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DOES PRIMARY SOVEREIGNTY RISK MATTER FOR BANK STABILITY? EVIDENCE FROM THE ALBANIAN BANKING SYSTEM

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Abstract
The paper studies the pass-through effect of primary sovereignty risk on bank stability. For this reason, we followed a new approach using on-site bank balance sheet information to construct our proxy, which represents each bank stability condition and uses a variety of internal and external factors to estimate a balance panel two-step General Method of Moments (GMM) approach for the period 2008 Q03 – 2015 Q03. The main findings provide strong empirical evidence supporting the view that primary sovereignty risk negatively affects bank stability. However, the pass-through effect of primary sovereignty risk is found to be relatively low. Rather improving macroeconomic and financial market conditions are found to be important components through which banks become more immune. The rest of the results imply that other bank-specific indicators, namely the extent of intermediation, off-balance sheet active, excessive capital, credit risk and profitability do not have a significant effect.

JEL Classification: C26, E32, E43, G21, H63
Key words: Bank Fragility, Primary Sovereignty Risk, Panel Data, Dynamic GMM

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1. Introduction

The recent global financial crisis (henceforth, GFC) of 2007 – 2009 highlighted yet again that the stability of the Albanian financial sector is largely dependent on the banking system [Bank of Albania, (2015)], mainly because the banking system constitutes the spinal cord of economic activity, which is seriously hampered, if banks, the most prominent agents in financial markets, exhibit some turbulent moments and cannot properly execute their financial function. This became even more evident in view of a possible Greek default crisis to which banking systems across the Central Eastern and South Eastern European (henceforth, CESEE) countries, and in particular Albania, were faced with some important challenges. Firstly, banks had to finance a non-austerity Albanian fiscal policy, at a time when financial markets started questioning the solvency of countries with a high debt burden on the verge of the possibility of Greek defaults, while rising spreads became the main driver in the run-up to a possible systemic risk for all European banks, especially in late 2011, and in the summer of 2012 [Black, *et al.* (2016)]. Secondly, the spill-over effects and Albanian banks' balance sheets problems triggered a contraction of the flow of bank lending to other sectors of the domestic economy due to the need for de-leverage. Despite an accommodating monetary policy, rising spreads were associated with rising banking system instability (See Graph 1 in the Appendix) that shows tightening of financing conditions in some sectors and significant withdrawals on economy equity and debt funds, making it more costly and difficult to support economic activity through lending.

Existing literature provides a fairly comprehensive review of the main internal and external determinants on bank stability, but one question of these cases still remains to be answered empirically, as there is no evidence on how primary sovereignty risk affects bank stability after GFC, particularly in the case of an Emerging Market Economy (EME), namely Albania. Therefore, this paper empirically analyses the effect of primary sovereignty risk on bank stability, which may ultimately lead to bank fragility. For this reason, we use a sample with quarterly data that includes 16 banks operating in the Albanian banking industry over the period 2008–2015. The empirical approach follows a five-step procedure. First, we constructed a new composite stability indicator by compiling the on-site bank balance sheet information for each of the 16 banks operating in the Albanian banking industry. Second, our stability indicator was expressed as a function of bank specific (internal) and macroeconomic (external) variables a using panel estimation approach based on a two-step Generalised Method of Moments (henceforth, GMM), and, specifically, the first difference transformation approach. Finally, we performed a variety of robustness checks. On the one hand, we included a set of control variables to mitigate in return potentially omitted-variable problems which ranged across bank-specific and market-specific indicators. On the other hand, we further augmented

the model to evaluate the extent to which off-balance-sheet activities, which banks are engaging in, may have an effect on bank stability.

The main findings provide strong empirical evidence supporting the view that primary sovereignty risk negatively affects bank stability. However, the pass-through effect of primary sovereignty risk is found to be relatively low. At the same time, we found that banks are more sensitive to economic activity and growth performance and macroeconomic risks linked with it. Other sovereignty risks linked to financial market conditions, fiscal stance and the price bubble are also found to significantly impact bank stability. Liquidity risk and monetary conditions are also important determinants of stability. The trade-offs with stability conditions are observed in relation to efficiency operations, while greater stability appears to be boosted in line with higher degree of market share and a higher extent of bank capitalisation. We also found that the scale at which banks anticipate off-balance sheet activities is negatively correlated to bank stability conditions, but this effect is relatively small and non-significant. The rest of the results imply that stability conditions are less sensitive to the degree of financial intermediation, excessive capital, as well as profitability. We did not find a significant effect with regards to credit risk.

This paper complements and expands existing literature in several aspects. First, this paper neither focused on real episodes of banking crises nor did we use a binary approach as a proxy for instability moments, both of which may either provide insufficient data for estimation purposes or be based on a threshold level and, therefore, may be easily criticised or produce false signals of instability moments. In addition, we neither used the Z-score nor did we use a credit risk indicator as an in-variant measure of the bank's risk-taking behaviour and distance from solvency, to which Fu *et al.* (2014) provide some arguments against, as a means of bank stability proxies. By contrast, rather than focusing on only one aspect of bank risk exposure, e.g., capital, profitability or credit risk, we proceeded by using a rather more sophisticated proxy for bank stability, which includes, instead, a wide range of information based on consolidated balance sheet data with regards to different aspects of bank risks, e.g. capital adequacy, asset quality, earnings, liquidity and sensitivity to market risk. Then, our proxy for bank stability was estimated through a set of statistical approaches that also included the use of the principal component analysis approach. Therefore, we strongly believe that our indicator is qualitatively more capable of directly capturing the most common factor identifying any possibility of outright bank defaults or/and instability episodes without much information loss. This approach is advantageous even for the fact that it avoids any pitfalls (e.g., insufficient volume of data or false signals) of using the binary approach to crises episodes. To our best knowledge, no previous study has employed such a bank stability indicator as the dependent variable to investigate how bank stability is affected by the primary sovereignty risk and we believe this is an important step

