South East European Journal of Economics and Business

ISSN 2233-1999

Volume 10 (2) 2015

COPYRIGHT

The South East European Journal of Economics and Business (SEEJ) focuses on issues important to various economics and business disciplines, with a special emphasis on South East European and other transition countries. For articles to be considered for the SEE Journal, authors should submit manuscripts electronically, as MS Word attachments through the following web page: seejournal.efsa.unsa.ba/submission. Submissions also should include supplementary file with an indication of the author's background or position. Articles are considered for publication if they have not been published or accepted for publication elsewhere and have not been concurrently submitted elsewhere. For more submission information, see the Guide for Submission of Manuscripts at the end of each issue or on the SEEJ website.

The South East European Journal of Economics and Business, ISSN 2233-1999, is published semiannually by the School of Economics and Business, University of Sarajevo, Trg Oslobodjenja - Alija Izetbegovic 1, 71000 Sarajevo, Bosnia and Herzegovina.

All correspondence should be addressed to The South East European Journal of Economics and Business. School of Economics and Business, Trg Oslobodjenja-Alija Izetbegovic 1, 71 000 Sarajevo, Bosnia and Herzegovina, telephone: 00-387-33-275-965, e-mail: seejournal.efsa.unsa.ba.

Abstracting and Indexing:
- Cabell's Directory
- CEJSH (The Central European Journal of Social Sciences and Humanities)
- Celdes
- CNKI Scholar (China National Knowledge Infrastructure)
- CNPIEC
- DOAJ
- EBSCO - Business Source
- EBSCO - Central & Eastern European Academic Source
- EBSCO - TOC Premier
- EBSCO Discovery Service
- ECONIS
- EconLit
- Elsevier - SCOPUS
- Google Scholar
- International Abstracts in Operations Research
- J-Gate
- JournalTOCs
- Naviga (Softweco)
- Primo Central (ExLibris)
- ProQuest - International Bibliography of the Social Sciences (IBSS)
- ReadCube
- Research Papers in Economics (RePEc)
- SCImago (SJR)
- Summon (Serials Solutions/ProQuest)
- TDOne (TDNet)
- Ulrich's Periodicals Directory/ulrichsweb
- WorldCat (OCLC)

It is available in a PDF format from the website of the School of Economics and Business, Sarajevo http://www.efsa.unsa.ba. SEE Journal articles are also available from Versita http://www.versita.com and Directory of Open Access Journals (DOAJ) http://www.doaj.org.

Publisher:
School of Economics and Business in Sarajevo

Content

7 DETERMINANTS OF FOREIGN DIRECT INVESTMENT IN TRANSITION ECONOMIES, WITH SPECIAL REFERENCE TO MACEDONIA: EVIDENCE FROM GRAVITY MODEL

Bardhyl Dauti

29 PROFESSIONAL OPINIONS AND ATTITUDES ON TAX POLICY IN BOSNIA AND HERZEGOVINA WITH A SPECIAL FOCUS ON THE FEDERATION OF BOSNIA AND HERZEGOVINA

Lejla Lazović-Pita, Ana Štambuk

45 MEASURING THE IMPACT OF INNOVATIONS ON EFFICIENCY IN COMPLEX HOSPITAL SETTINGS

Petra Došenović Bonča, Maks Tajnikar

55 MOBILE CARRIER SELECTION IN A POST-CONFLICT ENVIRONMENT – THE PRIMACY OF ETHNICITY OVER CONVENTIONAL NETWORK EFFECTS

Tarik Zaimović

69 IMPACT OF FINANCIAL CRISIS ON HEDGING EFFECTIVENESS OF FUTURES CONTRACTS: EVIDENCE FROM THE NATIONAL STOCK EXCHANGE OF INDIA

Kapil Gupta, Mandeep Kaur

89 THE INFLUENCE OF DIFFERENT INFORMATION SOURCES ON INNOVATION PERFORMANCE: EVIDENCE FROM FRANCE, THE NETHERLANDS AND CROATIA

Mirjana Pejić Bach, Andjelko Lojpur, Sanja Peković, Tatjana Stanovčić

102 THE NON-LINEAR RELATIONSHIP BETWEEN FISCAL DEFICITS AND INFLATION: EVIDENCE FROM AFRICA

Nurudeen Abu, Mohd Zaini Abd Karim

From the Editor

The South East European Journal of Economics and Business is a research-oriented journal dealing with topics in the fields of economics and business, with a particular focus on the transition economies of South East Europe (SEE). This issue (Volume 10, Issue 2) brings us five empirical papers focused on Bosnia and Herzegovina (BiH), Croatia, Slovenia and Macedonia, as well as two research articles treating economies in Asia and Africa. Such diversity in our published articles is a consequence of the increasing number of submissions the Journal currently receives, in addition to our commitment to publishing research papers focused on areas outside of the region of SEE. Research heterogeneity is not only present in our Journal's geographic coverage, but in the published papers' treatment of different economic/business topics, sectors, and methodologies. This issue includes such research areas as foreign direct investment, innovation, fiscal and monetary policy, the telecommunications sector, financial markets and the crisis. We do hope that such a research portfolio will bring interesting findings to our equally diverse audience.

Dauti reports his analysis of "Determinants of foreign direct investment in transition economies, with special reference to Macedonia: Evidence from the gravity model." In his investigation, Dauti relies on panel empirical modelling and investigates the main determinants of foreign direct investment (FDI) stocks in five SEE and ten EU member countries. An augmented gravity specification was used to uncover how typical gravity and FDI traditional determinants, together with different institutional factors, affect investors' decisions from the core OECD countries to invest in the targeted SEE and EU economies. The overall finding is that the investigated determinants are indeed important in affecting FDI stock, while bilateral FDI stock is subject to persistence effects. In the context

of Macedonia, there is a relatively strong gravitational character to Macedonia's inward FDI stock.

Pita-Lazović and Štambuk analysis, "Professional opinions and attitudes on tax policy in BiH, with a special focus on the Federation of BiH" uses survey data gathered from tax experts. As to be expected from taxation-based research on BiH, the study explores the consequences of the two different meso-level institutional environments in BiH (the Federation of BiH and the Republika Srpska). The authors identify that respondents are consistent in their opinions on the introduction of a progressive personal income tax (PIT), an excise duty on luxury products, the maintenance of personal, family allowances, the maintenance of the current value added tax (VAT) and corporate income tax rates. However, differences exist in the respondents' perceptions about the introduction of reduced VAT rates, the regressivity of the VAT, and priority given to equity over efficiency. Probability modelling highlighted these differences and indicated inconsistencies in the definition of the PIT tax base.

"Measuring the impact of innovations on efficiency in complex hospital settings" by Došenović-Bonča and Tajnikar provides an approach to measuring the impact of innovations on hospital efficiency based on research on general hospitals in Slovenia. The authors argue that the suggested methodology can be applied to any type of innovation, including technology-based innovations, as well as consumer-focused and business model innovations. They demonstrate that the impact of an innovation on hospital efficiency depends not only on the features of the studied innovation, but also on the characteristics of hospitals adopting the innovation and their external environment represented by a set of comparable hospitals.

Zaimović presents an empirical investigation from the telecommunication sector in BiH, entitled "Mobile carrier selection in a post-conflict environment – the primacy of ethnicity over conventional networking effects," which uses survey data and probability modelling to investigate what drives customers in their choices of mobile carriers. While Zaimović identifies the importance of traditional networking determinants, his results also reveal that costumers› decisions were driven by some non-traditional, post-conflict related influences. This refers primarily to the self-reported ethnicity of respondents, which is linked to the "ethnic affiliations" of providers. Interestingly enough, while conventional determinants differ for different mobile carriers, the ethnicity effect overwhelms the traditional networking determinants in the examined models.

Kaur and Gupta provide an empirical investigation of the Indian financial market: "The Impact of the financial crisis on the hedging effectiveness of futures contracts: evidence from the national stock exchange of India." The study focuses on the consequences of the latest financial crisis (2008) on the hedging effectiveness of three index futures contracts traded on the National Stock Exchange of India from January 2000 to June 2014. The study reports an improvement in hedging effectiveness during the post-crisis period. Its policy implications are that near month futures contracts are a more effective tool for hedging compared to next and far month contracts. In addition, liquidity is a more important determinant of hedging effectiveness than hedge horizons, and a time-invariant hedge ratio is more efficient than time-variant hedging.

"The Influence of different information sources on innovation performance: evidence from France, the Netherlands and Croatia" by Pejić-Bach, Lojpur, Peković and Stanovčić investigates the extent to which the usage of different information sources influences internal and external research and development (R&D) activities in Croatia, France and the Netherlands. Their empirical investigation is based on cross-sectional Community Innovation Survey data covering the period 2006-2008. The obtained results imply that internal sources, customers, suppliers and universities are important information sources for both internal and external R&D activities. Moreover, the study analyzes the significant similarities and differences that exist between countries of different levels of competitiveness.

Nurudeen's paper focuses on the link between the fiscal and monetary sectors: "The non-linear relationship between fiscal deficits and inflation: evidence from Africa." The author investigates the association between deficits and inflation in 51 African economies by using a panel GMM estimator (1999-2011). The results indicate that the deficit-inflation relationship is non-linear for the African sample and its different sub-groups. A percentage point increase in deficits results in a 0.25 percentage point increase in inflation rate, while the relationship becomes quantitatively greater once the deficits reach 23% of GDP. The results are different for different sub-groups. The author proposes the grouping of African countries according to their levels of inflation and/or income when examining the deficit-inflation nexus.

On behalf of Editorial Board
Adnan Efendic

University of Sarajevo
School of Economics and Business

DE GRUYTER OPEN

South East European Journal of Economics and Business
Volume 10 (2) 2015, 7-28
DOI: 10.1515/jeb-2015-0007

DETERMINANTS OF FOREIGN DIRECT INVESTMENT IN TRANSITION ECONOMIES, WITH SPECIAL REFERENCE TO MACEDONIA: EVIDENCE FROM GRAVITY MODEL[1]

Bardhyl Dauti

Abstract

This paper accounts for the main determinants of Foreign Direct Investment stocks to 5-South East European Countries and the 10-New Member States of the European Union countries by using an augmented Gravity Model, for the purpose of calculating the potential levels of FDI stock in Macedonia. The study takes into account country specific institutional factors that determine foreign investors' decisions from 20 core OECD countries to invest in SEE-5 and EU-NMS-10 countries. From the results of the study we find that gravity factors (market size and distance), institutional related factors (control of corruption, corruption perception index, regulatory quality, transition progress and WTO membership) and other traditional determinants of FDI (schooling, bilateral exports) appear to significantly determine inward FDI stock to the SEE region and new EU member states. The GMM estimates suggest that bilateral FDI stock is subject to persistence effects. The study additionally confirms the relatively strong gravitational character of Macedonia's inward FDI stock.

Key Words: *Foreign Direct Investment, SEECs, Panel Econometrics, Gravity Model*

JEL: *F21*

1 INTRODUCTION

The aim of this paper is to use panel data on bilateral FDI stocks from individual developed source economies to transitional developing host economies between 1994 and 2010 by focusing on market size, transaction cost and government policies as the determinants of FDI.

This paper investigates the potential level of foreign direct investments (FDI) in Macedonia. In this regard, the paper will consider estimation of bilateral FDI stocks between OECD-20 countries and EU-NMS-10 and SEE-5 using an augmented Gravity Model, based on a panel data set for the period 1994-2010. Macedonia is selected as a case study, in order to test how the model of the determinants of FDI applies to a semi – developed country. Moreover, the Macedonian government has taken important steps with regard to the promotion of the country to foreign investors, such as significant institutional reforms. Also, FDI in Macedonia are considered a crucial source of GDP growth, increased employment and exports and a main driving force for enhancement of the transition process in the country. Therefore, considering the importance of FDI for Macedonia's economy, the paper outlines the actual and potential determinants of FDI in Macedonia from source OECD-20 countries.

This study will enrich the empirical literature on FDI determinants, using bilateral data at the country level, by considering also institutional and transition-related factors as crucial in largely determining the size of FDI in transition economies. Moreover, the empirical

Bardhyl Dauti, PhD
Department of Economics, Faculty of Economics
State University of Tetova, Macedonia
E-mail: bardhyl.dauti@unite.edu.mk

study finds that FDI between the developed OECD-20 countries and the transitional SEE-5 and EU-NMS-10 countries is determined by gravity factors, host country institutional factors, and transition progress.

The paper is organized as follows. The next section presents the review of late empirical literature on FDI determinants in transition economies. Section three presents the methodology and hypothesis. Section four presents the econometric assessment and explanation of the econometric methodologies used for the purposes of estimation. Section five presents the calculation of FDI potentials in Macedonia at stock levels from individual OECD-20 source countries. The last section concludes the study.

2 *LITERATURE REVIEW OF FDI DETERMINANTS IN TRANSITION ECONOMIES*

Numerous studies have dealt with determinants of FDI in transition economies. (Hill et al. 1990; Itaki 1991; Resmini 2000; Bevan and Estrin 2000; Kinoshita and Campos 2004; Dimitri et al. 2005; Botrić and Škuflić 2006; Johnson 2006; Zulfiu 2008; Mateev 2008; Seric 2011; Gorbunova et al. 2012; Estrin and Uvalic 2013; Derado 2013).

Hill et al. (1990) discuss strategic, environmental and transaction factors with respect to the decision of entry mode. Strategic factors included the extent of national differences, extent of scale economies and global concentration. Environmental factors include country economic and political risk, demand conditions, and volatility of competition. Transaction cost considerations include the value of firm-specific know-how. The authors conclude that firms undertaking FDI should consider the country risk, since this favors licensing and joint ventures over wholly–owned subsidiaries. The logic behind this rationale lies under marginality rules of the management decision making process. If the establishment cost and the cost of know-how exceed licensing and joint ventures costs, the wholly–owned subsidiaries make no sense.

Itaki (1991) critically examined the Eclectic Paradigm, focusing mainly on the confusion between ownership advantage and location advantage. He argued that the ownership advantage consisted of firm's internal economies of integration, internalized external economies, and minimized transaction cost and market power. Itaki (1991) argued that the Eclectic Paradigm confused the ownership advantage in engineering terms and this advantage is influenced and inspired from location advantages. In this regard, the author suggested that the Eclectic Paradigm theory should differentiate between real and nominal terms.

Agarwal and Ramaswami (1992) examined the Eclectic Paradigm on the choice of entry modes of multinational firms. The results showed that firms used entry modes in high potential markets and they are likely to establish market presence in these markets through direct investments. However, the firm's abilities are constrained by their size and multinational experience.

Bevan and Estrin (2000) analyzed the determinants of FDI flows and country risk, employing a large panel data set for the period 1994-1998. The authors used bilateral data on the flows of FDI between source country i (EU-15) and receipt country j. (Bulgaria, the Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland, Romania, Slovak Republic, Slovenia and Ukraine). The authors looked at the role of location advantage and internalization advantage as defined in the Eclectic Paradigm. Bevan and Estrin (2000) found that of the location specific advantages, market size is a statistically significant factor for the host countries, owing to greater market opportunities for investors. Contrarily, the authors did not find support under that source for the idea that country size is a significant determinant of FDI inflows. In terms of ownership and internalization advantages, the results suggested distance and unit labor cost are negatively associated to FDI receipts. In this regard, country credit rating variability was also found to be significantly positively correlated with FDI inflows.

Kinoshita and Campos (2004) analyzed the location determinants of FDI into 25 transition economies, utilizing a panel data between 1990 and 1998. Considering location–specific advantages, within the OLI framework, the authors focused the research on market-seeking factors (to sustain existing markets or exploit new ones), resource–seeking factors (to acquire resources not available in the home country), and efficiency-seeking factors (to enable the firm to gain from the common governance of geographically dispersed activities in the presence of economies of scale and scope). The authors exploited host country characteristics and agglomeration economies as determinants of FDI location, by incorporating the past stock of FDI as a proxy for agglomeration economies. By using the General Method of Moments (GMM) estimation technique the authors found that agglomeration economies are the most significant determinant of FDI in transition economies. However, the poor quality of the bureaucracy in the host country is found to be a deterrent to foreign investment decisions even after controlling for the agglomeration effect. The results of the paper suggested that the more liberalized the country is towards external trade, the more FDI it will attract, confirming the finding of many studies

that trade and FDI are complementary to each other.

Derado (2013) employing panel data set for the period 1990-2004, analyzed the determinants of inward FDI stock into 12 transition economies originated from five foreign investor countries in the region. Contrary to expectations the author found negative and significant coefficient of GDP per capita in source countries, providing evidence that high income countries reduce their bilateral FDI activity to transition economies. The author also found a significant and positive impact from openness, an EU adherence dummy variable and small scale privatization on FDI for transition economies. Some additional studies of the determinants of Foreign Direct Investments in transition economies are presented in the tables below.

Table 1: Main findings for some of the determinants of FDI, suggested by empirical literature

Author	Dimitri et al. (2005)	Botrić and Škuflić (2006)	Andreas Johnson (2006)	Zulfiu (2008)
Investigation	Foreign Direct Investment in South Eastern Europe: How (and How Much) Can Policies Help?	Main Determinants Foreign Direct Investment in the South East European Countries.	FDI inflows to the Transition Economies in Eastern Europe: Magnitude and Determinants	Determinants of Foreign Direct Investment in Transition Economies: With particular Reference to Macedonia's Performance
Sample and period	Data: Panel Data, bilateral FDI flows between 15 host and 24 source countries. Period: 2000-2002	Sample: SEE – 7 countries. Period: 1996 – 2002	25 Transition Economies of CEE countries and CIS countries. Period: 1993 – 2003	Host country: Macedonia Source country: 29 source countries: Period: 1997-2003
Methodology	Panel Analysis GMM (General Method of Moments)	Panel Analysis: Methodology. Generalized Least Square (GLS)	Panel Analysis Methodology: Time invariant fixed effect, random effect and pooled OLS	One way RE and FE and System GMM and difference GMM
Findings	The findings suggest that high unit labor costs, a high performance tax burden, and to a lesser extent a high level of import tariff discourage FDI, while a liberal foreign exchange and trade regime and advanced reforms in the infrastructure sector encourage FDI.	Openness has a significant positive effect on FDI. At the same time characteristics of the economies, such as private sector share or service sector share, also proved to be significant and exerted positive influence on FDI. Thus, increasing trade with other economies positively influences FDI.	Using panel data into a CEE sample Johnson found that the proxies for host country demand has a significant positive effect on FDI. The result suggested that market seeking (absolute GDP, GDP per capita) is an important motive for investment in the CEE economies	Using One way RE the author found a positive and statistically significant coefficient for host country GDP and openness and negative and a statistically significant coefficient for distance Using one step and two step results from system and difference GMM the author found evidence that FDI stock is subject to persistence effects

Notes: Summary papers with empirical studies.

Table 2: Main findings for some of the determinants of FDI, suggested by empirical literature

Author	Miroslav Mateev (2008)	Adan Seric (2011)	Gorbunova et al. (2012)	Estrin and Uvalic (2013)
Investigation	Determinants of Foreign Direct Investment in Central and Southeastern Europe: New Empirical Test	Determinants of FDI location in Central and Eastern Europe.	New Evidence of FDI Determinants: An Appraisal over the transition period	Foreign direct investment into transition economies. Are the Balkans different?
Sample and period	Host countries of FDI are 8 transition economies: Hungary, Poland, the Check Republic, Slovakia, Slovenia, Bulgaria, Romania, and Croatia Source countries of FDI: EU-12 countries Period: 2001-2006	All CEE countries Using yearly data from 1995 to 2000	26 former socialist countries Period: 1994-2002	Host: 17 transition countries Source: More than 70 countries. Focus group: SEE-7: Albania, Bosnia and Herzegovina, Bulgaria, Croatia, Macedonia, Montenegro, Romania and Serbia Period: 1990-2011
Methodology	cross-section panel data analysis: LSDV with source country dummy	Fixed Effect and Dynamic Panel Estimation: two step least square regression	Feasible GLS and Prais - Winston transformation	OLS
Findings	It was found that gravity factors (GDP, population, distance and cultural proximity) and cost and transition specific factors (wages, corruption and risk credit rating) are statistically significant with the estimated sign as expected.	FDI into transition countries is driven mainly by market potentials, low labor cost and productivity, low labor cost, and abundant natural resources. FDI in transition economies might be market and efficiency seeking.	FDI are determined by market and institutional factors. Among market variables, relatively higher labor costs unexpectedly do not represent an problem for foreign investment. The variables proxying market stabilizing institutions play a more important role than those proxying market creating institutions.	Using augmented gravity model with institutional variable and dummy variable capturing EU membership, the authors found that, Western Balkans countries receive less FDI than other transition economies.

Notes: Summary papers with empirical studies.

3 METHODOLOGY, EMPIRICAL APPROACH AND DATA

In line with the theoretical framework of FDI determinants, we consider the role of geography in explaining the FDI pattern among SEE and CEE countries and other policy factors either resisting or promoting FDI by using the conceptual framework of the gravity model. The reduced form of the model including related selected variables is given below:

Where $\mathrm{fdi}_{ij,t}$ is a bilateral FDI stock from source country i to host country j at time t, in millions of US dollars. $\mathrm{gdp}_{ij,t-1}$ represents market size variables denoting the gross domestic product, in millions of US dollar in source and host country, respectively. Both variables are lagged by 1 time period, in order to control for endogeneity problems between FDI and GDP. We use the absolute difference of GDP per capita variable between source country and host country at time

$$lnfdi_{ij,t} = a_{ij} + u_t + b_0 lngdp_{i,t-1} + b_1 lngdp_{j,t-1} + b_2 ln\left|gdpc_{i,t-1} - gdpc_{j,t-1}\right| + b_3 lnx_{jt} + b_4 lny_{jt} + b_5 lny_{jt} \times d + d + \varphi + \delta + \theta + \varepsilon_{ij,t} \quad (1)$$

t $|gdpc_{i,t-1} - gdpc_{j,t-1}|$ as measures of factor endowment differentials between countries. The absolute difference of GDP per capita, between source and host country, will allow us to control for serial correlation between GDP and GDP per capita variable (Greene 2013). The country-pair specific effects, a_{ij} captures all the time invariant factors, such as distance, common land border, common language etc, while u_t is a time dummy, φ is host country dummy and σ is source country dummy and θ is pair country dummy, x_{jt} represent the vector of host country explanatory variables. y_{jt} stands for host country institutional-related variables and y_{jt}*d stands for host country institutional-related variables interacted with SEE dummy variable. The interaction terms, y_{jt}*d is included in the model to estimate the institutional determinants of inward FDI stock in SEE-5 countries, d denotes the constitutive term proxying SEE dummy variable. The EU-NMS-10 country group is taken as control group. ε_{ijt} is the standard error term.

3.1 Empirical model

Following the work of Bevan and Estrin (2004), Johnson (2006) and Mateev (2008) applied to the OLI framework, we employ the gravity model for explaining FDI patterns, among countries that have invested in the SEE-5 countries and EU-NMS-10. For estimation purposes, the extended gravity equation for FDI stocks in SEE and EU-NMS-10 countries is specified in the equation (2)[2]:

$$\begin{aligned} lnfdi_{ij,t} = {} & a_{ij} + u_t + b_0 lngdp_{i,t-1} + b_1 lngdp_{j,t-1} + b_2 lnd_{ij} \\ & + b_3 ln\left|gdpc_{i,t-1} - gdpc_{j,t-1}\right| + b_4 smctry_{ij} \\ & + b_5 wto_{jt} + b_6 bfdi_{jt} + b_7 lnbex_{ji,t} + b_8 lnsch_{jt} + b_9 lntp_{jt} + b_{10} lncpi_{jt} \\ & + b_{11} lncc_{jt} + b_{12} lnrq_{jt} + b_{13} lngov_{jt} + b_{14} lnrl_{jt} + b_{15} lnpr_{jt} + b_{16} lnva_{jt} \\ & + b_{17} lntp_{jt} \times d + b_{18} lncpi_{jt} \times d + b_{19} lncc_{jt} \times d + b_{20} lnrq_{jt} \times d \\ & + b_{21} lngov_{jt} \times d + b_{22} lnrl_{jt} \times d + b_{23} lnpr_{jt} \times d + b_{24} lnva_{jt} \times d + d + \varphi \\ & + \delta + \theta + \varepsilon_{ij,t} \qquad (2) \end{aligned}$$

Where i denotes a source country of FDI (OECD-20), j denotes individual SEE-5 and EU-NMS-10 receipt countries, t denotes the years from 1994 to 2010. The empirical model assumes that bilateral FDI in SEE and EU-NMS countries is a function of GDP, GDP per capita, distance, language, cultural and border similarities, world trade organization membership of the host economy, bilateral FDI agreement, trade openness, bilateral exports, schooling, transition progress, corruption perception index and world governance indicators like control of corruption, regulatory quality, government effectiveness, rule of law, political risk and voice and accountability. The dependent variable fdi_{ijt} is defined as the bilateral stock of FDI from source country i to host country j at time t. The source of this data is the OECD. The FDI stock variable contains a large number of zero observations and negative values[3].

3.2 Data description and hypothesis

Along the lines of previous research, the dependent variable fdi_{ijt} is defined as the bilateral stock of FDI from source country i to host country j at time t. The source of this data is the OECD. The FDI stocks are measured at current prices and current exchange rate in millions of US dollars.

Using a gravity framework, the expected economic factors that determine the size of FDI bilateral are: the market size factors represented by GDP and absolute difference of GDP per capita between source and host countries, and the transaction cost factor representing the distance. In the empirical model we include the variables of gdp_{it} and gdp_{jt} to consider the market size of host and source country. The empirical literature suggests a positive relationship between market size factors and the size of FDI (Bevan and Estrin 2004; Johnson 2006; Mateev 2008). The explanation is that the bigger the host country GDP the larger the FDI, since larger economies become more attractive for foreign capital. The larger the origin country of FDI the more FDI should emerge from this country; and the larger the market size of a host country the more FDI it should receive. Thus, for both variables we expect positively signed coefficients. The source of this data is UNCTAD.

In the empirical model we also include the variable of the absolute difference of GDP per capita between countries to capture the market size differentials between countries, as well as factor endowments

differentials between countries. In line with the Linder hypothesis (1961), it can also be taken to account for the differences in consumer tastes between countries. Moreover, considering the Linder's preference-based theory (1953), the effects of country characteristics, denoted by GDP per capita on FDI, do not accord well by including the respective levels of GDP per capita for both countries, but, rather by considering the absolute differences of GDP per capita between countries (Frankel et al. 1995)[4]. Based on the concept of cost comparative differences and combined tastes between countries, it is expected that high income OECD countries will focus their investments more towards relatively low income EU-NMS-10 and SEE-5 countries. Hence, there is an expected positive impact from the absolute difference of GDP per capita variable on FDI. However, the empirical literature suggests both positive and negative relationships between factor cost differentials and FDI (Globerman and Shapiro 2002). The positive (negative) sign of this variable may also be due to the fact that differences in wage levels are compensated (or not compensated) by productivity (Bergstrand 1989).The source of the data for this variable is UNCTAD.

The transaction cost variable in this study is represented by the distance between source and host country. The variable of distance $\ln d_{ijt}$ represents a gravity factor. Distance between source and host country is expected to have a negative effect on the size of FDI, due to costly adoptions of goods to local preferences (Johnson 2006) and high transportation costs (Bevan and Estrin 2000; Resmini, 2000). The variable of distance is measured by the actual route distance between the economic centers (generally, capital cities) of the source and host countries in kilometers. This variable is used in the model to proxy for the transaction, transportation cost and physical cost of foreign investments[5]. According to Resmini (2000), greater distance presents weaker trade ties between the FDI source country and the host country, thus providing for lower FDI stock levels. Typically, empirical studies proxy trade costs with bilateral distance.

However, a number of additional variables are also customarily used. In this regard, the model also includes additional gravity factors through dummy variables, like $smctry_{ij}$ which is a dummy variable that takes value one when two countries share a border, a language or were the same country in the past, correspondingly. In all cases, the coefficient is expected to be positive. This variable is used to capture information costs and search costs, which are probably lower for foreign investors whose business practices, competitiveness and delivery reliability are well known to one another. Firms in adjacent countries, or countries with common relevant cultural features, are likely to know more about each other and to understand each other's business practices better than firms operating in less similar environments. The source of the data for $smctry_{ij}$ is CEPII.

The variable $\ln bex_{jit-1}$ is considered in the model to account for bilateral exports from host country j to source country i. This variable is lagged by one time period to allow the bilateral exports the grace period before it starts impacting host country's inward stock of FDI. It is expected that host country bilateral exports encourage more FDI. Hence, export-oriented economies may be more successful in encouraging FDI. Therefore it is expected that a positive relationship exists between lagged bilateral exports and FDI. The source of the data for $lbex_{jit}$ is the OECD.

The variable $\ln sch_{jt}$ accounting for years of schooling of the host country population is measured by tertiary school enrolment as a per cent of gross school enrolment. This variable will account for efficiency-seeking motives of FDI, capturing the human capital developments in the host country (Borensztein et al. 1998). According to the research literature, there is a strong positive relationship between FDI and the level of educationalattainment in the domestic economy. In line with Borensztein et al. (1998) this variable is expected to present a positive relation to FDI: the more educated the workforce, the greater the incentive for investment, since a better educated workforce yields higher returns. Data is obtained from the World Bank database on education.

We augment the gravity model by considering additional explanatory variables that are expected to be significant FDI determinants. Therefore, considering the empirical work of Holland and Pain (1988), Mora et al. (2001), Kinoshita and Campos (2004), Bevan and Estrin (2004), we find that the importance of institutional development factors is significantly important for the investment decisions of foreign investors. Moreover, the quality of institutions is crucially important for less developed SEE countries. In the study we proxy for the quality of institutions in the host country through the World Bank's Worldwide Governance Indicators (WGI), which include six relevant measures, on per centile rank values, like control of corruption, regulatory quality, rule of law, government effectiveness, political risk and voice and accountability. These measurements are used in the study in order to account for institutional quality and advancement issues (economic and political institutions).

The index of control of corruption $\ln cc_{jt}$ captures perceptions of the extent to which public power is exercised for private gain, including both petty and grand forms of corruption, as well as "capture" of the

state by elites and private interests. It is expected that control of corruption will be negatively associated with bilateral FDI. The index of regulatory quality $\ln rq_{jt}$ measures perception of the ability of the government to formulate and implement sound policies and regulations that permit and promote private sector development. It is expected that regulatory quality index will be positively related to bilateral FDI. The index of rule of law $\ln rl_{jt}$ measures the perceptions of the extent to which economic agents have confidence in and abide by the rules of society, and in particular the quality of contract enforcement, property rights, the police and the courts, as well as the likelihood of crime and violence. It is expected that economic agents' confidence in the host country's institutional system, represented by quality of contract enforcement and property rights, will be positively related to bilateral FDI. The index of voice and accountability $\ln va_{jt}$ captures perception of the extent to which a country's citizens are able to participate in selecting their government, as well as freedom of expression, freedom of association, and a free media. The political stability index $\ln ps_{jt}$ captures the perception of the likelihood that the government will be destabilized or overthrown by unconstitutional or violent means, including politically-motivated violence and terrorism. The government effectiveness index $\ln gov_{jt}$ captures perception of the quality of public services, the quality of the civil service and the degree of its independence from political pressures, the quality of policy formulation and implementation and the credibility of the government's commitment to such policies. In general, it is expected that bilateral FDI from source to host country will increase as the overall institutional conditions in the SEE-5 and EU-NMS-10 host countries improve. Therefore, a positive relationship between FDI and host country governance indicators is expected.

The variable $\ln tp_{jt}$ is included in the model to capture the transition progress of host country institutions. Following Mrak and Rojec (2013), this variable is constructed by the sum of seven EBRD transition specific indexes, i.e. the indexes denoting large scale privatization, enterprise restructuring, competition policy, banking reforms and interest rates liberalization, securities markets and non-bank financial institutions, and infrastructure reform. Transition progress is included in the model as policy determinants of FDI to reflect the main transition characteristics of SEE-5 and EU-NMS-10 countries. It is expected that the transition progress will be positively associated with bilateral FDI stocks. The source of the data for this variable is the European Bank of Reconstruction and Development (EBRD).

Additionally, the Transparency International Corruption Perception Index (CPI) is included in the study to address the level of perceived corruption and to capture the investment climate in the host countries. The variable $\ln cpi_{jt}$ is measured by perceived corruption on a continuous scale from 1 to 10. In the model, we account for the effects of corruption as an institutionally-related determinant. The data is collected from Transparency International's website. The variable is expected to have a positive relationship with FDI stocks, since a higher value of the corruption index indicates a less corrupt business environment in the host country.

However, in the study there are also other institutional dummy variables included. The dummy variables, such as wto_{jt}, $bfdia_{ijt}$ are included in the model in line with the business network theory of FDI flows to denote institutional factors affecting FDI stocks into SEE countries. In this regard, wto_{jt} is included in the model to denote the membership of the receipt country of FDI into the World Trade Organization (WTO). The source of this data is the WTO database. The variable $bfdia_{ijt}$ is included in the model to denote bilateral investment treaties between country i and j at time t. The source of the data for bilateral investment treaties is UNCTAD.

Finally, to address the question of whether the main institutional determinants of FDI are different across the two group of countries (SEE countries versus EU-NMS), in the estimated model we introduce interaction variables between host country institutional variables and SEE dummy variable d. These variables are included in order to differentiate between the overall potential for FDI between the SEE-5 and EU-NMS-10 countries. It is expected that inward stocks of FDI may, to a certain extent, be independent of the above country-specific determinants and will be related to the geographic region of SEE that has been plagued by political instability and war for an important part of the time period under consideration. Therefore, the SEE-5 countries may be considered less attractive locations for FDI.

4 ECONOMETRIC ISSUES

We use different estimation methodologies to estimate the determinants of bilateral FDI stocks from OECD-20 to SEE-5 and EU-NMS-10 countries. In this regard, in the study we consider both static panel models and dynamic panel models. Additionally, other estimation techniques are considered in the study, in order to deal with the problem of zero observations in the dependent variable.

The problem with estimating FDI stocks using a

gravity equation is the multilateral resistance terms (MRTs). To proxy MRTs, following Rose and van Wincop (2001); Feenstra (2004); Baldwin and Taglioni (2006) we use country fixed effects for host countries and source countries, time fixed effects and country-pair fixed effects. Moreover, the LSDV models with time, country and pair dummies are employed to control for common external shocks and unobserved country-fixed effects. An advantage of LSDV estimates is that by adding the dummy for each country we estimate the pure effect of each individual explanatory variable, accounting also for unobserved heterogeneity (Greene 2013). This methodology also identifies individual-country specific and time effects.

However, due to the presence of zero FDI stocks in the FDI data matrix, we also present the results from Poisson Pseudo Maximum Likelihood Estimation technique (PPMLE) and the Random Effects Tobit (RET) estimation technique (Peracchi and Vivano 2004; Santos and Silva 2006). These estimation methodologies are presented in the study, in order to deal with the problem of negative observations in the bilateral FDI stock matrix. This problem can arise due to reporting statistical problems and measurement errors (Razin 2001). In this regard, to solve the problem of negative observations in the dependent variable we transform the dependent variable by replacing the negative values of the bilateral FDI stock data with zero values. By this transformation we take care of negative values and the coefficients from an OLS regression can still be interpreted as elasticity's for large values of the dependent variable (Guerin 2006). The advantages of using PPMLE is that they deal with the problem of zero FDI stocks, provide unbiased and consistent estimates in the presence of heteroscedasticity, all observations are weighted equally and the mean is always positive (Henderson and Millimet 2008; Westerlund and Wilhelmsson 2009; Silva and Tenreyro 2008).

It has been frequently argued that the static panel data approach may lead to biased parameter estimates as it does not take into account the potential endogeneity of explanatory variables. Moreover, the standard static panel model does not correct the biases due to the presence of the lagged dependent variable. Therefore, the use of pooled ordinary least squares (OLS), fixed effects accounting for country and time specific effects or random effects with generalized least squares would be inappropriate, since endogeneity would bias the results. To check for the robustness of our results obtained using the static panel data techniques, we run dynamic panel data regression using Arrellano-Bover/Blundell/Bond estimation procedure (Arrellano and Bover 1995; Blundell and Bond 1998).

One of the advantages of the GMM is that it utilizes a bigger subset of instruments.[6] However, the drawback of the GMM estimation technique is over fitting the endogenous variables by increasing the number of instruments, thus leading to biased and inconsistent estimates (Roodman 2008). The "system GMM" estimation technique is more suitable for the panel data models with a large number of individuals and a small number of time periods (small T, large N panels), with explanatory variables that are not strictly exogenous (Roodman 2008).

4.1 Results

In this section we present the empirical results. We discuss the economic interpretation of the models summarized in Tables 3, 4 and 5. All of the above-mentioned methodologies are presented for estimating the determinants of bilateral FDI. However, every method has its advantages and disadvantages. For this reason, as has become a common practice in empirical literature, we report the results of all of the above mentioned estimation methods for the same database.

4.1.1 Discussion of results from LSDV models

To consider whether the institutional determinants of FDI are different across two groups of host countries of (SEE-5 and EU-NMS-10 countries), the results with the interactions of the SEE-5 dummy variable with host country institutional factors are presented in columns 1-5. Additionally, as a benchmark category of these estimates, we also present the results without interaction terms (column 6). In this case we consider the whole sample of host SEE-5 and EU-NMS-10 countries as one group of host countries of FDI. Column 1 shows the results with time dummies. Columns 2 and 3 show the results for time invariant host country and source country fixed effects and for time varying host country and source country fixed effects, respectively. Finally, columns4 and 5 present a specification where pair effects are also added. Considering these estimates, as Bevan and Estrin (2004) find, the positive and significant coefficients of host and source country GDP and the negative and significant coefficient for distance indicates that FDI is determined by gravity factors, as expected. This means that our results are consistent with a transaction cost analysis of FDI in which FDI stocks are attracted between relatively large economies, but the gains from overseas production diminish with distance from the source country.

Table 3: Static panel estimates of the determinants of bilateral FDI stock

VARIABLES	(1) Robust LSDV	(2) Robust LSDV	(3) Robust LSDV	(4) Robust LSDV	(5) Robust LSDV	(6) Robust LSDV
Log of GDP in source c. (-1)	0.551***	-0.406	0.009	0.913**	0.913**	0.880**
	[8.38]	[-0.80]	[0.02]	[2.51]	[2.51]	[2.37]
Log of GDP in host. c. (-1)	0.764***	0.573**	0.896*	0.668**	0.668**	1.300***
	[10.98]	[2.19]	[1.89]	[2.16]	[2.16]	[4.68]
Log of diff. in GDPc (-1)	1.049***	0.727**	0.732**	-0.370***	-0.370***	-0.294**
	[12.18]	[2.23]	[2.13]	[-2.60]	[-2.60]	[-2.04]
Log of distance	-1.395***	-2.802***	-2.825***	-2.629***	-1.122***	-1.855***
	[-12.03]	[-17.71]	[-17.80]	[-3.63]	[-2.61]	[-4.89]
Same country	0.633***	-1.172***	-1.174***	29.522***	5.272***	-2.091
	[4.94]	[-5.29]	[-5.31]	[6.78]	[2.61]	[-1.28]
WTO membership	0.411**	0.101	0.103	0.086	0.086	0.155
	[2.30]	[0.62]	[0.51]	[0.55]	[0.55]	[1.00]
Bilateral FDI agreement	0.280	0.334*	0.306	0.063	0.063	-0.009
	[1.36]	[1.71]	[1.53]	[0.38]	[0.38]	[-0.05]
Log of bilateral exports (-1)	0.386***	0.273***	0.263***	0.137**	0.137**	0.147**
	[7.21]	[5.51]	[5.26]	[2.10]	[2.10]	[2.13]
Log of Schooling	-0.205	0.956***	0.343	0.313	0.313	0.226
	[-0.99]	[4.55]	[1.14]	[1.31]	[1.31]	[0.88]
Log of Transition progress	5.641***	5.198***	0.755	3.395**	3.395**	0.811
	[4.31]	[4.30]	[0.40]	[2.39]	[2.39]	[0.53]
Log of Corruption perc. index	-0.075	-0.902**	-0.961**	-1.054***	-1.054***	-0.402
	[-0.17]	[-2.03]	[-2.09]	[-2.91]	[-2.91]	[-1.27]
Log of Control of corruption	1.053*	-0.147	0.187	-0.203	-0.203	0.604*
	[1.78]	[-0.29]	[0.34]	[-0.47]	[-0.47]	[1.70]
Log of Regulatory quality	0.250	0.888	1.309*	1.331**	1.331**	0.790*
	[0.33]	[1.30]	[1.71]	[2.33]	[2.33]	[1.72]
Log of Government effectiveness	-1.538***	-0.057	0.677	1.206**	1.206**	0.432
	[-3.24]	[-0.10]	[1.02]	[2.48]	[2.48]	[1.05]
Log of Political risk	-0.346	-0.289	-0.262	-0.229	-0.229	-0.206
	[-1.12]	[-0.91]	[-0.73]	[-1.02]	[-1.02]	[-0.95]
Log of Voice and accountability.	0.367	-0.532	-0.011	1.049	1.049	-0.765
	[0.38]	[-0.57]	[-0.01]	[1.53]	[1.53]	[-1.29]
Log of Rule of law	-0.847**	0.638	0.136	-0.099	-0.099	-0.692
	[-2.09]	[1.17]	[0.24]	[-0.25]	[-0.25]	[-1.57]
Log of Corruption perc. index*d	3.305***	1.256	1.284	1.438*	1.438*	
	[2.92]	[1.13]	[1.15]	[1.85]	[1.85]	
Log of Transition progress*d	-8.480***	-5.212**	-3.666*	-4.623***	-4.623***	
	[-4.12]	[-2.33]	[-1.68]	[-2.93]	[-2.93]	
Log of Control of corruption *d	-1.299	1.437	0.876	1.820**	1.820**	
	[-1.55]	[1.47]	[0.86]	[2.39]	[2.39]	
Log of Regulatory quality*d	0.014	-0.003	0.006	-0.020	-0.020	
	[0.48]	[-0.11]	[0.19]	[-1.06]	[-1.06]	
Log of Government eff.*d	2.286***	0.096	0.101	-0.826	-0.826	
	[3.21]	[0.10]	[0.10]	[-1.11]	[-1.11]	
Log of Political risk.*d	0.144	1.536*	1.408*	0.454	0.454	
	[0.30]	[1.81]	[1.70]	[0.95]	[0.95]	
Log of Voice and acc.*d	-1.600	-3.152**	-3.506**	-3.615***	-3.615***	
	[-1.06]	[-2.18]	[-2.38]	[-3.93]	[-3.93]	
Log of Rule of law*d	-0.050	-0.672	-0.827	-1.497*	-1.497*	
	[-0.04]	[-0.51]	[-0.61]	[-1.67]	[-1.67]	
SEE-Dummy	26.358***					
	[4.89]					
Constant	-28.15***	-2.023	-5.551	-15.973***	-31.174***	-4.465
	[-9.45]	[-0.29]	[-0.80]	[-3.11]	[-5.68]	[-0.72]
Observations	1,932	1,932	1,932	1,932	1,932	1,932
R-squared	0.707	0.777	0.780	0.921	0.921	0.917
Time dummy	Yes	No	Yes	Yes	Yes	Yes
Host country dummy	No	Yes	Yes	No	Yes	Yes
Source country dummy	No	Yes	Yes	No	Yes	Yes
Country-pair (index) dummy	No	No	No	Yes	Yes	Yes

Notes: Dependent variable is log bilateral FDI stock. t-statistics in brackets, ***, ** and * indicate significance of coefficients at 1, 5 and 10 per cent, respectively.

Focusing on the most used specification, column 5, we find that host country GDP and source country GDP is positive and significant. This suggests that the income level and the size of host and source country market is an important determinant for foreign investors. A negative and significant coefficient of distance indicates that FDI stocks are determined by gravity factors, as expected. On the other hand, the positive coefficient of host country GDP and the negative coefficient of distance support the market–seeking and efficiency-seeking hypothesis of FDI. The estimated gravity coefficients can be interpreted as follows. Source and host country GDP has a positive and significant impact on bilateral FDI stock, with an elasticity of 0.913 and 0.668. An increase in source and host country GDP by 1 per cent increases bilateral FDI stock from source to host country on average by 1 and 0.7 per cent, respectively, ceteris paribus. The same estimates confirm that an increase in the road distance between capital cities of source and host country by 1 per cent will decrease bilateral FDI stock from source to host countries, on average, by 1.1 per cent, ceteris paribus. The findings from LSDV estimates (column 5) confirm the negative effect of the absolute difference of GDP per capita between countries on the size of bilateral FDI stock.

The estimated elasticity of the GDP per capita difference variable is -0.370. However, other LSDV specifications with time invariant host country and source country fixed effects and time varying host country and source country fixed effects confirm the positive relationship of GDP per capita difference with bilateral FDI stock. The negative (positive) sign of this variable may be attributed to the fact that differences in wage levels between countries are (compensated) not compensated by productivity (Bergstrand 1989). Interpreting the result from pair fixed effects (column 5), a 1 per cent increase of GDP per capita absolute differences between countries is associated with, on average, a 0.37 per cent decrease of inward FDI stock in host countries, ceteris paribus. We find that the coefficient of the same country, indicating a common border, common language or cultural similarities between source and host country at the same time, are positively associated to bilateral FDI stock. The model predicts that bilateral FDI stock between countries that share a language, and cultural and border similarities at the same time is higher than bilateral FDI stock between countries that do not share these similarities (see model 5). The explanation of this result is that countries in the sample that are close to each other do have bilateral FDI activity much more than countries that are distant to each other. The argument holds, since there is a significant amount of bilateral FDI activity between close countries of SEE-5 and EU-NMS-10.

To capture the partial effect of institutional development on the size of the inward stock of FDI in SEE countries, the institutional variables are interacted with the SEE dummy variable. The estimated coefficient of transition progress for EU-NMS-10 countries in the equation of FDI is 3.395 per cent (3.395-4.623*0), which is significant at a 5 per cent level of significance. For SEE-5 countries it is -1.228 per cent (3.395-4.623*1). The difference is 4.623 per cent less for SEE-5 countries is economically large and statistically significant at a 1 per cent level of significance. This result confirms the hypothesis that the size of bilateral FDI stock between EU-NMS-10 and SEE-5 countries varies with respect to transition progress development. The results confirm that a 10 per cent increase in transition progress, which is associated with advancements in the host country's transition reforms, increases (decreases) the size of bilateral FDI stock into host EU-NMS-10 (SEE-5) countries by 3.4 and 4.6 per cent, respectively, ceteris paribus.

The estimated elasticity of the control of corruption in EU-NMS-10 countries is -0.203 (-0.203+ 1.820*0) per cent, which is not significant. For SEE-5 countries it is 1.671 per cent (-0.203+1.820*1). The difference of 1.820 percentage points more for SEE-5 countries is statistically significant at a 5 per cent level of significance. The coefficient size, above 1 for SEE-5 countries, of the control of corruption index indicates that foreign investors are sensitive to misuse of political power by host country elites and governments. Interpreting this result, 1 per cent increases of the extent to which public power is exercised for private gains through corruption channels leads to an increase of bilateral FDI stock in the host SEE-5 countries, on average, by 1.820 per cent, ceteris paribus. This result may be attributed to discriminatory corruption, which means that in exchange for a bribe the host country governments offer the briber services that are not supposed to be offered.

The same estimates confirm that the estimated coefficient of the CPI index for the EU-NMS-10 countries in the equation of FDI is -1.054 per cent (-1.054+1.438*0). For SEE-5 countries it is 0.384 per cent (-1.054+1.438*1). The difference of 1.438 per cent, or one and a half percentage points more for SEE-5 countries, is statistically significant at 1 per cent level of significance. These results indicate that a 1 per cent increase in the CPI index, which is associated with lower perceptions by the host country population toward the presence of corruption in the business environment, the size of bilateral FDI stock into host countries SEE-5 countries increases by 0.38 per cent,

ceteris paribus. On the other hand, the negative coefficient of the CPI index for the benchmark category of EU-NMS-10 countries indicates that bilateral FDI stock into EU-NMS-10 countries, originating from OECD-20 countries, decreases as the business environment in the former group of countries is perceived to be less corrupt.

The estimated elasticity of bilateral exports in robust LSDV estimates is 0.137 per cent. This result suggests that the increase of bilateral exports of host SEE-5 and EU-NMS-10 countries serves as a channel through which FDI activity in the exporting countries expand. Also, the positive relationship between bilateral exports and bilateral FDI stock, on the other hand, confirms the complementarities between bilateral exports and bilateral FDI stocks. The significant and positive coefficient of bilateral exports indicate that a 10 per cent increase in the bilateral exports from country j to country i (from SEE-5 and EU-NMS-10 to OECD-20), increase bilateral FDI stock from country i to country j (from OECD-20 to SEE-5 and EU-NMS-10), on average, by 1.3 per cent, ceteris paribus.

4.1.2 Robustness check: discussion of results from alternative estimates

Table 4 reports the results from PPML and RET estimates, columns 7 and 8, as a robustness check to the LSDV estimates. Based on the likelihood-ratio test (χ^2) reported in the last row of each table, the estimated results from PPML and RET estimates are significant. The differences of the estimated coefficient size between different estimation techniques seems to suggest that these differences are driven either by the large number of zero observations in the sample or by heterogeneity of the data, based on the fact that in the selected sample we have included countries that are different with respect to macroeconomic development and their institutional level of development. Therefore, the presence of heterogeneity in the estimates raises the question of the best specified model.

To select the appropriate model we perform a Ramsey-RESET, which is applied by checking the significance of an additional regressor constructed as $(x'b)^2$, where b denotes the vector of estimated parameters. The p-value of this test is 2.61 in PPML and 5.79 in RET estimates, suggesting the selection of the RET estimates for interpreting the results.

In RET we find a significant effect from WTO membership. The enhancement effect of WTO membership is 25.48 per cent[7]. Also, a bilateral FDI agreement has a strong effect in RET estimates (with an average enhancement effect of 19.96 per cent). The same results suggest a positive relationship between schooling

Table 4: Robustness check: Alternative estimates of the determinants of FDI stock

VARIABLES	(7) Random Effect Tobit	(8) Poisson PPML
Log of GDP in source c. (-1)	0.494***	0.087***
	[5.46]	[3.01]
Log of GDP in host. c. (-1)	0.591***	0.102***
	[7.59]	[3.53]
Log of diff. in GDPc (-1)	0.112	0.242***
	[1.22]	[6.79]
Log of distance	-1.506***	-0.303***
	[-8.35]	[-6.13]
Same country	0.892	0.059
	[1.29]	[0.41]
WTO membership	0.227**	0.124**
	[2.26]	[1.98]
Bilateral FDI agreement	0.249*	0.182**
	[1.95]	[2.16]
Log of bilateral exports (-1)	0.217***	0.097***
	[6.27]	[5.18]
Log of Schooling	0.574***	-0.090
	[4.59]	[-1.49]
Log of Transition progress	5.923***	1.064**
	[8.13]	[2.52]
Log of Corruption perc. index	-1.276***	-0.364**
	[-5.02]	[-2.57]
Log of Control of corruption	-0.040	0.369*
	[-0.13]	[1.80]
Log of Regulatory quality	1.064***	-0.115
	[2.58]	[-0.46]
Log of Government effectiveness	-0.157	-0.251
	[-0.44]	[-1.24]
Log of Political risk	-0.083	-0.047
	[-0.48]	[-0.47]
Log of Voice and accountability.	0.560	0.393
	[1.04]	[1.40]
Log of Rule of law	-0.161	-0.022
	[-0.53]	[-0.12]
Log of Corruption perc. index*d	1.928***	0.826**
	[3.02]	[2.14]
Log of Transition progress*d	-5.854***	-1.666**
	[-5.05]	[-2.13]
Log of Control of corruption *d	1.344**	-0.265
	[2.56]	[-0.85]
Log of Regulatory quality*d	-1.112	-0.091
	[-1.64]	[-0.21]
Log of Government eff.*d	0.052	0.587**
	[0.10]	[1.98]
Log of Political risk.*d	0.578	0.172
	[1.55]	[0.90]
Log of Voice and acc.*d	-2.780***	-0.913**
	[-3.74]	[-2.18]
SEE-Dummy	25.628***	6.671***
	[8.02]	[3.84]
Constant	-25.822***	-7.25
	[-9.55]	[-4.62]
Ramsey-reset test (p-value)	5.79	2.21
Cons_1		-5.941***
		[-5.03]
Cons_2		-2.640***
		[-14.21]
Prob> chi2 (Wald chi - square);	0.000	0.000
Log-likelihood		
Observations	1,932	1,932
Number of groups	203	203

Notes: Dependent variable is log bilateral FDI stock. z-statistics in brackets, ***, ** and * indicate significance of coefficients at 1, 5 and 10 per cent, respectively.

and FDI. The estimated elasticity of schooling in the RET estimates is 0.012, indicating that a 10 per cent increase in tertiary school enrolment will increase bilateral FDI stock, from OECD-20 to SEE-5 and EU-NMS-10 countries, on average, by 0.1 per cent, ceteris paribus. This result supports efficiency-seeking considerations, that foreign investors are likely to locate their investments in countries with high potentials for efficient human resources and a well-educated labor force.

