 percent, ₦9,134.485 billion, and ₦19,496.87 billion respectfully. The probability value of Jarque-Bera statistics for all the variables shows their distribution level at mean zero and constant variance, while all variables are positively skewed to the right. This reveals that money demand and trade balance are normally distributed among all the incorporated variables of interest.

The graphical representation of the data to analyse the effects of currency depreciation on trade balance is shown in Figure 1. It reveals that trade balance reached its peak of ₦362,527,115 billion in 1994 when the money demand level was ₦19.445,452 billion, indicating a growth rate of about 300 per cent. This sudden increase in trade balance could be partly due to an increase in crude oil price in the international oil market, the import restriction policy of the time to promote exportation, and a loss in competitiveness of the sub-region's products in the Nigerian market. Generally, the data oscillated throughout the period, which reflected that financial data in Nigeria exhibited random walk and structural breaks. The money demand showed a reverse trend which could be a result of persistent expansionary fiscal policy and excess liquidity in the system with increased money demand. Overall, the study observed critically that the differences in the volatility of money demand and trade balance reflected the outcome of the various policies adopted by the government in the management of the Nigerian economy.

Table 1. Descriptive statistic

	IR	*MD*	*OPEN*	*P*	*RES*	*RL*	*TB*	*Y*
Mean	7.403594	5755.584	5259.310	58.51780	18398.79	18.75847	8474.284	35965.39
Median	4.952500	1457.700	5100.381	37.79266	9197.605	17.96500	3241.500	27112.63
Maximum	18.80000	23433.60	7959.177	195.9020	53000.36	29.80000	26232.50	75757.00
Minimum	1.410000	27.40000	3330.311	0.876848	1429.590	10.50000	14.90000	15237.99
Std. Dev.	5.423479	7600.335	1189.549	57.90920	16731.78	3.791365	9134.485	19496.87
Skewness	0.761688	1.099770	0.143485	0.918030	0.723142	0.956424	0.704772	0.712317
Kurtosis	2.006471	2.725934	2.160594	2.726236	2.056634	4.568608	1.951174	2.069040
Jarque-Bera	4.410368	6.550786	1.049273	4.594755	3.975570	8.159354	4.115800	3.861694
Probability	0.110230	0.037802	0.591770	0.100522	0.136999	0.016913	0.127722	0.145025
Sum	236.9150	184178.7	168297.9	1872.570	588761.2	600.2710	271177.1	1150892.
Sum Sq. Dev.	911.8377	1.79E+09	43865799	103957.7	8.68E+09	445.6080	2.59E+09	1.18E+10
Observations	33	33	33	33	33	33	33	33

Source: own elaboration

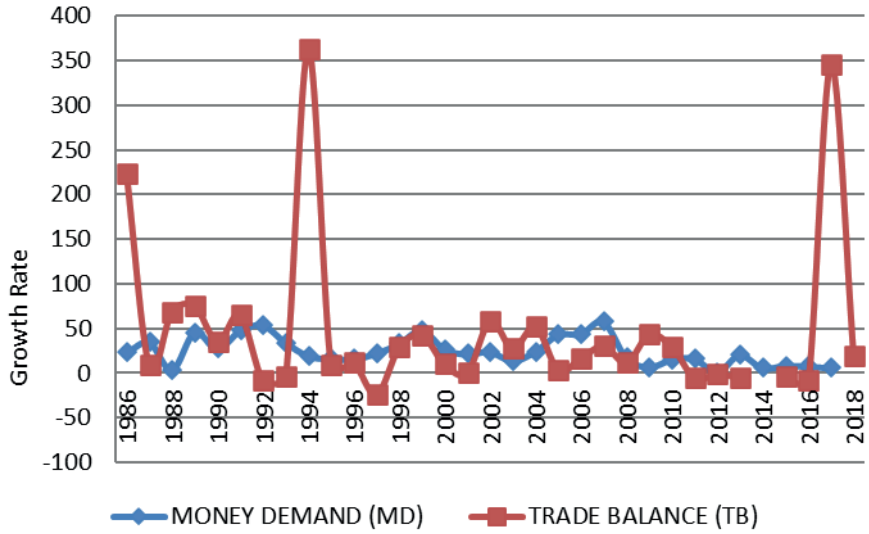

Figure 1. Money demand and trade balance
Source: own elaboration

4.1. Correlation matrix

The correlation matrix shown in Table 2 expressed the partial correlation of money demand and trade balance variables employed for this paper in Nigeria within the period of 1986–2017. The table shows the magnitude, strength and direction of their linear relationship, with some negative linear relationships. It indicates the existence of a variable showing positive correlation between the foreign reserve and the domestic price (0.666749), the lending rate and the interest rate (0.502763), which is in line with the economic theory because correlations among the explanatory variables neither violate any assumptions nor affect the unbiasedness of the regressors' coefficients (Wooldridge, 2013).

Table 2. Correlation Matrix

Correlation	*IR*	log(*MD*)	*OPEN*	*P*	*RES*	*REXRD*	*RL*	log(*TB*)
IR	1.000000							
log(*MD*)	–0.254740	1.000000						
OPEN	0.190439	–0.433914	1.000000					
P	–0.685823	0.203355	–0.604574	1.000000				
RES	–0.410492	0.488017	–0.195627	0.666749	1.000000			
RL	0.502763	–0.322390	0.005574	–0.366436	–0.401093	–0.061375	1.000000	
log(*TB*)	–0.448507	0.370500	–0.367677	0.205874	0.342776	–0.179065	–0.245067	1.000000
log(*Y*)	–0.371358	0.269215	–0.527527	0.463170	0.493195	–0.229176	–0.327088	0.401491

Source: own elaboration

4.2. Unit-root test results

Table 3 shows the results of the unit-root test using the Augmented Dickey Fuller (ADF) approach. The results show that the variables had a mixture of integration of order zero I(0) and one I(1). Specifically, the lending rate (*RL*) and trade balance (*TB*) were stationary at 5% significance level while the interest rate (*IR*), money demand (*MD*), domestic price level (*P*), domestic income (*Y*), Nigerian International reserve (*RES*) and trade openness (*OPEN*) were all stationary at first difference at 5% significance level. Having noted that the variables were of different orders of integration and first difference, the study therefore applied the Autoregressive Distributed Lag technique (ARDL) in line with the work of Pesaran, Shin, and Smith (2001) since one of the dependent variables (money demand) is non-stationary; none of the variables is I(2) in normal condition (ADF test); and none of the variables is I(2) in a structural break.

Table 3. Augmented Dickey Fuller unit root results

Variables	Level	First Difference	Order of Integration
IR	–0.9875	–6.2007	I(1)
ln*MD*	–1.9483	–3.3552	I(1)
ln*P*	–1.1399	–3.8824	I(1)
ln*RES*	–0.7860	–7.5311	I(1)
ln*Y*	0.1268	–3.4566	I(1)
OPEN	–2.9467	–5.1682	I(1)
RL	–4.5286	–	I(0)
TB	–3.5727	–	I(0)

Source: own elaboration

5. Presentation of research results

5.1. Results of the relationship between money demand and trade balance in Nigeria

Table 4 showed the results of the Autoregressive Distributed Lag of order (1, 2) on the effect of money demand on trade balance in Nigeria. The explanatory power of the model explained 60.8 per cent of the total variations in the total balance. This showed that 39.2 per cent of the total variations in the trade balance was not explained, indicating that all the explanatory variables played major roles in explaining significant changes in the trade balance of the Nigerian economy. Thus, the model had high goodness fit. The value of the F-statistic showed that the joint

explanatory variables significantly explained the trade balance at 5% significance level. Thus, the model was statistically significant at 5% level. The value of the Durbin-Watson d* statistic was approximately 2, indicating that the model had no serial autocorrelation problem.

Table 4. Autoregressive distributed lag results

Dependent Variable: log(*TB*)				
Variable	**Coefficient**	**Std. Error**	**t-Statistic**	**Prob.***
log(*TB*(–1))	0.374655**	0.184890	2.026371	0.0570
log(*MD*)	0.247224	0.514259	0.480740	0.6362
log(*MD*(–1))	–0.526088	0.736371	–0.714433	0.4836
log(*MD*(–2))	1.258532	0.642708	1.958170	0.0651
log(*RES*)	–0.185175	0.133555	–1.386500	0.1816
RL	–0.020437	0.019719	–1.036417	0.3130
OPEN	–1.93E–05	6.46E–05	–0.298111	0.7689
log(*Y*)	0.138481	1.039582	0.133209	0.8954
P	–0.015963**	0.004799	–3.325995	0.0036
IR	0.019918	0.039225	0.507791	0.6174
C	0.001934	8.373509	0.000231	0.9998
R-squared	0.608977	F-statistic		2.959046
Adjusted *R*-squared	0.403175	Durbin-Watson stat		1.789612

** Significant at 5% level.

Source: own elaboration

Table 5 shows that the F-statistic value (5.8173) in the ARDL Bound test was significantly higher than the critical value bounds of I(0) Bound and I(1) Bound at 5% significance level. This shows that the variables in the model have a long-run co-movement among themselves. Hence, there is a long-run relationship among the variables. Thus, the variables have a long-run co-movement and a long-run relationship.

Table 6 explained the short-run relationship between money demand and trade balance in Nigeria. This was confirmed by the negative coefficient of Error Correction variable (*CointEq*(–1)) characterised by 5% significance level which explained the speed of adjustment that made short-run periods converge to long-run periods. This result showed that it would take all the variables 20 years to converge from a short-run to long-run relationship.

The short-run coefficient of money demand had a positive sign and was statistically insignificant at 5% level while its lagged coefficient had a negative sign and was statistically significant at 10% level. The positive sign exhibited by the coefficient of money demand showed that a unit percent increase in demand for money would lead to a 0.25 per cent increase in trade balance, but this increase

had no significant impact on the growth of the economy. Hence, money demand had no significant effect on trade balance in Nigeria in the short-run while the coefficient of lagged money demand had a significant impact. The impact, however, had an inverse effect on the growth of trade balance, and consequently deterred the growth of the economy.

Table 5. Long-run co-movement results

ARDL Bounds Test		
Test Statistic	Value	*k*
F-statistic	5.817304	1
Critical Value Bounds		
Significance	I0 Bound	I1 Bound
10%	4.04	4.78
5%	4.94	5.73
2.5%	5.77	6.68
1%	6.84	7.84

Source: own elaboration

The short-run coefficients of federal reserve, lending rate, openness to world trade and price level were negatively signed and statistically insignificant at 5% level except the price level. The negative signs exhibited by these variables (federal reserve, lending rate and openness to world trade) showed that there was an inverse relationship between these variables (federal reserve, lending rate and openness to world trade) and trade balance, and that these relationships also contributed to the growth of trade in Nigeria to a statistically insignificant degree. Meanwhile, the negative and significant effect of price level showed that a unit percent decrease in the price level would lead to a 0.02% decrease in trade balance in the short run. Furthermore, the short-run coefficients of domestic output and the interest rate had positive signs and were statistically insignificant at 5% level. The direct effect exhibited by domestic output and interest rate showed that a unit per cent increase in the domestic output and the interest rate would lead to 0.14% and 0.02% insignificant increases in trade balance respectively in the short run.

Table 6. Short-run results of the relationship between money demand and trade balance

Dependent Variable: log(*TB*)				
Variable	**Coefficient**	**Std. Error**	**t-Statistic**	**Probability**
log(*MD*)	0.247224	0.514259	0.480740	0.6362
log(*MD*(–1))	–1.258532	0.642708	–1.958170	0.0651
log(*RES*)	–0.185175	0.133555	–1.386500	0.1816
(*RL*)	–0.020437	0.019719	–1.036417	0.3130
(*OPEN*)	–0.000019	0.000065	–0.298111	0.7689

Dependent Variable: log(*TB*)				
Variable	**Coefficient**	**Std. Error**	**t-Statistic**	**Probability**
log(*Y*)	0.138481	1.039582	0.133209	0.8954
(*P*)	–0.015963	0.004799	–3.325995	0.0036
(*IR*)	0.019918	0.039225	0.507791	0.6174
CointEq(–1)	–0.625345	0.184890	–3.382262	0.0031
R-squared	0.608977		F-statistic	2.959046
Adjusted *R*-squared	0.403175		Durbin-Watson stat	1.789612

Source: own elaboration

Table 7 showed the results of the long-run relationship between money demand and trade balance. The long-run result had no serial correlation problem as evidenced by the value of Durbin Watson d*-statistic, and the explanatory variables significantly explained the influence money demand had on trade balance (dependent variable) as evidenced by the value of F-statistic.

The long-run coefficient of money demand was positively signed and statistically significant at 5% level. The positive relationship exhibited by the coefficient of money demand in the long run had a significant influence on trade balance. Thus, this implied that a unit per cent increase in money demand would lead to a 1.57% significant increase in trade balance. The implication of this finding was that money demand had a significant influence on trade balance, enhancing the production of goods and fostering investment, which had led to increased growth.

The long-run coefficients of Federal Reserve, lending rate and openness to world trade were negatively signed and statistically insignificant at 5% level while the coefficient of price level was equally negative but statistically significant at 5% level. The negative signs exhibited by these variables (federal reserve, lending rate and openness to world trade) showed that there was an inverse relationship between these variables (federal reserve, lending rate and openness to world trade) and trade balance, and that these relationships contributed to the growth of trade in Nigeria to a statistically insignificant degree. Meanwhile, the negative and significant effect of price level showed that a unit per cent decrease in the price level would lead to a 0.03% decrease in trade balance in the long run. Furthermore, the long-run coefficients of domestic output and interest rate had positive signs and were statistically insignificant at 5% level. The positive effect exhibited by domestic output and interest rate showed that a unit per cent in the domestic output and the interest rate would lead to a 0.22% and 0.03% insignificant increase in trade balance respectively in the long run.

Table 7. Long-run results of the effect of money demand on trade balance

Dependent Variable: log(*TB*)				
Variable	**Coefficient**	**Std. Error**	**t-Statistic**	**Prob.**
log(*MD*)	1.566605**	0.386780	4.050374	0.0007
log(*RES*)	–0.296116	0.231064	–1.281532	0.2154
RL	–0.032682	0.031062	–1.052142	0.3059
OPEN	–0.000031	0.000105	–0.293206	0.7725
log(*Y*)	0.221448	1.678856	0.131904	0.8964
P	–0.025526**	0.009124	–2.797555	0.0115
IR	0.031851	0.063664	0.500301	0.6226
C	0.003093	13.389974	0.000231	0.9998
R-squared	0.608977		F-statistic	2.959046
Adjusted *R*-squared	0.403175		Durbin-Watson stat	1.789612

** Significant at 5% level.

Source: own calculations

Table 8 showed the diagnostic tests results that confirmed the authenticity of the results derived from the ARDL technique. The tests were in four folds: the normality test, serial correlation LM test, heteroscedasticity test, and stability test. The tests were carried out to check whether the series were normally distributed, free from the serial autocorrelation problem, had constant variance or suffered from functional form misspecification when the model did not properly account for the relationship between the dependent and observed explanatory variables. The value of the Jarque-Bera statistic showed that the data were normally distributed since its value was statistically insignificant at 5% level. Furthermore, the result of the serial correlation LM test using the Breusch-Godfrey method indicated that the time series data had no serial autocorrelation problem since the value of the statistic was not statistically significant at 5% level. The result of the heteroscedasticity test using the Breusch-Pagan-Godfrey technique showed that the data had constant variance as evidenced by the F-statistic value at 5% level that was not statistically significant. Finally, the results of stability test using the Ramsey RESET (Regression Equation Specification Error Test) test revealed that the series had no evidence of non-linearity since its F-statistic value was statistically significant at 5% level.

The results of the Autoregressive Distributed Lag on the effect of money demand on trade balance in Nigeria revealed that the short-run coefficient of money demand had a positive sign and was statistically insignificant at 5% level. The positive sign exhibited by the coefficient of money demand showed that a unit percent increase in demand for money would lead to a 0.25 per cent increase in trade balance, but this increase had no significant impact on the growth of the economy. Hence, money demand had no significant effect on trade balance in Nigeria in the short run while the coefficient of lagged money demand had a significant impact.

The impact, however, had an inverse effect on the growth of trade balance, and consequently deterred the growth of the economy. The positive relationship exhibited by the coefficient of money demand in the long run had a significant influence on trade balance. Thus, this implied that a unit per cent increase in money demand would lead to a 1.57% significant increase in trade balance. The implication of this finding was that money demand had a significant influence on trade balance.

Table 8. Diagnostic tests results for the effect of money demand on trade balance

Tests	Statistic	Values	Probability
Normality	Jarque-Bera	1.5448	0.4619
Serial Correlation LM	Breusch-Godfrey	1.0746	0.3635
Heteroskedasticity	Breusch-Pagan-Godfrey	2.1186	0.0763
Stability	Ramsey RESET	7.3577	0.0130

Source: own calculations

5.2. Discussion of findings

The positive relationship exhibited by the coefficient of money demand in the long run showed that money demand had a significant influence on trade balance and validated the alternative hypothesis of this study. With this finding, the study rejects **hypothesis I**: (H_0: There was no significant relationship between money demand and trade balance in Nigeria). Hence, money demand significantly affected changes in the trade balance in Nigeria for the years reviewed. This result was consistent with previous studies in developed, emerging and developing economies such as: Tsen (2011), Iyoboyi and Pedro (2013), Alhanom (2016), and Odior and Alenoghena (2016).

6. Conclusions and policy recommendations

this paper evaluates the effects of money demand on trade balance in Nigeria. The study makes use of ex-post facto research design and secondary annual time series data from 1986 to 2018, obtained from the 2018 Central Bank of Nigeria (CBN) statistical bulletin. To achieve the objectives of the study and address the stated hypothesis, preliminary diagnostic tests of the data series were conducted through the use of ADF unit root tests. The results of the Autoregressive Distributed Lag of order (1, 2) on the effect of money demand on trade balance in Nigeria showed that the explanatory power of the model explained 60.8 per cent of the total variations in trade balance. This showed that 39.2 per cent of the total variations

in trade balance was not explained, indicating that all the explanatory variables played major roles in explaining significant changes in the trade balance of the Nigerian economy. Thus, the model has high goodness fit. The value of the F-statistic shows that the joint explanatory variables significantly explained the trade balance at 5% significance level. Hence, the model was statistically significant at 5% level. The value of the Durbin-Watson d* statistic is approximately 2, indicating that the model has no serial autocorrelation problem.

The study has thus confirmed that money demand had a strong and positive relationship with trade balance over the analysed years. The study has empirically shown that a unit percent increase in money demand will lead to a 2% increase in trade balance. It is evident from these findings that money demand significantly influenced trade balance in Nigeria in the analysed period. Economic agents demanded more money in order to purchase more goods either locally or internationally. This enhanced the production of goods, increased exportation and fostered investment, thereby increasing growth and economic development.

The paper recommends that the Central Bank of Nigeria through the Monetary Policy Committee should amend qualitative and quantitative credit control policies with the aim of enhancing the flow of credit to the real and exporting sector of the economy to bring about the desired effect on trade balance. This was evident due to the fact that a unit percent increase in money demand led in the short run to a 2 per cent significant increase in trade balance, and hence to increasing economic growth. In the long run, a unit percent increase in money demand led to a 1.01% significant increase in trade balance. Also, the Federal Ministry of Trade and Investment should enhance export of internationally competitive goods through implementing export promotion policies. However, the study is limited to an analysis of effects of money demand on trade balance using the Nigerian data set, the study did not look for the bi-causal relationship between the variables. Hence, the paper also suggests that other methodologies, such as the vector autoregressive model-VAR or S-VAR, could be used for further studies on the causal relationship between these economic variables.