forward towards better understanding the underlying mechanisms. Second, to the best of our knowledge, no previous paper has either analysed the effect of primary sovereignty risk on bank stability or addressed stability issues regarding EMEs, particularity in the case of the Albanian banking system. Third, we focus only on the period after GFC and, therefore, provide new insights into the extent to which potential internal and external factors explain patterns of bank stability conditions, which may be relevant to both investors and regulators. Finally, it avoids any pitfalls, as described by Uhde and Heimeshoff (2009), related to data issues and ensures comparability across both dependent and independent variables, since it focuses only on a single country. Similarly, we do not make use of data from the Bankscope database, but, rather, we use data taken from the Bank of Albania, which provides the most accurate and reliable dataset on banking data.

The remainder of the paper is structured as follows: The next section discusses the literature review. Section 3 presents the methodology with regards to model specifications and data. Results are presented in Section 4. The material concludes in section 5 with final remarks and policy implications.

2. Literature review

The financial crisis of 2007/2009 has once again brought the issue of bank risk to the heart of academic discussion. In the realm of the determinants of bank stability, as Hutchison (2002) states, theoretical literature falls under three groups of models: 'bank-run models', as in, e.g., Diamond and Dybving (1983); 'adverse shock/credit channel' models, as in, e.g., Bernanke *et al.* (1992); and 'moral hazard' models, as in, e.g., Demirgüç-Kunt and Detragiache (2002). The empirical framework identifies several variables consistent with one or more theoretical models that fall under two main categories, namely, internal and external determinants. The former consist of indicators influenced by the management policy objectives and their ability to monitor risks and, thereby, focuses on the characteristic bank balance sheet indicators, such as size and asset quality, state of capital structure and liquidity, operational efficiency and leverage. Among these studies, Caprio and Klingebiel (1997) mention as the main source of bank fragility their ability to monitor lending quality, while Dell' Ariccia, *et al.* (2008) show that standards may decline further during credit and house price crises in order to get into the game. Diamond and Rajan (2005) conclude that the reason bank failures are contagious is also the same reason that bank assets are illiquid and a systemic liquidity shortage in the interbank money market and increasing financial integration can make funding liquidity pressures readily turn into issues of systemic insolvency [Jutasompakorn *et al.* (2014)]. Berger and Bouwman, (2013) found that strong capital structure is essential to absorb any negative shocks during turbulent episodes.

The latter category comprises macroeconomic and industry-specific variables that are outside the prerogative of bank-specific decisions and policies. Pill and Pradhan (1997) confirm a positive correlation regarding credit boom. To that, another group falls under heading problems of supervision and regulation patterns that consist of issues linked to the legal system and contract enforcement, bureaucracy and accounting standards, as well as the state of financial and banking system development and deposit insurance instruments [Demirguc-Kunt and Detragiache, (2002)]. Eichengreen and Rose (1998) place more emphasis on high interest spreads, which, either as a sign of banking problems or of curing inflation or of defending the exchange rate, are likely to hurt bank balance sheets, even if they can be passed on to borrowers, due to the tendency towards lower solvency conditions. Kaminsky and Reinhart (1998) also found that large and deteriorating fiscal deficits tend to increase bank crises probability, while the effect of the monetary base is negligible. Among these studies, Honohan (2000) finds that crises often occur in the latter part of boom – bust cycles, while a number of papers report that crises are less likely to happen in countries with strong or positive real growth, lower volatility of inflation pressure and better management of international capital [Demirguc-Kunt and Detragiache, (2005)]. Jahn and Kick (2012) concluded that the likelihood of bank distress is linked more highly to the concentration ratio in bank loan portfolios, and this is linked to the fact that specialised banks tend to be more stable than more diversified banks. At the same time, Boudebbous and Chichti (2013) report that high rates of credit expansion may finance an asset price bubble that increases bank fragility; these are often preceded by deteriorating terms of trade, but also by exchange rate appreciation, even though Domac and Martinez-Peria (2003) conclude that the duration of crises does not seem to be affected by developments in the exchange rate. On the other hand, Cole and White (2012) also analysed for years before 2007. The authors used a multivariate logistic regression model to analyse why commercial banks failed during the recent financial crisis. They found that traditional proxies for CAMELS components, as well as measures of commercial real estate investments, do an excellent job of explaining the failures of banks that were closed during 2009, providing support for the CAMELS approach to judge the safety and soundness of commercial banks. Fahlenbrach *et al.* (2012) show that stock return performance during the 1998 crisis could predict the probability of failure during the crisis. The authors also showed that reliance on short-term funding, high leverage, and high growth rates are all associated with poor bank performance in both crises.