The estimated elasticity of the regulatory quality index for EU-NMS-10 countries is 1.064 (1.064-1.112*0) which is significant at a 1 per cent level of significance. For SEE-5 countries it is -0.048 per cent (1.064-1.112*1). The difference of 1.112% less for SEE-5 countries is statistically insignificant. However, the index of regulatory quality for EU-NMS-10 countries above 1 indicates that the sensitivity of foreign investments coming from OECD-20 countries with respect to regulatory quality index developments in EU-NMS-10 countries is relatively high. The results indicate that a 1 per cent increase in regulatory quality index is associated with a 1.06 per cent increase of FDI stock in EU-NMS-10 countries, ceteris paribus. This result suggests that sound regulation policies that promote private sector developments in EU-NMS-10 countries contribute to the accumulation of inward stock of FDI.

4.1.3 Discussion of results from dynamic panel models

In this section we use the generalized method of moments (GMM) estimator proposed by Arrellano-Bond (1991) and Arrellano-Bover (1995)/Blundell-Bond (1998) and suggested by Roodman (2006). In all cases the dependent variables, gross domestic product for host and source country and bilateral exports, are endogenous and other explanatory variables are treated as exogenous. We use the institutional-related variables as instrumental variables for the endogenous variables, in order to overcome the endogeneity problem. Following Roodman (2006), we exclude distance and dummy variables like: smctry, bilateral FDI agreement and WTO membership, since using all of the explanatory variables used in LSDV estimates increases the number of instruments, thus overfitting the endogenous variable (Roodman 2006).

In particularly, we use the system GMM estimates and report robust two - step GMM estimates which provides standard errors that are robust to heteroscedasticity and serial correlation (Roodman 2006). We address the downward bias of standard errors in a two-step GMM by using the proposed correction term by Windmeijer (2005), which is implemented by the xtabond2 Stata command.

Table 5: Robustness check: System GMM results

VARIABLES	(9) System GMM	(10) System GMM
Log of lagged dependent variable (-1)	0.911***	0.657***
	[9.59]	[5.86]
Log of GDP in source country	-0.010	0.138
	[-0.06]	[0.46]
Log of GDP in host country	-0.121	-0.146
	[-0.34]	[-0.18]
Log of difference in GDP per capita	0.081	0.126
	[0.71]	[0.27]
Log of bilateral exports	0.104	0.279
	[0.65]	[1.04]
Log of schooling	0.142	1.354
	[0.60]	[1.10]
Log of transition progress	1.519	8.577
	[0.55]	[1.40]
Log of corruption perception index	-0.068	2.874
	[-0.09]	[1.01]
Log of control of corruption	-0.163	-0.944
	[-0.20]	[-0.80]
Log of regulatory quality	-0.569	-2.912
	[-0.33]	[-0.74]
Log of government effectiveness	-0.662	-1.989
	[-0.87]	[-0.82]
Log of political risk	-0.040	-0.320
	[-0.21]	[-0.74]
Log of voice and accountability	1.276	-0.069
	[0.93]	[-0.02]
Log of rule of law	-0.243	-1.212
	[-0.88]	[-1.42]
Log of corruption perception index*d	0.006	2.417
	[0.01]	[0.48]
Log of transition progress*d	0.090	-4.823
	[0.07]	[-0.88]
Log of control of corruption*d	0.666	0.283
	[1.17]	[0.15]
Log of regulatory quality*d	0.323	1.743
	[0.44]	[0.62]
Log of government effectiveness*d	0.293	1.378
	[1.10]	[0.49]
Log of political risk*d	-1.532	-0.010
	[-1.32]	[-0.01]
Log of voice and accountability	0.237	-0.048
	[0.19]	[-0.01]
Log of rule of law	0.911***	0.190
	[9.59]	[0.99]
Constant	-3.589	1.491
	[-0.81]	[0.38]
Observations	1,687	1,687
Number of groups	194	194
Arellano-Bond test for AR(1)	0.000	0.000
Arellano-Bond test for AR(2)	0.958	0.605
Number of instruments	45	45
Wald statistics, p value	0.000	0.000
Sargan test of overid. restrict, p value	0.458	0.560

Notes: Dependent variable is log bilateral FDI stock. z-statistics in brackets, ***, ** and * indicate significance of coefficients at 1, 5 and 10 per cent, respectively. Internal instruments are used for endogenous variables. Lag limits are 2/3 for the lagged dependent variable and 3/4 for endogenous regressors. The collapse option is always used. Year dummies are included but not shown. Column (10) shows the results with transformed dependent variable capturing the zero and negative observations in the matrix of the dependent variable. Lag limits are 2/3 for the lagged dependent variable and 3/4 for endogenous regressors.

The disadvantage of the system GMM is related to its causing the fast growth of the count of instruments with time dimensions, resulting in the overfit of the endogenous variable and the failure to remove the endogenous component (Roodman 2008). The presence of the endogenous component potentially can weaken the Sargan/Hansen statistics of over-identifying restrictions (Bowscher 2002). We use internal instruments for the lagged dependent variable to avoid the difficulty of finding valid external instruments. To deal with the instruments explosion, following Roodman (2008) we consider the lag limit of the dependent variable and other endogenous regressors and collapse the instruments.

The p-value of 0.00 of the Wald test in all specifications suggests rejection of the null hypothesis that the independent variables are jointly zero. The estimates from the robust system GMM are confirming the theoretically expected results. According to the results the estimated coefficient of the lagged dependent variable is positive and significant, suggesting that bilateral FDI stock is subject to persistence effects. The results confirm that the increase of the agglomeration effect of FDI by 10 per cent results in an increase of current FDI stock into host SEE-5 and EU-NMS-10 countries by 9.1 per cent, ceteris paribus (column 9).

The fact that some of the significant explanatory variables reported in the static panel models become insignificant in the GMM specification, with the exception of the lagged dependent variable, suggest that some of the explanatory power of the lagged dependent variable is being falsely attributed to the other variables in static specification. Therefore, the empirical findings of the model imply that there exist some omitted dynamics in the static panel models, thus confirming that the empirical findings related to determinants of FDI in transition economies, using static panel models, should be accepted with caution.

5 CALCULATING POTENTIAL INWARD FDI STOCK IN MACEDONIA

To calculate the actual and potential bilateral FDI stock in Macedonia, we have considered the coefficients from robust LSDV estimates, accounting for the LSDV results without interaction terms (column 6, Table 3). The potential FDI stocks in Macedonia are calculated using the host country dummy coefficient of Macedonia, the source country dummy coefficients of different OECD-20 countries and year dummies.

The calculations of FDI potentials in Macedonia are considered for the period 2007-2015. Due to the fact that the end period of the data that is used for estimation purposes is 2010, the calculation of FDI potentials are considered up to 2010 based on the data provided for the dependent variable, actual FDI stocks and other explanatory variables used in model 6. The calculation of FDI potentials for the period 2011-2015 is based on estimated data of bilateral FDI stock and other explanatory variables using a 3 year moving average calculation. In this regard, for the period 2011-2015, for calculation purposes we have used the year dummy of 2010.

The values of actual and potential bilateral FDI stocks in Macedonia from the origin OECD-20 countries in total for the period 2007-2015 are presented in Table 6. The results from Table 6 show that, according to the Gravity model (model 6), the actual FDI stock in Macedonia originating from OECD-20 countries is higher than the calculated potential FDI stock[8]. During the observed period, 2007-2010, we detect that actual inward FDI stock in Macedonia registered a constant increase.

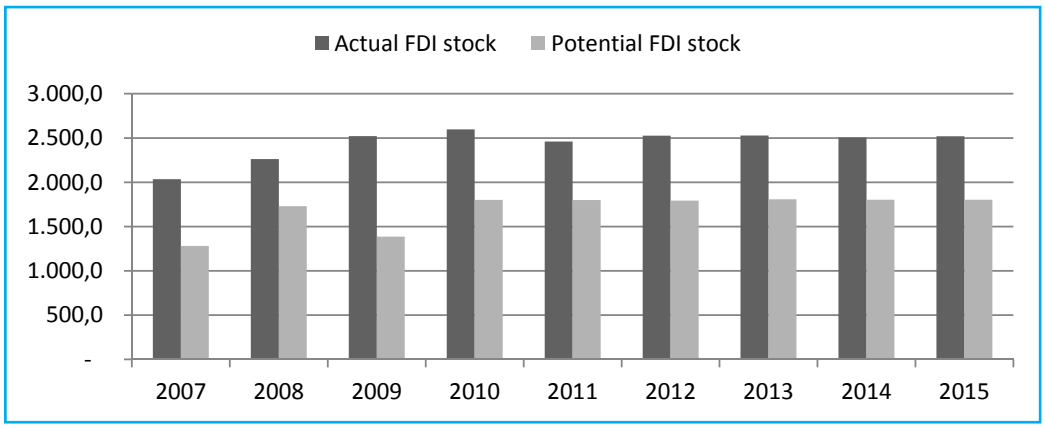
Table 6: Actual and Potential FDI stock in Macedonia, originating from OECD-20 countries, in total

	2007	2008	2009	2010	2011	2012	2013	2014	2015	Average
Actual FDI stock	2,035.2	2,262.7	2,521.5	2,598.3	2,460.8	2,526.9	2,528.6	2,505.4	2,520.3	2,439.7
Difference of act. FDI stock		227.4	258.8	76.7	-137.4	66.0	1.7	-23.2	14.8	
Percentage change of act FDI		11.1	11.4	3.0	-5.2	2.6	0.1	-0.9	0.6	
Potential FDI stock	1,281.4	1,729.7	1,385.7	1,802.1	1,799.7	1,793.0	1,809.0	1,803.6	1,803.1	1,689.7
Difference of pot. FDI stock		448.2	-344.0	416.3	-2.4	-6.6	15.9	-5.4	-0.4	
Percentage change of pot FDI		34.9	-19.8	30.0	-0.1	-0.3	0.8	-0.3	-0.0	
Ratio (Actual over Potential)	1.6	1.3	1.8	1.4	1.4	1.4	1.4	1.4	1.4	1,4
Difference (Actual-Potential)	753.8	532.9	1,135.8	796.2	661.1	733.8	719.7	701.9	717.2	750.3
Percentage change (act-pot)	58.8	30.8	82.0	44.2	36.7	40.9	39.8	38.9	39.8	45.7

Notes: The data on actual and potential FDI stock in Macedonia are presented in total, in millions of US dollars. Actual and potential FDI stocks are summed up for each individual source OECD-20 country.

Source: own calculation, using estimations from gravity model (6)

Figure 1: Ratio of actual-to-potential level of Macedonia's inward FDI-stock for the period 2007-2015, in total



Source: OECD, 2014; own calculation

Analyzing by years after 2010, we observe that actual FDI stock, in total, recorded an increasing rate with decreasing tendency[9], possibly due to global economic and financial turmoil, which clearly reduced the capabilities of Macedonia's economy to attract more FDI. This argument is reflected in the fact that from 2010 to 2011, the rate of total inward FDI stock in Macedonia originating from developed OECD-20 countries decreased by 5.2 per cent.

From 2007 to 2015, the total inward FDI stock in Macedonia, on average, was realized approximately 45.7 per cent higher than the level predicted by the gravity model. This difference is relatively smaller in 2011, around 36.7 per cent, and much larger in 2009, around 82 per cent. As shown in Table 6, the ratio of actual to potential FDI stock is higher than 1 for the whole observed period, 2007-2015, confirming the fact that the actual FDI stock in Macedonia originating from OECD-20 countries, in total, was higher than the potential FDI stock predicted by the model (figure 1).

Table 7: FDI actual in Macedonia in the period 2007-2015, by country of origin (in millions of US dollars)

	2007	2008	2009	2010	2011	2012	2013	2014	2015	Average	%
Austria	289.0	273.4	465.6	522.3	420.4	470.7	453.5	453.6	464.5	423.7	17.3
Belgium	38.9	2.0	2.0	2.0	1.6	1.6	1.6	1.6	1.6	5.9	0.2
Canada	3.4	4.4	4.1	5.5	4.7	4.7	4.9	4.8	4.8	4.6	0.2
Denmark	1.0	2.0	2.0	2.4	2.1	2.2	2.2	2.2	2.2	2.0	0.1
Finland	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	0.0
France	12.1	18.1	37.7	173.0	76.3	95.7	115.0	95.7	102.1	80.6	3.3
Germany	98.6	92.2	89.3	95.5	92.3	92.4	93.3	92.7	92.8	93.2	3.8
Greece	622.8	599.7	527.7	515.7	547.7	530.4	531.2	536.4	532.7	549.4	22.5
Ireland	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	0.0
Israel	6.3	5.8	5.7	5.8	5.8	5.8	5.8	5.8	5.7	5.8	0.2
Italy	53.4	77.3	80.5	78.2	78.7	78.7	78.6	78.8	8.8	75.9	3.1
Netherland	494.8	606.2	754.2	735.5	698.6	729.5	721.1	716.4	722.3	686.5	28.1
Norway	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	0.0
Portugal	2.6	3.2	2.3	2.1	2.5	2.3	2.2	2.4	2.3	2.4	0.1
Spain	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	0.0
Switzerland	245.1	283.0	289.7	198.9	257.2	248.6	234.9	246.9	243.5	249.8	10.2
Sweden	4.0	4.2	5.1	6.8	5.4	5.8	6.0	5.7	5.8	5.4	0.2
Turkey	51.3	60.6	71.3	64.1	65.3	66.9	65.4	65.9	66.1	64.1	2.6
UK	92.5	159.8	110.5	137.0	135.8	127.8	133.5	132.4	131.2	128.9	5.3
USA	52.7	67.4	69.9	49.7	62.3	60.7	57.6	60.2	59.4	60.0	2.5
Total	2072.2	2263.3	2521.7	2598.7	2460.8	2527.7	2511.4	2505.4	2520.3	2442.4	100.0

Notes: Actual FDI stock data is the inward FDI stock in Macedonia from OECD-20 countries: FDI/TNC database, based on data from the National Bank of the Republic of Macedonia.

Source: National Bank of Republic of Macedonia.

Table 8: FDI potentials in Macedonia in the period 2007-2015, by country of origin (in millions of US dollars)

	2007	2008	2009	2010	2011	2012	2013	2014	2015	Average	%
Austria	59.6	76.5	70.8	84.2	80.1	81.0	81.9	81.0	81.3	77.4	4.6
Belgium	38.9	50.5	43.6	52.2	51.2	50.7	51.4	51.1	51.1	48.9	2.9
Canada	29.7	36.3	34.8	37.9	36.4	36.4	36.9	36.6	36.6	35.7	2.1
Denmark	41.8	50.7	52.0	53.4	52.6	52.5	52.7	52.4	52.5	51.1	3.0
Finland	38.8	46.6	46.7	9.2	34.2	30.0	24.5	29.5	28.0	31.7	1.9
France	63.5	85.3	79.1	94.6	90.0	90.9	92.0	91.0	91.4	86.4	5.1
Germany	105.9	148.2	96.6	169.4	159.5	162.0	164.2	162.0	162.9	147.8	8.7
Greece	112.6	159.0	103.6	182.6	171.8	173.8	176.5	174.2	175.0	158.8	9.4
Ireland	38.9	45.4	44.6	50.0	47.9	48.2	48.8	48.3	48.4	46.7	2.8
Israel	27.7	34.7	34.8	37.9	35.9	36.2	36.7	36.2	36.4	35.1	2.1
Italy	214.0	314.0	194.5	360.2	339.8	344.3	349.2	344.8	346.4	311.9	18.5
Netherland	76.8	103.2	82.7	113.1	108.3	109.3	110.5	109.4	109.8	102.5	6.1
Norway	35.8	43.8	44.1	46.8	45.0	45.3	45.7	45.3	45.5	44.1	2.6
Portugal	35.3	42.4	40.6	45.2	43.2	43.4	44.0	43.5	43.6	42.4	2.5
Spain	44.9	62.4	51.2	65.8	64.2	63.8	64.7	64.2	64.3	60.6	3.6
Sweden	39.2	47.3	44.8	49.1	47.6	47.6	48.1	47.8	47.8	46.6	2.8
Switzerland	39.7	50.1	48.2	56.8	52.9	53.8	54.6	53.8	54.1	51.5	3.1
Turkey	136.1	197.5	159.1	156.0	202.3	188.5	189.8	195.5	191.7	179.6	10.6
UK	55.9	78.3	61.8	79.7	78.9	78.3	79.2	78.8	78.8	74.4	4.4
USA	46.4	57.7	52.1	58.1	57.9	57.0	57.8	57.6	57.5	55.8	3.3
Total	1,281.4	1,729.7	1,385.7	1,802.1	1,799.7	1,793.0	1,809.0	1,803.6	1,803.1	1,689.7	100.0

Notes: The data on potential FDI stock are calculated using the estimations from model 6.

Source: own calculation. Data on FDI potentials for the period 2011-2015 are based on estimated data

The data on actual FDI stock presented in Table 7 confirm that the highest level of inward FDI stock in Macedonia, between the period 2007-2015, on average, was recorded from countries relatively close to Macedonia: Netherland (28 per cent), Greece (22.6 per cent), Austria (17.3 per cent) and Switzerland (10.3 per cent).

The data on potential FDI stock, confirm that during the observed period 2007-2015, the highest level of potential FDI stock in Macedonia, is recorded from Italy (18.5 per cent), Turkey (10.6 per cent), Greece (9.4 per cent) and Germany (8.7 per cent).

In other words, the data confirm that relatively more distant OECD countries recorded less actual FDI stock and high potentials of FDI stock in Macedonia, once again confirming that actual FDI stock in Macedonia is significantly determined from gravitational attraction.

The comparison of actual and potential bilateral FDI stocks is presented in Table 9. Observing by individual OECD-20 origin countries of FDI, the data confirm the relatively strong gravitational character of Macedonian inward FDI stock, as outlined by the indicator of actual to potential FDI stock in Macedonia in Table 9. The comparisons show that based on the gravity model (model 6), the realized level of FDI stock is over potential during the years from 2007 to 2015 for some of the OECD-20 countries, such as Austria, Greece, Netherland and Switzerland (see Table 9).

In general, the main factors that contribute the most to closing the gap between potential and realized FDI stock for countries that show a high realization degree of FDI stock in Macedonia are the gravity-related factor of distance and other gravity- related factors proxying for GDP and GDP per capita in the source countries. This judgment is supported by the fact that less distant countries to Macedonia that are economically well developed possess relatively large market sizes: Greece, Austria, Switzerland and the Netherland have shown high realization levels of FDI stocks in Macedonia.

Table 9: Actual to potentials FDI in Macedonia in the period 2007-2015, by country of origin

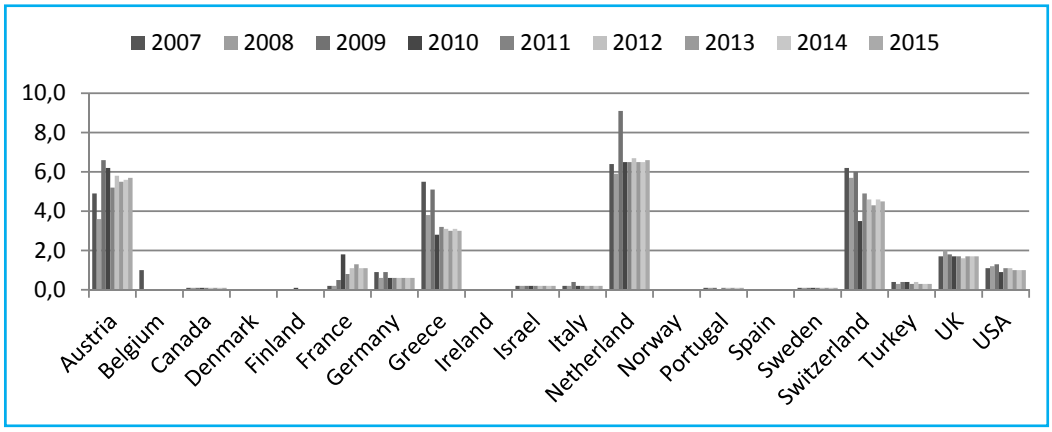
	2007	2008	2009	2010	2011	2012	2013	2014	2015
Austria	4.9	3.6	6.6	6.2	5.2	5.8	5.5	5.6	5.7
Belgium	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Canada	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Denmark	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Finland	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0
France	0.2	0.2	0.5	1.8	0.8	1.1	1.3	1.1	1.1
Germany	0.9	0.6	0.9	0.6	0.6	0.6	0.6	0.6	0.6
Greece	5.5	3.8	5.1	2.8	3.2	3.1	3.0	3.1	3.0
Ireland	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Israel	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2
Italy	0.2	0.2	0.4	0.2	0.2	0.2	0.2	0.2	0.2
Netherland	6.4	5.9	9.1	6.5	6.5	6.7	6.5	6.5	6.6
Norway	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Portugal	0.1	0.1	0.1	0.0	0.1	0.1	0.1	0.1	0.1
Spain	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sweden	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Switzerland	6.2	5.7	6.0	3.5	4.9	4.6	4.3	4.6	4.5
Turkey	0.4	0.3	0.4	0.4	0.3	0.4	0.3	0.3	0.3
UK	1.7	2.0	1.8	1.7	1.7	1.6	1.7	1.7	1.7
USA	1.1	1.2	1.3	0.9	1.1	1.1	1.0	1.0	1.0

Source: own calculation.

Figure 2 presents the ratios of realized to potential FDI for selected years. The ratio of actual to potential FDI below 1 shows that Macedonia received less FDI than is predicted by the model. Also, there exists more scope for receiving new FDI. The ratio of actual to potential FDI above 1 shows that it has received more FDI than potentially expected.

Regarding the selection of explanatory variables in the model (GDP, GDP per capita, distance, same country, bilateral FDI agreement, WTO membership, bilateral exports, corruption perception index, schooling, transition progress and governance indicators), it can be said that the Macedonian capacity to induce economic growth and structural reforms, and continue with institutional reforms, will appear as the critical factors in attracting more FDI in the future.

Figure 2: Ratio of potential-to-realized level of Macedonian inward FDI-stock between the years 2007and 2015, by country of origin



Source: OECD, 2014; own calculation

CONCLUSIONS

This paper has identified significant institutional determinants ofFDI stocks into host countries of SEE-5 and EU-NMS-10, and highlighted theimplications of different institutional factors for FDI stocks. Using an augmented Gravity Model, we focused the research mainly on the importance of gravity and institutional factors as primary determinants of FDI in host countries. As expected, all of these determinants play an important role in determining a firm's foreign market entry decision. Moreover, host country institutional-related factors appeared to significantly determine bilateral FDI stock from the OECD-20 countries. The estimates show that gravity factors like market size and income level-related variables are important determinants of FDI. The negative and significant coefficient of distance indicates that, as expected, FDI is determined by gravity factors. Moreover, the study confirms that a foreign investor's motives toward SEE-5 and EU-NMS-10 are driven by market seeking considerations.

Based on a panel data analysis we have found that FDI stocks into SEE-5 and EU-NMS-10 countries are significantly influenced by both gravity factors (distance, GDP in host country, GDP in source country, cultural, language and border similarities) and non-gravity factors (bilateral exports, schooling, transition progress CPI index, control of corruption, regulatory quality, WTO membership and bilateral FDI agreement). The positive and significant coefficients of market size factors (GDP) for both source and host country indicates that FDI is determined by host and source country market seeking considerations. Also, the positive and significant coefficients of schooling are a signal that foreign investors are considering efficiency - seeking considerations for positive FDI decisions.

The results of the study confirm the importance of institutions for FDI stocks in SEE-5 and EU-NMS-10 countries. The LSDV estimates predict that bilateral FDI stock between SEE-5 and EU-NMS-10 countries vary with respect to development in transition progress, CPI index and control of corruption. The robustness check estimates, using RET results, based on a transformed dependent variable, confirm the importance of institutional-related factors for the size of bilateral FDI stock. These estimates suggest that bilateral FDI stock into SEE-5 and EU-NMS-10 countries is also determined by host country WTO membership and bilateral FDI agreement. Also, the findings from RET estimates confirm that the size of inward FDI stock between SEE-5 and EU-NMS-10 countries vary with respect to regulatory quality index, i.e., perceptions of SEE-5 and EU-NMS-10 countries' governments' ability to promote private sector development.

The estimated values of potential FDI in Macedonia reveal that a further increase in inward FDI can be achieved only upon realization of further economic growth and better improvement of transition and institutional specific factors. Therefore, Macedonia's institutions should be focused on creating conditions for sustainable economic growth, thus reducing the gap between the actual level of FDI in Macedonia and its potential level from source OECD-20 countries.

The findings of the study can provide an analytical foundation for the evaluation of country policies and institutions aimed at making SEE-5 and EU-NMS-10 countries more attractive to foreign investors. The findings also suggest that strong emphasis should be placed by host country policy makers in improving the efficiency of government institutions, controlling corruption and bureaucracy and improving general economic conditions. These should also help policy makers in designing strategies for attracting more FDI.

References

Agarwal, S., Ramaswami, S. N. 1992. Choice of foreign market entry mode: impact of ownership, location and internationalization factors. Journal of International Business Studies 23(1): 1-27.

Arellano, M., Bond, S. 1991. Some Tests of Specification for Panel Data: Monte Carlo Evidence and an Application to Employment Equations. The Review of Economic Studies 58 (2): 277-297

Arellano, M., Bover, O. 1995. Another Look at the Instrumental Variable Estimation of Error-Components Models. Journal of Econometrics 68 (1): 29–51.

Baldwin, R., Taglioni, D. 2006. Gravity for dummies and dummies for gravity equations. National Bureau of Economic Research. Working Paper 12516, NBER

Bevan, A., Estrin, S. 2000. The Determinants of Foreign Direct Investment in Transition Economies. William Davidson Institute. Working Paper 342.

_____. 2004. The determinants of foreign direct investment into European transition economies. Journal of Comparative Economics 32 (4): 775-787.

Bergstrand, J. H. 1989. The Generalized Gravity Equation, Monopolistic Competition and the Factor-Proportions Theory in International Trade. The Review of Economics and Statistics 71(1): 141-153.

Borensztein, E., De Gregorio, J-W. L. 1998. How does foreign direct investment affect economic growth? Journal of International Economics 45(1): 115-135.

Botrić, V., Škuflić, L. 2006. Main Determinants of Foreign Direct Investment in the Southeast European Countries. Transition Studies Review 13(2): 359-377.

Bowsher, C. G. 2002. On Testing Over identifying Restrictions in Dynamic Panel Data Models. In: Economics Letters 77(2): 211-220.

Blundell, R., Bond, S. 1998. Initial Conditions and Moment Restrictions in Dynamic Panel Data Models. Journal of Econometrics 87(1): 115-143.

Dauti, B. 2015. Determinants of Foreign Direct Investment in South East European Countries and New Member States of European Union Countries. Economic and Business Review 17 (1): 93-115

Derado, D. 2013. Determinants of FDI in transition countries and estimation of the potential level of Croatian FDI. Financial Theory and Practice 37(3): 227-258.

Demekas, D. G., Horváth, B., Ribakova, E., Wu, Y. 2005. Foreign Direct Investment in Southeastern Europe: How (and How Much) Can Policies Help. IMF Working Paper .05/110.

Estrin, S., Uvalic, M. 2013. Foreign direct investment into transition economies: Are the Balkans different? LSE ‹Europe in Question› Discussion Paper Series. LEQS Paper, (64).

Feenstra, Robert. C. 2004. Advanced International Trade: Theory and Evidence, Princeton, NJ: Princeton University Press.

Fidrmuc, J., Fidrmuc, J. 2003. Disintegration and Trade. Review of International Economics 11(5): 811-829.

Frankel, J., Stein, E., Wei, S. J. 1995. Trading Blocs and the Americas: The Natural, the Unnatural, and the Supernatural. Journal of Development Economics 47 (1): 61–95.

Globerman, S., Shapiro, D. 2002. Global Foreign Direct Investment Flows: The Role of Governance Infrastructure. World Development 30(11): 1899-1919.

Gorbunova,Y., Infante, D., Smirnova, J. 2012. New Evidence on FDI Determinants: An appraisal over the transition period. Prague Economic Papers 31(1): 65-76.

Guerin, S. 2006. The Role of Geography in Financial and Economic Integration: A Comparative Analysis of Foreign Direct Investment, Trade and Portfolio Investment Flows. The World Economy 29(2): 189-209.

Greene, W. H. 2013. Econometric Analysis (5th ed). Upper Saddle River, N.J.: Prentice Hall.

Hill, C., Hwang, P., Kim, W.C. 1990. An Eclectic Theory of the Choice of International Entry Mode. Strategic Management Journal 11(2): 117-128.

Holland, D., Pain, N. 1998. The determinants and impact of foreign direct investment in the transition economies: a panel data analysis. In V. Edwards (Ed), Convergence or Divergence. Aspirations and Reality in Central and Eastern Europe and Russia, Proceedings of 4th Annual conference, Centre for Research into East European Business.

Henderson, D., Daniel, M. 2008. Is gravity linear? Journal of Applied Economics 23(2): 137-172

Itaki, M. 1991. A Critical Assessment of the Eclectic Theory of the Multinational Enterprise. Journal of International Business Studies 22(3): 445-460.

Johnson, A. 2006. FDI inflows to the Transition Economies of Eastern Europe: Magnitude and Determinants. The Royal Institute of Technology, CESIS (Centre for Excellence for Studies in Science in Innovation), Paper No, 59.

Kinoshita, Y., Campos, N. F. 2004. Estimating the determinants of foreign direct investment inflows: how important are sampling and omitted variable biases? BOFIT Discussion Paper No.10, Bank of Finland, Institute for Economies in Transition, Helsinki, Finland.

Mateev, M. 2008. Determinants of Foreign Direct Investment in Central and Southeastern Europe: New Empirical Tests. Oxford Journal 8(1): 133-149.

Mora, M. N., Sahay, M. R., Zettelmeyer, M. J., Garibaldi, M. P. 2002. What Moves Capital to Transition Economies? (No. 2-64). International Monetary Fund.

Mrak, M., Rojec, M. 2013. EU Accession as an instrument of Speeding up Transition; in Routledge Handbook on The Economics and Political Economy of Transition, edited by Gerard Turley and Paul Hare.

Nilsson, L. 2000. Trade integration and the EU economic membership criteria. European Journal of Political Economy 16 (4): 807-827.

Peracchi, F., Viviano, E. 2004. An Empirical Micro Matching Model with an Application to Italy and Spain. Temi di discussione (Economic working papers) 538, Bank of Italy, Economic Research and International Relations Area.

Razin, A. 2001. FDI flows: a critical look. Pinhas Sapir Center for Development, Tel-Aviv University.

Resmini, 2000. The Determinants of Foreign Direct Investment in the CEECs: New evidence from sectoral patterns. Economics of Transition 8(3): 665-689.

Roodman, D. 2006. How to Do Xtabond2: An Introduction to "Difference" and "System" GMM in Stata. Center for Global Development Working Paper, (103).

Roodman, D. 2008. A Note on the Theme of Too Many Instruments. Oxford Bulletin of Economics and Statistics 71(1): 135-158.

Rose, A. K., Van Wincoop, E. 2001. National money as a barrier to international trade: the real case for currency union. American Economic Review 91(2): 386–390

Seric, A. 2011. Determinants of FDI location in Central and Eastern Europe (CEE). OECD Journal: General Papers 2010 (2): 77-90.

Silva, J. S., Tenreyro, S. 2006. The Log of Gravity. The Review of Economics and Statistics 88(4): 641-658.

_____. 2008. Trading Partners and Trading Volumes: Implementing the Helpman-Melitz-Rubinstein Model Empirically. Discussion Paper 662, University of Essex.

Westerlund, J., Wilhelmsson, F. 2009. Estimating the gravity model without gravity using panel data. Applied Economics 43(6): 641-649.

Windmeijer, F. 2005. A finite sample correction for the variance of linear efficient two-step GMM estimators. Journal of Econometrics 126 (1): 25-51.

Zulfiu, M. 2008. Determinants of Foreign Direct Investment in Transition Economies: With Particular Reference to Macedonia's Performance, FIW Working Paper, No. 19.

(Endnotes)

1 The explanatory variables considered in this paper are similar to another paper which has been published in the Economic and Business Review (EBR), Vol 17(1), 2015; Faculty of Economics, University of Ljubljana. However, this paper differs significantly from the other one in terms of the considered sample size, literature review section and econometric methodologies. The dependent variable is: Bilateral FDI stock from OECD-20 countries to SEE-5 and EU-NMS-10 countries, whereas the dependent variable in the EBR paper is: Bilateral FDI stock from EU-14 countries to SEE-5 and EU-NMS-10 countries. Using the estimated LSDV coefficients, this paper also contributes to calculating FDI potentials in Macedonia, from origin OECD-20 countries.

2 Description of the variables used in the empirical model is given in appendix1. Descriptive statistics of the variables employed in the model is given in appendix 2. Correlation matrix of the variables used in the model is given in appendix 3.

3 To avoid this problem we transform the FDI stock variable. To account for possible zero and negative observations, we have transformed the dependent variable by treating the negative observations of bilateral FDI data as zero values. A transformed dependent variable is used in robustness check estimates: i.e Random Effect Tobit Estimates and Poisson - Pseudo Maximum Likelihood Estimates.

4 With aggregate data, at country level, there is more reason to focus on bilateral differences in comparative advantages and tastes (reflected by the absolute differences in GDP per capita) to explain aggregate bilateral FDI between different countries, with respect to income level. This is a reflection that all countries possess comparative advantages or preferences for something.

5 The source of this variable is http://www.geobytes.com.

6 System GMM is more persistent than difference GMM particularly with a higher persistence of the dependent variable and a lower time dimension (Blundell and Bond, 1998), The improvement in efficiency is enhanced by the ability of system GMM to use more information by generating more instruments not only for the lagged dependent variable, but for other regressors as well, which might themselves exhibit high inertia.

7 The formula to compute this effect is $\left(e^{b_i}-1\right)\times 100$, where b_i is the estimated coefficient

8 Potential FDI-stock is obtained as the value which would prevail if the entire Macedonian inward FDI would be determined by variables and parameters estimated by the model (Nilsson, 2000; Fidrmuc and Fidrmuc, 2003; Derado, 2013)

9 The increasing rate of inward FDI stock in Macedonia, in total from 2010 to 2011 although is positive (3.04 per cent), this rate of increase is low in comparison to the registered increase of inward FDI stock in Macedonia, from 2007 to 2008, and from 2008 to 2009, by 11.1 and 11.1 per cent, respectively.

APPENDIX 1: Description of variables used in the model and data sources.

Variable name	Measurement unit	Source
lnfdiijt	Outward FDI stock from source country: FDI stock from source country to host country at current year, in millions of US dollars	OECD
lngdpi,t	GDP in source country, millions of US dollars	UNCTAD
lngdpj,t	GDP in host country, millions of US dollars	UNCTAD
lndifgdpcij,t	Difference in GDP per capita between source country and host country, in PPP (constant 2005 international$), in logarithm	World Bank
lndij	Distance in kilometers between capital cities of host and source countries, in logarithm	www.geobytes.com
smctry	Dummy variables that take value one when two countries share a border, a language or were the same country in the past, correspondingly and zero otherwise	CEPII
lbexijt-1	Bilateral exports from country j to country i. In millions of US dollars	OECD
wtojt	World Trade Organization membership of host country. Dummy variable = 1 at the time of host country accession into WTO at year t, 0 otherwise	UNCTAD
bfdiaij	Bilateral Investment agreement. Dummy variable = 1, denoting the year of entry into force of bilateral investment agreement, at the time afterward, 0 otherwise	UNCTAD
lnschjt	School enrollment, tertiary (% gross)	World Bank
Ltransjt	Log of transition progress. The sum of the indexes of overall infrastructure reforms, banking reforms, trade and foreign exchange rate reforms and the index of the securities and non – bank financial institutions	EBRD
Lcpijt	Log of corruption perception index, range 0 - 10	Transparency International
lnccjt	Control of corruption in host country, in per centile rank, in logarithm	World Bank. WGI
lnrqjt	Regulatory Quality in host country, in per centile rank, in logarithm	World Bank. WGI
Lgovjt	Government effectiveness, in per centile rank, in logarithm	World Bank. WGI
lnrljt	Rule of law in host country, in per centile rank, in logarithm	World Bank. WGI
Lpsjt	Political risk, in per centile rank, in logarithm	World Bank. WGI
lnvajt	Voice and accountability in host country, in per centile rank, in logarithm	World Bank. WGI
SEE-dummy	SEE-5 equal 1 for SEE-5 countries; 0 - otherwise, capturing the benchmark category of EU-NMS-10 countries	Own knowledge

APPENDIX 2: Descriptive statistics of the estimated coefficients

Variable	Obs	Mean	Std.Dev.	Min	Max
Log of FDI	2306	5.09	2.58	-4.71	11.57
Log of FDI(transformed)	2306	5.14	2.46	0.00	11.57
Log of GDP in source country	5100	13.10	1.20	10.93	16.53
Log of GDP in host country	5100	10.10	1.21	7.57	13.18
Log of difference in GDP per capita	5100	9.91	0.78	3.23	11.42
Log of distance	5100	7.39	0.70	5.48	9.11
Language, border and cultural similarities	5100	0.02	0.14	0.00	1.00
WTO membership	5100	0.68	0.47	0.00	1.00
Bilateral FDI agreement	5100	0.80	0.40	0.00	1.00
Log of bilateral exports	4413	4.42	2.62	-12.43	12.26
Log of schooling	5080	3.66	0.45	2.33	4.50
Log of transition progress	4760	3.31	0.23	2.30	3.57
Log of Consumer Price Index	5100	1.33	0.30	0.69	1.90
Log of control of corruption	5100	3.90	0.49	1.92	4.46
Log of regulatory quality	5100	4.12	0.37	2.87	4.52
Log of government effectiveness	5100	3.97	0.51	1.92	4.44
Log of political risk	5100	3.92	0.53	1.35	4.49
Log of voice and accountability	5100	4.12	0.33	2.49	4.49
Log of rule of law	5100	3.91	0.49	2.21	4.46
Log of Consumer Price Index*see dummy	5100	0.35	0.51	0.00	1.48
Log of transition progress*see dummy	4760	1.12	1.51	0.00	3.47
Log of control of corruption*see dummy	5100	1.15	1.66	0.00	4.15
Log of regulatory quality*see dummy	5100	1.24	1.76	0.00	4.25
Log of government effectiveness*see dummy	5100	1.16	1.67	0.00	4.27
Log of political risk*see dummy	5100	1.11	1.60	0.00	4.22
Log of voice and accountability*see dummy	5100	1.26	1.79	0.00	4.23
Log of rule of law*see dummy	5100	1.24	1.76	0.00	4.25
SEE-dummy	5100	0.33	0.47	0.00	1

APPENDIX 3: Correlation matrix between variables employed in the model

	LFDI	LGDP_S	LGDP_H	LDIFG~Ca	LDISTW	SMCTRY	WTO	BFDIA	LBEX_1	LSCH	LTP	LCPI	LCC_pr	LRQ_pr
LFDI	1.0													
LGDP_S	0.2	1.0												
LGDP_H	0.5	0.0	1.0											
LDIFGDPC	0.3	0.2	0.0	1.0										
LDISTW	-0.3	0.4	0.1	0.0	1.0									
SMCTRY	0.2	-0.2	0.0	0.0	-0.4	1.0								
WTO	0.2	0.0	0.3	-0.1	0.1	-0.1	1.0							
BFDIA	0.1	0.0	0.2	0.1	0.1	-0.1	0.2	1.0						
LBEX_1	0.7	0.3	0.6	0.0	-0.3	0.1	0.2	0.0	1.0					
LSCH	0.2	0.0	0.3	0.0	0.0	-0.1	0.4	0.2	0.3	1.0				
LTP	0.4	0.0	0.5	0.0	0.0	0.0	0.6	0.4	0.4	0.6	1.0			
LCPI	0.1	0.0	0.2	-0.1	-0.1	0.0	0.3	0.1	0.3	0.6	0.7	1.0		
LCC_pr	0.2	-0.1	0.3	-0.1	0.0	0.0	0.4	0.1	0.4	0.6	0.7	0.9	1.0	
LRQ_pr	0.2	0.0	0.2	-0.1	0.0	0.0	0.5	0.1	0.3	0.6	0.8	0.8	0.8	1.0
LGOV_pr	0.2	-0.1	0.2	-0.1	-0.1	0.1	0.4	0.1	0.3	0.5	0.8	0.8	0.8	0.8
LPS_pr	0.2	-0.1	0.3	-0.1	0.0	0.1	0.5	0.0	0.4	0.4	0.7	0.7	0.8	0.8
LVA_pr	0.2	-0.1	0.3	-0.1	0.0	0.0	0.4	0.1	0.4	0.5	0.7	0.8	0.9	0.9
LRL_pr	0.2	-0.1	0.3	-0.1	0.0	0.0	0.4	0.1	0.4	0.6	0.7	0.8	0.9	0.9
LCPIS	-0.2	0.1	-0.3	0.1	-0.1	0.1	-0.4	0.0	-0.3	-0.4	-0.5	-0.5	-0.5	-0.6
LTPS	-0.2	0.1	-0.3	0.1	-0.1	0.1	-0.5	-0.1	-0.4	-0.4	-0.5	-0.5	-0.6	-0.7
LCC_prs	-0.2	0.1	-0.3	0.1	-0.1	0.1	-0.5	0.0	-0.4	-0.4	-0.5	-0.5	-0.5	-0.7
LRQ_prs	-0.2	0.1	-0.3	0.1	-0.1	0.1	-0.4	-0.1	-0.4	-0.4	-0.5	-0.5	-0.6	-0.7
LGOV_prs	-0.2	0.1	-0.3	0.1	-0.1	0.1	-0.4	-0.1	-0.4	-0.4	-0.5	-0.5	-0.5	-0.7
LPS_prs	-0.2	0.1	-0.3	0.1	-0.1	0.1	-0.4	-0.1	-0.4	-0.4	-0.5	-0.5	-0.5	-0.7
LVA_prs	-0.2	0.1	-0.3	0.1	-0.1	0.1	-0.5	-0.1	-0.4	-0.4	-0.5	-0.5	-0.6	-0.7
LRL_prs	-0.2	0.1	-0.3	0.1	-0.1	0.1	-0.4	-0.1	-0.4	-0.4	-0.5	-0.5	-0.6	-0.7
SEEd	-0.2	0.1	-0.3	0.1	-0.1	0.1	-0.5	-0.1	-0.4	-0.4	-0.5	-0.5	-0.6	-0.7

	LGOV_	LPS_pr	LVA_pr	LRL_pr	LCPIS	LTPS	LCC_prs	LRQ_prs	LGOV_prs	LPS_prs	LVA_prs	LRL_prs	SD
LGOV_pr	1.0												
LPS_pr	0.8	1.0											
LVA_pr	0.8	0.8	1.0										
LRL_pr	0.8	0.8	0.9	1.0									
LCPIS	-0.4	-0.6	-0.7	-0.6	1.0								
LTPS	-0.5	-0.7	-0.7	-0.6	1.0	1.0							
LCC_prs	-0.5	-0.6	-0.7	-0.6	1.0	1.0	1.0						
LRQ_prs	-0.5	-0.7	-0.7	-0.6	1.0	1.0	1.0	1.0					
LGOV_p	-0.4	-0.6	-0.7	-0.6	1.0	1.0	1.0	1.0	1.0				
LPS_prs	-0.5	-0.6	-0.7	-0.6	1.0	1.0	1.0	1.0	1.0	1.0			
LVA_prs	-0.5	-0.7	-0.7	-0.6	1.0	1.0	1.0	1.0	1.0	1.0	1.0		
LRL_prs	-0.5	-0.7	-0.7	-0.6	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	
SEEd	-0.5	-0.7	-0.7	-0.7	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0

DE GRUYTER OPEN

South East European Journal of Economics and Business
Volume 10 (2) 2015, 29-44
DOI: 10.1515/jeb-2015-0008

PROFESSIONAL OPINIONS AND ATTITUDES ON TAX POLICY IN BOSNIA AND HERZEGOVINA WITH A SPECIAL FOCUS ON THE FEDERATION OF BOSNIA AND HERZEGOVINA[1]

Lejla Lazović-Pita, Ana Štambuk

Abstract

This research is based on tax policy opinion survey data collected in Bosnia and Herzegovina (B&H) among tax experts. A special focus of the survey was to investigate the consequences of the different institutional environments that exist between the two entities of the country. After having reviewed all previous tax reforms in B&H, the most interesting results suggest that respondents agree on the introduction of a progressive personal income tax (PIT) and excise duty on luxury products, the maintenance of personal and family allowances and the maintenance of the current value added tax (VAT) and corporate income tax (CIT) rates. However, differences exist in the respondents' perceptions about the introduction of reduced VAT rates, the regressivity of the VAT, and giving priority to the equity principle over the efficiency principle in taxation. Probability modelling highlighted these differences and indicated inconsistencies in the definition of the PIT tax base, namely the comprehensiveness of the PIT base under the S-H-S definition of income.

Keywords: *opinion survey, tax policy, tax reform, B&H*

JEL: *H20*

INTRODUCTION

Since the 1970s and the outbreak of neo-liberal economic thought induced by globalisation, the tax policies of developed countries have mostly been tailored to respond to changes in macroeconomic government. Thus, in developed countries (mostly those of the European Union (hereafter: EU) and OECD members), tax policy has aimed at fulfilling the following objectives: shifting taxation away from labour towards consumption, broadening the income and consumption tax base, reducing the number and the size of income tax rates (personal income tax (hereafter: PIT) and corporate income tax (hereafter: CIT)), and improving tax compliance. These objectives are also more recent suggestions and recommendations from the OECD (2010) and the European Commission (Garnier et al. 2013). With the outbreak of the global financial crisis (hereafter: GFC) in 2008-2009, which brought the more profound problems of budget deficits (EUROSTAT 2013), the suggestions and recommendations for all EU members (i.e., developed and

Lejla Lazović-Pita, MSc
Teaching Assistant
School of Economics and Business,
University of Sarajevo
E-mail: lejla.lazovic@efsa.unsa.ba

Ana Štambuk, PhD
Assistant Professor
Faculty of Economics, University of Rijeka
E-mail: ana@efri.hr

transition countries) have become more significant. For transition countries, these problems are more serious. For example, Kapopoulos and Lazereton (2011) analyse fiscal policy stance and debt sustainability in South-Eastern European countries with the outbreak of GFC in 2008-2009, indicating the problem of growing budget deficits (and public debt).

As a small transition country, B&H is facing similar problems. Hence, in this paper we use a survey in order to establish whether there is a (dis)content with the current tax policy in B&H and if there is room for improvement. A questionnaire-based survey was conducted in two B&H entities with the aim of determining public and expert attitudes and opinions towards tax reforms in a small, war-torn transition country - B&H. Similar opinion-based surveys regarding tax reforms have already been conducted in the USA in three rounds in 1934, 1994, and 2013 (Slemrod 1995, Lim, Slemrod and Wilking 2013, DeGroat 2013) amongst US National Tax Association (NTA) members. Thus, in the US, comparisons to prior surveys or possible shifts in attitudes and opinions have been determined and analysed. In other countries in the world, opinion surveys have only recently become a useful tool in taxation research. Šimović, Blažić and Štambuk (2014, p. 409) provide an overview of general and specific papers based on tax policy based on opinion surveys worldwide. In transition countries and countries in the region, tax-related opinion surveys have been rarely applied. Šimović, Blažić and Štambuk (2013, 2014) present the results of a related tax policy expert opinion survey conducted in Croatia based upon the US survey. Similarly, Klun (2014) does the same for the case of Slovenia. These are the first surveys of this type conducted in the countries in the region. Hence, their significance is even greater, especially bearing in mind that the results from surveys in all three countries will be compared in the future. Therefore, in this paper, we will analyse results from a survey conducted in a B&H entity, namely the FB&H, in terms of the economic values and views regarding the tax system of B&H. Moreover, summarised results from a similar survey (Antić 2014) conducted in another B&H entity, namely the Republika Srpska (hereafter: RS), will be presented and briefly compared to the FB&H results.

Part two of the paper provides a brief summary of tax reforms in B&H since its independence. The third part defines the methodology and compares results from an analysis regarding status and perspectives of tax reforms in two B&H entities, FB&H and RS. The final part focuses on a survey conducted in FB&H and provides suggestions and recommendations.

1. TAX REFORMS IN B&H

Since the fall of Yugoslavia and Bosnian independence in 1992, B&H has gone through a difficult and turbulent period. Therefore, unlike any other transition country, it has entered the transition process in a completely war-torn state, since the war in B&H lasted from 1992 until 1995. During the war, B&H suffered tremendous human losses and material destruction in terms of ruined infrastructure (e.g. GDP fell by 80 per cent in 1992 compared to 1991, Hadžiahmetović 2005). However, the difficulties for B&H did not end there. With the end of the war, which was marked by the undersigning of the General Framework Agreement for Peace in Bosnia and Herzegovina, or, more commonly, the Dayton Agreement in 1995, B&H found itself 'stranded' by [through (international) political alchemy] a complicated state organisation unlike any other country in the world [an symmetric (con) federation]. Additionally, such state organisation has no basis either in the historical development of B&H, nor in any economic logic, but only in the war-painted front lines and the materialised brutal consequences of the war (Kreso and Lazović-Pita 2013).

Hence, with its current ethnic tensions and divided markets, B&H is presently organised as a two-entity state, with one self-governing administrative unit under the sovereignty of B&H. These are the aforementioned entities RS, FB&H, and the Brčko District (hereafter: BD) respectively. Kreso (2005) presents the current constitutional structure of B&H. The RS Entity consists of the entity level and municipalities, whereas FB&H has three levels of government (both excluding cities): the FB&H entity level, ten cantons and municipalities. BD will not be analysed due to the scope of the paper. Under such circumstances, fiscal policy in B&H is organised in a similar way to fiscally decentralised countries. However, the possible benefits of fiscal decentralisation in B&H cannot be determined, primarily due to overlapping authorities. This mainly relates to the number of fiscal institutions without clear (legal) competence. In fact, in B&H, there are fourteen Ministries of Finance (B&H, FB&H, RS, BD and ten cantonal); so, together with tax administration under their jurisdictions, this cumbersome public administration causes inefficiency and tax evasion measured by cumulated (and mostly unrecoverable) tax arrears (Indirect Tax Authority 2014, Tax Administration of FB&H 2014, Tax Administration of RS 2014).

B&H entered the transition process with a tax policy similar to that of Yugoslavia. Tax reforms in RS had begun during the war in B&H, i.e. in 1992, but were changed very often without a clear aim. In FB&H, tax reforms began in 1996 and were mostly

small modifications of the former Yugoslav tax system. Unfortunately, the Dayton Agreement, as the B&H's Constitution, did not provide any formal grounds in terms of organisation of fiscal policy, unlike monetary policy (under Currency Board Arrangement). Article 3 of the Dayton Agreement only mentioned the regulation of the customs policy under B&H's competence. Indirect taxes, direct taxes and social security contributions (hereafter: SSC) were under the entity's supervision at the time. Under such circumstances, there were no unified strategies in terms of reforming the current situation in public finances. The reforms that did happen resulted from the efforts of the international community in B&H, namely the Office of the High Representative (hereafter: OHR) and international financial institutions such as the IMF and the World Bank.

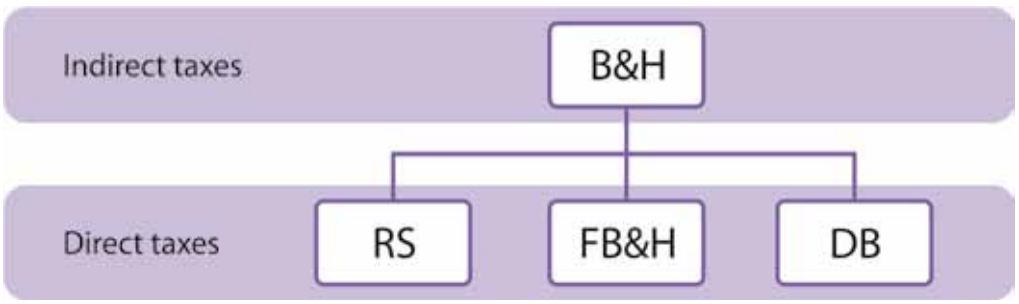
Thus, indirect taxes did go through a comprehensive reform under OHR decisions[2] in 2003, and indirect taxes are currently under the Indirect Tax Authority's (hereafter: ITA) jurisdiction. This means that customs, the value added tax (hereafter: VAT), and excise duties are unified at the level of B&H. Unification and centralisation of authorities brought numerous benefits, especially in terms of greater indirect tax revenues and more fiscal discipline. Since the replacement of the retail sales tax and the introduction of a broad-based-single VAT at the rate of 17 per cent, the ITA has been collecting all indirect tax revenues, which have had an upward trend (except in 2009 compared to 2008 due to the GFC, B&H Directorate for Economic Planning 2012).

In the field of direct taxes, reforms have been scarce and mostly adopted ad hoc. Some reforms have not been undertaken yet (e.g. SSC). Together with SSC, direct taxes are under the entities' jurisdiction, which causes distortions in terms of the income source and residency principles. Additionally, distortions are present in terms of the number of tax controls, overlapping authorities and, in turn, the availability of public goods (i.e. health, education, etc.). Figure 1 shows current the fiscal structure of B&H in terms of the legal jurisdiction of each level of government. Figure 2 summarises the main legal changes since 1996 in B&H, as well as the legal competence of each level of government within B&H. Due to numerous legal changes that occurred at different times, we will divide the process of B&H tax reforms into two periods: 1995-2006, and since 2006. 2006 was chosen as a benchmark year due to the fact that, in that year, the retail sales tax was replaced with the VAT. This was the biggest tax reform in B&H since its independence and was adopted primarily as a decision of the OHR.