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Wpływ popytu na pieniądz na bilans handlowy w Nigerii

Streszczenie: Prowadzone przez różnych autorów badania koncentrują się na wpływie deprecjacji waluty na bilans handlowy oraz politykę makroekonomiczną, podczas gdy związek między popytem na pieniądz a bilansem handlowym jest słabo udokumentowany w literaturze. W niniejszym artykule przeanalizowano wpływ popytu na pieniądz na bilans handlowy w Nigerii. Do analizy wykorzystano szeregi czasowe dla danych rocznych z okresu od 1986 do 2018 roku oraz autoregresyjny model o rozłożonych opóźnieniach (ARDL). Długookresowy współczynnik popytu na pieniądz miał znak dodatni i był statystycznie istotny na poziomie 5%. Pozytywne skorelowanie współczynnika popytu na pieniądz w dłuższej perspektywie miało znaczący wpływ na bilans handlowy. Oznaczało to, iż wzrost popytu na pieniądz o 1,57% prowadził do znacznego wzrostu bilansu handlowego o 1,57%. W konsekwencji można stwierdzić, iż popyt na pieniądz miał znaczący wpływ na bilans handlowy, prowadząc do zwiększenia produkcji towarów i promowania inwestycji, co zaowocowało zwiększonym wzrostem. Artykuł zawiera rekomendację, aby Bank Centralny Nigerii, za pośrednictwem Komitetu Polityki Pieniężnej, zmienił jakościową i ilościową politykę kontroli kredytowej tak, żeby usprawnić akcję kredytową i zwiększyć przepływ kredytów do eksportującego sektora gospodarki, w celu uzyskania pożądanego wpływu na bilans handlowy.

Słowa kluczowe: popyt na pieniądz, bilans handlowy, zasoby pieniężne, kredyt krajowy, ARDL

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Małgorzata Rejter
Uniwersytet Łódzki, Wydział Nauk Geograficznych, Instytut Geografii Miast, Turyzmu i Geoinformacji, UL0166122@edu.uni.lodz.pl

Potrzeby i marzenia seniorów jako czynniki pomyślnego starzenia się

Streszczenie: Celem artykułu jest identyfikacja potrzeb i marzeń seniorów, które uważane są w literaturze za czynnik pomyślnego starzenia się. Ważnym aspektem poruszanym w opracowaniu są również potrzeby zdrowotne, opiekuńcze i mieszkaniowe seniorów. Trudno poznać i zrozumieć spersonalizowane potrzeby starszych ludzi tylko poprzez wykorzystanie metod statystycznych czy ekonometrycznych. Dlatego jako główną metodę jakościową w pracy zastosowano wywiady przeprowadzone z kilkorgiem seniorów. Tylko dzięki takim bezpośrednim badaniom społecznym możemy zrozumieć ich potrzeby i marzenia. Realizacja możliwych do spełniania marzeń, a nawet same marzenia, stanowią cząstkę szczęścia, które przyczynia się do wydłużenia życia. Stan zdrowia seniorów wpływa w istotny sposób na ich zdolności do właściwego rozpoznawania i oceny rzeczywistości. Zły stan zdrowia ogranicza możliwość samodzielnego funkcjonowania w przestrzeni miejskiej. Kończy się to izolacją w mieszkaniu, która daje niekorzystne efekty, polegające na braku satysfakcji, i nie pozwala realizować swoich potrzeb oraz spełniać marzeń. Zidentyfikowane potrzeby i marzenia seniorów mogą pomóc w podejmowaniu odpowiednich działań dostosowujących przestrzeń miasta do ich wymagań i możliwości.

Słowa kluczowe: potrzeby zdrowotne, potrzeby mieszkaniowe, marzenia, seniorzy, przestrzeń miasta

JEL: I31, I14

1. Wprowadzenie

Procesy starzenia się dotyczą wszystkich żywych istot już od momentu poczęcia. Z wiekiem zmieniamy się, a razem z nami zmianie ulegają nasze potrzeby i marzenia. Priorytety dotyczące potrzeb zmieniają się z upływem lat, dojrzewają, ale zawsze istnieją i będą istnieć tak długo, jak długo będziemy żyć. Jednak człowiek w starszym wieku nie jest już tak sprawny fizycznie i intelektualnie jak za młodu i wtedy może potrzebować wsparcia. Jak zidentyfikować indywidualne potrzeby jednostki? Trudno poznać spersonalizowane potrzeby starszych osób tylko za pomocą metod statystycznych czy ekonometrycznych. Ujęcia ilościowe nie sprawdzają się jako narzędzia badania indywidualnych potrzeb ludzi. Z kolei studia przypadków bywają bezradne w badaniach prognostycznych, dlatego powinny poprzedzać badania ilościowe – mogą być podstawą zrozumienia życia ludzi starych. Natomiast modele statystyczne i ekonometryczne powinny stanowić następny etap badań gerontologicznych, które są niezbędne do prowadzenia skutecznej polityki społecznej. Świat trzeba najpierw zrozumieć, żeby go później modelować. Zamierzeniem autorki nie jest odrzucenie czy negacja ujęcia ilościowego, lecz wzbogacenie modelowania statystycznego i ekonometrycznego. Moc prognostyczna modeli statystycznych i ekonometrycznych powinna być wzbogacona empatycznym rozumieniem. Można zatem stwierdzić, że pojmowanie słowa powinno poprzedzać diagnozowanie zapisane w liczbach. Ujęcie liczbowe pozwala porządkować i prognozować badaną rzeczywistość, ale nie jest wystarczającym narzędziem jej wyjaśniania. Aby wyjaśnić zjawiska społeczne, trzeba najpierw zrozumieć indywidualność, czyli każdego w jego niepowtarzalnym życiu. Najlepiej zdołamy poznać seniorów poprzez studia przypadku konkretnych osób potrzebujących pomocy, a gdy zrozumiemy ich potrzeby, dopiero wtedy będziemy mogli im pomóc.

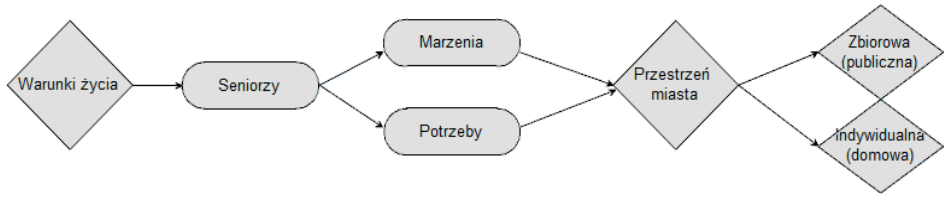
2. Podstawy metodologiczne

Według Rungego (2007) do najważniejszych metod stosowanych w pracy badawczej należą wywiad, obserwacja, ankietowanie, analiza dokumentów oraz techniki socjometryczne. W badaniach będących przedmiotem artykułu zastosowano metodykę modelu empiryczno-naukowego, który opiera się na doświadczeniu i obserwacji. Ten model zapoczątkowany został już w dziewiętnastowiecznej geografii (Chojnicki, 2010: 83).

> Geografowie społeczni dążą do identyfikacji czynników i procesów, które wpływają na materialne i humanistyczne relacje człowieka ze środowiskiem oraz kształtowanie określonych form i struktur terytorialnych zbiorowości społecz-

nych. Czynniki i procesy te mają naturę przyrodniczą, ekonomiczną, polityczną i kulturową. (Lisowski, 1990: 41)

W artykule zastosowano logiczny układ poruszanych zagadnień – począwszy od warunków, w jakich żyją osoby starsze, determinujących poziom ich potrzeb i marzeń. Ten proces umiejscowiony jest w przestrzeni miasta, z której korzystają seniorzy, podzielonej na przestrzeń publiczną oraz domową (rys. 1).



Rysunek 1. Układ logiczny zagadnień poruszanych w artykule
Źródło: opracowanie własne

Główną metodą zastosowaną w pracy było studium przypadku. Uzasadnieniem takiego wyboru był cel, jakim jest jakościowe przedstawienie problematyki badawczej. Dlatego też głównym źródłem dowodów w studium przypadku były wywiady, stanowiące ważne źródła pierwotne. Ponieważ większość studiów przypadków dotyczy spraw człowieka i jego zachowań, tak więc dzięki uczestnikom wywiadów możemy dużo dowiedzieć się na temat zachowań ludzi, w tym ich potrzeb i marzeń (por. Yin, 2015: 142–145). W swojej pracy autorka wykorzystała również obserwację terenową oraz własne doświadczenia życiowe.

Od września 2017 do września 2018 roku autorka przeprowadziła na obszarze Łodzi trzynaście wywiadów z seniorami. W poddanej badaniom grupie były osoby w wieku od 69 do 77 lat. Do przedstawienia w artykule wybrano ośmiu respondentów – siedem kobiet i jednego mężczyznę. Wykorzystano najciekawsze fragmenty ośmiu wywiadów wpisujących się w tematykę artykułu. Przedstawienie wszystkich informacji zawartych we wspomnianych wywiadach znacznie wykracza poza ramy przyjętego postępowania wyjaśniającego – także z uwagi na obszerne materiały, które zostały zebrane podczas prac terenowych.

W dalszej części opracowania podawano w skrócie płeć respondenta i wiek – dla kobiet w formacie (K.wiek), a dla mężczyzn (M.wiek). Dane dotyczące tego, kto brał udział w badaniach, kiedy się one odbyły i gdzie oraz jak przebiegały, zestawiono w Tabeli 1. W wyborze podmiotu badań zastosowano nielosowy dobór próby, nieprobabilistyczny, nieposiadający aparatu losowania. Był to dobór celowy (arbitralny), a jego klucz stanowiła realizacja celu badań. Do tej próby dobrano jednostki spełniające kryteria postawione przez autorkę w badaniach. Byli to ło-

dzianie w wieku senioralnym, powyżej 65 lat. Wadą takiego doboru próby było to, że nie był on reprezentatywny.

Tabela 1. Zestawienie danych dotyczących przeprowadzonych wywiadów

Lp.	Kto brał udział w badaniach?	Kiedy odbyły się badania?	Gdzie odbyły się badania?	Jak przebiegały badania?
1	Mężczyzna lat 77 (M.77)	13.09.2018	W domu respondenta	Trudno
2	Kobieta lat 69 (K.69)	13.09.2018	W domu respondentki	Emocjonalnie
3	Kobieta lat 72 (K.72)	13.09.2017	W domu badaczki	Miło
4	Kobieta lat 73 (K.73)	5.08.2018	W domu respondentki	Pozytywnie
5	Kobieta lat 74 (K.74)	19.05.2018	W domu respondentki	Nerwowo
6	Kobieta lat 75 (K.75)	2.09.2017	W domu respondentki	Spokojnie
7	Kobieta lat 76 (K.76)	16.08.2018	W domu respondentki	Miło
8	Kobieta lat 77 (K.77)	15.02.2018	W domu respondentki	Spokojnie

Źródło: opracowanie własne

W badaniach naukowych kluczową rolę stanowią wykorzystywane pojęcia. Tematyką pracy są potrzeby i marzenia stanowiące czynnik pomyślnego starzenia się. Wyjaśnienie tych pojęć wydaje się zatem celowe.

Potrzeby to silnie odczuwane pragnienia posiadania czegoś, co jest przydatne, niezbędne i konieczne do normalnej egzystencji lub do właściwego funkcjonowania. Natomiast marzenia to powstający w wyobraźni ciąg obrazów i myśli odzwierciedlających pragnienia, często nierealne, ale też przedmiot pragnień i dążeń (*Słownik języka polskiego PWN*). Potrzeby związane są z codzienną egzystencją, mówią nam o braku czegoś – poprzez ich zaspokojenie ludzie dążą do poprawy warunków życia. Marzenia i potrzeby łączą się ze sobą nierozerwalnie poprzez to, że nadają życiu sens i pomagają je ulepszać – czy to w sprawach codziennych, czy też w sprawach wyższego rzędu. Za uczucia wyższego rzędu możemy uznać marzenia – czasami pozostają one nieosiągalne, a czasami spełniają się i nadają życiu sens. Marzenia często sprzyjają pomyślnemu starzeniu się – dzięki dążeniu do ich spełniania zachowujemy sprawność fizyczną i intelektualną, samodzielność i pozytywnie postrzegamy świat. Spełnianie marzeń daje szczęście, a szczęśliwi seniorzy żyją dłużej (por. Kowaleski, Szukalski, 2008: 7).

Ważnym aspektem poruszanym w artykule są potrzeby seniorów wynikające bezpośrednio z warunków życia, które to oznaczają „ogólny stan zaspokojenia wszelkich potrzeb i działalności człowieka" (Liszewski, 2004: 10). Każdy człowiek ma określone potrzeby i zaspokaja je poprzez kontakty z otoczeniem, tak więc warunki życia można zdefiniować jako bezpośrednie relacje zachodzące między jednostką a otoczeniem (Regulski, 1982: 55). Człowiek w dążeniu do realizacji swoich potrzeb poszukuje najbardziej sprzyjających warunków, co daje mu siłę napędzającą do przemieszczania się w przestrzeni (Nowak, 2017: 60).

3. Potrzeby zdrowotne, opiekuńcze i mieszkaniowe seniorów

3.1. Potrzeby zdrowotne

Wojtyniak i Goryński (2001) przyjęli za Światową Organizacją Zdrowia, że stan zdrowia jednostki to *continuum* od pełnego dobrostanu fizycznego, psychicznego i społecznego, poprzez stany niedomagań, początkowo niezdiagnozowanych, a następnie rozpoznanych i określonych różnymi stopniami ciężkości, uciążliwości i różnymi konsekwencjami dla sprawności osoby, a kończąc na całkowitym wyczerpaniu zdrowia i w konsekwencji zgonie. Głównym czynnikiem wyznaczającym stan zdrowia populacji jest struktura wieku. Populacja o większym odsetku osób w starszym wieku ma gorszy stan zdrowia i większe potrzeby zdrowotne. W Polsce najwyższy odsetek osób w wieku 65 i więcej lat ma województwo łódzkie (14,2%). Przewiduje się dalsze postępowanie starzenia się społeczeństwa polskiego, z powodu przyspieszonego wzrostu udziału osób w wieku poprodukcyjnym wśród ludności. W ramach statystyki publicznej systemy informacyjne generują dane dla mierników zdrowia populacji. Istnieją informacje o zgonach i hospitalizacjach, ale brak jest szczegółowych informacji o przyczynach wizyt w poradniach podstawowej opieki zdrowotnej i u lekarzy specjalistów. Natomiast takie informacje mogłyby przysłużyć się do oszacowania zapadalności na choroby, które nie prowadzą do zgonu. Proponuje się przeprowadzanie co kilka lat ogólnopolskich badań stanu zdrowia ludności. Wyniki takich badań będą miały na celu szacowanie potrzeb w zakresie opieki zdrowotnej (Wojtyniak, Goryński, 2001: 4–36). Struktura wieku ludności nieprzerwanie zmienia się i powoli dąży do zwiększania się liczby seniorów. Umożliwiają to zdobycze medycyny, pomagające utrzymać zdrowie i przedłużające życie. Gerontolog Aubrey de Grey twierdzi, iż „sztandarowym projektem współczesnej nauki jest pokonanie śmierci oraz obdarzenie ludzi wieczną młodością" (Harari, 2018: 35). Na kondycję i jakość życia człowieka starszego ogromny wpływ ma potrzeba uczestnictwa i integracji w różnych grupach społecznych. Na podniesienie samopoczucia i satysfakcji seniora z życia wpływają kontakty, które dostarczają wsparcia i promują wzorce zachowań sprzyjających utrzymaniu zdrowia (por. Gałuszka, 2006: 114). Ponadto składniki jakości życia zależą od stylu życia (w domu lub w instytucjach) i osobistej kondycji (wieku, płci) (por. Fernández-Ballesteros, Zamarron, 2007).

3.2. Potrzeby opiekuńcze seniorów

W związku z „nową demografią", utratą zdolności zachowania równowagi urodzeń i zgonów, przyspieszeniem powiększania się liczby osób powyżej 65 lat zaspokojenie potrzeb opiekuńczych tych osób musi zwiększyć swój zasięg. Konsekwencje starzenia dotykają relacji międzypokoleniowych, które są związane z potencjałem opiekuńczym zamykającym się w ramach wsparcia rodziny. W związku z wydłużaniem się przeciętnego trwania życia powiększa się liczba osób mających żyjących rodziców, dziadków, pradziadków. Dzięki temu struktura życia rodzinnego przekształca się w kierunku całkiem nowych relacji międzypokoleniowych. Niestety, nie zawsze współczesna rodzina może czy też chce wypełniać obowiązki związane z opieką nad seniorami rodu, które wcześniej były uznawane za naturalne. W związku z tym zmniejsza się współczynnik potencjalnych opiekunów osób starych. W takim przypadku obowiązki opiekuńcze nad nimi powinno przejąć państwo. Jeśli liczba seniorów będzie nadal wzrastała, to i zapotrzebowanie na usługi opiekuńcze będzie rosło. Warto zatem przedsięwziąć kroki mające na celu kompleksowe zapoznanie się z potrzebami osób starych, w celu ułatwienia im życia (por. Janiszewska, Kikosicka, 2015: 141–154).

3.3. Potrzeby mieszkaniowe seniorów

Wraz z przyrostem ilości czasu wolnego seniorów, a tym samym czasu spędzanego w mieszkaniu, rośnie udział i znaczenie czynnika emocjonalnego w odniesieniu do miejsca, które traktowane jest jak dom. Stosunek emerytów do własnego mieszkania wiąże ich z nim, prowadzi do identyfikacji osoby z mieszkaniem i może przekształcić się w szczególną postawę w stosunku do otoczenia. Mieszkanie staje się atrybutem lub też symbolem statusu społecznego jego właściciela i to bez względu na to, czy tak jest w rzeczywistości, czy też tylko właściciel doszedł do takiego przekonania. Wpływa to na jego decyzje i postawy w sprawie mieszkania, jego wyposażenia i sposobu użytkowania (Goryński, 1973: 26).

