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Foreword to the twelfth issue of peer reviewed scientific Journal of Security and Sustainability Issues

Dear scientists, practitioners, politicians and international community,

I introduce to your attention the new issue of international peer reviewed scientific journal devoted to the sustainable development and security. Nowadays, sustainable development and positive contribution to the societies, communities, countries and regions became the ultimate goal of stakeholders’ efforts where the ability to perform productively as well as to meet the fundamental needs of population stimulated to switch our attention from growth to secure and sustainable development.

To that extent, the role of transport and communication system forms a nexus of crucial importance, which ultimately conditions the security and sustainability of entrepreneurial activity development and influences the daily life of the societies.

Good roads, passenger and freight rail, road, sea, inland waterways, air transport, electronic communications and postal areas serve as a precondition for a well functioning economy. The quality of complex communication system affects directly the entrepreneurial activities’ potential and results as well as the quality of households’ life. In addition, it impacts the level of secure and sustainable economic development that we all can experience and estimate.

I am delighted to have the opportunity to congratulate you for taking a joint international effort and bringing issues related to the entrepreneurship, secure and sustainable development for public attention, analysis and concern. I truly believe that scientific journals devoted to the sustainable development issues trigger theoretical and practical reflections on the raised problems and in that way contribute and facilitate the creation of conscious, sustainable and secure future.

Let us use the provided platform and join our professional competences, perceptions, views and problem solving abilities in order to choose the right path towards a secure and sustainable future.

Kind regards,

RIMANTAS SINKEVIČIUS
Minister of Transport and Communications of the Republic of Lithuania
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SECURE AND SUSTAINABLE SUPPLY CHAIN MANAGEMENT: INTEGRATED ICT-SYSTEMS FOR GREEN TRANSPORT CORRIDORS

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Abstract. In the EU White Paper on Transport 2011 the emphasis was laid on green transport corridors, i.e. transhipment routes with concentration of freight traffic between major hubs and by relatively long distances of transport marked by reduced environmental and climate impact while increasing safety and efficiency with application of sustainable logistics solutions. Green transport is based on inter-modality and advanced ICT-systems improving traffic management, increase efficiency and better integrate the logistics components of a corridor. Until today only the first steps have been realised in the implementation of green corridor concepts, so that concrete requirements and frame conditions for ICT-systems of green corridors are described on conceptual basis. Baltic Sea Region (BSR) enjoys a vanguard position in the development and realisation of green transport concepts in Europe and some research projects delivered already the first results for the requirements of ICT-systems supporting green transport corridors. Of special importance is the EU initiative “East-West Transport Corridor (EWTC II)” since for the first time a green corridor manual has been presented formulating recommendations and requirements of green transport corridors to European level. The authors took part in some important green transport corridor initiatives around the Baltic Sea, including EWTC project, and were involved in related research activities. This paper aims at pointing out the current status and the future direction of ICT-systems for green transport corridors, especially under the viewpoint of secure and sustainable green corridor management.

Keywords: sustainable supply chain management, green transport corridors, ICT-systems, secure inter-modal logistics

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1. Introduction

Despite recent economic turbulences the growth rates of economies and exporting economic sectors (e.g. Dudzevičiūtė 2013; Tvaronavičienė 2014) further increase of trade volumes is expected to continue in the future increasing the demands in the performance of logistics networks (Prause, Hunke 2014; Tvaronavičienė et al. 2013, Vasiliūnaitė 2014). The current estimations for Europe are predicting a 50% increase in passenger and freight transport within the next 20 years (Tetraplan 2009). The European Commission reacted on the development by presenting the White Paper on Transport 2011 setting the political framework for an EU Transport Policy Development in order to build for the next decades a competitive European transport system that will increase mobility and employment, remove major barriers in key areas and reduce fuel consumption. The emphasis in this approach is laid on green transport...
corridors, i.e. European transhipment route with concentration of freight traffic between major hubs and by relatively long distances of transport marked by reduced environmental and climate impact while increasing safety and efficiency with application of sustainable logistics solutions, inter-modality, ICT-infrastructure, common and open legal regulations and strategically placed transhipment nodes (COM 2011).

So in a couple of international initiatives, concepts for green transportation corridors have been developed, partly implemented and tested in order to find a more practical approach to the issue. The Baltic Sea Region (BSR) is an important arena for sustainable transport projects since in several logistics projects on European and regional level aspects of green transportation have been studied in order to design more efficient and safe processes for multi-modal transport (BSR Transportcluster 2012). All these projects highlight the efficient use of the available transport infrastructure, inter-modality and high-performance ICT-solutions together with intelligent transport systems (ITS) as main pillars for green corridors.

The results of the most important green transport projects in BSR lead to clear requirements and a list of needed functionalities which have to be provided by ICT-systems for the management of green corridor performance. The paper will give an overview over existing ICT-solutions for the major green corridor projects in the BSR, whereas an inside view will be given for the East-West Transport Corridor project (EWTC II) implementing an inter-modal green transport corridor between the South Baltic Sea and the Black Sea Region.

The last part of the paper will be dedicated to a comparative analysis of ICT-systems for the most important green corridor projects in the BSR including Scandria, TransBaltic and North East Cargo Link II. The conclusion part will highlight common functionalities and features of the current ICT-systems as well as missing areas, which have to be filled in the future. Finally, the question of requirements for a future integrated green corridor ICT-system will be discussed.

2. Methodology

Since the appearance of the first Transport White Paper (COM (2001) 370 final) of the European Commission (EC) in 2001 the necessity of shifting volumes of the dominant road traffic to other efficient transport modes is being expressed constantly. The goal was linked to the preparation of an environmental-friendly transport sector, and at the same time to provide secure and efficient transportation by reducing accidents, congestions and negative impacts through emissions, i.e. noise and pollution. After the revision of the EU Transport White paper (COM (2006) 314 final) in 2006, the concept of green corridors was introduced in the Freight Transport Logistics Action Plan (FTLAP 2007).

Since the EU enlargement in 2004 several initiatives were launched in BSR aiming at improving sustainable transportation in European Union. The first inside view in the logistics and ICT situation in BSR was given by the Interreg III project “LogOn Baltic – Developing Regions through Spatial Planning and Logistics & ICT Competence” during the years 2006 and 2007. The empirical activities of LogOn Baltic included a logistics survey, an ICT-survey and expert interviews, which were conducted in the project regions with a total of more than 1,200 participating companies (LogOn Baltic 2008; Kersten et al. 2007; Kron and Prause 2008).

Between 2008 and 2013 in a larger number of national and international projects about inter-modal and green transport concepts were developed and tested in BSR. Important initiatives like Green Corridor of the Swedish Logistics Forum, East-West Transport Corridor, TransBaltic or SuperGreen had different objectives but their results were based on expert interviews, surveys and case studies. Since the authors were involved in the empiric studies of some BSR projects or had access to relevant project results the methodology of the paper includes a literature review and analysis of theoretical material in the context of transport corridors and ICT application. Expert interviews and survey results which cover the whole BSR are tools for investigating the practical application of developed ICT systems. Furthermore, the paper uses a comparable analysis of the research outputs of relevant BSR projects to achieve research-based requirements for green corridor ICT-systems.

3. Conceptual background

In order to understand what a transport corridor means by theoretical backgrounds it can be helpful to see the corridor as a conglomeration of different
stakeholders which act along a defined geographical area in order to achieve different goals but with the same objective to reduce costs, increase efficiency, minimize environmental impact and create safe and sustainable logistics solutions. Realization of the increasing complexity of the interactions among acting organisations along their supply chains suggest that a network perspective may better explain the emergence of collaborative practices and integrative behaviours in logistics in general and supply chain management from organisation’s point of view. Furthermore studies acknowledge the importance of a network structure for the effective diffusion of supply chain-related practices (Roy et al. 2006) and for the efficiency and the flexibility of responses of the supply chain to customer expectations (Wathne, Heide 2004). As the stakeholders act in a coherent sense and are located in a certain geographical area such a transport corridor can be described as a tubular service cluster. For the example for the EWTC green corridor, linking in its kernel Sweden, Lithuania, Belarus and Ukraine, the tubular cluster has the following shape (Figure 1).

![Fig.1. Green transport corridor as a tubular service cluster](source: authors)

Figure 1 highlights a couple of interesting questions arising with green corridors. First topic is related to intercultural issues since different business cultures, different business models and different legal systems have to be harmonized. Another important issue is related to governance of green corridors since the heterogeneous set of stakeholders together with their own interests and agendas have to be unified in order to run and develop the whole green corridor.

Arising from the social network theory a transport corridor can be seen as a scale-free network, starting from dyadic relationships between two stakeholders and growing to a broader network. The behaviour of organisations in such systems as well as the impact on them has been studied and explained in resource dependence theory by Pfeffer and Salancik (1978) and by Meyer and Rowan (1977) in new institutionalism theory. Specific characteristics of scale-free networks vary with the theories and analytical tools used to create them, however, in general, scale-free networks have some common characteristics. One notable characteristic is the relative high number of nodes with relations to other nodes which greatly exceeds the average. The nodes with most of the relations are called “hubs”, and may serve specific purposes in their networks. It turns out that the major hubs are closely followed by smaller ones. These ones, in turn, are followed by other nodes with an even smaller number of degrees and so on. This hierarchy allows for a fault tolerant behaviour. If failures occur at random which, in the case of transport corridors, means the drop out of a stakeholder and the vast majority of nodes are those with small degree, the likelihood that a hub would be affected is almost negligible. Even if a hub-failure occurs, the network will generally not lose its connectedness, due to the remaining hubs. On the other hand, if a few major hubs are taken out of the network, the network is turned into a set of rather isolated graphs. Thus, hubs are both strength and weakness of scale-free networks. These properties have been studied analytically using percolation theory by Cohen et al. (2000) and by Callaway et al. (2000).

Rowley (1997) applied such a social network perspective to the stakeholder theory of the firm. Accordingly, research has started to address systems of dyadic interactions and stakeholder multiplicity, which can be also of importance for the understanding of a transport corridor concept. Opportunities for organizational resistance or adaptations to stakeholder expectations (Neville, Menguc 2006; Oliver 1991; Wolfe, Putler 2002) can be investigated. Vurro et al. (2009) investigated the predictors for stakeholder networks for value chains and identified two structural features of such stakeholder networks: Firstly, network density, defined as the degree of completeness of the ties between the actors in a network, has been identified as a likely determinant of corporate responsiveness in that it affects the ease of communication and efficiency of information flow across actors in the network. The second predictor, the degree of centrality in the network, that is, the extent to which an organization occupies a central position in the network, has been suggested as a further influence on the attentiveness of companies to stakeholder concerns and their willingness to accommodate their requests (Rowley 1997). When seeing the green corridor as network of supply chains with
the participation of various stakeholders it is necessary to understand how these stakeholders can communicate and cooperate. As the focus of this paper is laid on the role of ICT in these networks the theoretical background is given.

A literature review reveals an abundance of existing articles about the role of ICT in logistics and supply chain management covering a wide range of issues including enterprise resource planning (ERP), e-business as well as new technologies and other information systems for improving the supply chain management (Auramo et al. 2005; Ketikidis et al. 2008). By following the argumentation of Auramo et al. (2005) the commonly viewed functional roles of ICT in supply chain management can be classified into three categories:

- Transaction execution
- Collaboration and coordination
- Decision support.

A more concrete interpretation of the benefits of ICT in supply chain management has been formulated by Cross (2000) and Simchi-Levi et al. (2003):

- Reducing friction in transaction through cost-effective information flow
- Providing information, availability and visibility
- Enabling single point of contact for data

Empiric studies on ICT in supply chain management confirmed that the theoretical results described in the literature are in line with the perception of supply chain managers in companies since the involved practitioners stressed accordingly as the main benefits of ICT use in supply chain management (Grieger 2004; Auramo et al. 2005; Ketikidis et al. 2008):

- Improvement of information quality and quantity
- Improvement in operational efficiency
- Costs saving
- Reduction of lead time
- Enhancement of service level
- Higher flexibility.

Additionally it has to be emphasised the big differences between small and medium-sized enterprises (SMEs) and larger companies in ICT use in logistics and supply chain management due to large price differences among the existing information systems (Ketikidis et al. 2008). Consequently not every enterprise can afford sophisticated ERP or supply chain management systems making it complicated to integrate ICT-systems of the SME sector into supply chain management solutions.

The research results and corresponding literature is significantly reduced when it comes to ICT related topics in the context of inter-modality and even more limited in the context of the specific role of ICT in green corridors since these topics are part of on-going research activities (Bontekoning et al. 2004; Clausen et al. 2012). Since multi-modal transport corridors are built of networks of logistics companies and other corridor components their management depends on powerful ICT-systems (Daduna et al. 2012). Sander and Premus (2002) stressed the function of information in supply chain management referring to the glue that hold the collaborating business structures in the supply chain together whereas Evangelista (2002) stated that the role of ICT in supply chain management can be described as key integration element.

OSullivan and Patel (2004) pointed out that a lack of integration within and across different transport modes generate additional costs for the users so that Gustafsson (2008) proposed in order to make inter-modal transport as attractive as road based transport the integration between traffic and transport management is necessary. Oh (2011) was able to show that a modal-shift including supporting ICT-systems is a powerful measure towards green transportation since a reduction of 15% of greenhouse emissions can be achieved. But beside these special results the specific role and needed functionalities of ICT-systems in the context of green corridors is still part of recent research activities so that only a few number of publications exist (Clausen et al. 2012).

4. Network structures and ICT-systems

According to the Freight Transport Logistics Action Plan green corridors reflect an “integrated transport concept where short sea shipping, rail, inland waterways and road complement each other to enable the choice of environmentally friendly transport” stressing the multi-modal and green aspects (FTLAP 2007). In order to speed up the realisation of green corridor concepts in Europe in recent years an increasing number of initiatives have been started on national and transnational level to support the shift towards greener and more efficient logistic solutions. Main initiatives are East-West-Transport-Corridor (EWTC II), TransBaltic, Scandria and North-East-Cargo-Link (NECL II).

By taking into account the results of these initiatives the current situation shows that the main character-
istics of a green corridor and conditions that make a transport corridor actually green are varying but it is already visible that there are also common topics, which are recognised by all green corridor initiatives (Hunke, Prause 2012). Firstly, it is inter-modality, which enables the choice of environmental-friendly transport along the transport route, since reduced emissions is one of the obvious objectives of a greener transportation. Other important factors for green transport are adequate transhipment facilities, innovative transport units and vehicles, and advanced ITS-applications, which can be considered as requirements for green corridors, since the customers who chose to use a transport corridor expect not only environmental-friendly transport but would like to benefit from economic advantages and cost and time savings as well.

Therefore, economies of scale with bundled cargo together with high load factors are other factors for a green corridor, offered together with reliable time tables and adapted schedules for trains, ferries and other line traffic (Notteboom 2008; Daduna et al. 2012). The definition of the Commission covers also the fair and non-discriminatory access to corridors and transhipment facilities that make it possible for every customer to participate in the corridor and use the public available benefits. One approach to achieve these requirements for the implementation of green transport corridors is the development and establishment of an ICT-system.

4.1. Frame requirements for ICT-systems

The use of ICT-systems in the logistic networks depends heavily on the acceptance of the stakeholders. The technology acceptance model postulated by Davis et al. (1989) describes that the degree of user acceptance of technology has a positive effect on the usage of technology, which in turn also affects the performance of the network. According to DeLone and McLean (1992), the patterns and frequency of ICT-use are influential factors of individual impact such as quality, productivity and performance. Transferred from organizational theory the study of Igbaria and Tan (1997) of 625 employees in a large organization shows that user satisfaction on individual performance was actually related to ICT-use, therefore suggesting the ICT-use variable as an indicator of performance.

Vice versa, already the results of the research project LogOn Baltic project revealed huge differences in the logistics competences around the BSR, which are still valid until recent times (LPI 2012). As a result of the comparison of regions with different levels of competence, the LogOn Baltic has brought to light that the BSR regions with higher logistics competence enjoyed a higher degree of ICT-use in logistics as well as a significant higher level of outsourced logistics ICT-services linked to an advanced level of sophistication of used logistics ICT-systems. Another important observation was that the focus in outsourcing of logistics ICT-solutions was laid on closed and company oriented systems (Kron, Prause 2008). Expert interviews revealed that the landscape of inter-company logistics ICT-systems is dominated by larger production companies and logistics service providers to safeguard the control of their individual supply chains and to realise dedicated platforms for sourcing of transport services mainly from regional SMEs (Prause et al. 2010).

The requirement for openness and harmonisation applies also to supporting ICT-systems of green corridors which is in line with the results about multimodal transport systems. The set targets are in conflict with the still dominating situation in BSR which can be characterised by a rather closed and dedicated ICT-landscape in logistics (OSullivan, Patel 2004; Gustafsson 2008; Kron, Prause 2008; Prause et al. 2010).

4.2. Functional range of ICT-systems

A way to increase effectiveness and to decrease cost of the business’ activities in the supply chain is the optimization of activities in the supply chain on a cross company level within a network. While many existing IT-solutions offer effective means of managing business processes within companies, a cross-company management of the business processes requires different stakeholder’s cooperation. An e-platform is a solution to facilitate such collaboration. “A digital information exchange is a key to facilitating transports, improving transport system efficiency, and reducing negative impacts on the environment because it allows corridor actors to plan better and react quicker and more appropriately” (EWTC 2012). The ideal e-platform is a virtual environment that facilitates business activities of logistic service providers and customers needing shipment. Integration of supply chain processes and companies increases the per-
formance and security of supply chain management. Key benefits, resulting from integration provided by an e-platform are:

- take advantage of new supply and distribution channels,
- reduce cost of distribution system,
- exchange knowledge via open partner systems,
- increase quality and range of added value services.
- shorten supply chain through elimination of intermediary companies,
- gain quick access to vast knowledge on companies and goods (data mining),
- simplify and reduce time of ordering and distribution,
- enable customers to track orders,
- expand activity area to global market (Baltic AirCargo.Net 2012).

Geographical information plays also an important role for many business activity decisions. GIS service provides input to decision supporting tools and visual feedback to gain a better insight by tying geographical location information with relevant aspects of business activities. Spatial data and information about terrestrial transport modes are required so that the customer can view details of chosen infrastructure element. Visualization should include the position of all the relevant objects to supply chain management: goods, routes, facilities (warehouses, distribution centres, ports, rail stations etc.) and companies (e.g. material handling, customs, etc.). An e-platform provides opportunities to get valuable information for business intelligence. Gathered standardized statistical information on transactions is an input that allows performing various marketing analyses, developing business strategies and more accurately estimating demand for services traded on the platform. Implementation of semantic web technology will further increase analytical capabilities.

Platform usages itself provide wide range of information on demand, customers interest in available services, desired transport routes, destinations etc. Actual demand for a given service is more accurate information than interview results. This information is valuable for service providers planning their business and can be easily obtained by platform operator. (Baltic.AirCargo.Net 2012)

5. Application in practice

The EWTC II project plays in several senses a specific role among all green corridor projects in BSR since it aims to improve East-West trade routes between the Baltic Sea and the Black Sea Region by enhancing interoperability between different infrastructures, standards and systems, as well as removal of physical and operational bottlenecks, especially on the EU borders. But also on EU transport policy level EWTC II project has a vanguard position since for the first time a green corridor manual has been developed which will be used as a blue print for all future green transport initiatives and which has been forwarded to EU political level.

Special attention in the project was paid to co-modality, especially to rail transport including European and Russian gauge size together with short sea shipping in this corridor. The backbone of the project consists of the container train Viking, which shuttles between Klaipeda and Illichevsk via Minsk and Kiev. The Viking train is linked to Karlshamn in South Sweden by a ferry line and from Illichevsk via short sea shipping routes to destinations in the Black Sea. Due to these extensions, the EWTC II can be considered as a part of the Transport Corridor Europe–Caucasus-Asia (TRACECA) being able to attract new freight flows from Central Asia and China to Europe (Kusch et al. 2011).