The Decision was adopted in 2003, but it took three years for the entire process to become operational with the introduction of VAT. Moreover, due to the complicated tax system in B&H, Figure 2 only shows the main legal changes in the main tax types (i.e. customs, excise duties, sales tax – VAT, PIT, CIT, and SSC) since 1996 as changes in tax rates. Changes in tax base, allowances and deductions within each tax type are not considered (see below).

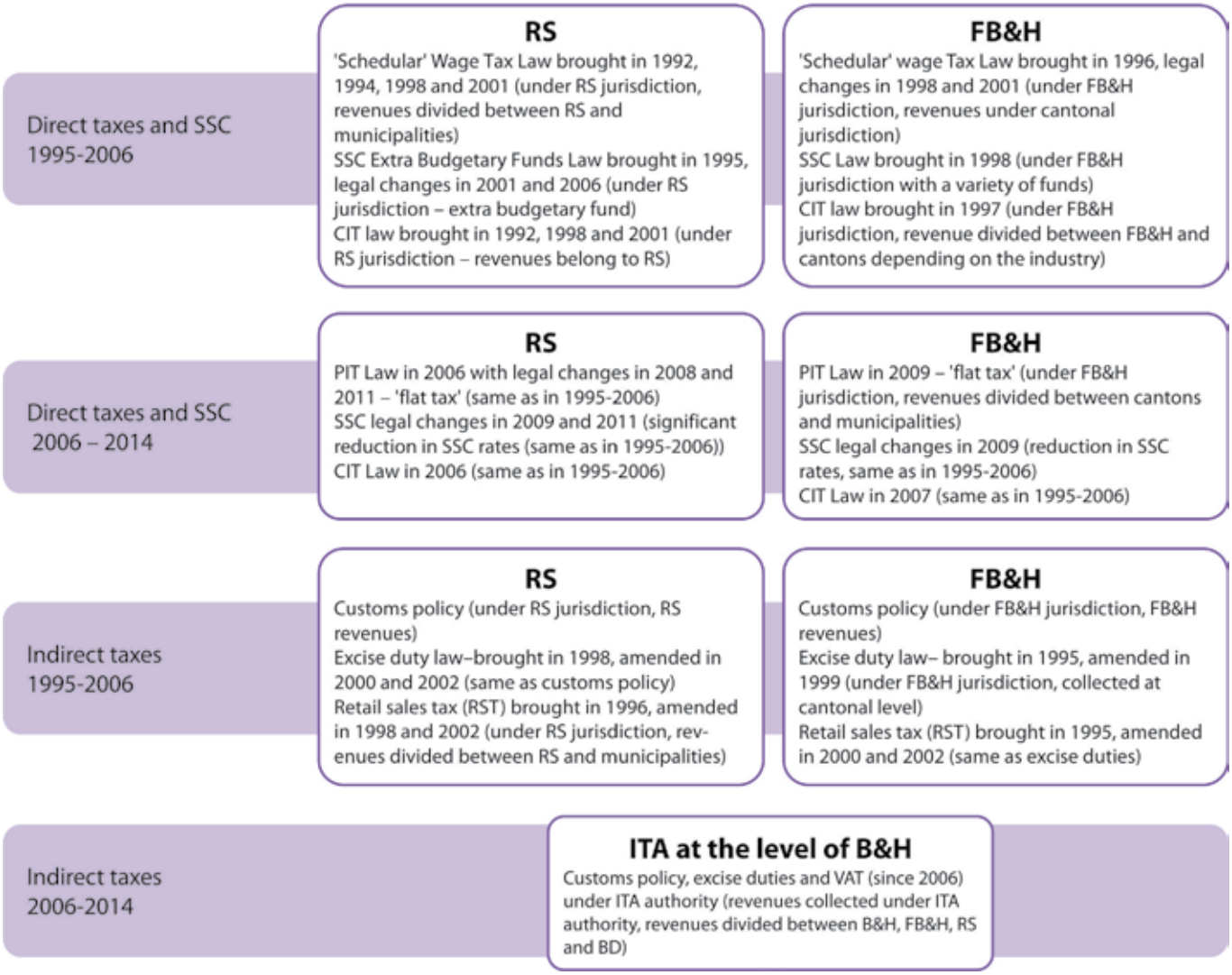
Figure 2 shows an array of legal changes in B&H. This interpretation relates solely to changes in statutory tax rates without going into details regarding changes in the tax base, allowances, deductions, or the treatment of specific groups of tax payers. If we could highlight two important reforms that occurred since 1996, they would be the replacement of Retail Sales Tax with the VAT in 2006 and the centralisation of indirect taxes (namely, customs and excise duties) at the level of B&H. Another important set of reforms occurred in 2008 and 2009 in the RS and FB&H respectively, and relates to the application of the 'flat tax' model at 10 per cent. Under the 'flat tax' model, we only consider the equalisation of PIT and CIT rates. Moreover, other important taxes such as property taxes, additional taxes on high income earning individuals, etc., were not considered. Figure 2 also shows the differences in the responsibilities of the state (B&H), entities and other sub-central levels of governments and funds. Again, we will not go into detail regarding

Figure 1: Fiscal Structures of B&H



Source: Autors' interpretation.

Figure 2: Overview of the Main Tax Reforms in B&H



N.B. information in brackets relates to allotment of revenues between levels of government
Source: Autors' interpretation.

the allocation of revenues between levels of government. We will only note that with the establishment of ITA, financing at the state level of B&H improved significantly (Kreso 2005). Under such circumstances, conducting a US-type survey in B&H is a challenging task. Moreover, in almost twenty years of transition process, none of B&H tax reforms were adopted as a result of economic or fiscal reasons in terms of the satisfaction of tax principles. The tax reforms were mainly a result of the aforementioned pressures from the international community; therefore, unlike in developed countries, reforms in B&H were mostly adopted ad hoc and without quantitative justifications in the decision making process. This is most visible in the VAT introduction at a rate of 17 per cent or the FB&H PIT reform in 2009 with the introduction of the 10 per cent 'flat tax'. The PIT draft law in FB&H had suggested two PIT rates of 10 and 15 per cent above a certain threshold, but this was not implemented. Therefore, tax reforms in B&H are a combination of international suggestions and political decisions within B&H rather than thorough economic analysis. Hence, this fact, together with a long and inefficient transition process led by slow and unfinished privatisation, has most certainly affected the opinions and attitudes of all of the target groups covered by the survey.

2. SURVEY METHODOLOGY

Expert surveys of this type were first conducted in the USA (Lim, Slemrod and Wilking 2013). In the countries of this region, a similar survey was conducted in Croatia (Šimović, Blažić and Štambuk 2014) and Slovenia (Klun 2014). If we compare the US and Croatian surveys, the US survey consisted of 100 yes/

no/don't know statements (Lim, Slemrod and Wilking 2013), and the Croatian survey consisted of 92 statements graded on a five- point Likert scale. Due to the peculiarities of the tax system of each country, the Croatian survey only had about a 20 per cent resemblance to the US survey (Šimović, Blažić and Štambuk 2014). However, the most important statements regarding economic and tax models are the same in both surveys.

Due to the specifics of the B&H constitution, especially in direct taxes, B&H's questionnaire was adapted to B&H's case. Hence, unlike the US and Croatian cases, a questionnaire was separately conducted in FB&H and RS, and each consisted of 64 and 61 statements respectively. 35 statements related to indirect taxes, and general economic and tax models were the same in both questionnaires. The differences in the number of statements mostly related to statements in the area of property taxes, deductions/exclusions in the area of PIT and the authority of sub-central levels of government in FB&H - Cantons. However, since the main statements in terms of economic models are the same in both questionnaires, comparison is possible. In both entities, the survey was conducted in the spring and summer of 2014 and, similarly to the Croatian case, a Likert scale was used. Respondents in both entities also provided their main demographic information such as their age, occupation and education. In accordance with the US and the Croatian surveys, respondents were divided into three groups: academics, professionals from the private sector, and the government sector, namely employees of the Ministries of Finance and tax administrations. Before going into details regarding each group, it has to be noted that, although the RS questionnaire was conducted in the same manner as the FB&H case, the RS results include a very limited number of respondents (only 28 in total). The results from the RS survey are summarised in Antić (2014). Due to the low level of responses in the RS, if we added the RS's answers to FB&H's case, they would be lost in the total number of respondents in the FB&H (195 responses). Hence, we will only briefly analyse the conclusions of RS respondents and compare them to those of the FB&H. Therefore, the focus will be on responses from the FB&H.

The survey was conducted in three main groups. The academics were contacted using e-mail addresses obtained from official universities' websites across the FB&H, and by post. It has to be noted that academics in the FB&H mostly teach at more than one university, including private universities. In academia, the questionnaire was sent to 87 addresses. The private sector was interviewed by email solely. Since the FB&H does not legally recognise tax advisory/consultants, this group included employees of international audit and tax advisory companies (i.e. the Big Four employees), domestic audit companies, and most frequently chartered accountants and auditors employed in the financial sector (banks, leasing companies, etc.). The headquarters of such financial institutions are mostly located in the FB&H. However, what seems to be the problem in the FB&H is the fact that due to the unregulated tax advisory sector (missing Law on Tax Consultancy/Advisory) individuals from different industries tend to engage in activities for which they are not formally authorised. The only group of professionals that were interviewed and do practically engage in tax advisory/consultancy are those employed in international tax advisory companies and, to some extent, in domestic tax advisory companies. The questionnaire was sent via email to 80 professionals. The government sector was also interviewed, mostly by email and post. When the interview was conducted, the FB&H government and FB&H Ministry of Finance faced a challenging period (i.e. violent protests and riots in February 2014, dismissal of the Federal Minister of Finance, etc.), and therefore, conducting a survey under such circumstances was very difficult. However, the survey was forwarded to the managing director of the Tax Administration of FB&H and was conducted among tax inspectors, employees inside the Central Office and the heads and deputies of cantonal tax offices in FB&H. Some were sent via email and some via post. The total number of potential respondents is therefore unknown, but the response in this group is considerable, since 110 surveys were filled out. The employees of the FB&H's Ministry of Finance, as well as the ITA, were also interviewed, but they make up only 14 per cent of all of the government officials that were interviewed. Thus, in total, 195 individuals responded to the survey in FB&H. In the RS, out of the 28 respondents, the most significant part was taken up by the government sector. Table 1 summarises the respondent structure for the FB&H.

Table 1: Respondent structure in the FB&H

Groups	FB&H*	
	No.	%
The academic community (universities, institutes)	44	22.7%
The government sector	111	57.2%
The private sector	39	20.1%
Total	194	100.0%

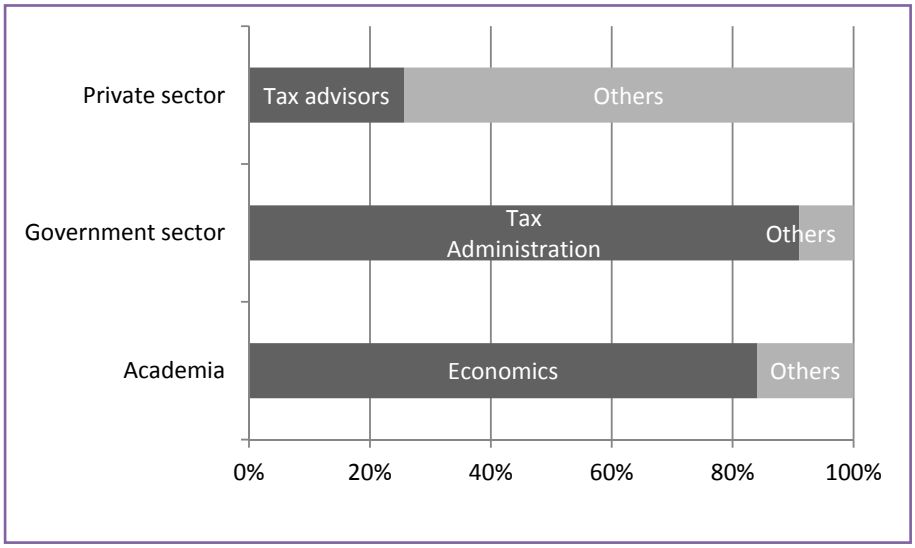
* One respondent did not answer this question (195 questionnaires were filled in).
Source: Authors.

Figure 3 summarises the structure of the FB&H's dataset. Similar to the Croatian case, most of the government sector and academia is taken by tax administration, and those teaching economics, respectively. However, unlike in the Croatian case, where 50 per cent of all private sector respondents were tax advisors, in the FB&H only 26 per cent of the sample are tax advisors (Šimović, Blažić and Štambuk 2013). In FB&H, the interviewed tax advisors were all employed in international and domestic tax consultancies. Thus, the majority of those interviewed in the private sector in FB&H were chartered accountants and auditors working in the financial sector in FB&H and dealing with taxes to some extent.

Figure 4 interprets the educational structure of the dataset for the FB&H. All experts have at least a bachelor's degree[3]. In the FB&H, the reason for this lies in the fact that the majority of the dataset is taken up by those employed in the government sector/tax administration. Academia and the private sector mostly have Ph.D. and master's degrees, respectively. In the FB&H, 50.7 per cent of the dataset were younger than 44 years of age, the average age in the private sector was 35 years, in academia 41, and in the government sector 49 years of age. The mode value in the FB&H is 57 years of age.

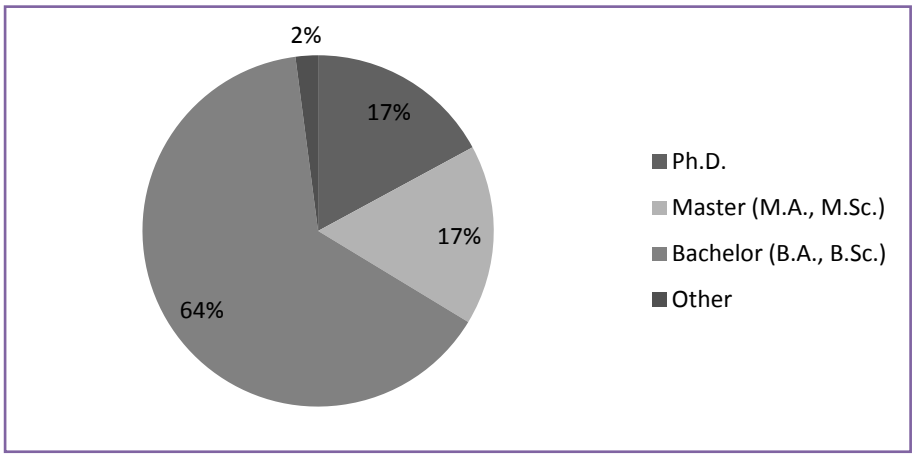
In order to conduct a comparative analysis in relation to the US or the Croatian survey, we will have to adopt a similar methodology. In the US and the Croatian surveys a reasonable benchmark of at least 61 per cent of yes/no answers (without neutral response) was considered a degree of consensus (Lim, Slemrod and Wilking 2013). Given that the FB&H case, similarly to the Croatian case, uses the Likert scale, answers were

Figure 3: The Structure of the Dataset in the FB&H by sectors



Source: Authors.

Figure 4: Educational structure of respondents in the FB&H



Source: Authors.

Table 2: Degree of Consensus (Number of Statements, without Neutral Response)

Degree of consensus	Total	Academic	Government	Private
Total 61-74%	24	21	23	16
Total 75-100%	33	35	31	39
Total 61-100%	57	56	54	55
Total 61-100% (in %)	89.1	87.5	84.4	85.9

Source: Authors.

summarised in a similar manner (without neutral answers). Table 2 summarises responses to the FB&H survey with a degree of consensus of at least 61 per cent and a more certain degree of consensus of 75 per cent, respectively.

Under the degree of consensus of 61 per cent in the US, 84 statements (out of 100) fulfilled this benchmark in the 2013 survey (Lim, Slemrod and Wilking 2013). In the Croatian case, 64 (out of 92 statements) fulfilled this criterion (Šimović, Blažić and Štambuk 2014). In the FB&H, 57 (out of 64 statements) reached the given degree of consensus, which is almost 90 per cent. A high level of consensus is definitely a good indicator, but does not necessarily indicate a consistent tax policy. Most (if not all) legal changes in the FB&H were far from serious tax reforms and were usually initiated and conducted by pressures from the international community in (F)B&H. This is most certainly true for all indirect taxes, slow and uncertain reforms in the field of direct taxes, and no reforms in the area of SSC. In order to provide an overall analysis of responses in the following part, we will interpret the results from the Likert scale (1 to 5) as follows: answers 1 and 2 will be summarised as 'I disagree', answer 3 is 'neutral', and answers 4 and 5 as 'I agree'[4].

3. TAX ISSUES AND THE ECONOMIC MODEL IN THE FB&H WITH COMPARISONS TO THE RS

In comparison to the US and Croatian surveys, which had 100 and 92 statements respectively, the FB&H survey only included 64 statements. The reason for this limited number of statements in the FB&H survey (and that of the RS) mostly relates to the fact that some statements were not applicable in the case of B&H (both entities). In this part of the paper, we will only compare the overall results among a limited number of statements in the FB&H and RS, and will try to include the level of consensus. Statements/questions were selected based on their significance in overall fiscal policy in terms of whether they were popular policy options, or whether there were significant differences in attitudes among the entities. Thus, in both entities, the questionnaires were divided into four groups.

The first part concerned statements regarding indirect taxes at the level of B&H, the second part related to general tax issues and economic models, the third part concerned property tax, and the final part dealt with direct taxes, namely PIT and CIT. The first and the second parts are identical in both surveys.

Table 3 summarises most distinct responses as yes/no/neutral responses to the questionnaire among the two B&H entities. Responses were virtually the same in both entities to statements regarding the treatment of excise duties, so they are not shown in Table 3. However, disagreement among entities was visible in responses dealing with the VAT. A statement regarding the introduction of a reduced VAT rate in the FB&H was responded positively by 72 per cent of respondents. Response to this statement in RS was divided in half between those who agreed and disagreed (Antić 2014). More specifically, in the FB&H survey, those coming from the government sector mostly agreed with this statement (72 per cent) whereas in the RS, the government sector mostly disagreed. The overall result in the RS was divided in half amongst those who agreed and disagreed (i.e. exactly 50 per cent, Antić 2014). The reason perhaps lies in the fact that most of those interviewed in the RS come from ITA, and are therefore aware of the additional complexity of the introduction of a reduced VAT rate (since the ITA is completely in charge of indirect taxes), whereas in the FB&H, those coming from the government sector are mostly in charge of direct taxes, so they mostly agreed with this statement.

In the second part, which regarded general tax issues and economic models, there were significant differences in opinion. One particular statement is important and relates to the efficiency-equity trade-off. In the RS case, respondents were divided and could not give preference to either the efficiency or equity principle (Antić 2014). In the FB&H, the preference was given to the equity principle over the efficiency principle (62 per cent). Responses regarding an increase in

Table 3: Summary of Expert Attitudes Regarding Indirect Taxes in the RS and FB&H, in %

	RS			FB&H		
Statement	No	Neutral	Yes	No	Neutral	Yes
Q01. B&H should introduce reduced VAT rate.	50	0	50	26	2	72
Q02. Standard VAT rate should be increased.	78	12	10	72	6	22

N.B. Data for RS are estimated based upon Antić, 2014.
Source: Autors' calculation.

tax penalties and satisfaction of the compliance principle in creating tax policy were positively responded to in FB&H, with 67 per cent agreeing. In the RS, more than 80 per cent agreed. The lower rate of responses in the FB&H to this question is a result of responses from the government sector. In the government sector in the FB&H, which is in charge of the administration of tax penalties, only 60 per cent agreed. We can only assume that the government sector in the FB&H faces different problems, such as establishing tax frauds, so they do not think that penalties for tax evasion/frauds should increase. In both the RS and FB&H, the remaining economic model issues are mostly responded to similarly. All respondents in the FB&H and RS feel that the SSC should not be increased. Although SSC rates have had a falling tendency in both entities, they significantly differ across the two entities in amount. In the FB&H, they amount to 41.5 per cent and are paid both by employer and employee, whereas in the RS they amount to 33 per cent and are all paid by the employer. Additionally, in the FB&H, all feel that the SSC paid by employee and employer should be consolidated into one payment (similar to the RS practice). Furthermore, all respondents in the FB&H and RS agreed on issues such as the lowering of the tax burden relative to GDP, reduction of public revenues and expenditures relative to GDP, and changes in the tax structure. Moreover, respondents in the FB&H feel that lower marginal income tax rates reduce leisure and increase work effort, that non-taxation of interest and financial capital gains encourages saving and investment, respectively, and that government tax relief and

T**able 4:** Summary of Expert Attitudes Regarding General Tax issues and Economic Models in the RS and FB&H, in %

Statement	RS			FB&H		
	No	Neutral	Yes	No	Neutral	Yes
Q19. Social security contributions should be increased at all levels (Pension, Health, Unemployment).	100	0	0	86	5	9
Q22. The entire tax burden (the level of taxes relative to GDP) should be reduced.	15	18	67	16	18	66
Q24. The entire level of public revenues (and public expenditures) relative to GDP should be lowered.	15	18	67	13	23	63
Q25. The tax structure should be changed.	5	28	67	7	16	77
Q26. The tax burden should be shifted from personal and corporate income to consumption.	45	15	40	39	17	44
Q27. The tax burden should be shifted from personal and corporate income to property.	32	18	50	28	21	51
Q28. Lower marginal income tax rates reduce leisure and increase work effort.	23	20	57	24	24	52
Q29. Non-taxation of interest encourages saving.	11	10	79	20	12	68
Q30. Non-taxation of financial capital gains encourages investment and promotes economic growth.	11	10	79	20	18	62
Q31. Different government tax reductions (reliefs, incentives) promote economic growth.	13	8	79	14	12	74
Q32. VAT is regressive.	39	18	43	44	22	34
Q33. Administrative and compliance costs of taxation should play a significant role in creating tax policy (these costs should be reduced by making the tax system significantly simpler).	19	3	78	8	9	83
Q34. The equity principle should have priority over the efficiency principle in creating tax policy.	33	33	34	19	19	62
Q35. Penalties for tax evasion should be increased.	22	8	70	25	7	67

N.B. Differences exist due to rounding errors or omitted responses.
Source: Autors' calculation and Antić (2014).

incentives promote economic growth. Additionally, only 43 per cent in the RS and 34 per cent in the FB&H consider the current single-rate VAT to be regressive. Within this group of statements, the most interesting statements related to 'incidence' statements were undecided responses from both entities. In the statement regarding a shift from income to consumption, respondents in the FB&H and RS reached similar levels of responses, with 40 per cent of respondents agreeing with this statement. Alternatively, responses regarding a shift from income to property reached 50 per cent of positive answers in both entities. Table 4 summarises the responses as yes/no/neutral answers for general tax issues and economic models.

The third part of the survey included property taxes. Since this part of tax policy is under the entities' supervision, most differences between the statements are in this (and final) part of the survey. The statement that is positively answered in both entities is related to the fact that property is a necessary additional indicator of the ability to pay besides income. Unlike the RS case, which did not have a specific set of statements, in the FB&H respondents agreed that the FB&H needs property tax reform and that ten cantonal laws should be consolidated into one. Furthermore, respondents in both entities answered positively to the statement regarding real estate tax being local tax in terms of revenues. The final part of the survey is related to statements about income taxes, namely personal and corporate income tax (PIT and CIT). Since these types of taxes, together with property taxes are under entities' legal supervision, there were differences in this part of the survey among entities. The most important statement regarding the introduction of progressive PIT in the FB&H and RS was positively answered. Additionally, respondents in both the FB&H and RS disagree with the possible increase of the 'flat tax' rate. Responses regarding introduction of progressive PIT in the FB&H are expected, but not in the RS. If we link the response to this statement to the efficiency-equity trade-off, we will see that the respondents in the FB&H are consistent, whereas in the RS that is not the case. In the FB&H, respondents gave priority to the equity principle (vertical equity) over efficiency, since the redistributive function of the state is, at least in theory, best satisfied through progressive PIT (Musgrave and Musgrave 1993). In the RS, 57 per cent of those primarily coming from the government sector were in favour of progressive PIT. The reason for favouring progressive PIT in the RS might perhaps lie in the fact that the government sector in RS, regardless of the PIT rate (flat or progressive), always pays out the same net wage to its employees, i.e. if and when legal changes in the tax rate occur (or the tax base in terms of standard and non-standard allowances) the government sector in the RS always corrects the gross wage, so that the net wage paid to employees would not be changed. In the FB&H, all responses regarding standard allowances and deductions are mostly unanimous and are similar to the RS responses (where comparable). Moreover, in the FB&H, the majority feel that financial capital gains and dividends should be taxed within PIT. This implies that all favour comprehensive a SHS definition of income, rather than an expenditure-based one. Additionally, in the FB&H, only slightly more than 50 per cent think that dividends should be given preferential treatment to other sources of income in terms of lower tax rates. These responses in the FB&H are particularly interesting, bearing in mind that dividends under 'flat tax' are currently not subject to tax. In the RS, on the other hand, under 10 per cent of 'flat tax' dividends are subject to taxation. In the RS, opinions regarding taxation of dividends are divided between the private (disagree) and government (agree) sectors (Antić 2014), but the majority agreed with preferential treatment of dividends compared to other sources of income.

Fringe benefits should continue to be exempt from taxation of income in the FB&H, and a cantonal/municipal surtax should not be introduced. The positive answer regarding non-taxation of fringe benefits from the FB&H's government sector is very peculiar, especially bearing in mind that non-taxation of fringe benefits narrows the tax base and can act in a stimulating way in terms of underreporting or 'envelope salaries'. Again, a small, war-torn transition country such as B&H with divided markets faces serious challenges regarding the high levels of the shadow economy (Schneider 2012). Moreover, the opinion regarding non-taxation of fringe benefits in the case of the FB&H is very concerning since fringe benefits take on average 40 per cent of the average monthly net wage, whereas in OECD countries they take as little as 1-2 per cent (OECD 2014). Regarding CIT, respondents in the FB&H and the RS think that CIT rates should not be increased (similar to answers regarding an increase in PIT rates). Similar answers were given in other areas of CIT in both entities. Table 5 summarises the aforementioned main results in the FB&H's and RS' statements in the third and final part of the survey grouping answers as yes/no/neutral.

Table 5: Summary of Expert Attitudes Regarding Direct Taxes in the RS and FB&H, in %

Statement	RS			FB&H		
	No	Neutral	Yes	No	Neutral	Yes
Q43_Property is a necessary additional indicator of ability to pay besides income.	6	13	81	8	10	82
Q46_Progressive income tax should be introduced.	28	15	57	29	5	66
Q47_Current personal income tax rate of 10 per cent should be increased.	79	21	0	74	13	14
Q48_Personal allowances in personal income tax should be re-introduced/abolished (RS and FB&H respectively).	12	10	78	77	6	17
Q49_Family allowances should be abolished.	94	3	3	82	5	12
Q50_Tax deductions/allowances for health costs should be introduced/abolished (RS and FB&H respectively).	9	16	75	71	7	21
Q51_Tax deductions/allowances for owner-occupied housing should be abolished.	72	7	21	67	7	26
Q53_Inside PIT, dividends should (not for the RS) be taxed.	48	7	45	25	9	66
Q54_Inside PIT, financial capital gains should be taxed.	27	21	52	23	14	63
Q55_Inside PIT, interest on saving and securities should be taxed.	78	2	20	72	8	20
Q56_All sources of income inside PIT should be taxed in the same way (at statutory rates, without allowing the lower withholding tax to be the final tax due).	45	25	30	42	26	32
Q57_Capital incomes should be taxed at lower rates than labour incomes.	54	23	23	53	19	28
Q58_Dividends should be taxed at lower rates than other incomes (due to the economic double taxation of dividends).	22	14	64	34	16	51
Q59_Compensation of employees (i.e. fringe benefits) should continue to be exempt from taxation on income.	26	2	72	17	7	77
Q60_Cantonal/municipal surtax should be introduced.	72	28	0	60	22	18
Q61_Corporate income tax rate should be increased.	65	10	25	62	9	29

Source: Autors' calculation and Antić (2014).

4. BINOMIAL PROBIT REGRESSION RESULTS FOR ECONOMIC VALUES IN THE FB&H

Similar to the US (Lim, Slemrod and Wilking 2013) and Croatian surveys (Šimović, Blažić and Štambuk 2014), we have developed a model regarding responses to the most important two statements dealing with tax reforms: those are statements 24 and 34. They were used as predictors (independent variables). Statements 24 and 34 relate to opinions regarding the lowering of the entire level of public revenues and expenditures to GDP and giving preference to the equity aspect over efficiency, respectively. In the Croatian survey, similar statements were used as predictors (the difference is in statement 24, but the inclination is the same in the Croatian survey). Those who answered positively to statement 24 are considered to be more neo-liberal in their economic values, i.e. they are promoting a lesser role of government in the economy. They are more likely to promote base-broadening measures as well as reduction in the top tax rates.

Those who answered positively to statement 34 are in favour of (vertical) equity and could be regarded as more 'classical interventionists' favouring redistributive issues. They should also favour greater government involvement in the economy. Moreover, unlike the former group, this group should be more in favour of a comprehensive S-H-S definition of income. Twenty six regressions were conducted. A binomial probit regression included grouped yes/no answers without neutral answers. The regression includes demographic characteristics (such as age, education, and employment sector) as independent variables, but they are not specifically analysed. The private sector is used as

a benchmark. Education as a benchmark is classified in two groups: those with and without Ph.D.

Thus, results presented in Table 6 show a few important points regarding general attitudes and specifics in terms of responses.

Those who answered positively to statement Q24 (compared to those who responded negatively[5]) are, unexpectedly, more likely to answer positively to the statement regarding the introduction of a financial transaction tax. This answer is not expected since this group should favour lesser government intervention, and hence taxation. In responses regarding PIT, those who claim lesser government involvement in the economy are more likely to favour abolishment of tax deductions for health costs in personal income taxation. This could be interpreted as a base-broadening

Table 6: Binomial Probit Regression Results for Economic Values in the FB&H

Question/Statement	Q24a	Q34b	χ2 e
	0.222	0.484	6831
Q01. B&H should introduce reduced VAT rate.	(0.369)	(0.327)	[0.337]
	-0.651	-0.767**	10425
Q02. Standard VAT rate should be increased.	(0.424)	(0.389)	[0.108]
	-0.168	0.42	6037
Q13. Excise duties on tobacco and tobacco products should be increased.	(0.445)	(0.397)	[0.419]
Q19. Social security contributions should be increased at all levels (Pension, Health, Unemployment).	0.621	0.447	491025
	(0.386)	(0.568)	[0]
	1.182**	-0.713*	18869
Q20. A financial transaction tax should be introduced.	(0.533)	(0.416)	[0.004]
	0.176	1.341***	21.32
Q21. A financial activities tax should be introduced.	(0.391)	(0.413)	[0.002]
Q23. General government should be financed less from taxes and more from different non-tax revenues (with an emphasis on different user charges).	1.424***	-0.595	13315
	(0.431)	(0.394)	[0.038]
Q39. Taxation should include other forms of property, too (movable property, financial property, etc.), i.e. should be a synthetic taxation of property (net wealth tax).	0.348	-0.431	500844
	(0.453)	(0.406)	[0]
	0.204	-0.117	8643
Q41. Inheritances and gifts should be taxed.	(0.373)	(0.344)	[0.195]
	-0.108	0.678*	8727
Q43. Property is a necessary additional indicator of ability to pay besides income.	(0.595)	(0.402)	[0.19]
	0.214	0.112	19025
Q46. FB&H should introduce progressive income tax.	(0.386)	(0.34)	[0.866]
	-0.883*	0.917*	18982
Q47. Current personal income tax rate of 10 per cent should be increased.	(0.486)	(0.534)	[0.004]
	0.12	-0.75*	9613
Q48. Personal allowances in personal income tax should be abolished.	(0.434)	(0.407)	[0.142]
	-0.093	-0.702*	7129
Q49. Family allowances should be abolished.	(0.434)	(0.373)	[0.309]
	1.117**	-0.722*	10044
Q50. Tax deductions/allowances for health costs should be abolished.	(0.548)	(0.376)	[0.123]
	0.511	-0.517	26146
Q51. Tax deductions/allowances for owner-occupied housing should be abolished.	(0.455)	(0.348)	[0.191]
	-0.098	-0.71*	6848
Q53. Inside PIT, dividends should be taxed.	(0.398)	(0.404)	[0.335]
	-0.29	-0.697*	5332
Q54. Inside PIT, financial capital gains should be taxed.	(0.421)	(0.401)	[0.502]

	-0.435	-0.24	42253
Q55. Inside PIT, interest on saving and securities should be taxed.	(0.386)	(0.344)	[0.33]
Q56. All sources of income inside PIT should be taxed in the same way (at statutory rates, without allowing the lower withholding tax to be the final tax due).	0.186	-0.28	9184
	(0.377)	(0.357)	[0.163]
	0.451	0.193	9193
Q57. Capital incomes should be taxed at lower rates than labour incomes.	(0.474)	(0.393)	[0.163]
Q58. Dividends should be taxed at lower rates than other incomes (due to the economic double taxation of dividends).	0.003	-0.085	0.958
	(0.373)	(0.346)	[0.987]
Q59. Compensation of employees (i.e. fringe benefits) should continue to be exempt from taxation on income.	0.112	0.186	3347
	(0.422)	(0.359)	[0.764]
	0.047	-0.253	4057
Q61. Corporate income tax rate should be increased.	(0.435)	(0.377)	[0.669]
Q62. Differentiated/reduced corporate income tax rates should be introduced for certain industries (e.g. agriculture, tourism).	-0.229	-0.072	34001
	(0.427)	(0.348)	[0.818]
	0.255	0.17	2392
Q64. Reinvested profits should be exempt from taxation.	(0.448)	(0.422)	[0.793]

Notes: Robust standard errors are in parenthesis. The p-values of the $\chi 2$ are in brackets. Other regressors include indicators of sector of employment, age and education.
* p< 0.1; ** p < 0.05; *** p < 0.01
aQ24 - The entire level of public revenues (and public expenditures) relative to GDP should be lowered.
bQ34 - The equity principle should have priority over the efficiency principle in creating tax policy.

Source: Authors' calculation.

measure within PIT. This group is more likely to answer negatively to the statement regarding an increase in the current 10 per cent 'flat rate'. This is in line with the *laissez faire* ideology. Unfortunately, other statements regarding the definition of the tax base were not significant.

Tax experts inclined to a greater role of government (i.e. those who answered positively to statement 34 in comparison to those who answered negatively) are more likely to disagree on a statement regarding an increase in the standard VAT rate. The responses to this statement could be explained as an awareness of tax experts that the current application of single-rate broad-based VAT causes regressivity and in turn distorts equity. However, one must not forget that most tax experts answered negatively to the statement regarding VAT regressivity (although a consensus was not reached on this particular statement). Moreover, experts might also feel that the standard VAT rate has already reached its peak at 17 per cent, even though this is currently the lowest VAT rate in the region. Contrary to expectations, this group is more likely to disagree on the introduction of a financial transactions tax. This could be justified by fragmented and underdeveloped financial markets in (F)B&H. However, those who favour equity over efficiency are more inclined toward the introduction of a financial activities tax. This could be justified by the fact that the FB&H financial market is bank-based. Expectedly, this group is more inclined to favour an increase in the current 10 per cent 'flat tax' and consider that property a necessary additional indicator of the ability to pay besides income. Additionally, this group is inclined to answer negatively regarding an abolishment of all allowances (personal, family and owner-occupied housing) which is in line with expectations. However, what is unexpected is the fact that this group is more inclined to be against the taxation of dividends and financial capital gains. Taxation of dividends and financial capital gains (realised) is a crucial parameter in the definition of the comprehensive income under S-H-S, which represents satisfaction of the ability-to-pay principle. However, this response among FB&H experts reflects the current policy of non-taxation of dividends and capital gains which in turn causes income shifting. Thus, the results shown in Table 6 in terms of economic values in the FB&H are unclear, with numerous unexpected answers indicating two important points: this brief analysis proves the point that tax reforms are adopted ad hoc and under pressure from the international community, and therefore, local tax experts have little knowledge regarding specific tax issues; the second point builds on the first regarding the crucial definition of the tax base in terms of its broadness (or narrowness), especially in PIT, i.e. the taxation of dividends and financial capital gains.

5. BINOMIAL PROBIT REGRESSION RESULTS FOR ECONOMIC VIEWS IN THE FB&H

Again, similar to the US and Croatian surveys (Lim, Slemrod and Wilking 2013, Šimović, Blažić and Štambuk 2014), binomial probit regression was conducted in order to determine taxpayers' behaviour and tax incidence. Statements 30 and 31 were used as behavioural predictors, and statements 26 and 27 as incidence predictors. Table 7 summarises the responses in terms of economic views.

Table 7, shows, similarly to the Croatian survey, that statement No. 31 (Different government tax reductions (reliefs, incentives) promote economic growth) turned out to be the best predictor among behavioural responses. The experts who answered positively (compared to those who answered negatively) to the aforementioned statement are more likely to be more inclined to an increase in standard VAT rates as well as excise duties on tobacco and tobacco products. The statement regarding an increase in standard VAT rates

Table 7: Binomial Probit Regression Results for Economic Views in the FB&H

	Behavioural responses		Incidence		
Question/Statement	Q30a	Q31b	Q26c	Q27d	χ2 e
Q01. B&H should introduce reduced VAT rate.	-0.194	0.239	-0.248	-0.123	11253
	(0.381)	(0.412)	(0.322)	(0.354)	[0.188]
Q02. Standard VAT rate should be increased.	-0.638	1.501**	0.422	0.315	12768
	(0.409)	(0.591)	(0.335)	(0.397)	[0.12]
Q13. Excise duties on tobacco and tobacco products should be increased.	-0.744	1.664***	-0.268	0.577	13491
	(0.546)	(0.584)	(0.404)	(0.445)	[0.096]
Q19. Social security contributions should be increased at all levels (Pension, Health, Unemployment).	0.366	-0.005	0.615	-0.095	14756
	(0.639)	(0.703)	(0.439)	(0.353)	[0.064]
Q20. A financial transaction tax should be introduced.	-0.597	-0.92	-0.515	-0.492	17046
	(0.417)	(0.572)	(0.34)	(0.428)	[0.03]
Q21. A financial activities tax should be introduced.	0.13	-1.229*	-0.742**	0.049	42025
	(0.444)	(0.685)	(0.35)	(0.368)	[0.007]
Q23. General government should be financed less from taxes and more from different non-tax revenues (with an emphasis on different user charges).	-0.323	0.573	0.287	0.314	4099
	(0.469)	(0.476)	(0.322)	(0.335)	[0.848]
Q39. Taxation should include other forms of property, too (movable property, financial property, etc.), i.e. should be a synthetic taxation of property (net wealth tax).	-0.239	-0.165	-0.362	0.909**	10724
	(0.442)	(0.467)	(0.326)	(0.37)	[0.218]
Q41. Inheritances and gifts should be taxed.	0.237	-0.693*	-0.617**	0.614*	13837
	(0.378)	(0.394)	(0.313)	(0.334)	[0.086]
Q43. Property is a necessary additional indicator of ability to pay besides income.	-0.335	-0.126	-0.12	0.535	8577
	(0.697)	(0.752)	(0.438)	(0.427)	[0.379]
Q46. The FB&H should introduce progressive income tax.	0.081	0.3	-0.124	0.697**	6861
	(0.416)	(0.458)	(0.323)	(0.327)	[0.552]
Q47. Current personal income tax rate of 10 per cent should be increased.	-0.355	-0.074	-0.104	1.135**	16859
	(0.495)	(0.466)	(0.398)	(0.553)	[0.032]
Q48. Personal allowances in personal income tax should be abolished.	-0.431	-0.568	-0.199	1.109***	18682
	(0.438)	(0.508)	(0.36)	(0.427)	[0.017]
Q49. Family allowances should be abolished.	-0.098	-0.58	-0.415	0.632	12551
	(0.433)	(0.501)	(0.405)	(0.413)	[0.128]
Q50. Tax deductions/allowances for health costs should be abolished.	-0.227	-0.118	-0.194	0.825**	21762
	(0.446)	(0.514)	(0.369)	(0.418)	[0.005]
Q51. Tax deductions/allowances for owner-occupied housing should be abolished.	-0.532	0.175	-0.507	0.734*	18915
	(0.431)	(0.475)	(0.329)	(0.38)	[0.015]

Q53. Inside PIT, dividends should be taxed.	-0.687	0.211	-0.388	0.372	10703
	(0.441)	(0.44)	(0.304)	(0.342)	[0.219]
Q54. Inside PIT, financial capital gains should be taxed.	-0.789	-0.783	-0.181	0.553	16303
	(0.505)	(0.618)	(0.327)	(0.352)	[0.038]
Q55. Inside PIT, interest on saving and securities should be taxed.	-0.208	0.121	-0.248	1.478***	21086
	(0.408)	(0.417)	(0.372)	(0.473)	[0.007]
Q56. All sources of income inside PIT should be taxed in the same way (at statutory rates, without allowing the lower withholding tax to be the final tax due).	0.704	0.02	0.136	-0.234	25448
	(0.48)	(0.494)	(0.353)	(0.405)	[0.001]
Q57. Capital incomes should be taxed at lower rates than labour incomes.	1.166**	0.301	0.753**	0.192	18165
	(0.486)	(0.538)	(0.375)	(0.391)	[0.02]
Q58. Dividends should be taxed at lower rates than other incomes (due to the economic double taxation of dividends).	0.461	0.48	0.47	-0.56	8391
	(0.378)	(0.428)	(0.323)	(0.357)	[0.396]
Q59. Compensation of employees (i.e. fringe benefits) should continue to be exempt from taxation on income.	0.531	0.653	-0.064	-0.498	18256
	(0.376)	(0.406)	(0.378)	(0.41)	[0.019]
Q61. The corporate income tax rate should be increased.	-1.433***	0.61	-0.478	0.428	17371
	(0.458)	(0.507)	(0.374)	(0.377)	[0.026]
Q62. Differentiated / reduced corporate income tax rates should be introduced for certain industries (e.g. agriculture, tourism).	-0.355	0.904**	0.24	-0.054	6406
	(0.412)	(0.434)	(0.328)	(0.344)	[0.602]
Q64. Reinvested profits should be exempt from taxation.	-0.363	1.582***	-0.021	0.238	14033
	(0.47)	(0.514)	(0.354)	(0.368)	[0.081]

Notes: Robust standard errors are in parenthesis. The p-values of the χ^2 are in brackets. Other regressors include indicators of sector of employment, age and education.
* p< 0.1; ** p < 0.05; *** p < 0.01
[a]Q26. The tax burden should be shifted from personal and corporate income to consumption.
[b]Q27. The tax burden should be shifted from personal and corporate income to property.
[c]Q30. Non-taxation of financial capital gains encourages investment and promotes economic growth.
[d]Q31. Different government tax reductions (reliefs, incentives) promote economic growth.

Source: Authors' calculations.

could be justified as a revenue compensating measure caused by increasing tax expenditures. Hence, those who responded positively to statement 31 are also likely to answer positively in terms of the introduction of reduced corporate income tax rates for certain industries and the exemption of reinvested profits from taxation. Those more inclined to tax reductions as a way of promoting economic growth are more likely to respond negatively to an introduction of financial activities tax as well as the taxation of inheritances and gifts. Again, responses show inconsistencies which could only be linked to fragmented tax policy within the FB&H, where comprehensiveness of tax reforms is unfortunately not considered. The possible introduction of a financial activities tax would probably be under the jurisdiction of the FB&H, whereas the taxation of inheritances and gifts is currently under cantonal jurisdiction (ten separate laws in each canton within the FB&H).

Statement No. 30 (Non-taxation of financial capital gains encourages investment and promotes economic growth) as a narrower statement proved to be a less important predictor (similar to Šimović, Blažić and Štambuk 2014). Those who answered positively to this statement (compared to those who answered negatively) are more likely to be against an increase in corporate income tax. This is an expected answer from those who are more inclined to neo-liberal ideology. Although responses are not statistically significant, statements regarding taxation of dividends, financial capital gains and interest on saving and securities have a negative relationship to the aforementioned statement, which is again a logical response of the more liberal experts.

Statement No. 27 (The tax burden should be shifted from personal and corporate income to property) turned out to be a more important predictor than statement 26 regarding a shift in tax burden

from personal and corporate income to consumption. Expectedly, those who answered statement 27 positively (compared to those who answered negatively) are more likely to favour a more comprehensive definition of taxation of property (statement No. 39). Moreover, respondents who answered positively to statement No. 27 are also more inclined to answer positively to the taxation of inheritance and gifts, the introduction of progressive PIT and an increase in the current 10 per cent PIT rate. Therefore, with base-broadening measures together with the introduction of progressive PIT (or an increase in 'flat tax'), experts are more in favour of comprehensive income tax under the S-H-S definition. This is very similar to responses in the Croatian survey (Šimović, Blažić and Štambuk 2014). However, what seems to be an unexpected response is that this group favours the abolishment of personal allowances (statement No. 48), and tax deductions for health costs (statement No. 50). These responses are not expected, since the S-H-S definition of income acknowledges personal allowances as standard allowances. Property is usually perceived as an additional indicator of the ability to pay besides income, and nowadays, in the 'hybrid' definition of income as tax base different sources of property (and property rights) are included in the income tax base. However, personal allowances are usually kept, although in some transition countries (e.g. Bulgaria, Georgia), they are abolished under the 'flat tax'. Those in favour of a shift from income to property are also more likely to answer positively regarding the taxation of interest on savings and securities.

CONCLUSION

This paper attempted to summarise the major results of a survey regarding tax policy issues and attitudes in B&H. Furthermore, the results from a similar survey conducted in the RS were compared with the FB&H case. Thus, even though B&H tax policy is conducted separately, the majority of respondents in both entities share common feelings regarding most tax policy issues. Differences amongst entities that do exist mostly relate to statements regarding the introduction of reduced VAT rates and preference in terms of the efficiency-equity trade-off. Interestingly enough, with the current B&H application of single rate broad-based VAT, most of the experts in both entities think that the VAT is not regressive. The FB&H survey also showed a very high degree of consensus among most statements about experts' attitudes. This is a surprising fact, especially under the current divided markets and complex tax policy. However, as we argued before, the FB&H survey showed a few inconsistencies in its responses, especially those related to general tax issues and economic models. Moreover, the greatest differences in responses between the entities occurred in this part of the survey.

The results of binomial probit regression in the FB&H regarding economic values were evaluated using two predictors: one promoting lesser, and the other promoting greater government intervention. The results were mostly expected (i.e. introduction of financial activities tax or lesser government financing from taxes, and more from different non-tax revenues). However, other results in the FB&H in terms of economic values are sometimes unclear, with numerous unexpected answers. Similarly, binomial probit regression for economic views provided similar unclear responses. The reason might be the fact that tax reforms in (F)B&H are adopted ad hoc and under pressure from the international community, and therefore, local tax experts have little knowledge regarding specific tax issues (i.e. comprehensiveness of income or consumption as a tax base); the second point builds on the first regarding the crucial definition of the tax base in terms of its broadness (or narrowness), especially in PIT, i.e. the taxation of dividends and financial capital gains. Similarly inconsistent responses could be found in the FB&H indicating an unclear direction for tax reforms. Hence, in the twenty years since the end of the war in B&H, tax reforms were adopted either ad hoc or under pressure from the international community, which is in turn reflected in the unclear direction of tax policy in (F)B&H.

References

Antić, D. 2014 (September). Anketa o poreznom sistemu i poreznoj politici BiH. [Opinion survey about tax system and tax policy]. Porezni savjetnik. 14-24.

B&H Directorate for Economic Planning. 2012. Annual Economic Report - Economic Trends for Years 2004-2012. Council of Ministers of B&H. http://dep.gov.ba/dep_publikacije/ekonomski_trendovi/Archive.aspx?langTag=bs-BA&template_id=140&pageIndex=1 (accessed: July 21, 2013).

DeGroat, B. 2013. What do Tax Policy Experts Think About U.S. Tax Policy? Michigan News, University of Michigan's Office of Tax Policy Research and the National Tax Association. http://ns.umich.edu/new/releases/21386-what-do-tax-policy-experts-think-about-u-s-tax policy (accessed: October 10, 2014).

EUROSTAT. 2013. General Government Deficit (-) and Surplus (+) - Annual Data as % of GDP. http://ec.europa.

eu/eurostat/tgm/table.do?tab=table&plugin=1&language=en&pcode=teina200 (accessed: July 15, 2014).

Garnier, G., Gburzynska, A., György E., Mathé, M., Prammer, D., Ruà, S., & Skonieczna, A. 2013. Recent Reforms of Tax Systems in the EU: Good and Bad News. Taxation papers. Working Paper No. 39. European Commission. http://ec.europa.eu/taxation_customs/resources/documents/taxation/gen_info/economic_analysis/tax_papers/taxation_paper_39.pdf (accessed: February 10, 2014).

Hadžiahmetović, A. 2005. Ekonomija Evrope. [European Economics]. Sarajevo: Ekonomski fakultet Sarajevo.

Indirect Tax Authority. 2014. Izvještaj o dužnicima po osnovu PDV-a na dan 02.07.2014. [Report on debtors for VAT on July 2, 2014]. http://www.uino.gov.ba/download/duznici/pdv%20duznici.pdf (accessed: January 27, 2015).

Kapopoulos, P. and Lazareton, S. 2011. Fiscal Policy Stance And Debt Sustainability In SEE Countries: A Comparative Analysis. The South East European Journal of Economics and Business 6 (2): 55-66.

Klun, M. 2014. Slovenian Experiences and Lessons from Tax Reforms. In Tax Reforms: Experiences and Perspectives, edited by H. Blažić, K. Ott, & H. Šimović, 149-157. Zagreb: The Institute of Public Finance.

Kreso, S. 2005. Fiscal Decentralization in B&H. Paper presented at the International Symposium: Bosnia and Herzegovina from Past to Present, Çanakkale Onsekiz Mart University, Çanakkale, April.

Kreso, S. and Lazović-Pita, L. 2013. Is Fiscal Discipline and Sustainability Strategy (FDSS) an Appropriate Option For B&H? Paper presented at the 6th International Conference The Changing Economic Landscape: Issues, Implications and Policy Options, Juraj Dobrila University of Pula, Pula, May.

Lim, D., Slemrod, J., Wilking, E. 2013. Expert and Public Attitudes Towards Tax Policy: 2013, 1994, and 1934. National Tax Journal. 66 (4): 775-806.

Musgrave, R.A. and Musgrave P. 1993. Javne financije u teoriji i praksi. [Public finance in theory and practice]. Zagreb: Institut za Javne Financije.

OECD. 2010. *Choosing a Broad Base - Low Rate Approach to Taxation*. OECD Tax Policy Studies No. 19. Paris. OECD. DOI: 10.1787/9789264091320-en (accessed: May 5, 2011).

OECD. 2014. Taxing Wages 2014. Paris. OECD. DOI: 10.1787/tax_wages-2014-en (accessed: April 25, 2015).

Official Gazette of B&H. 2003. Decision on the Establishment of the Commission for the Indirect Tax Policy. Official Gazette of B&H 4.

Schneider, F. 2012. The Shadow Economy and Work in the Shadow: What Do We (Not) Know? IZA DP No. 6423. http://ftp.iza.org/dp6423.pdf (accessed: July 15, 2013).

Šimović, H., Blažić, H., Štambuk, A. 2013. Što porezni stručnjaci misle o poreznom sustavu i poreznoj politici u Hrvatskoj? [What do tax experts think about Croatian tax system and tax policy?]. Porezni vjesnik. 22 (12): 31-37. http://www.ijf.hr/upload/files/file/PV/2013/12/simovic.pdf (accessed: April 20, 2014).

Šimović, H., Blažić, H., Štambuk, A. 2014. Perspectives of Tax Reforms in Croatia: Expert Opinion Survey. Financial Theory and Practice. 38 (4): 405-439. http://fintp.ijf.hr/upload/files/ftp/2014/4/simovic_blazic_stambuk.pdf (accessed: January 20, 2015).

Slemrod, J. 1995. Professional Opinions About Tax Policy: 1994 and 1934. National Tax Journal. 48 (1): 121-147.

Tax Administration of FB&H. 2014. Pregled poreznih obveznika sa iznosom duga po osnovu poreza, doprinosa, taksi i drugih naknada prema evidencijama kantonalnih poreznih ureda nadležnih ispostava na dan 28.02.2014. [Taxpayers debt status for taxes, contributions, fees and other fees according to the records of the cantonal tax offices on February 28, 2014 – a review]. Sarajevo. Tax administration of FB&H.

Tax Administration of RS. 2014. Pregled stanja duga na dan 28. 02. 2014. [Debt Status on February 28, 2014 – a review]. Banja Luka. Tax administration of RS.

(Endnotes)

1 This work has been supported in part by the Croatian Science Foundation under the project number IP-2013-11-8174 and in part by the University of Rijeka under project number 13.02.1.2.02.We would like to thank Prof. dr Sead Kreso for his support during this project. Also, we would like to thank Mr. Midhat Arifović and Mrs. Aida Hakalović from the Tax Administration of the FB&H for their engagement and willingness to expedite this survey. Authors would also like to thank the two anonymous referees for their useful suggestions.