Z badań przeprowadzonych przez autorkę wynika, że samotne osoby w starszym wieku żyją głównie w tych mieszkaniach, w których mieszkały wraz z rodziną, współmałżonkiem, dziećmi. Po wyprowadzeniu się dorosłych już dzieci czy też śmierci współmałżonka nadal pozostają w tym lokum, mimo że dla jednej osoby jest ono za duże. Wiąże się to z koniecznością utrzymania go w czystości, wykonania drobnych napraw czy remontów. Nie można również pominąć faktu opłat za mieszkanie: czynszu, ogrzewania, prądu. Nie jest to jednak żadnym bodźcem dla seniora do tego, aby podjął decyzję o zamianie lokum na mniejsze, bardziej dopasowane do potrzeb jednej osoby. Należy nadmienić, że do takiej decyzji nie skłania nawet fakt mieszkania na trzecim lub czwartym piętrze w bloku

bez windy. Jedna z respondentek (K.76), mieszkająca na trzecim piętrze, zdecydowała się na przeprowadzenie generalnego remontu mieszkania, a nawet nie pomyślała o tym, że w ramach tych kosztów mogła zamienić mieszkanie na mniejsze, uzyskując z tego tytułu profity finansowe. Kwestią do przeanalizowania jest zatem aspekt przynależności i emocjonalnego związania z mieszkaniem, w którym spędziło się z rodziną tyle lat. Ważną rolę odgrywają tu miłe wspomnienia związane z rodziną i afirmacja ich obecności w pamięci i sercu. Dom to miejsce, w którym jest się „u siebie" – w nim odbywały się najważniejsze wydarzenia związane z życiem rodziny i w nim chce się pozostać, aby celebrować pamięć o bliskich. To właśnie to miejsce dzieci uważają za dom rodzinny i odwiedzają wraz ze swoimi rodzinami. O tym miejscu opowiadają swoim dzieciom, wnukom i prawnukom: „W tym pokoiku mamusia mieszkała/tatuś mieszkał", „Tu spał/-a, tu się uczył/-a.", „A tu, widzisz, są moje pamiątki: książki, zabawki", „Tę muszlę przywiozłem/-łam znad morza jak byłam/-łem w twoim wieku". Dla młodszych pokoleń często jest to „miejsce kultu". Powodem tego może być pozostawienie „ich małego świata/pokoju" w stanie niezmienionym. A zatem gdyby senior podjął decyzję o przeprowadzce do mniejszego mieszkania, nie byłby to już dom rodzinny. Tak więc osobom starszym odpowiada taki stan, jaki jest, bo tu mogą przyjmować swoje dzieci wraz z ich rodzinami. A ich dzieci wracają do domu jak do siebie i dobrze się w nim czują, bo tam wspomnienia zapisane są rzeczach. W takim domu odbywają się święta i rocznice, ale w pozostałe dni seniorzy przeżywają w nim swoje ciche dni w samotności, choć w otoczeniu bliskich sercu pamiątek. Większość z nas swój świat buduje właśnie na zebranych pamiątkach czy też ulubionych książkach. Choć pragniemy, aby ten świat naszych wspomnień stał się światem naszych następców, to nie wiemy, czy dojdzie do takiego następstwa indywidualnych światów. Szerzej nauką o domu i zamieszkiwaniem w nim zajmuje się oikologia (Sławek, Kunce, Kadłubek, 2013).

Alternatywą dla samotnego życia jest zbiorowe zamieszkiwanie z podobnymi do siebie osobami, które wiąże się z otrzymywaniem wsparcia, posiłku, opieki lekarskiej. Jednak czy publiczne domy seniora to coś, o czym marzą wszyscy seniorzy? W wyjątkowych sytuacjach, na przykład ze względów zdrowotnych, takie wyjście jest jedynym możliwym dla osoby starszej. Już w latach siedemdziesiątych XX wieku Goryński zauważył, że mieszkania dla ludzi starych mogą być kiedyś specjalną formą mieszkania, której społeczne znaczenie będzie w Polsce wzrastało. Ma to związek z drugim wyżem demograficznym, obejmującym osoby w wieku poprodukcyjnym. Wpływają na to również zjawiska społeczne – w głównej mierze takie jak niechęć zamieszkiwania razem więcej niż dwóch pokoleń. Ta niechęć pojawia się tak w pokoleniu młodszym, jak i starszym. Osoby stare dążą do zachowania *status quo* swojej samodzielności jak najdłużej. W wielu krajach ten problem próbowano rozwiązać poprzez tworzenie specjalnie dedykowanych dla seniorów budynków typu pensjonatowego lub też mieszkań kolektyw-

nych. W Polsce takie rozwiązania ograniczają się do osób wymagających stałej opieki. Za najwłaściwszą formę uważa się mieszkania jedno- i dwuosobowe, które są odpowiednio wyposażone dla osób starszych. Nie są one jednak wyodrębnione z otoczenia osiedla mieszkaniowego, tak aby osoby stare nie były wyobcowane ze społeczeństwa i mogły w nim w miarę możliwości i potrzeb uczestniczyć (Goryński, 1973).

4. Miasto przyjazne seniorom i miasto nie dla starych ludzi

Światowa Organizacja Zdrowia w 2002 roku wdrożyła program Ramy polityczne dotyczące aktywnego starzenia się (*Policy Framework on Active Ageing*). Dzięki temu zwrócono uwagę na prawa mieszkańców miast – szczególnie ze względu na wiek. Wyraźnie zaznaczono, że miasto jest wspólną przestrzenią, która należy do zamieszkującej ją społeczności. Władze miejskie zostały zobowiązane do zapewnienia jakości życia wszystkich mieszkańców. Wiadomo, że z wiekiem postępuje niesprawność i rośnie liczba inwalidów, i to szczególnie w najstarszych grupach wiekowych, a to warunkuje sposób życia seniorów (Szołtysek, 2013: 67–70). Zmniejsza się możliwość ich swobodnego poruszania się i korzystania z dostępnej komunikacji miejskiej. Część taboru jest już niskopodłogowa, również nowo remontowane przystanki są adaptowane do możliwości wygodnego korzystania z nich przez osoby starsze, mające problem z poruszaniem się lub przemieszczające się na wózkach. Jednak nadal kursują tramwaje i autobusy, które są niedostępne dla nich. Seniorzy skarżą się na słabość i bóle w kolanach, które utrudniają lub też całkowicie wykluczają możliwość wejścia i zejścia po schodach prowadzących do pojazdów komunikacji miejskiej. Osoby te muszą czekać dłużej na pojazd niskopodłogowy lub dojść do przystanku, który ma perony dostosowane do możliwości seniorów i osób niepełnosprawnych. W opinii seniorów jest to dla nich znaczne utrudnienie, jeśli muszą tracić czas i siły, nadkładając drogi, aby dojść do przystanków dostosowanych do ich potrzeb. To bardzo ogranicza ich mobilność oraz chęć wyjścia z domu i planowania jakichkolwiek przemieszczeń na terenie miasta. Tak więc najczęściej osoby starsze ograniczają wyjścia z domu jedynie do koniecznych wizyt lekarskich. Nie korzystają z oferty kulturalnej miasta ani nie utrzymują kontaktów towarzyskich. Powoduje to ich izolację i osamotnienie. Taki stan prowadzi często do depresji, braku marzeń, planów na przyszłość i chęci do dalszego życia. Ideałem byłoby, gdyby władze miasta sukcesywnie podejmowały działania umożliwiające kompleksowe uczestnictwo seniorów w życiu kulturalnym miasta. Ważne jest, aby wszelkie działania władz opierały się na stawianiu człowieka w centralnym punkcie i aby to dla niego było przeznaczone i tworzone infrastrukturalne zago-

spodarowanie miasta. Nowo budowane wielorodzinne domy mieszkalne nie mają utrudniających poruszanie schodów przy wejściach do budynków, są wyposażone w płaskie powierzchnie łatwe do pokonania przez seniorów, osoby o kulach czy na wózkach inwalidzkich. Warto nadmienić, że wózkami poruszają się nie tylko niepełnosprawni, ale również małe dzieci i dla ich rodziców również jest to forma udogodnienia. Nowe budynki wyposażone są już w windy. W budynkach starego typu osoby niemogące się samodzielnie poruszać lub poruszające się z trudnością stają się więźniami, odizolowanymi od społeczeństwa, a jedyną możliwością kontaktu ze światem staje się widok z okna i obserwacja zachodzących zmian w otoczeniu. Pozostaje tęsknota za minionymi latami w zdrowiu i niezgoda na taki stan rzeczy, która staje się powodem zgorzknienia i narastającej frustracji z powodu przymusowej izolacji. Jedynym marzeniem takich osób jest pragnienie wyjścia z domu do ludzi i pełnoprawne uczestnictwo w życiu społecznym. Wiele takich osób samotnie spędza czas, oczekując na inicjatywę ze strony rodziny czy znajomych.

Europejska karta ochrony praw człowieka w mieście (*European charter for the safeguarding of human rights in the city*) gwarantuje mieszkańcom, bez względu na wiek, równe traktowanie, które mają koordynować władze miejskie, a także specjalną ochronę tym grupom mieszkańców, które nie są w pełni sprawne. Co więcej – nakazuje władzom miasta podjęcie działań mających na celu zapewnienie uczestnictwa w życiu miasta tej grupy użytkowników (Szołtysek, 2013: 71–72). Czy seniorzy wiedzą, że mają takie prawa i ułatwienia, to inna kwestia. Warto się nad tym zastanowić i sukcesywnie dążyć do poprawy życia seniorów. Globalna inicjatywa miast przyjaznych dla wieku (WHO Global Age-Friendly Cities Initiative) propaguje takie zarządzanie miastem, w którym bierze się pod uwagę wiek użytkowników, tak aby została osiągnięta spójność społeczna seniorów i wzmocnienie ich udziału w społecznym życiu miasta, a następnie zrównanie dostępu do przestrzeni publicznej, w tym budynków, ulic, chodników, parków, dla wszystkich mieszkańców, bez względu na wiek. Kolejny ważny punkt to uniwersalizacja mobilności publicznej. Rozumie się przez to realną możliwość przemieszczania wszystkich użytkowników miasta, niezależnie od ich wieku. Rozpatruje się również trudność w przemieszczeniu z chodnika do środka komunikacji miejskiej, którą należy rozwiązać na korzyść osób z niepełnosprawnością ruchową. W efekcie tego komunikacja środkami miejskimi powinna ułatwiać podróżowanie właśnie tej kategorii użytkowników. Bierze się również pod uwagę umożliwienie seniorom pozostania w kontakcie ze społecznością poprzez eliminację izolacji fizycznej, finansowej i społecznej. Mimo tych wytycznych dzisiejsze miasta nie są wzorem do naśladowania, co potwierdzają badania empiryczne przeprowadzone przez autorkę. Rozmowy z seniorami wykazały, że sami mieszkańcy potrafią wymienić wiele ułomności mieszkaniowych i komunikacyjnych, które nie gwarantują im bezpiecznego i komfortowego egzystowania i poruszania się po mieście. Urbanizacja nie bazuje na priorytecie tworzenia idealnego środowiska życia dla seniorów. Nawet młodzi ludzie odczuwają dyskom-

fort wynikający z nierówności chodników, szybko przejeżdżających rowerzystów, deskorolkarzy czy osób poruszających się pojazdami napędzanymi elektrycznie. A to wszystko dla starszych ludzi jest odczuwalne w zdwojony sposób i nie zachęca do samodzielnych wypraw, chociażby na spacer. A przecież ruch to zdrowie. Taka sytuacja wytwarza u seniorów coraz większy lęk przed otoczeniem i powoduje izolowanie się w swoich mieszkaniach. Nie mamy pojęcia, jak wiele starych osób samotnie spędza czas w swoich domach z obawy przed niedostosowanymi do ich potrzeb traktami komunikacyjnymi. Ich największą potrzebą i marzeniem jest to, aby móc bezpiecznie udać się na zakupy, do kościoła, parku czy zwyczajnie odwiedzić rodzinę bądź sąsiadów. Chęć wyjścia z domu walczy u nich z obawą przed upadkiem na nierównej drodze latem, a oblodzonej zimą. U starych osób bardzo częste są wypadki prowadzące do wykluczenia z dotychczasowej samodzielności. Takie obawy zamykają seniorów w domach. Tak powstaje ambiwalentne znaczenie domu. Dom (mieszkanie) stanowi azyl, bezpieczną twierdzę, ma zapisaną historię rodziny, ale również jest miejscem osamotnienia i uwięzienia z powodów niezależnych od seniora, a związanych z jego wiekiem i brakiem możliwości samodzielnego funkcjonowania poza nim. Nawet dla zdrowych, młodszych ludzi zauważalny jest czas przeznaczony na pokonanie przejścia dla pieszych, niedostosowany do możliwości seniorów. Seniorzy poruszają się wolniej i ich reakcje są spowolnione, co stwarza sytuacje niebezpieczne na drogach, które chcą przekroczyć. To również wpływa na jakość ich życia i obawy przed samodzielnym poruszaniem się po mieście. Takie sytuacje zmniejszają możliwości i chęci uczestnictwa w życiu społecznym i kulturalnym miasta. Seniorzy stają się także celem oszustów, na przykład sprzedających suplementy diety, mające im pomóc w sprawach zdrowotnych, niepotrzebny sprzęt domowy czy medyczny. Często też dochodzi do kradzieży mienia seniorów lub też ich danych osobowych, umożliwiających złodziejom wzięcie kredytu czy podjęcie innej niekorzystnej decyzji finansowej „na konto" seniorów. Jednym z przykładów jest ostatnio popularna i niechlubna „metoda na wnuczka", która – mimo wielu komunikatów w mediach i ostrzeżeń – cały czas zbiera swoje żniwo. Jest ona efektem samotności i izolacji seniorów, którzy są szczęśliwi, gdy odezwie się potrzebujący od nich pomocy wnuczek – czasem po wielu latach milczenia. Oczywiste i konieczne jest zatem to, że seniorzy powinni być chronieni pod wieloma względami przez państwo.

W Łodzi działa Sąsiedzki Klub „Przystanek", który dąży do poprawy warunków życia mieszkańców. W dniu 6 czerwca 2018 roku zorganizował on spotkanie obywatelskie z przedstawicielami lokalnej polityki. Z przykrością zauważono nieobecność wielu zaproszonych polityków, którzy o potrzebach łodzian przypominają sobie zazwyczaj dopiero przed wyborami. Sala udekorowana była dużym napisem „To nie jest kraj dla starych ludzi", zapożyczonym z filmu „No Country for Old Men" Joela i Ethana Cohenów z 2007 roku, który został oparty na powieści Cormaca McCarthy'ego o tym samym tytule. Tak więc uznano, że Łódź też nie jest miastem dla sta-

rych ludzi, dlatego zorganizowano to spotkanie. Dyskutowano nad sytuacją seniorów i osób niepełnosprawnych w mieście. Rozmowa ta była ciekawa i ukazała potrzebę wielu zmian, tak aby Łódź mogła stać się miejscem przyjaznym seniorom. Przeanalizowano konkretne problemy i możliwe rozwiązania. Mówiono głównie o nieprzystosowanej komunikacji miejskiej, braku ławek, nierównych chodnikach i wysokich krawężnikach utrudniających życie seniorom i osobom, które poruszają się o kulach czy na wózkach inwalidzkich. Mieszkańcy dyskutowali o minionych „Senioraliach" i stwierdzili, że można było wydane na nie fundusze przeznaczyć na zaspokojenie potrzeb, które zgłaszają starsze osoby. Krytyce poddane zostały również „Łódzka Tytka Seniora"[1] i „Pudełko Życia"[2]. Zdaniem seniorów akcje te mają charakter jedynie wizerunkowy i nie są tym, czego oni najbardziej potrzebują. Razi ich, że takie akcje wywołują stygmatyzację środowisk, do których są adresowane. Ideą powinna być integracja różnych grup – lepiej, aby były to wydarzenia kulturalne czy sportowe dla wszystkich grup wiekowych. Mówiono również o tym, że w Łodzi zmiany dla osób starszych i niepełnosprawnych wprowadzane są zbyt wolno, a pomysły na ich realizację nie są konsultowane z samymi zainteresowanymi. Władze lokalne nie opracowały strategii rozwiązywania problemów seniorów, a inicjowane działania są chaotyczne i nieprzemyślane. Na zakończenie urzędnicy odnieśli się do licznych propozycji i uwag. Padło wiele deklaracji i konkretne terminy ich realizacji. Niestety, dla seniorów kilka lat oczekiwania na poprawę sytuacji to termin nie do przyjęcia. Konieczne byłoby wprowadzenie spotkań z obywatelami w celu uzgadniania planów działań urzędników i lokalnych polityków. Byłby to krok zrobiony w kierunku seniorów, którzy rzadziej korzystają z internetu i nie mogą wypowiadać się w ramach łódzkich konsultacji społecznych. Należałoby zastanowić się, czy mieszkańcy są dla władz lokalnych, czy władze lokalne dla mieszkańców, a głównie nad tym, jak pomóc seniorom, aby łatwiej im się żyło (Janeczko, 2018: 15).

Z punktu widzenia jednostki dożycie starości świadczy o jej sukcesie. Jednak społeczne konsekwencje tego sukcesu nie stanowią już takiego pozytywnego odzewu i wywołują problemy, tak w życiu starych ludzi, jak i w instytucjach, które mają służyć im pomocą i wsparciem (por. Kowaleski, Szukalski, 2006: 9). Stanem pożądanym byłoby, gdyby wszyscy ludzie przeżywali jak najmniej cierpień wynikających z niesprawności ciała lub też płynących z braku pozytywnych więzi społecznych, rodzinnych, erotycznych, z braku oparcia we wspólnocie i szacunku ze strony innych osób. Z tego wynika, że konieczne jest, aby wszystkie instytucje, okoliczności, stosunki międzyludzkie i całe życie zbiorowe ludzi zostały tak ułożone, aby w jak największym stopniu pomagały w realizacji „Życzeń Minimalnych", w życiu maksymalnej liczby osób (Grzegorczyk, 1995: 104).

1 Spis wydarzeń miejskich oraz adresów organizacji pozarządowych.

2 Spis najważniejszych informacji o pacjencie, który ma pomagać ratownikom w razie interwencji.

5. Marzenia seniorów

W przeprowadzonych badaniach seniorzy odpowiadali na pytania o ich potrzeby i marzenia. Oto niektóre z ich wypowiedzi:

M.77: „Jakie marzenia można mieć w tym wieku? Tylko żeby żyć jeszcze któryś rok, w jako takim zdrowiu".

K.69: „Marzę, aby moje dzieci były bliżej, bo są daleko i brak mi bliższego kontaktu z nimi, bardzo za nimi tęsknię. Chciałabym mieć jeszcze psa, albo kota nawet bardziej, bo zawsze miałam, przez 30 lat pekińczyki, ale teraz boję się, że jak będę chciała gdzieś wyjechać, albo pójdę do szpitala, to kto się nim zajmie".

K.72: „Obecnie spełniam się w roli gospodyni domowej i opiekunki chorego męża, ale chciałabym więcej zadbać o siebie i swoje potrzeby. Jestem szczęśliwa i chciałabym być jak najdłużej samodzielną, by nie być ciężarem dla rodziny. Moim marzeniem jest większe uczestniczenie w życiu kulturalnym, wyjście z domu do teatru, na koncert".

K.73: „Ja powiem tak, że ja w zasadzie żyję takim dniem dzisiejszym. No po prostu, ja to tak mówię, moja wnuczka ma teraz 14 lat, marzę o tym, no bardzo bym chciała, żebym wiedziała, na jakie studia pójdzie, no jak jej życie się ułoży. I teraz bardziej patrzę na to, jak ona w życiu, no brzydkie słowo, ale wyląduje, jaka ona będzie w życiu, bardzo mi na tym zależy, jakie ona będzie miała wartości, czy ona przejmie po mnie te wartości, że warto być, a nie mieć".

K.74: „Ja już zwiedziłam świat. Ostatnio byłam w Anglii w 2011 roku, jak urodziła się moja prawnuczka Oliwia, pojechałam na jej urodziny. To było 50 kilometrów od Londynu. Od tej pory nie byłam nigdzie więcej za granicą. Marzenia to tylko to, żeby było zdrowie teraz".

K.75: „Moi marzeniem jest mieć jeszcze trochę więcej zdrowia, by częściej móc wychodzić na spacery i marzę, by mieć kotka, który by się do mnie przytulał, to wszystko".