The development of the ICT-system for the East-West Transport Corridor was influenced on theoretical considerations of Gustafsson (2008) and the results of “Green Corridor” initiative of the Swedish Logistics Forum (EWTC II 2012). Since the existing proposals were not practical enough to meet the needs of the East-West Transport Corridor, a special task 3C in the EWTC II was initiated for the development of a fitting ICT-system. On the base of expert interviews and surveys it was possible to specify 15 criterions for the ICT/ITS of the EWTC II, which have to be fulfilled in order to facilitate secure and sustainable transport, improve transport system efficiency, and reduce the negative impact of transports on the environment (Info Broker 2012):

1. Increase load factors from currently 30-50% to above 50% (EEA 2010; Notteboom 2008).
2. Usage of digital waybills will increase inter-modal transport efficiency.
3. Intelligent truck parking systems increase corridor efficiency by reducing up to 1h per driver and day for seeking safe parking areas (EWTC II 2012).
4. Better information at transfer nodes of the corridor by terminal service providers reduces waiting
times.
5. Up-to-date traffic information within the supply chain allows drivers and other operators to choose alternative routes.
6. Automatic Identification System data (AIS) about ship locations and estimated time of arrivals allow better resource management.
7. Access to up-to-date local weather data allows carriers to re-route or re-schedule transports.
8. Better matching of broadcasted transport information with the needs of logistics actors.
10. Easing of small cargo shipments by rail and sea in order to increase inter-modal operations related to rail and maritime transport since currently small shipments are dominated by road transport causing big carbon footprints.
11. Reduce idle costs by sharing of transport units, since too many low-rated and utilized transport units are scattered around ports, terminals and transfer nodes.
12. More efficient management of transnational oversized cargo transports by facilitating time-consuming entry processes and reduction of related bureaucracy.
13. Intelligent Port Access Control by using open integrated ICT-systems for pre-registration according to the EU security and terrorist regulations as well as transnational transports for reduction of delays at the port gates.
14. Implementation of data exchange between major transport hubs in the corridor will increase transport efficiency.
15. Improved cargo tracking would facilitate resource planning for consignors, consignees and transport operators.

These 15 requirements set the frame for the development of the ICT-system of EWCT II corridor in order to facilitate the surface transport sector by offering simple means to reduce costs and problems associated with accessing and exchanging relevant information by stressing the specific needs related to secure inter-modality and sustainability. The transport and traffic information components shall safeguard high efficiency, increase safety and reduce the environmental impact on green corridors by sharing information among the actors of the inter-modal transport process including briefings about current situation of traffic, weather, cargo position and port access in the corridor. The emphasis of the parking information system was motivated to ensure high levels of security and quality and enhanced seamless traffic flows.

The contribution of the ICT-solution to the realisation of a green corridor concept can be assessed by Key Performance Indicators (KPI) being developed in order to benchmark considered green corridors (Clausen et al. 2012). The KPIs of the EWTC II green corridor concept, used the KPI system of the SuperGreen (2010) project as a starting point, but their scope was enlarged by stressing social and economic aspects of the sustainability of the corridor (EWTC II 2012). As a result, the sustainable performance of the developed ICT-tool can be easily benchmarked when using these key performance indicators.

Furthermore, the TransBaltic project with its ICT-system “Logit 4SEE™” is another practical application. The ICT-system can be characterised as an ICT-tool for planning inter-modal chains giving the transport users the possibility to select the best alternative for door-to-door transports by delivering cost and time calculations to be able to find the optimal modal mix. “Logit 4SEE™” represents a multi-modal transport planning and monitoring system that allows a transparent supply chain management on the base of a web based application (TransBaltic 2012). Specific functionalities of “Logit 4SEE™” are:

- Description and registration of logistics offers of logistics service providers in the ICT-system including time schedules or duration of their transport services.
- Providing transport requests from registered customers for transport and logistics services containing transport instructions.
- Transport planning system calculating transit time, costs or CO₂ emission.
- Transport execution and monitoring of cargo along the transport chain including all kinds of cargo status information.
- Loads consolidation system from different transport orders going in the same direction for partial or whole transport chain.

The Scandria ICT-system can be regarded as an op-
timised version of the EcoTransIT tool for the Baltic Sea ferry transport inside the Scandria corridor. The Scandria ICT-system is a web-based online tool for inter-modal route planning, infrastructure information and for evaluating changes of inter-modal freight nodes and networks with a geographical focus on the area between the Adriatic Sea and Baltic Sea including road, rail, inland waterway, short sea shipping, and ferry networks. The main functionalities, covered by the Scandria ICT-system are (Scandria 2012):

- Inter-modal routing system offering alternative routes between inter-modal terminals.
- ICT-tool offering the usage of fixed relations in the routing process by taking under account already used inter-modal transport services by a transport operator and by offering different options for transport modes for routes in graphical form.
- Accessibility analysis tool analysing and optimising the accessibility of inter-modal terminals according to time, distance, energy consumption or costs.
- Terminal information tool providing information about terminal infrastructure, services and organisation.
- Scenario tool allowing the creation and comparison of different scenarios depending on the network and terminal parameters.

The NECL II system can be characterised as a logistic ICT-solution for transport matching. For the development of the ICT-tool, a full work package 5 of NECL II was dedicated in order to realise a fully operating transport matching system with a focus on the decrease of existing volumes of empty or partially loaded transports. The functionality of the NECL II system is laid on (NECL II 2012):

- Choice between alternative transport routes.
- Comparison of alternative transport routes.
- Possibility to optimise routes by cost, time, CO₂ emission
- Multi-criteria optimisation of transport routes.

6. Results of practical realization

It should be recalled that all considered green corridor projects accept the already discussed definitions and requirements of European Union about green transport corridors as well as the results of the “Green Corridor” initiative of Swedish Logistics Forum. All in all, by taking into account all discussed features of ICT-systems of the main green corridor projects in the BSR together with Northern understanding of a green transport corridor, it can be concluded that an appropriate ICT-system for the support of green corridors should facilitate the following functionalities:

- Routes planning
- Open architecture
- Standardisation of interfaces
- Electronic data interchange
- Transport optimisation
- Real time data information systems
- Inter-modal route planning
- Loads bundling and consolidation
- Cost calculation
- CO₂ emissions calculation
- Purchase of transport services
- Transport monitoring.

Additionally, the comparable analysis reveals that there are specific topics representing crucial factors for the development of green transport corridors but the existing ICT-systems of the BSR green corridor projects are not supporting corresponding functionalities. The most important missing functionalities are related to contracting, finance, return logistics and logistics pricing (Info Broker 2012; TransBaltic 2012; Prause et al. 2010; Theofanis, Boile 2009):

- All analysed green corridor ICT-tools support and focus on technical and organisational aspects of inter-modal transport planning but business and contracting related aspects of transportation have been neglected. One reason is that transport service providers give special business conditions for different clients and cargo, and they are not eager to be transparent with this information (Prause et al. 2010).
- Invoicing and payment services are hardly mentioned in the existing ICT-systems (TransBaltic 2012).
- Return of logistics assets including containers and train platforms is not considered in existing ICT-systems although big traffic is related to empty containers. A software module dealing with empty logistics assets may reduce the cost of containerised traffic and make transport greener (Wolf et al. 2012; Theofanis, Boile 2009).
- All transport planning tools are based on transport tariffs stored in a database. But freight rates are rather flexible being comparable to spot market prices in road transport or being subject to volume discounts in case of railway and maritime carriers. Hence, the existing models in the ICT-systems are too rigid and simple to model the reality in green transportation (Info Broker 2012; TransBaltic 2012).
Since the development of green corridor together with their ICT-systems is still on-going inside and outside BSR it will be only a question of time until these missing functionalities will be tackled in upcoming green corridor projects. A special frame condition on green corridor ICT-systems is set by the key performance indicators which are until now individually developed by each green corridor project in BSR and which are still part of the on-going research activities. In the considered BSR cases these key performance indicators are also impacting the functionalities of the green corridor ICT-systems.

In the future, one important task will be the integration of the existing ICT-tools of the green transport projects around the BSR into one integrated ICT-system of extended functionality in order to be able to utilise the available capacities around the BSR more efficiently towards a greener logistics. Such an integrated transportation ICT-system can bring together the big market players in logistics and trade as well as SME sector in logistics to realise a cheaper and more environmental-friendly transport. By taking into account the discussed issues the advantages of integrated ICT-system can be expressed by the following point:

- Increased accessibility of inter-modal freight transport solutions, i.e. the gain of door-to-door co-modal solutions together with environmental and logistics performance attributes.
- Improved synchronisation of logistics processes and better utilisation of logistic resources.
- Enhanced reliability of inter-modal services and better adaptability of logistics solutions through dynamic updated information.
- Reduced costs and effort for the management of complex transport chains.
- Possibility to use standardised electronic logistics documents like waybills and customs information along the transport chains.
- Creation of an open transport spot market along the involved green corridors including the possibility of a fair participation of logistics SME sector.

Since a fully working integrated ICT-system for green corridors is still a topic of the future, it is recommendable to use an open architecture able to integrate and exchange information with already existing systems. Related to the issue of open architecture is the question of the definition and use of standards, since businesses using data standards like Global Standards 1 (GS1), Universal Business Language (UBL), United Nations Electronic Data Interchange For Administration, Commerce and Transport (EDIFACT) were not focussed on the modelling of transportation processes, so there exists still the need for the development of standards regarding the description of logistics service, logistics nodes and other logistics objects. The existing standardisations can offer solutions for regions or branches, but there is no appropriate general solution for general multi-modal transport sector until now.

The comparative analysis of the running green corridor projects in the BSR brought to light that up to now it is possible to formulate minimum requirements for the provided functionalities that an integrated logistics platform system has to offer:

- Generation of inter-modal door-to-door transport alternatives comprising the whole transport chain planning.
- Transport chain visualisation.
- Multi-criteria transport optimisation tool.
- Calculation and measurements of energy consumption and CO₂ emissions.
- Standardised electronic data interchange in order to be able to integrate corporate systems using different communication standards.
- Information about logistics nodes, available services and service booking.
- Parking information and booking parking places.
- Up-to-date information about traffic and weather conditions.
- Transport tracking and monitoring
- Negotiation, contracting and booking system.
- Financial settlements.

However, these necessary functionalities are representing the more technical part of the requirements that have to be fulfilled by an integrated ICT-system. The more challenging task is to realise the organisational and political framework for such system architecture. By summing up the results of green corridor initiatives from BSR together with the discussions of the paper it can be stated that integrated ICT-systems have to meet the following system requirements (Green Corridor 2010; Info Broker 2012; TransBaltic 2012):

- Open architecture.
- Oriented on standards.
- Focus on inter-operability and co-modality.
- Independent of technology.
• Endorsed and adopted by major freight ICT-systems providers and logistics operators.
• Support the European transport and logistics system to be more efficient and environmental-friendly.
• Creation of a fair and balanced transport spot market within the corridors enabling market leaders and SMEs to interact at a low cost.

Especially the realisation of the last point represents a task which is placed far beyond technical questions because it needs to convince the current logistics players to open their closed ICT-systems and to integrate them into a common logistics platform which is linked to loss of their influence and market power. In order to succeed with these tasks, more research on green corridor business models and the possible benefits of integral corridor management systems for all participants will be necessary.

Another strong barrier for the implementation of green corridor ICT-systems is related with the fact that creating open data bases comprising freight tariffs and contracting conditions in order to be able to build transparent spot markets is again a political sensitive topic, where more incentives than general arguments have to be developed in order to increase the will to participate among the main logistics players in a green corridor. In case of the acceptance of participation of a critical mass of logistics companies in such systems, it is still necessary to develop a communication system between these co-operating companies and to agree on underlying business models, standards of documents and messages. But an important constraint for successful future applications and solutions in BSR is to be open and affordable for the small and medium companies due to the dominance of SME sector in logistics.

Conclusions

Green transport corridors play a growing role as transhipment routes for long distance freight traffic based on multi-modality and supporting ICT-systems. When it comes to the realisation of green corridor concepts, only a few pilot projects exist until now giving the opportunity to develop and test green corridor solutions together with their ICT-systems (EWTC II 2012; Info Broker 2012; TransBaltic 2012). The management and monitoring of the performance of green corridors is based on key performance indicators which are until now individually developed by each green corridor project in BSR and which are still part of the on-going research activities. These KPIs together with general demands on green corridors prove a high impact on the functionalities of supporting green corridor ICT systems (Green Corridor 2010).

The main future task will be the integration of the existing ICT tools of the BSR green transport projects into one overall integrated ICT-system of extended functionality facilitating and coordinating the available capacities around the BSR more efficiently towards a greener logistics. Such an overall integrated transportation ICT-system has to offer an ICT-platform for the different stakeholders of BSR logistics, to realise their cooperation according to the frame conditions and to improve the performance, safety and efficiency of green corridors.

Even if the final structure of such an overall system is still open, already now some cornerstones of such ICT-systems for green corridors are visible since they will rely on open architecture, use standards and realise green and democratic models for efficient multimodal logistics markets. Especially the realisation of the last point represents a task which is placed far beyond technical questions because it needs to convince the current logistics players of open their closed ICT-systems and to integrate them into an integrated logistics platform which is linked to the loss of their influence and market power. In order to succeed with these tasks, more research on green corridor business models and on potential benefits of integral corridor management systems for all participants is necessary.

But beside the discussed technical issues the results of the first implemented green corridors in BSR already revealed that political and cultural topics play also a crucial role for the acceptance and success of the green corridor concept. Important preconditions for the implementation of green corridor ICT-systems are related to transparency, cooperation and trust since the creation of open data bases comprising freight tariffs and contracting conditions are necessary to build transparent spot markets but at the same time these strategic and political sensitive topics represent main obstacles for the participation among the main logistics players in a green corridor.

So in order to safeguard the success of green corridor concepts the scope of research has to include cultural and political topics touching issues beyond ICT-systems so that the participation of a critical mass of
logistics companies in such systems can be realised. But the solutions of these questions need a lot of further research which is on the agenda in running and upcoming green corridor projects.

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1. Introduction

Consumption of various energy sources is very important to development of the national economy in each country and to the global economic development. Energy provides an essential ingredient for almost all human activities. Development of industrial production, transportation, activities in agriculture, mineral extraction, food production and storage, space and water heating, lighting, air conditioning, rendering of various services, etc. require corresponding consumption of energy sources. Modern energy services are engine of economic and social development, serve as one of major driving forces of sustainable development (Grybaitė 2011, Stańczyk 2011; Dudzevičiūtė 2012, Lankauskiene, Tvaronavičienė 2012; Vosylius et al. 2013; Vasiliūnaitė 2014).

During last four decades global economy was growing on average by 3% per year. Total population increased from 3.8 billion in 1971 to 7 billion in 2011, i.e. was growing on average by 1.6% per year. These two factors, including fast industrialization of developing countries, caused rapid growth of primary energy consumption. Total world primary energy over the period 1971-2011 was growing on average by 2.2% per year and in 2011 it amounted to 13.1 billion toe. Consumption of coal was increasing over this period on average by 2.4%, oil demand was growing on average by 1.2% and consumption of natural gas was growing on average by 2.9%. Contribution of fossil fuels into the global primary energy...
mix decreased only slightly – from 86.6% in 1971 to 81.6% in 2011.

Debate is lasting for decades about the potential problems for the future generations due to dwindling reserves of the traditional fossil fuels, dramatic consequences of wasteful energy consumption, threatening growth of greenhouse gas emissions, a great their influence on climate change and global warming (Lapinskienė et al. 2014; Mačiulis, Tvaronavičienė 2013; Tvaronavičienė 2012; Vosylius et al. 2013; Vasilienaitė 2014). During the last few decades there has been growing consensus that human activities, and in particular greenhouse gas emissions from fossil fuel combustion, cause problems of the global warming.

Over the past century the average planet’s temperature has increased by more than half a degree Celsius and all predictions are that the global warming will continue. Scientific community is concerned with consequences of this warming: significant and harmful effects on health and environment, growing number of extreme storm events and large wildfires, rising sea levels, etc. As a result of common efforts of scientists, various international organizations, governments, politicians and public, the concept of sustainable development was formulated in 1987 and the United Nations Framework Convention on Climate Change was signed by over 150 countries at Rio de Janeiro in 1992. Ambitious sustainability goals for Member States are formulated in the EU directives and communications, national strategies, and other documents. However, close dialog between industrialized and developing countries and common efforts of world community are still required. The aim of this paper is to discuss aspirations of sustainable global energy development and trends of primary energy consumption in the world, to set out some findings from analysis of foreseen energy demand scenarios. The paper also focuses on efforts directed to implementation of new energy policies.

2. Aspirations for sustainable energy development

The modern economy is closely linked to the energy that role is to ensure energy security and create favourable conditions for the economic well-being (Tvaronavičienė 2012, Miškinis et al. 2013; Vosylius et al. 2013; Dudzickūtė 2013; Tvaronavičienė 2014; Vasilienaitė 2014). Long-term energy policy of individual countries is based on modelling of potential future scenarios over the medium and long term period, as well on a comprehensive insight into development of the possible political, technological and environmental factors. The most important feature of the current energy systems is that the fossil fuels still dominate in the world energy balance and dependence on energy imports is increasing in many countries. Permanent growth of energy demand is stipulated by industrial development, mechanization and automation of processes in all sectors of the economy, growing population and increasing their mobility, the desire to ensure better working conditions and greater living comfort and other factors. However, there are still large differences in energy supply, as well as in economic-social conditions and quality of life between industrialized and developing countries. World Energy Congress, held in 2013, 13-17 October, Daegu, Korea, stated that 1.3 billion people in the world lack access to electricity and 2.7 billion have no access to modern and healthy forms of cooking (World Energy Insight 2013; Otto 2013).

Debate is lasting for several decades on various levels about the energy status, the potential problems for the future generations and consequences of growing greenhouse gas emissions on climate change. In 1968, the Club of Rome has brought together efforts of thirty experienced scientists, prominent politicians and businessmen to set out the global economic trends and to assess the potential risks. Using a special method of dynamic modelling (Forester 1971), changes in the global population, the necessary quantity of food products, the consumption of natural resources, as well as in the volume of industrial production and the extent of environmental pollution were analysed. Based on the evaluation of these factors, trends and interrelationships between them, very pessimistic future of the world was predicted a few decades ago – in a case global population, use of natural resources and industrial production are increasing in the same pace, environmental pollution at the beginning of the twenty-first century can achieve catastrophic level and ecological crisis can be inevitable (Meadows et al. 1972). The most important findings from these forecasts were as follows: it is necessary to review priorities of the social development and to abandon reckless economic growth as the sole and most important priority; it is necessary to pay more attention and resources for regulation and control of the use of main natural resources and
environmental pollution.

Results presented in the Club of Rome studies, despite criticism of many experts, have stimulated very active discussions of scientists, writers, and various organizations and public on the rational scenarios of future world development. In 1987, a special report of the World Commission on Environment and Development was presented at the General Assembly of United Nations. The concept of sustainable development was formulated in this report – “humanity has the ability to make development sustainable to ensure that it meets the needs of the present without compromising the ability of future generations to meet their own needs” (Our common future 1987).

In 1992, principles of sustainable development were formulated and adopted internationally in the Declaration at Rio de Janeiro United Nations World Summit. In addition the sustainable development action programme Agenda 21 was adopted (Agenda 21). In 2002, the sustainable development action programme was corrected at the World Summit in Johannesburg, and specific commitments to priority areas were approved. All states were required to develop and begin to implement national strategies for sustainable development. In 2003, Lithuanian Government approved National Strategy for Sustainable Development (National Strategy for Sustainable Development 2003). On 9 June 2006, the European Council adopted a revised EU Sustainable Development Strategy and imposed an obligation to Member States to update existing national sustainable development strategies and to ensure their consistency. In 2009, Lithuanian Government approved an updated National Strategy for Sustainable Development with ambitious objective – “to achieve, by 2020, the average development level of EU countries of 2003 according to the indicators of economic and social development as well as to the efficiency in consumption of resources, and to stay within the EU permissible limits with respect to the indicators of environmental pollution adhering to the requirements of international conventions to minimize environmental pollution and impact on the global climate change” (National Strategy for Sustainable Development 2009).

In 2009, the Netherlands Environmental Assessment Agency produced a report and presented an analysis of the energy consumption trends and global environmental problems. The focus of the report is given on energy supply and climate change, agriculture and biodiversity loss (Growing within Limits 2009). Insights are provided on measures that create conditions for sustainable development and a great potential for increase of energy efficiency and for more efficient food supply system is shown in the report. The implementation of the Challenge Scenario in the energy sector is recommended by increasing energy efficiency and deployment of renewable energy resources, by implementing carbon capture and storage technologies, reducing deforestation and non-CO\textsubscript{2} emissions. An essential condition for future actions – the reduction of global emissions can be achieved only by common efforts of developed and developing countries.

The stabilization of climate change is one of the priorities in the EU energy policy. In 2000, the European Commission established the First European Climate Change Programme with an objective to identify the most environmentally effective and most cost-effective policies and measures that can be taken to cut greenhouse gas emissions. The Second European Climate Change Programme was launched in 2005 with the aspiration to explore new cost-effective options for reduction of greenhouse gas emissions (European Climate Change Programme 2005). The next step in the EU energy policy was approval of the climate and energy package with an ambitious plan to improve energy efficiency by 20%, to reduce greenhouse gas emissions in the EU by 20% from the 1990 level and to achieve a mandatory target of a 20% share of renewable energies in the gross final energy consumption by 2020 (The climate and energy targets for 2020). In the recent documents new ambitious objectives are foreseen: continued progress towards a low-carbon economy, increase of energy security, reduction of dependence on energy import, reduction of the EU domestic greenhouse gas emissions by 40% below the 1990 level by 2030 (2030 framework for climate and energy policies) and by 80-95% by 2050 compared to the 1990 level (Roadmap for moving to a low-carbon economy in 2050). Ambitious sustainability goals for the Member States are formulated in the EU directives and communications, national strategies, and other documents.