2 The OHR, since the High Representative in B&H proclaimed the unified "Law on Customs and Excise Duties" which provided a basis for further developments in the field of indirect taxation. The High Representative passed in February 2003 the Decision on the Establishment of the Commission for Indirect Taxation Policy (Official Gazette of B&H, No. 4, 2003), pursuant to his powers and aimed at ensuring economic sustainability in B&H.

3 Bachelor's degree includes those who successfully finished undergraduate studies of both the pre-Bologna and Bologna types. Similarly, master studies include postgraduate studies in the same manner.

4 The Likert scale was scaled as following: 1-strongly disagree, 2-disagree, 3-neutral, 4-agree and 5-strongly agree.

5 All responses are analysed and discussed in comparison to those respondents who answered negatively to the given statements.

DE GRUYTER OPEN

South East European Journal of Economics and Business
Volume 10 (2) 2015, 45-54
DOI: 10.1515/jeb-2015-0011

MEASURING THE IMPACT OF INNOVATIONS ON EFFICIENCY IN COMPLEX HOSPITAL SETTINGS

Petra Došenović Bonča, Maks Tajnikar

Abstract

In this paper the authors propose an approach for measuring the impact of innovations on hospital efficiency. The suggested methodology can be applied to any type of innovation, including technology-based innovations, as well as consumer-focused and business model innovations. The authors apply the proposed approach to measure the impact of transcanalicular diode laser-assisted dacryocystorhinostomy (DCR), i.e. an innovation introduced in the surgical procedure for treating a tear duct blockage, on the efficiency of general hospitals in Slovenia. They demonstrate that the impact of an innovation on hospital efficiency depends not only on the features of the studied innovation but also on the characteristics of hospitals adopting the innovation and their external environment represented by a set of comparable hospitals.

Keywords: *healthcare, innovation, hospital processes, hospital efficiency, production-possibility frontier, Data Envelopment Analysis*

JEL: *I10, O30*

INTRODUCTION

This paper addresses the issues of adequately identifying the impacts of innovations in complex hospital settings and discusses how the impact of innovations on hospital efficiency should be measured. As shown by Vasileiou, Barnett and Young (2012) through interviews with 18 key informants in the United Kingdom who had won Health Service Journal awards for successfully implementing 15 service innovations, evidence of efficiency is one of the four concepts of evidence employed by health care innovators in pursuing service innovations and in demonstrating their success. In measuring the impact of innovations on hospital efficiency, technology-based innovations are those most commonly considered. However, there is increasing focus also on other types of innovations in health care, including consumer-focused innovation and business model innovation (Herzlinger 2006). The methodology proposed in this paper can be applied to any type of innovation.

The impacts of different types of innovations have been extensively studied in health care and existing empirical studies investigating the relationship between innovations and efficiency vary significantly in

Petra Došenović Bonča, PhD
Assistant Professor
University of Ljubljana, Faculty of Economics
E-mail: petra.d.bonca@ef.uni-lj.si

Maks Tajnikar, PhD
Full Professor
University of Ljubljana, Faculty of Economics
E-mail: maks.tajnikar@ef.uni-lj.si

their key research questions. Kazley and Ozcan (2009), for example, employ DEA to study how the use of electronic medical records impacted the efficiency of US acute hospitals. Lee and Menon (2000) similarly investigate the relationship between efficiency and investments in IT and find that hospitals investing more in IT are technically more efficient. Ozcan, Watts, Harris and Wogen (1998) analyze technical efficiency and provider experience in the treatment of stroke patients. They show that inefficient providers can lower their costs if they improve their processes according to the practices of more efficient providers. Nickel and Schmidt (2009) conducted a case study in a German university hospital to study how organizational changes and process reengineering impact capacity utilization and waiting times in its radiology department. Leu and Huang (2011) similarly demonstrate how modelling, reengineering and the informatization of processes can lower, for example, the hospital's bed occupancy rate, the number of working hours of the nursing staff and the share of patients with unplanned hospital admission within 72 hours of discharge. Tsiachristas, Notenboom, Goudriaan and Groot (2009) develop case studies that confirm innovations play an important role in increasing labour productivity in health care. De Castro Lobo, Ozcan, da Silva, Estellita Lins and Fiszman (2010) also examine hospital efficiency and productivity but adopt a Malmquist approach to study how they are affected by innovation in the form of a financing reform. The relationship between changes in payment systems and efficiency were also examined by DesHarnais, Hogan, McMahon and Fleming (1991). Very often longitudinal data is also used for constructing Malmquist indices that can be used to identify shifts in the production possibility frontier of the studied health care providers that are usually attributed to innovation adoption (for detailed reviews see Jacobs, Smith, and Street 2006; Fried, Knox Lovell, and Schmidt 2008; Hollingsworth 2003; Hollingsworth and Peacock 2008).

Studies addressing the issue of efficiency in health care in Slovenia include, for example, the comparative study of the costs of selected groups of diagnoses in selected hospitals in Slovenia (Setnikar-Cenkar and Seljak, 2004). A recent study by Lichtenberg (2015) investigates the impact of pharmaceutical innovation on mortality and hospitalisation in Slovenia. According to this study, new chemical entities launched in Slovenia during 2003-2009 have reduced the number of hospital discharges in 2010 by 7 percent.

The authors of this paper propose a different approach to studying innovations as factors of efficiency. They extend the analysis of process-level effects of innovations to their hospital-level efficiency effects. In doing so, they build on two important notions.

First, every innovation initially impacts specific hospital processes. Every innovation affects some hospital processes directly by, for example, altering their flow and/or structure and may also indirectly affect the input-output ratios of other unaltered processes simply because available capacities and the hospital's organizational structure determine the relationships between various hospital processes. Because hospitals as process organizations are in essence a set of various processes, this implies that every innovation impacts hospital efficiency both directly and indirectly, and that it is crucial we capture overall effects to correctly assess the innovation's impact on hospital level efficiency. The authors show that this is particularly challenging, because internal characteristics and especially the existing inefficiencies of the innovation-adopting hospital can significantly influence both the type and the magnitude of the process-level effects of the innovation being studied.

Second, by definition a successful innovation adopted by an organization sets a new benchmark for other comparable organizations. This has important implications for assessing the impacts of innovations on hospital-level efficiency because it can only be measured relatively to other hospitals. In such a setting a specific innovation alters benchmarks only if it indeed translates into technological progress that is reflected in shifts of the production possibility frontier and the reduced technical efficiency of hospitals that lag behind in adopting the innovation in question. In this context, a change adopted by a specific hospital is considered an innovation if it creates technological progress, while other changes that affect the studied hospital but are not novel to other observed hospitals need to be treated differently. This is why in designing their approach the authors pay special attention to separating the effects of a studied innovation from the catch-up effects that may arise in hospitals due to the increased technical efficiency of existing techniques. If the innovation is to shift the production possibility frontier, its impacts have to be observed in an innovation-adopting hospital that comprises the production-possibility frontier. Such hospitals are by definition technically efficient. This implies that the impacts of innovations on hospital efficiency have to be investigated in technically efficient hospitals.

The authors use the proposed approach to measure the impact of transcanalicular diode laser-assisted dacryocystorhinostomy (DCR), i.e. an innovation introduced in the surgical procedure for treating a tear duct blockage, on the efficiency of general hospitals in Slovenia. Even though the studied case innovation is an example of technology-based innovation, this

methodology can be applied to any type of innovation, such as consumer-focused and business model innovations, according to Herzlinger (2006).

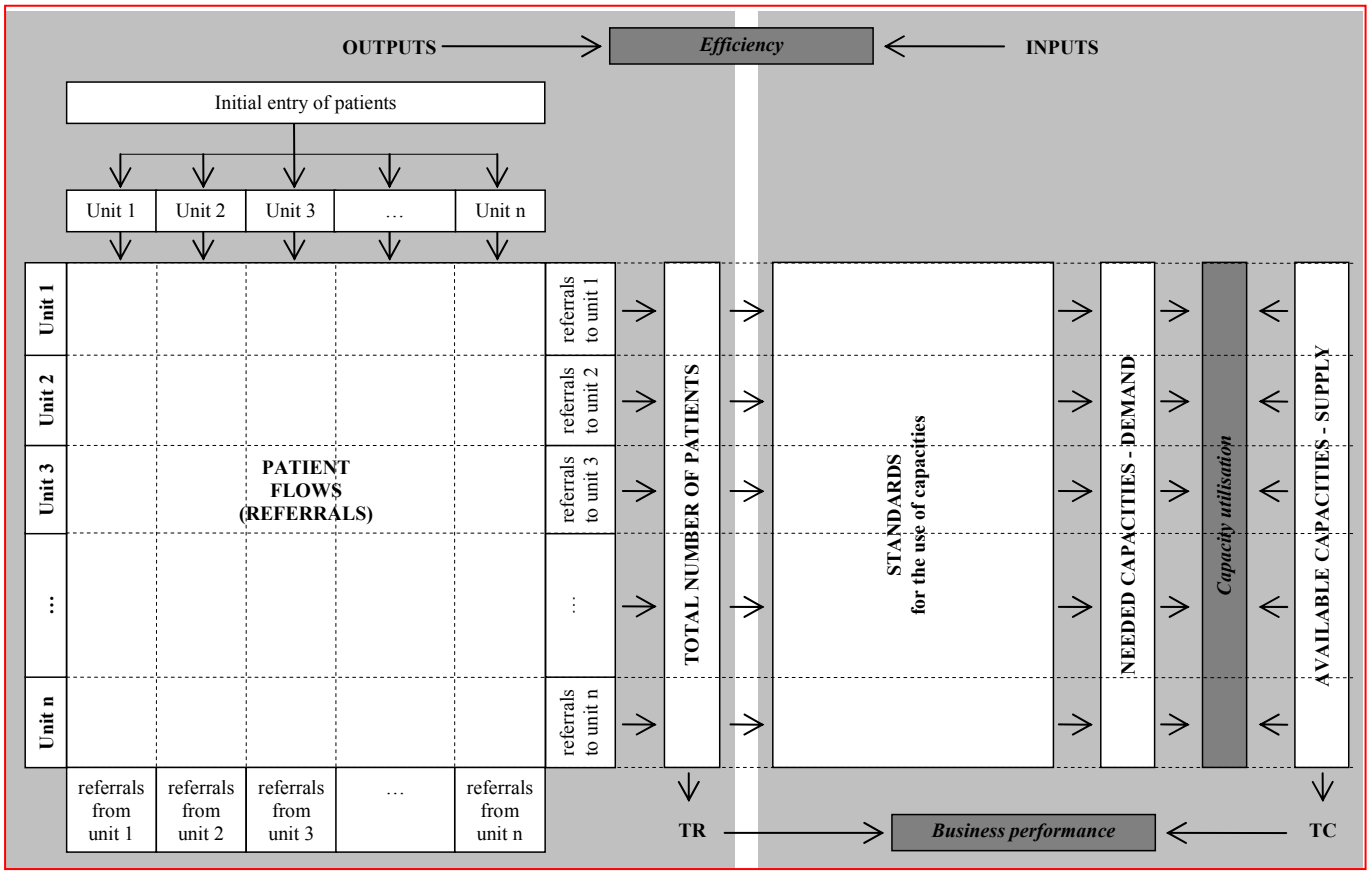
1 PROCESS-LEVEL IMPACTS OF INNOVATIONS IN COMPLEX PROCESS ORGANIZATIONS

Both the direct and indirect effects of innovations can be observed in a studied hospital. We may often find that a specific hospital process is altered by the studied innovation, and as a result the ratio of output to inputs of such a process increases. However, by observing also the innovation's indirect effects, i.e. the changes it provokes in other hospital processes, one might reveal the worsening of outputs-to-inputs ratios in other processes and consequently also on the level of the hospital as a whole. The impacts of a specific innovation must thus be observed not only at the level of individual processes, but also at the level of the individual organizational units of the innovation-adopting hospital so that its overall impact can be correctly identified and measured on the level of the hospital as a whole.

The process-level effects of the studied innovation can be translated into hospital level effects by using a model of the innovation-adopting hospital that represents it as a process organization (Ould 1995; Harmon 2007; Poulymenopoulou et al. 2003; Anyanwu et al. 2003; Lenz and Reichert 2007). In such a model, on the one hand, the structure and flow of individual core business processes form links between organizational units, while on the other, the available capacities and other resources of individual organizational units create a dependency between various core businesses. Figure 1 illustrates a simplified example of such a model of a hospital.

By controlling for both types of dependencies, the overall effects of an innovation can be determined on the level of individual processes, as well as on the level of individual organizational units and in the aggregate for the entire hospital. In identifying all direct and indirect innovation effects the authors pay special attention to the fact that the model of a hospital has to be designed so that it can measure the effects of innovations in terms of input and output categories that can then be used for estimating hospital efficiency. Input and output variables have to be designed to accommodate heterogeneous hospital inputs and outputs (O'Neill, Rauner, Heidenberger and Kraus 2008). In this way, the process-level direct and indirect effects of a specific innovation can be translated into hospital-level efficiency effects.

Figure 1: The model of a hospital



2 HOSPITAL-LEVEL EFFICIENCY IMPACTS OF INNOVATIONS

To assess the impacts of a studied innovation on hospital efficiency the authors include data envelopment analysis (DEA) in the proposed methodology. DEA has been widely used to assess hospital efficiency (Liu et al. 2013; Bouland et al. 2012). Even though other methods could also be used for the purpose of efficiency analysis (see, for example, Wagstaff 1989; Hollingsworth and Peacock 2008; Jacobs et al. 2006) DEA is employed in this paper because of the small size of Slovenia's public sector (Obadić and Aristovnik 2011; Zorić, Hrovatin and Scarsi, 2009).

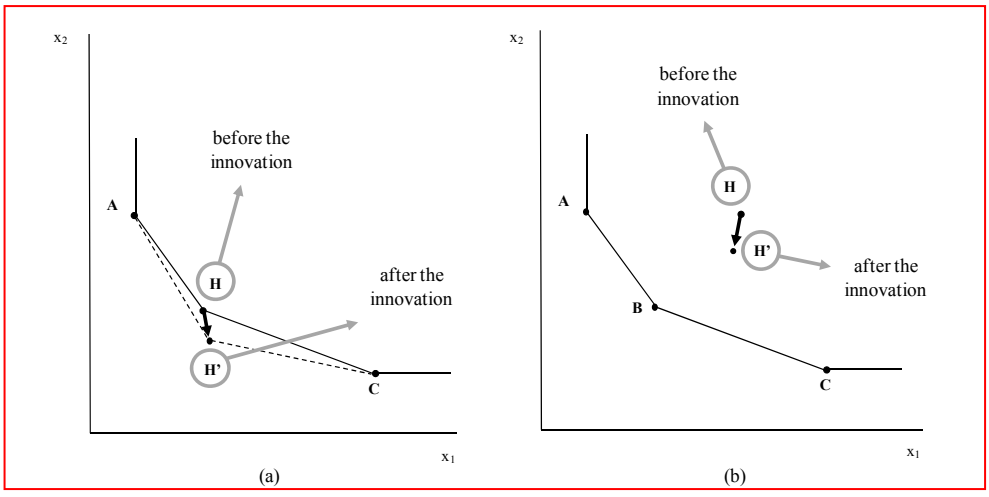
By using DEA the effects of a specific innovation on hospital efficiency can be measured by calculating the difference between the DEA efficiency scores that characterize the studied hospitals before the innovation was implemented by the innovation-adopting hospital and the DEA efficiency scores of the observed hospitals after the innovation was implemented by the innovation-adopting hospital.

For the purposes of this paper, however, the use of DEA is extended so that a theoretically consistent environment for identifying innovation effects is created. Namely, in studying innovations as factors of efficiency the authors build on the notion that innovations are new techniques or better solutions that organizations can apply to meet new requirements. As such, true innovations should translate into technological progress. In assessments of efficiency and productivity changes over time the latter is reflected in a desired shift of the production possibility frontier. This implies that the authors do not treat all changes hospitals adopt to increase their ratio of outputs to inputs, i.e. technical efficiency, as innovations. A novelty is treated as an innovation only if it represents a better solution for the whole set of studied hospitals. As such it has to be reflected in a shift of the production possibility frontier so that it can be clearly differentiated from the catch-up effect of inefficient hospitals (Zhu 2003, p. 279). Only in such a setting can benchmarking methods such as DEA set new targets and identify a reduction in the technical efficiency of those hospitals that lag behind in adopting the studied innovation.

2.1 Determining the Efficiency Impacts of Innovations in Inefficient Innovation-Adopting Hospitals

In observing and measuring the impact of innovations on hospital efficiency, one has to consider that the innovation-adopting hospital can be either an efficient or an inefficient hospital. In the first case, the innovation-adopting hospital comprises the production possibility frontier. In such a technically efficient hospital, a successful innovation will automatically be reflected in the shift of the observed production possibility frontier, thereby signifying technological progress for other hospitals and altering their benchmark. Figure 2a illustrates using an isoquant diagram for a single output-two inputs (x_1 and x_2) case that an innovation-adopting hospital H comprises a set of efficient hospitals (A, H and C). Because hospital H defines the production possibility frontier, any successful innovation that this hospital adopts automatically alters the frontier and shifts it closer to the origin. It is also possible that this hospital adopts a new technique that fails to improve its position and may even exclude the hospital from the set of efficient hospitals. Such an adopted novelty cannot be considered a successful innovation. This discussion raises an important issue of measuring output in health care organizations and the need to control for undesirable output in the form

Figure 2: The role of the efficiency status of innovation-adopting hospitals in observing the impact of innovations



of bad quality (Prior 2006).

If the innovation-adopting hospital exhibits inefficiency, meaning that it does not shape the production possibility frontier, the studied innovation will not necessarily translate into a shift of the production possibility frontier. In this case, as Figure 2b shows, the analysis of the innovation's impact on hospital efficiency may fail to interpret the studied innovation as technological progress and may thus set the benchmarks for other hospitals incorrectly. The inefficiency of the hospital in question measured by benchmarking methods such as DEA would decrease due to the innovation, but the innovation would not impact the measured efficiency levels of other comparable non-innovating hospitals. This is a direct consequence of an unaltered production possibility frontier that also implies unchanged benchmarks for the studied set of hospitals. As a result, there is no clear indication of what a specific innovation means for other non-innovating hospitals.

Another less obvious problem of studying the impacts of the studied innovation in an inefficient innovation-adopting hospital is that the innovation's process-level effects that depend on the structure and flow of business processes and the structure and distribution of capacities among hospital units may be influenced by existing inefficiencies. This is shown, for example, by Jakovljević et al. (2013), who show variability in the use of expensive high-tech services due to differences in the level of adherence to guidelines for the application of radiological methods in clinical practice. As a result of such existing inefficiencies, the measured effects of innovations can be influenced substantially by the characteristics of the innovation-adopting hospital.

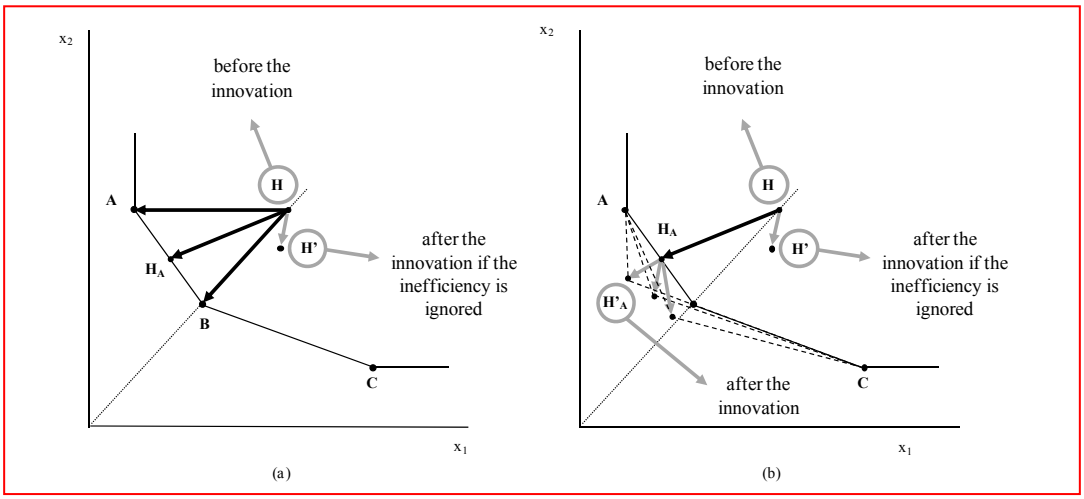
2.2 The Artificial Innovation-Adopting Hospital

If the innovation-adopting hospital proves to be inefficient, the authors suggest that the hospital be moved onto the frontier through the process of constructing an artificial hospital. In this way, the innovation-adopting hospital becomes efficient for the purpose of measuring the impact of a specific innovation on hospital efficiency.

An inefficient hospital can be moved onto the frontier in many different ways. One alternative refers to a proportional decrease of employed inputs, while other alternatives involve various disproportional reductions of employed inputs. These alternatives reflect the aggregate effects of the possible approaches an inefficient hospital could undertake to reengineer its processes. Figure 3a illustrates that the selected reengineering could move the inefficient innovation-adopting hospital H to, for example, points A, B or H_A. By moving the inefficient innovation-adopting hospital onto the frontier we construct an artificial hospital that eliminates the inefficiencies that characterize some of the innovation-adopting hospital's business processes.

By constructing the artificial hospital, the aggregate quantity of outputs and inputs of the innovation-adopting hospital are altered. Yet this move involves changes within the hospital on the level of its processes. A proportional decrease of the aggregate quantities of the hospital's inputs may be achieved with disproportional changes of inputs and outputs on the level of individual organizational units. Moreover, different input and output changes on the level of organizational units may result in the same aggregate changes on the level of the hospital. This implies, for example, that point H_A in Figure 3a does not depict a single artificial hospital. It can represent different

Figure 3: An artificial hospital as a tool for measuring the impact of innovations on hospital efficiency



artificial hospitals with the same aggregate quantities of inputs and outputs but with differing internal characteristics, i.e. differing structures, flows and features of business processes.

This means that the process of constructing an artificial hospital can create very different environments for measuring the impact of innovations on efficiency. In such environments the effects of innovations translate into shifts of the production possibility frontier. However, as Figure 3b illustrates, the shifts depend on the internal characteristics of the constructed artificial hospital. This implies that the same innovation may yield differing effects on hospital efficiency. This is due to the fact that its process-level effects depend strongly on the structure and flow of business processes and the structure and distribution of capacities within the hospital that are determined by the proposed or assumed form of reengineering. Regardless of the selected reengineering, a true innovation, if observed in the artificial hospital, alters the production possibility frontier. This may not be the case if the innovation is observed in the actual inefficient innovation-adopting hospital.

The construction of the artificial hospital thus enables us to measure the impact of innovations in a theoretically consistent way where a successful innovation shifts the production possibility frontier in line with the technological progress achieved. It also ensures that in the case of an inefficient innovation-adopting hospital the impacts of the studied innovation are not confounded with the hospital's catching up effect due to the increased efficiency of its existing techniques. Furthermore, the process-level effects of innovations are not mismeasured due to the innovation-adopting hospital's inefficiency. Yet the measured effects then depend not only on the characteristics of the innovation-adopting hospital and its external environment represented by a set of comparable hospitals in differing national health care systems (Jakovljević 2012), but also on the process of constructing the artificial hospital.

3 THE CASE INNOVATION: TRANSCANALICULAR DIODE LASER-ASSISTED DACRYOCYSTORHINOSTOMY

The authors apply the proposed approach to assess the hospital-level efficiency effects of an innovation introduced in the surgical procedure for treating a tear duct blockage in one hospital in Slovenia (Drnovšek-Olup et al. 2004; Drnovšek-Olup, Beltram, 2010; Olver 2002, pp. 115-126). They start their analysis by employing DEA to identify the production possibility frontier of general hospitals in Slovenia and to assess the efficiency status of the innovation-adopting hospital. For this purpose, they specify several input-oriented constant-returns-to scale (CRS) DEA models (Charnes et al. 1978; Zhu 2003) and employ pooled data on the inputs, outputs and input prices of 12 general hospitals in Slovenia for the period of 2005–2008. The studied hospitals represent the total population of general hospitals in the country.

Even though the authors examine different model specifications to check the consistency of the obtained results, only one specification can be used in the later stages of the analysis. Namely, the selected specification must include categories that are used to model those processes that are altered by the innovation in question and comprise the elements of the model of the innovation-adopting hospital that is used to translate the process-level effects of the case innovation to hospital-level effects.

In this paper, the number of inpatients and number of outpatients are used as outputs, while labour measured by the number of full-time equivalents (FTEs) and capital measured with the discounted cost value of property, plant and equipment represent the employed inputs. The price of labour is calculated as the ratio of real annual labour costs and the average number of FTEs. The price of capital is calculated as the ratio of the sum of depreciation cost and cost of financing on one hand, and the cost value of property, plant and equipment on the other. The selected output variables may not reflect output heterogeneity, but they are used in this paper because of the way the model of the innovation-adopting hospital was constructed. Both the model of the hospital and DEA analysis can of course be refined given available data. In this paper they are only used to illustrate the proposed methodology for assessing the impacts of innovations on hospital-level efficiency.

DEA applied in this paper reveals that the innovation-adopting hospital is both technically- and cost-inefficient. The radial measure of its technical efficiency equals 0.9821, and the radial measure of its cost efficiency is 0.9531.

3.1 Constructing an Artificial Hospital

Because the studied innovation-adopting hospital is both technically- and cost-inefficient, it was necessary to construct an artificial hospital that is an efficient twin of the inefficient innovation-adopting hospital. First, we need to identify the target aggregate values of the outputs and inputs that would render the innovation-adopting hospital efficient by moving it onto

the production possibility frontier. Second, we need to identify which changes need to be implemented at the level of hospital processes and units so that the aggregate target values of inputs and outputs can indeed be attained. This second step first involves a clear identification of various hospital processes that are used to develop a model of the innovation-adopting hospital, which is illustrated in Figure 1, and then altering the model's elements so that the hospital's inefficiency is eliminated.

The authors have developed and quantified such a model for an innovation-adopting hospital by using data regularly collected and reported by the studied hospital and by collecting data on site by observing hospital operations and interviewing hospital staff over a period of a year and a half. The model is not shown here because of the large data set, but as illustrated by Figure 1, it allows us to identify capacity utilization rates for every organizational unit of the studied hospital. For the purpose of illustrating the proposed methodology for measuring the impact of innovations on hospital efficiency the authors used the results of the capacity utilization analysis at the level of individual organizational units of the studied innovation-adopting hospital. By altering utilization rates and eliminating large differences in utilization rates between various organizational units they achieved a reduction in the quantity of inputs, which allowed the hospital to move onto the production-possibility frontier. As previously mentioned, this is not the only possible approach to transform an inefficient hospital towards efficiency. In the studied case, however, this seemed most reasonable because of a generally low capacity utilization rate, as well as the large differences in capacity utilization between different organizational units.

The alterations described above enabled the authors to construct from an inefficient innovation-adopting hospital an efficient artificial hospital whose aggregate values of inputs and outputs equal the target values of the inputs and outputs of the innovation-adopting hospital.

3.2 Impacts of the Case Innovation

The process level effects of the studied innovation were identified by developing the "as was" and "as is" process models and comparing their structures, flows and the relating consumptions of hospital resources per patient treated. Process modelling revealed that process-level direct and indirect effects of the case innovation studied in this paper include alterations in the structure and length of DCR surgery, a shortening of how long patients stay in the ophthalmology department, and an increase in the number of patients referred to the department of otolaryngology for additional tests. The studied innovation also created changes in the type of equipment used to deliver the surgery and length of equipment use. The studied innovation correspondingly altered the prices of inputs employed during surgery.

The identified direct and indirect process-level effects of the studied innovation were translated to hospital-level input and output effects by using the elements of the model of the artificial hospital. In this paper the case innovation does not alter the studied hospital's output, as it is determined by a contract with the provider of compulsory health insurance. The studied innovation does, however, reduce the required inputs. If the model of the hospital is refined given available data on output quality, both input and output changes could possibly be observed for the studied innovation.

By using the model of the artificial hospital we find that the case innovation decreases the aggregate quantity of the human capacities of the studied hospital by 0.25 full-time equivalents and the total value of its material capacities by €18,932, leaving the output level unaltered. This relatively small decrease results from the fact that only 0.1 percent of patients of the ophthalmology department of the analyzed hospital are candidates for DCR. This illustrates that the impact of innovations on hospital efficiency depends on the hospital setting.

3.3 Measuring the Impact of the Case Innovation on Hospital Efficiency

By using the methodology described above, the impact of case innovation on efficiency cannot be assessed by comparing the efficiency measure of the artificial hospital prior to innovation to its efficiency measure after the innovation is adopted. This is because the artificial hospital was constructed to represent an efficient twin of the innovation-adopting hospital and its technical efficiency measures equal 1 both prior to and after implementing the innovation in question. Even though the innovation does not alter the efficiency measures of the artificial hospital, it does shift the production possibility frontier. Consequently, the innovation's impact is reflected in the efficiency measures of other non-innovating hospitals. This means that the impact of a specific innovation on hospital efficiency can be measured by identifying changes in the average efficiency of the observed set of hospitals.

The innovation's impact on efficiency is thus measured by observing the change in the average technical efficiency of the studied hospitals and the change in the average cost efficiency of those hospitals. The results show that the case innovation decreases statistically significantly both average technical and average cost efficiency (Tables 1-2). The results regarding technical efficiency demonstrate that the case innovation has indeed shifted the production possibility frontier towards increased efficiency, meaning that the case innovation can be considered a successful innovation.

In this paper the authors suggest determining the impact of the case innovation on hospital efficiency by comparing the average DEA hospital efficiency scores characteristic of Slovenian general hospitals before the selected innovation was implemented by the artificial hospital and the average DEA hospital efficiency scores after the innovation was implemented. However, other approaches could be used to measure the impact of the case innovation on the production possibility frontier.

One alternative involves observing the impact of the innovation on hospital efficiency by identifying the change in the super efficiency measure of the innovation-adopting hospital prior to and after implementing the innovation (Andersen and Petersen 1993; Zhu 2003, p. 198). Other alternatives include observing the change in the influence measures of the innovation-adopting hospital (Pastor et al. 1999) and identifying the changes in the stability region of the innovation-adopting hospital (Zhu 2003, pp. 237-239). Although the results of these other approaches are not reported here, they all confirm that the case innovation has indeed shifted the production possibility frontier towards increased efficiency.

4. CONCLUSIONS

The proposed methodology for measuring the impact of innovations on hospital efficiency provides two important conclusions for studying the impact of innovations.

First, even though the assessment of efficiency involves the use of fairly standard methods and techniques, one has to think carefully about the efficiency measurement process when the goal is to measure the impact of innovations on efficiency. By definition, a successful innovation represents technological progress. Accordingly, its effects cannot be reflected solely by the improved efficiency status of the innovation-adopting hospital. Its effects have to be translated into a shift of the production possibility frontier so that the innovation truly and in a correct way impacts the efficiency status of all non-innovating hospitals. Only in such circumstances does it make sense to measure the impact of a specific innovation on hospital efficiency by identifying changes in the average efficiency of the observed set of hospitals.

Second, analyzing innovations in relation to efficiency requires that we do not observe the impacts of a specific innovation by isolating the innovation in question from its hospital internal and environment, where the latter is represented by a set of comparable hospitals. Namely, one must keep in mind that innovations create both direct and indirect effects and that both types of effects can be observed both at the level of processes and at the level of organizational units, and thus the hospital as a whole. Further, isolating the innovation in question from its hospital environment is made impossible by the fact that the efficiency of a specific hospital can only be measured relative to the efficiency of other comparable hospitals. This

Table 1: Comparison of technical and cost efficiency scores prior to and after implementation of the case innovation

	TECHNICAL EFFICIENCY (TE)		COST EFFICIENCY (CE)	
	before the innovation	after the innovation	before the innovation	after the innovation
	$A\theta_0$	$A\theta_1$	$B\theta_0$	$B\theta_1$
Average	0.8740	0.8733	0.8605	0.8597
Std. dev.	0.1006	0.1005	0.0997	0.0996
Min	0.6033	0.6030	0.5969	0.5963
No. of efficient DMUs	3	2	2	1

Table 2: The Wilcoxon signed-rank test – a comparison of average technical efficiency scores

	Comparison of TE and CE measures before and after the innovation	
	$A\theta_1$ and $A\theta_0$	$B\theta_1$ and $B\theta_0$
Z statistic	-5.907	-6.030
P-value (two sided test)	0.000	0.000

again demonstrates that the impacts of innovations on hospital efficiency are conditional on the hospital's internal characteristics and competitive environment. This is why the impact of a specific innovation differs across hospitals adopting the innovation, and that the adoption of a particular innovation that is reasonable for some hospitals may not create the desired effects for certain other hospitals. For example, capital-intensive innovation may significantly increase efficiency in certain environments, whereas the same innovation could also lead to reduced efficiency in other environments. One might easily imagine an innovation that improves technical efficiency but reduces cost efficiency due to a big rise in input prices.

The impacts of a specific innovation might thus, for instance, be significant in developed health care systems, while in another less developed health care system its impact could be minor. It is important to again to note that the direct and indirect process- and unit-level impacts of a specific innovation depend on the characteristics of the innovation-adopting hospital. This implies that we will obtain different impacts from a specific innovation if we observe them in two different efficient innovation-adopting hospitals. Regardless of these limitations, the methodology proposed in this paper does allow us to investigate the impacts of specific innovations in specific environments on efficiency. This provides managers with the information they need about whether the innovation in question actually improves the efficiency of their hospital.

REFERENCES

Andersen, P. and Petersen, N.C. 1993. A procedure for ranking efficient units in Data Envelopment Analysis. Management Science 39 (10): 1261-1264.

Anyanwu, K., Sheth, A., Cardoso, J., Miller, J. and Kochut, K. 2003. Healthcare enterprise process development and integration. Journal of Research and Practice in Information Technology 35 (2): 83-98.

Bouland, D.L., Fink, E., Dehaan, C. and Fontanesi, J. (2012). Data envelopment analysis: dynamic possibilities in an academic medical center application. The Journal of medical practice management 28 (2): 109-115.

Charnes, A., Cooper, W.W. and Rhodes, E. 1978. Measuring the efficiency of decision-making units. European Journal of Operational Research 2 (6): 429-444.

de Castro Lobo, M.S., Yasar, A.O., da Silva, A.C.M., Estellita Lins, M.P. and Fiszman, R. 2010. Financing reform and productivity change in Brazilian teaching hospitals: Malmquist approach. Central European Journal of Operational Research 18 (2): 141-152.

DesHarnais, S., Hogan, A.J., McMahon, L.F., Jr. and Fleming, S. 1991. Changes in rates of unscheduled hospital readmissions and changes in efficiency following the introduction of the Medicare prospective payment system: an analysis using risk-adjusted data. Evaluation & The Health Professions 14 (2): 228-252.

Drnovšek-Olup, B., Podboj, J. and Beltram, M. 2004. Transnazalna endoskopska dakriocistorinostomija (Transnazal endoscopic dacryocystorhinostomy). Zdravstveni vestnik 73 (5): 411-414.

Drnovšek-Olup, B. and Beltram, M. 2010. Long-term success rate of transcanalicular

laser dacryocystorhinostomy. Zdravniški Vestnik Suplement 79 (December): 62-67.

Fried, H.O., Knox Lovell, C.A. and Schmidt, S.S. 2008. The measurement of productive efficiency and productivity growth. New York: Oxford University Press.

Harmon, P. 2007. Business process change: a guide for business managers and BPM and Six Sigma professionals 2nd ed. Amsterdam: Elsevier/Morgan Kaufmann Publishers.

Herzlinger, R.E. 2006. Why innovation in health care is so hard. Harvard Business Review May: 58-66.

Hollingsworth, B. 2003. Non-parametric and parametric applications measuring efficiency in health care. Health Care Management Science 6 (4): 203-218.

Hollingsworth, B. and Peacock, S. 2008. Efficiency measurement in health and health care. London, New York: Routledge.

Jacobs, R., Smith, P.C. and Street, A. 2006. Measuring efficiency in health care: analytic techniques and health policy. Cambridge, New York: Cambridge University Press.

Jakovljevic, M.B. (2013). Resource allocation strategies in Southeastern European health policy. The European Journal of Health Economics 14 (2): 153-159.

Jakovljević, M., Ranković, A., Rančić, N., Jovanović, M., Ivanović, M., Gajović, O. and Lazić, Z. 2013. Radiology Services Costs and Utilization Patterns Estimates in Southeastern Europe – A Retrospective Analysis from Serbia. Value in Health Regional Issues 2 (2): 218-225.

Kazley, A.S. and Ozcan, Y.A. 2009. Electronic medical record use and efficiency: A DEA and windows analysis of hospitals. Socio Economic Planning Sciences 43 (3): 209-216.

Lee, B. and Menon, N.M. 2000. Information technology value through different normative lenses. Journal of Management Information Systems 16 (4): 99-119.

Lenz, R. and Reichert, M. 2007. IT support for healthcare processes – premises, challenges, perspectives. Data & Knowledge Engineering 61 (1): 39-58.

Leu, J.D. and Huang, Y.T. 2011. An application of business process method to the clinical efficiency of hospital. Journal of Medical Systems 35 (3): 409-421.

Lichtenberg, F.R. 2015. The impact of pharmaceutical innovation on premature mortality, cancer mortality, and

hospitalization in Slovenia, 1997–2010. Applied health economics and health policy 13 (2): 207-222.

Liu, J.S., Lu, L.Y.Y., Lu, W.M. and Lind, B.J.Y. 2013. A survey of DEA applications. Omega 41 (5): 893-902.

Nickel, S. and Schmidt, U.A. 2009. Process improvement in hospitals: A case study in a radiology department. Quality Management in Health Care 18 (4): 326-338.

Obadić, A. and Aristovnik, A. 2011. Relative efficiency of higher education in Croatia and Slovenia: an international comparison. Amfiteatru Economic 13 (30): 362-376.

Olver, J. 2002. Colour atlas of lacrimal surgery. Oxford: Butterworth Heinemann.

O'Neill, L., Rauner M., Heidenberger, K. & Kraus, M. 2008. A cross-national comparison and taxonomy of DEA-based hospital efficiency studies. Socio-Economic Planning Sciences 42 (3): 158-189.

Ould, M. 1995. Business processes: modelling and analysis for re-engineering and improvement. Chichester: John Wiley.

Ozcan, Y.A., Watts, J., Harris II, J.M. and Wogen, S.E. 1998. Provider experience and technical efficiency in the treatment of stroke patients: DEA approach. Journal of the Operational Research Society 49 (6): 573-582.

Pastor, J.T., Ruiz, J.L. and Sirvent, I. 1999. A statistical test for detecting influential observations in DEA. European Journal of Operational Research 115 (3): 542-554.

Poulymenopoulou, M., Malamateniou, F. and Vassilacopoulos, G. 2003. Specifying workflow process requirements for an emergency medical service. Journal of Medical Systems 27 (4): 325-335.

Prior, D. 2006. Efficiency and total quality management in health care organizations: A dynamic frontier approach. Annals of Operations Research 145 (1): 281-299.

Setnikar-Cankar, S. and Seljak, J. 2004. Effectiveness in the public sector: Comparison of the costs of selected groups of diagnoses in hospital health care in Slovenia. Economic and Business Review for Central and South-Eastern Europe 6 (1): 5-22.

Tsiachristas, A., Notenboom, A., Goudriaan, R. and Groot, W. 2009. Medical innovations and labor savings in health care. An exploratory study. The Hague: APE, Maastricht University.

Vasileiou, K., Barnett, J. and Young, T. 2012. The production and use of evidence in health care service innovation: a qualitative study. Evaluation & the Health Professions 36 (1): 93-105.

Zhu, J. 2003. Quantitative models for performance evaluation and benchmarking: Data Envelopment Analysis with spreadsheets and DEA Excel Solver. Boston: Kluwer.

Zorić, J., Hrovatin, N. & Scasi, G. 2009. Gas Distribution Benchmarking of Utilities from Slovenia, the Netherlands and the UK: an Application of Data Envelopment Analysis. South East European Journal of Economics and Business 4 (1): 113-124.

DE GRUYTER OPEN

South East European Journal of Economics and Business
Volume 10 (2) 2015, 55-68
DOI: 10.1515/jeb-2015-0010

MOBILE CARRIER SELECTION IN A POST-CONFLICT ENVIRONMENT – THE PRIMACY OF ETHNICITY OVER CONVENTIONAL NETWORK EFFECTS

Tarik Zaimović

Abstract

In this paper we analyze determinants which affect the selection of mobile carriers in a post-conflict environment - Bosnia and Herzegovina. We apply relevant probability modelling to test perceptions of individual respondents on different network effects obtained through a targeted representative survey. Furthermore, we explore whether some non-traditional influences might affect costumers, focusing on the role of demographic characteristics. Our results confirm that conventional network effects have a role in carrier selection, although they are different across carriers. However, we identify that the ethnicity of respondents overwhelms the traditional network effects by having the highest magnitude in the model. Our findings show that the "ethnic affiliation" of mobile carriers, attributed by the users, remains a persistent factor in attracting and keeping telecommunication costumers in Bosnia and Herzegovina.

Keywords: *network effects, mobile telecommunications, survey data, ethnicity, logistic regression, Bosnia and Herzegovina*

JEL: *M15, O32*

INTRODUCTION

As information technologies and telecommunications have become irreplaceable parts of our lives in recent decades, the role of network effects has become a subject of intense debate amongst scholars and practitioners. Network effects are a type of externality wherein products or services become more valuable with the greater number of people who use the same or compatible technology, product or service. Therefore, each new network user adds potential value through exchange with other network members (Arthur 1989; Economides 1996). A steady rise in the number of network users increases the total network value for all participants, so a considerable part of overall product value is attributed to the existence of network effects (Arthur 1990). Market winners in a variety of industries, including the telecommunications industry, tend to have these attributes associated with them.

Since the number of network users is assumed to reflect long-term market stability (Katz and Shapiro, 1994), consumers should generally prefer firms with larger installed bases (Shankar and Bayus 2003; Chun and Hahn 2007; Strader *et al.* 2007). Consequently, it can be especially difficult for newcomers to unseat

Tarik Zaimović, PhD
Assistant Professor
School of Economics and Business
University of Sarajevo
E-mail: tarik.zaimovic@efsa.unsa.ba

an established rival in markets where the influence of network externalities is strong. Moreover, given the value consumers place on installed base and market dominance, feature-richness and quality may lose in importance – with the result that the "best" product or service does not always win (Farrell and Saloner 1986; Katz and Shapiro 1992; Dranove and Gandal 2003).

Network effects can be viewed as positive externalities and/or as the utility the consumer gains by consuming a good itself, which increases with the number of other persons who consume the same good (Katz and Shapiro 1992). Varian *et al.* (2004) provides a simple way of looking at network effects, explaining that the value of the membership of one user (in a network) is positively affected by another user who joins and thus increases the network. Church and Gandal (2005) argue that network effects exist if the utility of consumption depends positively on the total number of consumers who buy a compatible product.

The existence of network effects in any particular industry involves new types of market dynamics – both for the network users (consumers) deciding to join a network and for manufacturers deciding on production (Goolsbee and Klenow 2002). In their decision to join a network, the consumer will consider network future size, which incentivizes the companies to invest in growing their network– substituting at times in the short term extra profit for long-term success and even a de facto monopoly (Economides 2009). Once the network has been established, markets favor the leading product at the expense of others. It is often a strong lock-in effect, and it raises problems of standardization and interoperability (Farrell and Saloner 1985; Katz and Shapiro 1994; Gruber and Verboven 2001).

Based on the outlines given above, we may easily cite many examples of industries that rely on network effects. In fact, any form of consumption with positive feedback to a similar degree, both on the demand and supply sides, could be understood under the term "network effects" or, if not internalized, "network externalities" (Liebowitz and Margolis 1994). Moreover, such a broad definition makes it difficult to define a uniform set of characteristics of the network, where every user is both a "consumer" and, willingly or not, a "supplier" of the established standard. Still, most authors agree that various forms of network externality significantly affect the consumers' decision to join a given network. When doing so, the consumer in fact considers a series of different direct and indirect network effects – albeit often with a poor understanding of their significance or value (Zaimovic and Avdic 2014).

The aim of this research is to analyze the significance of network effects in the Bosnian and Herzegovinian (henceforth, BiH) telecommunications market. The main question that we investigate is to what extent traditional network effects, including some non-traditional factors, play a role in consumer decision-making and loyalty in a developing telecommunication market. In this analysis we rely on new targeted survey data gathered in BiH. We apply relevant probability modelling in our estimation of the main determinants of consumers' operator choices to join a given network, and while we have identified a number of contemporary network effects, customers by large are still allied to carriers identified as ethnically "theirs". The main contribution of this paper is the finding that ethnicity remains an important determinant in the telecom market of a post-conflict economy and it trumps standard networking effects in terms of its magnitude. This is an important implication that should be considered in future research and by policy makers as well.

In our study, we start with a standard qualitative literature review (Section 1) that discusses the existing findings linked to our study as well as identifies some shortcomings that we aim to address. Next, we explain our research methodology (Section 2) through a description of the data used in empirical modelling and an explanation of our model specification choice. In Section 3 we provide a qualitative interpretation of our findings and continue by discussing the implications of the findings (Section 4) on future research. The last section concludes the paper.

1. LITERATURE REVIEW

There is a growing and rather heterogeneous literature focused on the different determinants and dimensions of network effects. For example, McIntyre and Subramaniam (2009) list 22 empirical studies published over the last 25 years, while Birke (2009) reports a list of 37 research-based works identified over the past 28 years. Given the focus of this paper, we discuss a number of relevant studies in the past ten years. With a more specific focus on mobile telephony, Kim and Kwon (2003) analyze more than 1,000 subscribers of one of the five main South Korean mobile telephony networks. They apply a conditional Logit estimation to determine whether consumers prefer larger mobile networks and conclude that indeed they do ("size effect"), not least because of the discount for calls within the network. The authors also point out that signal or network quality is an additional source of network effects. Fu (2004) had similar finding and also verifies that the install subscriber base is an important factor in Taiwanese consumer's operator choice, and that

subscriber bandwagon effect is related to on-net/off-net pricing.

On the other hand, Suarez (2005) looks at quarterly data from 177 operators from 47 countries in North and South America between 1992 and 2001. The authors investigate the mobile operators' selection of technology, on one hand, and consider interdependency of selection between the countries on the other hand. Operators were free to choose between three rival standards; the global system for mobile telecommunications, time division multiple access, and code division multiple access. While there is some interoperability between systems and all subscribers can call each other, other important characteristics of the technologies remain incompatible. The author concludes that the mobile operators' choice of technology is not influenced by the total installed base of the given technology, but by the installed base in the countries with which the operator expects the strongest communication ties (traffic). Suarez supports this claim with the finding that gross network size is a relatively poor proxy for network value and that other attributes may be contributing to the benefits of an installed base in network industries. Weitzel *et al.* (2006) argue that such attributes may include ties between network partners, as well as the density and topology of user networks.

Koski and Kretschmer (2005) present an analysis of 32 industrialized countries between 1991 and 2000 looking at the start-up of the GSM 2G networks. They conclude that standardization considerably accelerated entry and diffusion of 2G technology and that price competition within standards is less aggressive than competition between them. More surprisingly, they find that liberalization of fixed line telephony markets itself accelerates commercialization of GSM 2G networks. Using the same approach, Doganoglu and Grzybowski (2007) measure the impact of network effects on the penetration of mobile telephony into the German market between 1998 and 2003. They find that in the absence of network effects penetration levels for mobile phones would have been at least 50% lower by the end of the period in focus.

Birke and Swann (2006) provide an overview of the impact of price changes on the structure and volume of traffic. Having analyzed market data for the four largest mobile operators in Great Britain over five years, as well as for 1000 households in three stages, the authors conclude that an additional one percent discount on intra-network calls results in a 0.46% reduction in the ratio between on- and off-network calls. Interestingly, by using a Multinomial Logit estimation of operator choice, the authors find that each additional family member using the same network has much the same effect on operator choice as an overall increase of 9.2 million in the subscriber numbers for that network. Moreover, Birke, Swann (2006) also demonstrate that household members coordinate their choice of mobile phone carrier, so that, while the mobile phone networks were highly compatible with each other from a technological point of view, network effects were often induced by network operators through higher prices for off-net than for on-net calls. Birke (2008) investigates a large European mobile operator, looking for interdependency between the decision to switch networks and price differentials between on- and off-net calls. Social networks were added as an independent variable to the model. This study identifies that consumers prefer to be in the same network as those they communicate most with. If a co-worker switches to another network, the probability a given individual will also change network doubles. Lower prices for on-net calls can also be an entry barrier to switching networks.

In the extension of their earlier study, Birke and Swann (2010) confirm that the respondents coordinate choice of mobile carrier. They also identify the presence of social networks in carrier selection. This is a similar finding to that of Corrochera and Zirulia (2009); these authors conclude that Italian students who spend more time and pay more attention to the selection of mobile carrier are also those who pay more attention to local network effects and appreciate more operators' selection of their contacts.

In the analysis of the strength of network effects on the Polish market between 1996 and 2001, Grajek (2010) finds that the estimated market size without network effect would have been 15 times smaller than it actually is with network effects. They find that a strong tendency to reduce off-net calls results not just from lower prices for on-net calls, but also from other effects as well, including signal quality and conformist behavior on the part of users. Grajek and Kretschmer (2009) report that user heterogeneity dominates network effects, while different technological generations are complements in terms of usage, but substitutes in terms of subscription. One the other hand, Haucap and Heimeshoff (2011) in their investigation find that consumers may overestimate savings that result from reduced on-net charges and do not correctly incorporate the structure of on-net and off-net calls in their calculations to find optimal tariffs.

In a more recent study, Sobolewski and Czajkowsi (2012) use a multinomial logit model to identify the presence of strong network effects in the Polish mobile market. They attribute these findings to the ratio of the respondents' social group using the same operator and to the strength of on-net price discounts.

In addition, their finding indicates that the degree of price-based competition between mobile operators is limited by non-price factors, which do contribute to subscribers' choices. Also, Karacuka *et al.* (2013) analyzes local network effects on operator choice in the Turkish mobile market and relying on a nationwide survey they find close relationship between operator choice and the carrier selection of other people in their local area rather than the overall size of the operator.

Basaran *et al.* (2014) rely on multinomial and conditional logit estimations to examine the operator choice decisions of subscribers in the Turkish mobile market. They find that overall subscriber base and carriers' pricing strategies are important factors to new subscribers. In addition, their finding further emphasizes that social networks, compared to price or the installed base, have a more significant influence on operator choice and that subscribers that have already selected their carrier are more reluctant to switch because of established contact and the advantages of lower on-net prices. In other words, Basaran *et al.* (2014) confirm that social network ties, like family, friend or colleagues, are more important in their selection than prices or the overall size of the operator.

Building on the studies presented above, we develop a model for investigating the consumer selection of mobile service providers currently operating in Bosnia and Herzegovina. The mobile service was introduced few years after the Bosnian war (1991-1995). Under the initial mobile provision licensing arrangement (licenses issued in April 2001), all three carriers (BH Telecom, Telecom Srpske and Croatian Telecom) were obliged to provide signal coverage over 80% of the country's territory by 2004 (including all major cities and roads). BH Telecom was the first one that achieved this goal, in 2003, significantly exceeding the threshold level, and by 2006 all three had met this licensing requirements provision. By 2010, the signal coverage was above 95% of BiH territory and all three carriers had offices and sales-points in all the major cities in the country. Moreover, the Communications Regulatory Agency (CRA) had by 2008 introduced a number-portability service, so that by the end of 2012, despite some initial difficulties during introduction, it had become part of the standard service-packages offered by all three mobile carriers. Accordingly, by using the targeted survey data from 2013, we will analyze determinants of costumers' choice and loyalty to its providers.

Considering the post-conflict environment of BiH, it is inevitable to investigate the effect of ethnicity in our modeling, since different ethnic determinants have been already identified as important in much of the empirical (social) research focused on this country (Efendic *et al.* 2011; Efendic *et al.* 2014). This is because BiH is a multicultural country with one of the most 'complicated' ethnic structures in Europe, which has been deepened by a number of problems in the recent past, including the recent Bosnian war.

When BiH was part of ex-Yugoslavia (1945-1992), it was one of the six republics having the highest level of ethnic tolerance (Hodson *et al.* 1994; Dyrstad 2012). Unfortunately, the war caused a structural break in ethnic composition. This was the period when a multiethnic BiH went through a radical change from ethnically quite tolerant to quite intolerant in just a few years (Dyrstad 2012). Almost two decades after the war, the country remains highly segregated along ethnic lines, where the three main ethnic groups have substantial autonomy and control over their own ethno-territorial units (Bieber 2010). Ethnic divisions created during the war period have largely been institutionalized by the constitution (Bieber 2006), including initially the telecommunication market as well. Accordingly, the three telecommunications operators were initially organized following ethnic lines established during the war. When establishing their mobile services, signal coverage was also limited to specific areas within BiH. Establishment of the state-level Communication Regulatory Agency eventually produced fierce market competition, especially for urban areas. Nevertheless, our initial research presumption was that the choice of mobile carrier in Bosnia and Herzegovina still reflects the ethnicity of respondents and their being linked to the logic "our" and "their" providers. In the last decade we have seen former state-owned and nationally identified telecom operators (e.g. France, Deutsche, or British telecom) becoming largely global service providers understanding the ethnic, national or racial dimension in carrier selection, which indicates that this social contextualization should receive additional research attention as well. BiH is a transition and post-conflict country, and it is expected that national and ethnic self-identification will still play an important role in everyday life. Accordingly, we believe that BiH is a good example for assessing this social determinant, which is an interesting point for further investigation; thus in our model we gave special attention to the ethnic identification of respondents.