Among other studies, Aubuchon and Wheelock (2010) examine bank thrift failures between 1 Janurary 2007 and 31 March 2010, mostly focusing on regional economic characteristics associated with bank failures, rather than on detail characteristics of the banks themselves. Other studies have shown that firms drew down their credit lines during the crisis in anticipation of shocks to their liquidity

position (Ivashina and Scharfstein (2010), Campello *et al.* (2011)), and that riskier borrowers tended to utilise a larger portion of their credit lines, especially so during a crisis [Dwyer, *et al.* (2011)]. Beltratti and Stulz, (2012) confirm the findings of Laeven and Levine (2009) concerning the pre-crisis period, but challenge the view that poor bank governance was a major cause of the crisis, by showing that banks with more shareholder-friendly boards performed significantly worse during the crisis. In a more recent paper, DeYoung and Torna (2013) examine the degree to which the composition of a bank's income sources affected bank distress during the recent financial crisis. They show that for distressed banks the probability of bank failure increased with non-traditional, asset-based activities (venture capital, investment banking and asset securitisation), but declined with non-traditional, purely fee-based activities (securities brokerage and insurance sales). The authors also show that banks with a substantial amount of non-traditional, asset-based activities tended to take more risk in their traditional banking activities. Berger and Bouwman (2013) exploit an exogenous source of variation in the stock of capital buffers to study the effect of capital on two dimensions of bank performance, i.e., probability of survival and market share, and find the effect to vary across banking crises, market crises, and normal times. In particular, capital increases the probability of survival and market share of smaller banks for all three types of crises, but improves the performance of medium and large banks, primarily during banking crises. In return, Antoniades (2015) builds on the work of Cole and White (2012) and argues that commercial bank failures in the United States can be explained by the deterioration of conditions in the real estate sector, a process which started as early as 2006 and lasted well after the funding crisis ended. The author identifies three sources of bank exposure to the real estate sector, which operate through its (a) illiquid assets; (b) marketable securities; and (c) off-balance sheet credit line portfolios, while asking whether pre-crisis choices which shifted the balance of each portfolio towards real estate products increased the probability of bank failure during the Great Recession.

3. Methodology and the sample

3.1 The variable selection Approach

3.1.1 Dependent variable

A review of relevant literature shows that different proxies that come from balance sheet and profit and loss information of banks are used to measure bank risk. However, there is no consensus which measure best fits to gauge risk [Noth and Tonzer (2015)]. For example, among many authors, Boudebbous and Chichti (2013) agree that bank stability is difficult to define and measure due to constant changes to the financial and banking environment. For example, some view it in the absence of excessive volatility, stress or crises and as a 'stable state', in which 'the financial

system efficiently performs its key economic functions', such as allocating resources and spreading risk, as well as settling payments [Deutsche Bundesbank, (2003) and Jahn and Kick (2012)].

In this aspect, the literature review can be distinguished between those that make use of and those that focus on analysing the determinants of stability indicators. The former range among those studies that use single or composite indices variables or other studies that identify leading indicators of bank fragility, as well as build early warning signals models, in which they empirically evaluate the causes of instability periods in an *ex post* approach. For example, some, use Z-Score, which indicates banks distance from default by calculating the difference between the bank's profitability and the bank's equity ratio, scaled by the volatility of bank profitability [Demirgüç-Kunt *et al*. (2008), Berger *et al.* (2009), Kasman and Kasman (2015), Dushku (2016), Noth and Tonzer (207)]. Others use the non-performing assets, which include loans 30 or 90 days past due date, nonaccrual loans and other real estate properties, indicating what bank asset risks are used [Berger *et al.*(2009), Jiménez *et al*. (2013), Noth and Tonzer (207)]. There is also another group of studies that use loan loss provisions as a means of future losses that reduce the operating income for the current period or/and loan loss reserves as an indicator that reflects the amount of loan provisions on banks' balance sheet and reduces the book value of loans.

In the macro-prudential regulatory frameworks, some have succeeded in developing one-stop indicators that combine macroeconomics and bank level data for which they use a binary approach to signal instability periods [Illing and Liu (2006)].[2] However, Hagen and Ho (2007) argue that this methodology may be misleading for two main reasons. First, bank interventions may occur even in the absence of an acute crisis in the banking sector. Second, not every crisis leads to a visible policy intervention, as central banks and regulators may be able to successfully fend off a crisis using less spectacular means. In return, using a non-probit model, Fiordelisi *et al.* (2011) approached bank risk through the means of a cumulative Expected Default Frequency (EDF) for each bank calculated by Mood's KMV and Ötker and Podpiera (2010) use Credit Default Swaps (CDS). Other papers use accounting risk-taking measurements, such as Z-score [Cleary and Hebb (2016)], in the belief that this allows the analysis of the entire variable profile of a firm simultaneously, rather than sequentially, so as to examine individual characteristics. Black *et al.* (2016) use a distress insurance premium risk indicator, which integrates the characteristics of bank size (total balance-sheet liabilities), the probability of failure based on CDS and the correlation (equity return correlations) and explore the source of systemic risk as well as the contribution from individual banks and countries.

2. See also Jahn and Kick (2012) and Cevik *et al.* (2013).

Empirical literature provides a good description of how one may attempt to build a composite indicator of stability, but, obviously, this paper follows the Uniform Financial Rating System approach, introduced by US regulation in 1979, referred to as CAELS rating (Capital adequacy, Asset quality, Earnings, Liquidity and Sensitivity to market risk).[3] First, using statistical methods, all indicators included in each of these categorises are normalised into a common scale with a mean value of zero and a standard deviation of one.[4] The formula is as follows:

$$Z_t = \left(\frac{X_t - \bar{\bar{\mu}}}{\bar{\sigma}} \right) \tag{2}$$

Where, X_t represents the value of indicators X during period t; μ is the mean value and σ is the standard deviation. Second, all normalised values of the set of correlated indicators used within one category are then converted into a single uncorrelated index by means of a statistical procedure, namely the principal component analysis (PCA) approach, which is yet again standardised based on the procedure of Equation (1). Then, the sub-indices estimated are transformed between values [0, 1] using exponential transformation [1 / (1 + exp(-Z*)]. Finally, our bank stability index (*CAELS*) is derived as the sum of the estimated exponentially transformed sub-indices, as follows:

$$CAELS_{t,w} = \omega_1 \sum_{i=1}^{n} Z^*_{t,C} + \omega_2 \sum_{i=1}^{n} Z^*_{t,A} + \omega_3 \sum_{i=1}^{n} Z^*_{t,E} + \omega_4 \sum_{i=1}^{n} Z^*_{t,L} + \omega_5 \sum_{i=1}^{n} Z^*_{t,S} \tag{3}$$

$$\sum_{*=a,b,c,d,e} \omega^* = 1 \tag{4}$$

Where, n is the number of indicators in each sub-index; '*C*' relates to capital adequacy; '*A*' represents a proxy to asset quality; '*E*' represents a proxy to earnings; '*L*' represents a proxy to liquidity efficiency categories; and '*S*' is related to the sensitivity of market risk. All indicators used within each category are reported in Table 1 in the Appendix. Z* is the exponentially transformed simple average of the normalised values of each indicator included in the sub-index of the given bank

3. CAELS is an acronym for Capital adequacy; Asset quality; Earnings; Liquidity; and Sensitivity to market risk. This rating system was first introduced to assess the health of individual banks. Following an onsite bank examination, bank examiners assign a score on a scale of one (worst) to five (best) for each of the five CAELS components. They also assign a single summary measure, known as 'composite' rating. See also Cole and White (2010). This approach is also used by the International Monetary Fund Compilation Guide (See IMF (2006) on Financial Soundness Indicators and other authors, e.g., Wheelock and Wilson (2000), Sere-Ejembi, *et al.* (2014) and Cleary and Hebb (2016). In the case of Albania, the indicators we use are reported monthly by each bank in a special reporting format, under the CAELS criteria.
4. Normalizing the values avoids introducing aggregation distortions arising from differences in the mean value of indicators.

stability index. Then, the index estimated is used as a relative measurement, where an increase in the value of the index for any particular dimension indicates a lower risk in this dimension for the period in question, compared with other periods.

The advantage of this approach is fourfold. First, as presented in Graph 2 in the Appendix, *CAELS* represents a useful "complement" to on-side examination, rather than a substitute for them [Betz *et al.* (2014)], and, thereby, creates a comprehensive, monthly-based, internal supervisory 'thermometer-like' instrument that can be used to evaluate bank stability in real time and on an uniform basis and to identify those institutions that require special supervisory attention and concern with regards to both present and future banking sector conditions. Second, it builds on the recommendation of ECB (2007). Therefore, we believe it more accurately reflects the Albanian financial structure, since it attaches more weight to the banking sector and includes the most prominent agents in the financial markets, while it takes advantage of a broad range of bank level data. Third, the PCA approach highlights the most common factor identifying data patterns without much loss of information. Four, it does not assume the probability form of the binary approach, which may expose it either to limitations of an insufficient number of episodes or to the vulnerability of the methodology employed to calculate the threshold level. The latter may even provide false banking distress signals. Rather, the PCA comprises a simpler approach that is easier to explain and implement. Most importantly, it allows analysing the state of the bank as it develops and it is also applicable in cross-section comparisons.

3.1.2 The set of Independent variables

The structure of a bank balance sheet can influence the vulnerability of banks to both internal and external shocks. First, bank size, which is also referred to as an indicator of the bank's market share, is included in the argument that banks assess their performance in comparison to each other on this basis [Berger and Bouwman (2013)]. It is expected that size should have a positive coefficient, assuming that probability to cope with instability periods increase with bank size, as opposed to smaller banks. However, some theories imply that, under certain circumstances, an increasing market share could be counter-productive. If a higher market share comes through higher capital or/and more aggressive policies, this may then lead to higher attractiveness of innovative, but risky products, which entails higher deposits or/and higher leverage and inversely increases bank risk taking, and, therefore, the probability of default [Besankoa and Kanatasb, (1996)].

Second, Hughes and Mester (2009) advocate the inclusion of efficiency indicators, while Fiordelisi *et al.* (2015) believe that supervisory authorities may allow efficient banks (with high quality management) greater flexibility in terms of their overall stability condition, *ceteris paribus*, and *vice versa*. Furthermore, Shawtari *et al.* (2015) support that variability of efficiency is a better measure for the performance of banks when compared to averaging methods, such as return on asset (RoA) and return on equity (RoE). To that end, any policy-decision by the bank authority to

make the bank more attractive or/and more competitive and *vice versa* would be reflected on bank balance sheet income-cost indicators. This refutes our assumption that decreasing efficiency would deteriorate the bank's health status.

Third, a sufficient amount of capital, which serves as a safety cushion, is also important for a bank's daily operational activity. This is due to the fact that capital acts as a buffer against financial loses, protecting the bank from solvency risks. Adequate capital enables banks to fulfil the minimum capital adequacy ratio under potential solvency risks [Betz, *et al.* (2014)]. Therefore, we assume that any policy-making reflects the strength of capital structure and, thereby, stability is a condition for a bank's financial leverage. It is expected that solvency risk diminishes with a higher ratio of capitalisation, allowing the bank to absorb any shock it may experience. Therefore, such a ratio is expected to be positively associated with bank stability.