K.76: „Czy ja mam marzenia? Chyba tylko chciałabym, żeby moim dzieciom żyło się lepiej, żeby nie byli wykorzystywani, żeby nie byli oszukiwani, żeby im było lepiej, a dla siebie to ja nic nie potrzebuje. Spokoju, zdrowia, tak, tak, tak. Po 9 operacjach to zawsze coś tam ubytku jest i to zdrowie pada. Poza tym praca, którą przeszłam, też na zdrowie wpływa jakoś ujemnie. Potrzeby na pewno się zmieniają, bo to jest tak, że jak się ma coś, to się myśli, że jak bym miała, to coś tam więcej trochę, to byłoby lepiej. Marzenia to piękna rzecz i każdy może je mieć".

K.77: „Marzę jedynie o tym, aby jak najdłużej pozostawać w jako takim zdrowiu, możliwości samodzielnego zajmowania się sobą i nie chcę być ciężarem dla nikogo".

Tabela 2. Zestawienie marzeń respondentów

Lp.	Kto brał udział w badaniach?	Marzenia
1	Mężczyzna lat 77 (M.77)	Zdrowie
2	Kobieta lat 69 (K.69)	Bliższy kontakt z dziećmi, posiadanie psa lub kota
3	Kobieta lat 72 (K.72)	Samodzielność i rozrywka kulturalna
4	Kobieta lat 73 (K.73)	Wiedza o tym, jak się wnuczce w życiu ułoży
5	Kobieta lat 74 (K.74)	Zdrowie
6	Kobieta lat 75 (K.75)	Zdrowie i mieć kotka
7	Kobieta lat 76 (K.76)	Zdrowie, spokój i aby dzieciom żyło się lepiej
8	Kobieta lat 77 (K.77)	Zdrowie

Źródło: opracowanie własne

Na ośmioro poddanych badaniom seniorów pięciu jako główne marzenie wymieniło zdrowie. Jest to związane z ich stanem zdrowia i na tym etapie życia jest to najważniejszym marzeniem, często nieosiągalnym. Ze zdrowiem wiąże się bezpośrednio bycie samodzielnym, bo tylko zdrowa osoba może być samodzielna i może korzystać z oferty kulturalnej miasta. Kolejnym marzeniem, deklarowanym przez dwie respondentki, jest wiedza o tym, jak będzie się żyło dzieciom, wnukom i pragnienie, aby im było lepiej. Łączy się to z niewypowiedzianym marzeniem długiego życia dla siebie, bo tylko wtedy można być obserwatorem życia swoich dzieci i wnuków. Dwie osoby jako swoje marzenie na drugim miejscu wymieniły pragnienie posiadania psa lub kota. To marzenie ma związek z brakiem bliskiego kontaktu z dziećmi i chęcią zastąpienia ich chociażby kontaktem z jakimś stworzeniem, którym można się opiekować i które będzie namiastką dzieci. Jest to aspekt przeniesienia uczuć i pragnienia posiadania kogoś, kogo można obdarzyć uczuciem, do kogo można się przytulić. Jest to ważna sfera życia w każdym wieku, która najbardziej uwidacznia się, kiedy osoby stare stają się samotne. Pragnienie posiadania psa czy kota w przypadku respondentek pozostanie tylko w gestii marzeń – ze względu na to, że ich zdrowie nie jest najlepsze i w każdej chwili może się pogorszyć, co wiązałoby się z koniecznością pobytu w szpitalu.

Wynikiem obserwacji terenowej jest zamieszczona poniżej rozmowa, niebędącą wywiadem przeprowadzonym przez badaczkę, a zasłyszaną rozmową telefoniczną. Była to rozmowa telefoniczna przeprowadzona w tramwaju przez około 70-letnią kobietę:

> Boli mnie głowa, że oczy mi z głowy wychodzą. Nie mogłam w nocy się wyspać, bo wstawałam do męża. Musiałam mu dać tabletkę, bo bolała go głowa. Wiesz, jak to jest, jak chłop jest chory, to świat się kończy. A gdzie w tym jestem ja? Kto o mnie zadba? Wiesz, moje koleżanki też narzekają na mężów, że są jak dzieci i trzeba się nimi opiekować. Najlepiej chwalą swoje życie te moje koleżanki, które są same i nie muszą znosić kaprysów swoich chorych mężów. A jeszcze lepiej chwalą koleżanki, które mają panów, z którymi spotykają się tylko cza-

> sami, a mieszkają same. Na co dzień mogą zajmować się tylko sobą, a czasami mogą dla przyjemności spotkać się towarzysko z przyjacielem. I to jest najlepszy układ dla osób w naszym wieku.

Z powyższej wypowiedzi wywnioskować można, że starsze osoby, będące w związkach, opiekują się członkiem rodziny kosztem własnych sił, swojego spokojnego snu. Jeśli zatem z obowiązku i lojalności wypada opiekować się mężem czy żoną, to nasuwa się pytanie, kto zaopiekuje się opiekunem, gdy on opadnie z sił z powodu choroby czy z przemęczenia. Opieka nad chorą osobą to przecież praca przez cały dzień. A seniorzy nie mają już takiej siły ani zdrowia, aby 24 godziny na dobę wykonywać pracę opiekuńczą. Przytoczona rozmowa i wywiad (K.72) ukazują dwa skrajne przypadki. Obie respondentki na pewno się męczą, sprawując opiekę nad mężem, ale jedna widzi w tym problem, a druga szczęście. Tak więc trzeba mieć wiele odpowiedzialności i miłości do współmałżonka, aby z sercem i ogromną cierpliwością wykonywać konieczne czynności opiekuńcze.

Ponadto powyższy cytat potwierdza tezę zawartą w artykule Howie, Troutman-Jordan i Newman (2014: 61–70), że osoby stare cenią bardziej wsparcie przyjaciół niż rodziny czy instytucji społecznych.

6. Podsumowanie

W artykule starano się wykazać, że potrzeby i marzenia seniorów stanowią czynniki pomyślnego starzenia się. Służą one zachowaniu zdrowia i pozytywnemu spojrzeniu na świat, przyszłość i ludzi. Dobrze dobrane marzenia dają seniorom chęć do dalszego życia. Chce się im żyć, aby móc zobaczyć moment realizacji swoich marzeń – czasami dość przyziemnych, jednak uskrzydlających i pomagających pomyślnie się starzeć. Marzenia różnią się od siebie, zmieniają pod wpływem wieku, przeżyć, ale to właśnie one dają chęć do dalszego życia. A nie ma nic gorszego niż człowiek bez chęci do życia. Seniorzy często tylko egzystują, próbują jakoś przeżyć kolejny, trudny, bolesny dzień – czy to z powodu choroby, obowiązków, czy samotności. Dlatego wydaje się konieczne rozpoznawanie różnorakich ich potrzeb i proponowanie działań dostosowujących przestrzeń miast do bezpiecznego i przyjaznego funkcjonowania seniorów. Oferta przeznaczona dla nich jest gwarancją ich swobód obywatelskich. W wyniku przeprowadzonych badań dowiedziono, że marzenia, jakie mają starsi ludzie, to głównie pragnienie zdrowia dla siebie i jak najdłuższej samodzielności. Swoje marzenia seniorzy przenoszą na dzieci, wnuki i prawnuki, pragnąc dla nich powodzenia w życiu, szczęścia i miłości w rodzinie. Chcą jak najdłużej uczestniczyć w życiu najbliższych, tym samym jak najdłużej żyć, aby móc być obecnymi w życiu swoich potomków. W efekcie przeprowadzonych badań należy zmodyfikować tezę mówiącą, że największym

problemem osób starszych jest ich samotność. Z przeprowadzonych wywiadów wynika, że osoby opiekujące się współmałżonkami nie są osobami samotnymi. Jednak z powodu dużej liczby obowiązków związanych z opieką nie mogą zadbać o własne potrzeby oraz realizować swoich pragnień i marzeń. W szczególności nie mogą realizować swoich dążeń związanych z relacjami społecznymi i towarzyskimi. W związku z powyższym tezę, że jednym z problemów osób starszych jest samotność, należy zastąpić tezą o niewystarczającej liczbie i jakości kontaktów społecznych i towarzyskich.

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Seniors' Needs and Dreams as Factors of Successful Aging

Abstract: The aim of the research was to present the dreams of seniors on the basis of field research. Thanks to the obtained research material, based on the case study method, the needs and dreams of the elderly were diagnosed. The research results obtained in this way allow to identify activities leading to their meeting needs.

Keywords: health needs, housing needs, dreams, seniors, city space

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Justyna Danielewicz
University of Łódź, Faculty of Management, Department of City and Regional Management
Łódź, Poland, justyna.danielewicz@uni.lodz.pl

Integrated Management of Metropolitan Areas in Romania

Abstract: The rapid urbanisation of the world leads, among others, to dynamic development of metropolitan areas. The functional relationships between territorial units which make up a metropolitan area mean that the preparation of economically, spatially and environmentally coherent strategies needs to be coordinated at the metropolitan level in order to prevent negative effects of metropolisation and to ensure sustainable development of such an area. This in turn requires that the approach towards managing development shifts in favour of governance and integrated strategies. The paper aims at assessing whether the integrated planning and management is used in metropolitan areas in Romania. The desk research method was applied to analyse Romanian legislation for metropolitan areas, integrated strategies for the development of metropolitan areas and reports on their implementation. Interviews with representatives of selected associations of metropolitan areas provided additional valuable insight.

Keywords: governance, metropolitan areas, integrated planning and management, Romania

JEL: R58, R52, R11

1. Introduction

Contemporary processes of globalisation and the related metropolisation cause fundamental changes in the form, structure, and organisation of cities (Solecki, Leichenko, 2006: 8). The process of metropolisation reconfigures space. From the spatial point of view, there is a noticeable tendency of the population to realign within and around large cities or metropolises. From the functional point of view, there is a tendency to concentrate activity within large cities or metropolises.

As the population grows in the surrounding areas, especially due to urban sprawl and the influx of people from other locations, the geographical and administrative boundaries of cities become insufficient for the purpose of defining the emerging urban areas. This expansion is driven by the broad endogenous local process of economic development which forces communities to gather around the urban centre that acts as a growth pole, in order to increase the level of competitiveness. Metropolitan development is therefore an administrative and economic challenge to the management and coordination of a wider range of resources.

Cities and metropolitan areas are, on the one hand, the "engines" of economic development where jobs, business, and higher education are concentrated. They are generally more productive than smaller urban agglomerations and rural areas. This is due to the territorial capital concentrated in their area, which includes, among others, a higher level of human capital. The larger the metropolitan area, the higher the profile of secondary education and the more talented its inhabitants, which in turn translates into a higher level of productivity. Agglomeration benefits or positive externalities related to the size of the metropolis are another reason for greater productivity. According to OECD estimates, agglomeration benefits are responsible for increasing the productivity of residents by 2 to 5 percent as the city's population doubles (Combes, Duranton, Gobillon, 2011). 75% of Europe's population live in cities and around 85% of GDP is generated in urban areas. Thus, the prosperity prospects of most countries are largely determined by metropolitan areas, which means that effective metropolitan governance is of national importance (Ahrend et al., 2017). On the other hand, metropolitan areas are the site of significant problems related to social cohesion and environmental sustainability. Living in the city is conducive to achieving economies of scale and is inextricably linked with the benefits achieved by providing public services such as hospitals, schools, and universities. However, living in the city is also associated with a number of problems and negative effects. A particular problem faced by metropolitan areas is rapid suburbanisation and urban sprawl. This, in turn, has environmental implications. Cities produce countless amounts of toxic pollutants and greenhouse gases, consume enormous amounts of non-renewable fuels, and burn and store the majority of their waste (Blowers, Pain, 1999). Europe's cities are responsible for 80% of energy consumption and 80% of greenhouse gas emissions. Therefore, they

face the problem of climate change. The challenges to the sustainable development of cities are also posed by the increase in individual consumption and ineffective use of natural resources, as well as the new forms of development which result in the emergence of socially divided, unfair and segregated areas (Cook, Swyngedouw, 2012: 1960). Environmental problems are a typical example of negative externalities and a consequence of the current consumption patterns and lifestyle choices that lead to the abuse of natural resources, the destruction of ecosystems and overpopulation of open areas (Ambruosi et al., 2010: 321).

The fact that the middle and upper classes are moving out of the metropolitan centre increases the intensity of individual commutes. This in turn causes an increase in noise, air pollution and traffic congestion.

Threats to sustainable development result not only from the environmental issues but also from social problems. In metropolitan areas, income inequalities and the progressing impoverishment of the disadvantaged are clearly visible, which in turn leads to social polarisation and segregation, and consequently, to spatial segregation. Districts of wealth and poverty are created in cities. This process is often accompanied by cultural and ethnic segregation, which in turn leads to social exclusion. Unemployment and scarcity of housing are the problems that plague the less affluent residents. The development of metropolitan areas is also often accompanied by an increase in crime and various types of pathologies.

A coordinated management approach is necessary to overcome these challenges. Metropolitan areas are functional units created by a large, complicated, and functionally coherent urban complex, the essential feature of which is the presence of metropolitan functions and functional connections. This cluster constitutes one economy and one labour market, usually under multiple local government jurisdictions. Any metropolitan area includes a number of autonomous territorial units with borders defined by the historical locations of towns and villages. These administrative structures are incapable of fully meeting the challenges of economic and social realities in large urban agglomerations. Although each administrative unit is managed by an independent local authority, one cannot overestimate the importance of the functional connections between individual communes and the central city in the metropolitan area which allow the inhabitants of nearby towns to benefit from easy access to the city's employment market, cultural, educational and health care institutions, as well as its sports and recreational facilities. The clear discrepancy between the administrative borders within which municipalities function to meet the needs of their residents and the borders determined by functional relationships that reflect the actual area of influence of individual urban centres means that to ensure the effectiveness of actions taken by public authorities, it is necessary to implement integrated planning and management methods.

Another characteristic of metropolitan areas is diversity (Heinelt, Kübler, 2004). Metropolises are home to a wide variety of public, private, and social ac-

tors who have varied interests and ideas about public urban issues. These actors attempt to participate in the identification and resolution of these issues. Therefore, metropolitan communities must develop governance mechanisms for the purpose of making decisions about the city and its policies, assimilating the existing groups of actors, and absorbing the complexity involved in governing these broad spaces (Brody, 2003; Portney, 2009).

Poor communication and coordination among local governments in metropolitan areas can have many negative consequences and result in missed opportunities. For example (World Bank Group, 2020):

1. Fragmentation of certain public services (particularly those that benefit all communities, such as public transport) results in higher costs and financing challenges for each local government.
2. Inefficiencies due to a lack of broad-based planning can also arise in such sectors as solid waste disposal and flood management.
3. Negative spillovers. Air pollution, flooding and crime do not respect jurisdictional borders.
4. Free ridership. For example, the core city may need to address such problems as congestion from its own resources without fair contributions from the neighbouring jurisdictions that benefit from the positive effects of the agglomeration.
5. Underutilisation of some land which may have a limited value locally but potentially carry a higher value from a regional perspective.
6. Disparity between parts of the metropolitan area, e.g. differences in local financial capacities, creating large differences in the quality of amenities and services.

Overcoming metropolitan problems requires coordination and cooperation of local authorities and other stakeholders operating in the metropolitan area. This coordination and cooperation can be of more or less formalised nature. Metropolitan authorities which form a part of local government are the most formalised form of management coordination in metropolitan areas, while various types of loose agreements, often informal ones, between stakeholders in a given metropolitan area are the least formalised form.

The aim of this study is to assess the extent to which an integrated approach to development management is used in the management of metropolitan areas in Romania, with particular emphasis on governance. Romanian metropolitan areas have been chosen as the case study because, on the one hand, they have developed dynamically in recent years, which causes a number of problems (mentioned above) and requires changes in the approach to management, and on the other hand, there is little literature on the management of metropolitan areas in Eastern European countries where, since the end of the 1990s, we have witnessed the process of transition from a centrally planned economy to a market economy. The desk

research method was applied to analyse Romanian legislation for metropolitan areas, integrated strategies for the development of metropolitan areas and reports on their implementation. Interviews with representatives of selected associations of metropolitan areas, conducted by e-mail between June and September 2020, provided additional valuable insight.

2. Integrated development management in metropolitan areas

Generally speaking, integrated development management can be understood as the combination of various activities at the level of a functional area and the creation of appropriate institutions to respond to problems in this area. Already in the Leipzig Charter, there are recommendations for cities that could be successfully applied to metropolitan areas. The Charter recommends that integrated development programmes for the entire functional area be devised. These implementation-oriented planning tools should (*Karta Lipska...*, 2007):

1) define a coherent vision and development goals for the entire area,
2) coordinate various territorial, sectoral, and technical plans and strategies, and ensure that the planned investments contribute to promoting the sustainable development of the functional area,
3) coordinate and spatially focus the use of funds by public and private sector actors, and
4) be coordinated at the local as well as urban level and involve citizens along with other partners who can significantly contribute to the shaping of the future quality of each area in economic, social, cultural and environmental terms.

In the Pact of Amsterdam, the ministers responsible for urban affairs agreed that the complexity of urban challenges requires integrating various aspects of policies to avoid conflicting consequences and to increase the effectiveness of interventions in urban areas. Among priority topics of the EU urban agenda, there are ones that are key for the development of metropolitan areas (Urban Agenda…, 2016):

1. Effective urban governance, including citizens' participation and new models of governance.
2. Governance across administrative borders and inter-municipal cooperation: urban-rural, urban-urban and cross-border cooperation; a link with territorial development and the Territorial Agenda 2020 (well-balanced territorial development).
3. Sound and strategic urban planning; a link with regional planning and balanced territorial development, with a place-based and people-based approach.
4. An integrated and participatory approach.

The purpose of integrated planning is not only the development of the city or metropolis as a whole, but also the development of its individual areas, especially the problem ones. Development is based not only on space transformation but also on solving social and economic problems. The integrated planning process defines the development needs of the city and its problem areas as well as the methods of addressing them in the urban space. The interests of residents and users of the space are analysed. The investments agreed on in this process are secured by their inclusion in detailed spatial development plans. As a consequence, such integrated city development planning precedes local law-making procedures.

Integrated development planning enables various entities to engage in comprehensive and multi-level activities in the form of partnership, and with a high degree of socialisation. It also makes controlling development processes possible. The essence of integrated development planning is a network of connections between various entities and the establishment of partnerships so development projects can be implemented. Thanks to integrated planning and management, cities can cope with the new challenges of quality spatial, social, and economic reconstruction.

Integrated management within a metropolitan area requires the widest possible cooperation of local government authorities, crossing the predetermined borders of administrative and competence divisions (Markowski, 2011). It is therefore not surprising to find that integrated planning has become established in planning studies during the past decades (Rotmans, van Asselt, Vellinga, 2000), along with policy integration (Geerlings, Stead, 2003; Albrechts, 2006; Hull, 2008; Stead, Meijers, 2009; Vigar, 2009; Candel, 2017; Tosun, Lang, 2017) and collaborative planning (Healey, 2010). It requires careful consideration of the dynamic systems of territorial connections that change both in time and space (Mantey, 2013).