3. Current trends in the world energy

World economy has increased over the last four decades by 3.3 times. Overall global economic growth was slowing down: over the decade 1971-1980 a rate of economic growth was equal on average to
3.8% per year, in 1980-1990 decreased to 3.0%, in 1990-2000 – to 2.8%, in 2000-2011 – to 2.6% per year. However, as shown in Figure 1, the overall global economic slowdown has led to this tendency due to slower economic growth in industrialized countries belonging to Organization for Economic Cooperation and Development (OECD). Due to the global economic crisis the GDP in these countries over the period 2000-2011 was increasing on average by 1.6% per year. Meanwhile, in developing countries economic growth over the last three decades was increasing: over the decade 1980-1990 a rate of economic growth was equal on average to 2.4% per year; in 1990-2000 the GDP was increasing on average by 3.1% per year, and in 2000-2011 by 6.1% per year. The GDP in China over the period 2000-2011 was growing on average by 9.9% per year, and the GDP growth index has increased over this period by 2.8 times, while global economic growth index during this period was equal to 32%, and in the United States – only 19%.

Role of developing countries in the global economy is becoming stronger – a share of GDP they created in 2005 U.S. dollars, using estimates of Purchasing Power Parity, increased from 34.6% in 2000 to 46.1% in 2011. Economic growth in the Asian region, and particularly in China, is even faster. The share of the China economy in the global economic structure has increased from 7.4% in 2000 to 14.6% in 2011. The role of the United States economy during this period decreased significantly – from 23.1% in 2000 to 18.8% in 2011 (Figure 1).

In spite of all the fears and many prompts to change trends of energy consumption as well as considerable efforts to substitute fossil fuels by renewable energy sources, the total world energy consumption, including use of oil and oil products, natural gas and coal, is still increasing. Total consumption of primary energy in the world was growing over the period 1971-1980 on average by 3.0%, in 1980-1990 by 2.0%, in 1990-2000 by 1.4%, and in 2000-2011 on average by 2.4% per year. As shown in Figure 2, the rapid economic growth in developing countries over the period 1990-2000 has led not only to the growth of energy consumption in these countries, but also to the overall growing trend of energy demand in the world. Primary energy consumption in China has been growing extremely fast – on average by 8.6% per year. In 2009, due to the economic crisis, which was painful for most countries, the total consumption of primary energy in the world was by 1% less than in 2008. In 2011, the total primary energy con-

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**Fig.1.** Trends of the World economic growth

*Source: International Energy Agency 2012, 2013a, 2013b*
Consumption in industrialized countries was the same as in 2000 – 5.3 billion toe. Meanwhile, primary energy consumption in developing countries increased by 66.1% – from 4.4 billion toe in 2000 to 7.4 billion toe in 2011. Primary energy consumption in China in 2009 was for the first time higher than in the United States. In 2011, primary energy consumption in China was 2.7 billion toe and over the eleven years period has increased by 2.5 times. The total primary energy consumption in the world has increased over the period 2000-2011 by 29.8%.

Various forms of energy, and in particular petroleum products used for transport of goods and passengers as well as electricity widely penetrated to all human activities, has been and remain one of the most important and essential component of humanity needs to ensure the progress and improve the living conditions. Over the period 2000-2011 coal demand was increasing very rapidly (4.4% per annum) and total consumption of this fuel rose from 2.4 billion toe in 2000 to 3.8 billion toe in 2011. However, oil and oil products are still dominating in the global primary energy mix with 4.1 billion toe in 2011. Natural gas consumption during this period increased by 34.4%, and the share of this fuel in the global primary energy consumption increased to 21.3% in 2012.

![Fig.2. Trends of the world primary energy consumption](image)

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Aspirations for sustainability and global energy development trends

Fig. 3. Structure of the World primary energy consumption in 2011
Source: International Energy Agency 2013c

Nuclear fuel in absolute terms was almost the same over this period, and its share in the primary world's energy mix decreased to 5.2%. Consumption of renewable energy sources in 2011 was 32.7% higher than in 2000, but their share in the primary energy mix in 2011 accounted for only 13.2% (Figure 3).

4. World energy development scenarios

World energy demand development is influenced by many factors, which can lead to different trends in the energy demand growth as well as different ways giving opportunity to meet them. In 2013, experienced experts of the International Energy Agency produced a comprehensive study on the world energy development trends by 2035. The three global scenarios are analysed in the energy outlook: 1) Current Policies Scenario, 2) New Policies Scenario, and 3) 450 Scenario. New Policies Scenario can be considered as the basic scenario. It is based on the assumption that the right combination of energy policies and the current and future technologies can weaken the links between the economic growth, energy demand and energy-related greenhouse gas emissions.

The selection of these scenarios was stipulated at a large extent by two major findings from long-term scientific research on climate change: 1) it is necessary to stabilize the average global temperature increase so that, compared to data in the pre-industrial period, it does not exceed 2°C; 2) the strategic objective can be achieved only if greenhouse gas concentration in the atmosphere as measured by a number of carbon molecules per million molecules does not exceed the 450. On the other hand, in recent years a lot of discussions continue on the influence of factors that can affect climate change: whether it is necessary to ensure that temperature rises less than 2°C; what is the real impact of greenhouse gas emissions on climate change; whether the solar influence on climate change is assessed correctly; what could be the effects of climate change on a global society and individual lifestyles, ecosystems and water resources?

As one can see from Figure 4, the continued growth of global energy demand is foreseen in all three scenarios – the Current Policies Scenario predicts that by 2035 primary energy demand in the world will increase by 44%, in a case the New Policies Scenario energy demand will increase by 33%, and in the 450 Scenario primary energy demand will increase by 14% compare with the 2011 level. Energy demand growth in the world will be stipulated by the global economic and population growth – it is foreseen that GDP will grow on average by 3.6% per year until 2035 and will increase over this period by 2.3 times, while population in the world will increase up to 8.7 billion.
Significant changes in the global energy mix could be stipulated by very different growth rates of fossil fuels and renewable energy sources. As one can see from Table 1, consumption of coal, oil and natural gas by 2035 in the Current Policies Scenario will increase by 40% and in the New Policies Scenario by 24% compared with the 2011 level. In a case when assumptions of the 450 Scenario are realized, consumption of fossil fuels would increase only by 4% up to 2020, but then demand of these fuels will start to decline. In 2035 total consumption of coal, oil and natural gas will decrease by 11% compare with the 2011 level. And vice versa, consumption of renewable energy sources will increase in 2035 by 2.3 times in the 450 Scenario, by 77% in the New Policies Scenario and by 58% in the Current Policies Scenario compare with the 2011 level. The share of renewable energy sources in the world's primary energy mix will increase from 13.2% in 2011 to 26% in 2035 in the 450 Scenario, to 18% in the New Policies Scenario and only to 15% in the Current Policies Scenario. Growth of nuclear fuel consumption is foreseen in all scenarios – in the Current Policies Scenario consumption of this fuel will increase over the period 2011-2035 by 51%, in a case of the New Policies Scenario by 66%, and in the 450 Scenario by 2.3 times. When preparing scenarios of the future world's energy development, preliminary assessment of potential impact of an accident at the Fukushima Daiichi nuclear power plant on nuclear power development was done. However, currently the scope and a pace of nuclear power development remain uncertain.

**Fig.4.** Forecast of the world primary energy demand

*Source: International Energy Agency 2013c*
Policy actions directed to stabilisation of the energy demand growth and diversification of energy supply from new sources (including unconventional oil and gas) will be critical in the medium and long-term period (Tvaronavičienė 2012; Miškinis et al. 2013; Vosylius et al. 2013; Dudzevičiūtė 2013; Vasilūnaitė 2014; Tvaronavičienė 2014). Global energy demand can grow significantly due to increasing consumption of petroleum products in the transport sector of developing countries (Tvaronavičienė et al. 2013; Dudzevičiūtė 2013). It is predicted that, despite the significant increase in energy efficiency of vehicles, rapid growth in the number of cars can lead to growth of energy demand. No doubt alternative technologies in the transport sector, including cars with low fuel consumption, electric cars, etc., will become economically viable. However, the longer period is required seeking to penetrate market by feasible alternative technologies.

It is likely that energy demand growth will cause crucial increase of greenhouse gas emissions and will contribute to climate changes of global scale (Dudzevičiūtė 2013; Miškinis et al. 2013; Lapinskienė et al. 2014). In a case when current energy consumption trends continue, global emissions of greenhouse gas will rise by 2035 to 43.1 Gt or by 38% compare with the 2011 level. The implementation of energy trends foreseen in the New Policies Scenario would increase greenhouse gas emissions to 37.2 Gt or by 19%. Such increase of these emissions will cause in the long-term dangerous rise of global average temperature. To stabilize climate change additional energy saving measures must be implemented, electricity generation at coal-fired power plants should be limited, continued support for deployment of renewable energy sources should be foreseen and other measures incorporated in the 450 Scenario must be implemented. In a case assumptions of the 450 Scenario are realized, volume of greenhouse gas emissions will decrease by 2035 to 21.6 Gt or by 69% compare with the 2011 level.

The recent energy outlook (BP 2014) of the world’s energy development by 2035, produced by experts of the famous oil and gas production company BP, predicts the growth of energy demand, primary energy mix and volumes of greenhouse gases emissions, which are similar to prediction of experts from the International Energy Agency foreseen in the New Policies Scenario. The World Energy Council has warned participants of the 22nd World Energy Congress about the prevailing myths that hinder governments, the energy industry and civil society to create a sustainable energy future (World Energy Council Statement 2013) and presented position on expected changes:

- Energy demand growth in the world will slow down or energy demand will remain the same. In reality energy demand will further grow and will increase by two times till 2050, this increase will be caused mainly by economic growth in developing countries;
- Peak of oil extraction is inevitable owing to limited global oil reserves. In reality oil shortage is still not felt. Extraction of oil from existing fields is improved, new fields are discovered, new technologies allow extraction of unconventional oil and gas;
- Growing energy demand could be met with the new clean energy sources. Despite significantly faster relative growth of contribution from renewable energy sources, which will reach by 2050 from 20% to 30% in the global primary energy mix, volume of fossil fuels consumption in 2050 will amount to 10-16 billion toe;

<table>
<thead>
<tr>
<th>Actual development</th>
<th>Current Policies Scenario</th>
<th>New Policies Scenario</th>
<th>450 Scenario</th>
</tr>
</thead>
<tbody>
<tr>
<td>2000</td>
<td>2011</td>
<td>2020</td>
<td>2035</td>
</tr>
<tr>
<td>Coal</td>
<td>2357</td>
<td>3773</td>
<td>4843</td>
</tr>
<tr>
<td>Oil</td>
<td>3664</td>
<td>4108</td>
<td>4546</td>
</tr>
<tr>
<td>Natural gas</td>
<td>2073</td>
<td>2787</td>
<td>3335</td>
</tr>
<tr>
<td>Nuclear</td>
<td>676</td>
<td>674</td>
<td>866</td>
</tr>
<tr>
<td>Hydro</td>
<td>225</td>
<td>300</td>
<td>379</td>
</tr>
<tr>
<td>Bioenergy</td>
<td>1016</td>
<td>1300</td>
<td>1472</td>
</tr>
<tr>
<td>Other renewables</td>
<td>60</td>
<td>127</td>
<td>278</td>
</tr>
<tr>
<td>Total</td>
<td>10071</td>
<td>13070</td>
<td>15359</td>
</tr>
</tbody>
</table>

Source: International Energy Agency 2013c
• Overall emissions of greenhouse gas could be reduced till 2050 by 50%. Even in the best case volume of greenhouse gas emissions in the world in 2050 can be by almost two times higher compare with the internationally agreed target, corresponding to 450 ppm;
• Current business and market models are appropriate. Current market and business models are not able to cope with the problems posed by the increasing share of renewable energy sources in the global primary energy mix, deployment of distributed systems and the growing flow of information;
• Current programmes will provide a universal access to energy in the next 10-15 years. Universal access to energy is still far from reality. When implementing the current measures, about 530-880 million people in the world will live without electricity in 2050.

Position of the World Energy Council presented in the official statement demonstrates concern for the future of the global energy development and calls for effective actions to transform energy systems in the world, otherwise there may be a risk for aspirations of energy security, energy supply at reasonable price and environmental sustainability.

Conclusions

Energy is a central aspect of social, economic, and environmental development. Therefore sustainable energy development can guarantee access to clean and reliable energy at affordable prices, will contribute to mitigation of climate change, to increase of energy security and to poverty reduction.

Global energy demand growth in the medium and long-term period could be stipulated by economic and population growth in developing countries. Based on comprehensive analysis in a study prepared by energy experts of the International Energy Agency, three scenarios of global energy demand growth are foreseen: a) in a case the current energy consumption trends will continue, primary energy demand in the world by 2035 will increase by 44% compare with the 2011 level; b) in a case new energy policy provisions will be implemented rates of energy demand growth will be moderate – about 1.2% per year over the period 2011-2035; c) only essential transformation of the world’s energy systems can ensure a slow (approximately 0.5% per year) growth of energy demand, substantial increase of the role of renewable energy sources and stabilization of the average global temperature increase so that, compared to data of the pre-industrial period, it does not exceed 2°C.

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THE IMPACT OF 2008 FINANCIAL CRISIS ON FIRM’S PRODUCTIVITY: EVIDENCE FROM LATVIA, LITHUANIA AND ROMANIA

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Abstract. This study examines the impact of 2008 financial crisis on firms’ productivity in Latvia, Lithuania, and Romania by using the World Bank’s Enterprise Financial Crisis Survey data. The Work Bank carried out the survey to have a short, quick, and cost-efficient evaluation of the effect of the 2008 global financial crisis on companies in European and Central Asian countries. We find that different firm-specific variables affect the firm’s productivity in Latvia, Lithuania, and Romania. Firms benefited from huge market potential and this location proximity to capital city can improve the chance of being less affected from the crisis only in Latvia. On the contrary to the findings for Latvia, the capital city variables are not statistically significant for firms in Lithuania and Romania. Working capital financing matters for firms in Latvia and Lithuania while short-term leverage is important for firms in Lithuania and Romania. More interestingly, we observe that R&D expenses may not improve firms’ performance at the time of financial crisis.

Keywords: financial crisis, productivity, firm-level data, R&D, capital city

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JEL Classifications: O16, O1, O320

1. Introduction

The financial crisis that began with the collapse of the subprime mortgage market in United States in late 2007 quickly spread to most countries and lead to a global financial crisis. The world economy which grew by 1.38% in 2008 shrank by 2.1% in 2009. Transition and developed economies were severely affected by the crisis whereas developing economies experienced an increase of 2.7 percent in 2009. After growing at an annual rate of 5.4% and 2.7% in 2007 and 2008, respectively, GDP in Central and Eastern Europe had a decline of -3.6 percent in 2009. While crisis affected all regions, Eastern Europe and Central Asia was hit at most (Clarke et al. 2012).

One root cause of 2008 financial crisis has been accused of the deficiency in financial regulation: Loose credit control, credit booms, and the failure of financial regulation in the banking sector (Fuschi, Tvaronavičienė 2014), and that leads to asset price bubbles, eventually economic recession and firm’s bankruptcy. However it was argued that not only financial sector (Fuschi, Tvaronavičienė 2014) but also corporate sector in general plays an important role in the financial crisis: In particular, the quality of corporate governance in the corporate sector does matters in the crisis episodes (Fuschi, Tvaronavičienė 2014). A widely shared wisdom is that better corporate governance ensures better financial performance of a firm, and this view was challenged at the time.
of extreme business environment, for example at the time of financial crisis, at which quick and instant decision have to be made in response to external shock of decline in demand and credit crunch. In a financial crisis the performance of a firm depends on managerial decision, which may deviate from the norm and it will significantly affect firm's financial performance. Previous studies especially focus on large listed companies while leaving the gap for small and medium enterprises being overlooked.

In this paper, we aim to relevance of firm heterogeneity in response to financial crisis by using the World Bank Financial Crisis Survey data. The Work Bank carried out the survey to have a short, quick, and cost-efficient evaluation of the effect of the 2008 global financial crisis on companies in European and Central Asian countries. The first round of the survey was performed in June-July 2009, the second round - in February-March 2010, and the third round was implemented in June-July 2010. The survey basically aimed to understand the effects of 2008 financial crisis on sales, employment, finances, and expectations. To our knowledge, only a few studies used this survey data. Clarke et al. (2012) examine how country and firm characteristics affected financial constraints and firm survival during crisis period in Eastern Europe and Central Asia (ECA). It is shown that firms that had access to external credits are able to cope with decrease in demand and as a result they are more likely to survive during crisis. Large firms face more with changes in the severity of financial constraints while on average those firms have less severe constraints. Moreover, financial constraints are less severe in countries with well-established foreign banks (Fuschi, Tvaronavičienė 2014). Mannaso and Merikull (2011) analyze the R&D and credit constraint patterns during the pre-crisis and in the aftermath of the global financial crisis. It is shown that at the time of the financial crisis, most of the firms experienced a sharp decline in demand and as a result, the firms’ need for external finances has decreased dramatically. The sales growth of the firms increases the likelihood of firms to conduct R&D during the pre-crisis period and during the crisis. Moreover, listed firms are less likely to spend for R&D in the aftermath of the crisis.

This study examines the impact of 2008 financial crisis on firms’ productivity in Latvia, Lithuania, and Romania by using the World Bank’s Enterprise Financial Crisis Survey data. The Work Bank carried out the survey to have a short, quick, and cost-efficient evaluation of the effect of the 2008 global financial crisis on companies in European and Central Asian countries. We find that different firm-specific variables affect the firm’s productivity in Latvia, Lithuania, and Romania. Firms benefited from huge market potential and this location proximity to capital city can improve the chance of being less affected from the crisis only in Latvia. On the contrary to the findings for Latvia, the capital city variables are not statistically significant for firms in Lithuania and Romania. How working capital is financed matters for firms in Latvia and Lithuania while short-term loan are important for firms in Lithuania and Romania. More interestingly, we observe that R&D expenses may not able to improve firms’ performance at the time of financial crisis. The rest of the paper is organized as follows: Section 2 provides a literature review. Section 3 describes the data. Section 4 presents the methodology while Section 5 discusses the findings. Section 6 provides a summary and concludes the paper.

2. Literature Review

The literature considers a variety of firm specific variables as the determinants of firms’ survival and performance during the financial crisis period. It is documented that there is a substantial heterogeneity across firms which is explained by firm-specific characteristics such as size, age, leverage, collateral, ownership structure, and industry effects (Spaliara and Tsoukas 2013, Vereskun 2013, Dudzevičiūtė 2013; Laužikas, Krasauskas 2013; Mačiulis, Tvaronavičienė 2013; Giriūnas et al. 2013, Antanavičius 2013, Dudzevičiūtė 2014; Korsakienė, Tvaronavičienė, 2014, Antanavičienė 2014, Vasil'iuaitė 2014). Among those, size is considered as an important determinant for firm performance especially in the crisis period. It is generally accepted that smaller firms are more vulnerable to economic downturns mainly due to their limited financial sources. According to Narjoko and Hill (2007), larger firms (especially that are export-oriented and foreign owned) are less affected from domestic crises as they are more likely to borrow from international financial markets. Credit rationing becomes more severe and the tight money policy negatively affects the availability of credits especially for small size firms in the crisis period (Narjoko and Hill 2007; Domac and Ferri 1999). Nugent and Yhee (2002) argue that during a recession or a financial crisis, banks may first screen out SMEs. Small firms are forced to use short-term credits often at high interest rates from nonbank institutions.
financial institutions. Besides those financial limitations, small firms are more prone to downturns due to few customers and limited human and technological resources. As small firms are more reliant on fewer customers, they can be easily affected from delays in collections from customers during downturn (Nugent and Yhee 2002). On the contrary, bigger firms are expected to be less affected from the financial crisis due to the scale merit and the higher trust from investors, financial institutions, and customers (Iwasaki 2014). It is also argued that small firms may cope with financial crisis better than bigger firms as they might be flexible and adapt easily to new business environment more quickly while bigger firms may suffer from inertia, inflexibility, formalized roles, and lack of timely responses to financial crisis (Tan and See 2004; Mačiulis, Tvaronavičienė 2013; Giriūnas et al. 2013, Vereskun 2013). Sato (2000) show that SMEs respond to crisis by strategies such as flexible switch in products or business lines. As the markets will shrink in crisis periods, small firms might be able to exploit market niches (Varum and Rocha 2012). Moreover, as in general small firms face problems in accessing to formal credits small firms can continue using informal credits during the crisis which may be difficult for bigger firms (Bilgin et al. 2012, Vereskun 2013.). Berry et al. (2001) show that small firms performed better compared to larger counterparts in the crisis period. As a third stream of research, a limited number of studies document that size and firm performance is not clear (Forbes 2002; Claessens et al. 2012; Giriūnas et al. 2013, Vereskun 2013).