2. RESEARCH METHODOLOGY

2.1. Sample and data collection

The research data relates to consumers' decision in selecting one of the three mobile operators in Bosnia and Herzegovina. The survey sample was 2,500

individuals covering proportionally different entities, regions, municipalities, ethnic groups, gender, as well as urban/rural areas in BiH. The interviews were conducted on a face-to-face basis by a professional agency. The questionnaire was organized in two sections. In the first part the respondents were asked basic demographic questions, and the second part was composed of 15 questions relevant for this investigation. Descriptive statistics as well as sample demographics are provided in the Appendix[1]. After excluding respondents who did not use mobile telephones[2] the sample was reduced to 2,054, which was later used for all estimations. The final sample was 53.8% males and 46.2% females, with 61.9% of respondents from the Federation of BIH, 35.2% from the RS and 2.9% from the Brčko District. As for self-reported ethnicity, 53.7% were Bosniaks, 36.1% Serbs, and 10.1% Croats. Due to a lack of data from state telecommunication authorities our model is solely based on our cross-section survey.

2.2. Model specification

The dependent variable is the mobile carrier choice itself (variables for BH Telecom – "bhtel," Telecom Srpske – "ts" and Croatian Telecom – "ct"). A table with descriptive statistics is presented in the Appendix, while explanations of the controlled variables are detailed below:

- *price* – in telecommunications markets competition is often reduced to "price" as core competitive and marketing strategy. While product price in network industries has received specific attention in the empirical literature (Birke and Swann 2006; Grajek 2010; Sobolewski and Czajkowsi 2012) it is often seen as a reflection of the value of attractive product features, including a large installed base or adherence to current technological standards (Brynjolfsson and Kemerer 1996; Gallagher and Wang 2002; Gandal *et al.* 2000, Srinuan *et al.* 2012a), or as a strategic variable to be used by the firm to develop its installed base, as a network industry evolves (Ohashi 2003; Chakravarty 2003; Clements and Ohashi 2005). In our model we asked if the price of services was important in the decision to select a given operator[3].
- *freemin* and *bundle* – the *freemin* variable looks at how many free minutes were offered by the various carriers and how this affects consumer selection within the BiH telecommunications market. The variable *bundle* controls for how the vendor tailors service packages to meet consumer needs and to what extent the availability and structure of service packages affect carrier selection. These variables are often included as marketing initiatives in mobile carriers' "family plans," "in-network" rates or "free minutes," and are services designed to provide greater value through larger network size (Kim and Kwan 2003; Birke and Swann 2006).
- *family* and *colleague* – the *family* and *colleague* variables control for how important it is for the consumer to be in the same network as his/her family members and professional colleagues, respectively. Consumers prefer to be in the same network as those they communicate with most (Goolsbee and Klenow 2002; Suarez 2005; Birke and Swann 2006, 2010; Karacuka *et al.* 2013). Birke (2008) finds that when co-workers switch to another network the probability of a given user changing network as well doubles. The effect is even stronger for family members in the same network. Basaran *et al.* (2014) confirm that social network ties are more significant in operator selection than prices or the size of the operator.
- *size* – overall size of the installed base is often attributed to the winner-take-all nature of success in network industries. Companies in network industries – especially in telecommunications – as a matter of principle focus on building up the installed base as quickly as possible, with a view of offering future consumers greater network benefits (Majumdar and Venkatraman 1998; Schilling 2003; Madden *et al.* 2004). This variable controls for the influence of overall network size, or more precisely said, the overall number of users with a given telecom operator (Shankar and Bayus 2003; Asvanund *et al*. 2004; Chun and Hahn 2007; Strader *et al*. 2007) on consumer carrier choice.
- *residence* – in developing mobile markets, overall network coverage/signal quality (Kim and Kwon 2003) can be the determining factor for

1 Appendix is available at: http://www.efsa.unsa.ba/ef/docs/Mobile_carrier_selection_Appendix.pdf

2 In our survey 17.9% of respondents answered that they do not use mobile phones, which corresponds to the official mobile service penetration of 83% in BiH published by the state Communication Regulatory Agency at the time of the survey.

3 Please note that while some authors (e.g. Karacuka et al. 2013; Basaran et al. 2014) use minute-price in standard tariff plan or weighted prices according to respondent's call distribution, due to differences in exiting tariff plans offered by the carriers in BiH, as well as lack of data from CRA, we estimate the importance of price on consumer's carrier selection based on survey data.

carrier selection. This BiH country specific variable codes at how network coverage in the area of consumers' residence affects carrier selection.

- *landline* – given the tendency to select mobile carrier based on a pre-existing landline contract – especially during the introductory phase on developing mobile markets (Hausman 2006; Karacuka *et al.* 2011; Srinuan *et al.* 2012), we introduce the variable landline in order to investigate the importance of this link.
- *no-porta* – this variable looks at the extent to which a customer's decision to change service providers is affected by the additional cost incurred, i.e. whether they would change carrier if there were no additional charges and if they could keep their phone number (Liebowitz and Margolis 1995; Shy 2002). The cost of switching is often cited as one of the main elements contributing to a lock-in situation in network markets (Farrell and Klemperer 2007; Srinuan *et al.* 2012a). In telecommunications, this is often related to the ability to transfer mobile numbers between carriers.
- *vas* – value added services and complementary products are often considered crucial to network development (Brynjolfsson and Kemerer 1996; Gupta *et al.* 1999; Gallagher and Wang 2002; Venkartman and Lee 2004; Clements and Ohashi 2005; Duan and Chen 2007). In our model, we looked at how available value added services and the range of complementary products/services impact consumers' decision-making in carrier selection.
- *alt_oper* – a specific feature in transition and developing telecommunications markets – the coexistence of dominant and emerging "alternative" telecom operators – is often seen as a matter of particular concern for the regulators (Kotski and Kretschmer 2005). In this study, we investigate whether the presence of alternative operators has any impact on the quality of services offered by the dominant operators, and so in turn on user preference in carrier selection.
- *quality* and *crm* – service quality and customer relations more generally are frequently cited, albeit not uncontroversially, as the main sources of indirect network effects (Liebowitz and Margolis 1994; Weitzel *et al.* 2006; Beck *et al.* 2008). We use the variables *quality* and *crm* to assess the influence of these factors on carrier choice in BiH.
- *new_tech* – introduction of new technologies is one of the fundamental competitive principles in telecommunications markets. A major driver of key success factors in many, if not most, mobile service markets is the introduction of new technologies (Liikanen *et al.* 2004), which is more often ascribed to the need to construct a competitive position than to user preference or needs. By including this variable in our model, we explore the impact of technology.
- *ethnicity* – as explained earlier, because of the post-conflict context of the country, in our model we have paid special attention to a variable that codes different ethnicities. Hence, we control for the self-reported ethnicity status in our modeling procedures following previous research conducted in BiH (Efendic *et al.* 2011; Efendic *et al.* 2014).
- Finally, the traditional individual/demographic variables controlling for *gender, age, education, region, and urban/rural* are also included in the initial model.
- We estimate our model using binary Logit methodology[4], which is a multiple regression model applied to a binary dependent variable. We rely on a Logit but not on an OLS estimate because OLS for this binary model is not efficient and the conventional assumptions for the error term do not apply (Heij *et al.* 2004). However, still it is possible to use a non-linear version of the OLS, but the Maximum Likelihood Estimation technique is easier to use and it has an advantage over OLS because it takes into account the heteroskedasticity of the data (Wooldridge 2006).

Following Wooldridge (2006) our general statement of a binary response model was as follows:

$$P(y=1|x) = G(\hat{\beta}_1 + \hat{\beta}_2 x_2 + ... + \hat{\beta}_k x_k) = G(x \cdot \hat{\beta})$$

The binary dependent variable representing the selection of one of three mobile operators in BiH, where "x" is the $1xK$ vector of the "k" independent variables, "$\hat{\beta}$" is $Kx1$ vector of the coefficients to be estimated including a constant as the first term (i.e., $x \cdot \hat{\beta} = \hat{\beta}_1 + \hat{\beta}_2 x_2 + ... + \hat{\beta}_k x_k$). "G" is a function taking on values between zero and one for all real numbers "z", i.e., $0 \prec G(z) \prec 1$. "$\Pr(y=1|x)$" is the probability that the dependent variable takes a value of "1" conditional on the given values of the independent variables. In other words, the effect of a particular variable in the model is estimated conditional on the given values of all other independent variables in the

4 Appendix with Logit and Multinomial logit baseline estimations is available at: http://www.efsa.unsa.ba/ef/docs/Mobile_carrier_selection_Appendix.pdf

specification, including the constant term. The predicted probabilities are calculated conditional on the set of all explanatory variables. It is not practical to explain how every possible combination of independent variables in the model could affect the predicted probability. However, the most useful outcomes are obtained by calculating marginal changes in the model that provide information on how the outcome probability changes as a particular variable changes from zero to one, holding all other variables constant (Efendic 2010). Since our independent variables in the base specification are binary explanatory variables, then the partial effect (i.e., marginal change – MC) from changing a particular independent variable "x_k" from zero to one, holding all other v ariables fixed, is calculated from the following formula:

$$MC = G(\hat{\beta}_1 + \hat{\beta}_2 x_2 + ... + \hat{\beta}_{k-1} x_{k-1} + \hat{\beta}_k)$$

$$-G(\hat{\beta}_1 + \hat{\beta}_2 x_2 + ... + \hat{\beta}_{k-1} x_{k-1})$$

Since our dependent variable has more than two values, we will also be estimating a Multinomial Logit Model, which is, however, not too different from a binary Logit model, insofar as it estimates separate binary Logit models for each pair of outcome categories (Long and Freese 2006). As estimation of the predicted probabilities again depends on all the explanatory variables in the model, a problem of over-interpretation arises, especially as we are dealing with three possible combinations of results. As with the Logit model, more "useful" information can be obtained by calculating marginal changes. For the Multinomial Logit Model the marginal change calculation is rather complicated (Wooldridge 2006) since it depends on all the $\hat{\beta}_{k,j|J}$ combinations. However, it may be obtained through the following equation (Long and Freese 2006).

$$MC = \frac{\partial \Pr(y = m|x)}{\partial x_k} = \Pr(y = m|x)$$

$$\left\{ \hat{\beta}_{k,m|J} - \sum_{j=1}^{J} \hat{\beta}_{k,j|J} \Pr(y = j|x) \right\}$$

Our baseline results reported below are from the binary Logit estimates since we want to examine the effect of ethnicity for every mobile operator separately. As part of the robustness analysis, we have also estimated models using binary Probit estimation, but the results did not differ with respect to the sign or significance of the estimated coefficients. We reach the same conclusion if we estimate a Multinomial logit model for three possible outcomes.

Following good research practice, we first report the model diagnostics. Both the Likelihood ratio as well as Wald test for all three models reject the null hypothesis at the highest level of significance (p=0.000) that the variables included in the model are jointly equal to zero. We also performed a Hosmer-Lemeshow test, which compares predicted probabilities from the model with the observed data (Long and Freese 2006), providing simple measure of fit. The results do not reject the null hypothesis at any conventional level of significance, and the estimated models for all three operators do fit well. All estimations were implemented in Stata 11 software.

3. DISCUSSION OF RESULTS

The following table provides a summary of the baseline results for the three estimated models.

In the initial specification we included standard demographic/individual variables, namely, variables controlling for gender, age, education, region, and urban/rural area. However, none of these variables is significant at conventional levels of statistical significance. Since the model diagnostics proved to be better when we exclude these variables from the model, they are not used in the final specification. It is important to note that the obtained results remain fully consistent in terms of statistical significance, estimated signs and even magnitudes. This checking was part of our robustness procedure and this estimation is available upon request from the author.

Table 1: The baseline model results for three mobile carriers (marginal effects)

	BH Telecom (*bhtel*)		Telecom Srpske (*ts*)		Croatian Telecom (*ct*)	
	y= .33466307		y= .49316423		y= .04167889	
	dy/dx	P>|z|	dy/dx	P>|z|	dy/dx	P>|z|
price	.0140865	0.853	-.0826943	0.348	.0167330	0.288
freemin	.0990555	0.132	-.0791755	0.366	-.0108697	0.682
bundle	-.1558778	0.008	.2292977	0.000	-.0202078	0.263
family	.0459241	0.458	.0109260	0.883	-.0448478	0.163
colleagu	.0926880	0.085	-.1511037	0.018	.0170350	0.210
size	.0325199	0.424	-.0616852	0.192	.0081288	0.468
residenc	-.1181989	0.172	-.0427972	0.610	.0435347	0.000
landline	.1471261	0.000	-.0950502	0.046	-.0367917	0.010
no_porta	-.0803368	0.045	.1095778	0.024	-.0058088	0.614
vas	-.0692966	0.140	.1838933	0.000	-.0291176	0.033
alt_oper	-.0280931	0.502	.0623393	0.193	-.0003097	0.978
quality	-.1075267	0.177	.0508576	0.555	.0164984	0.236
new_tech	-.1129992	0.018	.0010552	0.984	.0364896	0.002
crm	-.0678995	0.342	.1349609	0.084	-.0093271	0.657
bosniacs	omitted[5]		-.8106514	0.000	-.2732839	0.000
serbs	-.7322741	0.000	omitted		-.1899129	0.000
croats	-.3820513	0.000	-.5789735	0.000	omitted	

	BH Telecom (*bhtel*)	Telekom Srpske (*ts*)	Croatian Telecom (*ct*)
Number of obs.	= 1,519	= 1,519	= 1,519
Likelihood ratio test	chi2(17) = 1006.21 Prob > chi2 = 0.0000	chi2(17) = 1025.92 Prob > chi2 = 0.0000	chi2(17) = 394.76 Prob > chi2 = 0.0000
Wald test	chi2(17) = 458.28 Prob > chi2 = 0.0000	chi2(17) = 480.10 Prob > chi2 = 0.0000	chi2(17) = 282.00 Prob > chi2 = 0.0000
Hosmer-Lemeshow test	chi2(8) = 10.17 Prob > chi2 = 0.2531	chi2(8) = 9.80 Prob > chi2 = 0.2795	chi2(8) = 6.69 Prob > chi2 = 0.5704

We start our discussion with the results obtained for the standard network determinants in the model. There is only one significant variable for all three estimated models – the variable *landline*. Assuming no change in the other parameters, consumers of BiH Telecom value the link between mobile and landline carrier and select BH Telecom over the other two carriers (15% higher probability). Since BH Telecom still maintains a leadership position in major urban areas and business centers[6] this result is not surprising. Accordingly, this mobile carrier exploits the "*landline link*" locking-in customers to affordable and integrated service packages[7]. On the other hand, this variable is significant but negative for the other two carriers, hence suggesting an antipodal valuation of the *landline* variable. This to a certain extent can be attributed to the shifting corporate policies of Telecom Srpske and Croatian Telecom towards the largest competitors' market (BH Telecom) and thus services offered to customers have to be designed without relying on an existing consumer-base.

5 In each model the ethnic variable with significant correlation has been omitted from the presented results. In the case of BH Telecom this variable is "*Bosniaks*", for Telecom Srpske "*Serbs*" and for Creation Telecom "*Croats*".

6 The Penetration level for landline telephony in households is estimated at 80% (CRA 2013).

7 Integrated services (Dual, Triple or Quadruple) in telecommunications is a term for providing service over a single broadband connection: exp. broadband Internet access, television, telephone and discriminatory pricing for selected mobile numbers.

Next to *landline*, the variable *bundle* and *no_porta* are statistically significant for two direct market competitors – BH Telecom and Telecom Srpske, but with different signs. In other words, *ceteris paribus*, consumers are less likely to select BH Telecom as their mobile carrier, if they value a service-package customization (*bundle*, -16%) or can switch carrier without additional cost (*no_port*, -8%) while keeping their phone number. Contrary to BH Telecom, in the Telecom Srpske model the *bundle* variable has a positive effect (22%), giving Telecom Srpske a lead amongst customers who value service-package customization. The obtained coefficient on the *no_porta* variable (estimated at the border line of significance) indicates that number portability and switching costs are to a certain extent issues to consider in carrier selection among the users of Telecom Srpske (11%).

In looking at variables significant for a particular carrier in the BH Telecom model, the variable *new_tech* indicates that the consumers are less likely (-11%) to select BH Telecom as their mobile carrier if they value new technology and solutions offered. Opposed to this is the finding for Croatian telecom; the *new_tech* variable is both significant and positive in sign, so even though the value for marginal effects are rather small (4%), it does indicate that customers are more likely to select Croatian Telecom as their carrier if they value new technologies and services. Furthermore, we find that the customers who value value-added services – *vas* - and complementary products are more likely to join the Telecom Srpske network (18% higher probability). Additionally, the significance of *colleague* variable reveals additional decision-making preferences, indicating a lack of importance of social ties in carrier selection. Consumers are less likely to select Telecom Srpske as their mobile carrier (-15%) if they place little importance on social networking with colleagues from work. On the other hand, this variable is positive (9%) for BH Telecom customers, confirming the importance of social ties in the selection of BH Telecom.

Finally, bearing in mind post-war realities in BiH, it was important to investigate whether ethnicity plays a significant role in consumer decision-making. The results do suggest that almost 20 years after the war ethnicity still plays an important role. In all three models, the variable that codes ethnicity of the respondent is significant at the highest level (p=0.000), with very high marginal effects and negative signs for carriers considered to belong to "other ethnicity"' (i.e. not the respondent's ethnicity[8]). Looking at the results for BH Telecom (dominant in the majority Bosniak areas), the results suggest that in 73% cases the Serbs and in 38% cases the Croats are less likely to select BH Telecom as their mobile carrier in comparison to Bosniaks. Similar results are obtained for Telecom Srpske (dominant in majority Serb areas) – there is 81% smaller probability that Bosniaks and 58% smaller probability that the Croats are likely to select Telecom Srpske as their carrier. Finally, for Croatian Telecom it is less likely by 19% that Serbs and less likely by 27% that Bosniaks are going to choose Croatian Telecom (dominant in the Croatian majority area) as their mobile carrier in comparison to Croats.

4. RESEARCH IMPLICATIONS

Although we identify the importance of standard network effects in our research, we find that consumers' ethnic self-reported identity plays an important role in carrier selection. The effect of ethnicity is the "best identified" in terms of significance, "consistent" sign and magnitude for all three operators. However, we find that control variables associated with more contemporary network effects remain important. For example, the link between landline operator and mobile carrier (the *landline* variable) remains significant for all three operators[9]. The variable is positive for the largest telecom operator – BH Telecom – since consumers value the benefits of having a large network in both landline and mobile communications, as well as coverage in the biggest urban areas in the country. The negative sign comes as something of a surprise for Telecom Srpske since this is the second largest operator in the country providing landline services to a large network of households and businesses. Here the lack of importance of the *landline-mobile* link for Telecom Srpske users can be attributed to the fact that the operator was recently privatized and has conducted a persuasive and aggressive marketing campaign in the areas where they traditionally do not have a large user base. This has been accompanied with a steep increase in the number of mobile service users obviously not valuing the link with their landline service providers. The case is similar for Croatian Telecom, whose installed user base is the smallest with regard to both landline and mobile service provision, so that the association with landline provision, although significant, is negative. This to a certain extent confirms that these two operators have "*won-over*" customers in

8 As expected, we observed a relationship between the carriers and the associated ethnicity based on the predominant consumer base and ethnic majority territory. For BH Telecom, this are Bosniaks; for Telecom Srpske, Serbs; and for Croatian Telecom, Croats. In our estimations for each model we omitted these specific variables and focused on the two other ethnicities.

9 At present, all three operators provide both landline and mobile services.

the territories they cover, so that their goal is now to make inroads into the BH Telecom market and develop their strategies for attracting customers.

Our research indicates that respondents are the most critical towards the largest operator and we find as many as three variables with a negative sign. Thus, whether customers base their operator choice on the customer packages being offered in mobile telephony – *bundle* (-16%), or on the ability to transfer their number – *no_port* (-8%), or indeed new technology – *new_tech* (-11%), or on any of the other fixed parameters, they are less likely to choose BH Telecom than the other two operators. A number of reasons could be given for these results, but the fact is that BH Telecom covers largely urban areas; has a customer base with probably the highest educational profile; and is by far the largest and more advanced carrier – its customer expectations are rather high and thus are more critical.

With regard to Telecom Srpske, it is particularly interesting that the two variables that were negative for the largest competitor, namely *bundle* and *no_port*, are positive. Indeed, for customers for whom the mobile service packages being offered (23%) as well as number portability without additional cost (11%) are of main concern, the Telecom Srpske is the more likely choice. Moreover, the only negative variable for Telecom Srpske is the variable relating to consumers' social ties, or in our case whether the operator is being used by friends or colleagues from work. Interestingly, this variable is opposite in sign to that of its biggest competitor (BH Telecom) as this value is negative for Telecom Srpske (-15%), while for BH Telecom it is positive (9%). This all suggests that Telecom Srpske's business policy is clearly directed toward market competition, with its biggest competitor aggressively pursuing BH Telecom's consumers.

BH Telecom should also be worried by the fact that all the indicators from the descriptive statistics show a comparative relationship between BH Telecom and Telecom Srpske as two directly competing operators. Also, customers particularly value aforementioned services (*bundle* and *no_port*) for which BH Telecom has negative values and scores worse than the other two carriers. Among the three carriers, customers who responded in the survey that they value service packages offered by the carrier (-16%) and number portability without additional cost (-8%), are less likely to select BH telecom as their carrier.

In looking at the results presented above, we have seen that consumers pay little attention to service price and do not correctly asses the structure in their calculations to find optimal tariffs, to some extent confirming the findings of Grajek (2010) as well as Sobolewski and Czajkowsi (2012). Also, our findings have confirmed those of Karacuka *et al.* (2013), that carrier selection is closely related to other people in their local area carrier choice, rather than the overall size of the operator or price. Finally, our findings clearly show that social networks, compared to price or the installed base, have more significant influence on operator choice, confirming the findings of Birke (2008) and Basaran *et al.* (2014).

Thus far, in available research, we have seen the use of a number of traditional control variables (e.g. gender, age, education, rural/urban, etc.) while to our knowledge, the ethnicity of the respondents has been neglected. In the case of BiH, because the service provision by mobile carriers has been countrywide for almost a decade, we considered it important to assess whether perceptions of their ethnic self-assessment have influenced carrier selection and to what extent. In spite of the long list of positive trends evident from the preceding analysis, our model indicates clearly that the variable coding ethnicity still represents a rather significant factor in the model. A particularly strong association between the variables representing ethnic self-assessment and choice of carrier confirms that the majority of respondents still view either directly or indirectly (we cannot make this distinction) the carriers as representing ethnic categories. In other words, the respondents are still more inclined to choose or to stay with a mobile carrier perceived as "their own," while not ignoring conventional network effects. Although limited to a post-conflict country, this study provides a look at carrier selection while assessing the influence of the ethnic dimension of respondents. Understanding ethnic, national or racial dimensions in service provision in today's social context should receive much more attention, and with the changing social and ethnic landscape in Europe the findings presented in this study could serve as an initial look at possible challenges ahead.

CONCLUSIONS

In this paper we analyze the role of network effects in mobile service provision in BiH by relying on respondents' (consumers) perceptions. While we identify a number of contemporary network effects, especially in relations between the two direct market competitors (BH Telecom and Telecom Srpske), by in large the customers are still overwhelmingly allied to the operators identified as belonging to their ethnicity. Controlling for other variables, the ethnicity of the respondents clearly shows a particularly important and strong influence when it comes to the selection of "ethnically suitable" carrier, as well as negative values for the "other" two carriers. Apparently, ethnicity

remains an important determinant in this market and trumps standard networking effects in terms of magnitude. We believe that this is the main contribution of this paper and that it applies more generally to post-ethnic-conflict societies.

Network effects remain an important aspect of anti-rust and regulatory analyses in mobile services as they directly influence consumer' decision to opt for a carrier. What we have seen from our study is that a traditional network effect, for example price or network size, is not perceived by users as important, and that market dynamics rely on a different set of pertinent issues. The link between landline and mobile service provision has a significant effect for all three estimated models, but with different signs. This link is significant and positive for users of the largest telecom operator in the country (BH Telecom). Interestingly, when customers base their operator choice on the quality of service packages being offered or the ability to transfer their number to a different carrier, they prefer Telecom Srpske (the second largest carrier), confirming to a certain extent that the development of better quality customer packages has resulted in attracting customers who are slowly losing sight of carrier "national prefix". Consequently, we have seen Telecom Srpske (now renamed to: "*m:tel*") gradually making inroads into the Federation of BiH market, particularly the BH Telecom market. In all, attributing dramatic changes in demand for telecommunication services only to price competition (a significant drop in end-user prices in practically all telecommunication services), and by ignoring network effects, could result in misaligned competitiveness strategies and overall approaches to consumers (Zaimovic *et al.* 2015).

Although we do find some of the contemporary network effect to be significant in the mobile carrier market, the values associated with the variable that codes ethnicity lead us to conclude that the choice of carrier is still largely based on the ethnic identification of the individual carriers as "ours" – which in itself, at least for Bosnia and Herzegovina, could now be viewed as a network associated externalities.

Finally, we would like to mention some of the limitations of this research. First, we base our research on survey data, which means that we are working with perceptions of respondents but not on measurable outputs or their real decisions. Accordingly, what people say is not necessarily something they do; their answers might be subjective and contain perception bias. Still, personal opinions are welcomed and interesting simply because people are the best judges of their own interests and their views are often more relevant than opinions of some high experts, planning authorities and even some statistical indicators (Efendic and Pugh 2015). Bearing in mind this is a cross-section survey, the time dimension and potential timing effects in the model remains to be explored. The model specification was built on a theory including some country-specific determinants, but always some new determinants might be relevant to explore, including other methodologies. In particular, it might be interesting to explore potential endogeneity caused by the simultaneity of some networking effects, which we cannot address at this time.

For future research it could be interesting to further explore the effect of ethnicity in the model by estimating multi-level models based on location of respondents or the structure of different groups within the same ethnicity. It could be important to control for ethnic diversity at the local level and its effect in the model, as well as other post-conflict determinants (e.g. the war (e)migrant status, international migration experience, including some interaction effects). In addition, considering the presented findings, although limited to the context of BiH, understanding the ethnic, national or racial dimension in service/product selection in today's social context should receive more attention. Also, in the recent decade we have seen a number of state-owned telecom operators making investments in rebranding and market re-profiling, shifting away from their initial image to a more "generic one" (e.g Deutsche telecom to t-com or France Telecom to Orange, etc.). Following findings presented in this study, assessing possible changes in consumers' carrier choice in EU countries - provided that they are familiar with operator history and pre-rebranding title - might provide an interesting new perspective on consumers' carrier decisions. Finally, replication of this study in other post-conflict environments, especially in the South-East European region, is welcomed, as well as retesting these results in BiH with the inclusion of a dynamic component.

REFERENCES

Arthur, W.B. 1989. Competing technologies, increasing returns, and lock-in by historical events, Economic Journal 99: 116-131.

Arthur, W.B. 1990. Positive feedbacks in the economy, Scientific American February: 92-99.

Asvanund, A., Clay, K.; Krishnan, R., Smith, M.D. 2004. An empirical analysis of network externalities in peer-to-peer music-sharing networks, Information Systems Research 15(2): 155-174.

Basaran, A., Cetinkaya, M., Bagdadioglu, N. 2014. Operator choice in the mobile telecommunications market: Evidence from a Turkish urban population, Telecommunications Policy 38: 1-13.

Beck, R., Beimborn, D., Weitzel, T., König, W. 2008. Network effects as drivers of individual technology adoption: Analyzing adoption and diffusion of mobile communication services, Information Systems Frontiers 10: 415-429

Bieber, F. 2006. Post-war Bosnia: Ethnicity, Inequality and Public Sector Governance, Basingstoke: Palgrave Macmillan.

Bieber, F. 2010. Bosnia and Herzegovina since 1990, in Ramet, S. (ed.), Central and Southeast European Politics Since 1989, Cambridge: Cambridge University Press, pp. 311-328.

Birke, D. 2008, Diffusion on networks: modelling the spread of innovations and customer churn over social networks, in N. Gronau and C. M¨uller (eds), Bildung von sozialen Netzwerken in Anwendungen der Social Software. Berlin: GITO Verlag.

Birke, D. 2009. The economics of networks: A survey of the empirical literature, Journal of Economics Surveys 23(4): 762-793.

Birke, D., Swann, G.M.P. 2006. Network effects and the choice of mobile phone operator, Journal of Evolutionary Economics 16(1–2): 65–84.

Birke, D., Swann, G.M.P. 2010. Network effects, network structure and consumer interaction in mobile telecommunications in Europe and Asia, Journal of Economic Behavior and Organization 76(2): 153-167.

Brynjolfsson, E., Kemerer, C.F. 1996. Network externalities in microcomputer software: an econometric analysis of the spreadsheet market, Management Science 42(12): 1627–1647.

Chakravarty, S. 2003. Experimental Evidence on Product Adoption in the Presence of Network Externalities, Review of Industrial Organization 23: 233-254

Chun S.Y., Hahn M. 2007. Network externality and future usage of Internet service, Internet Research 17(2): 156-168.

Church, J., Gandal N. 2005. Platform Competition in Telecommunication, Handbook of telecommunications economics, Elsevier 2: 119-153.

Clements, M.T., Ohashi, H. 2005. Indirect network effects and the product cycle: video games in the US, 1994–2002, Journal of Industrial Economics 53(4): 515–542.

Corrocher, N., Zirulia, L. 2009. Me and you and everyone we know: An empirical analysis of local network effects in mobile communications, Telecommunications Policy 33(1–2): 68–79

CRA, 2013. State Commination Regulatory Agency-CRA, Annual Report for 2013

Doganoglu, T., Grzybowski, L. 2007. Estimating network effects in mobile telephony in Germany, Information Economics and Policy 19(1): 65–79.

Dranove, D., Gandal, N. 2003. The DVD-vs.-DIVX standard war: empirical evidence of network effects and preannouncement effects, Journal of Economics and Management Strategy 12(3): 363-386.

Duan W., Chen Y. 2007. Key Factor to Drive Success of New Product with Network Effects: Product Quality or Installed Base? Systems Engineering - Theory & Practice 27(7): 144-148

Dyrstad, K. 2012. After ethnic civil war: Ethno-nationalism in the Western Balkans, Journal of Peace Research 49(6): 817-831.

Economides, N. 1996. The economics of networks, International Journal of Industrial Organization 14(6): 673-699.

Economides, N. 2009. Networks, Telecommunication Economics, and Digital Convergence, Notes on Network Economics - MBA class

Efendic, A. 2010. Institutions and economic performance in transition countries, LAP Lambert Academic Publishing

Efendic, A., Mickiewicz, T., Rebmann, A. 2014. Growth aspirations and social capital: young firms in a post-conflict environment, International Small Business Journal 33(5): 537-561.

Efendic, A., Pugh, G. 2015. Institutional effects on economic performance in transition: a dynamic panel analysis, Acta Oeconomica 4/2015.

Efendic, A., Pugh, G., Adnett, N. 2011. Confidence in formal institutions and reliance on informal institutions in BiH: An empirical investigation using survey data, Economics of Transition 19(3): 521–540.

Farrell, J., Klemperer, P. 2007. Coordination and Lock-in: Competition with switching cost and network effects, Handbook of Industrial Organization 3: 1967-2072.

Farrell, J., Saloner, G. 1985. Standardization, compatibility, and innovation, Rand Journal of Economics 16(1): 70–83.

Farrell, J., Saloner, G. 1986. Installed base and compatibility – innovation, product preannouncements and predation, American Economic Review 76(5): 940-955.

Farrell, J., Saloner, G. 1992. Converters, Compatibility, and the Control of Interfaces, The Journal of Industrial Economics, Vol. XL

Fu, W.W. 2004. Termination-discriminatory pricing, subscriber bandwagons, and network traffic patterns: the Taiwanese mobile phone market, Telecommunications Policy 28(1): 5–22.

Gallaugher, J., Wang, Y. 2002. Understanding network effects in software markets: Evidence from Web server pricing, MIS Quarterly 26: 303-327.

Gandal, N., Kende, M., Rob, R. 2000. The Dynamics of Technological Adoption in Hardware/Software Systems: The Case of Compact Disc Players, RAND Journal of Economics 31: 43-61

Goolsbee, A., Klenow, P.J. 2002. Evidence on learning and network externalities in the diffusion of home computers, Journal of Law and Economics 45(2): 317-343.

Grajek, M. 2010. Estimating network effects and compatibility: Evidence from the Polish mobile market, Information Economics and Policy 22(2): 130–143.

Grajek, M., Kretschmer T. 2009. Usage and diffusion of cellular telephony 1998-2004, International Journal of Industrial Organization 27(2): 238–249.

Gruber, H., Verboven, F. 2001. The evolution of markets under entry and standards regulation – the case of global mobile telecommunications, International Journal of Industrial Organization 19(7): 1189-1212.

Gupta S., Dipak C. J., Sawhney M.S. 1999. Modeling the Evolution of Markets with Indirect Network Externalities: An Application to Digital Television, Marketing Science 18(3): 396-416.

Haucap, J., Heimeshoff, U. 2011. Consumer behavior towards on-net/off-net price differentiation. Telecommunications Policy 35, 325-332.

Hausman, J. 2006. Mobile telephone, Handbook of telecommunications economics, Elsevier 1: 563-604

Heij, C., de Boer, P., Franses, P. H. and van Dijk, H. K. 2004. Econometric Methods with Applications in Business and Economics, Oxford: Oxford University Press.

Hodson, R., Sekulic, D., Massey, G. 1994. National tolerance in the former Yugoslavia, American Journal of Sociology 99(6): 1534-1558.

Huang, C.I. 2010. Intra-household effects on demand for telephone service: Empirical evidence, Quant Mark Econ 11: 231-261

Karacuka, M., Çatik, A. N., Haucap, J. 2013. Consumer choice and local network effects in mobile telecommunications in Turkey, Telecommunications Policy 37: 334-344.

Karacuka, M., Haucap, J., Heimeshoff, U. 2011. Competition in Turkish mobile telecommunications markets: Price elasticities and network substitution, Telecommunications Policy 35(2): 202-210.

Katz, M.L., Shapiro, C. 1992. Product introduction with network externalities, The Journal of Industrial Economics 11(1): 55-83.

Katz, M.L., Shapiro, C. 1994. Systems competition and network effects, Journal of Economic Perspectives 8(2): 93-115.

Kim, H.S., Kwon, N. 2003. The advantage of network size in acquiring new subscribers: a conditional logit analysis of the Korean mobile telephony market, Information Economics and Policy 15(1): 17-33.

Koski, H., Kretschmer, T. 2005. Entry, standards and competition: firm strategies and the diffusion of mobile telephony, Review of Industrial Organization 26(1): 89-113.

Liebowitz, S., Margolis, S. 1994. Network externality – an uncommon tragedy, Journal of Economic Perspectives 8(2): 133-150.

Liebowitz, S., Margolis, S. 1995. Path dependence, lock-in, and history, Journal of Law, Economics, and Organization 11: 205-226.

Liikanen, J., Stoneman, P., Toivanen, O. 2004. Intergenerational effects in the diffusion of new technology: the case of mobile phones, International Journal of Industrial Organization 22(8-9): 1137-1154.

Long, S.J., Freese, J. 2006. Regression Models for Categorical Dependent Variables Using Stata, Second Edition, Texas: A State Press Publication.

Madden, G., Coble-Neal, G.; Dalzell, B. 2004. A dynamic model of mobile telephony subscription incorporating a network effect, Telecommunications Policy 28(2): 133-144.

Majumdar, S., Venkatraman, S. 1998. Network effects and the adoption of new technology: Evidence from the U.S. telecommunications industry, Strategic Management Journal 19: 1045-1062.

McIntyre, D., Subramaniam, M. 2009. Strategy in Network Industries: A Review and Research Agenda, Journal of Management 35(6): 1494-1517.

Ohashi, H. 2003. The role of network effects in the US VCR market, 1978-1986, Journal of Economics and Management Strategy 12(4): 447-494.

Schilling, M. 2003. Technological leapfrogging in the U.S. video game console industry, California Management Review 45: 6-32.

Shankar, V., Bayus, B. 2003. Network effects and competition: An empirical analysis of the home video game industry, Strategic Management Journal 24: 375-384.

Shy, O. 2002. A quick-and-easy method for estimating switching costs, International Journal of Industrial Organization 20: 71-87.

Sobolewski, M., Czajkowsi, M. 2012. Network effects and preference heterogeneity in the case of mobile telecommunications markets, Telecommunications Policy 36: 197-211.

Srinuan P., Srinuan C., Bohlin E. 2012. Fixed and mobile broadband substitution in Sweden. Telecommunications Policy 36 (3): 237-251.

Srinuan, P., Bohlin, E., Madden, G. 2012a. The determinants of mobile subscriber retention in Sweden. Applied Economics Letters 19 (5): 453-457.

Strader T.J., Ramaswami S.N., Houle, P.A. 2007. Perceived network externalities and communication technologies acceptance, European Journal of Information Systems 16: 54-65.

Suarez, F. 2005. Network effects revisited: the role of strong ties in technology selection, Academy of Management Journal 48(4): 710-720.

Varian, H.R., Farrell J., Shapiro C. 2004. The Economics of Information Technologies, Cambridge University Press

Venkatraman, N., Lee, C. 2004. Preferential linkage and network evolution: A conceptual model and empirical test in the U.S. video game sector, Academy of Management Journal 47: 876-892.

Weitzel, T., Beimborn, D., Konig, W. 2006. A unified economic model of standard diffusion: The impact of standardization cost, network effects, and network topology, MIS Quarterly 30: 489-514.

Wooldridge, J. M. 2006. Introductory Econometrics A Modern Approach, Third Edition, Mason: Thomson South-Western.

Zaimović T., Zaimović A., Mustafić A. 2006. Bosnia and Herzegovina telecommunication sector outlook, Procedia - Social and Behavioral Sciences 195: 82-92

Zaimovic T., Avdic A. 2014. Review of the selected empirical papers in network economy, Sarajevo Business and Economics Review 33: 73-100.

DE GRUYTER OPEN

South East European Journal of Economics and Business
Volume 10 (2) 2015, 69-88
DOI: 10.1515/jeb-2015-0009

IMPACT OF FINANCIAL CRISIS ON HEDGING EFFECTIVENESS OF FUTURES CONTRACTS: EVIDENCE FROM THE NATIONAL STOCK EXCHANGE OF INDIA

Kapil Gupta, Mandeep Kaur

Abstract

The present study examines the impact of the 2008 financial crisis on the hedging effectiveness of three index futures contracts traded on the National Stock Exchange of India for near, next and far month contracts over the sample period of January 2000 – June 2014. The hedge ratios were calculated using eight methods; Naive hedging, Ederington's Model, Autoregressive Integrated Moving Average, Vector Autoregressive, Vector Error Correction Methodology, Generalized Autoregressive Conditional Heteroskedasticity, Exponential Generalized Autoregressive Conditional Heteroscedasticity and Threshold Generalized Autoregressive Conditional Heteroskedasticity. The study finds an improvement in hedging effectiveness during the post-crisis period, which implies that during the high-volatility period hedging effectiveness also improves. It was also found that near month futures contracts are a more effective tool for hedging as compared to next and far month contracts, which imply that liquidity is a more important determinant of hedging effectiveness than hedge horizons. The study also finds that a time-invariant hedge ratio is more efficient than time-variant hedging. Therefore, knowledge of sophisticated econometrical tools does not help to improve hedge effectiveness.

Keywords: *Hedge ratio, hedge horizon, financial crisis, heteroscedasticity, conditional volatility*

JEL: *C13, C22, C32, D81, D82, G14, N25 and O16*

INTRODUCTION

Risk is omnipresent in all financial transactions and has become the center stage of every economic activity. The need to manage price risk against unwanted fluctuations in asset value by hedgers and risk-averse investors has led to the emergence of derivatives like futures, options, swaps ,etc. (Bose, 2006) Specifically, hedging involves transferring price risk from entities less willing to take risk to those more willing or able to do so. Therefore, besides hedgers, speculators also very actively trade in the futures market.

Ederington (1979) suggests that a hedge is said to be effective if it reduces portfolio variance to a minimum level and is highly affected by the behavior of basis1, the liquidity of futures contracts, the time-to-maturity of futures contracts, the risk aversion of investors, hedge horizons and price trends in the market (eg. See Figlewski, 1984). For instance; Chang et al., (2010), observed that hedge effectiveness is found to be higher in a bull market than in a bear market, which may be attributed to the fact that low volatility appears in uptick markets and vice-versa.

Kapil Gupta, PhD
Assistant Professor
Punjab institute of Management (PIM), India

Mandeep Kaur
Research Scholar
Punjab institute of Management (PIM), India
E-mail: kaur_mandeep13@ymail.com

1 Basis in the literature means difference between futures price and cash price.

King and Wadhwani (1990); Majid and Kassim (2009); Karim et al. (2011) and Sugimoto et al. (2014) also observe that a financial crisis in one country always devastates the financial health of other major economies of the world in terms of its spillover effect. The recent financial crisis of 2008 originated in the United States and spread over Europe and Asia, thus weakening their economic and financial strength (Joshi, 2012). A major impact has been observed in the financial health of these nations in the form of significant changes in the structure of price trends in their financial markets. The crisis drove down equity levels across the globe and major stock markets of the world exhibited the persistence of the volatility during the crisis and post-crisis period (Mazumder and Ahmad, 2010; Al-Rjoub and Azzam, 2012; Ali and Afzal, 2012 and Singhania and Anchalia, 2013).

It has also been observed that the global financial crisis of 2008 significantly impacted the volatility of the Indian stock market (Ali and Afzal, 2012; Joshi, 2012 and Dufrénot and Keddad, 2014). Moreover, futures trading is not only popular in developed markets of the world, but is equally popular in emerging markets like India, which is evident from the fact that Indian equity futures consistently rank amongst the top five markets of the world for the last decade2. However, to the best of our knowledge, in the Indian context only a few attempts have been made to examine hedge effectiveness (Bhaduri and Durai, 2007; Rao and Thakur, 2008; Gupta and Singh, 2009 and Pradhan, 2011) and these studies have primarily focused on examining a superior methodology for determining an optimal hedge ratio. Therefore, the present study is an attempt to shore this literature gap by examining the impact of the 2008 financial crisis on the hedging effectiveness of futures contracts, and also to study the relationship between hedging effectiveness, price trends and the time-to-maturity of equity futures contracts in India.

Further discussion in the study has been organized into four sections: Section 2 presents a detailed literature review of hedging; Section 3 discusses the database and research methodology employed for estimating optimal hedge ratios and examining hedging effectiveness; Section 4 analyzes the results, and Section 5 concludes the study.

REVIEW OF LITERATURE

A strand of literature (see Table 2) observes that the success of hedging depends upon the strong and stable relationship between cash and the futures market that allows the hedger to hedge the price risk contained in his / her portfolio. However, Figlewski (1984); Castelino (1992) and Dimson and Mussavian (1998) also observe that the existence of various market anomalies (like noise trading by investors, interest rate changes, transaction costs, seasonal variations, demand and supply conditions, informational inefficiency, thin trading, etc.) disturbs the relationship between cash and futures markets, which leads to variation in basis, thereby affecting the efficiency of hedges. Hence, the presence of an efficient futures market (exhibited by an efficient price discovery mechanism, information assimilation efficiency and the existence of a strong arbitrage base) is a pre-requisite for efficient hedging.

Early investigations in hedging literature has led to the development of three different hedging theories based upon the varied objectives of investors, which includes conventional (traditional or naive) hedging theory, Working's hedging theory and Portfolio hedging theory. The conventional / naive hedging theory assumes that the price movement in cash and futures markets is perfectly correlated as both markets are exposed to a common information set and the investor is a risk averter. Hence, it suggests that the optimal hedge ratio is to have an equal number of futures contracts as spot exposures, but in the inverse direction, i.e. a long position in futures and a short position in cash, and vice versa. Thus, naive-hedging theory allows hedgers to transfer the risk of price changes in the portfolio to speculators more willing to bear such risks (Floros and Vougas, 2004). However, this theory fails to cater to basis risk, i.e. the movement / change in spread between spot and futures prices. Moreover, in practice, it is unlikely that a perfect correlation exists between cash and futures prices. Therefore, in order to hedge both price risk and basis risk, Working (1953) unveiled a new approach to hedging where the hedger acts as a speculator and not as a risk avoider, thus contradicting the naive hedging theory. Working argued that the objective of hedging is not to minimize risk, but to maximize profits by speculating on basis. Thus, this theory suggests that a long hedger will hedge portfolio risk if the basis is expected to rise, whereas a short hedger will hedge if the basis is expected to fall (Gupta and Singh, 2009).

While Working's theory proved to be an improvement over the naive-hedging theory, it suffers from an unrealistic assumption that hedgers can maximize their wealth at any level of risk. Therefore, Johnson (1960) and Stein (1961) came out with a portfolio approach to hedging that was further extended and quantified by Ederington (1979). As per this approach,

2 Please see Monthly Reports published by the World Federation of Exchanges at www.world-exchanges.org

the hedger's objective is neither to minimize portfolio risk (variance) nor to maximize profits at any level of risk, but to optimize the risk-return trade-off in the portfolio. An important contribution of the portfolio approach is the concept of the Minimum-Variance Hedge Ratio (MVHR), i.e., the hedge ratio that minimizes the risk of the hedged position (Ederington, 1979). Conventional hedging theory and Working's hedging theory help in estimating a constant hedge ratio only, whereas portfolio hedging theory allows for estimating constant as well as time-varying optimal hedge ratios.

Among the three hedging theories discussed above, portfolio hedging theory became most popular because it allows for the estimation of both constant as well as time-varying hedge ratios, unlike naive hedging theory and Working's hedging theory. As observed by Johnson (1960) and Stein (1961), the hedger always prefers a portfolio that optimizes risk and return. Hence, a hedger may choose the best hedge ratio from a wide range of hedge ratios lying on an efficient frontier, depending upon his / her risk preference. Though both naive and Ederinton's hedge ratios assume the investor to be a risk averter, unlike naive-hedge ratio, Ederington's hedge ratio is slope coefficients, which is computed as the ratio of the covariance of futures and cash market returns to the variance of future returns.

The traditional, Working (1953) and Ederington (1979) hedging theories have assumed the hedge ratios to be constant. However, it is a well-established fact that a financial time series observes time varying patterns, and that volatility clustering is their innate feature (Gupta and Singh, 2009). Hence, voluminous literature has found that time-varying hedge ratios are superior to constant hedge ratios (Myers, 1991; Park and Switzer, 1995; Aggarwal and Demaskey, 1997; Moschini and Myers, 2002; Harris and Shen, 2003; Pattarin and Ferretti, 2004; Kofman and McGlenchy, 2005; Floros and Vougas, 2006; Bhaduri and Durai, 2007; Lee and Yoder, 2007 and Yang and Lai, 2009). Furthermore, Yang and Allen (2004) confirmed that a time-varying hedge ratio performs better during out of sample hedging. However, Lien (2005) observed that the OLS hedge ratio outperforms the time-varying hedge ratio, which is confirmed by the findings of Bhargava and Malhotra (2007), who found that OLS performs better during the short-run. Furthermore, Lien and Luo (1994) commented that both constant as well as time-varying hedge ratios are equally efficient when the trader is extremely risk averse.

Ederington (1979) further suggested that futures hedging for longer periods performs much better than for shorter periods, which is also consistent with the findings of Figlewski (1984) who observed that a one day hedge is comparatively less effective than a one week hedge due to the presence of higher basis risk. Furthermore, Chen et al. (2002) also found that as the investment horizon increases, higher hedging effectiveness is observed, which may be due to the fact that market over-reactions are found in shorter horizons, but that rationality prevails in longer horizons. Chen et al. (2004) also found that hedge ratios and their efficiency have a positive relationship with the hedging horizon, which implies that if a hedging horizon is long, then the naive-hedge ratio will be close to the minimum variance hedge ratio. Juhl et al., (2012) also found that when cash and future prices are co-integrated, a longer hedge horizon yields an optimal hedge ratio close to the naive hedge ratio. Moreover, In and Kim (2006) mentions that hedging effectiveness does not only depend upon hedging horizon, but that the risk aversion of the hedger also affects hedging effectiveness, which implies that investors with low risk aversion have short-run hedge ratios and vice versa. Furthermore, Neuberger (1991) found that the rollover of futures contract adds to hedging effectiveness.

Moreover, Figlewski (1984) found that basis risk (arising from unexpected dividends on cash portfolios, transaction costs, hedge duration and time to expiration) is an important determinant of an efficient hedge ratio. A strand of literature (Table 2) has also observed that basis risk is positively associated with the time-to-expiry of futures contracts. Hence, for contract expiry, the hedger will be left with price risk only, implying that naive hedge ratio may be an efficient hedge ratio when a contract is approaching its expiry date, which is consistent with the findings of Ederington (1979). Moreover, Monoyios and Sarno (2002) found that the speed of adjustment of basis towards its equilibrium value is an increasing function of the size of the deviations from equilibrium.

Figlewski (1984) and Stoll and Whaley (1987) suggests that cash and futures markets do not tend to move together. Therefore, an estimation of the optimal hedge ratio becomes essential for risk management. Advancements in the literature of econometrics have led to the development of numerous methodologies for estimating an optimal hedge ratio, which can be either constant hedge ratios (such as Ordinary Least Square (OLS, VAR, VECM, etc.), or time varying hedge ratios (such as GARCH, EGARCH, TARCH, BGARCH, etc.). Floros and Vougas (2004) compared hedge ratios estimated through four models i.e. OLS, ECM, VECM and M-GARCH, and their findings indicate that the M-GARCH model provides lower hedge ratios compared to other models, and captures time

variation, thereby improving hedging performance at a lower cost. On the other hand, Gupta and Singh (2009) found that the hedge ratio estimated through VAR and VECM reduced the portfolio variance to the largest extent as compared to other methodologies, as the cash and futures market observes long-run co-movement. However, Hatemi and Roca (2006) suggested that the use of the Kalman Filter approach for estimating the time-varying hedge ratio has been found to be more efficient. They also suggested that the time path of the estimated hedge ratio can be analyzed to determine volatility in the hedge ratio, which has implications in terms of the cost of rebalancing a hedged portfolio. Thus, hedgers can evaluate the suitability of the hedging instrument to be used. A strand of literature (See Table 2) examining the effectiveness of optimal hedge ratios has found that time-varying hedge ratios are superior to constant hedge ratios.

However, Gupta and Singh (2009) also suggested that hedging through liquid futures contracts by estimating the long-run hedge ratio involves low hedging cost and provides flexibility to hedgers with respect to time-to-expiry. Similarly, Bhaduri and Durai (2007) compared the optimal hedge ratios estimated from four models, i.e. OLS, VAR, VECM and DVEC-GARCH and their results indicate that the time varying hedge ratio derived from DVEC-GARCH provides better hedging effectiveness in terms of mean returns and average variance reduction. However, hedge ratios estimated through OLS out-perform the hedge ratios estimated by other methods at short time horizons in terms of average variance reduction. Rao and Thakur (2007) also examined the efficiency for the Indian Futures market and Indian options markets by comparing the JSE (Johnson, 1960; Stein, 1961 and Ederington, 1979) and HKM (Herbst, Kare and Marshall, 1993) methodology for futures and fBM (Fractional Brownian Motion) and BSM (Black-Scholes Model, 1973) methodology for options. Their findings indicate that the HKM methodology in the case of futures and the fBM methodology in the case of options yield Optimal Hedge ratios in the Indian Futures and Options markets, respectively.

The estimation of an optimal hedge ratio in all models assumes that the distribution of returns on the hedged portfolio is normal, which means that the mean and variance alone are sufficient to determine the optimal hedge ratio. However, there exists indisputable evidence to suggest that the return distributions of speculative assets depart from normality (Brooks et al., 2012). Therefore, Brooks et al., (2012) observed that ignorance of higher moments leads to sub-optimal hedge ratios and suggests a new methodology considering the impact of higher moments on the determination of optimal hedge ratios.

Moreover, asymmetrical behavior of hedging effectiveness, Khatib and Hatemi-J (2011) observed that optimal hedge ratios also exhibit asymmetrical behavior. Their findings imply that an optimal hedge ratio is different when an investor expects a price increase at maturity and is different when investors expect a price decrease at maturity. The reason for this asymmetrical behavior can be attributed to the fact that investors respond more to negative shocks than to positive ones, which leads to the asymmetric behavior of stock returns (Longin and Solnic, 2001). Furthermore, Alizad and Nomikos (2004) also observed that hedge ratios are significantly different across different states of the market, and found that more efficient hedge ratios may be obtained if the hedge ratios are allowed to be dependent upon the state of the market.