Finally, in order to solve the problem of omitted variable bias in the regression and to capture adverse macroeconomic shocks, which may affect bank stability conditions, we also include an indicator linked to economic activity and another one associated with primary sovereignty risk. The former captures the state of the economy, which means that higher economic growth or upward movement in expectations of economic performance, which enhances the ability for economic agents to meet their commitments, makes bank instability less likely. This is why we expected economic activity to have a positive sign. The latter, presents a collection of concentrated risks (e.g., political risk, exchange rate risk, economic risk, sovereign risk and transfer risk) associated with investing in a foreign country, which can reduce the expected return on portfolio investments and must be taken into consideration whenever investing abroad. This risk is expressed as the spread between the domestic rate and an assumed risk-free rate [Jutasompakorn, *et al.* (2014)].[5] Therefore, a higher sovereignty risk inducing higher domestic interest rates makes the solvency condition harder and bank stress more prominent, and *vice versa* [Domac and Martinez-Peria (2003)]. In other words, we expect that an increase in sovereignty spreads would negatively affect bank stability.

3.2 Sample and the Data

Sample data for this study are quarterly and composed of bank-specific and industry-specific data, which are taken from balance sheet and income statement items of 16 banks operating in Albania, as well as of some macroeconomics variables. The strength of the dataset is its sample coverage and reliability of infor-

5. These authors use the Libor and Overnight Index Swap (OIS) spread on the belief it is a widely accepted, generous proxy used for the repo haircuts. The former is the unsecured interbank borrowing rate. The latter is a risk free rate, as it is an accurate measure of investors' expectations of the effective repo rate or the monetary authority target.

mation. It covers all banks operating in Albania in the last two decades. The sample consists of 960 quarterly sets of data for 16 banks operating in Albania, since 2001 Q01. However, due to the focus of this paper, the empirical study focuses on the period 2008 Q03 – 2015 Q03, as the second half of 2008 marks the beginning of pass-through effects of GFC into the Albanian economy.[6] These include a total panel of balanced observations with 448 observations and 28 periods.

Variables used for empirical analysis are as follows: The bank-specific and market-specific variables as well as the stability indicator are estimated individually for each bank. *CAELS* represents the bank stability condition estimated as explained in Section 3.2.1 (See also Table 2, in the Appendix). This is transformed into an index, taking the average performance during the year 2010 as the base year. *EFFICIENCY* is a proxy as a gross expenditure to gross income ratio. *LEVERAGE* presents the total equity to total asset ratio of individual banks. *SIZE* represents a market-specific variable. It is expressed as the ratio of an individual bank's assets to the total banking system assets. The bank-specific variables, the market-specific variable and the stability indicator are individually estimated for each bank. The macroeconomic variables are aggregated indicators that represent the state of the economy. *GDP* represents gross domestic production. It is transformed in real terms by deflating with the Consumer Price Index (CPI). *PSRISK* represents the spread between domestic 12 months' T-Bills and the German 12 months' T-Bills. They are transformed in real terms by subtracting the respective domestic and German annual inflation rates. All data represent end-period values. They are log-transformed, besides *PSRISK* and *CRISIS*. Further, the dataset developed for this paper has several sources. Data on *GDP* are taken from the Albanian Institute of Statistics. Data on domestic *T-Bills* rates are taken from the Ministry of Finance. Data on German 12 months' *T-Bills* rate and German *CPI* are taken from Bloomberg. The rest of the data are taken from the Bank of Albania.

With regards to the sample, Table 2 in the Appendix provides some stylised facts with regards to the Albanian financial sector. First, we notice that the value of financial sector assets as a ratio to the GDP has increased substantially from 78.6% in 2008 to nearly 105.1% in 2015. A large portion of financial intermediation is due to the banking sector, where bank assets shifted from about 75.9% in 2007 to nearly 94.9% by the end of 2015. At the same time, bank deposits are the main funding source of the banking system. Bank deposit to GDP ratio reached nearly 74.2% in the year 2016 from as low as 63.6% before the financial crisis. Second, the actual structure of the banking sector is privately owned. We also notice that in 2016 the largest

6. The Albanian economy was not directly affected by the GFC, but the spill-over effects through financial and trade linkages were immediately transmitted from 2008 Q04, which, at the same time, provides justification as to why we chose the empirical estimation from this period.

4 banks (CR-4) held nearly 68.7% of total assets from nearly 63.1% in 2007, while the banking system is considered to be moderately concentrated as the *HHI* shows. Similarly, in Table 3 in the Appendix, we summarise the main variables that we use in our empirical analyses, with regards to quarterly observations. The data show that the mean (median) GDP annual growth rate is 3.1% (2.5%), with a maximum value around 9.7% and a minimum of 0.5%. The sovereignty primary risk (*PSRISK*) has a mean value of nearly 5.9% with a maximum of nearly 8.6% and a minimum of nearly 3.2%. Equity to asset ratio (*LEVERAGE*) has a mean value of nearly 14.2%, with a maximum value of 23.1% and a minimum of nearly 6.9%. Capital adequacy ratio (CAR), which banks are expected to meet at 12% under the Basel I rules, has, on average, been at nearly 30.1%. At the same time, in Table 4 we present the correlation matrix between the variables of our interest for the period 2008 Q03 – 2015 Q04. Results show that there is positive correlation between our stability index, *CAELS*, with variables such as *GDP*, *LEVERAGE* and *SIZE*, while correlation with *PSRISK* and *EFFICIENCY* is negative. The degree of correlation with *GDP* and *EFFICIENCY* is stronger. In addition, correlation – covariance analysis between left-hand-side and right-hand-side variables, as reported in Table 4 in the Appendix, show that *CAELS* is positively linked to *GDP*, *SIZE* and *LEVERAGE*. On the other hand, there is negative correlation with regards to *PSRISK* and *EFFICIENCY*. This relationship is relatively stronger with regards to *GDP*, *EFFICIENCY* and *SIZE* and relatively weaker with *PSRISK* and *LEVERAGE*. These results are a preliminary way of confirming our expectations as the correlation matrix does not necessarily indicate a causation relationship.