We can distinguish five forms of integration:

1. Spatial integration. It is particularly important in metropolitan areas with strong anthropopression affecting the areas around the central city. In order to prevent the uncontrolled urban sprawl, it is necessary to implement an integrated spatial policy for the entire metropolitan area.
2. Functional (sectoral) integration. Due to the fact that social, economic, environmental, and spatial phenomena are closely interrelated, it is necessary to depart from a sectoral approach to development planning in order to create a coherent strategy for socio-economic and spatial development.
3. Time integration. When planning various activities, it is necessary to consider the schedule of their implementation within the entire functional area in order to reduce costs.
4. Stakeholder integration. Integrated planning and developments can be achieved through multi-level governance (Paulsson, 2020: 4), i.e. the cooperation of national, regional, and local public entities, business entities and social sector organisations, including the inhabitants themselves. Integrated planning of-

ten denotes horizontal collaboration between different organisations within one policy field. In this context, collaborative planning is used to describe and acknowledge that governmental organisations cannot implement their plans or policies alone, but that they are interdependent on other actors in society (Healey, 2010). Integrated planning may also refer to vertical collaboration, where governmental organisations placed at different levels in the governance structure (e.g. local, regional and national) must coordinate their activities to achieve a common objective (Bulkeley, Betsill, 2005; Newig, Fritsch, 2009). Many scholars agree that while an administratively fragmented city can choose to govern and manage its parts individually, collaborative connections lead to better outcomes. Research has documented these advantages of cooperation and coordination (e.g., Morgan, Mareschal, 1999; Feiock, 2004). Scholars suggest that the vertical relationships between state governments and their municipalities and the horizontal relationships between local governments shape regional governance (Miller, Lee, 2009). Cities are an arena of constant interaction among diverse institutional actors leading to the development of agreements and contracts between them. For this cooperation to develop, the entities must have convergent priorities that cannot be achieved independently.

5. Financial integration. The development of metropolitan areas, which are the engines of development, requires the funds not only from the territorial units of the functional area, but also the funds from the central budget, European funds, and private resources. Public-private partnership is a key form of financial integration that determines the future competitiveness of individual metropolises.

It would be ideal to implement all forms of integration simultaneously. If an integrated approach to development planning is adopted at the metropolitan level, it is usually inevitable. For example, planning the development of housing zones in conjunction with the development of public transport infrastructure requires functional integration (transport, spatial and housing policy), stakeholder integration (local and regional authorities of individual municipalities, often also central authorities, public transport operators, developers), financial integration (public and private funds, including external funds), spatial integration (all planned investments included in the spatial development plans of individual territorial units), and temporary integration (construction of a road or a railway line across the territories of different communes should take place at the same time, as it will allow the authorities to select one contractor and reduce costs).

In practice, however, the possibilities for full integration tend to be limited.

The next part of this study focuses on the analysis of the approach to development management in Romanian metropolitan areas. Particular attention was paid to the forms of integration.

3. The place of metropolitan areas in the Romanian administrative system

Romania is a democracy with a parliamentary cabinet system and a tripartite division of powers. Legislative power is held by the bicameral parliament – the Chamber of Deputies (lower house) and the Senate. Executive power is exercised by the government and the president, while the judiciary is held by courts and tribunals. The territorial division of the country includes:

1) 8 regions that do not have the status of administrative units and do not have legal personality. Their task is, above all, to coordinate the development of their constituencies. After Romania joined the European Union, they were classified as corresponding to the NUTS–2 level (Lege nr. 315, 2004);
2) 41 counties (Romanian *județ*) and one separate city (Romanian *municipiu*) – Bucharest;
3) 2,861 rural communes (Romanian *comune*) and 320 urban communes and towns.

Local organs of public administrations are local councils, mayors, and county councils (Guvernul României, 2019).

Territorial units with a large number of inhabitants and of high economic, social, political and scientific importance for the entire country or meeting the necessary conditions of development in these categories are classified as cities (at least 40,000 inhabitants) or as municipalities (min 10,000 population) (Lege nr. 100, 2007). Romanian legislation regulates the status of urban centres depending on the number of their inhabitants and their regional importance, and assigns them ranks accordingly (Lege nr. 351, 2001):

1. Rank 0 – Bucharest – the capital city, a commune of European importance;
2. Rank I – municipalities of national importance with a potential impact at the European level;
3. Rank II – communes of regional or county importance or communes that balance the network of locations (Romanian *municipi*);
4. Rank III – municipalities (Romanian *orase*).

A special status was given to the city of Bucharest, which has also the status of a county and is divided into six sectors with separate authorities and offices reporting to the city hall. The central government is represented by a prefect at the county level.[1]

The Romanian literature defines metropolitan areas as "spaces influenced by urban centres which perform macro-regional functions and whose population

1 See European Committee of the Regions, *Romania*, https://portal.cor.europa.eu/divisionpowers/Pages/Romania.aspx [accessed: 15.08.2020].

exceeds 1 million people" (Grigorescu et al., 2012: 45). Only the metropolitan area of Bucharest meets these conditions. The population of other large cities does not exceed 430,000, and their functional areas have approximately one million inhabitants. In order to support the development of metropolitan areas, the Romanian government has introduced provisions according to which a metropolitan area can be "formed by an association based on a voluntary partnership between the main urban centres and the adjacent urban and rural municipalities within 30 km from the central city which have developed cooperation on multiple levels" (Lege nr. 351, 2001). Cooperation in the form of an association of individual entities is the only institutionalised form of managing metropolitan areas allowed in Romania.

These provisions have been supplemented by other regulations aimed at improving organisation and management in metropolitan areas. Government Regulation No. 53/2002 on the framework status of the administrative-territorial unit states that metropolitan areas may be established only by administrative units located around Bucharest (rank 0) and by units located around first-rank cities (Ordonața nr. 53/2002).

The Administrative Code defines a metropolitan area as a cooperation structure with legal personality, established by Bucharest or the first rank cities and the rural areas in the immediate vicinity in order to implement joint development projects of local or regional importance or for the provision of shared public services. This structure is formed as an association. At the same time, it stresses that the legislative and executive authorities of each administrative-territorial unit within the area retain their local autonomy in accordance with the law (Guvernul României, 2019). Clearly, the central regulations say nothing about the delegation of any powers to the metropolitan level. These associations are legal persons, governed by private law, but have a special statute – the state acknowledges that they act in the interest of the public, and thus grants them the status of entities performing in the interest of the general public. The organ of the association is the board consisting of representatives of all administrative units in the area. The board may appoint a technical body whose operation should be financed from the association's own resources. The responsibilities of both bodies must be laid down in the association's statutes. The functioning of the association can be financed by contributions from its members and other sources, in accordance with the law (Lege nr. 215/2001, 2007).

4. Development of metropolitan associations

The first metropolitan associations started to form in 2004 when the Romanian government adopted the Regional Development Act. It stipulated that each of the seven regions (except Bucharest) would have its own growth pole to counterbalance

the dominant position of the capital city (Lege nr. 315, 2004). The following cities of the 11 first-rank centres were selected: Cluj-Napoca, Iași, Timișoara, Constanța, Craiova, Brașov, and Ploiești. Bucharest and these centres, with their functional areas, account for 50 percent of the Romanian population and generate 75 percent of all business revenues in the country (Ionescu-Heroiu, 2016).

The possibility of acquiring European Union funds acted as a stimulus to develop metropolitan areas. According to the 2007–2013 National Strategic Reference Framework, the cities listed as growth poles could use up to 50% of the resources from the "Supporting sustainable urban development – potential growth poles" priority axis 1. The condition for acquiring the funding was the formation of an inter-municipal association and the adoption of the Integrated Programme of Urban Development (IPUD). The funds were allocated to projects aimed at improving the quality of life and creating jobs through rehabilitation of urban infrastructure, improvement of services, including social services, as well as through the development of support systems for businesses and entrepreneurs. The projects implemented in Axis 1 of the Regional Operational Programme equalled ca 2.26 billion EUR, 621 million EUR of which were dedicated to just seven growth poles (Benedek, Varvari, Litan, 2019: 178).

One of the areas of the Integrated Programme of Urban Development, intervention 1.1, provided financial assistance for the development and implementation of IPUDs. The Strategic Framework for the Territorial Development of Romania 2030 calls for an integrated approach to the urban-rural relationship. It highlights the necessity to consolidate this relationship by approaching the development of rural areas not in opposition to the cities but in alignment with them, with particular emphasis on stimulating local partnerships and on integrated territorial planning (Hințea, Neamțu, 2014). Instead of implementing projects piecemeal, it was commonly agreed that generating synergies was far more productive. This policy required a multi-sectoral approach that focused not only on socio-economic development but also recognised the importance of spatial planning in ensuring sustainable urban development. Local authorities were encouraged not to think solely in terms of ROP funds when preparing integrated development plans and to focus primarily on the comprehensive, cross-sectoral development challenges faced by metropolitan areas (*Growth...*, 2013: 44).

Funds available under the ROP were the stimulus that led to the institutionalisation of metropolitan areas. The creation of inter-municipal associations had been possible since 2001 (Lege nr. 215/2001, 2007), but till 2007 only three areas had chosen this form of cooperation. However, after 2008 all seven metropolitan areas included in the growth poles policy created Inter-municipal Development Associations (IDA) and by the end of 2009 actually developed IPUDs (Table 1). The timeframe of those strategies spanned the period until the year 2015.

Table 1. Metropolitan areas of growth poles in Romania

Name	Administrative units	Year of creation	No of employees in MDA	Population (2016)	Area (km^2)
Iași Metropolitan Area	21 communes, 1 county	2004	7	472.733	808
Brașov Metropolitan Area	18 communes, 1 county	2005	25	473.470	1,368.58
Constanța Metropolitan Area	16 communes, 1 county	2007	14	500.000	1013,5
Cluj-Napoca Metropolitan Area	19 communes	2008	n. a.	417.552	1,537.54
Craiova Metropolitan Area	24 communes	2009	3	394.646	1498,62
Ploiești Metropolitan Area	14 communes, 1 county	2009	8	302.462	478
Timișoara Metropolitan Area	27 communes, 1 county	2009	n. a.	468.162	2439,12

Source: own elaboration

The seven Integrated Urban Development Plans (IPUDs) are remarkably similar in terms of structure since all the local authorities involved benefited from a great deal of technical expertise, know-how transfer and training from the central government during the drafting process. It explains why these plans follow a similar format. In order for the IPUDs to be an effective planning instrument, their provisions need to be reflected to a certain extent in the local development strategies (Hințea, Neamțu, 2014). In practice, most ROP-financed investments were concentrated in city centres and did not help integrate larger metropolitan areas into a coherent, functional, and development-oriented urban ecosystem. Only 0.7% of the funds were distributed by the associations, which clearly suggests their symbolic status and poor capacity for integrated management. Due to the limited sources of IDA financing, these resources are frequently insufficient to coordinate metropolitan projects, which results in the inconsistent effectiveness of the associations. In fact, only two of these associations – the Constana and Brașzov metropolitan areas – have been able to engage in the actual implementation of projects that reach outside the central cities. The process has led to a significant improvement in infrastructure and public services. In addition, it has promoted greater productivity and internal migration (Cristea, Ionescu-Heroiu, 2017). However, there are also some associations that have a purely theoretical aspect and do not work in practice (e.g. Cluj-Napoca). The areas of primary focus for the associations that seek to coordinate activities at the metropolitan level are:

1) integrated development planning;
2) sustainable public transport systems within the whole metropolitan area;
3) integrated economic development;

4) attracting new investments and increasing access to resources;
5) improvement and development of transport, telecommunications, and energy infrastructure;
6) reducing disproportions between towns in the metropolitan area;
7) development of human resources, increasing the level of employment and combating social exclusion and social imbalance;
8) development of new residential areas;
9) development and improvement of public services;
10) environmental protection and sustainable development;
11) development of tourism and the service sector;
12) joint promotion.

At the same time, it should be noted that these IPUDs' provisions are rarely reflected in the implementation of specific projects.

Land development planning is one of the areas where a more integrated approach is needed, given the fact that all of the seven cities have been sprawling toward the neighbouring rural communities, and their mutual interdependencies have grown. Romanian legislation provides metropolitan plans for major cities and their municipalities that should contain solutions to problems and strategies for metropolitan areas. These regulations say nothing though about how these plans should relate to the plans of other areas (*Enhanced...*, 2013: 53). The spatial planning system provides for plans for metropolitan areas but their implementation is certainly limited. There is no legal framework granting planning mandates to inter-municipal development associations that currently manage metropolitan areas. Moreover, the research conducted in communes in metropolitan associations shows that both urban and rural communities are hesitant to name spatial planning as one of the areas where cooperation can occur. They believe that spatial planning issues should be handled locally, without the interference from other communities (Hințea, Neamțu, 2014).

5. Governance in metropolitan areas

Governance in metropolitan areas is complex. The adoption of the growth poles policy has resulted in the obligation to appoint a coordinator in each metropolitan area to supervise both the development and implementation of an integrated development plan. The coordinator's duties include: establishing stable cooperation and consultations, at both the central and local level, with institutions involved in the development and implementation of the integrated development plan; participation in working meetings during the development and implementation of the integrated development plan; participation in monitoring the implementation schedule of the integrated development plan; and preparation of regular reports and information

documents on the state of implementation of the integrated development plan. The coordinator functions within the Regional Development Agency (RDA) assigned to the region with the growth pole in question (Hotărârea nr. 1513, 2008).

Part of governance is the requirement for each metropolitan area to conclude tripartite contracts with the Ministry of Regional Development and Public Administration, the Ministry of Economy and Finance (via the Agency for Coordination of Structural Instruments) and the Regional Development Agency (*Growth...*, 2013: 26). All seven metropolitan areas signed such contracts in 2009. Their scope is in each case remarkably similar (the same). Their role is to coordinate the rights and obligations of the parties involved, and to establish a procedure for interinstitutional cooperation with regard to the selection and duties of pole coordinators. The contracts define the procedure of coordinators' recruitment, their powers, and sources of funding (Hotărârea nr. 1513, 2008). Coordinators were selected from among RDA employees, town hall employees or employees of other local institutions. The arrangements adopted in these contracts apply also to the area leader, the President of the Inter-Communal Development Association (IDA), a body established at the metropolitan level. The Growth Pole Coordinator is committed to establishing an ongoing cooperation and consultations with the Growth Pole Leader. Formally, there is no hierarchical relationship between the coordinator and the area leader (Figure 1).

At the central level, the Ministry of Economy and Finance and the Ministry of Regional Development and Public Administration, in charge of guidelines, cooperate with the Growth Pole Coordinator, namely the Regional Development Agency. The Agency is the executive body of the economic and development regions created in 1998. The agency cooperates with the Metropolitan Development Association.

There are, however, no further records regarding the role of associations in these agreements, although they are generally responsible for the implementation of projects and policies at the metropolitan level, and their role and powers should be defined in clear terms.

Due to the fact that the governance system in metropolitan areas is strictly defined by law, there are no significant differences in the manner of institutionalisation. The differentiating feature is the size and functioning of technical bodies, which is directly associated with a varying number of permanent MDAs' employees. This number ranges between three and twenty five.

Independently of metropolitan associations, municipalities in metropolitan areas form numerous single-target associations for inter-municipal development, with a varying number of members. In the case of public transport, the association is usually formed by the city and the surrounding towns and villages whose residents commute to work in the city. In the case of waste management, the association is sometimes even larger than the territorial boundaries of the metropolitan area, often involving the entire county.

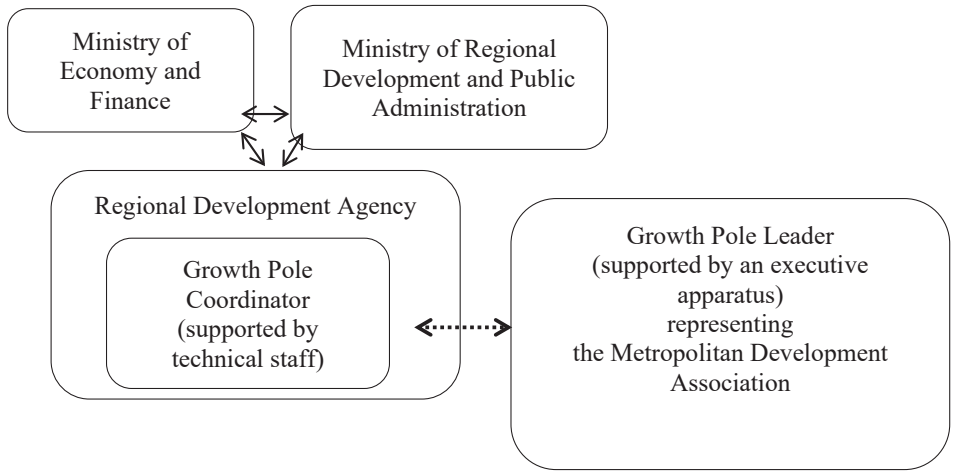

Figure 1. Governance structure in Romanian metropolitan areas.
Source: World Bank, 2013

6. Conclusions

The analyses of the World Bank show that metropolitan areas in Romania do not function properly. There are only a few areas that have a functional public transport system (e.g. Cluj-Napoca), only a few cities have zoning plans for metropolitan areas (e.g. Braov, Craiova), and even fewer have managed to implement projects at the metropolitan level (e.g. Constana) (Ionescu-Heroiu, 2016).

The barriers to their development are complex and include:

1. No clear legal framework. The regulations regarding metropolitan areas are scattered among many legal acts. The role and powers of metropolitan areas are poorly explained in various regulatory documents related to the policy of growth poles and they overlap with the powers of other tiers of public administration. There are no separate regulations governing the functioning, characteristics, and financing mechanisms of metropolitan development associations (*Growth...*, 2013: 86). Currently, their functioning and funding is viewed on a par with those of any other association. The lack of specific legislation also makes it difficult for territorial units to use other methods of financing, such as funds intended for the public sector or fiscal instruments. Also, the possibility of delegating powers by territorial entities is severely limited. Currently, MDAs can only play a symbolic role, providing a platform for networking and cooperation between local governments, without any clearly defined tasks, which considerably weakens their status.

2. Lack of accountability and transparency due to the fact that MDAs are not governed by directly elected bodies, difficult decision-making as each decision must be approved by all legislative bodies of the partnering entities. There are also no mechanisms to incentivise proper management of associations. They mostly employ public officials for whom their work in the association is an additional and relatively poorly remunerated obligation.
3. Lack of financial resources and dependence on transfers from other tiers of government; over-dependence on European money for financing infrastructure projects, which means diminishing the importance of priorities for which such financing is not available. Moreover, investment needs of the growth poles exceed financial capacities of local governments. In the absence of central government's support for new projects, which coincides with increased expectations of residents regarding the quality of public services, leisure, entertainment, and promotion of healthy life style, mayors often prefer to focus solely on issues that directly affect their constituencies. Poor central government incentives limit the ability of local administrations to adopt an integrated metropolitan development approach.
4. Dominance of the central city, a lack of trust and no tradition of cooperation all result in poor relations between the central city and the surrounding units. While integrated development plans for growth poles should also cover peri-urban areas, the number and variety of projects targeting suburban towns is meagre compared to those planned for urban centres. Oftentimes rural communities are treated as junior partners because they lack the resources to co-finance truly metropolitan projects. It is therefore difficult for rural communities to see the city as the generator of a spill-over effect in terms of welfare and development opportunities. A lack of trust among the partners forming the associative structures sometimes stops large projects because not all parties can identify the advantages to be derived from the cooperation.
5. The voluntary character of the association. In practice, some metropolitan areas exclude certain communities in the functional zones surrounding growth poles.
6. Delimitation of metropolitan areas. Narrowing the analysis and intervention to the area with a radius of 30 km around a central city does not account for the fact that major urban agglomerations tend to have larger functional economic areas. Therefore, there is a need for a comprehensive policy, inclusive of growth poles within a broader spatial context.
7. Terms of office for authorities in metropolitan associations. The mayors who are members of the association can agree on a set of common goals and introduce measures to achieve these goals, but new elections can bring about changes in management and give rise to a new set of problems.
8. Limiting governance to cooperation between local governments and the central government. Other public sector entities as well as private and non-gov-

ernmental stakeholders should be included in this process, and communication as well as public participation should be promoted.