Ownership structure also plays an important role for firm survival and performance during the downturn. Gonenc and Aybar (2006) examine the performance of Turkish industrial firms listed in Borsa Istanbul on and around the 2001 financial crisis. Concentrated ownership has a negative impact on the stock performance prior and during the financial crisis whereas business group affiliation doesn’t have any effect stock prices. It is also found that adjusted returns are positively related with total exposure, firm size and export-sales ratio. Kolasa et al. (2010) examine the impact of last global crisis on Polish firms. Foreign firms performed significantly better in terms of sales growth compared to domestic firms both before and during the recent crisis. The exit rates of foreign owned and larger firms are lower while exporting firms are more prone to exiting the market during crisis especially due to the decrease in foreign demand. Varum and Rocha (2011) show that in terms of employment growth, foreign firms are no different than indigenous firms during recessions whereas SMEs’ turnover is more severely affected by downturns. Godart et al. (2012) show that all Irish firms were negatively affected by the crisis and that their exit probabilities increased during 2008-2009. More importantly, while foreign firms are less like to exit when the economy is stable; during the crisis period foreign firms are no different than domestic firms in terms of their exit probabilities. Liu et al. (2012) show that state-owned enterprises in China performed better during the financial crisis (August 2007 through December 2008) due to the less severe financial constraints while they performed poorly before the crisis. Large shareholders’ ownership has a U shaped relation with change in Tobin’s Q during the crisis period.

Board structure matters for the firm performance during the crisis period. Erkens et al. (2012) examine the impact of corporate governance on the performance of 296 financial firms from 30 countries during the 2007–2008 financial crisis. The crisis leads to a decrease in stock prices of all financial firms whereas firms with more independent boards and higher institutional ownership had worse stock returns compared to other firms. Institutional investors encouraged managers to increase shareholder returns by greater pre-crisis risk taking. And independent board members encouraged manager to raise more equity capital during the crisis which then caused a wealth transfer from existing shareholders to debt holders. Francis et al. (2012) show that board independence does not affect firm stock performance proxied by buy-and-hold abnormal returns during the crisis (October 2007 to March 2009). However, after redefining independent directors as outside directors who are less connected with current CEOs, a positive and significant relationship between this measures namely strong independence and firm performance is found. It is also shown that outside financial experts are important for firm performance. Moreover, the effect of outside financial experts on firm performance is higher than that of strong independence. Iwasaki (2014) document that board of directors and audit committee have an important role for the survival probability of Russian firms during the financial crisis. Van Essen et al. (2013) by using 1,197 firm data across 26 European countries, find that CEO duality and large board size are beneficial during a crisis whereas large numbers of board sub-committees decreases the abnormal returns.
3. Data

We use the World Bank’s Enterprise Financial Crisis Survey data which was implemented during 2008, 2009, and 2010 to address the impact of the global economic crisis on the corporate sector.\(^1\) The survey includes firms from manufacturing, retail, and other services industries\(^2\) and it is conducted through telephone interviews. The survey basically aimed to understand the effects of 2008 financial crisis on sales, employment, finances, and expectations. The survey covered data for unlisted firms from Bulgaria, Hungary, Latvia, Lithuania, Romania, and Turkey. The survey provides data on how the crisis affected the corporate sector; how firms responded, and their expectations about the business environment in post-crisis period. Several business attributes are claimed to be important determinants for corporate performance, especially during downturn periods and the survey provides important firm-specific data.

As The World Bank Financial Crisis Survey data is not commonly used in the literature, we would like to give some details about the survey in this section. The first part of the survey covered the details such as the region, city, size, and industry of the firm. The size and industry distribution of firms surveyed in 2010 are given in Table 1. It is seen that there is a homogenous distribution among the size of the firms surveyed. 41% of firms surveyed is small size in Lithuania.

| Table 1. Size and Industry Distributions of Firms in World Bank Financial Crisis Survey |
|-----------------------------------------------|---------|---------|---------|
| Panel A. Size                                  |         |         |         |
| Latvia                                        | Lithuania | Romania |
| Small >=5 and <=19                            | 36%      | 41%      | 29%      |
| Medium >=20 and <=99                         | 31%      | 32%      | 38%      |
| Large >=100                                   | 33%      | 28%      | 33%      |
| Panel B. Industry                             |         |         |         |
| Latvia                                        | Lithuania | Romania |
| Manufacturing                                 | 34%      | 37%      | 37%      |
| Retail                                        | 34%      | 24%      | 27%      |
| Other services                                | 32%      | 39%      | 37%      |

*Source: Correa et al. (2010)*

Section B focuses on changes in sales and supplies in the crisis period. In more details, the change in sales compared to previous period, sales expectations, the share of national sales, indirect exports, and direct exports, and capacity utilization ratio. The average decline in sales in crisis period is around 35% in the crisis period. Firms in Latvia and Lithuania experienced a sales decline of 48.4% and 48%, respectively. Firms operating in food and electronics industry are less affected from the crisis compared to firms in other industries while the biggest sales drops are observed in basic metals industry and construction industry. The decline in demand was almost uniformly distributed geographically among capital cities, cities with a population of over 250,000 to 1 million, and cities with less than 50,000 population (Correa and Ilooty 2010). In section C, survey examined the labor force of the firm. The firms in all countries had fewer permanent full-time employees crisis period compared to pre-crisis period.

Section D asks about the financing decisions of firms such as whether the firms delay payments, share of the sales on credits, working capital financing, current level of total liabilities, share of debt in foreign currency, share of short term liabilities. Firms in Latvia, Lithuania, and Romania had an average short term ratio of 49.2%, 80.1%, 56.9% and an average foreign currency debt ratio of 39.4%, 20.7%, and 31.2%, respectively. This shows that firms mostly rely on short term debt. During the crisis, firms tend to
use internal fund to finance working capital (Correa and Iootty 2010). Around half of the firms in Latvia and Lithuania delayed their payments to authorities or suppliers for more than one week.

Section E questions the impact of financial crisis on firms. According to the survey, the most important effect of the financial crisis is the decline in demand compared with increase in the level of debt, increase in input cost, and reduced access to credit. The drop in demand was experienced by around 75 percent of firms (75.4%, 70.5% and 78.5% of firms in Latvia, Lithuania, and Romania, respectively) (Correa and Iootty 2010).

\[
\text{LnPROD}_{it} = \beta_0 + \beta_1 \text{Capital City}_{it} + \beta_2 \text{Size}_{it} + \beta_3 \text{Internal Finance} + \beta_4 \text{External Finance} + \beta_5 \text{Short term Loan} + \beta_6 \text{R} \& \text{D} + \epsilon_{it}
\]

The dependent variable, \( \text{PROD}_{it} \), is firms’ productivity proxied by sales per full-time worker. Where it represents individual firm \( i \) and \( t \) represents year \( t \), spanning from 2009-2011. \( k \) is a category of firm size: 1 = small firm, 2 = medium firm, 3 = large firm. \( \text{Size}_{it} \) is a multinomial variable; it represents the firm size, with small firm taken as the benchmark. \( \text{Capital City} \) is a dummy variable, it takes 1 if the firm locates in the Capital City, and otherwise it takes 0. The variable of Internal Finance is the proportion of firms’ capital that was financed by its own retained earnings. External Finance represents proportions of firms’ capital finance by the banks. Short term Loan represents the level of short term loan. The \( \text{R} \& \text{D} \) is about the change of Research and Development inputs. We also include the variable of the proportion of foreign debt in the model, and we found no significant impact on productivity together with smaller observations, therefore we do not report the results. For Lithuania and Romania, we exclude the firm size variable because it is very insignificant.

5. Findings

Table 2, 3, and 4 present the empirical results for Latvia, Lithuania, and Romania, respectively. It is seen some of the firm-specific characteristic are crucial for enterprises in face of financial crisis (Tvaronavičienė 2014, Vasiliūnaitė 2014). Firms benefited from huge market potential and this location proximity to capital city can improve the chance of being less affected from the crisis only in Latvia (Tvaronavičienė 2014, Vasiliūnaitė 2014). The estimated coefficient of “Capital City” is positive and statistically significant in all models for the firms in Latvia. The productivity of firms located in the capital city during the financial crisis was higher than firms located in other areas. This finding is consistent with the existing literature of geographical economics. Numerous studies have been investigating the relationship between firm performance and firms’ locational distribution, resting on the importance of innovation, knowledge sharing, knowledge transfer and technology acquisition (Beugelsdijk 2007; Knoben and Oerlemans 2006). On the contrary to the findings for Latvia, the capital city variables are not statistically significant for firms in Lithuania and Romania. This difference may be attributed to city populations and number of developed cities. For example, in Latvia the most crowded city is the capital city with a population of around 660,000 and the remaining cities are all populated fewer than 100,000. Although in Lithuania and Ro-
The impact of 2008 financial crisis on firm’s productivity: evidence from Latvia, Lithuania and Romania

Ender Demir, Chi Keung Marco Lau, Mehmet Huseyin Bilgin

mania the capital cities have the highest population, there are cities which are relatively crowded and some cities are developed like the capital cities.

Although the literature considers size as an important determinant for firm performance especially in the crisis period (Giriūnas et al. 2013), we do not find evidence of firm size effect: which implies no matter what is the size of the firm it was still affected by the crisis. Our findings support supportive evidence to Forbes (2002) and Claessens et al. (2012) who show that size and firm performance relation is not clear or not related at all.

Table 2. Determinants of Firms’ Productivity: Panel Data Analysis (Latvia)

<table>
<thead>
<tr>
<th></th>
<th>(1)</th>
<th>(2)</th>
<th>(3)</th>
<th>(4)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Capital City</td>
<td>0.472***</td>
<td>0.464***</td>
<td>0.553***</td>
<td>0.552***</td>
</tr>
<tr>
<td></td>
<td>(3.27)</td>
<td>(3.18)</td>
<td>(3.50)</td>
<td>(3.47)</td>
</tr>
<tr>
<td>Medium Firm</td>
<td>-0.245</td>
<td>-0.243</td>
<td>-0.171</td>
<td>-0.148</td>
</tr>
<tr>
<td></td>
<td>(-1.27)</td>
<td>(-1.27)</td>
<td>(-0.85)</td>
<td>(-0.74)</td>
</tr>
<tr>
<td>Large Firm</td>
<td>0.246</td>
<td>0.215</td>
<td>0.268</td>
<td>0.287</td>
</tr>
<tr>
<td></td>
<td>(1.43)</td>
<td>(1.23)</td>
<td>(1.41)</td>
<td>(1.50)</td>
</tr>
<tr>
<td>Internal</td>
<td>0.00512*</td>
<td>0.00705**</td>
<td>0.00721**</td>
<td></td>
</tr>
<tr>
<td>Finance</td>
<td>(1.90)</td>
<td>(2.17)</td>
<td>(2.22)</td>
<td></td>
</tr>
<tr>
<td>External</td>
<td>0.00439</td>
<td>0.00330</td>
<td>0.00368</td>
<td></td>
</tr>
<tr>
<td>Finance</td>
<td>(1.11)</td>
<td>(0.87)</td>
<td>(0.97)</td>
<td></td>
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<tr>
<td>Short-Term</td>
<td>0.00136</td>
<td>0.00159</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Loan</td>
<td>(0.91)</td>
<td>(1.05)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>R &amp; D</td>
<td>-0.543**</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>(-4.30)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Constant</td>
<td>10.26***</td>
<td>10.20***</td>
<td>10.08***</td>
<td>10.03***</td>
</tr>
<tr>
<td></td>
<td>(72.42)</td>
<td>(54.93)</td>
<td>(49.06)</td>
<td>(49.49)</td>
</tr>
<tr>
<td>N</td>
<td>422</td>
<td>422</td>
<td>324</td>
<td>324</td>
</tr>
<tr>
<td>adj. R²</td>
<td>0.081</td>
<td>0.102</td>
<td>0.134</td>
<td>0.146</td>
</tr>
</tbody>
</table>

Numbers in parentheses are t-values. ***, **, and * denote significance at the 1%, 5%, and 10% level, respectively.

For firms in Latvia and Lithuania, internal finance which is the proportion of firms’ working capital that was financed by its own retained earnings positively affect the productivity. External finance variable measured by proportion of firms’ working capital finance by the banks is positively associated with firm productivity for firms only in Lithuania under model 1. In general, we find that external finance is not related with productivity while Claessens et al. (2012) find that dependence on external finance for working capital led to a decrease in firm-level sales in the 2008–09 crises for 7722 manufacturing firms from 42 countries. Short-term loan has a positive impact on productivity for firms in Romania and Lithuania. This is on the contrary to the findings of Van Essen et al. (2013) who show that leverage is negatively associated with firm performance. Recently, Spaliara and Tsoukas (2013) explore the link between firm survival and financial healthiness during the 1997-1998 Asian crises by using a panel of five Asian economies. It is shown that firms’ financial status plays an important role in terms of survival during the Asian crisis. More specifically, leverage, profitability, and collateral are important determinants of survival. However, the firms in those emerging markets may have problem in accessing to long-term leverage during crisis and tend to use more short-term loans to sustain daily operations. Therefore, those short-term funds may be used to boost productivity.

Coefficient estimates for State aid are statistically significant only for firms in Romania. There is a negative relationship between state aid and productivity. Stollinger and Holzner (2013) analyze the impact of state aid on increasing exports in EU. It is argued that well-functioning governments implement more successful industrial policies and the state aid provided is more inductive to productivity and exports. Our findings support the findings of Stollinger and Holzner (2013) who document that in Romania which has the lowest government effectiveness score among the 27 EU Member States, the marginal effect of state aid turns negative.

The coefficient estimates for R&D are negative for firms in all countries while it is only significant for firms in Latvia. For firms who still undergo research innovation activities lose competitiveness at the short time period during the crisis. Srinivasan et al. (2011) also provide similar results. It is found that marginal effects of R&D on profits are negative during recession but this result may differ by firm characteristics.
Table 3. Determinants of Firms’ Productivity: Panel Data Analysis (Romania)

<table>
<thead>
<tr>
<th></th>
<th>(1)</th>
<th>(2)</th>
<th>(3)</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>-0.173</td>
<td>-0.313</td>
<td>-0.237</td>
</tr>
<tr>
<td>B</td>
<td>(-0.49)</td>
<td>(-0.95)</td>
<td>(-0.60)</td>
</tr>
<tr>
<td>C</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Capital City</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Internal Finance</td>
<td>0.00249</td>
<td>-0.00468</td>
<td>-0.00713</td>
</tr>
<tr>
<td></td>
<td>(0.22)</td>
<td>(-0.43)</td>
<td>(-0.61)</td>
</tr>
<tr>
<td>External Finance</td>
<td>-0.00435</td>
<td>-0.00822</td>
<td>-0.00581</td>
</tr>
<tr>
<td></td>
<td>(-0.48)</td>
<td>(-0.95)</td>
<td>(-0.65)</td>
</tr>
<tr>
<td>Short-Term Loan</td>
<td>0.0000000161***</td>
<td>0.000000160***</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(3.06)</td>
<td>(2.79)</td>
<td></td>
</tr>
<tr>
<td>State Aid</td>
<td>-1.935***</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>(-2.91)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>R &amp; D</td>
<td>-0.0112</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>(-0.03)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Constant</td>
<td>12.18***</td>
<td>12.30***</td>
<td>11.99***</td>
</tr>
<tr>
<td></td>
<td>(14.01)</td>
<td>(15.13)</td>
<td>(14.39)</td>
</tr>
<tr>
<td>N</td>
<td>66</td>
<td>66</td>
<td>66</td>
</tr>
<tr>
<td>adj. R²</td>
<td>0.025</td>
<td>0.156</td>
<td>0.113</td>
</tr>
</tbody>
</table>

Numbers in parentheses are t-values. ***, **, and * denote significance at the 1%, 5%, and 10% level, respectively.

Table 4. Determinants of Firms’ Productivity: Panel Data Analysis (Lithuania)

<table>
<thead>
<tr>
<th></th>
<th>(1)</th>
<th>(2)</th>
<th>(3)</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>0.202</td>
<td>0.165</td>
<td>0.166</td>
</tr>
<tr>
<td>B</td>
<td>(1.09)</td>
<td>(0.89)</td>
<td>(0.90)</td>
</tr>
<tr>
<td>C</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Capital City</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Internal Finance</td>
<td>0.00617**</td>
<td>0.00533*</td>
<td>0.00540*</td>
</tr>
<tr>
<td></td>
<td>(2.14)</td>
<td>(1.84)</td>
<td>(1.85)</td>
</tr>
<tr>
<td>External Finance</td>
<td>0.00419*</td>
<td>0.00379</td>
<td>0.00360</td>
</tr>
<tr>
<td></td>
<td>(1.66)</td>
<td>(1.50)</td>
<td>(1.41)</td>
</tr>
<tr>
<td>Short-Term Loan</td>
<td>1.05e-08**</td>
<td>1.10e-08**</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(2.01)</td>
<td>(2.09)</td>
<td></td>
</tr>
<tr>
<td>State Aid</td>
<td>0.306</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>(0.66)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>R &amp; D</td>
<td>-0.0263</td>
<td></td>
<td>-0.263</td>
</tr>
<tr>
<td></td>
<td>(-0.92)</td>
<td></td>
<td>(-0.87)</td>
</tr>
<tr>
<td>Constant</td>
<td>11.45***</td>
<td>11.44***</td>
<td>11.43***</td>
</tr>
<tr>
<td></td>
<td>(81.00)</td>
<td>(81.37)</td>
<td>(80.86)</td>
</tr>
<tr>
<td>N</td>
<td>276</td>
<td>276</td>
<td>276</td>
</tr>
<tr>
<td>adj. R²</td>
<td>0.013</td>
<td>0.086</td>
<td>0.093</td>
</tr>
</tbody>
</table>

Numbers in parentheses are t-values. ***, **, and * denote significance at the 1%, 5%, and 10% level, respectively.

Conclusions

This study examines the impact of 2008 financial crisis on firms’ productivity in Latvia, Lithuania, and Romania by using the World Bank’s Enterprise Financial Crisis Survey data. The Work Bank carried out the survey to have a short, quick, and cost-efficient evaluation of the effect of the 2008 global financial crisis on companies in European and Central Asian countries. We find that different firm-specific variables affect the firm’s productivity in Latvia, Lithuania, and Romania. Firms benefited from huge market potential and this location proximity to capital city can improve the chance of being less affected from the crisis only in Latvia. On the contrary to the findings for Latvia, the capital city variables are not statistically significant for firms in Lithuania and Romania. How the working capital is financed matters for firms in Latvia and Lithuania while short-term loan are important for firms in Lithuania and Romania. More interestingly, we observe that R&D expenses may not able to improve firms’ performance at the time of financial crisis.
References


Tvaronavičienė, M. 2014. If industrial sector development is sustainable: Lithuania compared to the EU, Entrepreneurship and Sustainability Issues 1(3):134–142 DOI: http://dx.doi.org/10.9770/jesi.2014.1.3(2)


SUSTAINABLE DEVELOPMENT FACETS: EXPORTING INDUSTRIAL SECTORS FROM INSIDE

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Abstract. Sustainable development of country economy is being driven by various factors. Economy of each country is comprised of economic sectors. External and internal development drivers differently affect different economic sectors, as a rule. Since economic sectors are not homogeneous, their expanding or contracting depends on behavior of concrete market players; i.e. business companies. The paper aims to reveal factors affecting patterns of development exporting companies attributed to industrial sector and its sub-sectors of Lithuanian economy. Methodology of the investigation is based on development of theoretically grounded questionnaire, targeting revealing factors impacting international competitiveness of industrial companies. Impact of factors, attributed to external business environment, and role of factors attributed to internal development forces are to be indicated. Obtained results, is expected, and would allow to foresee trends and main drivers of further development of exporting Lithuanian industrial sectors.

Keywords: factor analysis, exporting industrial sectors, chemical and chemical products, external and internal drivers

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JEl classification: C380 F140 O190

1. Introduction: approaches toward characterizing of Lithuanian industry

The first characteristic of any country’s industrial development level is percent of value added, created by industry. Hence, industry share in Lithuanian economy is comparatively high in the EU context. It could be as well claimed that the share is high in the context of developed countries (Tvaronavičienė 2014). Since scare resources retard economic development, Lithuania’s industrial development prospective, its competitiveness has to be assessed by taking into account its energy security. Lithuania is exceptionally energy dependent. Import dependency will persist in nearly observed future, and there is low probability that energy prices would decrease significantly (Miškinis et al. 2013; Tvaronavičienė 2014). Hence, activity growth trends of industrial sector and its subsectors and respective energy consumption have to be taken into account, energy intensities estimated. Industrial subsectors threatening increasing energy intensity have to be closely observed, and more energy efficient ones supported. It is unanimously agreed, that countries with...
well-developed high-tech industry have competitive advantage over other industrial countries.