Finally, prior to empirical estimation, all data were subjected to a unit root test procedure in an effort to understand their properties and to ensure that their order of integration fulfilled the criteria for our empirical estimation approach. The latter is a pre-requisite condition so as to generate consistent and unbiased results. Therefore, the unit root test approach includes the Augmented Dickey-Fuller (ADF) and the Phillips-Perron (PP) Fisher Chi-square tests. The reason is twofold: First, these tests are built on the same null hypothesis that panel variables are stationary. Second, they are mostly used for unbalanced panel models, such as our sample. Results are presented in Table 5 in the Appendix. Findings imply that some of the variables included in our specified model are integrated of order zero I (0). This means that they are stationary. Therefore, they enter the model at level. This set of variables includes *EFFICIENCY* and *LEVERAGE*. The other variables, namely *CAELS*, *GDP, PSRISK* and *SIZE* are found to be integrated in order one, I (1). This means they pose non-stationary properties. Therefore, they enter the model as first difference, since it will transform them into a stationary stance.[7] Finally, data on *GDP*, *CPI* and *HPI* are taken from the Albanian Institute of Statistics (INSTAT). Data on domestic T-Bills

7. These results are also robust for use in other unit root test approaches, including the Im. Pesaran and Shin W-stat test and Fisher test. Data can be provided upon request.

rate are taken from the Ministry of Finance. Data on German 12 months T-Bills rate and German Consumer Price Index are taken from Bloomberg. The rest of the data are taken from the Bank of Albania.

3.3 The empircal estimation Approach

The empirical model specifications draw on the extensive review on several studies that have sought to identify the characteristics that cause banks to fail or get distressed. Among them, use has been drawn on the assumption by Wheelock and Wilson (2000), Cole and White, (2012), Betz *et al.* (2014) and Black *et al.* (2016), but this paper departs differently from them in that it also analyses how primary sovereignty risk affect bank stability conditions. Therefore, our empirical model is expressed as follows:

$$CAELS_{i,t} = \alpha + \beta_i * X'_{i,t} + \varepsilon_{i,t} \quad (1)$$

Where, $CAELS_{i,t}$ is a stability indicator of bank i at time t, while $i = 1, ..., N$ and $t = 1, ..., T$. $X'_{i\,t}$ is a vector of explanatory variables grouped in three main categories: (1) $Banking'_{i,t}$ is a set of bank-specific explanatory variables; $Market'_{i,t}$ is a set of explanatory industry variables; $Macroeconomics'_{i,t}$ is a set of control variables that account for the state of the economy, and consist of two variables, namely, the output and the primary sovereignty risk; α is a constant term; β_i is a vector of coefficients to be estimated; $\varepsilon_{i,t}$ is an error term assumed to be identically and independently distributed with a mean value of 0 and variance $\sigma_u^2 A = \pi r^2$.

One potential problem with Equation [1] is the fact that, as a partially specified model, it puts together a variety of variables and, so, it nests a conditional restriction with a variety of unconditional ones, thus leading to an over-identification of problems. Under these circumstances Maximum Likelihood estimators' are needed to identify the moments whose squares are minimised in order to satisfy only the subset of correct restrictions. To correct for this, the estimation approach is based on the General Method of Moments (GMM) difference weights (AB-1-step), as proposed by Arellano and Bond (1991) and Arellano and Bover, (1995). Han and Phillips (2010) suggest GMM be constructed so as to achieve partial identification of the stochastic evolution and to be robust to the remaining un-modelled components. The GMM does not require distributional assumptions on the error term and it is more efficient than the Panel Least Square, Robustness Least Square and the Two Least Two Square approach, since it accounts for heteroscedasticity [Hall (2005)]. Another potential problem is the issue of endogeneity, given that our left hand side variables also include information used in the right hand side as explanatory variables.[8] Therefore, in practical terms, GMM is also a virtuous approach to deal

8. Theoretically, this issue would not be a problem, given that the estimation approach to calculate our dependant variable also considers the advantages of the PCA, which would highlight the most common factor identifying patterns in the data. Nevertheless, PCA, by no means, guaranties that it can solve endogeneity problems.

with potential endogeneity and dynamic panel data problems in model estimation [Anderson and Hsiao (1981)]. This approach also resolves up-ward (downward) bias in standard errors t-statistics due to its dependence on estimated values (since it uses the estimated residuals from an one-step estimator), which may lead to unrealistic asymptotic statistical inference [Judson and Owen, (1999); Bond and Windmeijer (2002); Ansari and Goyal (2014)]. This is especially true in the case of a data sample with a relatively small cross-section dimension [Arellano and Bond (1991)]. The instrument variable is based on past information of $X'_{i,t}$, and to limit the number of instruments, we limit the lag range used in generating the instruments to 4, as suggested by Roodman (2009). We also used 4 lags in the assumption that the process of decision-making at the bank level is annually revised. Then, the Sargan and Hansen test is used for over-identifying restrictions based on the sample analogy of the moment conditions adapted in the estimation process, so as to determine the validity of instrument variables (i.e. tests of the lack of serial correlation and consistency of instrument variables).