On the basis of the discussion above, it can be observed that the debate related to estimation of an optimal hedge ratio has not yet been settled. Most studies covering the issues of hedging effectiveness have been undertaken only in developed economies (see Table 2). However, to the best of our knowledge, only a few studies have been undertaken in emerging economies such as India. The studies that have addressed the issue of hedging effectiveness on stock index futures market in India include Bhaduri and Durai (2007); Rao and Thakur (2008); Gupta and Singh (2009) and Pradhan (2011). The nevertheless, the scope of these studies was limited to finding a superior methodology to estimate an optimal hedge ratio in the equity futures market. Moreover, as discussed in Section 1, the global financial crisis of 2008 enhanced the volatility of Indian equity markets. Therefore, the present study also attempts to examine the relationship between hedge effectiveness, price trends and the time-to-maturity of equity futures contracts in India during the pre- and post-global financial crisis period.

DATABASE AND RESEARCH METHODOLOGY

In India, the derivatives market was introduced in the year 2000 on the recommendation of the L.C. Gupta Committee to meet the need for providing a risk management program to both investors and industry. The first financial derivative, Sensex futures, was launched on the Bombay Stock Exchange of India Ltd. (BSE), which commenced its trading on June 9, 2000, followed by the National Stock exchange of India Ltd. (NSE), which launched S&PCNXNIFTY futures for near, next and far month contracts on June 12, 2000.

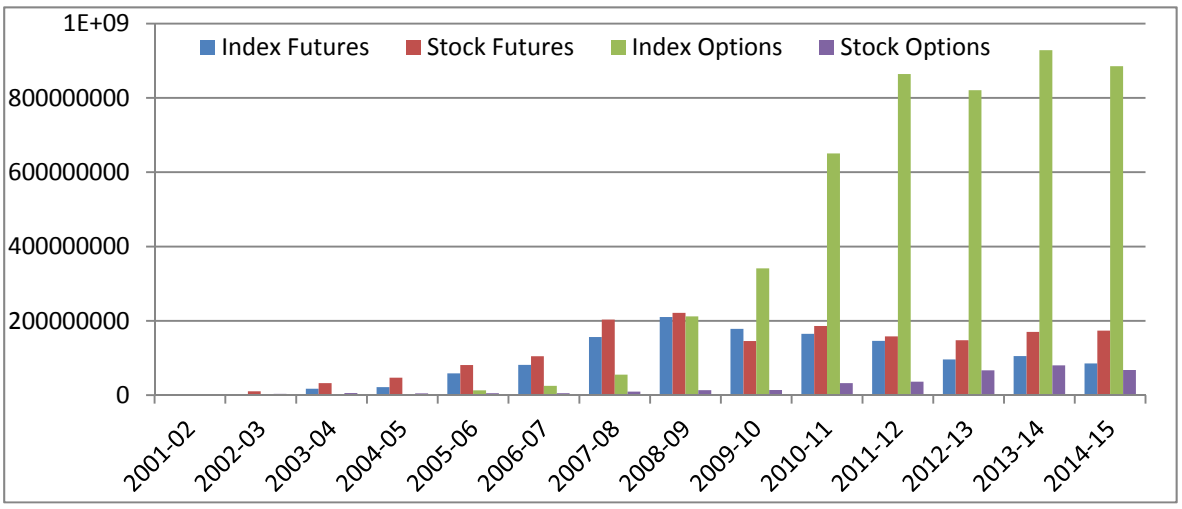
Since the inception of the derivatives market, the equity futures market has shown phenomenal growth

both in terms of volume of contracts and number of products. During 2013-14, the total number of index futures traded on NSE was 105,270,529, and stock futures 170,414,1863. The range of products, which started with index futures contracts, now includes index futures and options, stock futures and options, interest rate futures, currency futures and bond futures. Despite an initial slow pick up, the number of options contracts traded has observed significant growth after 2007-08, whereas, the number of futures contracts traded has observed a declining trend since then. The business growth of the futures and options segment at the NSE is presented below.

The scope of the present study, however, is restricted to equity futures contracts. The sample size of the study comprises three indices: S&PCNXNIFTY, CNXIT and BANKNIFTY which were selected on the basis of their consistent trading history and high liquidity. The data was collected for near month, next month and far month contracts for all three indices comprising the study sample from the official website of the National Stock Exchange of India (NSE) at www.nseindia.com. The period of the study is from the inception date of the respective indices up to June 30, 2014 as presented below:

Hedging theory requires that the trader take simultaneous but opposite-in-sign trading positions in two markets with the magnitude of prediction of one market (cash / futures market) through the other (futures / cash market), which is known as the hedge ratio. Since estimation of the hedge ratio is a statistical process involving regressing cash market returns on futures returns, prior to undertaking any statistical procedures it is important to examine the time series properties of the data under investigation. The very first step in any econometric investigation of a time series is to examine whether that time series contains unit roots. If it does, then it should be transformed for further examination; otherwise the statistical results would be spurious. Therefore, the stationarity of the three indices understudy has been tested by using the Augmented Dickey Fuller (ADF) test, and it has been observed that the prices (both futures prices and cash prices) are non-stationary, whereas, the natural

Graph 1: Business growth of the Futures and Options Segment (Number of Contracts Traded)



Source: www.nseindia.com

Table 1: Sample Size and Sample Period of Study

Symbol	Period of study	Number of Observations (For Near, Next and Far Month contracts)		Total
		Pre-crisis	Post-crisis	
S&PCNXNIFTY	June 12, 2000 – June 30, 2014	1898	1573	3471
CNXIT	August 29, 2003 – June 30, 2014	1092	1611	2703
BANKNIFTY	June 13, 2005 – June 30, 2014	638	1612	2250

3 Source: NSE Fact Book, 2014

log of the first difference of prices (i.e. $\ln(p_t / p_{t-1})$) is stationary4. Thus, the returns of futures contracts and the cash market are considered for estimating hedge ratios.

Moreover, since both cash and futures markets are linked through an arbitrage process (Stoll and Whaley, 1987), and the price of the futures contract determined through a cost-of-carry model in long-run is not expected to be different from spot price plus risk premium to hold positions in the cash market. Therefore, appreciating the stationary and stable long-run relationship between the two markets, five econometric procedures have been undertaken that address various economic as well as statistical issues involved in estimating an optimal hedge ratio. Among these would be an efficient hedge ratio, which can help hedgers minimize portfolio variance.

Furthermore, Ederington (1979) suggests a minimum variance hedge ratio, which presumes a strong and stable long run relationship between the two markets, and where hedging effectiveness will depend upon the coefficient of R^2. Equation (4.1) explains the procedure suggested by Ederington (1979), which works efficiently when futures market returns are an unbiased predictor of cash market returns. In equation (4.1), $R_{s,t}$ is cash market returns, $R_{f,t}$ is futures market returns, α_o is the intercept term and ε_t is the error term. Therefore, as per the cost-of-carry model, futures returns are assumed to be an unbiased predictor of prospective cash market return, hence the intercept and error term should not be significantly different from 0, and consequently R^2 will improve.

$$R_{s,t} = \alpha_0 + \beta_1 R_{f,t} + \varepsilon_t \quad \text{..... (4.1)}$$

Equation (4.1) may be economically justifiable, but until the statistical properties of the estimation procedure are satisfied, the estimated value of β_1 won't be reliable. In addition to containing unit roots, another feature of the financial time series is that these are autocorrelated, which implies that successive returns of one speculative asset are significantly predictable. Significantly autocorrelated cash and futures market returns suggest that successive stock and / or futures returns are not random, but rather due to mean reversion, volatility clustering, information asymmetry or an inefficient microstructure that are a function of the previous information set(s) (Fama, 1970 and 1991 and Dimson and Mussavian, 1998). Therefore, if stock returns are autocorrelated, then avoidance of it may bias the estimated hedge ratio. Hence, equation (4.1) modified to equation (4.2) (to include the autoregressive terms5 of cash market returns), may provide better results, and hence an improved R^2, which otherwise could have been biased on account of significant serial correlation. In equation (4.2), $R_{s,t}$ is cash market returns, $R_{f,t}$ is (are) futures market returns, $R_{s,t-i}$ is autoregressive term(s) whose order varies between i to p determined as per Schwartz Information Criteria (SIC), α_o is the intercept term and ε_t is the error term.

$$R_{s,t} = \alpha_0 + \sum_{i=1}^{p} \alpha_i R_{s,t-i} + \beta_1 R_{f,t} + \varepsilon_t \quad \text{.....(4.2)}$$

Literature on financial econometrics has further observed that stock returns observe volatility clustering, which implies that an information set continues to affect stock return the volatility of the few periods ahead. In other words, volatility clustering implies that large price changes will be followed by large price changes, and small price changes will be followed by small price changes. In equations (4.1 and 4.2), if the variance of the error term is constant6, the hedge ratio estimated through the Ordinary Least Square (OLS) method will be valid; however, a vast amount of academic literature (Engle, 1982; Bollerslev, 1987; Myers, 1991; Park and Switzer, 1995; Floros and Vougas, 2004 and Pattarin and Ferretti, 2004) has suggested that stock returns are heteroscedastic in nature. Therefore, the Autoregressive Conditional Heteroscedasticity model (ARCH) (Engle, 1982) generalized by Bollerslev (1986) called GARCH (p, q) applies, in which conditional variance depends not only upon the squared residuals of the mean equation but also on its own past values. The GARCH (p, q) model is given by equation (4.3)

$$h_t = \omega + \sum_{i=1}^{p} \alpha_i \varepsilon_{t-i}^2 + \sum_{j=1}^{p} \beta_j h_{t-j} + \upsilon_t \quad \text{....(4.3)}$$

4 The estimated results are not reported in the paper, but, are available on demand.

5 Order of autoregression has been determined on the basis of Schwartz criteria. The Schwartz criterion uses a function of the residual sum of squares together with a penalty for large number of parameters. Specifically, the Schwartz information criterion minimizes the expression: T * log (RSS) + K * (log T), where T is the number of observations, RSS is the sum of the squared residuals and K is the number of regressors. Lagged terms provide an explanation of the short-run deviations from the long-run equilibrium for the two test equations.

6 The Langrage Multiplier Test, whose null hypothesis states that the variance of error term is homoscedastic. Therefore, rejection of the null hypothesis will ask the researcher to apply an appropriate model from the GARCH family.

Where, h_t is the conditional volatility, α_i is the coefficient of the ARCH term with order i to p and β_j is the coefficient of the GARCH term with order j to q. The conditional volatility as defined in equation (4.3) is determined by three effects: the intercept term (ω), the ARCH term ($\alpha_i\varepsilon^2_{t-i}$) and the forecasted volatility from the previous period called the GARCH component ($\beta_j h_{t-j}$). Parameters ω and α should be higher than 0, and β_j should be positive in order to ensure conditional variance (h_t) to be non-negative. In addition, it is necessary that $\alpha_i+\beta_j\leq 1$, which secures covariance stationarity of conditional variance. Therefore, if the variance of the error term in equation (4.2) is not constant, equation (4.3) would be attached to equation (4.2), meaning the estimation of the hedge ratio (β_1) would be subject to the nature of the index return's volatility.

Furthermore, Nelson (1991), by taking into account the asymmetric relationship between conditional volatility and conditional mean, proposes an Exponential GARCH (EGARCH) model based upon the logarithmic expression of conditional volatility in cash and futures market returns. If the stock returns are asymmetric and the interaction between old and new information observes leverage effects, the EGARCH model (i.e. equation (4.4)) may help to estimate an improved hedge ratio as compared to that estimated through the GARCH process in equation (4.3)

$$h_t = \gamma_1 + \gamma_2 \left| \frac{\varepsilon^2_{t-1}}{h_{t-1}} \right| + \gamma_3 \frac{\varepsilon^2_{t-1}}{h_{t-1}} + \gamma_4 h_{t-1} \qquad \text{.....(4.4)}$$

Equation (4.4) reports the leverage relationship between the old and new information, but in speculative markets, besides the leverage effect, it has been observed that traders react heterogeneously to positive and negative news. For instance, Karpoff (1987), in a survey on the relationship between information arrival (trading volume as a proxy for information arrival) and the behavior of stock market volatility, has reported that volatility in the declining market was always higher than in the rising market. Therefore, it would be more appropriate (if conditional volatility behaves differently to positive and negative news) to segregate the impact of both positive and negative news, which can be done by specifying the variance equation in the TARCH (Threshold Autoregressive Conditional Heteroscedasticity) framework and then estimating the optimal hedge ratio in the mean equation.

Equation (4.5) lays down the variance equation of the TARCH model, where equation (4.4) is modified to include $\varepsilon^2_{t-i}\xi_{t-i}$, which is a dummy for negative news having value 1 if there is negative news and 0 otherwise. Therefore, an appropriate GARCH methodology would be able to capture the stylized behavior of the conditional volatility of cash market returns, and hence the estimated hedge ratio will be statistically robust.

$$h_t = \omega + \sum_{i=1}^{p} \alpha_i \varepsilon^2_{t-i} + \sum_{i=1}^{p} \alpha_k \varepsilon^2_{t-1} \xi_{t-i} + \sum_{j=1}^{p} \beta_j h_{t-j} + \upsilon_t$$

.....(4.5)

where
(a) $\xi_{t-i} = 1$, if $\varepsilon_{t-i} < 0$
(b) $\xi_{t-i} = 0$, if $\varepsilon_{t-i} > 0$

The estimation of the hedge ratio through OLS, GARCH or EGARCH processes may provide better estimates of the hedge ratio, but the optimality of the hedge ratio will still be doubtful because both markets observe a significant lead-lag relationship in terms of volatility spillover and information dissemination. Therefore, estimating an optimal hedge ratio by regressing only the cash market returns on the lagged returns of both futures and cash market may be biased because the converse is also true, as the volatility spillover is bidirectional and continuous. Therefore, in the present case, either the Vector Autoregression Model (VAR) (when both markets observe causal relationships) or the Vector Error Correction Methodology (VECM) (when both markets are cointegrated) may provide efficient speculative forecasts, and hence a robust hedge ratio may be estimated.

The VAR model simultaneously regresses the lagged returns of both variables, whereas VECM, in addition to lagged returns, also considers the error correction term (if both series are cointegrated). Hence both methodologies estimate the optimal hedge ratio by considering the theoretical relationship between the two markets (i.e. lead-lag in the short-run and cointegration in the long-run), which confirms the volatility spillover between the two markets through the arbitrage process. Equations (4.6) and (4.7) specify the estimation process of the VAR methodology, while equations (4.8) and (4.9) stimulate the estimation procedure of VECM. The hedge ratio, on the basis of VAR and VECM, will be computed as $\sigma_{s,f} / \sigma^2_f$, where $\sigma_{s,f} = \text{cov}(\varepsilon_{ft}, \varepsilon_{st})$ and $\sigma^2_f = \text{var}(\varepsilon_{ft})$.

$$R_{s,t} = \sum_{i=1}^{M} \alpha_i R_{s,t-i} + \sum_{j=1}^{N} \beta_j R_{f,t-j} + \varepsilon_{st} \qquad (4.6)$$

$$R_{f,t} = \sum_{k=1}^{O} \alpha_k R_{s,t-k} + \sum_{l=1}^{P} \beta_1 R_{s,t-1} + \varepsilon_{ft} \qquad (4.7)$$

$$R_{f,t} = \alpha_{0f} + \sum_{i=1}^{p} \alpha_{if}(F_{t-i} - S_{t-i}) + \sum_{j=1}^{q} \beta_f R_{f,t-j} + \sum_{k=1}^{m} \beta_f R_{s,t-k} + \varepsilon_{ft} \quad \text{.....(4.8)}$$

$$R_{s,t} = \alpha_{0s} + \sum_{i=1}^{p} \alpha_{is}(F_{t-i} - S_{t-i}) + \sum_{l=1}^{n} \beta_s R_{s,t-l} + \sum_{h=1}^{o} \beta_s R_{f,t-h} + \varepsilon_{st} \quad \text{..... (4.9)}$$

Therefore, in the present study, the optimal hedge ratio is estimated through OLS, GARCH, EGARCH, TARCH, VAR and VECM procedures, which may be constant or time-varying depending upon the property of the series understudy. After estimating the optimal hedge ratio through the aforementioned statistical procedures, the hedging effectiveness of all hedge ratios will be compared and the optimal hedge ratio, which reduces the portfolio variance to a minimum level, would be proposed as an efficient hedge ratio. The efficiency of the optimal hedge ratio would be measured as a percentage decline in portfolio variance as shown in equation (4.11), where Var (U) and Var (H) represent the variance of un-hedged and hedged portfolios, respectively. σ_s and σ_f are the standard deviations of the cash and futures returns, respectively, $\sigma_{s,f}$ represents the covariability of the cash and futures returns and h* is the optimal hedge ratio.

$$\text{Hedge effectiveness} = \frac{\text{Var (U) - Var (H)}}{\text{Var (U)}} \quad \text{.....(4.10)}$$

$$\text{Var (U)} = \sigma_s^2 \quad \text{.....(4.11)}$$

$$\text{Var (H)} = \sigma_s^2 + h^{*2}\sigma_f^2 - 2h^*\sigma_{s,f} \quad \text{.....(4.12)}$$

RESULTS AND ANALYSIS

Before discussing the optimal hedge ratio estimation results through the various econometric procedures proposed in Section 3 and comparing their efficiency in reducing portfolio risk, it is important to discuss the time series properties of the series under examination. The results in Table 3 indicate important information relating to the summary statistics of futures and cash markets. Table 3 shows that the returns of both futures and cash markets are significantly skewed (negatively skewed in most cases) and their coefficient of kurtosis is significantly different from three, irrespective of crisis period, which implies that futures and cash market returns do not conform to a normal distribution. The null hypothesis that futures and cash market returns follow a normal distribution is further tested through a Jarque-Bera test that is statistically significant, and rejects the null hypothesis for all index futures and cash market returns. Finding asymmetric returns in the futures and cash markets is not a new observation, and summary statistics in the current study are consistent with the findings of Kendall (1953); Fama (1965); Stevenson and Bear (1970); Chen (1996); Reddy (1997) and Kamath (1998).

The type of traders in the two markets may be a potential factor affecting the theoretical distribution of speculative asset returns. It is an established fact that the Indian cash market is predominantly driven by foreign as well as domestic institutional investors, and that retail investors play little role in market movements. On the other hand, in the futures market retail investor participation is very significant and institutional investors have little role to play.7 Therefore, the asymmetric profile of investors in both markets may be a strong determinant for significant asymmetry in basis because institutional investors base their trading decisions on sophisticated analyses undertaken by teams of professionals, whereas retail traders base their decisions on firm-specific or insider information (Thomas, 2006) which can be stale or late, and as a result the timing of trading by the two groups of investors will be different, and hence new information will take time to die out and will cause asymmetric jumps in the conditional volatility of both markets.

Furthermore, Table 4 reports the hedge ratio estimated through Naive, Ederington's Model, ARMA (p,q), VAR, VECM, GARCH (p,q), EGARCH (p,q) and TGARCH (p,q). The hedge ratios estimated through eight models are reported for near month, next month and far month contracts. Three major observations in table 4 can be found. Firstly, hedge ratio coefficients for post crisis period are relatively higher as compared to pre-crisis period through all the models (except CNXIT near month and next month contracts). The reason for such a result may be due to the contagion effect of the crisis on world economies, including India (Nikkinen, 2013; Bekiros, 2014 and Dufrénot, 2014). Therefore, these results are consistent with the findings of

7 Retail participants drive approximately 60% of the total trading volume in the Indian equity futures market; however, the participation of institutional traders approximates only 10% of the total trading volume. For reference, see the Monthly Derivatives Market Update published by National Stock Exchange of India (www.nseindia.com)

Figlewski (1984) who observes that increases in the co-movement between cash and futures markets leads to a higher hedge ratio. Second, the hedge ratio estimated through Ederington's model, ARMA (p,q), VAR and VECM are constant hedge ratios and their hedging coefficients are relatively smaller than the hedge ratios estimated through time varying models i.e. GARCH, EGARCH and TGARCH. Lastly, hedge ratios for near month futures contracts are relatively higher than the hedge ratio coefficients for next month and far month contracts, which is consistent with the findings of Ederington (1979). From second and third observations, the conclusion can be drawn that the cost of hedging through a constant hedge ratio and near month futures contracts are higher than time varying hedge ratios and far month futures contracts. Furthermore, the coefficients of hedge ratios estimated through VAR and VECM are very close to hedge ratios estimated through Ederington's OLS model, which implies that it incorporates the property of the cost of carry model.

Furthermore, Table 5 reports hedge effectiveness in the form of variance reduction after taking a hedging position by using the estimated hedge ratios. An important observation is that hedging effectiveness was found to be increased during the post-crisis period (except CNXIT near month and next month contracts). Another important observation is that Ederington's OLS model gives the highest hedging effectiveness, whereas the naive hedging model gives the lowest hedging effectiveness among all of the models. Furthermore, near month hedging is found to be more effective than next month and far month hedging. Moreover, there is no significant difference between hedge effectiveness by using the hedge ratio estimated through Ederington's model, ARMA (p,q), VAR, VECM, GARCH (p,q), EGARCH (p,q) and TGARCH (p,q). These findings are consistent with the findings of Maharaj et al. (2008) and Gupta and Singh (2008), which suggests that knowledge of sophisticated econometrical procedures does not help to construct a better portfolio and to improve hedging effectiveness. However, hedging effectiveness estimated by the naive method is significantly low in all cases, irrespective of the financial crisis. Moreover, the probable reason for near month futures contracts being a more efficient hedging instrument than next month and far month futures contracts is the variation of liquidity across these three contracts. The near month futures contracts are more liquid than the next month and far month contracts, and thus near month futures contracts are a more efficient hedging instrument.

Furthermore, negative values for hedge ratio coefficients have been observed for CNXIT far month and BANKNIFTY far month contracts during the pre-crisis period, which may be due to insufficient trading volume (see Table 6). Another important finding is that the results of the optimal hedge ratio and hedging effectiveness for CNXIT near month and next month contracts have been consistently an exception to the results of the other two indices (i.e. S&PCNXNIFTY and BANKNIFTY). The reason for such an exception may be due to the fact that the global financial crisis of 2008 adversely affected the business of the Indian IT industry and the sentiments of investors, which is evident from two facts. First, the correlation coefficients of spot and futures price series for CNXIT for all the three types of contracts (i.e. near month, next month and far month) declined in the post-crisis period (see Table 7). Second, the average traded volume for CNXIT contracts show a declining trend after 2007 (see Table 6) which may be due to negative sentiment among investors towards IT stocks, whereas the traded volume for NIFTY and BANKNIFTY continued to rise.

CONCLUSION

The global financial crisis of 2008 originated in the United States and its spillover effect has been observed over both developed and emerging economies. Equity markets especially witnessed a downfall at the global level and Indian stock markets exhibited enhanced volatility, volatility clustering and mean reversion. Furthermore, volatility and price trends in the market have found to be an important determinant of hedge effectiveness. Also, as mentioned in Section 1, numerous studies have found that the time-to-expiry of futures contracts is an important determinant of hedging effectiveness. However, the Indian derivatives market has observed remarkable growth in futures trading since its inception in the year 2000 and to the best of our knowledge, there have been only a few attempts to study it (see, Bhaduri and Durai, 2007; Rao and Thakur, 2008; Gupta and Singh, 2009 and Pradhan, 2011) all of which have restricted their scope to examining the optimal hedge ratio in the Indian equity futures market. Therefore, the present study is an attempt to examine the impact of the global financial crisis of 2008 and time-to-expiry of futures contracts upon hedging effectiveness by using the three benchmark indices of NSE (S&PCNXNIFTY, CNXIT and BANKNIFTY).

The returns of both futures and cash markets are found to be significantly negatively skewed and kurtic, which rejects the null hypothesis that market returns are symmetrically distributed among buyers and sellers, implying that the information dissemination

process is inefficient in the market under study. Furthermore, basis has found to be negatively skewed, which may be due to the existence of a negative correlation between basis and the time-to-expiry of futures contracts.

Hedge ratios have been estimated for near month, next month and far month contracts by employing eight different methodologies: naive, Ederington's Model, VAR, VECM, ARMA (p,q), GARCH(p,q), EGARCH(p,q) and TGARCH(p,q) during the pre-crisis and post-crisis periods. The present study finds that hedge ratios during the post-crisis period are relatively higher than during the pre-crisis period, which implies that the cost of hedging has been increased during the post-crisis period. Second, hedge ratios for near month futures contracts are relatively higher than the hedge ratio coefficients for next month and far month contracts, irrespective of the crisis period. Moreover, it has been found that hedge ratios estimated through constant hedging models [Ederington's model, VAR, VECM and ARMA (p,q)] are relatively smaller than the hedge ratios estimated through time varying models (GARCH, EGARCH and TGARCH) The results of hedging effectiveness suggest that hedging effectiveness has been increased during the post-crisis period. Another important finding is that hedging effectiveness as examined by Ederington's OLS model has been found to be consistently highest for all of the three indices during the pre- and post-crisis periods. Therefore, the study suggests the use of the OLS method for hedging with equity futures. Moreover, the main benefit of using Ederingon's OLS is that it gives the highest hedging effectiveness with the lowest cost (lowest hedge ratio) as compared to hedge ratios estimated by other models. It is also found that near month hedging is more effective than next month and far month hedging. Moreover, the study suggests that the use of any econometric procedure for estimating an optimal hedge ratio does not lead to an improvement in the hedging effectiveness of the portfolio. Moreover, it has been found that due to declines in trading and a reduction in correlation between futures and spot prices for CNXIT, there has been a decline in hedging effectiveness. These findings are also consistent with Gupta and Singh (2009), who suggests that liquidity plays an important role in hedging effectiveness.

The results of the present study are surprisingly inconsistent with the results of most of the studies on short-term and long-term hedging (see, Ederington, 1979; Figlewski, 1984; Kamara and Siegal, 1987; Chen et al., 2002; Chen et al., 2004; In and Kim, 2006 and Juhl et al., 2012), which found that long-term hedging is better than short-term hedging.

The overall conclusion of the study suggests that, first, hedging effectiveness has increased after the crisis, yet is also accompanied by an increase in the cost of hedging; and that second, short period hedging (as identified by near month contracts) in the Indian equity futures market is more effective than long period hedging, the reason for which can be attributed to the fact that near month contracts are more liquid than next month or / and far month contracts, while short-term hedging has found to be more costly than long-term hedging.

REFERENCES

Abdulnasser Hatemi-Ja, Eduardo Roca. 2006. Calculating the Optimal Hedge Ratio Constant, Time Varying and the Kalman Filter Approach. Applied Economics Letters 13: 293–299.

Aggarwal, Raj, and Andrea L. DeMaskey. 1997. Using Derivatives in Major Currencies for Cross-Hedging Currency Risks in Asian Emerging Markets. The Journal of Futures Markets 17 (7): 781–796.

Ali, R. and Afzal, M. 2012. Impact of the Global Financial Crisis on Stock Markets: Evidence from Pakistan and India. Journal of Business Management and Economics 3 (7): 275-282.

Alizadeh, Amir, and Nikos Nomikos. 2004. A Markov Regime Switching Approach for Hedging Stock Indices. The Journal of Futures Market 24 (7): 649-674.

Al-Rjoub, S and Azzam, H. 2012. Financial Crises, Stock Returns and Volatility in an Emerging Stock Market: The Case of Jordan. Journal of Economic Studies 39 (2): 178 - 211.

Anshuman, R. & Goswami, R. 2000. Day of the Week Effects on the Bombay Stock Exchange. Research Paper Presented in UTI Capital Market Conference Proceedings: 1-33.

Barua, S. K. 1981. The Short-run Price Behavior of Securities: Some Evidence on Efficiency of Indian Capital Market. Vikalpa, 16 (2): 93-100.

Bekiros, S. D. 2014. Contagion, Decoupling and the Spillover Effects of the US Financial Crisis: Evidence from the BRIC Markets. International Review of Financial Analysis 33: 58-69.

Bhaduri, Saumitra N, and S. Raja Sethu Durai. 2007. Optimal Hedge Ratio and Hedging Effectiveness of Stock Index Futures: Evidence from India. NSE Research Paper. NSE, India.

Bhargava, Vivek, and D.K. Malhotra. 2007. Determining the Optimal Hedge Ratio: Evidence from Cotton and Soybean Markets. Journal of Business and Economic Studies 13 (1): 38-57.

Bose, S. 2006. The Indian Derivatives Market Revisited, ICRA Bulletin: Money and Finance, Jan-July, 2006: 81-112.

Brooks, Chris, Ales Cerny, and Joelle Miffre. 2012. Optimal Hedging with Higher Moments. The Journal of Futures Markets 32 (10): 909-944.

Butterworth, Darren, and Phil Holmes. 2001. The Hedging Effectiveness of Stock Index Futures: Evidence for the FTSE-100 and FTSE-Mid250 Indexes Traded in the UK. Applied Financial Economics 11: 57-68.

Carlton, D.W. 1984. Futures Markets: Their Purpose, Their History, Their Successes and Failures. The Journal of Futures Markets 4 (3): 237-271.

Castelino, M. G. 1989. Basis Volatility: Implications for Hedging. Journal of Financial Research 12 (2): 157-172.

Castelino, Mark G. 1992. Hedge Effectiveness: Basis Risk and Minimum-Variance Hedging. The Journal of Futures Markets 20 (1): 89-103.

Chan, Leo, and Donald Lien. 2001. Cash Settlement and Price Discovery in Futures Market. Quarterly Journal of Business and Economics 40 (3/4): 65-77.

Chang, Eric, Ray Y. Chou, and Edward Nelling. 2000. Market Volatility and the Demand for Hedging in Stock Index Futures. The Journal of Futures Markets 20 (2): 105–125.

Chaudhuri, S. K. 1991. Short-Run Behavior of Industrial Share Price Indices: An Empirical Investigation. Prajnan 22 (2): 169-183.

Chen, P. 1996. A Random-Walk or Color-Chaos on the Stock Market? Time- Frequency Analysis of S & P Indexes. Studies in Nonlinear Dynamics & Econometrics1 (2): 87-103.

Chen, Chao-Chun, and Wen-Jen Tsay. 2011. A Markov Regime-Switching ARMA Approach for Hedging Stock Indices. The Journal of Futures Market 31 (2): 165-191.

Chen, Sheng-Syan, Cheng-Few Lee, and Keshab Shrestha. 2004. An Empirical Analysis of the Relationship Between the Hedge Ratio and Hedging Horizon: A Simultaneous Estimation of the Short- and Long-Run Hedge Ratios. The Journal of Futures Markets 24 (4): 359-386.

Chen, Sheng-Syan, Cheng-Few Lee, and Keshab Shrestha. 2001. On a Mean-Generalized Semivariance Approach to Determining the Hedge Ratio. The Journal of Futures Markets 21 (6): 581–598.

Cox, Charles C. 1976. Futures Trading and Market Information. The Journal of Polotical Economy 84 (6): 1215-1237.

Crowder, W. J. and Phengpis, C. 2005. Stability of the S&P500 Futures Market Efficiency Conditions. Applied Financial Economics15: 855-866.

Diagler, R. T. and Wiley, M. K. 1999. The Impact of Trader Type on the Futures Volatility-Volume Relation. The Journal of Finance 54 (6): 2297-2316.

Dimson, E. and Mussavian, M. 1998. A Brief History of Market Efficiency. European Financial Management 4 (1): 91-104.

Dufrénot, G and Keddad, B. 2014. Spillover Effects of the 2008 Global Financial Crisis on the Volatility of the Indian Equity Markets: Coupling or Uncoupling? A study on Sector-Based Data. International Review of Financial Analysis 33: 17-32.

Ederington, Louis H. 1979. The Hedging Performance of the New Futures Markets. The Journal of Finance 34 (1): 157-170.

Evans, T. 2006. Efficiency Tests of the U.K. Financial Futures Markets and the Impact of Electronic Trading Systems. Applied Financial Economics16: 1273-1283.

Fama, E. F. 1965, The Behavior of Stock-Market Prices. The Journal of Business38 (1): 34-105.

Fama, E. F. 1970. Efficient Capital Markets: A Review of Theory and Empirical Work. Journal of Finance25 (2): 383-417.

Fama, E. F. and French, K. R. 1987. Commodity Futures Prices: Some Evidence on Forecast Power, Premiums, and the Theory of Storage. Journal of Business 60 (1): 55-73.

Figlewski, Stephen. 1984. Hedging Performance and Basis Risk in Stock Index Futures. The Journal of Finance 39 (3): 657-669.

Floros, Christos, and Dimitrios V. Vougas. 2004. Hedge Ratio in Greek Stock Index Futures Market. Applied Financial Economics 14: 1125-1136.

Floros, Christos, and Dimitrios V. Vougas. 2006. Hedging Effectiveness in Greek Stock Index Futures Market, 1999-2001. International Research Journal of Finance and Economics 5: 7-18.

Garbade, Kenneth D, and Willaim L. Silber. 1983. Price Movement and Price Discovery in Futures and Cash Markets. The Review of Economics and Statistics 65 (2): 289-297.

Gupta, K. and Singh, B. 2006a. Random Walk and Indian Equity Futures Market. ICFAI Journal of Derivatives Market III (3): 23-42.

Gupta, K. and Singh, B. 2006b. Investigating the Price Discovery Efficiency of Indian Equity Futures Market. PARADIGM X (2): 33-45.

Gupta, K. and Singh, B. 2009. Estimating the Optimal Hedge Ratio in Indian Equity Futures Market. Journal of Financial Risk Management VI (3 & 4): 38-98.

Gupta, O. P. 1985. Behavior of Share Prices in India: A Test of Market Efficiency. National Publications, New Delhi.

Holmes, Phil. 1995. Ex Ante Hedge Ratios and the Hedging Effectiveness of the FTSE-100 Stock Index Futures Contracts. Applied Economics Letters 2: 56-59.

In, Francis, and Sangbae Kim. 2006. The Hedge Ratio and the Empirical Relationship Between the Stock and Futures Markets: A New Approach Using Wavelet Analysis. The Journal of Business 79 (2): 799-820.

Johnson, L. 1960. The Theory of Hedging and Speculation in Commodity Futures. Review of Economic Studies 27: 139-151.

Joshi, P. 2012. Financial Crisis and Volatility Behavior of Stock Markets of Asia. Quest-Journal of Management and Research 2 (2): 35-44.

Juhl, Ted, Ira G. Kawaller, and Paul D. Koch. 2012. The Effect of the Hedge Horizon on Optimal Hedge Size and Effectiveness When Prices are Cointegrated. The Journal of Futures Markets 32 (9): 837–876.

Kamara, Avraham. 1982. Issues in Futures Markets: A Survey. The Journal of Futures Markets 2 (3): 261-294.

Kamara, Avraham, and Andrew F. Siegel. 1987. Optimal Hedging in Futures Markets with Multiple Delivery Specifications. The Journal of Finance 42 (4): 1007-1021.

Kamath, R. R., Chakornpipat, R. and Chatrath, A. 1998. Return Distribution and the Day-of-the-Week Effects in the Stock Exchange of Thailand. Journal of Economics and Finance22 (2-3): 97-106.

Karim, B. A., Jais, M. and Karim, S. A. A. 2011. The Subprime Crisis and Stock Index Futures Markets Integration. The Journal of Risk Finance12 (5): 400 - 408.

Karpoff, J. M. 1987. The Relation Between Price Changes and Trading Volume: A Survey. Journal of Financial and Quantitative Analysis22 (1): 109-126.

Kendall, M. G. and Hill, B. A. 1953. The Analysis of Economic Time Series Part I. Prices. Journal of Royal Statistical Society 9: 11-25.

Kenourgios, Dimitris, Aristeidis Samitas, and Panagiotis Drosos. 2008. Hedge Ratio Estimation and Hedging Effectiveness: The Case of the S&P 500 Stock Index Futures Contract. International Journal of Risk Assessment and Management 9 (1/2): 121-134.

King, M. A. and Wadhwani, S. 1990. Transmission of Volatility between Stock Markets. Review of Financial Studies, 3 (1): 5-33.

Kofman, Paul, and McGlenchy Patrick. 2005. Structurally Sound Dynamic Index Futures Hedging. The Journal of Futures Markets 25 (12): 1173-1202.

Kroner, Kenneth F., and Jahangir Sultan. 1993. Time-Varying Distributions and Dynamics Hedging with Foreign Currency Futures. The Journal of Financial and Quantitative Analysis 28 (4): 535-551.

Kumar, S.S.S. 2012. Financial Derivatives. New Delhi: PHI Learning Private Limited.

Lee, Hsiang Tai, and Jonathan K. Yoder. 2007. A Bivariate Markov Regime Switching GARCH Approach to Estimate Time Varying Minimum Variance Hedge Ratios. Applied Economics 39: 1253–1265.

Lien, Donald. 2005. A Note on the Superiority of the OLS Hedge Ratio. The Journal of Futures Markets 25 (11): 1121–1126.

Lien, Donald, and Xiangdong Luo. 1994. Multiperiod Hedging in the Presence of Conditional Heteroskedasticity. The Journal of Futures Markets 14 (8): 927-955.

Longin, F. M., and Solnik, B. 2001. Extreme Correlation of International Equity Markets. Journal of Finance 56: 649-676.

Lypny, G. and Powalla, M. 1998. The Hedging Effectiveness of DAX Futures. European Journal of Finance 4: 345-355.

Maharaj, E. A., Moosa, I., Dark, J. and Silvapulle, P. 2008. Wavelet Estimation of Asymmetric Hedge Ratios: Does Econometric Sophistication Boost Hedging Effectiveness?. International Journal of Business and Economics 7 (3): 213-230.

Majid, M. S. A. and Kassim, S. H. 2009. Impact of the 2007 US Financial Crisis on the Emerging Equity Markets. International Journal of Emerging Markets 4 (4), 341-57.

Mangala, D. and Mittal, R. K. 2005. The Efficiency of the Indian Stock Market: An Evidence of Day-of-the-Week Effect. Gyan – A Bi-Annual Journal of Management & Technology 1 (1): 3-8.

Marisetty, V. B. 2003. Measuring Productive Efficiency of Stock Exchanges using Price Adjustment Coefficients. International Review of Finance4 (1-2): 79-99.

Mazumder, M. I. and Ahmad, N. 2010. Greed, Financial Innovation or Laxity of Regulation?. Studies in Economics and Finance 27 (2): 110 - 134.

Mishra, B. 1999. Presence of Friday Effect in Indian Stock Market. Paradigm3 (2): 57-64.

Moolman, H. C. 2004. An Asymmetric Econometric Model of the South African Stock Market. Ph. D Dissertation, University of Pretoria.

Monoyios, M. and Sarno, L. 2002. Mean Reversion in Stock Index Futures Markets: A Nonlinear Analysis. The Journal of Futures Markets22(4): 285-314.

Moschini, GianCarlo, and Robert J. Myers. 2002. Testing for Constant Hedge Ratios in Commodity Markets: A Multivariate GARCH Approach. Journal of Empirical Finance 9: 589–603.

Myers, Robert J. 1991. Estimating Time-Varying Optimal Hedge Ratios on Futures Markets. The Journal of Futures Markets 20 (1): 73-87.

Nath, G. C. 2002. Long Memory and Indian Stock Market – An Empirical Evidence. Research Paper Presented in UTI Capital Market Conference Proceedings, pp. 1-20.

Nelson, D. B. 1991. Conditional Heteroskedasticity in Asset Returns: A New Approach. Econometrica59: 347-370.

Neuberger, Anthony. 1999. Hedging Long-Term Exposures with Multiple Short-Term Futures Contracts. The Review of Financial Studies 12 (3): 429-459.

Nikkinen, J., Saleem, K. and Martikainen, M. 2013. Transmission Of The Subprime Crisis: Evidence From Industrial And Financial Sectors Of BRIC Countries. The Journal of Applied Business Research29 (5): 1469-1478.

Pant, B. and Bishnoi, R. T. 2001. Testing Random Walk Hypothesis for Indian Stock Market Indices. Research Paper Presented in UTI Capital Market Conference Proceedings, pp. 1-15.

Park, Tae H., and Lorne N. Switzer. 1995. Time-Varying Distributions and the Optimal Hedge Ratios for Stock Index Futures. Applied Financial Economics 5: 131-137.

Pattarin, Franceso, and Riccardo Ferretti. 2004. The Mib30 Index and Futures Relationship: Econometric Analysis

and Implications for Hedging. Applied Financial Economics 14: 1281-1289.

Rao, S. V. D. and Thakur, S. 2008. Optimal Hedge Ratio and Hedge Efficiency: An Empirical Investigation of Hedging in Indian Derivatives Market. Available at https://www.soa.org/library/monographs/other-monographs/2008/april/mono-2008-m as08-1-thakur.pdf (accessed January 21, 2014).

Rao, K. N. 1988. Stock Market Efficiency: the Indian Experience, Proceedings of National Seminars on Indian Securities Markets: Thrust and Challenges, March 24-26, University of Delhi, 1988: New Delhi.

Ranjan, R. and Padhye, A. 2000. Market Anomalies in Emerging Markets: Revisiting the Calendar Effect in Stock Prices. ICICI Research Centre. Org., pp. 1-19.

Pradhan, K. C. 2011. The Hedging Effectiveness of Stock Index Futures: Evidence for the S&P CNX Nifty Index Traded in India. South East European Journal of Economics & Business 6 (1):111-123.

Reddy, S. Y. 1997. Efficiency of Indian Stock Markets: An Empirical Analysis of Weak-Form EMH of the BSE. Research Paper Presented in UTI Capital Market Conference Proceedings, pp. 91-115.

Sharma, J. L. 1983. Efficient Capital Markets and Random Character of Stock Price Behavior in Developing Economy.Indian Journal of Economics 63: 395- 419.

Singhania, M. and Anchalia, J. 2013. Volatility in Asian Stock Markets and the Global Financial Crisis. Journal of Advances in Management Research 10 (3): 333 - 351.

Stein, Jerome L. 1961. The Simultaneous Determination of Spot and Futures Prices. The American Economic Review 51 (5): 1012-1025.

Stevenson, A. R. and Bear, M. R. 1970. Commodity Futures: Trends or Random Walks?. The Journal of Finance25 (1): 65-81.

Stoll, H. R. and Whaley, R. E. 1990. Dynamics of Stock Index and Stock Index Futures Returns. Journal of Financial and Quantitative Analysis 25 (4): 441-468.

Sugimoto, K., Matsuki, T. and Yoshida, Y. 2014. The Global Financial Crisis: An analysis of the Spillover Effects on African Stock Markets. Emerging Markets Review 21: 201-233.

Telser, Lester G. 1981. Why There are Organised Futures Markets. Journal of Law and Economics 24 (1): 1-22.

Theobald, Michael, and Yallp, Peter. 2001. Mean Reversion and Basis Dynamics. The Journal of Futures Markets 21 (9): 797–818.

Theobald, Michael, and Peter Yallup. 1997. Hedging Ratios and Cash / Futures Market Linkages. The Journal of Futures Markets 17 (1): 101-115.

Woking, Holbrook. 1953. Futures Trading and Hedging. American Economic Review 43: 314-343.

Working, Holbrook. 1962. New Concepts Concerning Futures Markets and Prices. The American Economic Review 52 (3): 431-459.

Yang, Ming Jing, and Yi-Chuan Lai. 2009. An Out-of-Sample Comparative Analysis of the Hedging Performance of Stock Index Futures: Dynamic Versus Static Hedging. Applied Financial Economics 19: 1059-1072.

Zeng, T. 2001. Mean Reversion and the Comovement of Equilibrium Spot and Futures Prices: Implications from Alternative Data-Generating Processes. The Journal of Futures Markets 21 (8): 769-796.

Table 2: Literature Review of Hedging Effectiveness

Author (year of study)	Market understudy	Symbols	Sample period	Methodology	Hedging effectiveness
Ederington (1979)	U.S.A.	GNMA and T-Bill Futures Markets	Jan. 1976 to Dec. 1977 and Mar. 1976 to Dec. 1977	OLS	Futures hedging is better for longer periods than short periods
Figlewski (1984)	U.S.A.	S&P500, NYSE, AMEX, NASDAQ, DOW	June 1982 to Sept 1983	OLS	Basis risk disturbs hedging effectiveness, therefore one week hedging is better than overnight hedging
Kamara and Siegel (1987)	U.S.A.	Soft Wheat and Hard Wheat	Jan. 1970 to March 1981	OLS	Far period hedging is better than near to expiration period
Myers (1991)	U.S.A.	Wheat Futures	June 1977 to May 1983	OLS and BGARCH	Time varying hedge ratios are better than constant hedge ratios.
Kroner and Sultan (1993)	U.S.A.	BP, CD, GM, JY and SF	Feb. 1985 to Feb. 1990	Naive, OLS, ECM and ECM-GARCH	Time varying error correction methodology takes care of transaction costs,and thus outperforms other methodologies.
Lien and Luo (1994)	U.S.A.	BP, CD, GM, JY and SF	March 1980 to Dec. 1988	OLS, BGARCH, ECM	If a trader is extremely risk aversee, both constant and time varying hedge ratios are equally efficient, whereas to achieve utility maximization the objective GARCH hedge ratio is most efficient.
Homles (1995)	U.K.	FTSE100 Futures and FTSE100 Index	July 1984 to June 1992	Ex-Post MVHR, Ex-Ante MVHR and Beta	MVHR based upon historical data is better
Park and Switzer (1995)	U.S.A. and Canada	S&P500, MMI and TSE35	June 1988 to Dec. 1991	Naive, OLS, OLS with Cointegration and BGARCH	Time varying hedge ratios are superior to constant hedge ratios.
Aggarwal and Demaskey (1997)	Hong Kong, South Korea, Singapore, Taiwan, Indonesia, Philippines and Thailand	BP, CD, GM, JY and SF	Jan. 1983 to Dec. 1992	Naive and OLS	Cross hedging is beneficial.
Theobald and Yallup (1997)	U.K.	FTSE100 Futures and FTSE100 Index	Jan. 1985 to Dec. 1995	OLS	Futures contracts can provide hedging benefits only when both markets do not suffer with the problem of non-synchronous trading.
Neuberger (1999)	U.S.A	Crude oil futures	July 1986 to Aug. 1997	Ex-ante and OLS	Rollover of futures contracts adds to hedging effectiveness
Theobald and Yallup (2001)	U.K.	FTSE-100 Index Futures and FTSE-100 Index	Jan 28, 1999 to Dec 3, 1999	Autocorrelation	Partial adjustment coefficients induce mean reversion in the basis change, which are highest at shorter intervals (< 15 mins)
Butterworth and Holmes (2001)	U.K.	FTSE-100 Index Futures and FTSE-mid250 Index	Feb. 1994 to Dec. 1996	OLS, LTS	A new contract is more effective in hedging ITCs than established FTSE100 contracts.

Chen et al., (2001)	U.S.A.	S&P500 Futures	April 1982 to Dec. 1991	M-GSV, MEG, Sharpe, OLS and Standard mean variance	M-GSV minimizes the portfolio variance by maximum
Moschini and Myers (2002)	U.S.A.	Corn Futures	Jan. 1976 to June 1997	BEKK, GARCH and OLS	Supports time varying hedge ratio
Chen et al., (2002)	Taiwan	TAIFEXTAIEX-TAIEX AND SGXMSCI-MSCI	July 1998 to July 2000	OLS, Bayesian Approach	Hedging effectiveness observes a positive relationship with hedging horizon.
Alizadeh and Nomikos (2004)	U.S.A. and U.K.	S&P500 Futures and S&P500 Index and FTSE100 Futures and FTSE100 Index	May 1984 to March 2001	OLS, ECM, GARCH and Markov Regime Switching Models	By allowing the hedge ratio to be dependent upon the state of market, one may obtain a more efficient hedge ratio.
Floros and Vougas (2004)	Greece	FTSE/ASE-20 index and FTSE/ASE-40 index		OLS, VECM and M-GARCH	The M-GARCH model provides the best hedging ratios.
Chen et al., (2004)	U.S.A., U.K., Canada, Japan, Australia	7 Stock Market Index futures, 11 Commodity futures, 2 metals and 5 currencies	June 1982 to Dec. 1997	OLS	Short-run hedge ratio is significantly < 1 but as the hedge horizon increases it approaches 1 while hedging effectiveness also improves.
Pattarin and Ferretti (2004)	Italy	Fib30 and Mib30 Index	Nov. 1994 to Sept. 2002	Naive, OLS, ECM, GARCH, EWMA	Time varying hedge ratio based upon EWMA is better
Lien (2005)	N/A	N/A	N/A	OLS, ECM	OLS is a superior model over error correction model.
Kofman and McGlenchy (2005)	Hong Kong	HSIF and HIS	Jan. 1994 to July 2003	Naive, Expanding window, Rolling window, EWLS and ROC	Dynamic hedging is better than constant hedging.
Hatemi and Roca (2006)	Australia	MSCI index	Jan 1, 1988 to Sept 8, 2001	Kalman Filter Approach	Kalman Filter Approach is statistically more efficient and has better forecasting properties.
Floros and Vougas (2006)	Greece	FTSE/ASE20 Index Futures and FTSE/ASE Mid 40 Index Futures	Aug. 1999 to Aug. 2001 and Jan. 200 to Aug. 2001	OLS, ECM, VECM and BGARCH	Time varying hedge ratio is superior to constant hedge ratios
In and Kim (2006)	U.S.A.	S&P500 Futures and S&P500 Index	April 1982 to Dec. 2001	Wavelet Analysis	Hedging effectiveness does not only depend upon hedging horizon: risk aversion of hedger also affects hedging effectiveness. Investors with low risk aversion have short-run HE and vice versa.
Bhaduri and Durai (2007)	India	Nifty Index Futures and Nifty Index	Sept. 2000 to Aug. 2005	OLS, ECM, BVAR and M-GARCH	(i) GARCH model performs better in the long-run whereas OLS is a better measure during the short-run. (ii) Time-varying hedge ratios are superior to constant HR

Bhargava and Malhotra (2007)	U.S.A.	Cotton and Soybeans Futures	Jan. 1994 to Dec. 1999 and Jan. 1995 to Dec. 2000	Traditional regression method, Modified regression method and ECM	Traditional regression method performs better than others
Lee and Yoder (2007)	U.K.	Corn and Nickel Futures and Spot Markets	Jan. 1991 to Dec. 2004	RS-BEKK, BEKK and OLS	Time varying hedge ratio performs better.
Rao and Thakur (2008)	India	Nifty Index Futures and Nifty Index Options	Jan. 1, 2002 to Mar. 28, 2002	HKM, JSE, fBN,	HKM methodology yields better Optimal Hedge ratio than JSE methodology in the Indian Futures Market
Kenourgios et al., (2008)	U.S.A	S&P500 stock Index futures	July 3, 1992 to June 30, 2002	OLS, ECM, GARCH, EGARCH	ECM is superior to other models and remains stable over time.
Gupta and Singh (2009)	India	Nifty Index Futures, Nifty Index, Nifty Stock Futures and Nifty Stock	2003-07	VAR, VECM, GARCH, EGARCH, TARCH and OLS	(i) VAR and VECM reduced the portfolio variance by the maximum extent (ii) Hedging through liquid futures contract involves low hedging cost.
Yang and Lai (2009)	U.S.A and U.K.	DJIA, S&P500, Nasdaq100, FTSE100, CAC40, DAX30 And Nikkei225	Nov. 30, 1998 to Feb. 20, 2003	GJR-EC-GARCH, GJR-GARCH, EC-OLS AND OLS	Dynamic hedging (EC models) is better than static hedging.
Chang et al., (2010)	U.S.	Crude oil and Gasoline spot and futures	Jan. 1, 1996 to Dec. 31, 2005	OLS, MD-GARCH, BEKK-GARCH, CCC-GARCH, ECM-MD, ECM-BEKK,ECM-CCC, State space models	Hedging effectiveness is higher in bull markets than in bear markets
Pradhan (2011)	India	Nifty index and Nifty index futures	-NA-	OLS, VAR, VECM, M-GARCH	Time-varying models (VEC-GARCH and VAR-GARCH) reduced portfolio variance to maximum extent
Chen and Tsay (2011)	U.S.A. and U.K.	S&P500 and FTSE100	May 9, 1984 to Aug. 1, 2007 and Aug. 8 2007 to July 29, 2008	OLS, GARCH, MRS-ARMA, MRS-MA	MRS-ARMA is superior over other models.
Juhl et al., (2012)	U.S.A	Gasoline cash and futures	Jan. 2006 to April 2008	OLS and ECM	Longer hedge horizon yield optimal hedge ratio close to 1 when cash and future prices are cointegrated
Brooks et al, (2012)	U.S.	Corn, cotton, gold, heating oil, silver, soybean oil and sugar future and spot markets	Jan. 31, 1979 to Sep. 30, 2004	OLS, MINIMAX	Higher moments impact the optimal hedge ratios when returns from hedged portfolio depart from normality.