Juxtaposing of high-tech industry’ shares reveals in selected countries let us reveal that in this respect Lithuania lags behind. Share of high-tech industry in Lithuania is comparatively low and has to be increased: the task is complicated followed by complex implementation (Tvaronavičienė 2014). In order to indicate factors affecting further industrial development, we articulate methodology, which allowed let us glancing at the development drivers through lenses of industrial market players.

2. Methodology of industrial development factors’ indication: composition of questionnaire, survey aims and expected results

We intend to identify factors of industry development through survey of Lithuanian exporting companies. Processed obtained primarily data and interpretation of the results, we believe, would allow to shed a light on development processes and would lead to novel insights. Hence, while composing a questionnaire we aim to reveal how multiple factors, distinguished by us, affect development of Lithuanian industry and its subsectors.

Here we need to indicate clearly, that there is a wide range of factors, which impact economic growth. Such processes affect the economic development as migration of labor force (Balkytė, Tvaronavičienė 2011); globalization processes (Lankauskienė, Tvaronavičienė 2012; Tvaronavičienė et al. 2013, Antanavičienė 2014); institutions (Tvaronavičienė, Grybaité 2012); all kind of innovative activities (Dudzevičiūtė, Tvaronavičienė 2011); abundance or scarcity of strategic resources resources (Vosylius et al. 2013, Laužikas, Krasauskas 2013; Vasiliūnaitė 2014, Tvaronavičienė 2014), investments of local or foreign origin (Tvaronavičienė, Lankauskienė 2011, Antanavičienė 2014), financial health (Mačiulis, Tvaronavičienė 2013), economic policy (Tvaronavičienė 2012, Tvaronavičienė 2014) and many not listed factors. All those factors affect economic development simultaneously; in adition their impact differs within different groups of countries (Tvaronavičienė, Lankauskienė 2011, Laužikas, Krasauskas 2013, Tvaronavičienė 2014). Same factors affect structures of countries’ economies and influence their transformation patterns (Tvaronavičienė, Lankauskienė 2012, 2013). Since each approach can be adopted and grounded, we need to clarify assumptions we formulate. We point out, that despite intense discussion among scholars, majority of them unanimously agree, that main driving forces of economic development are investments (of local and foreign origin), labor force, innovations and scare resources (Lankauskienė, Tvaronavičienė 2013). In Lithuanian case we put emphasis on energy, since Lithuania is energy dependent (Miškinis et al. 2013; Tvaronavičienė 2014). In order to clarify how listed indicators are seen from point of view of industrial market players, we incorporate those questions into survey. The questionnaire is comprised from two major parts, which are named as inside and outside competitiveness factors. Inside competitiveness factors, ranked from into 5 categories from claiming “very important” to “not important at”, in our research would include: high quality of production; relatively low production price; low labor cost; low energy intensity; energy efficiency; high labor productivity; high qualification of labor; expenses of labor qualification raise; innovative production methods; R&D expenses; insignificant pollution. Respectively, under outside competitiveness factors, we mean macroeconomic environment (GDP growth, level of country unemployment, inflation); industry sector’s expansion or contraction; considerable unmet demand, energy resources’ price level; accessibility to financial capital.

Before starting factor analysis of the responses in Chemical and petrochemical industry, let us observe and comment on industrial companies response taken irrespective to the industrial sector they belong.

We received 139 responses out of 600 enterprises questioned (over 8000 exporting industrial enterprises in Lithuania). What is peculiar about responses, that 40% of respondents indicate, that productivity is satisfying; despite, as it was indicated above, high-tech industry development in Lithuania is insufficient. The latest investments are being directed to expansion of productive capacities, rather than R&D (note: investments into energy saving technologies are considered as important). The forces, impacting economic development are being listed in the following order: the first, energy consumption, the second, investments (local are being considered of higher importance compared to those of foreign origin; the third, innovations. Unexpectedly, respondents are rather sceptic about impact of economic policy. Before we go to the factor analysis of chemical industry,
let us glance at sub-sector structure of manufacturing in selected countries (Table 1).

**Table 1.** Manufacturing sub-sectors contribution to total value added, percent

<table>
<thead>
<tr>
<th>Manufacturing sub-sectors</th>
<th>Developed countries</th>
<th>Developing countries</th>
<th>Lithuania</th>
</tr>
</thead>
<tbody>
<tr>
<td>Food, beverages and tobacco</td>
<td>9,5</td>
<td>8,5</td>
<td>17,2</td>
</tr>
<tr>
<td>Textiles and leather</td>
<td>3,8</td>
<td>1,8</td>
<td>9,9</td>
</tr>
<tr>
<td>Wood and wood products</td>
<td>2,1</td>
<td>1,4</td>
<td>1,6</td>
</tr>
<tr>
<td>Paper and print</td>
<td>8,3</td>
<td>6,3</td>
<td>4,6</td>
</tr>
<tr>
<td><strong>Chemical and chemical products</strong></td>
<td><strong>9,3</strong></td>
<td><strong>8,8</strong></td>
<td><strong>10,9</strong></td>
</tr>
<tr>
<td>Coke, refined petroleum</td>
<td>2,6</td>
<td>2,2</td>
<td>7,0</td>
</tr>
<tr>
<td>Rubber and plastics</td>
<td>3,0</td>
<td>2,4</td>
<td>3,6</td>
</tr>
<tr>
<td>Non-metallic minerals</td>
<td>3,3</td>
<td>2,5</td>
<td>5,4</td>
</tr>
<tr>
<td>Basic metals</td>
<td>4,5</td>
<td>3,6</td>
<td>7,1</td>
</tr>
<tr>
<td>Fabricated metal products</td>
<td>6,2</td>
<td>5,0</td>
<td>4,3</td>
</tr>
<tr>
<td>Machinery and equipment (instruments)</td>
<td>34,0</td>
<td>45,6</td>
<td>18,9</td>
</tr>
<tr>
<td>Transport equipment</td>
<td>9,9</td>
<td>9,1</td>
<td>7,2</td>
</tr>
<tr>
<td>Furniture and other</td>
<td>3,5</td>
<td>2,8</td>
<td>2,3</td>
</tr>
<tr>
<td><strong>Total manufacturing</strong></td>
<td><strong>100</strong></td>
<td><strong>100</strong></td>
<td><strong>100</strong></td>
</tr>
</tbody>
</table>


Coke, refined petroleum products, food, beverages and tobacco, and chemical and chemical products are three main manufacturing sub-sectors generating the highest percentages of total value added in Lithuania. Meanwhile, machinery and equipment contributes the highest percentages to total value added in both developed and developing countries. Over the period of 2000–2009, sub-sector of chemicals and chemical products was one of the most growing sectors in Lithuania and developing countries. If we take a closer look on the structure of Lithuanian manufacturing industry, we notice that the traditional sectors such as food, beverages and tobacco; textile and leather do not contribute so much value added as it used to be. To determine external and internal drivers of industrial development we apply exploratory factor analysis (EFA). This unique technique summarises the information from set variables into a smaller set of factors. Each factor is composed of variables that correlate highly with each other and interact weakly with the variables present in other factors (Perrobelli, Oliveira 2013).

Let’s say we observe \( k \) variables \( X_1, X_2, \ldots, X_k \) then general model (1) is based on an assumption that the behaviour of each variable \( X_j \) is determined by \( m \) common factors \( F_1, F_2, \ldots, F_m \) and a single factor \( e_i \).

\[
X_j = \lambda_{j1} F_1 + \lambda_{j2} F_2 + \ldots + \lambda_{jm} F_m + e_i = \sum_{i=1}^{m} \lambda_{ij} F_j + e_i, \quad (1)
\]

where \( \lambda_{km} \) represents the load factor that is used to linearly combine the common factors \( F_m \) and points to the intensity of the correlation between \( X_j \) and \( F_m \). The general model is similar to a multivariate linear regression as knowing \( F_j \) and \( \lambda_{ij} \) it would be possible to forecast \( X_j \). However, the purpose of factor analysis is different. Knowing \( X_j \) we are able to define and forecast common factors \( F_j \).

The first step for implementing factor analysis is the construction of a correlation matrix of all variables to be analysed, which allows investigating the association between variables (Perrobelli, Oliveira 2013). In this step we perform Kaiser-Meyer-Olkin (KMO) and Bartlett’s tests. KMO test is a measure of sampling adequacy. If KMO is >0.5 none of variables are eliminated. The value of Bartlett’s test of sphericity, sig. is 0.000, which is also indicates that the data, most likely, fit to the factor analysis (p<0.05) (Ulbinaitė et al. 2013).
Next step is the extraction of the most significant factors. The factor loading of each variable represents the correlation between the variable and its respective factor. In our analysis, we apply the principle component analysis factor extraction method. Third step is the rotation of factors, which allows better to understand factors and to define correlation between variables and factors. For the rotation we use varimax method with Kaiser normalization. The last step of factor analysis is generation of common factor scores. In this step we apply regression method for calculating common factors. EFA was performed using statistical package for social sciences (SPSS). For the methodological purposes we devide our research into two parts. The first one explores the competitiveness factors of whole Lithuanian manufacturing sectors, and the second one analyses external and internal competitiveness factors of sub-sector of chemical and chemical products.

3. Discussion of the results

3.1. The external and internal development drives of Lithuanian industrial sectors

Data set was checked for suitability by calculating Cronbach’s Alpha, KMO and Bartlett’s Test of Sphericity (Table 2). The obtained results indicated that data is suitable for further investigation. In all cases values of Cronbach’s Alpha and KMO are higher than 0.5.

| Source: authors' calculation |

The results of analysis of internal development drivers of Lithuanian manufacturing industry show that the largest part of variance is explained by two factors. The first factor (variables A8, A9, A10, A11, A12) explains 31.18 per cent and the second one (variables A4, A5, A13, A14) – 13.95 per cent. In total four factors explain more than 62 per cent of the variance. For further analysis, it is recommended (Dumitrescu et al. 2013) to retain those factors with the Eigenvalue higher than 1 (the initial variables are standardized, having therefore variatnion of 1, thus a factor’s Eigenvalue is bigger than 1 explains more than a single’s variables variation).

In our case, four factors (Table 3) of which Eigenvalues are higher than 1 have been formed. As it was mention above, the first factor is combined of five variables: expenditure on personnel qualification improvement; innovative production methods; investments into equipment and technologies; expenditure on market research. The second one contains four variables, the third – three (A1, A2, A3) and. The fourth factor is composed of two variables (A7, A8): high level of labour productivity and high qualified labour force.

Table 2. Results of data-fit for factorial analysis

<table>
<thead>
<tr>
<th>Lithuanian manufacturing industry</th>
<th>Chemical and chemical products</th>
</tr>
</thead>
<tbody>
<tr>
<td>Internal factors</td>
<td>External factors</td>
</tr>
<tr>
<td>Cronbach's Alpha</td>
<td>0.821</td>
</tr>
<tr>
<td>Kaiser-Meyer-Olkin Measure of Sampling Adequacy.</td>
<td>0.720</td>
</tr>
<tr>
<td>Bartlett’s Test of Sphericity, Sig.</td>
<td>0.000</td>
</tr>
</tbody>
</table>

Table 3. Rotated Component Matrix of Internal Development Drivers of Lithuania’s manufacturing industry
We distinguish two dependent variables: the annual revenues \(X_1\) and the revenues from export \(X_2\). The multiple regression analysis is performed in two stages. We assume that the linear relationship exists between defined factors and dependent variables.

In the first stage of multiple regression analysis, we calculate factor scores when the development of exporting sectors is based on internal drivers factors. The values of independent variables are entered into the model at the same time. The formulas 2 and 3 are composed of standardized Beta coefficients:

\[
X_1 = 0.144F_1 - 0.065F_2 - 0.113F_3 + 0.117F_4 + e_1 \quad (2)
\]

\[
X_2 = 0.198F_1 + 0.076F_2 - 0.121F_3 + 0.073F_4 + e_2 \quad (3)
\]

Calculated loadings of the factors indicate that annual revenue will grow if factor 1 and factor 4 increases, while the changes of other two factors would have negative influence on annual revenue. Meanwhile, the growth of factor 1, factor 2 and factor 3 will accelerate revenues from export.

Performing the second stage of multiple regression analysis, we follow the same methodology.

\[
X_1 = 0.087F_1 - 0.084F_2 + e_{13} \quad (4)
\]

\[
X_2 = 0.057F_1 + 0.008F_2 + e_{14} \quad (5)
\]

Calculated loadings of the factors show that annual revenue of exporting Lithuanian industrial sector will increase if factor 1 changes and declines if prices of energy grow and shortage of financial capital arises. However, for both annual revenues and revenues from export the changes of external development factors have lower impact than internal.

### 3.2. The internal and external development drives of chemical and chemical products sub-sector

The analysis of internal development drivers of chemical and chemical products sub-sector indicated that the largest part of variance is explained by four factors (Table 6). The first factor explains more than 37 per cent.

**Table 4.** Total Variance Explained of of External Competitiveness Factors of Lithuania's industry

<table>
<thead>
<tr>
<th>Component</th>
<th>Initial Eigenvalues</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total</td>
<td>% Of Variance</td>
</tr>
<tr>
<td>1</td>
<td>2,035</td>
</tr>
<tr>
<td>2</td>
<td>1,100</td>
</tr>
<tr>
<td>3</td>
<td>0.770</td>
</tr>
<tr>
<td>4</td>
<td>0.620</td>
</tr>
<tr>
<td>5</td>
<td>0.474</td>
</tr>
</tbody>
</table>

**Source:** authors’ calculation

First factor extracted of this research explains 40,704 per cent of total variance. It is composed of three variables (Table 5): the macroeconomical environment \(B1\), the development of industry \(B2\), and the large unsatisfied demand \(B3\). Second factor explains 22,005 per cent of total variance. It is composed of the prices of energy resources \(B4\) and the availability of financial capital \(B5\). Following the methodology, we apply regression analysis to identify an impact of a single factor on the development of exporting Lithuanian industrial sectors.

**Table 5.** Rotated Component Matrix of External Competitiveness Factors of Lithuania’s industry

<table>
<thead>
<tr>
<th>Variable</th>
<th>Component 1</th>
<th>Component 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Macroeconomical environment (B1)</td>
<td>0.692</td>
<td>0.208</td>
</tr>
<tr>
<td>Development of industry (B2)</td>
<td>0.861</td>
<td>0.002</td>
</tr>
<tr>
<td>Large unsatisfied demand (B3)</td>
<td>0.695</td>
<td>0.131</td>
</tr>
<tr>
<td>Prices of energy resources (B4)</td>
<td>0.182</td>
<td>0.795</td>
</tr>
<tr>
<td>Availability of financial capital (B5)</td>
<td>0.064</td>
<td>0.838</td>
</tr>
</tbody>
</table>

**Source:** authors’ calculation

From five variables defining drivers of the external development drivers of Lithuanian manufacturing industry, two factors of which Eigenvalue is higher than 1 have been formed (Table 4).

**Table 4.** Total Variance Explained of of External Competitiveness Factors of Lithuania’s industry
The second one explains 24.62 per cent of variance. In total four extracted factors explain 85 per cent.

**Table 6. Total Variance Explained**

<table>
<thead>
<tr>
<th>Component</th>
<th>Initial Eigenvalues</th>
<th>Total</th>
<th>% Of Variance</th>
<th>Cumulative %</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>5.247</td>
<td>37.482</td>
<td>37.482</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>3.448</td>
<td>24.625</td>
<td>62.107</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>1.995</td>
<td>14.250</td>
<td>76.357</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>1.234</td>
<td>8.812</td>
<td>85.170</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>0.920</td>
<td>6.574</td>
<td>91.744</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>0.649</td>
<td>4.635</td>
<td>96.379</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>0.244</td>
<td>1.740</td>
<td>98.119</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>0.211</td>
<td>1.504</td>
<td>99.623</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>0.053</td>
<td>0.377</td>
<td>100.000</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>5.795E-16</td>
<td>4.140E-15</td>
<td>100,000</td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>2.981E-16</td>
<td>2.129E-15</td>
<td>100,000</td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>-1.093E-16</td>
<td>-7.804E-16</td>
<td>100,000</td>
<td></td>
</tr>
<tr>
<td>13</td>
<td>-4.349E-16</td>
<td>-3.106E-15</td>
<td>100,000</td>
<td></td>
</tr>
<tr>
<td>14</td>
<td>-4.636E-16</td>
<td>-3.311E-15</td>
<td>100,000</td>
<td></td>
</tr>
</tbody>
</table>

**Source:** authors’ calculation

**Table 7. Rotated Component Matrix**

<table>
<thead>
<tr>
<th>Variable</th>
<th>Component 1</th>
<th>Component 2</th>
<th>Component 3</th>
<th>Component 4</th>
</tr>
</thead>
<tbody>
<tr>
<td>High production quality (A1)</td>
<td>0.937</td>
<td>-0.123</td>
<td>0.087</td>
<td>-0.017</td>
</tr>
<tr>
<td>Low production costs (A2)</td>
<td>0.679</td>
<td>0.457</td>
<td>0.494</td>
<td>0.144</td>
</tr>
<tr>
<td>Cheap labour force (A3)</td>
<td>0.622</td>
<td>-0.650</td>
<td>-0.153</td>
<td>0.085</td>
</tr>
<tr>
<td>Low energy intensity (A4)</td>
<td>0.816</td>
<td>-0.002</td>
<td>0.036</td>
<td>-0.112</td>
</tr>
<tr>
<td>Efficiency of energy consumption (A5)</td>
<td>0.462</td>
<td>0.174</td>
<td>0.360</td>
<td>0.742</td>
</tr>
<tr>
<td>High level of labour productivity (A6)</td>
<td>0.150</td>
<td>0.095</td>
<td>0.937</td>
<td>-0.073</td>
</tr>
<tr>
<td>High qualified labour force (A7)</td>
<td>-0.067</td>
<td>0.856</td>
<td>-0.223</td>
<td>-0.146</td>
</tr>
<tr>
<td>Expenditures on personnel qualification improvement (A8)</td>
<td>0.093</td>
<td>0.676</td>
<td>-0.518</td>
<td>0.402</td>
</tr>
<tr>
<td>Innovative production methods (A9)</td>
<td>0.119</td>
<td>0.132</td>
<td>0.256</td>
<td>-0.859</td>
</tr>
<tr>
<td>Investment into equipment and technologies (A10)</td>
<td>0.074</td>
<td>0.884</td>
<td>0.267</td>
<td>0.138</td>
</tr>
<tr>
<td>Expenditure on new technologies (A11)</td>
<td>-0.257</td>
<td>0.791</td>
<td>0.136</td>
<td>-0.063</td>
</tr>
<tr>
<td>Expenditure on market research (A12)</td>
<td>0.831</td>
<td>-0.385</td>
<td>0.277</td>
<td>0.132</td>
</tr>
<tr>
<td>Relatively low demand for energy sources in manufacturing (A13)</td>
<td>0.893</td>
<td>-0.232</td>
<td>0.200</td>
<td>0.104</td>
</tr>
<tr>
<td>Low environmental pollution caused by the production (A14)</td>
<td>0.732</td>
<td>0.208</td>
<td>-0.365</td>
<td>0.225</td>
</tr>
</tbody>
</table>

**Source:** authors’ calculation

In the next step we perform the multiple regression analysis. The following formulas were made:

\[
X_1 = 0.365F_1 + 0.474F_2 - 0.097F_3 + 0.181F_4 + e_{C1}
\]

\[
X_2 = 0.423F_1 + 0.297F_2 - 0.171F_3 + 0.659F_4 + e_{C2}
\]

The first formula represents relationship between the annual revenue of the companies in the sub-sector of chemical and chemical products and internal development drivers of the chemical and chemical products sub-sector. The obtained loadings show that high-qualified labour force, expenditures on personnel qualification improvement, investment into equipment and technologies, and expenditures on new technologies significantly affect the annual revenue. This impact is expressed as the loading of factor 2 (0.474), which is the highest, compared to others.

Analysing the second mathematical expression we draw conclusion that the revenues from export in
this sub-sector mostly influenced by efficiency of energy consumption and applied innovative production methods. In this case the loading of the most influencing factor is much higher than others (0.659). Two factors of external drivers of the development of chemical and chemical products sub-sectors, which Eigenvalue is higher 1, have been extracted (Table 8). The first factor comprised of four variables out of five explains more than 64.3 per cent of variance. The other factor explains 26.1 per cent of variance. Obtained results reveal that all variables highly correlated with factors as the loading rage from 0.772 to 0.961. Formed equations (8 and 9) show that the factor 1 has notable affect on the annual revenues. Meanwhile, the second one is irrelevant as it is loading equal to 0.042

**Conclusions**

Sustainable development of the economy is based on various factors, which differ within specific sub-sectors. The article explored internal and external development drivers of whole Lithuanian industry. Statistical data showed that sub-sector of chemical and chemical products has been the one of the most growing sectors in Lithuania since 2000. For that reason, it was chosen to determine if the same internal and external development drivers affect one of the most growing industrial sub-sector and the whole Lithuanian exporting industry. Fourteen internal and five external development drivers were distinguished. Results revealed that some differences exist.