9. Overcoming the limitations listed above is necessary in order to increase the effectiveness of metropolitan areas. They are struggling with a number of problems related to the uncontrolled urban sprawl and a growing demand for public services in suburban areas. It is therefore crucial that a clear legal framework for the metropolitan area management system is developed, not only to ensure functional spatial planning at the metropolitan level but also to increase implementation capacity. This legislation should separate the MDAs from the general category of non-governmental organisations. It should define how local/county powers are transferred to the association, clarify funding mechanisms (including fiscal powers), and allow metropolitan associations to access the funds that are currently available only to the public sector beneficiaries. The process of local economic development can no longer be envisioned without cooperation with the neighbouring communities.[2] Several cities are already short of land for large future projects and need to work closely with the adjacent communities to identify suitable investment locations. There is also the negative financial impact of commuters from suburban communities who use the services provided by the city but at the same time also take advantage of the lower taxes and lower real estate prices in the neighbouring rural communities. Interdependencies between the city and the suburban communities need to be acknowledged by both parties, and joint solutions need to be found.

Metropolitan areas can benefit from integrated management in the following ways:

1) more effective implementation of tasks through cooperation between various entities to make decisions and reach an agreement as to the method of their implementation;
2) efficient delivery of public services;
3) coordination of tasks at the supra-local level enabling the creation of a clear framework of development;
4) the ability to perform tasks that would not be possible for individual units;
5) an increase in social capital in a given area;
6) improving the quality of life.

It should be remembered that not all types of metropolitan problems can be solved through cooperation and a bottom-up management approach. The state also has a significant role to play here in promoting and stimulating integration of metropolitan management, using all the available instruments.

2 The experiences of the countries of Western and Central Europe may help in developing solutions favourable to metropolitan areas in Romania (cf.: Danielewicz, 2013).

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Zintegrowane zarządzanie rozwojem obszarów metropolitalnych w Rumunii

Streszczenie: Zachodzące na świecie procesy gwałtownej urbanizacji prowadzą między innymi do dynamicznego rozwoju obszarów metropolitalnych. Powiązania funkcjonalne między jednostkami terytorialnymi wchodzącymi w skład obszaru metropolitalnego powodują, że w celu zapobiegania negatywnym skutkom metropolizacji i zapewnienia zrównoważonego rozwoju takiego obszaru należy koordynować na poziomie metropolitalnym przygotowanie spójnych gospodarczo, przestrzennie i środowiskowo strategii. To z kolei wymaga zmiany podejścia do zarządzania rozwojem w kierunku współrządzenia i zintegrowanego planowania rozwoju. Celem artykułu jest ocena, czy zintegrowane planowanie i zarządzanie jest stosowane w obszarach metropolitalnych Rumunii. W badaniach wykorzystano metodę *desk research*, w ramach której przeanalizowano rumuńskie ustawodawstwo dotyczące obszarów metropolitalnych, zintegrowane strategie rozwoju obszarów metropolitalnych oraz raporty z ich realizacji. Cennym uzupełnieniem informacji były wywiady z przedstawicielami wybranych stowarzyszeń obszarów metropolitalnych.

Słowa kluczowe: współrządzenie, obszary metropolitalne, zintegrowane planowanie i zarządzanie, Rumunia

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Tatiana Medková
University of Economics, Prague, tatiana.polonyankina@vse.cz

The Impact of Gender on Unemployment: Cross-country and Within-country Analysis of the European Labour Markets during Economic Recession[1]

Abstract: This paper investigates the impact of gender on the individual probability of being unemployed and makes a cross-country comparison across 13 European countries during the European recession. Applying a general logit model for each country and capital, whilst controlling for the year, as well as for individual and regional characteristics, the probability of unemployment was estimated using individual labour force data from 2011 to 2014. Cook's distance is used to examine the differences between labour markets of capital regions (or cities) and non-capital regions. Using the size of Cook's distance, models are calibrated, and models which include the degree of urbanization and occupation type are evaluated. The results are presented in the form of a spatial map and show that gender affects the probability of unemployment in the majority of the analysed countries. Overall, the effect is lower in capital than in non-capital regions.

Keywords: gender, labour market, unemployment, logit, Cook's distance

JEL: J700, C130

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1. Introduction

Gender equality is currently an important and frequently discussed topic. The European Union has defined targets to achieve equality in labour market participation in the EU and has established a roadmap for increased participation of women in the workforce (European Commission, 2013). Economic independence is a prerequisite for both women and men to be in control of their lives and is said to be a sign of a developed society.

This article compares the impact of gender on the probability of unemployment for 13 European countries, concentrating on the time period after the crisis (2011–2014) when the majority of European economies experienced a recession. The gender impact is most likely caused by the uncertainty in the labour markets, along with a higher unemployment rate in the recession period, with female workers enduring a higher negative impact.

There are differences between capital cities and other cities in a country Capitals are often more heterogeneous than other types of cities, they host the government, they are likely to be national industrial, cultural and commercial centres with concentration of headquarters of companies. They tend to be economically stronger, for example, London has a much higher GDP per capita than the rest of the UK. Eurofound (2020) recently pointed out that: "in Europe, people living in the capital city generally have a better quality of life than people living in other parts of a country. Residents of the capital city also feel higher life satisfaction than people living outside the capital." Capitals are examined separately in Musterd, Marciaczak, van Ham and Tammaru (2016), who investigates socioeconomic differences looking only at European capitals.

The main methodological contribution of this paper is the separation of capital labour markets based on the values of Cook's statistic, which we also use as the evaluation metric for model calibration. Lastly, the general logistic model is applied, controlling for macroeconomic regional characteristics, such as GDP, population density, and degree of area urbanization, as well as individual characteristics such as education, age, gender, marital status, nationality and the occupation specialization of an individual. Theoretical Background and Model Definition.

The applied model is constructed taking into account that our dependent variable is dichotomous, taking the value 1 when an individual is unemployed and 0 when employed and the explanatory variables are either continuous or dummy variables for categorical predictors. The basic general logistic regression model (1) is used to regress probability of unemployment π_i for individual *i* given an explanatory variable x_i and coefficients β_0 and β_1:

$$\pi_i = \frac{\exp(\beta_0 + \beta_1 x_i)}{1 + \exp(\beta_0 + \beta_1 x_i)}, \tag{1}$$

The model may be rewritten in the form of (2):

$$\text{logit}(\pi_i) = \log\left(\frac{\pi_i}{1-\pi_i}\right) = \beta_0 + \beta_1 x_i, \tag{2}$$

where β_1 can be interpreted as the impact of 1 unit change in x_i on the log odds ratio $\log\left(\frac{\pi_i}{1-\pi_i}\right)$ for a continuous variable and as an impact of having a characteristic x_i (ie $x_i = 1$) on the log odds ratio for a dummy variable.

The general logistic regression model (1) is modified by increasing the number of explanatory variables. The probability of being unemployed π_i for an individual *i* is assumed to be dependent on these exogenous variables:

1) x_{1i}^s a first difference of regional GDP per capital standardised using (8);
2) x_{2i}^s a first difference of regional population density standardised using (8);
3) x_{3i} and x_{4i} are dummies for a degree of area urbanization: a) densely populated area (the base), b) intermediate area (X_{3i}), c) thinly populated area (X_{4i});
4) x_{5i} to x_{7i} are year dummies for analyzed time period 2011–2014: year 2011 is the base, x_{5i} is the dummy variable with the value 1 for the survey year 2012, x_{6i} is the dummy variable with the value 1 for the survey year 2013, x_{7i} is the dummy variable with the value 1 for the survey year 2014;
5) x_{8i} a dummy variable *immig*, which takes value 1 for immigrant and 0 for native;
6) x_{9i} a gender dummy variable *female*, with 1 for female and 0 for male;
7) x_{10i} a marital status variable *married*, with 1 for a married individual and 0 otherwise;
8) x_{11i} to x_{14i} are dummies for 5 age groups: up to 29 years (the base), individuals age 30 to 39 (x_{11i}), individuals age 40 to 49 (x_{12i}), individuals age 50 to 59 (x_{13i}), and individuals age 60 to 66 (x_{14i});
9) x_{15i} to x_{16i} are dummies for highest educational attainment level, with three categories: primary (the base), secondary (x_{15i}) and university (x_{16i});
10) x_{17i} to x_{24i} are dummies for profession of an individual as an occupation group by current employment or last employment before becoming unemployed (9 groups by NACE classification[2] with group 1 as the base).

2 Occupations were created by ISCO with levels: 1) managers, 2) professionals, 3) technicians and associated professionals, 4) clerical support workers, 5) service and sales workers, 6) skilled agricultural, forestry and fishery workers, 7) craft and related workers, 8) plant and machine operators, and assemblers, 9) elementary occupations.

The macroeconomic variables $\boldsymbol{x}_1$ and $\boldsymbol{x}_2$ are downloaded from the Eurostat webpage for each NUTS region and year of analysis and merged with information about individual location. Based on the theory of Ocun's law, which defines the inverse relationship between economic growth and unemployment rate (for more see e.g. Knotek, 2007), we expect that the estimated coefficient will be negative.

The full regression model is:

$$\operatorname{logit}(\pi_i) = \operatorname{Prob}(y_i = 1 \mid x_{1i},...,x_{24i}) = \frac{\exp(w_i)}{(1+\exp(w_i))}, \tag{3}$$

where:

$$w_i = \beta_0 + \beta_1 x_{1i} + \beta_2 x_{2i} + ... + \beta_{24} x_{24i}. \tag{4}$$

The estimation of parameters is done using the Maximum Likelihood method, where the function of the Lagrangian is written in equation 5 (for more see Dobson, 1990 or Wooldridge, 2002):

$$\begin{aligned} \operatorname{logL}(\beta_0,...,\beta_{24}) = &\sum_{i=1}^{n}\left[y_i \log\left(\frac{\exp(w_i)}{1+\exp(w_i)} \right)\right] + \\ &+\sum_{i=1}^{n}\left[(1-y_i)\log\left(1-\frac{\exp(w_i)}{1+\exp(w_i)} \right)\right]. \end{aligned} \tag{5}$$

Each model for each country/capital is tested for multicollinearity of explanatory variables using the variance inflation factor (VIF). If any terms in a linear model have more than 1 df (as is the case for the dummies for categorical variables), then generalized variance-inflation factors (Fox, Monette, 1992) are calculated. The generalized VIFs are invariant with respect to the coding of the terms in the model. To adjust for the dimensions of dummy variables GVIFs are scaled:

$$GVIF^{1/(2\mathrm{df})}, \tag{6}$$

where df are degrees of freedom associated with the term. We conclude that there is no multicollinearity problem in our models, which could affect regression results significantly.

Models were also evaluated by calculating diagnostics for generalized linear models (for more see Davison, Snell, 1991). Cook's distance D_i is calculated using (7) by removing point i from regression and calculating $\hat{Y}_j(i)$ the new fitted value from regression without the removed point, where p is a number of regression coefficients and $\hat{\sigma}^2$ is estimated variance from the fitted model including all observations.

$$D_i = \frac{\sum_{j=1}^{n} (\hat{Y}_j - \hat{Y}_j(i))^2}{(p+1)\hat{\sigma}^2}, \tag{7}$$

The statistics give information on how much all the values in the regression model change when observation *i* is removed. For each model two plots are displayed: 1) Cook's distance, plotted against the standardized leverages, 2) Cook's distance plotted against case number, enabling us to find which observations are influential. The plots help to identify influential outliers and are used for a model evaluation. Particularly here, we consider the situations where variables defining degree of urbanization and occupation are included or excluded in the model and the situations where capitals are estimated separately from the non-capital regions.

Differences in labour mechanism in capitals and other parts of countries is analysed by a two-step evaluation process: first, we include a dummy variable for capital (or year and capital) in each country estimation and note the significance of its coefficient; secondly we examine the Cook's distance to identify outliers to see whether individuals living in the capital have notable influence on model calibration. When there is evidence of difference we split data into two data sets and estimate capitals separately from the rest of the country. The size of the Cook's distance is also used to evaluate models including variables for degree of urbanization and occupations. These are included in the final models when their presence decreases Cook's distance and improves the predictability of the model. If this is not the case, they are excluded from the regression model.

To increase comparability of the β_j coefficients as measures of influence for continuous variables with different magnitudes, we use a standardization method. A continuous variable x_{ji} is re-scaled using (8), where $\overline{x_j}$ is the variable mean and s_{X_j} is the standard deviation.

$$x_{ji}^s = \frac{x_{ji} - \overline{x_j}}{s_{X_j}}. \tag{8}$$

2. Data

Empirical analysis is done for 13 European countries: Spain, Ireland, Germany, Austria, Belgium, Czech Republic, Finland, France, Italy, Netherlands, Sweden, Slovakia and United Kingdom. The sample of countries is chosen with respect to data availability. The number of observations varies from a minimum of 80,102 individuals from the Czech Republic to 879,145 individuals from France. The analysed time period is from 2011 to 2014. The intent is to include only the economically active population, so only individuals between 15 and 66, are included, and

inactive individuals and individuals in compulsory military service are excluded from this list. An 'immigrant' is considered to be an individual with nationality different from the country of current residence.

The Labour Force Survey (LFS) contains individual data on different NUTS levels for different countries. This detail gives us geographic information about an individual's location and defines regions for which the expected probabilities can be computed. In our analysis we combine three NUTS levels using:

1) NUTS 0 level: Netherlands,
2) NUTS 1 level: Austria, Germany, United Kingdom,
3) NUTS 2 level: Czech Republic, Italy, France, Spain, Belgium, Finland, Sweden, Ireland, Slovakia.

Total numbers: 13 countries = 124 regions (islands and non-European parts are excluded).

The regional economic characteristics GDP and population density are downloaded from the Eurostat public online database (Eurostat, 2017). The regional economic statistics are merged with LFS data by the region of an individual's location.

3. Empirical results

The general logistic regression model in its variations was used to estimate the impact of gender on the probability of being unemployed. The estimated parameters of the whole model are displayed in the Appendix.

The probabilities of being unemployed for males and females are computed using the equation below with the other predictor variables in their standardised values, continuous variables set to their mean levels and dummies set equal to 0.

$$\text{Prob}\left(y_j = 1\right) = \frac{\exp\left(\hat{\beta}_{1,GDP}\overline{x}_{1,GDP,j} + \hat{\beta}_{2,PD}\overline{x}_{2,PD,j} + \hat{\beta}_{9,female}\right)}{\left(1 + \exp\left(\hat{\beta}_{1,GDP}\overline{x}_{1,GDP,j} + \hat{\beta}_{2,PD}\overline{x}_{2,PD,j} + \hat{\beta}_{9,female}\right)\right)}. \tag{9}$$

The estimated parameters $\hat{\beta}_{1i}$, representing the estimated coefficient for GDP, $\hat{\beta}_{2i}$, the estimated coefficient for the population density, and $\hat{\beta}_{9i}$, the estimated coefficient for gender from (3) and (4), are used to calculate the probability of being unemployed Prob(y_j = 1) for females in region *j* as a logistic function, where $\overline{x}_{1,GDP,j}$ is the mean of the standardised regional first differences of the GDP in Euro per habitat between 2011 and 2014 for region *j*, $\overline{x}_{1,PD,j}$ is the mean of the standardised regional first differences of population density between 2011 and 2014 for region *j*. The same probability was calculated for males with the variable x_{9i} = 0. Fi-

nally, the spatial map of differences in probabilities of unemployment for males and females is presented in Figure 1.

The map shows the presence of spatial patterns within regions as well as between some neighbouring countries. The within-country-region similarities were expected, given the common economical and legislative environments, which were represented by the GDP and population density. Overall, the capital regions differ from non-capital regions; in the former, the estimated differences are lower, or the gender impact is insignificant.

The expected differences in labour markets between capitals and the non-capital regions of a country were also supported by differences found in the rest of the estimated parameters. Immigrants differ less from natives in most capitals in comparison to the rest of the country. This suggests that integration works better in big cities/capitals, which tend to have more opportunities for international workers. Age groups, in general, do not have statistically significant parameters in capital regions.

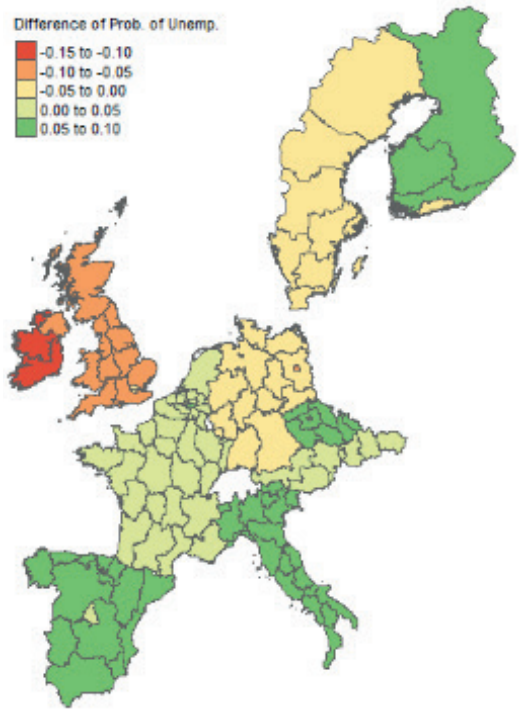

Figure 1. Differences in probability of unemployment between female and male
Source: author's computation in R, Eurostat data

With respect to regional characteristics of economic evolution, GDP per habitat has, in the majority of the models, a significant negative impact on the prob-

ability of being unemployed in European regions. The results are in line with the theory of Ocun's law. Population density has mostly a negative impact on the probability of being unemployed and is not significant for some capitals (London, Hamburg and Bremen, Belgium region 31, and Prague), but it is positive for the Netherlands and Finland. The degree of urbanization was included in the model for all countries except for Spain, the Czech Republic and the UK, and it was found to have a decreasing impact. Educational attainment clearly decreases the probability of being unemployed in all regression models. This impact increases with the degree of education, supporting the theory that education improves individuals' positions in the labour market.

The main limitation of the study is data. Survey data in general underrepresent some groups of individuals. Teperova (Tepperova, Zouhar, Wilksch, 2016) mentioned undersupplying of immigrants which has a minor impact on this study. The LFS data does not include consistent information needed for all countries, in order to have comparative data we analyse the representative sample of 13 European countries.

4. Conclusion

In this paper, the general logistic regression model is applied on individual data – about 5 million economically active individuals, in 13 European countries – to estimate the probability of unemployment while controlling for individual and regional economic characteristics during the economic recession. The estimations were done at country level. Most of the capitals were estimated separately, based on the value of Cook's distance. The map of differences between regional probabilities of unemployment, between males and females showed that there are spatial dependencies between regions inside countries and between some neighbouring countries.

The estimated results suggest that gender does play a role in European labour markets, however the impact is generally low. For some labour markets, the probability of being unemployed is estimated to be higher for females, while for other markets, the opposite impact was estimated. The impact of gender on the probability of being unemployed was lower, or insignificant, for capitals in comparison to non-capitals.