Source: Updated Table 1 in (Gupta & Singh, Estimating the Optimal Hedge Ratio in Indian Equity Futures Market, 2009)

Table 3: Descriptive Statistics

Symbol	Variables	Period	Count	Mean	Std. Dev.	Skewness	Kurtosis	Jarque-Bera
S&PCNXNIFTY (Near Month)	Futures Return	Pre-Crisis	1897	0.0008	0.02	-1.01	12.43	7344.65 (0.00)
		Post-Crisis	1572	0.0001	0.02	0.04	12.30	5669.80 (0.00)
	Cash Return	Pre-Crisis	1897	0.0008	0.01	-0.78	8.74	2795.45 (0.00)
		Post-Crisis	1572	0.0001	0.02	0.14	13.20	6823.50 (0.00)
	Basis	Pre-Crisis	1898	-3.02	10.73	-1.16	7.16	1793.99 (0.00)
		Post-Crisis	1573	8.60	15.92	-0.08	4.75	201.74 (0.00)
S&PCNXNIFTY (Next Month)	Futures Return	Pre-Crisis	1897	0.0008	0.02	-1.05	13.58	9194.46 (0.00)
		Post-Crisis	1572	0.0001	0.02	-0.06	12.13	5465.49 (0.00)
	Cash Return	Pre-Crisis	1897	0.0008	0.01	-0.78	8.74	2795.45 (0.00)
		Post-Crisis	1572	0.0001	0.02	0.14	13.20	6823.50 (0.00)
	Basis	Pre-Crisis	1898	-5.78	16.2	-1.17	5.44	908.54 (0.00)
		Post-Crisis	1573	25.21	29.36	-0.04	3.20	2.99 (0.22)
S&PCNXNIFTY (Far Month)	Futures Return	Pre-Crisis	1897	0.0008	0.02	-1.23	13.82	9740.50 (0.00)
		Post-Crisis	1572	0.0001	0.02	-0.01	12.09	5407.43 (0.00)
	Cash Return	Pre-Crisis	1897	0.0008	0.01	-0.78	8.74	2795.45 (0.00)
		Post-Crisis	1572	0.0001	0.02	0.14	13.20	6823.50 (0.00)
	Basis	Pre-Crisis	1898	-6.66	21.53	-0.71	5.04	489.67 (0.00)
		Post-Crisis	1573	39.75	41.16	0.03	2.67	7.48 (0.024)
CNXIT (Near Month)	Future Return	Pre-Crisis	1091	-0.0010	0.07	-29.98	958.70	41683009 (0.00)
		Post-Crisis	1610	0.0005	0.02	-1.12	15.85	11421.08 (0.00)
	Cash Return	Pre-Crisis	1091	-0.0010	0.07	-30.13	965.59	42285710 (0.00)
		Post-Crisis	1610	0.0005	0.02	-0.998	15.48	10709.18 (0.00)
	Basis	Pre-Crisis	1092	6.30	62.33	-0.11	33.20	41513.72 (0.00)
		Post-Crisis	1611	6.53	20.74	-0.50	8.51	2103.39 (0.00)
CNXIT (Next Month)	Future Return	Pre-Crisis	1091	-0.0011	0.13	-6.01	334.08	4989438 (0.00)
		Post-Crisis	1610	0.0005	0.03	-0.03	31.21	53368.76 (0.00)
	Cash Return	Pre-Crisis	1091	-0.0010	0.07	-30.13	965.59	42285710 (0.00)
		Post-Crisis	1610	0.0005	0.02	-0.998	15.48	10709.18 (0.00)
	Basis	Pre-Crisis	1092	30.51	658.63	23.33	690.03	21575285 (0.00)
		Post-Crisis	1611	-10.68	216.9	-1.37	10.02	3818.326 (0.00)
CNXIT (Far Month)	Future Return	Pre-Crisis	1091	-0.0010	0.07	-30.22	969.40	42620824 (0.00)
		Post-Crisis	1610	0.0004	0.02	-2.28	64.93	258683.8 (0.00)
	Cash Return	Pre-Crisis	1091	-0.0010	0.07	-30.13	965.59	42285710 (0.00)
		Post-Crisis	1610	0.0005	0.02	-0.998	15.48	10709.18 (0.00)
	Basis	Pre-Crisis	1092	348.84	2653.76	6.87	49.70	107821.6 (0.00)
		Post-Crisis	1611	51.38	286.45	0.28	4.56	184.10 (0.00)

BANKNIFTY (Near Month)	Future Return	Pre-Crisis	637	0.0015	0.02	-0.34	4.56	77.07 (0.00)
		Post-Crisis	1611	0.0003	0.02	0.17	7.92	1629.82 (0.00)
	Cash Return	Pre-Crisis	637	0.0016	0.02	-0.25	4.48	65.10 (0.00)
		Post-Crisis	1611	0.0003	0.02	0.19	7.79	1549.99 (0.00)
	Basis	Pre-Crisis	638	6.64	23.44	0.16	6.01	242.80 (0.00)
		Post-Crisis	1612	13.70	36.38	0.15	3.83	52.57 (0.00)
BANKNIFTY (Next Month)	Future Return	Pre-Crisis	637	0.0015	0.03	-0.49	15.70	4307.52 (0.00)
		Post-Crisis	1611	0.0003	0.02	0.18	7.48	1352.79 (0.00)
	Cash Return	Pre-Crisis	637	0.0016	0.02	-0.25	4.48	65.10 (0.00)
		Post-Crisis	1611	0.0003	0.02	0.19	7.79	1549.99 (0.00)
	Basis	Pre-Crisis	638	23.70	150.25	0.53	13.22	2806.04 (0.00)
		Post-Crisis	1612	36.04	65.31	-0.02	5.04	278.75 (0.00)
BANKNIFTY (Far Month)	Future Return	Pre-Crisis	637	0.0016	0.02	1.78	28.67	17823.39 (0.00)
		Post-Crisis	1611	0.0003	0.03	-1.34	36.83	77316.5 (0.00)
	Cash Return	Pre-Crisis	637	0.0016	0.02	-0.25	4.48	65.10 (0.00)
		Post-Crisis	1611	0.0003	0.02	0.19	7.79	1549.99 (0.00)
	Basis	Pre-Crisis	638	31.11	295.31	0.36	3.24	15.67 (0.0004)
		Post-Crisis	1612	66.75	238.99	2.07	26.81	39247.8 (0.00)
Figures in parentheses represents p value of JarqueBera Test statistics.								

Table 4: Estimation of Optimal Hedge Ratio

Symbol	Period	Naïve	OLS	ARMA OLS	GARCH (1,1)	EGARCH (1,1)	TGARCH (1,1)	VAR	VECM
S&PCNXNIFTY (Near Month)	Pre-Crisis	1	0.92	0.94	0.94	0.93	0.94	0.92	0.93
	Post-Crisis	1	0.95	0.96	0.97	0.97	0.97	0.95	0.95
S&PCNXNIFTY (Next Month)	Pre-Crisis	1	0.92	0.95	0.95	0.94	0.95	0.93	0.93
	Post-Crisis	1	0.95	0.96	0.97	0.97	0.97	0.95	0.95
S&PCNXNIFTY (Far Month)	Pre-Crisis	1	0.86	0.90	0.94	0.93	0.93	0.89	0.89
	Post-Crisis	1	0.96	0.96	0.97	0.97	0.97	0.95	0.96
CNXIT (Near Month)	Pre-Crisis	1	0.990	0.999	0.999	0.998	0.996	0.997	0.998
	Post-Crisis	1	0.98	0.99	1.004	1.005	1.003	0.98	0.98
CNXIT (Next Month)	Pre-Crisis	1	0.33	0.38	0.36	0.30	0.31	0.87	0.88
	Post-Crisis	1	0.21	0.22	0.36	0.36	0.36	0.22	0.22
CNXIT (Far Month)	Pre-Crisis	1	-0.018	-0.018	-0.01	-0.02	-0.001	-0.10	-0.10
	Post-Crisis	1	0.13	0.13	0.09	0.09	0.09	0.13	0.14
BANKNIFTY (Near Month)	Pre-Crisis	1	0.95	0.98	0.98	0.99	0.99	0.96	0.96
	Post-Crisis	1	0.97	0.98	0.98	0.98	0.99	0.97	0.97
BANKNIFTY (Next Month)	Pre-Crisis	1	0.38	0.37	0.38	0.38	0.38	0.38	0.42
	Post-Crisis	1	0.95	0.98	0.99	0.99	0.99	0.97	0.97
BANKNIFTY (Far Month)	Pre-Crisis	1	0.019	0.008	0.001	-0.003	-0.008	0.012	0.062
	Post-Crisis	1	0.43	0.44	0.99	0.99	0.99	0.53	0.54

Table 5: Portfolio Variance Reduction (Percentage)

Symbol	Period	Naive	OLS	ARMA OLS	GARCH (1,1)	EGARCH (1,1)	TARCH (1,1)	VAR	VECM
S&PCNXNIFTY (Near Month)	Pre-Crisis	93.81	94.55	94.47	94.5	94.53	94.51	94.54	94.54
	Post-Crisis	98.07	98.37	98.35	98.33	98.31	98.31	98.37	98.37
S&PCNXNIFTY (Next Month)	Pre-Crisis	92.80	93.49	93.40	93.41	93.43	93.41	93.48	93.47
	Post-Crisis	97.92	98.21	98.19	98.17	98.17	98.16	98.20	98.20
S&PCNXNIFTY (Far Month)	Pre-Crisis	82.64	84.99	84.75	84.29	84.31	84.31	84.90	84.89
	Post-Crisis	97.96	98.18	98.17	98.15	98.15	98.15	98.18	98.18
CNXIT (Near Month)	Pre-Crisis	99.55	99.56	99.55	99.55	99.56	99.56	99.56	99.56
	Post-Crisis	96.63	96.69	96.68	96.63	96.63	96.63	96.68	96.68
CNXIT (Next Month)	Pre-Crisis	-97.51	32.19	31.48	31.98	31.95	32.01	-53.48	-55.07
	Post-Crisis	-146.9	10.74	10.70	05.01	05.09	04.9	10.70	10.66
CNXIT (Far Month)	Pre-Crisis	-100.1	00.03	00.03	00.026	00.03	00.026	-00.68	-00.63
	Post-Crisis	-95.61	02.18	02.18	01.97	01.97	01.97	02.18	02.17
BANKNIFTY (Near Month)	Pre-Crisis	95.96	96.22	96.15	96.12	96.09	96.12	96.21	96.20
	Post-Crisis	98.55	98.65	98.63	98.63	98.63	98.62	98.65	98.65
BANKNIFTY (Next Month)	Pre-Crisis	-58.94	33.97	33.96	33.97	33.96	33.97	33.97	33.44
	Post-Crisis	95.99	96.32	96.2	96.13	96.10	96.10	96.27	96.25
BANKNIFTY (Far Month)	Pre-Crisis	-153.7	00.06	00.04	00.008	-00.02	-00.06	00.05	-00.24
	Post-Crisis	-21.2	27.4	27.37	-18.84	-19.18	-19.18	25.99	25.59

Table 6: Descriptive Statistics of Futures Contracts Volume

Symbol	Contract month	Period	Count	Mean	Minimum	Maximum	Std. Dev.
S&PCNXNIFTY	Near	Pre	1898	135556.2	19	1338598	183077.1
		Post	1573	427064.2	14371	1251159	208680.7
	Next	Pre	1898	17196.69	0	456357	47617.18
		Post	1573	58028.91	331	654667	92553.04
	Far	Pre	1898	351.8298	0	11833	799.4081
		Post	1573	2416.155	11	25076	2501.269
CNXIT	Near	Pre	1092	471.1612	0	3683	480.5841
		Post	1611	264.2384	1	3028	243.8575
	Next	Pre	1092	50.45238	0	3164	213.6881
		Post	1611	34.89758	0	2981	121.7317
	Far	Pre	1092	0.130952	0	50	1.882008
		Post	1611	0.109870	0	20	0.860288
BANKNIFTY	Near	Pre	638	2011.188	27	10453	1.409485
		Post	1612	60314.10	557	343417	38311.60
	Next	Pre	638	173.9169	0	3087	432.0245
		Post	1612	6517.636	0	92572	12209.66
	Far	Pre	638	0.147335	0	32	1.382868
		Post	1612	139.6712	0	3801	259.1689

Table 7: Correlation Coefficient of Return Series

Symbol	Contract month	Period	Count	Correlation Coefficient
S&PCNXNIFTY	Near	Pre	1897	0.973
		Post	1572	0.992
	Next	Pre	1897	0.967
		Post	1572	0.992
	Far	Pre	1897	0.922
		Post	1572	0.991
CNXIT	Near	pre	1091	0.999
		Post	1610	0.984
	Next	Pre	1091	0.568
		Post	1610	0.328
	Far	Pre	1091	-0.0180
		Post	1610	0.148
BANKNIFTY	Near	Pre	637	0.982
		Post	1611	0.994
	Next	Pre	637	0.584
		Post	1611	0.982
	Far	Pre	637	0.024
		Post	1611	0.524

DE GRUYTER OPEN

South East European Journal of Economics and Business
Volume 10 (2) 2015, 89-101
DOI: 10.1515/jeb-2015-0012

THE INFLUENCE OF DIFFERENT INFORMATION SOURCES ON INNOVATION PERFORMANCE: EVIDENCE FROM FRANCE, THE NETHERLANDS AND CROATIA

Mirjana Pejić Bach, Andjelko Lojpur, Sanja Peković, Tatjana Stanovčić

Abstract

Information sources are considered a catalyst for innovation improvement, and because of this it is particularly important to learn more regarding their impact on innovation performance. Therefore, the goal of this research is to investigate to what extent the usage of different information sources influences internal and external R&D activities in three countries, Croatia, France and the Netherlands, by employing CIS data, which covers the period from 2006 to 2008. These countries were chosen because of the different levels of their country competitiveness (measured by the Global Competitiveness Index), which permits us to investigate if the usage of information sources has varying impact on their innovation performance. Our results reveal that internal sources, customers, suppliers and universities are important information sources for both internal and external R&D activities in all three countries. However, significant differences are also found. Firms from the Netherlands (which has the highest country competitiveness) use information sources differently, relying on competitors as one of their most important sources of innovation. On the other hand, the government did not have any impact on firms in Croatia (which has the lowest country competitiveness), indicating that this may be the reason for similar countries lagging behind.

Keywords: *information sources, innovation intensity, Croatia, France, Netherlands*

JEL: *O32, D83*

1. INTRODUCTORY REMARKS AND RELATED LITERATURE

Innovation is today considered one of the main drivers of economic growth. The empirical literature increasingly shows the benefits that firms can obtain from being innovative. Indeed, innovation is considered a strategic tool that helps firms achieve competitive advantage (e.g. Porter, 1990), with innovations in information and communication technology among the most important (Pejić Bach, 2014; Varajão et al., 2009). Consequently, much research has been conducted in order to investigate the drivers of innovation

Mirjana Pejić Bach, PhD
University of Zagreb, Croatia
Faculty of Economics & Business – Zagreb,
Department of informatics
E-mail: mpejic@efzg.hr

Andjelko Lojpur, PhD
University of Montenegro, Faculty of Economics
E-mail: andjelko@ac.me

Sanja Peković, PhD
University of Montenegro, Faculty of Tourism and Hotel Management
E-mail: pekovic.sanja@yahoo.fr

Tatjana Stanovčić, PhD
University of Montenegro, Faculty of Tourism and Hotel Management
E-mail: stanja@ac.me

in developing countries (e.g. see Lojpur et al., 2015 for comprehensive reviews; Hashi et al., 2013b; Pejić Bach et al., 2013). The most frequently examined factors that influence the level of innovativeness are the size and type of the firm, its industrial sector, group membership, technological opportunities, market share, information sources, degree of competition and its absorptive innovation capacity (Crepon et al.,1998; Kleinknecht & Mohnen, 2002; Lojpur et al., 2015).

In today's business, firms' innovative activities mainly depend on complementary information sources that can be obtained internally or externally. Scholars argue that firms can achieve significant advantages through the interfirm flow of cross-border knowledge, which can enhance firm innovativeness (Iwasa & Odagiri 2004). Therefore, among the previously mentioned innovation drivers, information sources are one of the most important (Varis & Littunen, 2010). Accordingly, competitive advantage is based on open-innovation, in which firms obtain sources of knowledge through a variety of external open pathways (Chesbrough, 2003; Chesbrough, 2006), as well as on social relationships (Leonard & van Zyl, 2014; Roblek et al., 2013). Through open innovation, firms' activities are based on the sourcing of external knowledge (Chesbrough, 2006; Krotov, 2008). Moreover, networks of customers, suppliers, competitors and other non-market participants are a key source of innovations (de Reuver, 2009, West & Bogers, 2014). Additionally, by establishing network ties, firms can expand their knowledge and thus enhance their innovation capabilities.

Despite the apparent importance of information sources for innovation, the available studies explore the statistical relationships between certain sources of information and innovation performance, but rarely address if different economic frameworks may influence this relationship. Previous research argues that innovation performance is dependent on institutional frameworks and the various structural characteristics of the national economy (Lojpur et al., 2015). However, research on the impact of information sources on innovation activities is usually conducted on only one country (e.g. Segarra-Blasco & Arauzo-Carod, 2008). Research conducted on a sample of three and more countries is scarce. One example is the research conducted by Griffith et al. (2006) that revealed that the usage of information sources is somewhat different in France, Germany, Spain and UK.

In our work, we have focused on three countries: the Netherlands, France and Croatia. We have chosen these three countries because they differ according to their competitiveness. As a proxy for country competitiveness, we have used the Global Competitiveness Index. The Netherlands ranked 8th, France ranked 16th and Croatia ranked 61st according to the Global Competitiveness Report in 2008-2009 (Schwab & Porter, 2010). In addition, at the time of the research, Croatia was a candidate EU-member country, and a post-communist country, which could be sources of possible differences. Therefore, the choice of these three countries allowed us to shed some light on the possibly variable impact of information sources on the innovation activities in three different countries, measured in internal and external R&D investments. Such research is scarce, since other authors have compared countries that have similar innovation activities (Griffith et al., 2006). Hashi et al (2013a) compare EU member and candidate countries according to knowledge spillovers, innovation activities, and the competitiveness of their industries, and revealed that substantial differences exist. These studies, however, compare only groups of countries without providing comparison at the individual country level.

Therefore, in order to remedy this lack in the literature, this paper presents an empirical examination of the influence of different information sources on innovation performance in three countries: France, Croatia and the Netherlands. The data are derived from the 'Community Innovation Survey' (CIS8), a cross-sectional survey that covers the period from 2006 to 2008. Using other data sources for comparison of innovation activities is of questionable reliability because of the "substantial discrepancies in the representation of industries from new and old EU member states in the EU market and in the quality of their exports" (Hashi et al., 2013a, p.28). Hence, in our work, we have focused only on the CIS database.

In this research we have investigated the impact of different information sources (internal, market related, and non-market related) on innovative activities. As a proxy for the level of innovative activities, we use two indicators: internal and external R&D. Internal R&D indicates if the firm engages in creative work to increase the stock of knowledge for developing new and improved products and processes, while external R&D indicates if the firm engages with other partners for the purpose of innovative activities. The choice of two dependent variables is related to the theory of knowledge-based innovations, which considers R&D the main source for new or improved products and processes (Amara and Landry, 2005). This paper will provide important insights into how firms from different countries (with different levels of country competitiveness) perceive and engage in using different information sources as the drivers of innovation activities. The results of our research may help a firm's managers and policy-makers to improve the targeting

of their policies and strategies for acquiring information as a driver of innovation. At the same time, the results can be beneficial for external agents, such as governmental bodies, universities, consultants, and conferences, who can test if the information that they provide themselves has a positive impact on the innovative activities of firms in the countries where they operate.

In the next section we present a literature review, followed by our empirical strategy. We then discuss our findings. The final section concludes by highlighting the implications and contributions of this research.

2. LITERATURE REVIEW

In order to create competitive advantage, firms have to rely on knowledge from different partners. If firms rely only on their internal resources, they will miss important opportunities that various actors could provide them (Chesbrough, 2003). Accordingly, innovation activities present an interactive process involving relationships between firms and different market actors (Yam et al., 2011), since interaction with various sources of information can offer additional assets that are necessary for innovation (Romijn and Albaladejo, 2002). Previous scholars provide arguments that support the positive link between different sources of information and innovation performance. Indeed, it is argued that the ability of firms to absorb knowledge gained through their networks is critical to successful innovation (Cohen & Levinthal, 1990). Several researchers have investigated different information sources that could impact the innovation activities of firms (e.g. Amara & Landry, 2005; Leiponen et al., 2011; Herstad et al., 2014). The rationale that links different sources of information and innovation performance is based on the fact that access to a larger variety of sources of information provides firms with more timely information about opportunities for development (Burt, 1992). The following discussion summarizes those arguments.

Internal sources may also have an impact on firm innovation. More precisely, sources inside a firm or Group facilitate the transfer of knowledge that improves innovation performance (Frenz and Ietto-Gillies, 2007; Lojpur et al., 2015).

Market related sources of information, such as customers and suppliers, are considered an important mechanism through which firms improve their innovation activities (Amara and Landry, 2005). *Customers* are important relationship partners that can provide advantageous information (e.g. competition, new technology, and customer needs). In this sense, Rothwell (1994) lists the following customer related mechanisms that help firms to improve their level of innovation: complementary knowledge; precise sets of user requirements; sources of solicited information on new/ evolving needs; information on post-launch improvements; and enhancements to the likelihood that innovation will be adopted by other firms within the same user community. *Suppliers* are also sources of information that provide information sharing generated by their customers and suppliers. Previous scholars confirmed the important role of suppliers for the development of innovation activities (Teubal et al., 1991; Bruce et al., 1995). Information obtained from *competitors* helps firms to improve their position by diagnostic benchmarking and position advantage building (Day & Wensle, 1988; Dickson, 1992). Therefore, Lawson and Samson (2001) argue that a firm with superior competitor information can use this knowledge to its advantage by applying its strengths against a rival's weakness and internalize competitors' strengths by imitation and improvement.

Information for innovative activities can be also provided from *agents that are not directly related to the market*, like consultants, universities, governmental bodies, as well as conferences, trade fairs and exhibitions. Tether & Tajar (2008) argue that *consultants* have an important role for innovation in firms, since they can act as sources of external ideas. Moreover, Hargadon & Sutton (1997) argue that consultants do not create fundamentally new technologies but transfer ideas from one context to another, which itself leads to improved innovation. Since *universities* are recognized for their abilities to produce highly qualified professionals and cutting edge scientific research, more cooperation between firms and universities could improve the diffusion of knowledge, resulting in greater firm innovation (Janeiro et al., 2013). Cooperation with *government* provides access to financial resources and information infrastructures, which help firms to become innovative. In the same vein, Amara & Landry (2005) underline the importance of sources of information from government, indicating that the more sustained and intense the interactions between firms and government, the more these boost innovation performance. *Conferences, trade fairs and exhibitions* are considered platforms for new products or the promotion of services. Therefore, participation in these events supports knowledge creation and interactive learning (Maskell et al., 2004; Bathelt & Schuldt, 2008), which advance innovation.

In sum, different sources of innovation are positively associated with innovation activities. Therefore, we test whether *information sources from (a) firm itself; (b) customers; (c) suppliers (d) competitors; (e) consultants;*

(f) universities; (g) government; (h) and conferences are positively associated with *a firm's R&D activities*.

In our model, we also use the following control variables: the size of the company, if the company is part of the group, the market in which the company operates (local, national, EU, other), the most important market of the company (local and national), usage of external funding, and the industry in which the company operates. We presume that the size of the company, if the company is part of the group and has an orientation towards the EU and other markets, as well as funding, should have a positive impact on innovative activities. At the same time, orientation towards local and national markets should have a negative impact, while for the most part the industry in which the company operates should have a neutral effect. Our presumptions regarding the impact of control variables on innovative activities are based on Lojpur et al., (2015).

3. METHODOLOGY

3.1. Data sources

The data are derived from a cross-sectional survey called the 'Community Innovation Survey,' (CIS8) which covers the period from 2006 to 2008 and is based on the Oslo Manual drawn up by the OECD. The Community Innovation Survey is the result of a significant increase in the importance given to innovation issues at the EU level. The CIS surveys are comprehensive in terms of the range of questionnaire items, including direct measures of innovation performance and a wide variety of factors influencing innovation. The Community Innovation Survey also collects data on the usage of different information sources for innovation (Tether, 2001; Fagerberg et al., 2012). More precisely, CIS tracks the usage of the following information sources as drivers of innovation: firm, suppliers, customers, competitors, consultants, universities, government, and conferences. We use the CIS8 from three countries, France, the Netherlands and Croatia. The CIS8 survey in France is carried out by the Ministry of Economics, Finances and Industry, the data from Netherlands is created by Statistics Netherlands, while in Croatia the CIS8 survey is carried out by the Central Bureau of Statistics. The French sample contains 19,901 observations, the Netherlands sample contains 10,612 observations, and the Croatian sample contains 3,333 observations. CIS data for France and Croatia was obtained from the responsible national bodies for external media (CD), while CIS data for the Netherlands was used in the research on-site at the Statistics Netherlands, Den Haag, the Netherlands during May, 2014.

3.2. Dependent Variable

In order to examine the influence of different information sources related to R&D activities we use two indicators. The first, called **R&D internal**, is a binary variable indicating if during the three years from 2006 to 2008 a firm engaged in creative work to increase its stock of knowledge for developing new and improved products and processes. The second, **R&D external**, is also a binary variable and measures if during the three years from 2006 to 2008 a firm engaged with other partners in creative work to increase its stock of knowledge for developing new and improved products and processes.

3.3. Explanatory Variables

Since firms gain new ideas from a different variety of sources, we use eight dummy variables that represent different types of information sources for a firm's innovativeness. More precisely, we use the variable **Firm**, which is a binary variable that takes the value 1 if important information sources include the firm itself; **Supplier** is a binary variable that indicates if a firm's important information sources include suppliers of equipment, materials, components, or software; the variable **Customer** indicates that customers are among a firm's important information sources; the variable **Competitors** takes the value 1 if competitors are among a firm's important information sources; **Institutions** takes the value 1 if institutions are among a firm's important information sources; the binary variable **Universities** equals 1 if universities are among a firm's important information sources; the variable **Government** gives us an answer if government is among a firm's important information sources; and finally, **Conferences** present a binary variable that takes the value 1 if conferences are among a firm's important information sources.

The explanatory variables are:

- **Firm itself**: During the three years from 2006 to 2008, important information sources included the firm itself; Dummy variable (=1 if yes)
- **Supplier**: During the three years from 2006 to 2008, important information sources included suppliers of equipment, materials, components, or software; Dummy variable (=1 if yes)
- **Customer**: During the three years from 2006 to 2008, important information sources included

customers; Dummy variable (=1 if yes)
- **Competitors**: During the three years from 2006 to 2008, important information sources included competitors or other firms in the sector; Dummy variable (=1 if yes)
- **Consultants**: During the three years from 2006 to 2008, important information sources included consultants; Dummy variable (=1 if yes)
- **Universities**: During the three years from 2006 to 2008, important information sources included universities or other higher education institutions; Dummy variable (=1 if yes)
- **Government**: During the three years from 2006 to 2008, important information sources included government or public research institutes; Dummy variable (=1 if yes)
- **Conference**: During the three years from 2006 to 2008, important information sources included conferences, trade fairs, exhibitions; Dummy variable (=1 if yes)

3.4. Control Variables

Following previous studies we use several control variables, such as Size, Group, Market, Funding and Sector of Activity, which we found to be important drivers of R&D activities (e.g. Harris & Trainor, 2011; Lojpur et al., 2015).

The control variables are:
- **Size**: Size of the firm; Number of employees, Continuous variable
- **Group**: Whether belonging to a group; Dummy variable (=1 if yes)
- **Local**: The firm has sold its products and/or services on the local market during the last three years; Dummy variable (=1 if yes)
- **National**: The firm has sold its products and/or services domestically during the last three years; Dummy variable (=1 if yes)
- **EU**: The firm has sold its products and/or services in other European Union (EU), EFTA or EU candidate countries during the last three years; Dummy variable (=1 if yes)
- **Local – the most important market**: Local market as the most important market; Dummy variable (=1 if yes)
- **National – the most important market**: National market as the most important market; Dummy variable (=1 if yes)
- **Funding**: Public funding from local or regional authorities, the central government, the EU, the EU's 6th or 7th Framework Programme for RTD; Dummy variable (=1 if yes)
- **Sector of activity**: The main activity of the firm is in a particular sector; Dummy variable (=1 if yes)

The variables used in estimation and sample statistics for France, Croatia and Netherlands are presented in Table 1.

3.5. Empirical strategy

Following the previous literature, the following econometric specifications are estimated to shed light on information sources that drive cross-country R&D activities:

$$Y_i^* = \alpha + \sum_{i=1}^{16} \beta_i X_i + \mu_i, \quad i = 1, 2, ..., N. \tag{1}$$

where X_i represents the vector of variables for different sources of innovation and controls; β_1-β_{16} are

Table 1: Definition of variables and sample statistics

Variables	France		The Netherlands		Croatia	
	Mean	SD	Mean	SD	Mean	SD
Dependent variables						
R&D internal (binary 0-1)	0.23	0.42	0.18	0.39	0.19	0.39
R&D external (binary 0-1)	0.10	0.30	0.10	0.30	0.14	0.35
Explanatory variables: Information sources						
Firm itself (binary 0-1)	0.32	0.46	0.26	0.44	0.29	0.45
Suppliers (binary 0-1)	0.20	0.40	0.21	0.41	0.26	0.44
Customers (binary 0-1)	0.20	0.40	0.20	0.40	0.24	0.43
Competitors (binary 0-1)	0.13	0.34	0.13	0.33	0.17	0.37
Consultants (binary 0-1)	0.07	0.26	0.07	0.26	0.09	0.28
Universities (binary 0-1)	0.05	0.22	0.05	0.22	0.07	0.25
Government (binary 0-1)	0.04	0.19	0.04	0.19	0.04	0.20
Conferences, trade fairs and exhibitions (binary 0-1)	0.12	0.33	0.10	0.30	0.19	0.40

Table 1: *Continued*

Variables	France		The Netherlands		Croatia	
	Mean	SD	Mean	SD	Mean	SD
Control variables						
Size (# of employees)	268.56	2549.25	204.93	3314.00	127.49	441.67
Group (binary 0-1)	0.63	0.48	0.54	0.50	0.26	0.44
Local market (binary 0-1)	0.85	0.35	0.73	0.45	0.89	0.32
National market (binary 0-1)	0.58	0.49	0.68	0.46	0.50	0.50
EU market (binary 0-1)	0.34	0.47	0.43	0.49	0.37	0.48
Other market (binary 0-1)	-	-	-	-	0.28	0.45
Local market – the most important (binary 0-1)	0.58	0.49	0.36	0.48	0.60	0.49
National market – the most important (binary 0-1)	0.33	0.47	0.38	0.48	0.23	0.42
External funding (binary 0-1)	0.07	0.26	0.09	0.29	0.10	0.31
Manufacturing (binary 0-1)	0.29	0.45	-	-	0.42	0.50
Agrifoods (binary 0-1)	0.06	0.23	-	-	-	-
Services (binary 0-1)	0.23	0.42	-	-	0.19	0.40
Finance (binary 0-1)	0.02	0.15	-	-	-	-
Sales (binary 0-1)	0.22	0.42	-	-	0.11	0.31
Construction (binary 0-1)	0.05	0.22	-	-	0.16	0.37
Transport (binary 0-1)	0.12	0.32	-	-	0.06	0.24
Food, nutrition & flowers (binary 0-1)	-	-	0.08	0.26	-	-
High tech systems & materials (binary 0-1)	-	-	0.13	0.34	-	-
Life science (binary 0-1)	-	-	0.07	0.25	-	-
Main ports & logistics (binary 0-1)	-	-	0.35	0.48	-	-
Shipping (binary 0-1)	-	-	0.07	0.25	-	-
Chemical (binary 0-1)	-	-	0.11	0.31	-	-
Creative (binary 0-1)	-	-	0.13	0.34	-	-
Energy (binary 0-1)	-	-	0.04	0.21	-	-

Note: All of the variables are Dummy variables (=1 if yes), except the size which is measured by the number of employees
Source: Authors' calculation using CIS8 in France, the Netherlands, Croatia

slope coefficients to be estimated and α and μ are the intercept and the disturbance term, respectively. The model of firms' R&D activities is stated as a discrete-choice model, with the dummy variables indicating R&D activities, internal and external, as the dependent variables Y_i:

$$Y_i = 1 \quad if \quad Y_i^* > 0,$$
$$Y_i = 0 \quad otherwise. \tag{2}$$

We specified logistic distributions for μ and maximized the log-likelihood of the logit models (Greene, 2003) to estimate the models' parameters up to a positive constant.

4. RESULTS

The first goal of the present study is to examine the relationship between different types of sources of innovation on R&D performance. Tables 2, 3 and 4 provide this information.

We can notice from Table 2 that six out of the eight examined sources of information influence positively and significantly internal R&D activities in French firms. More precisely, only suppliers and competitors are not relevant as sources for a firm's internal R&D improvement. However, when looking at external R&D activities, we may conclude that suppliers play a significant role as a source of external R&D activities. Only competitors are not significantly related to external R&D activities. Most of the control variables have a significant impact on both internal and external R&D activities in French firms. However, orientation

Table 2: The impact of source of innovation on R&D – French Sample

	Internal R&D		External R&D	
	Estimate	SE	Estimate	SE
Intercept	-3.24***	0.13	-4.65***	0.15
Explanatory variables: Information sources				
Firm itself	3.10***	0.07	2.41***	0.10
Suppliers	-0.03	0.06	0.25***	0.06
Customers	0.83***	0.06	0.29***	0.07
Competitors	0.05	0.07	0.04	0.07
Consultants	0.24***	0.09	0.69***	0.07
Universities	0.62***	0.13	0.21***	0.10
Government	0.33***	0.14	0.35***	0.11
Conferences, trade fairs, exhibitions	0.49***	0.07	0.12*	0.07
Control variables				
Size	0.00***	0.00	0.00***	0.00
Group	0.14***	0.06	0.71***	0.06
Local Market	-0.29***	0.07	0.05	0.07
National	0.26***	0.08	0.07	0.10
EU market	0.41***	0.07	0.17*	0.09
Local – the most important	-0.41***	0.11	-0.31***	0.11
National – the most import.	-0.06	0.10	-0.18**	0.08
Funding	1.30***	0.10	0.83***	0.07
Agrifood	0.02	0.11	0.31***	0.11
Services	-0.22***	0.07	-0.38***	0.08
Finance	-0.36***	0.15	-0.19	0.16
Commerce	-1.02***	0.08	-0.34***	0.09
Construction	-0.95***	0.14	-0.40***	0.17
Transport	-0.01	0.11	-0.27***	0.14
Tests of global quality				
Test of prediction model (concordant percentage)	94.4		90.7	
Test of global nullity (likelihood ratio)	1264.73***		4718.65***	
Number of observations	19 901		19 901	

Notes: (*), (**) and (***) indicate parameter significance at the 10, 5 and 1 percent levels, respectively; Reference for sector activity: manufacturing

Source: Authors' calculation using CIS8 in France

towards the local and national market has a negative effect on both internal and external R&D.

Turning to the sample from the Netherlands (Table 3), the situation is slightly different compared to the French sample. We may notice that, as with the previous results, competitors are not significantly associated with internal R&D activities, but have a significant impact on external R&D. Also, the findings suggest that government is not a significant source of R&D activities (both internal and external) when looking at firms from the Netherlands. In this sense, compared to the French case, where government should continue to provide incentives regarding R&D, firms in the Netherlands are not dependent on this type of incentive. Furthermore, the impact of conferences, trade fairs and exhibitions disappears when we look at external R&D activities. Control variables have a weaker effect on innovative activities compared to the French sample. Size does not have any impact, while firms that are part of the group are more active regarding external R&D. On the other hand, as with the French sample, orientation towards the local market as most important has a negative effect both on internal and external R&D. It is interesting to note that funding has a negative effect on external R&D. Industry sector is not related to innovativeness, with the one exception of firms from the high technical systems & materials sector, which are more active

Table 3: The impact of source of innovation on R&D – the Netherlands Sample

	Internal R&D		External R&D	
	Estimate	SE	Estimate	SE
Intercept	-4.58***	0.31	-4.81***	0.32
Explanatory variables: Information sources				
Firm itself	2.93***	0.12	-2.10***	0.14
Suppliers	0.45***	0.10	0.43***	0.10
Customers	0.81***	0.10	0.53***	0.10
Competitors	-0.09	0.10	0.45***	0.10
Consultants	0.20 *	0.11	1.10***	0.10
Universities	0.46**	0.16	0.93***	0.14
Government	0.13	0.18	-0.17	0.16
Conferences, trade fairs, exhibitions	0.35***	0.10	0.14	0.10
Control variables				
Size	-0.00	0.01	-0.00	0.00
Group	0.05	0.09	0.35***	0.10
Local Market	0.11	0.10	0.03	0.10
National	0.27**	0.14	0.04	0.15
EU market	0.22**	0.11	0.20*	0.12
Local – the most important	-0.33***	0.11	-0.20**	0.11
National – the most import.	-0.21	0.16	-0.27*	0.17
Funding	-0.00	0.13	-0.26**	0.12
Food, Nutrition & Flowers	0.07	0.17	0.28*	0.15
High Tech Systems & Materials	2.25	0.13	0.89***	0.10
Life Sciences	0.33	0.30	0.14	0.30
Main Ports & Logistics	0.77	0.28	0.20	0.28
Shipping	0.13	0.30	0.22	0.31
Chemical industry	-0.53	0.28	-0.14	0.28
Creative industry	-0.42	0.32	-0.07	0.33
Energy	0.44	0.29	-0.03	0.30
Tests of global quality				
Test of prediction model (concordant percentage)	95.9		93.0	
Test of global nullity (likelihood ratio)	2917.66***		2912.79***	
Number of observations	10612		10612	

Notes: (*), (**) and (***) indicate parameter significance at the 10, 5 and 1 percent levels, respectively; Reference for sector activity: manufacturing

Source: Authors' calculation using CIS8 in the Netherlands

regarding external R&D.

Finally, when looking at Croatian firms, we may say that the important sources for R&D activities are more similar to those from the Netherlands than they are to the results from France. Table 4 indicates that as with firms from the Netherlands, competitors and government do not positively influence internal R&D. Moreover, competitors do influence external R&D, while the relationship is not significant for government and conferences, trade fairs, and exhibitions. Regarding control variables, size has a significant impact on both internal and external R&D, as well as funding. Also, orientation towards the EU market as well as other markets, positively influences external R&D. Some of industries have a negative effect on innovation activities, such as transport and services.

5. DISCUSSION

In order to discuss our findings, a summary of the research is presented in Table 5. For each of the independent variables the following information is provided: (i) if the independent variable does not have a significant impact, this is stated as *None*; (ii) if the independent variable does have a significant impact on

Table 4: The impact of source of innovation on R&D - Croatian Sample

	Internal R&D		External R&D	
	Estimate	SE	Estimate	SE
Intercept	-3.09***	0.34	-4.29***	0.39
Explanatory variables: Information sources				
Firm itself	1.93***	0.15	1.55***	0.17
Suppliers	0.60***	0.14	0.70***	0.15
Customers	0.80***	0.15	0.48***	0.17
Competitors	0.13	0.14	0.31**	0.15
Consultants	0.33**	0.17	0.94***	0.16
Universities	0.46**	0.19	0.52***	0.19
Government	-0.09	0.24	0.14	0.23
Conferences, trade fairs, exhibitions	0.48***	0.14	0.21	0.15
Control variables				
Size	0.00***	0.00	0.00**	0.00
Group	-0.05	0.14	-0.01	0.15
Local Market	0.04	0.21	0.14	0.22
National	0.17	0.16	0.05	0.17
EU market	0.04	0.18	0.34*	0.19
Other	0.14	0.17	0.40**	0.18
Local – the most important	0.02	0.22	-0.13	0.23
National – the most import.	0.20	0.22	-0.19	0.23
Funding	0.41***	0.14	0.53***	0.15
Construction	-0.34	0.27	0.36	0.29
Sales	-0.27	0.29	0.50	0.32
Transport	-0.74**	0.35	0.12	0.38
Services	-0.77***	0.27	0.37	0.30
Tests of global quality				
Test of prediction model (concordant percentage)	90.3		89.0	
Test of global nullity (likelihood ratio)	1211.26***		883.44***	
Number of observations	3333		3333	

Notes: (*), (**) and (***) indicate parameter significance at the 10, 5 and 1 percent levels, respectively; Reference for sector activity: manufacturing

Source: Authors' calculation using CIS8 in Croatia

the dependent variable, (+) or (-) signs are used to indicate the direction of the impact and 1%, 5% or 10% are used to indicate the level of significance.

The firm itself, when used as an internal source of information for internal R&D activities, is statistically significant in all three countries, which is in line with the findings of Frenz & Ietto-Gillies (2007). The contribution of our research is that relying on internal sources of information is negatively related to external R&D activities in the Netherlands, which is the highest ranked country according to the Global Competitiveness Index. This may indicate that firms that invest more in external R&D activities do not rely on internal sources of innovation in countries with a higher level of competitiveness.

Market-related information sources (suppliers, customers, and competitors) are also investigated. The usage of customers as a source of information has a positive impact both on internal and external R&D, which confirms research conducted by Rothwell (1994). A similar impact is generated by the usage of suppliers as a source of information, similar to Teubal

Table 5: Summary of results

Variables	France		Netherlands		Croatia	
	R&D Internal	R&D External	R&D Internal	R&D External	R&D Internal	R&D External
Explanatory variables						
Firm itself	(+) 1%	(+) 1%	(+) 1%	(-) 1%	(+) 1%	(+) 1%
Suppliers	None	(+) 1%	(+) 1%	(+) 1%	(+) 1%	(+) 1%
Customers	(+) 1%	(+) 1%	(+) 1%	(+) 1%	(+) 1%	(+) 1%
Competitors	None	None	None	(+) 1%	None	(+) 5%
Consultants	(+) 1%	(+) 1%	(+) 10%	None	(+) 5%	(+) 1%
Universities	(+) 1%	(+) 1%	(+) 5%	(+) 1%	(+) 5%	(+) 1%
Government	(+) 1%	(+) 1%	None	None	None	None
Conference, fairs and exhibitions	(+) 1%	(+) 10%	(+) 1%	None	(+) 1%	None
Control variables						
Size	(+) 1%	(+) 1%	None	None	(+) 1%	(+) 5%
Group	(+) 1%	(+) 1%	None	(+) 1%	None	None
Local	(-) 1%	None	None	None	None	None
National	(+) 1%	None	(+) 5%	None	None	None
EU	(+) 1%	(+) 10%	(+) 5%	(+) 10%	None	(+) 10%
Other	-	-	-	-	None	(+) 5%
Local – the most important	(-) 1%	(-) 1%	(-) 1%	(-) 5%	None	None
National – the most import.	None	(-) 5%	None	(-) 5%	None	None
Funding	(+) 1%	(+) 1%	None	(-) 5%	(+) 1%	(+) 1%
Agrifoods	None	(-) 1%	-	-	-	-
Services	(-) 1%	(-) 1%	-	-	(-) 1%	None
Finance	(-) 1%	None	-	-	-	-
Commerce / Sales	(-) 1%	(-) 1%	-	-	None	None
Construction	(-) 1%	(-) 1%	-	-	None	None
Transport	None	(-) 1%	-	-	(-) 5%	None
Food, nutrition & flowers	-	-	None	(+) 10%	-	-
High tech systems & materials	-	-	None	(+) 1%	-	-
Life science	-	-	None	None	-	-
Main ports & logistics	-	-	None	None	-	-
Shipping	-	-	None	None	-	-
Chemical industry	-	-	None	None	-	-
Creative industry	-	-	None	None	-	-
Energy	-	-	None	None	-	-
Tests of global quality						
Test of prediction model (concordant percentage)	94.4	90.7	95.9	93.0	90.3	89.0
Test of global nullity (likelihood ratio)	1264.73***	4718.65***	2917.66***	2912.79***	1211.26***	883.44***

Notes: None indicates no significant impact, (+) or (-) signs indicate significant impact and 1%, 5% or 10% are used in order to indicate the level of the significance.

Source: Authors' calculation using CIS8 in France, Netherlands, Croatia

et al.(1991) and Bruce et al.(1995), while France is an exception, since suppliers did not have a significant impact on internal R&D in companies in that country. The usage of competitors as an information source for internal R&D does not have a significant impact in any of the countries, which runs contrary to the results of Day & Wensley (1988) and Dickson (1992). Our research reveals that having competitors as a source of information has a positive impact in the Netherlands and Croatia only on external R&D, although the impact in the Netherlands is stronger (significant at 1%) compared to that of Croatia (significant at 5%). This may

indicate that the usage of competitors as a source of information could be a significant generator of country competitiveness, which is the case in the Netherlands. It may also be a significant generator of innovativeness in countries which struggle with competitiveness, such as Croatia.

Information sources that are not related to the market have a mixed impact. Universities have a positive impact on both internal and external R&D activities. However, firms in the Netherlands report no impact from consultants and conferences, fairs and exhibitions on R&D external activities, which confirms the findings of Janeiro et al. (2013). Also, government seems to have no impact as an information source for innovative activities for internal R&D activities among firms in the Netherlands. Moreover, government does not have any impact on internal or external R&D activities in Croatian firms. A lack of governmental support may be the reason for lower innovative activities in Croatia, which in turns negatively impacts the competitiveness of the country, which confirms the finding of Amara & Landry (2005). As a result, because of lower competitiveness, governmental information sources remain irrelevant, thus creating a vicious cycle of low innovativeness and low competitiveness in developing countries. On the other hand, governmental sources of information were also irrelevant for companies in the Netherlands, thus indicating that companies in most developed countries do not rely on government, but on other sources of information.

Regarding the control variables, the results are also different across countries. Overall, the control variables in most cases do not have a significant impact on internal or external R&D in Croatian firms. The usage of funding, as well as orientation towards the EU and other markets, had significant impacts on innovative activities in Croatia. Orientation by the French firms towards local and national markets did not have a significant impact on external R&D. Size, Group and orientation to the local market did not have a significant impact on R&D activities in the Dutch firms. To summarize, the control variables had a weaker impact for firms from the Netherlands, as representative of countries with higher country competitiveness, as well for the firms from Croatia, as representative of countries with lower country competitiveness.

In general, the findings suggest that different types of information sources are useful complements to contextual factors in increasing the probability of a firm becoming innovative. Accordingly, to become innovative, firms have to be linked to different market actors through information and knowledge exchange. However, the results also suggest that not all information sources influence innovation activities to the same degree in countries with different overall level of competitiveness. Moreover, based on our results we may also conclude that the overall level of competitiveness and institutional framework matters when examining the relationship between information sources and R&D capabilities.

6. CONCLUSION

R&D capabilities are important tools for a firm's overall growth that warrant continuing scholarly research. The prior studies on R&D mainly focus their attention on the firm's characteristics as drivers of a firm's R&D activities instead of on broader mechanisms that promote R&D. In order to fill this important gap in the literature, we provide an empirical analysis concerning the relationship between sources of information and R&D activities. In doing so, we use eight proxies for information sources and we also distinguish between two types of R&D activities, internal and external. Additionally, in order to consider if institutional framework matters, we test our results using three countries: France, the Netherlands and Croatia. We have chosen these countries because of their different levels of overall competitiveness.

Our results indicate the following. First, it can be concluded that some sources of information have the same impact across the three different countries, irrespective of country competitiveness. Second, companies in the Netherlands, as a representative of countries with high country competitiveness, use information sources in a different manner. In Dutch companies, usage of internal information sources has a negative impact on external R&D, and the usage of competitors has a positive impact on external R&D. This could indicate that the most innovative firms in the most developed countries do not rely on internal resources, but instead use competitors as an important source of information for innovative activities. Third, the usage of the government as an information source for innovative activities did not have a significant impact on internal or external R&D in Croatia, which could be the sources of the lower overall competitiveness of that country. Also, governmental information did not have a significant impact on internal or external R&D in the Netherlands. In addition, French firms reported that the usage of government sources of information for innovative activities has a positive impact on both internal and external R&D. Therefore, it may be that governmental support has a reverse U-relationship with innovative activities, making it successful only for countries that are developed, but not among the top ten countries

according to their competitiveness. Fourth, the results from France are similar to those from Croatia. At first sight, it may be striking that the impact of information sources in France is more similar to its impact in Croatia than in the Netherlands. However, the France is not among the top ten countries in the world regarding country competitiveness as measured by the Global Competitiveness Index. Therefore, our results could indicate that the firms in the top innovative countries (represented by the Netherlands) use information sources in a different manner compared to those of countries that lag behind (represented by France), while the countries that lag behind the most (represented by Croatia) miss government support. Overall, we may conclude that choices of innovation sources have varying effects on R&D performance from one country to another, and also that companies in countries with different competitiveness levels use information sources in different manners.

Regarding control variables, we can suggest that their impact depends on national context. Size, group, orientation towards national and EU markets and funding have a positive and significant impact on R&D activities in France. Conversely, only orientation towards national and EU markets as the most important markets positively influence R&D activities in the Netherlands, as well as the high technical systems & materials sector. Regarding the case of Croatia, only size and funding significantly influence innovative activities, indicating that in developing economies only large firms that are subsidized by external agents for their innovativeness invest in R&D.

A number of managerial implications emerge from this research. Identifying the successful sources of innovation may enable managers to define R&D strategies in relation to their potential sources. Additionally, innovative activities are achieved not only through internal sources, but also through interaction with external knowledge sources. Therefore, managers have to be aware that they have to look outside their immediate environment to boost their firm's innovation activities. Our research also emphasizes that institutional factors are important: matching the broader economic framework to differing types of information sources yields the best outcomes for innovation activity. Governmental sources of information are not efficient both in developing and the most developed countries, thus raising the question of their usability in either context.

Two limitations of the research apply that could be overcome through future analysis. First, future research should focus on the different indictors of innovation in order to propose a more comprehensive conclusion. Additionally, these findings emerge from cross-sectional data collected at one point in time in a limited number of countries. Therefore, a longitudinal approach with more countries in the sample would be welcome in confirming the obtained results.

REFERENCES

Amara, N., & Landry, R. 2005. Sources of information as determinants of novelty of innovation in manufacturing firms: evidence from the 1999 Statistics Canada innovation survey. Technovation, 25 (3): 245-259.

Pejić Bach, M. Zoroja, J., & Vukšić, V. B. (2013). Review of corporate digital divide research: A decadal analysis (2003-2012). International Journal of Information Systems and Project Management, 1(4): 41-55.

Bathelt, H., & Schuldt, N. (2008). Between luminaires and meat grinders: International trade fairs as temporary clusters. Regional Studies, 42(6): 853-868.

Bruce, M., Leverick, F., Littler, D., & Wilson, D. (1995). Success factors for collaborative product development: a study of suppliers of information and communication technology. R&D Management, 25(1): 33-44.

Burt, R.S. 1992. Structural Holes: The Social Structure of Competition, Harvard University Press, Cambridge, MA.

Chesbrough, H. 2003. Open Innovation: How Companies Actually Do It. Harvard Business Review, 81(7):12-14

Chesbrough, H. 2006. Open innovation: a new paradigm for understanding indus-trial innovation. In: Chesbrough, H., Vanhaverbeke, W., West, J. (Eds.), OpenInnovation: Researching a New Paradigm. Oxford University Press, Oxford, 1–12.

Cohen, J., & Levinthal, D.A. 1990. Absorptive capacity: A new perspective on learning and innovation. Administrative Science Quarterly, 35(1): 554–571.

Crepon, B., Duguet, E., & Mairesse, J. 1998. Research, innovation and productivity: an econometric analysis at the firm level. Economics of Innovation and New Technology, 7(2):115–158.

Day, G.S., & Wensle, R. 1988. Assessing advantage: A framework for diagnosing competitive superiority. Journal of Marketing, 52(2): 1–20.

de Reuver, M., Bouwman, H., & MacInnes, I. 2009. Business model dynamics: a case survey. Journal of theoretical and applied electronic commerce research, 4(1): 1-11.

Dickson, P.R. 1992. Toward a general theory of competitive rationality. Journal of Marketing, 56(1): 69–83.

Fagerberg, J., Mowery, D. C., & Nightingale, P. 2012. Introduction: The heterogeneity of innovation—evidence from the Community Innovation Surveys. Industrial and Corporate Change, 21(5): 1175-1180.

Frenz, M., & Ietto-Gillies, G. (2009). The impact on innovation performance of different sources of knowledge: Evidence

from the UK Community Innovation Survey. Research Policy, 38(7): 1125-1135.

Greene,W.H. 2003. Econometric Analysis, 5th Edition. Upper Saddle River, New Jersey: Prenctice Hall.

Griffith, R., Huergo, E., Mairesse, J., & Peters, B. 2006. Innovation and productivity across four European countries. Oxford Review of Economic Policy, 22(4): 483-498.

Hargadon, A., & Sutton, R.I. 1997. Technology brokering and innovation in a product development firm. Administrative Science Quarterly, 42(4): 716-749.

Harris, R. & Trainor, M. 2011. A matching analysis of why some firms in peripheral regions undertake R&D whereas others do not. Economics of Innovation and New Technology, 20(4): 367-385.

Hashi, I., & Stojcic, N. (2013a). Knowledge spillovers, innovation activities, and competitiveness of industries in EU member and candidate countries. Economic annals, 58(198): 7-34.

Hashi, I., & Stojčić, N. (2013b). The impact of innovation activities on firm performance using a multi-stage model: Evidence from the Community Innovation Survey 4. Research Policy, 42(2): 353-366.

Herstad, S. J., Aslesen, H. W., & Ebersberger, B. 2014. On industrial knowledge bases, commercial opportunities and global innovation network linkages. Research Policy, 43(3): 495-504.