The analysis of internal development drivers of exporting Lithuanian sector, indicated that two of four factors affect the growth of annual revenues while the growth of factor 1 (five drivers), factor 2 and factor 3 accelerate revenues from export. Meanwhile, in the chemical and chemical products industry annual revenues are determined by three of four factors. The analysis of internal development drivers of chemical and chemical products showed that the same factors affect annual revenues and revenues from export. These results proved that chemical and chemical products sector is highly dependent on export. Exploring external development drivers, we found out that for both annual revenues and revenues from export the changes of external development factors have lower impact than internal in whole exporting sectors.

However, the sub-sector of chemical and chemical products is considerably more dependent of external development drivers than whole exporting industrial sectors.

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SUSTAINABLE DEVELOPMENT OF REAL ESTATE MARKET: IMPACT OF THE MICRO AND MESO LEVEL FACTORS

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Abstract. Fully functioning and effectively regulated real estate market is one of the factors of strengthening the economy of any country. Sustainable real estate market economy is essential to guarantee labor mobility and improve the management of migration flows within the country. In this regard, constant monitoring of factors affecting the selling price of residential real estate is necessary. A number of macro, meso and microlevel factors affects the selling price of residential property in different ways. Some factors have a stronger effect in a long term, some factors – in medium and short term. Each residential property object is unique and has a specific system of qualitative and quantitative micro level characteristics affecting the market price. The aim of this study is to examine and determine the effects of some micro and meso level property factors in two largest cities of Latvia at its price in short term period.

Keywords: factors, market price, residential real estate appraisal of secondary housing market

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JEL Classifications: F34, G21, G24

1. Introduction

The recent global financial crisis was the result of inadequate regulation of the real estate market and the financial markets. Real estate prices have been artificially overblown, mortgage lending was uncontrolled, the financial markets have developed complex financial instruments incomprehensible to most market participants, credit risks have been inadequately evaluated (Dubauskas 2012; Baikovs, Gariškaitė-Milvydienė 2012; Zariņš 2013; Giriūnas et al. 2013; Wahl, Prause 2013; Mačiulis, Tvaronavičienė 2013; Vosylis et al. 2013; Borseková et al. 2012; Ercsey 2012; Laužikas, Mokešckienė, 2013; Korsakienė 2013; Wahl, Prause 2013; Fusch, Tvaronavičienė 2014; Vasiliiūnaitė 2014; Korsakienė, Tvaronavičienė 2014). These processes detrimented sustainable development processes and diminished regional competitive advantage (Makštutis et al. 2012; Giriūnas et al. 2013, Borseková et al. 2012; Gariškaitė-Milvydienė 2012; Lankauškienė, Tvaronavičienė 2012; Dudevčiūtė 2012; Vosylis et al. 2013; Laužikas, Mokešckienė, 2013; Wahl, Prause 2013, Korsakienė, Tvaronavičienė 2014). To control the real estate market and to improve safety of investments in the real estate market is necessary to increase knowledge about the dynamics of the market and improve access to information on the performed transactions (Vasiliūnaitė 2014; Baikovs, Zariņš 2014; Korsakienė 2013; Ercsey 2012) and therefore it is necessary to monitor the real estate prices and the factors influencing these prices. Adequate assessment of residential property, as a basis for lending should be clear to all market operators and be part of the policy for the formation of stable real estate markets. To adequately assess residential property it is necessary to adequately assess

Latvia is sufficiently polarized territory. The population of Riga was 1,182,9 thousand inhabitants in 2011, the population of Daugavpils was 137,4 thousand inhabitants which is 55% of all residents of Latvia (Haite 2014). In the capitals, major regional, cultural Centers with a high level of financial flows, effective investments and good development prospects real estate market is developing fast enough and prices for residential real estate set a relatively high level eventually. Riga is the largest city of central, Riga region and the capital of Latvia, Daugavpils is largest city of the peripheral region of Latgale, the second largest and most important city after Riga. Many factors of macro, meso and microlevel affect the selling price. Some factors have a stronger effect in long-term period, some factors – in medium and short –term period. The object of the research is a nature and strength of association between some factors of residential property and price of the real estate in two largest cities of Latvia: Riga and Daugavpils. The aim of the research is to study and to determine the degree of influence of some micro and meso-level factors of residential real estate at its price in the short term. To achieve the research objectives authors used the following methods: correlation analysis (Pearson's correlation coefficient), ANOVA, Chi-Square Tests, Tests of Between-Subjects Effects, log-linear form of regression.

2. Methodological basis of research

The objective factors affecting the selling price of residential properties mainly include the economic determinants. These economical factors can be classified into macroeconomic, microeconomic and mesoeconomic. The first group includes factors related to the general situation in the market. From the point of view of the demand these factors are socio-demographic factors (population or individual age groups, birth, death, marriage rate, divorce rate, the need for housing etc. (Tze San Ong 2013); socio-economic factors (GDP, (Wheeler and Choudhury 1993), employment rate, income, purchasing capacity etc.), political factors (housing public policy and subsidies, taxes Tan (2010)), financial and credit factors (savings, availability of mortgage loans, credit conditions – Barakova et al. (2003), Peek and Wilcox (2006), Estrella (2002), Mc Cathy and Peach (2002), inflation rate - Zhu (2004). From the point of view of the supply: the territorial and legal factors (land use plans of cities and municipalities, legal availability and support of housing construction), economic and technological factors (the capital return rate, the number of available apartments in the housing market etc.) - Mikulaš 2009; Sander and Polasky 2009; Real Estate Market Review 2012; Krajewska and Szopinska 2011; Kucharska-Stasiak 2010; Kwiecien et al. 2010; Rymarzak 2010). The main mesoeconomic factor is belonging of a residential property to national, regional or local level centers etc. (Galati et al. 2011; Garmaise and Moskowitz 2004; Green et al. 2005; Himmelberg et al. 2005).

Microeconomic factors unlike macroeconomical factors characterize only objective parameters of specific transactions. Of these, we pay special attention to to the quality of housing factors describing the apartment, house or cottage as the object of transaction: the number of rooms, type of project (Galati et al. 2011), area, type of structure (panel or brick buildings), balcony, loggia, floor, technical condition of residential property, social infrastructure near the object (Yi Wang et al. 2012; Black 1999; Owusu-Edusei and Espey 2003; The Reinvestment Fund 2007; Tiebout 1956; Wulsin 2009). Sirmans and Macpherson (2003) found that each additional 1000 square feet of residential property increases the selling price by about 3,3%; each additional bedroom increases the price by about 4%; every extra bathroom increases the price by about 4%; every extra toilet increases the price by about 24%; central air conditioning increases the selling price by about 12%; ceiling height of nine feet increases the price by about 6%, availability of the basement increases the price by about 9%; loundry in the basement decreases the price by about 2%; presence of the fireplace has a strong positive impact on the selling price (each fireplace increases the price by about 12%); presence of a garage increases the selling price by about 13%; presence of a swimming pool increases the selling price by about 8% (Sirmans and Macpherson. 2003). Authors studied how residential property prices depend on objective microlevel factors in 2010-2011 when consequences of financial crisis had a strong impact in Latvia, there was an economic downturn, lending for purchasing the residential property was
frozen by political decisions, incomes and purchasing power of the population decreased significantly which had strong impact on real estate market and caused a sharp decline of the real estate prices. In this situation differences in prices of residential property in Daugavpils and Riga largely determined by meso and microlevel factors.

3. The results of the study

Authors conducted the collection and analysis of the information at three levels: regional, local, individual. The Land Service (Valsts Zemes Dienests (VZD)) database was used by authors to collect the information. Analysis showed that apartments – from one to four rooms – in Riga are significantly more expensive than in Daugavpils (Figure 1).

The average market price of the apartments with a different number of rooms in Daugavpils and Riga, 2010-2011

Source: author’s calculations according to the Land Service (Valsts Zemes Dienests) database data SIA Arco Real Estate unpublished data, the database of the deals (VZD, 2010, 2011), (Latvian Sworn Bailiffs Board 2011), (SIA Arco..., 2010, 2011)

The cost of one-room apartment in Daugavpils varies from 2000 Ls to 16000 Ls, average price is 4845 Ls with an average standart deviation 1759 Ls. In Riga average price of such apartments is 15328 Ls and maximum price reaches 31000 Ls but price for half of sold apartments is more than 14759 Ls. Even greater differences were observed about the price for several rooms apartments. So, the average price of three-rooms apartment in Riga is 55201 Ls while the average price in Daugavpils is 13226 Ls.

The average apartment price by project type in Riga and Daugavpils, 2010-2011

Source: author’s calculations according to the Land Service (Valsts Zemes Dienests) database data SIA Arco Real Estate unpublished data, the database of the deals (VZD, 2010,2011), (Latvian Sworn Bailiffs Board 2011), (SIA Arco..., 2010, 2011)
Also we can state significant difference in price by comparing apartments of the same project in Riga and Daugavpils. Thus, the average price of apartments of “series 103” or project “Lithuanian” in Riga is 29082 Ls but the average price of similar apartments in Daugavpils is 8622 Ls (Figure 2).

**Fig.3.** The relationship between the market price of the apartment and its area, 2010-2011
*Source*: author’s calculations according to the Lande Service (Valsts Zemes Dienests) database data SIA Arco Real Estate unpublished data, the database of the deals. (VZD, 2010, 2011), (Latvian Sworn Bailiffs Board 2011), (SIA Arco., 2010, 2011)

There is a statistically strong direct relationship between apartment’s area and its market price. In Daugavpils correlation is stronger \((r=0.811)\) than in Riga \((r=0.715)\) (Figure 3).

**Fig.4.** Relationship between value of apartments with different number of rooms and their area in Daugavpils, in 2010-2011
*Source*: author’s calculations according to the Lande Service (Valsts Zemes Dienests) database data SIA Arco Real Estate unpublished data, the database of the deals. (VZD, 2010, 2011), (Latvian Sworn Bailiffs Board 2011), (SIA Arco., 2010, 2011)
Fig. 5. Relationship between value of apartments with different number of rooms and their area in Riga, in 2010-2011

Source: author’s calculations according to the Lande Service (Valsts Zemes Dienests) database data SIA Arco Real Estate unpublished data, the database of the deals. (VZD, 2010, 2011), (Latvian Sworn Bailiffs Board 2011), (SIA Arco., 2010, 2011)

Apartment’s area most strongly affects its price for three-room apartments (r=0.701 - Daugavpils, r=0.548 – Riga) while the least strong for two-room apartments (r=0.389 - Daugavpils, r=0.359 – Riga). There is a linear dependence between one-room apartment’s price in Daugavpils and its area. The price of one-room apartments in Daugavpils depends on their area significantly (r=0.518) while in Riga this dependance is not significant (r=0.183, p=0.317) (Figure 4,5).

Fig. 6. The average transaction amount in popular districts of Daugavpils, 2010-2011

Source: author’s calculations according to the Lande Service (Valsts Zemes Dienests) database data SIA Arco Real Estate unpublished data, the database of the deals. (VZD, 2010, 2011), (Latvian Sworn Bailiffs Board 2011), (SIA Arco., 2010, 2011)
District factors significantly affect the price of apartments in Riga and Daugavpils as well (ANOVA, p<0.05). Apartments in the center of cities are more expensive than apartments in other districts. The average price of apartments is 13017 Ls/sq.m in center of Daugavpils and 5827-7090 Ls/sq.m in other districts. The average price of apartments is 59410 Ls/sq.m in center of Riga and 25322 – 48288 Ls/sq.m in other districts (Figure 6,7).

In Daugavpils the price of apartments in the center is significantly different than the price of apartments in other districts, where significant differences were not observed. Price of apartments in Mežciems district, Riga, is lower than in center and higher than in Teika but the differences are not statistically significant. Apartments in Purvciems and Pļavnieki districts are cheaper but their price does not differ from each other, while its price is different than price of apartments in other districts of city. This can be explained by the fact that over the last two years in these districts few apartments were sold and their condition was poor (requiring repair).

Distance between district and the center of city is not the only factor to explain why there are different prices of the apartments located the same distance from the center. It seems that the city zoning is advisable to carry out by the social and urban planning factors taking into account the quality of the housing and its district location. Social factors should include differentiation of the urban population in terms of income which determines the trend: poor people move to the suburbs. It is so called factor of the social geography (Figure 8, 9).
Type of building project is a factor that has a significant impact on the price of apartments in Riga and Daugavpils (ANOVA, p < 0.05). Comparison of one-bedroom apartments in Daugavpils shows that the price of the apartments in "pre-war" and "Stalin era" type apartments differs significantly from the prices of other types of apartments for which we cannot find statistical differences. The price of two-room apartments in project "series 103" and "Lithuanian" buildings is significantly different than the price of apartments in series 318, 602, 467 buildings and do not differ the price in "special project" type buildings.

In Riga the price of apartments in "pre-war" and "Stalin era" buildings is different than the price of apartments in other buildings but unlike Daugavpils they are cheaper and such differences are statistically significant. Two-room and three-room apartments in "pre-war" and "Stalin era" buildings in Riga are more expensive as well as in Daugavpils. In Riga only three-room apartments in project "series 103" and "Lithuanian" buildings are more expensive than apartments in series 318, 602, 467 buildings while in Daugavpils such differences are significant for two-room apartment level. In Riga two-room and three-room apartments in "special project" type buildings are cheaper than apartments in "pre-war" and "Stalin era" buildings but more expensive than apartments in...
in “series 103” and “Lithuanian” project buildings. In Daugavpils three-room apartments in “series 103” and “Lithuanian” project buildings are more expensive than apartments in “Special project” buildings (Figure 10, 11).

The comparison of price two-room apartments of various planning showed that traditional preference of apartments with isolated rooms is typically for Riga. However in Riga and Daugavpils differences of prices for various planned buildings are shown only at the level of a statistical trend (t-test for Equality of Means, 0.05<p<0.1).

In Daugavpils and Riga there is observed relationship between type of two-room apartments and their planning (Chi-Square Tests, p<0.05). Most apartments with combined rooms belongs to 318, 602, 467 series buildings. In Daugavpils there were sold 68% of such apartments, in Riga – 17%. In Daugavpils there were sold 8% of “pre-war” and “Stalin era” type apartments with combined rooms, in Riga – 29%. Despite the fact that in Riga separated room
Apartments are more expensive and the difference in the price is especially notable for the “pre-war” and “Stalinera” type apartments, the joint effect of with rooms planning is not statistically significant (Tests of Between-Subjects Effects, p=0.480).

![Diagram of transaction price vs. building material]

**Fig. 12.** Comparison of the price of apartments in panel and brick buildings in Riga and Daugavpils, 2010-2011

*Source: author’s calculations according to the Lande Service (Valsts Zemes Dienests) database data SIA Arco Real Estate unpublished data, the database of the deals. (VZD, 2010, 2011), (Latvian Sworn Bailiffs Board 2011), (SIA Arco., 2010, 2011)*

The comparison of the price of apartments in panel and brick buildings shows that apartments in brick buildings are significantly more expensive both in Riga and Daugavpils (t-test for Equality of Means, p<0.05) (Figure 12). Significant relationship exists between material of external walls of buildings and type of building project (Chi-Square Tests, p<0.05). “Pre-war” and “Stalinera” buildings are mostly made of brick, “series 103” and “Lithuanian” project – made of panel.

![Diagram of transaction price vs. presence of balcony or loggia]

**Fig. 13.** Comparison of price of different type of apartments in Daugavpils by the presence of balcony or loggia, 2010-2011

*Source: author’s calculations according to the Lande Service (Valsts Zemes Dienests) database data SIA Arco Real Estate unpublished data, the database of the deals. (VZD, 2010, 2011), (Latvijas, 2011), (SIA Arco., 2010, 2011)*
Fig. 14. Comparison of price of different type of apartments in Riga by the presence of balcony or loggia, 2010-2011

Source: author’s calculations according to the Landes Service (Valsts Zemes Dienests) database data SIA Arco Real Estate unpublished data, the database of the deals. (VZD, 2010, 2011), (Latvian Sworn Bailiffs Board 2011), (SIA Arco., 2010, 2011)

The presence of balcony or loggia can significantly increase the price of apartments in “pre-war” and “Stalin era” type buildings and price of apartments in 103 series and “Lithuanian” project buildings (t-test for Equality of Means, p<0.05) (Figure 13, 14).

Fig. 15. Presence of a balcony or a loggia in different project apartments in Daugavpils, 2010-2011

Source: author’s calculations according to the Landes Service (Valsts Zemes Dienests) database data SIA Arco Real Estate unpublished data, the database of the deals. (VZD, 2010, 2011), (Latvian Sworn Bailiffs Board 2011), (SIA Arco., 2010, 2011)

The presence of a balcony or a loggia in the apartment significantly correlates with a type of apartment both in Daugavpils and in Riga (Chi-Square Tests, p<0.05). Among the apartments in “pre-war” and “Stalin era” buildings only 25% of the apartments in Daugavpils and 20% in Riga have a balcony or loggia. There are 60% of the apartments with a balcony or a loggia in “series 103” and “Lithuanian” type buildings, in series 318, 602, 467 buildings (Figure 15).
Technical condition has a significant impact on the price of apartments in all districts of Daugavpils (ANOVA, p<0.05). In Riga despite the fact that the apartments in the best condition are more expensive in all districts except Mežciems, these differences are significant only in Purviems district (ANOVA, p=0.003). The effect of influence of such factors as district and technical condition was not observed both in Riga and Daugavpils (Tests of Between-Subjects Effects, p=0.832, p=0.831). There is statistically significant relationship between technical condition of apartments and city apartments are located (Chi-Square Tests, p<0.05). In Riga 25% of sold apartments were in very good technical condition, in Daugavpils there were 5% of such apartments. In Daugavpils 65% of sold apartments were in satisfactory condition while in Riga there were 19% of such apartments (Figure 16, 17).

The dependence between the technical condition of the apartments and districts they are located are statistically significant only in Riga (Chi-Square Tests, p<0.05), in Daugavpils such dependence was not observed (Chi-Square Tests , p=0.284). If in center of Riga 60% of sold apartments were in very good technical condition then in Mežciems percentage of such apartments was less than 6% (Figure 18, 19).
Technical condition of apartments has significant impact on price of apartments with different conditions: if the condition of apartment is better, the apartment is more expensive (ANOVA, $p<0.05$).

The effect of the joint influence of both factors – type and technical condition, is observed in Daugavpils: apartments in “pre-war” and “Stalin era” buildings in excellent technical condition are much more expensive than apartments of the same type in good or satisfactory condition (Tests of Between-Subjects Effects, $p<0.05$).

Statistically significant relationship between technical condition of sold apartments and district they are located are not observed (Chi-Square Tests, $p=0.177$). In Riga such relationship is observed at the level of statistical trend (Chi-Square Tests, $p=0.076$). 39% of apartments in “pre-war” and “Stalin era” buildings sold in Riga were in excellent technical condition. There were only 28% of sold apartments in “series 103” and “Lithuanian” buildings in excellent condi-
tion and 16% of apartments in 318, 602, 467 series buildings (Figure 20, 21).

The effect of the joint influence of such factors as floor (first, last) and project type is observed in Riga (Tests of Between-Subjects Effects, p=0.05). The apartments in first and last floor are significantly cheaper. In Daugavpils this factor has no impact on price of apartments.

**Fig. 20.** The price of apartments on the top floor in comparison with others

**Fig. 21.** The price of apartments on the first floor in comparison with others

*Source:* author’s calculations according to the Lande Service (Valsts Zemes Dienests) database data SIA Arco Real Estate unpublished data, the database of the deals. (VZD, 2010, 2011), (Latvian Sworn Bailiffs Board 2011), (SIA Arco., 2010, 2011)

**Fig. 22.** The average price of apartments of different types in Daugavpils depending on the floor they are located, 2010-2011

*Source:* author’s calculations according to the Lande Service (Valsts Zemes Dienests) database data SIA Arco Real Estate unpublished data, the database of the deals. (VZD, 2010, 2011), (Latvian Sworn Bailiffs Board 2011), (SIA Arco., 2010, 2011)
In Daugavpils the significant relationship between type of sold apartments and floors they are located is observed (Chi-Square Tests, $p<0.05$). 22% of apartments in “pre-war” and “Stalin era” buildings were located on top floors, 13% - on the first floor while only 12% of apartments in “series 103” and “Lithuanian” project buildings were located on the top floor (Figure 22, 23).