The estimated parameters, in general, differ for capital and non-capital regions, indicating that different labour market mechanisms are at play. The models show that individual characteristics have a lower impact in capitals, and that married individuals are less likely to be unemployed. Lastly, the unemployment probability decreases as the degree of education increases, and is higher for immigrants in the majority of the European countries investigated.

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Appendix
Tables of results of empirical analysis

Tables set 1: Estimation results of probability of being unemployed, applying the general logit model (defined in (3) and (4))

Data	Austria (incl. capital)		Madrid (Spain)		Spain (excl. capital)	
Variables	**Estimates**	**SE**	**Estimates**	**SE**	**Estimates**	**SE**
(Intercept)	–1.18***	0.00	–0.67***	0.00	–0.39***	0.00
Region variables:						
FD. EURHAB stand	–0.44***	0.00	–0.06**	0.03	–0.02	0.01
FD. POPDE stand	0.04***	0.01	–0.04***	0.01	0.24***	0.00
Urbanization 1	Ref.	Ref.	Ref.	Ref.	Ref.	Ref.
Urbanization 2	–0.35***	0.00				
Urbanization 3	–0.69***	0.00				
Year:						
2011	Ref.	Ref.	Ref.	Ref.	Ref.	Ref.
2012	–0.60***	0.00			0.38***	0.00
2013	–0.79***	0.00			0.61***	0.00
2014	–0.63***	0.00			0.62***	0.00
Individual variables:						
immigrant	0.67***	0.00	0.45***	0.08	0.62***	0.00
female	0.01	0.02	0.07	0.06	0.22***	0.00
married	–0.62***	0.00	–0.39***	0.06	–0.45***	0.00
Age groups:						
15–29 years	Ref.	Ref.	Ref.	Ref.	Ref.	Ref.
30–39 years	–0.33***	0.00	–0.47***	0.08	–0.65***	0.00
40–49 years	–0.45***	0.00	–0.51***	0.09	–0.82***	0.00
50–59 years	–0.45***	0.00	–0.71***	0.10	–0.97***	0.00
60–66 years	–0.88***	0.00	–0.71***	0.15	–1.24***	0.00
Education:						
primary	Ref.	Ref.	Ref.	Ref.	Ref.	Ref.
secondary	–0.76***	0.00	–0.33***	0.07	–0.61***	0.00
university	–1.27***	0.00	–0.94***	0.00	–1.09***	0.00

Data	Berlin (Germany)		Estimates Hamburg and Bremen (Germany)		Germany (excl. capital, cities)	
Variables	**Estimates**	**SE**	**Estimates**	**SE**	**Estimates**	**SE**
(Intercept)	–2.46***	0.00	–3.06***	0.00	–3.47***	0.00
Region variables:						
FD. EURHAB stand	–0.04**	0.02	–0.04	0.03	–0.13***	0.00
FD. POPDE stand	–0.02***	0.01	0.04	0.03	–2.81***	0.00
Urbanization 1	Ref.	Ref.	Ref.	Ref.	Ref.	Ref.
Urbanization 2					–0.26***	0.00

Data	Berlin (Germany)		Estimates Hamburg and Bremen (Germany)		Germany (excl. capital, cities)	
Variables	**Estimates**	**SE**	**Estimates**	**SE**	**Estimates**	**SE**
Urbanization 3					–0.41***	0.00
Year:						
2011	Ref.	Ref.	Ref.	Ref.	Ref.	Ref.
2012					1.12***	0.00
2013					1.19***	0.00
2014					1.31***	0.00
Individual variables:						
immigrant	0.45***	0.06	0.47***	0.10	0.61***	0.00
female	–0.23***	0.05	–0.17**	0.08	–0.09***	0.01
married	–0.55***	0.00	–0.44***	0.08	–0.76***	0.00
Age groups:						
15–29 years	Ref.	Ref.	Ref.	Ref.	Ref.	Ref.
30–39 years	0.17***	0.07	0.07	0.11	0.11***	0.02
40–49 years	0.08	0.07	0.03	0.11	–0.03*	0.02
50–59 years	0.11	0.07	0.08	0.11	0.25***	0.00
60–66 years	0.37***	0.10	0.23	0.16	0.56***	0.00
Education:						
primary	Ref.	Ref.	Ref.	Ref.	Ref.	Ref.
secondary	–0.61***	0.00	–0.48***	0.09	–0.76***	0.00
university	–1.04***	0.00	–0.86***	0.14	–1.58***	0.00

Data	France (incl. capital)		Rome (Italy)		Italy (excl. capital)	
Variables	**Estimates**	**SE**	**Estimates**	**SE**	**Estimates**	**SE**
(Intercept)	–0.78***	0.00	–0.77***	0.00	–0.83***	0.00
Region variables:						
FD. EURHAB stand	–0.03***	0.00	–0.09***	0.01	–0.14***	0.00
FD. POPDE stand	–0.12***	0.00	0.21***	0.00	0.00	0.01
Urbanization 1	Ref.	Ref.	Ref.	Ref.	Ref.	Ref.
Urbanization 2	–0.15***	0.00			–0.20***	0.00
Urbanization 3	–0.46***	0.00			–0.25***	0.00
Year:						
2011	Ref.	Ref.	Ref.	Ref.	Ref.	Ref.
2012	0.09***	0.01			0.09***	0.02
2013	0.14***	0.00			0.32***	0.00
2014	0.16***	0.00			0.50***	0.00
Individual variables:						
immigrant	0.84***	0.00	0.01	0.04	0.42***	0.00
female	0.11***	0.00	0.25***	0.00	0.28***	0.00
married	–0.57***	0.00	–0.53***	0.00	–0.43***	0.00
Age groups:						
15–29 years	Ref.	Ref.	Ref.	Ref.	Ref.	Ref.
30–39 years	–0.65***	0.00	–0.97***	0.00	–0.95***	0.00

Data	France (incl. capital)		Rome (Italy)		Italy (excl. capital)	
Variables	**Estimates**	**SE**	**Estimates**	**SE**	**Estimates**	**SE**
40–49 years	–0.97***	0.00	–1.37***	0.00	–1.31***	0.00
50–59 years	–1.08***	0.00	–1.70***	0.00	–1.61***	0.00
60–66 years	–1.25 ***	0.00	–2.01 ***	0.00	–1.92 ***	0.00
Education:						
primary	Ref.	Ref.	Ref.	Ref.	Ref.	Ref.
secondary	–0.62***	0.00	–0.53***	0.00	–0.61***	0.00
university	–1.24***	0.00	–0.98***	0.00	–0.95***	0.00

Data	Ireland (incl. capital)		London (UK)		United Kingdom (excl. capital)	
Variables	**Estimates**	**SE**	**Estimates**	**SE**	**Estimates**	**SE**
(Intercept)	–0.40***	0.00	–2.92***	0.59	–2.21***	0.00
Region variables:						
FD. EURHAB stand	0.01	0.01	–0.04*	0.02	–0.06	0.07
FD. POPDE stand	–0.04***	0.01	0.08	0.20	–1.37***	0.30
Urbanization 1	Ref.	Ref.	Ref.	Ref.	Ref.	Ref.
Urbanization 2	0.11***	0.02				
Urbanization 3	0.11***	0.00				
Year:						
2011	Ref.	Ref.	Ref.	Ref.	Ref.	Ref.
2012	0.04***	0.01			0.08	0.10
2013	–0.08***	0.01			–0.08*	0.04
2014	–0.25***	0.00			–0.26***	0.10
Individual variables:						
immigrant	0.21***	0.00	0.24***	0.08	0.31***	0.05
female	–0.43***	0.00	–0.15**	0.07	–0.27***	0.00
married	–0.70***	0.00	–0.54***	0.08	–0.91***	0.00
Age groups:						
15–29 years	Ref.	Ref.	Ref.	Ref.	Ref.	Ref.
30–39 years	–0.37***	0.00	–0.10	0.10	–0.28***	0.04
40–49 years	–0.45***	0.00	–0.07	0.10	–0.47***	0.00
50–59 years	–0.64***	0.00	–0.25**	0.12	–0.42***	0.00
60–66 years	–0.88***	0.00	–0.30	0.19	–0.34***	0.06
Education:						
primary	Ref.	Ref.	Ref.	Ref.	Ref.	Ref.
secondary	–0.50***	0.00	–0.08	0.10	–0.48***	0.00
university	–1.28***	0.00	–0.45***	0.11	–0.93***	0.00

Data	Brussels (Belgium)		Walloon Brabant (Belgium)		Belgium (excl. capita, cities)	
Variables	**Estimates**	**SE**	**Estimates**	**SE**	**Estimates**	**SE**
(Intercept)	–0.83***	0.00	–5.31*	2.74	–0.93***	0.00
Region variables:						
FD. EURHAB stand	0.02	0.03	0.04**	0.02	–0.47***	0.00
FD. POPDE stand	–0.04*	0.02	–13.43	8.25	–1.13***	0.22
Urbanization 1	Ref.	Ref.	Ref.	Ref.	Ref.	Ref.
Urbanization 2					–0.57***	0.00
Urbanization 3					–0.74***	0.00
Year:						
2011	Ref.	Ref.	Ref.	Ref.	Ref.	Ref.
2012					–0.22***	0.04
2013					–0.26***	0.04
2014					–0.03	0.04
Individual variables:						
immigrant	0.11**	0.05	0.73***	0.12	0.75***	0.00
female	–0.25***	0.05	0.22***	0.08	0.15***	0.02
married	–0.20***	0.05	–0.66***	0.10	–0.67***	0.00
Age groups:						
15–29 years	Ref.	Ref.	Ref.	Ref.	Ref.	Ref.
30–39 years	–0.11*	0.06	–0.88***	0.11	–0.73***	0.00
40–49 years	–0.28***	0.06	–1.05***	0.00	–0.99***	0.00
50–59 years	–0.66***	0.00	–1.20***	0.00	–1.07***	0.00
60–66 years	–1.43***	0.20	–0.78***	0.20	–1.44***	0.00
Education:						
primary	Ref.	Ref.	Ref.	Ref.	Ref.	Ref.
secondary	–0.45***	0.00	–0.61***	0.10	–0.73***	0.00
university	–1.28***	0.00	–1.24***	0.00	–1.40***	0.00

Data	Netherlands (incl. capital)		Helsinki (Finland)		Finland (excl. capital)	
Variables	**Estimates**	**SE**	**Estimates**	**SE**	**Estimates**	**SE**
(Intercept)	–1.22***	0.00	–3.35***	0.43	–0.39***	0.00
Region variables:						
FD. EURHAB stand	–1.15***	0.00	–0.01	0.04	–0.02	0.01
FD. POPDE stand	0.02**	0.01	1.40***	0.27	0.24***	0.00
Urbanization 1	Ref.	Ref.	Ref.	Ref.	Ref.	Ref.
Urbanization 2	–0.31***	0.00				
Urbanization 3	–0.40***	0.00				
Year:						
2011	Ref.	Ref.	Ref.	Ref.	Ref.	Ref.
2012	–2.71***	0.00			0.38***	0.00
2013					0.61***	0.00
2014					0.62***	0.00

Data	Netherlands (incl. capital)		Helsinki (Finland)		Finland (excl. capital)	
Variables	**Estimates**	**SE**	**Estimates**	**SE**	**Estimates**	**SE**
Individual variables:						
immigrant	0.70***	0.00	0.71***	0.10	0.62***	0.00
female	0.06***	0.02	–0.06	0.05	0.22***	0.00
married	–0.65***	0.00	–0.52***	0.07	–0.45***	0.00
Age groups:						
15–29 years	Ref.	Ref.	Ref.	Ref.	Ref.	Ref.
30–39 years	–0.18***	0.03	–1.03***	0.00	–0.65***	0.00
40–49 years	–0.13***	0.03	–1.07***	0.00	–0.82***	0.00
50–59 years	0.14***	0.03	–0.88***	0.00	–0.97***	0.00
60–66 years	0.44***	0.00	–0.67***	0.12	–1.24***	0.00
Education:						
primary	Ref.	Ref.	Ref.	Ref.	Ref.	Ref.
secondary	–0.40***	0.00	–0.88***	0.00	–0.61***	0.00
university	–0.95***	0.00	–1.30***	0.00	–1.09***	0.00

Data	Prague (Czech Republic)		Czech Republic (excl. capital)		Slovakia (incl. capital)		Sweden (incl. capital)	
Variables	**Estimates**	**SE**	**Estimates**	**SE**	**Estimates**	**SE**	**Estimates**	**SE**
(Intercept)	–1.73***	0.38	–0.76***	0.00	–2.20***	0.00	–0.74***	0.00
Region variables:	Ref.	Ref.	Ref.	Ref.	Ref.	Ref.	Ref.	Ref.
FD. EURHAB stand	0.07	0.05	0.01	0.04	–0.11***	0.00	–0.06***	0.01
FD. POPDE stand	–0.02	0.05	–0.89***	0.00	–0.10***	0.00	–0.09***	0.00
Urbanization 1	Ref.	Ref.	Ref.	Ref.	Ref.	Ref.	Ref.	Ref.
Urbanization 2					–0.07***	0.03	–0.09***	0.01
Urbanization 3					0.02	0.03	–0.25***	0.00
Year:								
2011	Ref.	Ref.	Ref.	Ref.	Ref.	Ref.	Ref.	Ref.
2012			0.12	0.08	–0.09***	0.03	–0.07***	0.02
2013			0.04	0.09	–0.10***	0.03	–0.08***	0.03
2014			–0.05	0.07	–0.19***	0.03	–0.16***	0.04
Individual variables:								
immigrant	–0.91*	0.51	–0.00	0.12	–0.03	0.21	1.14***	0.00
female	0.00	0.16	0.35***	0.00	0.17***	0.00	–0.03***	0.01
married	–0.83***	0.18	–0.67***	0.00	–0.49***	0.00	–0.40***	0.01
Age groups:								
15–29 years	Ref.	Ref.	Ref.	Ref.	Ref.	Ref.	Ref.	Ref.
30–39 years	0.28	0.22	–0.43***	0.00	0.03	0.03	–0.91***	0.00
40–49 years	–0.16	0.26	–0.60***	0.00	–0.16***	0.03	–1.02***	0.00
50–59 years	0.01	0.26	–0.52***	0.00	–0.02	0.03	–0.91***	0.00
60–66 years	–0.80*	0.45	–0.61***	0.08	–0.70***	0.00	–0.62***	0.00

Data	Prague (Czech Republic)		Czech Republic (excl. capital)		Slovakia (incl. capital)		Sweden (incl. capital)	
Variables	**Estimates**	**SE**	**Estimates**	**SE**	**Estimates**	**SE**	**Estimates**	**SE**
Education:								
primary	Ref.	Ref.	Ref.	Ref.	Ref.	Ref.	Ref.	Ref.
secondary	–0.94***	0.30	–1.40***	0.00	–0.64***	0.00	–0.87***	0.00
university	–1.77***	0.34	–2.29***	0.00	–1.01***	0.00	–1.37***	0.00

Note 1: The tables show estimated parameters ("Estimates") and standard errors ("SE") of the impact of explanatory variables on probability of being unemployed, using logit model and maximal likelihood estimation for each country and some separated capitals. Model for Hamburg and Bremen was added by dummy to catch differences between the cities. Models for Berlin, Hamburg and Bremen, London and Slovakia were estimated controlling also for occupations, estimated variables which are displayed in Table set 2.
Note 2: P-values are presented as: * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.

Source: author's computation in R, Eurostat data

Table set 2: Estimation results for impact of occupations on probability of being unemployed, applying the general logit model (defined in (3) and (4))

Data	Berlin (Germany)		Hamburg and Bremen (Germany)		London (UK)		Slovakia	
Variables	**Estimates**	**SE**	**Estimates**	**SE**	**Estimates**	**SE**	**Estimates**	**SE**
Occupation 1	Ref.	Ref.	Ref.	Ref.	Ref.	Ref.	Ref.	Ref.
Occupation 2	0.24	0.16	0.17	0.24	0.11	0.15	–0.17**	0.08
Occupation 3	0.24	0.16	–0.06	0.24	0.49***	0.16	0.32***	0.08
Occupation 4	0.84***	0.16	0.46*	0.24	0.70***	0.16	0.84***	0.00
Occupation 5	1.02***	0.15	0.66***	0.24	0.74***	0.15	0.87***	0.00
Occupation 6	1.53***	0.25	0.51	0.45	0.00	0.74	1.32***	0.00
Occupation 7	1.06***	0.16	0.79***	0.24	–0.25	0.23	1.03***	0.00
Occupation 8	0.82***	0.17	0.67**	0.26	0.64***	0.21	1.12***	0.00
Occupation 9	1.49***	0.00	1.02***	0.24	0.69***	0.17	1.58***	0.00

Note 1: The table shows estimated parameters ("Estimates") and standard errors ("SE") of impact of occupations for models where occupations were included, using logit model and maximal likelihood estimation. P-values are presented as: * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.
Note 2: P-values presented as: * $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$.
Note 3: Occupations were created by ISCO with levels: 1. Managers, 2. Professionals, 3. Technicians and associate professionals, 4. Clerical support workers, 5. Service and sales workers, 6. Skilled agricultural, forestry and fishery workers, 7. Craft and related trades workers, 8. Plant and machine operators, and assemblers, 9. Elementary occupations

Source: author's computation in R, Eurostat data

Wpływ płci na bezrobocie: międzynarodowa i wewnątrzkrajowa analiza europejskich rynków pracy podczas recesji gospodarczej

Streszczenie: W niniejszym artykule zbadano wpływ płci na prawdopodobieństwo bezrobocia i dokonano porównania między 13 krajami europejskimi podczas recesji gospodarczej. Stosując ogólny model logitu dla każdego kraju i stolicy, jak również kontrolując rok oraz cechy indywidualne i regionalne, oszacowano prawdopodobieństwo bezrobocia na podstawie danych dotyczących siły roboczej w latach 2011–2014. Odległość Cooka służy do badania różnic między rynkami pracy regionów stołecznych (lub miast) a regionami niebędącymi stolicami. Korzystając z wielkości odległości Cooka, modele są kalibrowane, a modele uwzględniające stopień urbanizacji i typ zawodu – oceniane. Wyniki przedstawiono w formie mapy przestrzennej – pokazują one, że płeć wpływa na prawdopodobieństwo bezrobocia w większości analizowanych krajów. Ogólnie efekt jest mniejszy w przypadku regionów stołecznych.

Słowa kluczowe: płeć, rynek pracy, bezrobocie, logit, dystans Cooka

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Jerzy Korzeniewski
University of Łódź, Faculty of Economics and Sociology, Department of Demography, Łódź, Poland
jerzy.korzeniewski@uni.lodz.pl

A Modification of the Leacock-Chodorow Measure of the Semantic Relatedness of Concepts

Abstract: The measures of the semantic relatedness of concepts can be categorised into two types: knowledge-based methods and corpus-based methods. Knowledge-based techniques make use of man-created dictionaries, thesauruses and other artefacts as a source of knowledge. Corpus-based techniques assess the semantic similarity of two concepts making use of large corpora of text documents. Some researchers claim that knowledge-based measures outperform corpus-based ones, but it is much more important to observe that the latter ones are heavily corpus dependent. In this article, we propose to modify the best WordNet-based method of assessing semantic relatedness, i.e. the Leacock-Chodorow measure. This measure has proven to be the best in several studies and has a very simple formula. We asses our proposal on the basis of two popular benchmark sets of pairs of concepts, i.e. the Ruben-Goodenough set of 65 pairs of concepts and the Fickelstein set of 353 pairs of terms. The results prove that our proposal outperforms the traditional Leacock-Chodorow measure.