4. Empirical Results

4.1 The benchmark model

This section reports the main results from the model, as specified in Equation [1], which are reported in Column [1] of Table 6 in the Appendix. The panel GMM model considers the period of the GFC aftermath. The sample includes a dataset with quarterly data for the period 2008 Q03 – 2015 Q04, which includes a total panel of balanced observations with 448 observations and 28 periods. The model includes fixed cross-section effects and makes use of 'White Cross-Section' standard errors and covariance (degree of freedom corrected). At the bottom of the table, we report General Method of Moments (GMM) weight differences (AB-1-step) and specification test results for the GMM estimation. First, AR (1) and AR (2) are the Arellano-Bond tests for first and second order autocorrelation of residuals. One should reject the null hypothesis of no first order serial correlation, but not the null hypothesis of no second order serial correlation of residuals. Second, the Sargan and Hansen test of over-identifying restrictions indicates whether instruments are uncorrelated with the error term. The GMM does not require any distributional assumptions on the error term and it is more efficient than the Two Least Two Square approach, since it accounts for heteroscedasticity [Hall (2005)]. Results show that, in our case, the requirements are met as suggested by the p-values of AR (1) and AR (2) tests. In addition, the Sargan and Hansen test suggests that the instruments used in all specifications are appropriate. This means that our model is properly specified and that the empirical analyses are robust and consistent with the GMM estimation criterion.

A glance at the results confirms that stability conditions of banks react in relation to the responses of other explanatory variables according to the predictions obtained from the theory.[9] For example, the coefficient of *GDP* has a positive sign, as expected. This suggests, as in the case of Demigruc-Kunt and Detragiache (2002), that increases in economic growth have a positive effect on bank stability. The effect is found to be statistically significant at 1 percentage (%) level. Therefore, one would expect that higher economic growth would play a relatively crucial role for bank stability conditions. It is also of great importance to understand, however, that, from another point of view, this result implies that banks also have a relatively significant role for the economic conditions in which they operate, since an upward movement in economic activity would improve the situation of the banking system through higher financial intermediation or low risks related to bank sovereignty risks.

Second, *PSRISK* has the negative effect expected on bank stability.[10] It implies that decreasing sovereignty primary risk, as measured by the spread ratio of domestic and foreign risks, increases bank stability and, therefore, lower risks are expected to materialise through improving bank stability conditions. This result complements the findings of Jutasompakorn *et al.* (2014), but, by contrast, the estimated marginal effect is considered to be relatively small, even though it is statistically significant at 10%. This suggests that banks consider shocks related to primary sovereignty risk, even though the pass-through is relatively small. The reason is fourfold. First, public borrowing has been orientated towards longer-term maturities and towards foreign borrowing. This has lowered the pressure on banks and, at the same time, has provided the market with more foreign liquidity. Second, the government has taken several structural reforms to minimise possible fiscal risks, which includes the pension system reform, the energy sector, etc. Third, banks in Albania operate under a flexible interest rate onto which they impose a marginal fixed rate. There-

9. However, as instrumenting is technically difficult in the Arellano-Bond model, we also apply a standard panel Ordinary Least Square (OLS) approach with random effect and with fixed effect, including the lagged dependent variable as an additional regressor. The former also included some fixed effect factors that distinguish two important components, namely small versus large banks and foreign-owned versus domestic-owned. Results came out to be relatively similar to our findings through the difference GMM approach, while findings through means of fixed effects were more consistent and robust with the estimation through random effects. Results are also relatively robust and similar to findings when CAELS is estimated based on the simple average approach rather the PCA approach and the model is estimated with panel first difference GMM with the second step difference approach. Finally, they are also robust to the estimation of the two-step GMM estimation approach.

10. To ensure the authenticity of our results, under the assumption of robustness checks, we also specified the model by using a primary sovereignty indicator that accounts only for the effect of monetary policy shock, proxy, in this model, as the spread between real term overnight rate and the real EONIA rate. Results were relatively similar. The estimated effect is found to be relatively small, even though statistically significant.

fore, any negative shock that leads to an interest rate hike is immediately reflected on their interest bargaining, enabling them to hedge interest rates to a certain extent. Last, but not the least, contrary to those in other countries, banks in Albania have been well-capitalised and have not been vulnerable to a shortage of liquidity, despite recent trends and financial disintermediation.

The picture on the bank stability patterns becomes much clearer when analysing the market-specific and bank-specific factors. First, the extent to which banks are positioned with respect to their market share, *SIZE*, which also incorporates the effect of economies of scale in bank behaviour, has a positive effect on bank stability, as expected. The coefficient is statistically significant at 5%. On the one hand, stability patterns are positively linked with a positive shock due to a policy decision-making that drives banks toward larger market shares. On the other hand, it is a sign that, in the case of the Albanian banking industry, the economy of scale persists. Therefore, as Berger and Bouwman (2013) put forward, our interpretation is that bank size and the market share value could be a source of economic strength for the bank, and, just like capital, they could make banks more attractive and more confident to either support higher loan levels at lower costs or to support a turbulent moment caused by both endogenous and exogenous factors.

Similarly, other specific variables associated with patterns at bank level are found to be crucial for bank stability. They have the expected sign and are statistically significant at conventional level. For example, the coefficient related to *EFFICIENCY* is found to have the negative sign expected, supporting the existence of a reserve relationship between operational efficiency and bank stability conditions. It suggests that bank stability would increase proportionally to any upturns in operational efficiency. At the same time, this relationship is also statistically significant at a 10% conventional level, suggesting that it is a fundamental issue in terms of stability. Therefore, banks should be aware that any policy decision-making, in an attempt to make banks more attractive, may lead to lower productivity and would come to a cost in terms of their stability. The reason is twofold. First, in order to be competitive and attractive, banks may find it difficult to shift all the cost to their clients. Second, a few large banks dictate the ruling interest rate policy, so the others need to follow suit, and that does not allow them to 'overcharge'.