Authors used log-linear regression in order to establish the percentage change of the selling price depending on some characteristics of the property at the micro level in studied cities: $\ln Y = \alpha + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \beta_4 X_4 + u$, where $X_1$ – WC and bathroom (combined/non combined), $X_2$ – total area of apartment (sq.m.), $X_3$ – technical condition of apartment (bad, average, excellent), $X_4$ – district of the city (central/peripheral) but the interpretation of the regression coefficients is as follows:

$$\frac{dY}{Y} = \beta \frac{dX}{X} = \beta \frac{dY}{Y} \Rightarrow \beta = 100 \% \frac{dY}{Y}$$

the coefficients at the independent variables show by what percentage increases $Y$ by increasing $X_i$ by 1 unit.

Thus, the following equation were observed:

$$\ln Y = 6.683 + 0.179 X_1 + 0.035 X_2 + 0.410 X_3 + 0.315 X_4 + u$$

(significance level of each coefficient and intercept $p=0.000$), therefore the presence of separated WC and bathroom increases the price of the property by 18%, increasing of total area by 1 sq.m increases price by 3.5%, improving the technical condition by one level (bad, satisfactory, excellent) increases price by 41% but the location of the apartment in center of city increases price by 31.5% (compared to peripheral area). Presence or absence of a balcony or loggia is not significant ($p>0.5$).

**Conclusions**

After analyzing the real estate market in Riga and Daugavpils on realized sales in 2010-2011 (see Table 1) we can make the following conclusions:

Residential property has a good economic value which depends not only on consumer properties of a specific object but also the characteristics of the location. Apartments in Riga are more expensive than in Daugavpils. Apartments in the center of cities are more expensive than in other districts.

The influence of individual factors determining the price of apartments in Daugavpils in Riga is different. Therefore it is advisable to analyze the effect of factors on the price of apartments separately.

Factors such as the district has a significant impact on the price of property both in Daugavpils and Riga. The special district is the center of city where the apartments are usually more expensive.

Factors such as “type of building project” also has a significant impact on the price of apartments. The apartments in “pre-war” and “Stalin era” type buildings are significantly more expensive.
Factors such as “material of the building walls”, “sanitary-technical room”, “planning of the rooms” can affect the price of apartments but they tend to be associated with factors such as “type of building project”.

Technical condition of the apartment has a significant impact on the price. Good repair in the apartment is able to increase its value significantly.

One of the main factors determining the price of apartment is its area. The number of the rooms in the apartment is closely related to this factor.

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REGIONAL SECURITY DYNAMIC OF SOUTH ASIAN REGION: ANALYSIS OF KASHMIR CONFLICT

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Abstract. This article demonstrates how Kashmir conflict between India and Pakistan change regional security dynamic in South Asia. The formation of regions, intensification and importance of regional power is interesting for different kind of scientists, including political analysts, due to the changing values of national nations in a global world and due to the power separation between members of international system. Regional nations, which are analyzed, are one of the most rapidly growing markets, what is more, a lot of important changes in politics, which give the world a tumble of particular tendencies, happens in these countries. All things considered, it is important to get information about processes which happens in Southern Asia, especially, in India which is a regional power. The article analyzes how regional security system in South Asia. Analysis of regional security dynamic in India-Pakistan conflict demonstrates how organization serves the purpose of enhancing the efficiency of transactions among states, but the ambiguity in them also functions as a tool to manage distribution of power.

Keywords: regionalism, regional security, Kashmir conflict, South Asia region, relations between India and Pakistan


JEL Classifications: ROO, R1, R5, O1, FOO, F5

1. Introduction


The proliferation of regional groupings of Asian states is perhaps the most notable and consequential feature of the international landscape to take shape from the second half of 20th century, and especially since the Cold War’s end. Regional institutions in Asia have both expanded in number and, because many often overlap in a given territory, have increasingly begun to coordinate their activities. Since the end of the Cold War, regional institutions have deepened their integration and expanded their roles and tasks that they can undertake. If current trends continue, rela-
Regional security dynamic of south Asian region: analysis of Kashmir conflict

Theoretical basis for the review of the regional security analyzed by Bose (2003), Burki (2007), Harshdeep (2009), Schaffer, H. B. and Schaffer, T. C. (2005). The first part of analysis is on historical paradigm of the regional security in South Asia. Second part describes regional security dynamic in the South Asia. Analysis is performed determining reasons limiting regional security institutions effectiveness. Third part of analysis is Kashmir conflict in the South Asia security structures. The logic of comparison must include both elements of similarity and elements of difference; therefore, in order to derive the greatest values from the analysis process, there have been chosen three different – in their purpose, development, member and issue scope – regional organizations institutions. Article is completed conclusions remarks on South Asia regional security dynamic.

2. Historical perspective on regional security in South Asia

Conflicts of Southern Asia’s region into three parts: (1) inter-regional conflicts which happen among countries of the region; (2) intraregional conflicts which happen inside the countries of the region; (3) extra-regional conflicts which happen outside the boundaries of the region. Countries involved into inter-regional conflicts are Pakistan and Bangladesh, Bhutan and Nepal, India and Bangladesh, India and Nepal, India and Pakistan (Ahmad 1999). These conflicts influence various political, economic and social problems which influence security factor and development of regionalization in Southern Asia’s region (more information about description of Southern Asia’s region on Table 1).

Table 1: The description of Southern Asia’s region

<table>
<thead>
<tr>
<th>The description of Southern Asia’s region</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Region corresponds to the boundaries of ancient India;</td>
</tr>
<tr>
<td>• It has ethnic, linguistic and religious variety;</td>
</tr>
<tr>
<td>• Confrontation between India and Pakistan (conflict until 1947);</td>
</tr>
<tr>
<td>• According to population, it is the biggest region in the world (1, 45 billion people);</td>
</tr>
<tr>
<td>• It is the second region after sub-Saharan Africa according to number of conflicts;</td>
</tr>
<tr>
<td>• It has a huge flow of refugees from other countries of the region;</td>
</tr>
<tr>
<td>• The level of development is very low in this region;</td>
</tr>
<tr>
<td>• Regional collaboration is minimal.</td>
</tr>
</tbody>
</table>

Source: by the author

Intraregional conflicts reflect regional variety inside the countries. The best way to notice all dangers re-
lated with security in the region, is to see Southern Asia as a separate civilization (looking from historical perspective), regional macro-culture which has artificially divided national values. These previously mentioned factors show such dangers related with ethnic and religious aspects as Sikhs in Punjab, Tamils in Sri Lanka, Indians in Nepal and Nepalis in Bhutan (Warikoo 2006). What is more, extraregional conflicts exist in this region as well. Huge flow of refugees which happens due to the inter-regional and intraregional conflicts also influences heterogeneity of the region (Bose 2003). When Pakistan was created, millions of refugees crossed the border, when Bangladesh separated from Pakistan, 10 millions of Bengali went to India as well as Tamils went to India from Sri Lanka (Rai, Rulers 2004). Flow of refugees increases the tension among countries of the region.

Inter-regional flows of refugees also exist: people from Tibet moves to India, people from Afghanistan moves to Pakistan, etc. This inter-regional flow of refugees increases inter-regional tension.

The beginning of the conflict was separation of India and Pakistan in 1947. The conflict was started when Hari Singh, duke of Kashmir, decided to join India. Pakistan was against this decision due to the fact that most of the citizens in Kashmir were Muslims (Prakash 1985). Then warriors of Pakistan came to Kashmir. More then 50 000 people were killed during this conflict. Resolution of UN in 1949 required to march out the warriors of Pakistan from Kashmir and to leave all the power to plebiscite in that territory (Burki 2007). After that conflict Pakistan gets 1/3 of the territory while India gets 2/3 of it. What is more, regulatory line was also defined (Figure 1).

The war between India and Pakistan started in 1965 due to the skirmish between these two countries in Kashmir. This war lasted for five weeks and it was finished by UN. The reason of Kargil conflict in 1999 was infiltration of Pakistan’s warriors into the trap of Indian warriors. It was the first war among India and Pakistan which had nuclear weapons already ( Chandidas 1968).

<table>
<thead>
<tr>
<th>No.</th>
<th>Crises</th>
<th>Year</th>
<th>Crisis type</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Junagadh</td>
<td>1947</td>
<td>Interstate-ethnic</td>
</tr>
<tr>
<td>2.</td>
<td>Kashmir I</td>
<td>1947</td>
<td>Interstate-ethnic</td>
</tr>
<tr>
<td>3.</td>
<td>Hyderabad</td>
<td>1948</td>
<td>Interstate-ethnic</td>
</tr>
<tr>
<td>4.</td>
<td>Punjab War Scare I</td>
<td>1951</td>
<td>Interstate</td>
</tr>
<tr>
<td>5.</td>
<td>Rann of Kutch</td>
<td>1965</td>
<td>Interstate</td>
</tr>
<tr>
<td>6.</td>
<td>Kashmir II</td>
<td>1965</td>
<td>Interstate-ethnic</td>
</tr>
<tr>
<td>7.</td>
<td>Bangladesh</td>
<td>1971</td>
<td>Interstate-ethnic</td>
</tr>
<tr>
<td>8.</td>
<td>Punjab War Scare II</td>
<td>1987</td>
<td>Interstate</td>
</tr>
<tr>
<td>10.</td>
<td>India-Pakistan Nuclear Tests</td>
<td>1998</td>
<td>Interstate</td>
</tr>
<tr>
<td>11.</td>
<td>Kashmir IV – Kargil</td>
<td>1999</td>
<td>Interstate-ethnic</td>
</tr>
<tr>
<td>12.</td>
<td>Indian Parliament Attack</td>
<td>2001</td>
<td>Interstate-ethnic</td>
</tr>
</tbody>
</table>

Source: by the author

Period from 2001 until October 2002 was the period of terrorist attacks against India’s Parliament. This period is considered as low intensity conflict and terrorism in Jamm and Kashmir where rebellion against India is actively supported by Pakistan (more information about Crises in the India-Pakistan conflict 1947-2003 in Table 2).

3. Regional security dimension: relations between India and Pakistan

The biggest threat for national integrity in after-colonial Asia was ethnicity (dependence to one or another ethnic group). Conflicts which arise due to the differences in religion, ethnicity, linguistics and different national movements are the basic problem which retards regional development. Huge amount of conflicts is typical for this region. These conflicts are determined by politicizing the religion. Political movements which happen between the nations of Asia and which are related with religion and linguistics are the basis of conflicts which make Central and Southern Asia the region of politicized culture (more about levels of international conflicts in Figure 2).

![Levels of international conflicts](source)

India, due to the ambition of becoming a biggest power, tries to have all the influence on neighboring regions such as Central Asia, the Gulf, China and Southeastern Asia. For example, India had a bargain with ASEAN organization due to the treaty of free market space. This treaty was injured in 2007. What is more, India tries to participate in peace-supporting and humanitarian operations and constantly emphasizes its democratic values. However, while dealing with perspectives of India in regional frames, the present discussions about reforms of United Nations Safety Council. These discussions make a possibility for India to become a permanent member of United Nations Safety Council.
The main purpose of the article is to identify and to analyze the fact that the dominance of India in this region is determined by geographical centrality, martial possibilities, size of its territory and population, market, big industrial base and the control of sophisticated civilian technologies. All these aspects differentiate India from other nations of the region and give the possibilities for this country to act as an accredited leader of the region safety. There are two reasons which determine legitimating of India in regional dominance. First one is hegemony of India in the region and second one is the use of military power in Sri Lanka (1987) and in the Maldives (1989) due to the protection of national interests. On the other hand, Pakistan, which is a strong country itself, is blocking the ambition of India to become the leader of the region or maybe even the biggest power. The existence of the Pakistan reduces entrenchment and legitimation of India as the power of regional safety. Pakistan’s ability to throw down a challenge to the dominance of India was supported by “borrowed” power and maintenance of USA and China during the Cold War period. After the Cold War and especially after the 11 September 2001, India became closer to the USA (Evans 2001). These closer relations between India and USA help India to strengthen its position inside and outside the region. The main national interests of the Pakistan, which involves ambitions to counterbalance the dominance of India and to solve the conflict of Kashmirian (more about factors of Kashmir conflict in Figure 3).

India undertakes the role of safety guarantor in order to strengthen its power in the region. Due to this fact, India tries to control the conflicts of smaller nations (for example, the intervention of peace-maintenance in Sri Lanka (1987-1990) and operation called “Cactus” in the Maldives (1988)) (Noorani 1996). Such role of India restores the trust of this country as the power of the region strengthens its position in Asia and what is more, it became a very important thing in forming the safe society in the region. Safety complex in South Asia was completely formed in 1947. After the period of imperialistic controlling of the region and after the recession of Britain, not only independence was restored but also division was done: the power of the region was given to two independent nations – India and Pakistan (Sri Lanka and the Maldives achieve their independence later) (Tenenbaum 2009). India and Pakistan is the basement of safety complex in this region nowadays. The dominance of distinctive status quo in the region. This means that it is typical for safety complex of South Asia region to keep the succession of regional structure even after the Cold War (Prabhu 2002). The chapter ends with the idea that the structure of the region remains the same after the Cold War despite the changes inside and outside the region.

National priorities of India which are comprehensible mostly as counterbalance to China, the strengthening of the internal welfare and development of economics, the control of political situation in South Asia, the desire of international appreciation and desire to become the biggest power and the permanent member of UNO Safety Council (Navlakha 2009). The differences between national interests of India and Pakistan show the existence of tension between these two countries. This tension exists because of different ambitions: India formulates global ambitions while Pakistan formulates local and regional ambitions.

The fact that Indian ambition to get the status of the biggest power was not accredited due to the Pakistan, which still see itself as the pole of regional power. India and Pakistan have tried nuclear weapons on each other. These actions expand the concern and strengthen the tension both inside and outside the region. The absent of nuclear weapon distribution treaty between India and Pakistan. The lack of such treaty has influence on the dynamics of regional safety: it does not give the region the sense of safety and

Fig. 3. Factors of Kashmir conflict

Source: by the author
stability and determines permanent tension. What is more, it opens the region for the pressure of the outside countries.

Other important area is economic relations in the region. It is emphasized that SAFTA (agreement of free market space in South Asia) was established in 2006 (Ghaha 2004). It is emphasized that free market space was fully developed until 2008; what is more, it is supposed that union of customs may emerge until 2015 while economical union may emerge until 2020. However, the fact that the tension between India and Pakistan is troubling all progress of SAARC (Masood 2008). India gets the most benefits from free market space. On the other hand, smaller and less wealthy countries have more loss in the spheres of market, affectivity and the welfare of the country. It is noted that bilateral liberalism may be more effective in searching the welfare and economic growth.

Smaller countries of the region are afraid of Indian dominance, what is more, disagreements on politics and territory slows down the endeavor of economic unification. This pipeline should be built from Iran to India through the Gulf, Turkmenistan and Pakistan (Ganguly 2000). It would be useful for both countries due to the possibility to use gas instead of coal or petroleum; also it would have economic benefits for both countries. The position while dealing with economical collaboration forms the attitude that this organization may lay the basement for collaboration with China, ASEAN, EU, Russian in order to strengthen the position of South and Central Asia and also may be helpful for the interests of India.

It is possible to highlight quick growth of regional economy which would encourage collaborating intensively in the sphere of market between countries. However, development of political dialogue is still not a priority sphere in the perspective of the region. Collaboration and integration in to the economic sphere is encouraged by quick economic growth in the region (Schaffer; Schaffer, 2005). It is possible that economic integration may help to expand this collaboration to the political sphere, too. The regional conflicts in which India is involved. First of all, there are conflicts between India and Bangladesh, India and Nepal, India and Pakistan. These conflicts influenced a lot of political, economic and social problems which have influence on safety dynamics and development of the regionalization in this region. Other important thing is that these conflicts, which happen inside the region, fully show regional variety. If we look at South Asia as separate civilization in a historical point of view or as a regional macro-culture with artificially divided national values, it will be easier to understand various dangers which are related with ethical and religious aspects such as sikhai in Punjab or tamils in Sri Lanka (Habibullah 2004).

Finally, extra-regional conflicts are presented. These conflicts arise due to the cultural differences, different perspectives of different countries, higher heterogeneity and huge amount of refugees. Firstly, after the establishment of the Pakistan, millions of refugees crossed the new border in both sides, then when Bangladesh segregates from Pakistan, about 10 million bengals moved to India, tamils from Sri Lanka was also moving to India (Jha 2003). The flow of refugees expands tension between nations of the region. What is more, interregional flow of refugees which expands tension between regions also exists in this region: refugees from Tibet move to the India, refugees from Afghanistan moves to Pakistan, refugees from Burma moves to Bangladesh.

4. Factors of the future on regional security dynamic in Kashmir region

Other factor affecting the dynamics of the security is relations between India and China. These relations are analysed due to the fact that they have influence on the formation process of the region of Central and South Asia. It is emphasized that attrition between China and India was influenced by such factor as problems due to the demarcation of the border. These problems expanded tension between these two countries. However, relations between China and India, despite the still existing distrust, are visibly improving in the few latter decades.

This is obvious from series of treaties which were signed between these two countries and also from decreased support of India to Pakistan. China stays neutral during the Kargil war (1999) between India and Pakistan. The position of China says that such triangle as China-India-Pakistan is not a play with zero amount and that China’s better relations with India do not indicate that China is turned away from the Pakistan (The Economist 2008). However, such tension between these two countries does not have a negative influence on strengthening the regional integration. So, China as the biggest power holds quite a flexible position while dealing with the region of
South Asia. In 2004 when the China and Pakistan ministers of the science meet each other, these two countries understood that the problem of Kashmir cannot be solved by military or violent actions; in order to solve the problem they should use diplomacy (Zutshi 2003). It is emphasized that due to the fact that the peace process would be effective it is necessary to reconcile the soldiers of Kashmir and to make confidence between two sides of the conflict. The purpose of the peace is to solve territorial problems, overcome the hostility, expand the market and develop transit through united border of these countries.

The conflict between India and Pakistan involves unsolved questions due to the territory, political misunderstandings, and the problem of identity and the lack of strong economic relations (Yadav 1996). There are two factors which to explain this long-lasting conflict between India and Pakistan: the aspect of territory and problems with national identity. It is emphasized that peace process in this region is retarded by longstanding positions of these countries:

Pakistan is accused of terrorism while India is accused of xenophobia (Harshdeep 2009). Situation when broader civil and academic community, media and ordinary people are not involved in the process of problem solving is due to the very conservative bureaucratic mechanisms. Dipolarity which determines safety movements in all region and subordinates region for the confrontation between India and Pakistan is typical for the distribution of the power in this region.

Development of the region is retarded by Kashmirian problem. This problem has reached an impasse and due to this fact, it presumably will not be solved in the near future. Territorial borders between India, Pakistan, China, Nepal and Bangladesh are not clearly defined and due to this fact it is the source of the tension between these countries (Ganguly 2006). What is more, internal conflicts which cannot be solved even by nuclear weapon (more information about Indian and Pakistani positions on Kashmir in Table 3).

Table 3. Indian and Pakistani positions on Kashmir

<table>
<thead>
<tr>
<th>Indian position</th>
<th>Pakistani position</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Legal base - Instrument of Accession of the State of Jammu and Kashmir to the Union of India in 1947;</td>
<td>• Rejection of the Instrument of Accession;</td>
</tr>
<tr>
<td>• Kashmir is integral part of India;</td>
<td>• India broke Stand Still Agreement;</td>
</tr>
<tr>
<td>• Elections legalize the choice of people;</td>
<td>• Kashmir’s people reluctance of belonging to India;</td>
</tr>
<tr>
<td>• Pakistan is the main problem of insurgency in Kashmir;</td>
<td>• Kashmir is a disputed territory with unfinished partition;</td>
</tr>
<tr>
<td>• Human rights abuses – insignificant;</td>
<td>• Pakistan is a provider of moral and diplomatic help for Kashmir;</td>
</tr>
<tr>
<td></td>
<td>• India’s unrighteousness non implementing UN resolutions – no plebiscite held;</td>
</tr>
<tr>
<td></td>
<td>• Human rights abuses made by Indian Armed Forces;</td>
</tr>
<tr>
<td></td>
<td>• Two-nation theory;</td>
</tr>
</tbody>
</table>

Source: by the author

There are three main possible scenarios of the future in the region of Kashmir. First one is that it is possible that status quo will be left for Kashmir. In a second case, India attaches Kashmir to itself and, according to the third scenario, Pakistan attaches Kashmir to itself (Ganguly 1990). However, there are more possibilities while dealing with the future of Kashmirian region. It is possible that Kashmir may be divided along the river of Chenab or that independence may be given to this region. It is possible to make such a conclusion: peace process and possible scenarios will be just the perspectives of the future until countries stop competing for this region.