Iwasa, T., & Odagiri, H. 2004. Overseas R&D, Knowledge Sourcing, and Patenting: An Empirical Study of Japanese R&D investment in the US. Research Policy, 33(5): 807–828.

Janeiro, P., Proença, I., & da Conceição Gonçalves, V. (2013). Open innovation: Factors explaining universities as service firm innovation sources. Journal of Business Research, 66(10): 2017-2023.

Kleinknecht, A., & Mohnen, P. 2002. Innovation and Firm Performance: Econometric Explorations of Survey Data. Palgrave, Hampshire and New York.

Krotov, V., & Junglas, I. 2008. RFID as a Disruptive Innovation. Journal of theoretical and applied electronic commerce research, 3(2): 44-59.

Lawson, B., & Samson, D. 2001. Developing Innovation Capability in Organizations: A Dynamic Capabilities Approach. International Journal of Innovation Management, 5(3): 377-400.

Leiponen, A., & Helfat, C. E. 2011. Location, decentralization, and knowledge sources for innovation. Organization Science, 22(3): 641-658.

Leonard, A., & van Zyl, D. (2014). Social relationships in IT project teams: its role, complexity and the management thereof. International Journal of Information Systems and Project Management, 2(1): 21-39.

Lojpur, A., Pejic-Bach, M., & Pekovic, S. 2015. Determinants of Innovation Intensity in Developed and in Developing Economies: The case of France and Croatia, International Journal of Innovation Management. Available at: http://www.worldscientific.com/doi/abs/10.1142/S1363919615500498

Maskell, P., Bathelt, H., & Malmberg, A. 2004. Temporary clusters and knowledge creation: The effects of international trade fairs, conventions and other professional gatherings. SPACES, 4: 1–34.

Pejić Bach, M. (2014). Exploring Information and Communications Technology Adoption in Enterprises and its Impact on Innovation Performance of European Countries. Ekonomický časopis, 2014(4): 335-362.

Porter M. E. (1990). The Competitive Advantage of Nations, Macmillan, London.

Roblek, V., Pejic Bach, M., Meško, M., & Bertoncelj, A. (2013). The impact of social media to value added in knowledge-based industries. Kybernetes, 42(4): 554-568.

Romijn, H., & Albaladejo, M. (2002). Determinants of innovation capability in small electronics and software firms in southeast England. Research policy, 31(7): 1053-1067.

Rothwell, R. 1994. Towards the fifth-generation innovation process. International Marketing Review, 11(7): 7-31.

Schwab, K. & Porter, M.E. (2010). Global Competitiveness Report 2008-2009. Available at: http://www.weforum.org/pdf/GCR08/GCR08.pdf

Segarra-Blasco, A., & Arauzo-Carod, J. M. 2008. Sources of innovation and industry–university interaction: Evidence from Spanish firms. Research Policy, 37(8): 1283-1295

Tether, B. 2001. Identifying innovation, innovators and innovative behaviours: a critical assessment of the Community Innovation Survey (CIS). Manchester: Centre for Research on Innovation and Competition, University of Manchester.

Tether, B. S., & Tajar, A. (2008). Beyond industry–university links: Sourcing knowledge for innovation from consultants, private research organisations and the public science-base. Research Policy, 37(6): 1079-1095.

Teubal, M., Yinnon, T., & Zuscovitch, E. (1991). Networks and market creation. Research Policy, 20(5): 381-392.

Varajão, J., Trigo, A., & Barroso, J. (2009). Motivations and trends for it/is adoption: insights from Portuguese companies. International Journal of Enterprise Information Systems (IJEIS), 5(4): 34-52.

Varis, M., & Littunen, H. 2010. Types of innovation, sources of information and performance in entrepreneurial SMEs. European Journal of Innovation Management, 13(2): 128-154.

West, J., & Bogers, M. (2014). Leveraging external sources of innovation: a review of research on open innovation. Journal of Product Innovation Management, 31(4): 814-831.

Yam, R., Lo, W., Tang, E. P., & Lau, A. K. 2011. Analysis of sources of innovation, technological innovation capabilities, and performance: An empirical study of Hong Kong manufacturing industries. Research Policy, 40 (3): 391-402.

DE GRUYTER OPEN

South East European Journal of Economics and Business
Volume 10 (2) 2015, 102-112
DOI: 10.1515/jeb-2015-0013

THE NON-LINEAR RELATIONSHIP BETWEEN FISCAL DEFICITS AND INFLATION: EVIDENCE FROM AFRICA

Nurudeen Abu, Mohd Zaini Abd Karim

Abstract

Although, there is abundant research on the fiscal deficit-inflation relationship, little has been done to investigate the non-linear association between them, particularly in Africa. This study employs fixed-effects and GMM estimators to examine the non-linear relationship between deficits and inflation from 1999 to 2011 in 51 African economies, which are further grouped into high-inflation/ low-income countries and moderate-inflation/middle-income countries. The results indicate that the deficit-inflation relationship is non-linear for the whole sample and sub-groups. For the whole sample, a percentage point increase in deficit results in a 0.25 percentage point increase in inflation rate, while the relationship becomes quantitatively greater once deficits reach 23% of GDP. The subsamples report different relationships. Although our results cannot be used as the base for generalization, we identify importance of grouping African countries according to their levels of inflation and/or income, rather than treating them as a homogeneous entity.

Keywords: *Fiscal deficits, inflation, Africa*

JEL: *H30, H60*

INTRODUCTION

One of the thorniest issues in economics discourse is whether fiscal deficits contribute to inflationary pressure in an economy. Although the seminal work of Sargent and Wallace (1981) triggered the debate on the relationship between deficits and inflation, researchers have attempted to examine the connection among budget deficits, monetary growth and inflation (see Hamburger and Zwick 1981; McMillin and Beard 1982; Ahking and Miller 1985). Catao and Terrrones (2005) suggested that if a government continuously runs budget deficits in order to attain macroeconomic objectives, it will resort to financing such deficits via credit creation and in turn puts upward pressure on inflation. The growth in money stock that results from the deficits raises private sector wealth and demand relative to the supply of goods and services, leading to higher inflation or prices. Moreover, the extent to which monetary policy is employed in balancing government's budget is the key to determining the impact of deficits on inflation (Sill 2005). The fiscal theory of price level (FTPL) on the other hand, states that

Nurudeen Abu, PhD
Othman Yeop Abdullah Graduate School of Business
Univeristi Utara Malaysia
E-mail: abu.nurudeen@yahoo.com

Mohd Zaini Abd Karim
Professor
Othman Yeop Abdullah Graduate School of Business
Univeristi Utara Malaysia
E-mail: zaini500@uum.edu.my

prices are not determined by monetary growth, but only adjust to the increase in the private sector nominal wealth caused by the deficits that are financed via bonds (Tekin-Koru and Özmen 2003).

The Ricardian Equivalence (RE) predicts that deficits may not lead to higher demand and prices since government tax cut in the current period would be financed by proportionate tax increases in the future. Thus, knowing that a higher tax would be imposed on them in the future to enable the government to repay its debt, consumers would not consider themselves wealthier and/or increase their demand to the extent that it would lead to inflation (Anoruo 2003). But in the absence of the RE, the increased wealth would lead to higher demand for goods and services and inflation (Tekin-Koru and Özmen 2003).

Earlier, Sutherland (1997) presented a model to explain how the level of public debt influences the impact of fiscal policy on consumption. The author argued that at moderate levels of debt fiscal policy has an expansionary effect, as current generations of consumers discount future taxes because they may be dead when a government debt stabilization program would be implemented. Given this, consumers will increase their demand, leading to inflation. However, at higher levels of debt current consumers know that there is a high probability that they would be alive when the fiscal stabilization programme comes into force. Therefore, deficits may have a dampening impact on consumers' demand and inflation.

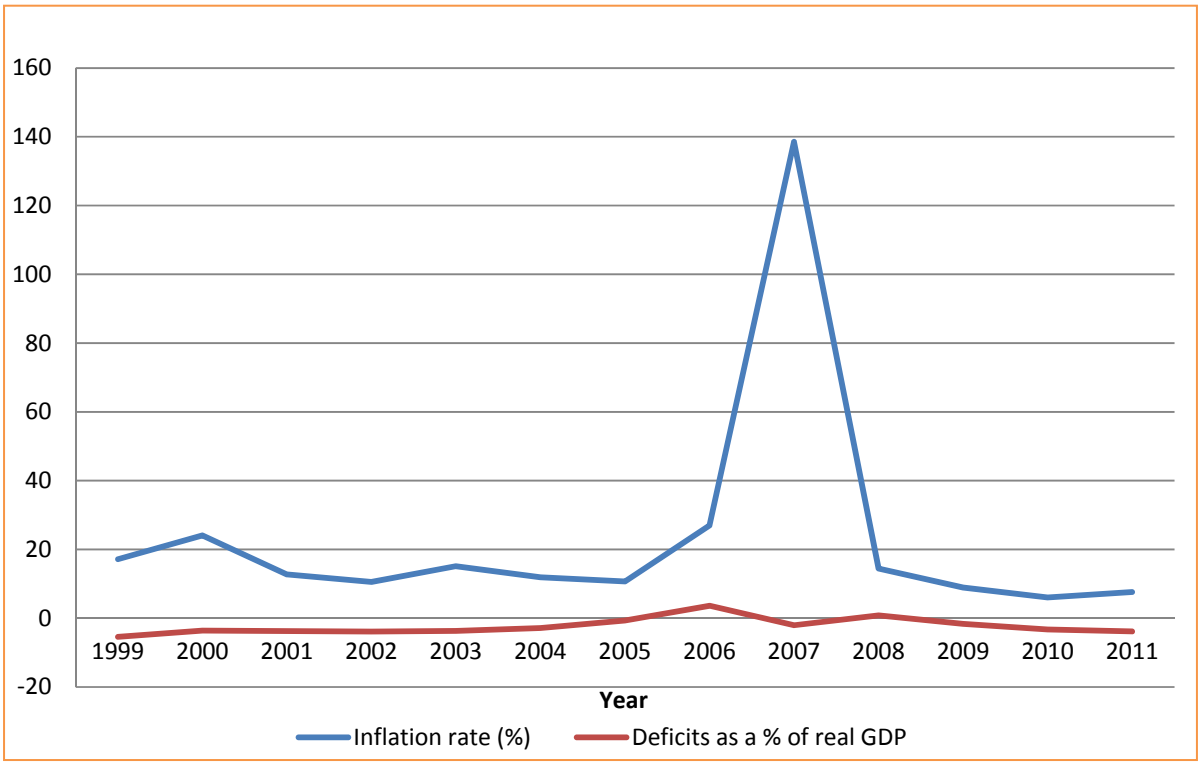
It has also been suggested that in countries where the central bank is not independent, the government can easily influence monetary policy and compel the central bank to keep interest rates low so that the cost of borrowing and financing government's deficits will be less. This can result in inflation (Rother 2004). But in countries where the central bank is to some extent independent and freely pursues the objective of low and stable inflation, it is uncommon to see government running deficits to the level that it will ask the apex bank to print more money to enable it to finance its deficits (Sill 2005). In this case, deficits may not result in inflation. Even if a deficit is not monetized, it may still have an inflationary impact via reduced national savings, higher interest rates, lower private investment and declining output growth (Abu and Karim 2012). Also, many developing economies do not have a vibrant and well-developed capital market where government can raise funds through the issuance of debt instruments such as bonds and treasury bills. This gives government the leverage to always fall back and/or direct the central bank to create credit to enable it finance its deficits (Shahin 1992), with its attendant effects on prices. From the issues highlighted above, there appears to be controversy surrounding the exact relationship (and its direction) between deficits and inflation.

The role of fiscal policy on inflation has gained prominence in developing countries because they are perceived to be less efficient in tax collection, politically unstable and unable to access adequate external borrowing (Alesina and Drazen 1991; Cukierman, Edwards, and Tabellini 1992). These factors tend to reduce the relative cost of seigniorage, and they have increased their dependence on inflation tax (Jalil, Tariq, and Bibi 2014). Moreover, Jacobs, Schoeman, and Van Heerden (2002) contended that expansion in government deficits to a considerable extent is to blame for large debt, high inflation, inadequate investment and poor economic growth in developing countries. However, researchers have yet to give adequate attention to the issue of persistent and growing deficits in developing countries (Anoruo 2003).

A cursory look at available information (Figure 1) indicates that the group of countries considered in this study recorded deficits between 1999 and 2011, except in 2006 and 2008, when they had a surplus. In addition, the region's inflation rate remained relatively high, peaking at 139% in 2007. Furthermore, the pattern of movement of deficits and inflation is not very clear, as they moved in the same direction in some years and opposite in others. For instance, while the average overall deficits (as a percentage of GDP) declined from 5.4% in 1999 to 3.6% in 2000, the average inflation rate jumped from 17.2% to 24.0% during the same period. However, with a further increase in average overall deficits to 3.9%, the average inflation rate dropped to 10.6% in 2002. Although the average overall deficits declined to 0.7% in 2005, the average inflation rate increased to 10.7%. Interestingly, the overall surplus (as a percentage of GDP) in 2006 (3.6%) and 2008 (0.8%) coincided with high rates of inflation, average overall deficits increased gradually from 1.6% in 2009 to 3.3% in 2010 and 3.8% in 2011, and the average inflation rate declined from 8.9% in 2009 to 6.0% in 2010, before climbing to 7.6% in 2011.

Given the unclear pattern in movement of deficits and inflation, it is possible that the relationship between them is non-linear. Furthermore, since the average inflation rate is higher in low-income African countries relative to their middle-income counterparts (as we shall see later in the descriptive statistics in the discussion section) the effect of deficits on inflation may vary across different income groups (with different inflation levels). It has been suggested that the deficits-inflation association may vary across countries with different levels of inflation (Catao and Terrones 2005).

Figure 1: Movements in inflation rate and budget deficits in selected African countries



Source: Authors computation base on data obtained from the African Development Bank statistics pocketbook (various issues).

The question that arises from our discussion is whether the deficits-inflation relationship is non-linear in African countries, and if the effect of deficits on inflation varies across different income groups (with varying inflation rates). Thus, the main objective of this study is to examine whether the relationship between deficits and inflation is non-linear, including investigating if the effect of deficits on inflation varies across different income groups in Africa.

The present study is relevant because Asiedu (2006) suggested that studies focusing on Africa are important due to the general belief that the Africa is structurally different from other regions of the world, that the lessons from East Asia or Latin America are not applicable to the region because their situations are fundamentally different, and that Africa's leaders can learn from one another. Moreover, empirical studies that pay attention to Africa's performance will have greater acceptability among the continent's policymakers (Asiedu 2006). Following the introduction, the second section reviews the relevant literature on deficits and inflation, while the third section contains a description of the study's methods and data analysis. Section four includes the study's results and their discussion, while the fifth section provides recommendations and conclusions.

REVIEW OF RELEVANT LITERATURE

Many studies have been conducted to examine the relationship between deficits and inflation, both in developing and developed countries. Whereas some studies discovered that rising fiscal deficits lead to higher inflation in developing and high-inflation countries, others found an insignificant impact from deficits on inflation in advanced and low-inflation economies. For instance, Jalil, Tariq, and Bibi (2014) tested the FTPL for Pakistan from 1972 to 2012, using the autoregressive distributed lag (ARDL) model. The empirical evidence illustrates that deficits have a positive impact on inflation. Other variables that have a positive effect on inflation include interest rates, government sector borrowing and private borrowing. Habibullah, Cheah, and Baharom (2011) employed the granger causality test within the error correction framework to examine the long-run relationship between deficits and inflation in 13 Asian countries. The authors confirmed the existence of a long-run relationship between the variables, and concluded that deficits contribute to inflation in developing countries in Asia. Lin and Chu (2013) employed a dynamic panel quantile regression model under an ARDL specification to examine the deficit-inflation relationship in 91 countries during the period of 1960-2006. The results

demonstrate that fiscal deficit has a strong effect on inflation in high-inflation episodes, but the effect of deficits on inflation is weak in low-inflation episodes. Similarly, Catao and Terrones (2005) used dynamic panel techniques to examine both the short-run and long-run effects of fiscal deficits on inflation in 107 countries from 1960 to 2001. The empirical evidence indicates the existence of a strong and positive relationship between deficits and inflation in high-inflation and developing countries.

In addition, Edwards and Tabellini (1991) reported that deficits do have a positive effect on inflation for a sample of developing countries. Moreover, Fischer, Sahay, and Vegh (2002) found a strong relationship between deficits and high inflation for some countries in the sample of 133 countries they considered in their study. Sahan and Bektasoglu (2010) studied the relationship between deficits and inflation in Turkey and 16 European Union countries using cointegration tests by Pedroni (1995, 1999) and Larsson, Lyhagen and Löthgren (2001). The results indicate that the existence of a long-run association between deficits and inflation in certain EU countries including the Czech Republic, Hungary, Slovakia, Sweden and Turkey. Metin (1998) analyzed the empirical relationship between inflation and budget deficits in Turkey within a multivariate cointegration framework. The results demonstrate that budget deficits had an inflationary impact on the Turkish economy. Tan (2006) investigated the short-run and long-run relationship between deficits, inflation and economic growth in Malaysia from 1966 to 2003. The author's findings indicate that deficits had a short-run inflationary effect on the economy because they were being monetized. Solomon and de Wet (2004) employed cointegration analysis to examine the relationship between budget deficits and inflation in Tanzania over the period 1967-2001. The authors confirmed a causal relationship running from budget deficits to inflation due to monetization of the deficits.

On the other hand, some studies have established that deficits do not have inflationary effect in developed and low-inflation economies. Marco and Butters (2010) illustrated that large deficits neither coincided with high inflation nor preceded inflation in Finland, Japan, and Sweden, and attributed it to the independence/autonomy enjoyed by central banks in the countries. Sahan and Bektasoglu (2010) also found the absence of any relationship between deficits and inflation in EU countries including Austria, Belgium, Denmark, France, Germany, Italy, the Netherlands, Norway, Spain and the U.K. Similarly, Catao and Terrones (2005) failed to establish a significant relationship between deficits and inflation in low-inflation advanced economies. Fischer, Sahay, and Vegh (2002) suggested that there is no clear association between deficits and inflation in low-inflation countries. Perkarski (2008) concluded that worsening public finance or rising deficits may not account for the rising inflation in high-inflation economies. King and Plosser (1985) studied the relationships among fiscal deficits, money growth and inflation in the United States and 12 other countries. The authors asserted that deficits do not lead to money growth and inflation.

De Han and Zelhorst (1990) used nonparametric correlation measures to study the relationship between seigniorage and government deficits in 17 developing countries that were further categorized into low-inflation and high-inflation groups. The authors discovered a weak association between seigniorage and government deficits, but the relationship is stronger during high-inflation episodes. Karras (1994) examined the effects of budget deficits (along with money growth, investment and real output growth) on inflation in a sample of 32 countries. He concluded that deficits do not lead to high inflation because they are not monetized. Other studies have confirmed a strong link between deficits and inflation in economies where the securities or capital market is less developed (see Cottarelli, Griffiths, and Moghadam 1988).

Despite the numerous studies on the deficits-inflation relationship, little has been done to examine if the relationship is non-linear particularly in the developing region of Africa. Given that the movement in deficits and inflation is not clear (as we pointed out in the introduction) it is possible that the relationship between them is non-linear, and any estimated relationship between them may vary. This study extends the literature by examining whether the deficits-inflation relationship is non-linear in African countries.

METHOD AND DATA ANALYSIS

This study employs a panel dataset to investigate the relationship between fiscal deficits and inflation in 51 African countries from 1999 to 2011. In deriving the inflation model, we employed the ideas of the FTPL which postulates that deficits leads to inflation and the monetarists' assertion that it is the growth in the money supply that results in inflation. For instance, the FTPL argues that if a government persistently runs deficits, it has to finance it through credit creation (Catao and Terrones 2005). The accompanying credit expansion raises aggregate demand. Given that supply often lag behind demand, this will results in higher prices.

In addition, poor fiscal policy makes it easy for governments to shorten the maturity structure of their debt including rolling over the debt frequently (Amato and Gerlach 2002). This increases the risk of an impending confidence crisis that would requires the central bank to step in to monetize a portion of or the total debt, leading to higher inflation. Similarly, deficits raises inflation rate via a crowd-out effect (Fischer 1993). Rising deficits leads to declining aggregate savings, putting upward pressure on rates of interest and lowering private investment and production. The low level of output results in a scarcity of goods and services and higher inflation.

The Quantity Theory of Money, on the other hand, argues that growth in money stock leads to high inflation. This notion is based on the money neutrality assumption that money does not have a significant effect on real variables such as output. Therefore, any growth in monetary aggregates will only raise demand relative to supply, leading to higher prices. Even though the classical school argues that monetary growth is the major cause of inflation, they submit that deficits can lead to inflation if deficits are monetized (Hamburger and Zwick 1981). The foregoing discussion suggests that inflation is the outcome of both monetary and fiscal policies.

Thus, we specify a model in which inflation (INF) is dependent on deficits (DEF) and money supply growth (MOS) as follows.

$$INF_{it} = \alpha_{10} + \alpha_{11}DEF_{it} + \alpha_{12}MOS_{it} + U_{1it} \quad (1)$$

Furthermore, since deficit financing is often more than not intended to enhance a country's productive capacity via investment in socio-economic infrastructures, among other things, output growth is therefore expected to accompany fiscal expansion. The growth in output in turn may have some impact on the level of inflation. For instance, as an economy experiences output expansion, the demand for factor inputs will increase. Consequently, this leads to the exhaustion and scarcity of inputs and as a result increases in their prices. On the other hand, sustained output growth will result in supply matching the demand, which might have arisen from the increased deficits, thus putting inflation under control. Based on these arguments, we include economic growth (RGDP) as a potential determinant of inflation in our model. The new inflation model is:

$$INF_{it} = \alpha_{20} + \alpha_{21}DEF_{it} + \alpha_{22}MOS_{it} + \alpha_{23}RGDP_{it} + U_{2it} \quad (2)$$

As we stated in the introductory section, the movement in deficits and inflation suggests that their relationship may be non-linear and vary over time. Therefore, an attempt would be made to ascertain whether non-linearity holds for the variables. In fact, Catao and Terrones (2005) argued that there is need for an econometric model that captures the non-linearity between deficits and inflation. To this end, we introduce a deficits-square variable or quadratic term (DEF*DEF) in the model to capture the non-linearity between deficits and inflation. Thus, we have a model of the following form:

$$INF_{it} = \alpha_{30} + \alpha_{31}DEF_{it} + \alpha_{32}DEF_{it} * DEF_{it} + \alpha_{33}MOS_{it} + \alpha_{34}RGDP_{it} + U_{3it} \quad (3)$$

Where it refers to time period t in country i. The variables are measured or defined as follows. RGDP is the growth rate of real gross domestic product and MOS is broad money supply (M2) growth. INF is inflation rate, while DEF is budget deficits as a percentage of GDP. The data were collected from the African Development Bank statistics pocketbook (various issues), and cover the 1999-2011 period for 51 African countries (excluding Liberia, Somalia and South Sudan which were left out due to the unavailability of data).

In order to estimate the deficits-inflation relationship, we employed a fixed-effects estimator that allows for unobserved time-invariant variation in country specific characteristics, with robust standard errors. In addition, since our panel of countries has data for a short time span (that is, a short time series and relatively large cross section), we also employed the Generalized Method of Moments (GMM) estimator (Arellano and Bond 1991). The GMM (dynamic) model allows us to take into consideration the fact that inflation rate, fiscal deficits and other regressors are correlated with time-invariant country specific characteristics. Moreover, the introduction of an inflation rate variable lagged by one period allows for the persistence of inflation rate.

The GMM estimator uses the first differences of both dependent and explanatory variables. Despite its advantages over the fixed-effects estimator, the GMM estimator has some shortcomings. Even though the first differencing eliminates country specific effects, the lagged dependent variable is correlated with the disturbance term so that further lags of the dependent variable including the first differences of the independent variables are employed as instruments. In this case, using the one-step GMM estimator with robust standard error will result in inefficient estimates (that is, large standard errors). This necessitates the

employment of the two-step GMM estimator which is more efficient compared with the one-step GMM estimator.

In order to check for the robustness of the GMM estimator, we perform two main tests. The first test is the Hansen test of over-identification. This tests the validity of the instruments employed, including validating the results. The second test tests the presence of serial correlation. The autoregressive tests give useful information on whether the disturbance terms in the first difference regression display serial correlation. While we expect the disturbance term in first difference to have first-order serial correlation, the existence of second-order serial correlation renders the GMM estimates inconsistent. In essence, the absence of second-order serial correlation validates the model.

RESULTS AND DISCUSSION

Prior to estimating the inflation model, we computed the descriptive statistics for the variables employed in this study. Recall that the objective of this study is to examine whether the relationship between deficits and inflation is non-linear, in addition to investigating if the effect of deficits on inflation varies across different income groups (with varying inflation levels). Therefore, we grouped the 51 countries in our sample according to their level of income. Based on the World Bank grouping, our sample is divided into low-income countries and middle-income countries. The low income countries sub-group comprises of 24 countries, while the middle income countries sub-group consists of 27 countries. The descriptive statistics in Table 1 indicates that the mean (average) inflation rate for the whole sample is 23.59%. Interestingly, the average inflation rate for the middle-income countries sub-group is 9.11% compared to 39.84% for the low-income countries sub-group.

These suggest that low-income African countries are also high-inflation countries, and middle-income countries are moderate-inflation countries. Thus, one may expect the deficits-inflation relationship to vary overtime across different income groups with different inflation levels.

Next, we proceed with our analysis by estimating the inflation model using a fixed-effects estimator. The results in Table 2 demonstrate that money supply growth has a positive and significant effect on inflation (ρ-value=0.0000), but economic growth has a significant and negative effect on inflation (ρ-value=0.0004). However, deficits and deficits-square do not have any significant effect on inflation. This may be due to the fact that the fixed-effects estimator fails to take into account the dynamics of inflation behavior.

The results of GMM estimation for the model that exclude deficits-square are reported in Table 3. In interpreting the GMM estimates, we focus on models

Table 1: Descriptive statistics

Whole sample					
	Mean	Max	Min	Std. Dev.	Obs.
INF	23.59	6723.70	-8.70	267.66	656
DEF	-2.33	51.40	-124.90	10.18	663
RGDP	4.54	48.10	-41.80	5.95	661
MOS	32.53	6194.40	-77.50	260.68	606
Middle-income countries					
	Mean	Max	Min	Std. Dev.	Obs.
INF	9.11	325.00	-8.50	24.63	347
DEF	-0.71	51.40	-124.9	11.66	351
RGDP	4.42	48.10	-41.80	5.63	349
MOS	18.77	530.9	-26.30	37.52	327
Low-income countries					
	Mean	Max	Min	Std. Dev.	Obs.
INF	39.84	6723.70	-8.70	388.80	309
DEF	-4.15	41.60	-54.50	7.83	312
RGDP	4.67	43.40	-14.10	6.28	312
MOS	48.66	6194.40	-77.50	381.77	279

Source: Authors computations based on data collected from the African Development Bank Statistics Pocketbook (various issues). +/- DEF implies budget surplus/budget deficits.

Table 2: Fixed effects estimates for whole sample (Dependent variable: INF)

Regressor	2(a)	2(b)
Constant	-8.5069(2.5231)[0.0008]	-8.4896(2.5189)[0.0008]
DEF	0.0529(0.1692)[0.7544]	0.0785(0.1897)[0.6792]
DEF*DEF		0.0007(0.0016)[0.6871]
RGDP	-0.7010(0.1952)[0.0004]	-0.7077(0.1967)[0.0004]
MOS	1.0635(0.0334)[0.0000]	1.0635(0.0334)[0.0000]
R2	0.9835	0.9835
No of Obs.	599	
No of Countries	51	

Robust standard errors generated using the panel corrected standard error (PCSE) method are in brackets. Probability values are in square brackets.

that are valid and have consistent estimates (using the autoregressive test for the presence of second-order serial correlation and the J-statistic test for the validity of instruments). The results illustrate that there is an absence of second-order serial correlation (ρ-value=0.1780), while the J-statistic indicates that the instruments are valid (ρ-value=0.4733) in the two-step GMM estimates. The results also reveal that money supply growth has a significant and positive effect on inflation (ρ-value=0.0000), while economic growth has a significant and negative effect on inflation (ρ-value=0.0000).

We continued our analysis by including the deficits-square in the model. The results reported in Table 4 demonstrate that the two-step GMM estimator is more efficient because the autoregressive test reveals that there is an absence of second-order serial correlation in the estimates (ρ-value=0.2110), and the J-statistic shows that the instruments are valid (ρ-value=0.5168). In addition, the results indicate that the deficits-inflation relationship is non-linear, and that the non-linear term is statistically significant (ρ-value=0.0000).

It must be pointed out that it is difficult to interpret the coefficient of squared independent variables as in the case of DEF*DEF. However, one can calculate the breaking point by differentiating the estimates with respect to DEF. This helps us to get an idea of the deficits value where the relationship changes (this is the turning or breaking point of the curve). For instance, taking the derivative of the estimates in Table 4 with respect to DEF yield 0.2404+0.0052*(2)=0.25. Next, we take the ratio of the coefficient of the linear term (DEF) to twice the coefficient of the non-linear or quadratic term (DEF*DEF) to enable us interpret the relationship correctly. Thus, 23.12 [or 0.2404/2(0.0052)] is the threshold or value of deficits share in GDP at which the relationship changes or reverses.

Overall, the relationship is positive as a percentage point increase in DEF (% of GDP), ceteris paribus and on average, results in a 0.25 percentage points rise in the rate of inflation in African countries over the

Table 3: GMM estimates for whole sample without deficits-square (Dependent variable: INF)

Regressor	One-step	Two-step
INF(-1)	0.9048(0.4113)[0.0283]	0.9052(0.0008)[0.0000]
DEF	0.0182(0.3767)[0.9614]	0.0069(0.0098)[0.4793]
RGDP	-1.1982(0.7283)[0.1006]	-1.1922(0.0079)[0.0000]
MOS	0.9778(0.0538)[0.0000]	0.9777(0.0001)[0.0000]
No of obs.		
No of Countries	491	
Diagnostics:	51	
J-statistic	223.45[0.0000]	46.98[0.4733]
AR(2)	2.30[0.0212]	1.32[0.1780]

Heteroskedasticity-robust standard errors are in brackets. Probability values are in square brackets. AR(2) is a test of second-order serial correlation. J-test is the Hansen over-identification test.

Table 4: GMM estimates for whole sample with deficits-square (Dependent variable: INF)

Regressor	One-step		Two-step
INF(-1)	0.9090(0.0006)[0.0263]		0.9096(0.0006)[0.0000]
DEF	0.2509(0.0119)[0.7287]		0.2404(0.0119)[0.0000]
DEF*DEF	0.0057(0.0005)[0.0000]		0.0052(0.0005)[0.0000]
RGDP	-1.2824(0.0102)[0.0800]		-1.2795(0.0102)[0.0000]
MOS	0.9773(0.0001)[0.0000]		0.9773(0.0001)[0.0000]
No of obs.		491	
No of Countries		51	
Diagnostics:			
J-statistic	214.65[0.0000]		44.93[0.5168]
AR(2)	2.18[0.0290]		1.25[0.2110]

Heteroskedasticity-robust standard errors are in brackets. Probability values are in square brackets. AR(2) is a test of second-order serial correlation. J-test is the Hansen over-identification test.

observed period. A positive coefficient on DEF*DEF indicates a concave upward relationship (more specifically, a right-side-up parabola). In other words, the relationship between fiscal deficits and inflation is positive and becomes quantitatively larger once fiscal deficits reach 23.12% of GDP (i.e., excessive government spending fuels inflation). Furthermore, the results indicate that money supply growth has a positive and significant effect on inflation (ρ-value=0.0000), but economic growth has a negative and significant effect on inflation (ρ-value=0.0000).

Moreover, we examined whether the deficits-inflation relationship varies across different income groups (with varying inflation levels). We wish to state that (henceforth) only results of estimations for models consisting of deficits-square are reported because it is in these models we found deficits and/or deficits-square to be significant. Furthermore, since deficits and/or deficits-square are insignificant in the fixed-effects estimations, only the results of the GMM estimation are reported.

The results of the GMM estimation for high-inflation/low-income countries presented in Table 5 illustrate that the two-step GMM estimator is more efficient, as an autoregressive test indicates the absence of second-order serial correlation in the estimates (ρ-value=0.3228), while the J-statistic reveals that the instruments used are valid (ρ-value=0.6231). The results of the two-step GMM estimation demonstrate that the deficits-inflation relationship is non-linear for high-inflation/low-income countries, and the quadratic term is significant (ρ-value=0.0000). Taking the first derivative of the estimates with respect to DEF yields -1.2597+0.0269*(2)=-1.21. The ratio of the coefficient of the linear term (DEF) to twice the coefficient of the quadratic term (DEF*DEF) is -23.41[or -1.2597/2(0.0269)].

Overall, the relationship is negative as a percentage

Table 5: GMM estimates for low income countries (Dependent variable: INF)

Regressor	One-step		Two-step
INF(-1)	0.9800(0.0812)[0.0000]		0.9814(0.0022)[0.0000]
DEF	-1.2199(0.8535)[0.1543]		-1.2597(0.0465)[0.0000]
DEF*DEF	0.0264(0.0381)[0.4896]		0.0269(0.0032)[0.0000]
RGDP	-0.7544(0.4891)[0.1244]		-0.9468(0.1559)[0.0000]
MOS	0.9516(0.0136)[0.0000]		0.9517(0.0002)[0.0000]
No of obs.		226	
No of Countries		24	
Diagnostics:			
J-statistic	110.69[0.0000]		16.50[0.6231]
AR(2)	1.19[0.2338]		0.98[0.3228]

Heteroskedasticity-robust standard errors are in brackets. Probability values are in square brackets. AR(2) is a test of second-order serial correlation. J-test is the Hansen over-identification test.

Table 6: GMM estimates for middle income countries (Dependent variable: INF)

Regressor	One-step		Two-step
INF(-1)	0.2294(0.1136)[0.0445]		0.2282(0.0015)[0.0000]
DEF	-0.1832(0.1997)[0.3597]		-0.1855(0.0053)[0.0000]
DEF*DEF	-0.0016(0.0018)[0.3666]		-0.0017(0.0001)[0.0000]
RGDP	-0.7944(0.4012)[0.0488]		-0.8022(0.0120)[0.0000]
MOS	0.7079(0.1603)[0.0000]		0.7072(0.0013)[0.0000]
No of obs.		265	
No of Countries		27	
Diagnostics:			
J-statistic	106.10[0.0003]		24.04[0.3451]
AR(2)	-0.20[0.8343]		0.24[0.8080]

Heteroskedasticity-robust standard errors are in brackets. Probability values are in square brackets. AR(2) is a test of second-order serial correlation. J-test is the Hansen over-identification test.

point increase in DEF (% of GDP), ceteris paribus and on average, results in a 1.21 percentage points fall in the rate of inflation. A positive coefficient on DEF*DEF indicates a concave upward relationship. In other words, the relationship between fiscal deficits and inflation in low-income and high-inflation African countries is negative overall, but less so once the fiscal deficits reach 23.41% of GDP. Also, the results illustrate that money supply growth has a positive and significant effect on inflation (ρ-value=0.0000), but economic growth has a significant and negative effect on inflation (ρ-value=0.0000).

In addition, the results of the GMM estimation for moderate-inflation/middle-income countries reported in Table 6 reveal that the two-step GMM estimator is more efficient, because the autoregressive test illustrates that there is an absence of second-order serial correlation in the estimates (at a ρ-value=0.8080), while the J-statistic indicates that the instruments are valid (ρ-value=0.3451). The results also reveal that the deficits-inflation relationship is non-linear, and the coefficient of the non-linear term is statistically significant (ρ-value=0.0000). The first derivative of the estimates with respect to DEF is -0.1855-0.0017*(2)=-0.19. The ratio of the coefficient of the linear term (DEF) to twice the coefficient of the non-linear term (DEF*DEF) is 54.56 [or -0.1855/2(-0.0017)]. Overall, the relationship is negative, as a percentage point increase in DEF (% of GDP), ceteris paribus and on average, results in a 0.19 percentage points fall in the rate of inflation. A negative coefficient on DEF*DEF indicates a concave downward relationship. In other words, the relationship between fiscal deficits and inflation is negative overall, but more so for fiscal deficits below 54.56% of GDP. Also, the results demonstrate that money supply growth has a positive and significant effect on inflation (ρ-value=0.0000), and economic growth has a significant and negative effect on inflation (ρ-value=0.0000).

The results reported above are indeed revealing. The fixed-effects estimates show that deficits and deficits-square do not have any significant effect on inflation. This may be due to the fact that the fixed-effects model does not take into account the dynamics of inflation behavior. In addition, the diagnostic tests demonstrate that the two-step GMM estimator is more efficient because the autoregressive tests indicate that there is no presence of second-order serial correlation in the estimates. Moreover, the J-statistic validates the model, as it suggests that the instruments employed are valid.

The results also illustrate that the deficits-inflation relationship is non-linear for the whole sample, including moderate-inflation/middle-income countries and high-inflation/low-income countries. For the whole sample, a percentage point increase in deficits results in 0.25 percentage points increase in inflation rate. The relationship becomes quantitatively greater once fiscal deficits reach 23.12% of GDP. In the case of high-inflation/low-income countries, a percentage point increase in fiscal deficits leads to a 1.21 percentage points fall in inflation rate. The relationship gets quantitatively lesser once fiscal deficits reach 23.41% of GDP. In moderate-inflation/middle-income countries, a percentage point increase in fiscal deficits results in a 0.19 percentage points fall in inflation rate. The relationship becomes quantitatively greater for fiscal deficits below 54.56% of GDP.

These findings are not surprising, as it was pointed out earlier that the movement in deficits and inflation is not very clear, and suggested that the relationship between them may be non-linear. Moreover, the results reveal that the effect of deficits on inflation is

different for countries at different level of income and varying inflation levels. Catao and Terrones (2005) had earlier reported different effects from deficits on inflation for countries with varying levels of inflation.

In addition, the results reveal that money supply growth has a positive and significant effect on inflation. This finding lends support to the claim that growth in monetary aggregates leads to inflation. The finding is also consistent with that reported by Paun and Topan (2013) for Romania. The positive sign of the money supply growth coefficient suggests that in a high-inflationary environment no one wants to hold cash, which makes the prices of goods rise. The results also illustrate that economic growth has a negative and significant effect on inflation. The negative impact of economic growth suggests that the expansion of goods and services will match aggregate demand over time, leading to lower inflation.

CONCLUSION AND RECOMMENDATIONS

This paper investigates whether the deficits-inflation relationship is non-linear from 1999 to 2011 in 51 African economies, which are further grouped as high-inflation/low-income countries and moderate-inflation/middle-income, using fixed-effects and GMM estimators. The results indicate that the deficits-inflation relationship is non-linear, and that the effect of deficits on inflation varies across different income groups with disparate levels of inflation.

Although the results of this research cannot be used as the basis for generalization, the findings of this study highlight the importance of grouping countries according to their levels of inflation and/or income, rather than treating them as a homogeneous entity when examining the deficits-inflation nexus, particularly for the African continent. Although different effects from fiscal deficits have been established across different groups of countries, reducing deficits can check excessive increases in inflation in Africa over time.

REFERENCES

Abu, N. and Karim, M. Z. A. 2012. Inflationary effects of fiscal deficits in developing countries: Empirical evidence from Africa. A paper presented at the Universiti Putra Malaysia National Research & Innovation Conference for Graduate Students in Social Sciences, December, 276-286.

Ahking, F. W. and Miller, S. M. 1985. The relationship between government deficits, money growth and inflation. Journal of Macroeconomics 7: 447-467.

Alesina, A. and Drazen, A. 1991. Why are stabilizations delayed?. American Economic Review 81 (5): 1170-1188.

Amato, J. D. and Gerlach, S. 2002. Inflation targeting in emerging market and transition economies: Lessons after a decade. European Economic Review 46: 781-790.

Anoruo, E. C. 2003. An empirical investigation into the budget deficit-inflation nexus in South Africa. South African Journal of Economics 71 (2): 146-154.

Arellano, M. and Bond, S. 1991. Some tests of specification for panel data: Monte Carlo evidence and an application to employment equations. Review of Economic Studies 58: 277-297.

Asiedu, E. 2006. Foreign direct investment in Africa: The role of natural resources, market size, government policy, institutions and political instability. World Economy 29 (1): 63-77.

Catao, L. and Terrones, M. E. 2005. Fiscal deficits and inflation. Journal of Monetary Economics 52: 529-554.

Cottarelli, C., Griffiths, M. and Moghadam, R. 1998. The non-monetary determinants of inflation: A panel data study. IMF Working Paper 23.

Cukierman, A., Edwards, S. and Tabellini, G. 1992. Seigniorage and political instability. American Economic Review 82: 537-555.

De Haan, J. and Zelhorst, D. 1990. The impact of government deficits on money growth in developing countries. Journal of International Money and Finance 9: 455-469.

Edwards, S. and Tabellini, G. 1991. Explaining fiscal policies and inflation in developing countries. Journal of International Money and Finance 10: 16-48.

Fischer, S. 1993. The role of macroeconomic factors in growth. Journal of Monetary Economics 32: 485-512.

Fischer, S., Sahay, R. and Vegh, S. 2002. Modern hyper and high inflations. Journal of Economic Literature XL: 837-880.

Habibullah, M. S., Cheah, C. and Baharom, A. H. 2011. Budget deficits and inflation in thirteen Asian developing countries. International Journal of Business and Social Science 2 (9): 192-204.

Hamburger, M. J. and Zwick, B. 1981. Deficit, money and inflation. Journal of Monetary Economics 7: 141-150.

Jacobs, D., Schoeman, N. J. and Van Heerden, J. H. 2002. Alternative definitions of the budget deficit and its impact on the sustainability of fiscal policy in South Africa. South African Journal of Economics 70 (3): 251-257.

Jalil, A., Tariq, R. and Bibi, N. 2014. Fiscal deficit and inflation: New evidences from Pakistan using a bounds testing approach. Economic Modelling 37: 120-126.

Karras, G. 1994. Macroeconomic effects of budget deficits: Further international evidence. Journal of International Money and Finance 13: 190-210.

King, R. G. and Plosser, C. I. 1985. Money, deficits and inflation. Carnegie-Rochester Conference Series on Public Policy 22: 147-96.

Larsson, R, Lyhagen, J. and Löthgren, M. 2001. Likelihood-based cointegration tests in heterogeneous panels. Econometrics Journal 4: 109-142.

Lin, H-Y. and Chu, H-P. 2013. Are fiscal deficits inflationary?. Journal of International Money and Finance 32: 214-233.

Marco, B. and Butters, R. A. 2010. What is the relationship between large deficits and inflation in industrialized countries?. Federal Reserve Bank of Chicago Economic Perspectives Q3: 83-100.

McMillin, W. D. and Beard, T. R. (1982). Deficits, money and inflation. Journal of Monetary Economics 10: 273-277.

Metin, K. 1998. The relationship between inflation and the budget deficits in Turkey. Journal of Business and Economic Statistics 16 (4): 412-422.

Paun, C. and Topan, V. 2013. The monetary causes of inflation in Romania. Romania Journal of Economic Forecasting 1: 5-23.

Pedroni, P. 1995. Panel cointegration: Asymptotic and finite sample properties of pooled time series tests with an application to the PPP hypothesis. Indian University Working Papers on Economics.

Pedroni P. 1999. Critical values for cointegration tests in heterogeneous panels with multiple regressors. Oxford Bulletin of Economics and Statistics (Special Issue) 0305-9049: 653-670.

Perkarski, S. 2008. Budgets deficits and inflation feedback. CORE Discussion Paper 54.

Rother, P. C. 2004. Fiscal policy and inflation volatility. European Central Bank Working Paper Series 317.

Sahan, F. and Bektasoglu, Y. 2010. Panel cointegration analysis of budget deficit and inflation for EU countries and Turkey. A Paper presented at the Izmir University of Economics 6th Internatioanl Student Conference, Izmir, Turkey.

Sargent, T. and Wallace, N. 1981. Some unpleasant monetarist arithmetic. Federal Reserve Bank of Minneapolis Quarterly Review 1-17.

Shahin, W. N. 1992. Money supply and deficit financing in economic development. Westport Connecticut, Greenwood.

Sill, K. 2005. Do budget deficits cause inflation?. Business Review Q3: 26-33.

Solomon, M. and de Wet, W. A. 2004. The effect of a budget deficit on inflation: The case of Tanzania. South African Journal of Economic and Management Sciences 7 (1): 100-116.

Sutherland, A. 1997. Fiscal crises and aggregate demand: Can high public debt reverse the effects of fiscal policy?. Journal of Public Economics 65: 147-162.

Tan, E. C. 2006. Fiscal deficits, inflation, and economic growth in a successful open developing economy. Review of Applied Economics 12 (1): 129-139.

Tekin-Koru, A. and Özmen, E. 2003. Budget deficits, money growth and inflation: The Turkish evidence. Applied Economics 35 (5): 591-596.

SUBMISSION GUIDELINES

The South East European Journal of Economics and Business (SEEJ) primarily addresses important issues in economics and business, with a special focus on South East European (SEE) and countries in transition. The SEEJ also publishes high-quality papers that might not be directly focused on SEE region. Articles may involve explanatory theory, empirical studies, policy studies, or methodological treatments of tests.

Manuscripts are reviewed with the understanding that they

- are substantially new;
- have not been previously published, unless without copyrights as part of the proceedings of a conference sponsored by the School of Economics and Business;
- have not been previously accepted for publication;
- are not under consideration by any other publisher, and will not be submitted elsewhere until a decision is reached regarding their publication in the SEE Journal.

The procedures guiding the selection of articles for publication in the journal require that no manuscript be accepted until it has been reviewed by the Editorial Board and at least two reviewers who are experts in their respective fields (often members of the International Editorial Board). The manuscripts are judged solely on the basis of content, clarity, and contribution to the field. All manuscripts are judged on their contribution to the advancement of science, the practice of economics and business, or both. Articles should be written in an interesting, readable manner, and technical terms should be defined. In some highly exceptional circumstances, the journal will publish a solicited manuscript from a noted scholar on a topic deemed of particular interest to the development of the fields of economics and business. Manuscripts submitted to the journal can be processed most expeditiously if they are prepared according to these instructions.

MANUSCRIPT PREPARATION

Manuscripts should be typed double-spaced, including references, and formatted for the A4 (21cm x 29,7cm) paper size. Single spacing should not be used aside from tables and figures. Page numbers are to be placed in the upper right-hand corner of every page. A tab indent should begin each paragraph. Please allow the text to wrap, rather than placing a hard return after every line. Manuscripts ordinarily should be between 4,000 and 6,000 words (ca. 15 typewritten pages of text) using Times New Roman l2-point type. Articles of shorter or longer length are also acceptable. Please refrain from using first person singular in the text of the manuscript unless it is a solicited article or book review.

In the article, please be sure that acronyms, abbreviations, and jargon are defined, unless they are well-known or in the dictionary or The Chicago Manual of Style, 15th edition (e.g., Table 14.4 and sec. 15.55). Quotes of 10 or more words must include page number(s) from the original source. Every citation must have a reference, and every reference must be cited.

For any details of manuscript preparation not included in the following sections, see The Chicago Manual of Style, 15th edition, Chicago and London: University of Chicago Press, 2003, and review recent issues of the journal.

What Goes Where?
Together with your manuscript, please prepare additional supplementary file to be uploaded after you upload the manuscript. Supplementary file should contain: article title, with full name of author(s), present position, organizational affiliation, full address including postal code and country, telephone/fax numbers, and e-mail address. Author(s) must be listed in the order in which they are to appear in the published article. Please clearly indicate which author will serve as the primary contact for the journal and be especially sure to provide an e-mail address for this person.

The sections of the manuscript should be placed in the following order: title page, body, appendices, endnotes, reference list, tables, figures. Each section should begin on a new page.

Title Page - Title of paper, without author(s) name(s), and a brief abstract of no more than 150 words substantively summarizing the article. JEL classification code to facilitate electronic access to this manuscript should also be listed on this page.

Body - The text should have its major headings centered on the page and subheadings flush with the left margin. Major headings should use all uppercase letters; side subheadings should be typed in upper- and lowercase letters. Do not use footnotes in the body of the manuscript. If used, please place endnotes in a numbered list after the body of the text and before the reference list; however, avoid endnotes wherever possible because they interrupt the flow of the manuscript. Acronyms, abbreviations, and jargon should be defined unless they are well-known (such as IMF) or they can be found in the dictionary. Quotes of 10 or more words should include page number(s) from the original source. Every citation must have a reference, and every reference must be cited.

Tables and Figures - Each table or figure should be included in the manuscript where appropriate. The data in tables should be arranged so that columns of like materials read down, not across. Non-significant decimal places in tabular data should be omitted. The tables and figures should be numbered in Arabic numerals, followed by brief descriptive titles. Additional details should be footnoted under the table, not in the title. In the text, all illustrations and charts should be referred to as figures. Figures must be clean, crisp, black-and-white, camera-ready copies. Please avoid the use of gray-scale shading; use hatch marks, dots, or lines instead. Please be sure captions are included. Indicate in text where tables and figures should appear. Be sure to send final camera-ready, black-and-white versions of figures and, if possible, electronic files.

References - References should be typed double-spaced in alphabetical order by author's last name.

Reference Citations within Text - Citations in the text should include the author's last name and year of publication enclosed in parentheses without punctuation, e.g., (Johnson 1999). If practical, the citation should be placed immediately before a punctuation mark. Otherwise, insert it in a logical sentence break.

If a particular page, section, or equation is cited, it should be placed within the parentheses, e.g., (Johnson 1990, p. 15). For multiple authors, use the full, formal citation for up to three authors, but for four or more use the first author's name with "et al." For example, use (White and Smith 1977) and (Brown, Green, and Stone 1984). For more than three authors, use (Hunt et al. 1975), unless another work published in that year would also be identified as (Hunt et al. 1975); in that case, list all authors, e.g., (Hunt, Bent, Marks, and West 1975).

Reference List Style - List references alphabetically, the principal author's surname first, followed by publication date. The reference list should be typed double-spaced, with a hanging indent, and on a separate page. Do not number references. Please see the reference examples below as well as reference lists in recent issues. Be sure that all titles cited in the text appear in the reference list and vice versa. Please provide translations for non-English titles in references, page ranges for articles and for book chapters, and provide all authors' and editors' names (not "et al.," unless it appears that way in the publication).

Journal article:
Smith, J. R. 2001. Reference style guidelines. Journal of Guidelines 4 (2): 2-7 [or 4:2-7].
_____.2001. Reference style guidelines. Journal of Baltic Studies 4 (2): 2-7.

Book:
Smith, J. R. 2001. Reference style guidelines. Thousand Oaks, CA: Sage.

Chapter in a book:
Smith, J. R. 2001. Be sure your disk matches the hard copy. In Reference style guidelines, edited by R. Brown, 155-62. Thousand Oaks, CA: Sage.

Editor of a book:
Smith, J. R., ed. 2001. Reference style guidelines. Thousand Oaks, CA: Sage.

Dissertation (unpublished):
Smith, J. R. 2001. Reference style guidelines. Ph.D. diss., University of California, Los Angeles.

Paper presented at a symposium or annual meeting:
Smith, J. R. 2001. A citation for every reference. Paper presented at the annual meeting of the Reference Guidelines Association, St. Louis, MO, January.

Online:
Smith, J. R. 2001. Reference style guidelines. In MESH vocabulary file (database online). Bethesda, MD: National Library of Medicine. http:// www.sagepub.com (accessed October 3, 2001).

Mathematical Notation - Mathematical notation must be clear within the text. Equations should be centered on the page. If equations are numbered, type the number in parentheses flush with the right margin. For equations that may be too wide to fit in a single column, indicate appropriate breaks. Unusual symbols and Greek letters should be identified by a marginal note.

Permission Guidelines – Authors are solely responsible for obtaining all necessary permissions. Permission must be granted in writing by the copyright holder and must accompany the submitted manuscript. Authors are responsible for the accuracy of facts, opinions, and interpretations expressed in the article.

Permission is required to reprint, paraphrase, or adapt the following in a work of scholarship or research:

- Any piece of writing or other work that is used in its entirety (e.g., poems, tables, figures, charts, graphs, photographs, drawings, illustrations, book chapters, journal articles, newspaper or magazine articles, radio/television broadcasts);
- Portions of articles or chapters of books or of any of the items in the preceding paragraph, if the portion used is a sizable amount in relation to the item as a whole, regardless of size, or it captures the "essence" or the "heart" of the work;
- Any portion of a fictional, creative, or other nonfactual work (e.g., opinion, editorial, essay, lyrics, commentary, plays, novels, short stories);
- Any portion of an unpublished work

MANUSCRIPT SUBMISSION

Submit manuscripts electronically, in MS Word format, through through the following web-page: seejournal.efsa.unsa.ba/submission.

All additional correspondence should be addressed to:
The South East European Journal of Economics and Business
University of Sarajevo, School of Economics and Business

Trg oslobodjenja-Alije Izetbegovica 1
71000 Sarajevo
Bosnia and Herzegovina
E-mail: seejournal@efsa.unsa.ba

SEP JOURNAL

ISSN 2233-1999