Keywords: text mining, WordNet network, semantic relatedness, Lecock-Chodorow measure

JEL: C39, C65, Z13

1. Introduction

The wish to determine semantic relatedness or its inverse, semantic distance, between two words, terms or, more broadly, two lexical concepts is a problem that dominates many tasks of natural language processing such as document summarisation, information retrieval, information extraction, word sense disambiguation, machine text translation, thesaurus creation, and the automatic correction of errors in texts. Many of these tasks require a numerical measure of the semantic relatedness between two arbitrary terms. For example, in information retrieval, we are in need of such assessments in order to expand the query words; facing the problem of word sense disambiguation, we need them in order to choose an appropriate meaning of a word. It is of substantial importance to note that semantic relatedness is a more general notion than similarity; similarterms are semantically related due to their similarity (*football – rugby*), but dissimilar terms may also be semantically related due to relationships such as antonymy (*cold – heat*), or meronymy (*car – motor*), or by any kind of frequent association (*water – fire, goalkeeper – football, rain – umbrella*). The aforementioned computational tasks usually make use of relatedness rather than similarity.

However, it is not certain how to assess many available approaches that have been designed for measuring semantic relatedness. The most widely accepted approach is to assess the quality of methods by checking how they mimic human judgement on the relatedness of a given pair of terms. Therefore, some benchmark data sets should be required to make any research feasible. We use two popular data sets in our research. One of two major groups of methods of determining semantic relatedness, i.e. the group of knowledge-based methods, has to refer to some kind of dictionary, thesaurus, or similar source. It is not certain which one is the best, especially if we take into account the special area with which a given study is concerned. In our research, we will refer to probably the most comprehensive database of the English language, namely the WordNet. We give a short description of this database in the next section.

The remaining part of the article is organised as follows. Section 2 contains the description of WordNet. In Section 3, we present an overview of existing approaches, in Section 4 we propose a modification of the Leacock-Chodorow measure, and in Section 5 we present its evaluation. In Section 6, some concluding remarks are given.

2. WordNet description

WordNet is a large lexical database of the English language which was devised at Princeton University. In WordNet, nouns, verbs, adjectives and adverbs are grouped into sets of synonyms (synsets), each expressing a distinct concept.

In WordNet 3.0, there are 147,278 concept nodes, 70% of which are nouns. The backbone of the relations between them is constituted by hypernymy and hyponymy (accounting for almost 80% of relations). Apart from these two, synonymy, antonymy and meronymy (6 types) are used. At the top of the hierarchy, there are 25 abstract concepts termed unique beginners (see Figure 1). The maximum depth of the noun hierarchy is 16 nodes (17 if the theoretical top root is included).

{act, action, activity}	{natural object}	{food}
{artefact}	{plant, flora}	{substance}
{animal, fauna}	{natural phenomenon}	{time}
{attribute, property}	{possession}	{group, collection}
{body, corpus}	{process}	{location, place}
{cognition, knowledge}	{quantity, amount}	{motive}
{communication}	{relation}	
{event, happening}	{shape}	
{feeling, emotion}	{state, condition}	

Figure 1. List of 25 unique beginners for nouns in WordNet

Source: Fellbaum, 1998

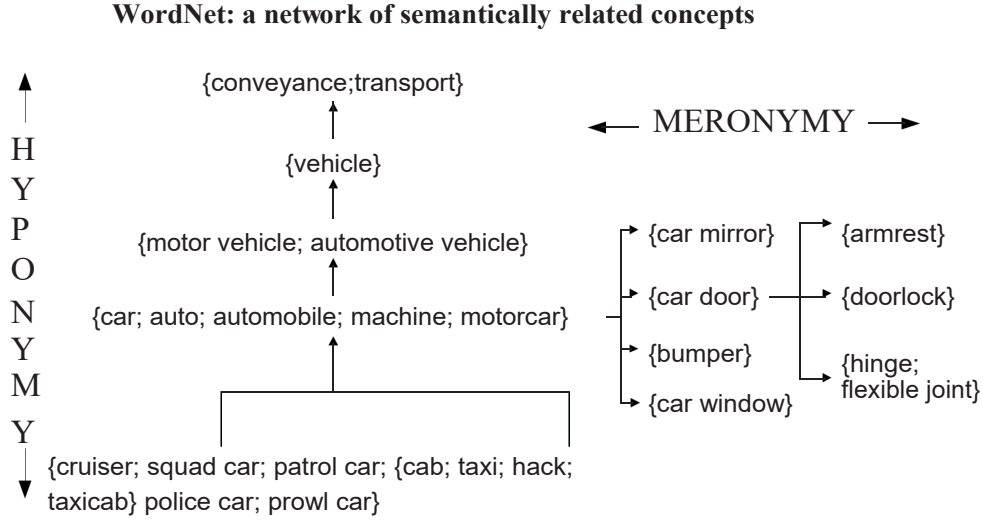

Figure 2. Exemplary structure of the WordNet network

Source: Fellbaum, 1998

In Figure 2, an exemplary structure of concepts connected with the word *car* is presented with some relations between these concepts. Mining WordNet can be made easier by applying packages or programming platforms. In our research, the *nltk* package (Bird, Loper, Klein, 2009) was used extensively.

3. Overview of existing approaches

The measures of the semantic relatedness of terms can be categorised into two types: knowledge-based methods and corpus-based methods. Knowledge-based techniques make use of man-created dictionaries, thesauruses and other artefacts as a source of knowledge. Corpus-based techniques assess semantic relatedness making use of a large corpus of text documents. Generally, there is no agreement on whether knowledge-based measures outperform corpus-based ones, but, what is crucial in our opinion, the latter ones are heavily corpus dependent, and thus unsettled. Budanitsky and Hirst (2006) provide a comparison of five different measures of either similarity (or distance) or relatedness of pairs of concepts. Let us first concentrate on knowledge-based methods. In the formulas given below, we use the following notation: $len(c_i, c_j)$ – the shortest path between concept c_i and concept c_j; $depth(c_i)$ – the taxonomy depth of concept c_i, i.e. the length of the path from the root of the taxonomy to concept c_i; $lso(c_i, c_j)$ – the lowest common subsume (i.e. hypernym) of both concepts c_i and c_j. Hirst and St-Onge (1998) propose the following relatedness measure:

$$rel_{HS}\left(c_i, c_j\right) = C - len\left(c_i, c_j\right) - k \cdot turns\left(c_i, c_j\right). \tag{1}$$

In this formula, $turns(c_i, c_j)$ is the number of the direction changes on the path from c_i to c_j. Symbols C and k are constants in the aforementioned research: $C = 8$, $k = 1$. Leacock and Chodorow (1998) propose the following similarity measure:

$$sim_{LC}\left(c_i, c_j\right) = -log_2 \frac{len\left(c_i, c_j\right)}{2 \cdot \max\_depth}. \tag{2}$$

A popular (available in the *nltk* computer package) measure of similarity is the Wu and Palmer (1994) formula:

$$sim_{WP}\left(c_i, c_j\right) = \frac{2 \cdot H}{N_1 + N_2 + H}, \tag{3}$$

where N_1 and N_2 is the number of "is-a" links from, respectively, c_i and c_j to $lso(c_i, c_j)$, and H is the number of "is-a" links from $lso(c_i, c_j)$ to the root of the taxonomy.

In order to provide some kind of comparison basis, we present the results of the Budanitsky and Hirst (2006) research (see Table 1) along with three corpus based measures. The idea of this group of methods is to use a measure of the information content (*IC*) of concept c in the form of the following logarithm in base 2 of the likelihood $p(c)$ of the occurrence of concept c:

$$IC(c) = -\log p(c). \tag{4}$$

Thus, the formulas of the three measures are as follows. The Resnick (1995) similarity measure:

$$sim_R(c_i, c_j) = -\log p\left(lso(c_i, c_j)\right). \tag{5}$$

The Jiang and Conrath (1997) distance measure:

$$dist_{JC}(c_i, c_j) = 2\log p\left(lso(c_i, c_j)\right) - \log p(c_i) - \log p(c_j). \tag{6}$$

The Lin (1998) similarity measure:

$$sim_L(c_i, c_j) = \frac{2\log p\left(lso(c_i, c_j)\right)}{\log p(c_i) + \log p(c_j)}. \tag{7}$$

In recent years, some new similarity or relatedness measures appeared, however, to the best of the author's knowledge, none of them is entirely knowledge-based, and they are usually topic dominated methods. For example, Zugang, Jia and Yaping (2018) developed an interesting semantic relatedness measure for geographical applications and McInnes et al. (2014) proposed a measure to be applied in medicine.

Table 1. The Rubenstein-Goodenough set of word pairs with human ratings of semantic relatedness

1	cord	smile	0.02	34	car	journey	1.55
2	rooster	voyage	0.04	35	cemetery	mound	1.69
3	noon	string	0.04	36	glass	jewel	1.78
4	fruit	furnace	0.05	37	magician	oracle	1.82
5	autograph	shore	0.06	38	crane	implement	2.37
6	automobile	wizard	0.11	39	brother	lad	2.41
7	mound	stove	0.14	40	sage	wizard	2.46
8	grin	implement	0.18	41	oracle	sage	2.61
9	asylum	fruit	0.19	42	bird	crane	2.63
10	asylum	monk	0.39	43	bird	cock	2.63
11	graveyard	madhouse	0.42	44	food	fruit	2.69
12	glass	magician	0.44	45	brother	monk	2.74
13	boy	rooster	0.44	46	asylum	madhouse	3.04
14	cushion	jewel	0.45	47	furnace	stove	3.11
15	monk	slave	0.57	48	magician	wizard	3.21
16	asylum	cemetery	0.79	49	hill	mound	3.29
17	coast	forest	0.85	50	cord	string	3.41
18	grin	lad	0.88	51	glass	tumbler	3.45

19	shore	woodland	0.90	52	grin	smile	3.46
20	monk	oracle	0.91	53	serf	slave	3.46
21	boy	sage	0.96	54	journey	voyage	3.58
22	automobile	cushion	0.97	55	autograph	signature	3.59
23	mound	shore	0.97	56	coast	shore	3.60
24	lad	wizard	0.99	57	forest	woodland	3.65
25	forest	graveyard	1.00	58	implement	tool	3.66
26	food	rooster	1.09	59	cock	rooster	3.68
27	cemetery	woodland	1.18	60	boy	lad	3.82
28	shore	voyage	1.22	61	cushion	pillow	3.84
29	bird	woodland	1.24	62	cemetery	graveyard	3.88
30	coast	hill	1.26	63	automobile	car	3.92
31	furnace	implement	1.37	64	midday	noon	3.94
32	crane	rooster	1.41	65	gem	jewel	3.94
33	hill	woodland	1.48				

Source: Budanitsky, Hirst, 2006

4. A Modification of the Leacock-Chodorow measure

We used two popular benchmark data sets in order to analyse the quality of the Leacock-Chodorow measure and to find possibilities of improving it. The first data set is the Rubenstein-Goodenough (RG65) data set of 65 pairs of nouns (see Table 1) meant rather for assessing similarity than relatedness. The second data set is the Fickelstein (F353) (avail. at http://alfonseca.org/eng/research/wordsim353.html) set of 353 pairs of terms, meant rather for assessing relatedness. The RG65 dataset was analysed in the research carried out by Budanitsky and Hirst (2006) for some of the mentioned methods. One has to keep in mind that different values given in various studies are of different nature, some are distances (dissimilarities) and some are similarities. Therefore, in order to achieve some kind of comparison basis, one has to make them uniform, e.g. transform the values to the relatedness measure on the interval [0; 1]. The same goes for judgements provided by humans, they are usually given on different scales, e.g. in the RG65 set, the scale was from 0 to 4, and in the F353 set, the scale was from 0 to 10. After standardising the results, it turned out that the Leacock-Chodorow measure proved to be the best (in the case of both RG65 and F353 sets), both in terms of the medium arithmetic absolute deviation from the human judgement and in terms of the correlation measured by the Spearman rank correlation coefficient.

Taking a closer look at some particular pairs of words and at formula (2), it is easy to observe that the reason the Leacock-Chodorow measure has proven wrong is probably too deep normalisation. If both compared words are in the middle of the WordNet taxonomy, or even at the top, but do not have much in common

(which occurs very often), formula (2) tends to assign relatedness values of medium size while human values are close to zero. This observation is illustrated in two graphs in Figure 3. To the right of the number 0.5, on the horizontal axis, the values of the mean absolute deviation between the Leacock-Chodorow measure and human judgements stabilise, the worst departures from human judgement occur at the beginning. Therefore, we suggest to modify the Leacock-Chodorow measure in the following way. Up to a certain threshold T, say $T = 0.5$, calculate the measure in the form of a linear combination of global normalisation (as in the Leacock-Chodorow measure) with coefficient α and local normalisation with coefficient 1 – α, see formula (8). The local depth is the sum of the taxonomy depths of both concepts c_i, c_j.

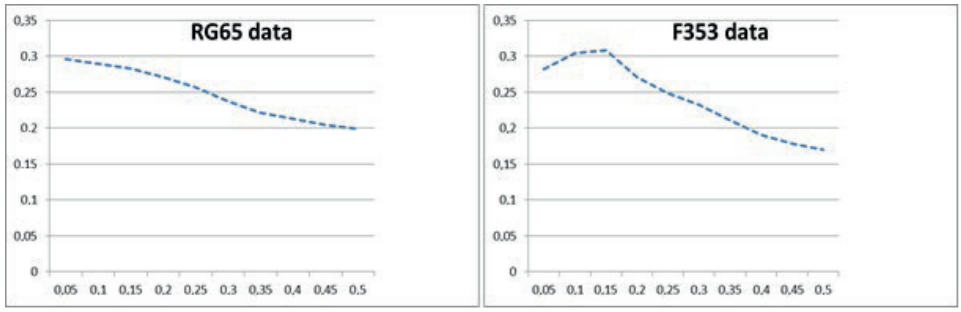

Figure 3. Arithmetic mean absolute deviation between the Leacock-Chodorow method and human judgements for the pairs of concepts for which the human judgement is below the value given on the horizontal axis.

Source: own elaboration

$$sim\left(c_i, c_j\right) = -\alpha \cdot \log_2 \frac{len\left(c_i, c_j\right)}{2 \cdot \max\_depth} - \left(1-\alpha\right) \cdot \log_2 \frac{len\left(c_i, c_j\right)}{2 \cdot local\_depth}. \quad (8)$$

Above the threshold T, calculate the measure as in the original Leacock-Chodorow formula. As far as the choice of α is concerned, we propose the value of the Leacock-Chodorow measure for α, albeit other options, e.g. the squared measure, might also be attractive.

5. Experimental evaluation

We evaluated our proposal using both RG65 and F353 datasets. We applied two criteria. The first one was the arithmetic mean absolute deviation between human judgements and those resulting from the methods for the pairs of words for which the human judgement did not exceed 0.05; 0.1; 0.15; 0.2; 0.25; 0.3; 0.35; 0.4; 0.45; 0.5. The

second one was the Spearman rank correlation coefficient between the measures' rank values and the rank values of human judgements with the correction for tied ranks.

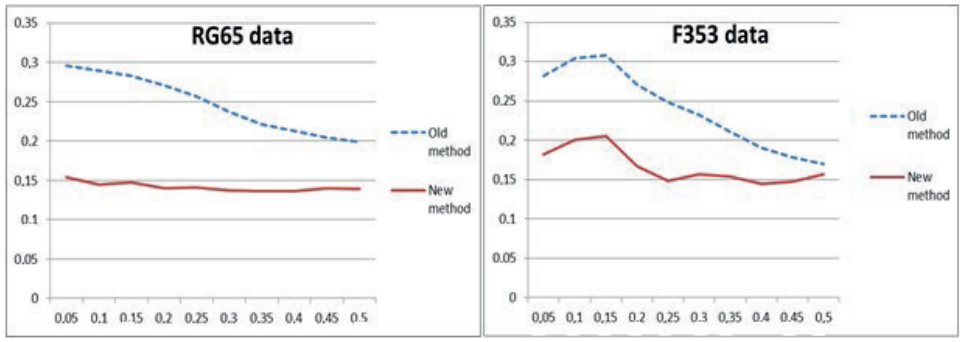

Figure 4. Absolute deviation between both methods and human judgements for the pairs of concepts for which the human judgement is below the value given on the horizontal axis

Source: own elaboration

The results of the first criterion are presented in Figure 3. It follows clearly that the modification achieved much smaller deviations from human judgements than the original Leacock-Chodorow formula. The results of the second criterion are as follows. For the RG65 dataset, the original Leacock-Chodorow formula achieved 0.782 correlation and our modification achieved 0.783. For the F353 dataset, the original Leacock-Chodorow formula achieved 0.317 correlation while our modification had 0.333 correlation.

6. Conclusions

In our opinion, the proposed modification achieves better results because it does not have the drawback of relating the distance between two terms to the whole depth of the WordNet taxonomy. The modification creates perspectives for further developments in mimicking human judgements more closely, e.g. one can use different α in formula (8) or one can take into account terms or concepts closely related to the concepts analysed with a view to smoothing 'discrepancies' resulting from single word analysis. One can also try to determine α by means of optimisation techniques with respect to, e.g. topic-oriented measures or with respect to WordNet searching techniques aimed at analysing closely related terms.

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Modyfikacja miary semantycznego podobieństwa pojęć Leacock-Chodorowa

Streszczenie: Miary semantycznego podobieństwa pojęć można podzielić na dwa rodzaje: metody oparte na wiedzy i metody oparte na bazie tekstów. Techniki oparte na wiedzy stosują stworzone przez człowieka słowniki oraz inne opracowania. Techniki oparte na bazie tekstów oceniają podobieństwo semantyczne dwóch pojęć, odwołując się do obszernych baz dokumentów tekstowych. Niektórzy badacze twierdzą, że miary oparte na wiedzy są lepsze jakościowo od tych opartych na bazie tekstów, ale o wiele istotniejsze jest to, że te drugie zależą bardzo mocno od użytej bazy tekstów. W niniejszym artykule przedstawiono propozycję modyfikacji najlepszej metody pomiaru semantycznego podobieństwa pojęć, opartej na sieci WordNet, a mianowicie miary Leacock-Chodorowa. Ta miara była najlepsza w kilku eksperymentach badawczych oraz można zapisać ją za pomocą prostej formuły. Nową propozycję oceniono na podstawie dwóch popularnych benchmarkowych zbiorów par pojęć, tj. zbioru 65 par pojęć Rubensteina-Goodenougha oraz zbioru 353 par pojęć Fickelsteina. Wyniki pokazują, że przedstawiona propozycja spisała się lepiej od tradycyjnej miary Leacock-Chodorowa.

Słowa kluczowe: badanie tekstu, sieć WordNet, podobieństwo semantyczne słów, miara Leacock-Chodorowa

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REDAKTOR INICJUJĄCY
Agnieszka Kałowska

SKŁAD I ŁAMANIE
Mateusz Poradecki

KOREKTA TECHNICZNA
Elżbieta Rzymkowska

PROJEKT OKŁADKI
Katarzyna Turkowska

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Wydawnictwo Uniwersytetu Łódzkiego
90-131 Łódź, ul. Lindleya 8
www.wydawnictwo.uni.lodz.pl
e-mail: ksiegarnia@uni.lodz.pl
tel. (42) 665 58 63