Conclusions

Institutional capacity refers to the ability of a regional institution to make decisions, as well as the existence of organs, rules and procedures to implement them. Of concern here are the capacity and efficacy to collect, collate and analyze data; the principles and procedures to make decisions; the necessary subsidiary organs to carry out these decisions; command, control and communications capabilities; and administrative and logistics support. To be effective, regional institutions must command the respect and authority of the parties to the dispute in concern.
For this to be the case, they must be perceived to be impartial and strong, and with a good track record. Recognition and support by other regional and global institutions as well as cooperation with them may also enhance credibility. Lack of coordination and especially competitive behavior by other institutions may undermine legitimacy and credibility.

Fast economic growth is visible in the region nowadays. This economic growth may encourage countries to collaborate more effectively while dealing with market sphere. This factor is even rising: economics in India has risen 7,4 percent in 2013 while economics of Pakistan, Bangladesh and Sri Lanka has risen 6,6 percent during the same year. It encourages collaboration and integration in the sphere of economics. It is possible that economic integration may expand collaboration in the political sphere later as well.

Six assumptions can be made while talking about retardation of regional development: (1) Unresolved situation in Kashmir; (2) Boundaries between India and Pakistan, Nepal, Bangladesh are still not defined and it is the source of tension between these countries; (3) Relations between China and India are still very intensive; (4) Inner conflicts; (5) Low level of development; (6) Illiteracy of people in Southern Asia’s region.

The states of the South Asia are in a difficult situation. However, based on the theory of neo-liberalism, cooperating successfully may first require a level of sovereign control and unifying national identity that many states are still trying to create. In the emerging international environment, being a strong, legitimate, sovereign state may be a necessary prerequisite to building the foundation of a successful regional organization. States must first have a firm grip on the levers of sovereignty before they can loosen their hold. New international forces may be states to accept new responsibilities. However, if states lack the capacity and the internal unity necessary to manage these new responsibilities, then they are left in a more difficult situation than before. Globalization could promote to collapse of domestic structures. This being said, the best prospect for institutional development in the South Asia is still that states believe that regional institutions can assist the state-building process.

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JOURNAL OF SECURITY AND SUSTAINABILITY: KEY SUCCESS FACTORS OF SUSTAINABLE ENTREPRENEURSHIP IN CONDITIONS OF GLOBAL ECONOMY

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Abstract. Contemporary attempts to develop securely and sustainably requires new approaches towards driving factors of development, especially related to human behavior. Sustainable entrepreneurship concept becomes topical. For business practitioners and researchers it is associated with the ability to discover new opportunities for self-realization and creation of economic and social value for both consumers and the organization, country, region and the world. Entrepreneurship is a qualitative social feature that includes human abilities to build and develop innovations and business. Each country’s or region’s level of economic development is linked to entrepreneurial competencies of community. Cautious use of scare resources, social responsibility have to become integrated into sustainable entrepreneurship concept. Under such circumstances it is important to identify the key success factors of sustainable entrepreneurial, because promotion of sustainable entrepreneurship is becoming one of the cornerstones of strategy of Europe aimed to become the most competitive economy in the world. Comparing European and USA development potential, one of the main reasons for the backwardness of the EU has been identified lack of entrepreneurship. Scientists investigating the concept of sustainable entrepreneurship and its components expose to the problem, which is more integrated approach that reflects the reality. Therefore paper aims to present the concept of sustainable entrepreneurship formulated taking into account secure and sustainable development context and identify key success factors for sustainable entrepreneurship in the global economy. This paper presents and combined different approaches of scientists exploring the key success factors for sustainable entrepreneurship in the contemporary global economy.

Keywords: secure and sustainable development, key success factors, sustainable entrepreneurship, global economy

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JEL Classifications: 01, 03, F61, F62

1. Introduction

Secure and sustainable economic development is a complex, multifaceted process, which is being affected by an array of factors (Dudzevičiūtė, Tvaronavičienė 2011; Grybaite 2011; Radović Marković 2011; Stańczyk 2011; Tvaronavičienė, Lankauskienė 2011; Dudzevičiūtė 2012; Ercey 2012; Lankauskienė, Tvaronavičienė 2012; Lavrinovich et al. 2012; Makštutis et al. 2012; Tvaronavičienė 2012; Tvaronavičienė, Grybaite 2012; De Alencar, Almeida 2013; Baikovs, Zariņš 2013; Galan – Ladeiro et al. 2013; Giriūnienė 2013; Laužikas, Krasauskas 2013; Laužikas, Mokšeckienė 2013; Mačiulis, Tvaronavičienė 2013; Šileika, Bekerytė 2013; Vosylius et al. 2013; Wahl, Prause 2013; Antanavičienė 2014; Tvaronavičienė 2014; Vasiliūnaitė 2014; ...
The concept of sustainable entrepreneurship is a new concept in management literature. Sustainable entrepreneurship is sometimes also named as sustainability entrepreneurship. The concept is developed aiming to relate sustainable development (Dudzevičiūtė, Tvaronavičienė 2011; Grybaitė 2011; Radović Marković 2011; Stańczyk 2011; Tvaronavičienė, Lankauskienė 2011; Dudzevičiūtė 2012; Ercey 2012; Lankauskienė, Tvaronavičienė 2012; Lavrinovich et al. 2012; Makštutis et al. 2012; Tvaronavičienė 2012; Tvaronavičienė, Grybaitė 2012; De Alencar, Almeida 2013; Baikovs, Zariņš 2013; Dudzevičiūtė 2013; Galan – Ladero et al. 2013; Giriūnienė 2013; Laužikas, Krasauskas 2013; Laužikas, Mokšeckienė 2013; Mačiulis, Tvaronavičienė 2013; Šileika, Bekerytė 2013; Vosylius et al. 2013; Wahl, Prause 2013; Antanavičienė 2014; Caurkubule, Rubanovskis 2014; Prause, Hunke 2014; Tvaronavičienė 2014; Vasiliukaitė 2014) and entrepreneurship literature (Hall et al. 2010; Bhati, Manimala 2011; Baikovs, Zariņš 2013; Dudzevičiūtė 2013; Raidienė, Jonušauskas 2013; Wahl, Prause 2013; Antanavičienė 2014; Bileišis 2014; Tvaronavičienė 2014; Vasiliukaitė 2014). It is also could be identified, that time from successful representation of idea to its implementation is decreasing. In this context is becoming very important sustainable entrepreneurship as key factor to achieve organization’s uniqueness and value creation, because a key factors of successful development of the country or region is becoming knowledge and innovation based entrepreneurship promotion. Because of this business activities are focused on development of innovative technologies, development of innovative and sustainable value creation chain, as well as strategic partnership in entrepreneurial environment (Balkienė 2013; Dudzevičiūtė 2013; Moskvina 2013; Wahl, Prause 2013). Because of this is needed to create the new provisions of strategic thinking for entrepreneurship, encouraging people to engage actively in business, based on unique business model (Wahl, Prause 2013), innovative and environment friendly environment creation, focused to solution of social problems (Balkienė 2013; Moskvina 2013; Wahl, Prause 2013).

The article aims to define sustainable entrepreneurship and to make contribution to scientific literature aiming to define key success factors of sustainable entrepreneurship.
2. Definition of sustainable entrepreneurship

In order to describe the concept of sustainable entrepreneurship at the beginning is necessary to define the concept of entrepreneurship, which is dealt with in different scientific fields: economics, psychology, management, education science.

Entrepreneurship is seen today as a cultural and economic phenomenon. Entrepreneurship through the creation of new businesses that produce new products and services, and thereby ensure public needs; create new jobs and contribute to the overall economic stimulus and development of community life quality. Particular attention in recent years is being paid to youth entrepreneurship, believing that young people have a lot of potential to create, develop and manage their own businesses, thereby contributing to a variety of social problems such as youth unemployment and unemployment in general, the involvement of anti-social activities, lack of employment etc.

From the economic prospective, the enterprise is regarded as the organization supposed to achieve results. In psychological sciences entrepreneurship is perceived as an individual personal characteristics, traits, abilities in acting organization’s success. From the science of management positions entrepreneurship is understood as an element of strategic management and seeks to identify the links between the organization’s entrepreneurship skills and intentions. Of education positions entrepreneurship is examined through entrepreneurship education and innovation perspective.

Vining and de Kluijver (2007) refers to the conditions of modern entrepreneurship to be considered in light of the growing importance and influence of the phenomenon of globalization. Therefore, the authors perceive entrepreneurship as a three-dimensional interface, including:

- the ability to discover new opportunities;
- the ability to deploy and use existing resources to exploit discovered opportunities;
- participation in a global society and preparation for global competition.

Galloway (2009) argues that the concept of entrepreneurship can be fully understood just in case it will explore how the relationship between personality characteristics and personal knowledge and practical skills with a whole based on appropriate attitudes and learning. Galloway (2009) believes that young people who want to develop and successfully develop their business is important, organizational, communication, planning, problem-solving skills that can be learned; as well as perseverance, creativity, self-confidence, initiative, which is largely innate, although it can also be developed and strengthened; finally, teamwork and negotiation skills, foresight. The author points out that the analysis of young people’s business, it can be seen in the fact that it is individuals having a certain innate characteristics - these are the people who are able to attract others and inspire them to work together, to the inner self motivation are by nature curious and receptive innovation. Thus, some inborn traits leads to more successful young person’s self-employment in the business.

Župerka (2010) states that entrepreneurship is defined by characteristics of a person, values, skills, attitudes provisions own business building intentions in the context of activating. The author distinguishes between the internal and external determinants of entrepreneurship. The analysis of individual entrepreneurship curriculum, educational intervention aimed to influence individual entrepreneurial internal factors (attributes, values, skills, perceptions, and behavior). Outside of personal entrepreneurial factors (social, economic, political, legal) acts personal point of view of intrapreneurship within an institutional framework for entrepreneurship education (Župerka 2010).

These few examples of the entrepreneurial concept definitions show that different authors emphasize different aspects of entrepreneurship. Some believe that the more important the qualities that a person can acquire and develop (eg, creative thinking, appropriate skills, etc.). Others more emphasis on internal personal orientations (eg, determination, self-confidence, trust you intuition, etc.).

Summarizing the results of research suggests that entrepreneurship is perceived and interpreted in three ways:

- Inner dimension: the concept of entrepreneurship is treated as belonging to the individual and his ability t. y. orientation of the individual internal factors;
- The external dimension: the concept of entrepreneurship examines the emerging opportunities and conditions in the external environment on the market;
- Integral approach, the concept of entrepreneurship is associated with the external and internal factors, vol. y. as emerging opportunities outside of the in-
dividual’s skills and changes in the circumstances, to take advantage of the changes.

Since the famous Brundtland Report (World Commission on Environment and Development 1987), sustainable development is defined as a development ‘that meets the needs of the present without compromising the ability of future generations to meet their own needs’. The relationship between entrepreneurship and sustainable development has been addressed by various streams of thought and literature such as: ecopreneurship environmentally orientated entrepreneurship; social entrepreneurship - entrepreneurship that aims to provide innovative solutions to unsolved social problems; institutional entrepreneurship, contributing to change regulatory, societal and market institutions, responsible entrepreneurship - a term coined which joining economic, technological, environmental factors is or must be responsible to society, enhancing the business positive contribution to society whilst minimizing negative impacts on people and the environment (Kardos 2012).

Social entrepreneurship is one of form of sustainable entrepreneurship. Social entrepreneurship is defined as entrepreneurial activity with an embedded social purpose (Austin et al. 2006). Social entrepreneurs usually start with small initiatives, they often target problems that have a local expression but global relevance, such as access to water, promoting small-business creation, re-integration of individuals into the work-force or waste management (Santos 2012; Moskvina 2013).

The concept of sustainable entrepreneurship can be defined by different theoretical ways. Therefore, sustainable entrepreneurship would be an area within the larger concept of sustainable development (Parra 2013). Sustainable entrepreneurship can be understood as the examination of how, by whom, and with what economic, psychological, social, and environmental consequences the opportunities are discovered, created, and exploited to bring future goods and services into existence (Cohen and Winn 2007, p. 35). From the process scope, it is the process of discovering, evaluating, and exploiting the economic opportunities present in market failures which detract from sustainability, including those that are environmentally relevant (Dean and McMullen 2007, p. 58). As well sustainable entrepreneurship is defined as the teleological process aimed at the achievement of sustainable development by discovering, evaluating and exploiting opportunities and creating values that produce economic prosperity, social cohesion and environmental protection (Katsikis and Kyrgidou 2008, p. 2).

According to Lans et al. (2014), sustainability is a shared challenge with regard to economic (profit), social (people) and environmental (planet) goals for many parties in society. Sustainability is however not only something to act upon, comply with or engage in, but can also be seen as a major source for opportunities. The growing interest in sustainable entrepreneurship suggests that sustainability is an important addition to, or even a guiding element for, ‘new’ entrepreneurship, recognizing at the same time shortcomings of ‘old’ entrepreneurship. Opportunities with regard to sustainability are more complex than business opportunities which address a one dimensional problem, remove a serious pain point, or meet a significant want or need. Sustainability opportunities have, in their rudimentary form, more the character of ‘wicked’ problems. Each sustainability opportunity should be approached as a new challenge. What worked in the past, does not necessarily work for the future (Lans et al. 2014).

According to Lans et al. (2014), the concept of sustainable entrepreneurship has gained importance over recent years. The relationship between entrepreneurship and sustainable development has been dealt with through various schools of thought, often resulting in the launching of new types of entrepreneurs, such as the ecopreneur and the social entrepreneur. The concept of ‘sustainable entrepreneurship’ has been coined more recently as an overarching way of looking at the contribution of entrepreneurial endeavours to social, ecological and economic aspects: or, in other words, sustainable development (Lans et al. 2014).

According to Lans et al. (2014), in order to be able to recognize sustainable development as a business opportunity, sustainable entrepreneurs are in need of opportunity recognition skills, but also, for instance, interpersonal skills which enables them to interact with, learn from and adapt to stakeholders.

To summarize the above opinions of different authors, it can be seen that the promotion of sustainable entrepreneurship has a positive impact on both the individual level and the social level. The concept of sustainable entrepreneurship in the context of globalization is presented in figure 1.
In sum, sustainable entrepreneurship in the context of globalization is very much affected by increase the quality of life by various processes of globalization, and by this changed needs and behavior of consumers. We can identify shift from need of cheap goods and services of mass production to niche products and services based on social and environmental responsibility. By reached good life quality consumers start to consider newer concepts of goods and services, taking into account not only benefit and value that they get from the product, but as well public benefits in the terms of socio-economic, environmental, respect of ethical values (like fair trade supply chain, animal rights, support of local production). By this change of consumption entrepreneurs are encouraged to balance their personal benefits with public benefits, and to orientate their entrepreneur activities towards creation of secure and sustainable future.

3. Key success factors of sustainable entrepreneurship for secure and sustainable development

In the literature of strategic management, key success factors are understood as a set of essential facts that are needed in order to achieve business goals and to gain success in industry sector, to win a game of competition. To understand the nature of sustainable entrepreneurship it is needed to identify key success factors of business companies that integrate into their business model and activities the elements of sustainable entrepreneurship. Besides key success factors of sustainable enterprise, entrepreneurs must to understand key success factors of specific industry of their business.

To understand nature of sustainable entrepreneurship is needed to understand sustainability. Lazos-Ruiz et al. (2013) provides sustainability concept, that consist of (1) wise use of natural resources, (2) territorial approach to rural development, (3) local groups running the enterprise, (4) sustainability-driven entrepreneurship. Balancing these aspects is one of key dimension of key success factors of sustainable entrepreneurship.

Oneill and Gibbs (2013) research on green entrepreneurs, that is one of the forms of sustainable entrepreneurship, key success relate with the concept of nicheness and suggest that niche status is something they value and seek to maintain, as mainstream businesses become greener, niche businesses move on to the next niche or innovative product in order to differentiate themselves from the mainstream.

Lans et al. (2014) based on a systematic review of the literature identified two groups of entrepreneurship and sustainable development competencies. The main factors of entrepreneurship competence are: opportunity competence (entrepreneurial competence relates to the identification of opportunities); social competence (the ability to build up and maintain relationships); business competence (ability to develop, organize and coordinate management systems); industry-specific competence (technical knowledge
(know-how) and market knowledge (know-what)); entrepreneurial self-efficacy (a person's belief in his/her own (entrepreneurial) competence).

According to Lans et al. (2014), individual competencies for sustainable development have received much attention in sustainability literature. Based on these studies, Dentoni et al. (2012) have developed a framework consisting of seven competencies which are required for those who are actively involved in dealing with sustainability in their work environment. They identified the following competencies for sustainable development in a business environment (Lans et al. 2014):

- systems-thinking competence: the ability to identify and analyze all relevant (sub)systems across different domains (people, planet, profit) and disciplines, including their boundaries;
- embracing diversity and inter-disciplinarily: the ability to structure relations, spot issues and recognize the legitimacy of other viewpoints in business decision-making processes regarding environmental, social and economic issues, to involve all stakeholders and to maximize the exchange of ideas and learning across different groups (inside and outside the organization) and different disciplines (interdisciplinary));
- foresight-thinking competence: this capacity includes skills in creativity, opportunity recognition, innovation and balancing of local/global and short-term/long-term perspectives;
- normative competence: the ability to map, apply and reconcile sustainability values, principles and targets;
- action competence: the ability to actively involve oneself in responsible actions to improve the sustainability of social-ecological systems;
- interpersonal competence: the ability to motivate, enable, and facilitate collaborative and participatory sustainability activities and research;
- strategic management: the ability to collectively design projects, implement interventions, transitions, and strategies towards sustainable development practices.

Parrish (2010) suggest the values and motives that give rise to sustainability entrepreneurship, based on equanimity between self, other people, and nature, result in specific organizing tensions that have the potential to challenge the viability of these enterprises in a competitive market context. Spence et al. (2010) shows, that individuals are more managers than entrepreneurs and have a low sustainable entrepreneurial orientation. Hence, drawing on neo-institutional theory, institutional evolution in their field should lead these firms to more sustainability. Various isomorphisms could develop based on market pressures from competitors and suppliers; government pressures due to the implementation of more stringent laws; and mesoeconomic pressures from professional organizations and the diffusion of local and international standards (Spence et al. 2010). Ability to resist market pressure by value based business organization and marketing is one of key success factors of sustainable entrepreneurship. These values usually are related with inner values of entrepreneur.

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**Fig. 2. Key success factors of sustainable entrepreneurship**

*Source: authors*
In sum, key success factors of sustainable entrepreneurship should be balanced on four dimensions. One dimension is secure sustainability (Balšskorski 2012; Dūdevičiūtė 2012; Makštutis et al. 2012; Miškinis et al. 2013; Vosilytė et al. 2013; Frause, Hunke 2014; Tvaronavičienė 2014; Vasilïnaïtė 2014) that practically could be implemented by wise use of natural resources, territorial approach of business, local business running, sustainability-driven understanding in all business processes. Second dimension is strategy focused on niche products or services, meeting niche or more sophisticated needs of consumers. Third dimension is related to entrepreneurship and sustainable development competences - systems-thinking competence, embracing diversity and inter-disciplinarily, foresight-thinking competence, normative competence, action competence, interpersonal competence, strategic management. Fourthly dimension is ability to resist market pressure by value based business management and marketing that is not a least key success factor, because requires inner motivation by entrepreneur. Achieving these key success factors can lead each business to successful in means of competition, integrating sustainability aspect in business processes.

Conclusions

Sustainable entrepreneurship is a new concept and a very progressive one to achieve success of small and medium enterprises in a very complex competitive environment. Sustainable entrepreneurship could be defined as the process of identifying and starting a new business venture, organizing and managing needed resources, thinking both risks and revenues related with the venture, while considering of how, by whom, and with what economic, psychological, social, and environmental consequences the opportunities are discovered, created, and exploited to bring future goods and services into existence and compliment to secure and sustainable development processes.

Rise of social entrepreneurship is very much connected to change of consumption behavior in terms of shift from need of cheap goods and services of mass production to niche products and services based on social and environmental responsibility. These process works as catalyst to rise and develop social entrepreneurship. By change of consumption needs entrepreneurs are encouraged to balance their personal benefits in terms of revenues and profits with public benefits in terms of secure and sustainable development, and to orientate their entrepreneur activities considering social-economic and environmental aspects.

Key success factors of sustainable entrepreneurship is consisted by four dimensions – security and sustainability of development, that practically could be implemented by wise use of natural resources, territorial approach of business, local business running, sustainability-driven understanding in all business processes; niche strategy; entrepreneurship and sustainable development competences (such as systems-thinking competence, embracing diversity and inter-disciplinarily, foresight-thinking competence, normative competence, action competence, interpersonal competence, strategic management); ability to resist market pressure by value based business management and marketing. The key ingredient of these success factors is motivation of entrepreneur that could be increased by various political measures aiming to rise initiative of people to run existing or start new business ventures in more secure and sustainable way, and take into account the long-term development prospective and outcomes.

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Towards economic security and sustainability: key success factors of sustainable entrepreneurship in conditions of global economy


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