Finally, as the coefficient related to *LEVERAGE* shows, capital patterns are found to have the expected positive effect on *CAELS*. The relationship is also found to be statistically significant at 1%. This suggests that increasing bank capital is also quite an important factor and stability conditions improve as banks become more capitalised. One important consideration is the fact that *LEVERAGE* has the highest coefficient among other bank-specific variables. This is not surprising, given that most policy decision-making at bank level is based on the degree of bank capitalisation. From a policy point of view, it is quite important to understand that results show that the stability of banks operating in Albania is quite sensitive to bank capitalisation. Therefore, banks should also be aware that policy making, with regards

to lending or stock of deposits, should be based on the degree of the bank's ability to fulfil capital and liquidity requirements. From a policy point of view, it is also crucial to point out that bank-specific variables are found to have the highest effect compared to other macroeconomic and market specific indicators. This implies that bank stability is more sensitive to developments within the banking sectors rather than outside it.

4.2 The Alternative Augmented model

To control the potentially omitted variables problem, following Berger *et al.* (2013), our benchmark model, as specified in Equation [1], is re-specified and augmented to contain a second broad set of control variables, *Z*, to the extent that this allows us to analyse the determinants of bank stability by simultaneously including an extra control variable into the benchmark model. These variables consist of a group of macroeconomic and bank-specific variables. The group of macroeconomic variables includes indicators such as *DEBT* proxy for the fiscal policy stance, *FSI* proxy for the financial market stress condition, *HPI* proxy for the housing market price index and *REER* proxy for the market exchange rate pressure. We also include two other variables that may better capture issues linked to payment solvency risk and liquidity risk, such as *MCI* proxy for the monetary conditions index and *CoBM0* proxy for currency out of the banking system.[11] The second group of variables also includes a set of indicators, namely, *DL* to account for the extent of intermediation effect; *DEPOSIT* (*LOAN*) to account for bank sensitivity to the level of deposits (loans) patterns within the bank; *CAPITAL for* the effect that excessive capital has on bank stability, and, finally, *NPL,* which represents the effects of non-performing loans.[12]

11. *DEBT* represents the ratio of total public debt (internal and external) to the nominal *GDP*. *FSI* represents a proxy for the Albanian financial stability condition and follows the methodology by Shijaku (2014)]. It is transformed into an index, taking the base year average performance during the year 2010. The estimated *FSI* is a relative measurement, where an increase in the value of the index at any particular dimension indicates a higher risk in this dimension for the period, compared with other periods. *HPI* presents the inflation rate in the real estate market, calculated as the first difference of the log-transformed of the housing price index. *REER* presents the real effective exchange rate. *MCI* is the monetary condition index of Albania taken from the Bank of Albania. *CoBM0* is the ratio of currency out of the banking system to monetary base, *M0*. Data are log-transformed. *DEBT* and *HPI* enter the model in first difference, while the rest is included in their stationary form.
12. *DL* represents the ratio of deposit-to-loan of individual banks. *DEPOSIT* (*LOAN*) represents the ratio of deposit-to-asset (loan-to-asset) of individual banks. *NPL* represents the ratio of non-performing loans to total bank loans. *CAPITAL* represents excessive capital over the minimum regulatory threshold level. It is generated as the difference between the actual capital adequacy ratio calculated as the ratio of equity over risk-weighted assets and the 12% threshold level required by Basel II capital adequacy regulations. NII represents revenues from non-interest activities divided by total revenues. All data are log-transformed, except *CAPITAL*. They enter the model specification in their stationary form.

The model is estimated at a level based on the results of the Unit Root tests approach (See Table 5 in the Appendix). It also includes cross-section fixed effects and makes use of 'White Cross-Section' standard errors and covariance (degree of freedom corrected). The results are presented in Table, 6 Equation (2) to Equation (7), and Table 7 in the Appendix. They show that the behaviour of variables does not change and findings are robust around the same findings as in Equation (1) analysed in Section 4.1.

The bulk of evidence reported in Tables 6 and 7 in the Appendix indicates that the inclusion of the set of control variables does not alter results, which are generally qualitatively similar to the main results of core variables in our benchmark specification, Equation [1]. Findings demonstrate the robustness of results with respect to the sign of the coefficient, even though in some cases their level of significance changes. With regards to macroeconomic variables, *GDP* has a positive and statistically significant effect on *CAELS*. To that effect, *PSRISK* continues to exhibit a reverse relationship, which continues to have the lowest effect among core variables, albeit with non-statistically significant properties in some of the model specifications. Other results show that *SIZE* does, still, positively affect *CAELS*, even though it becomes statistically insignificant. Yet again, *EFFICIENCY* continues to be negatively related to *CAELS*. At the same time, *LEVERAGE* positively contributes to *CAELS*. Both of these indicators are statistically significant through all models.

Turning to our set of control variables, we found that the financial market stance has the negative effect expected on bank stability. This effect is also found to be statistically significant at 5%. This is potentially due to the fact that the banking sector and financial sectors developments are more closely interconnected, even though the state of the financial sector in Albania is not fully developed. Similarly, as expected, bank stability is found to have a negative and statistically significant relationship with the fiscal policy stance, which is also similar to the findings of Demirguc-Kunt and Detragiache (2005). Therefore, any policy action that leads to lower borrowing or/and improves the fiscal stance is found to have a positive impact on bank stability. The IS-LM is also linked to the crowding-out effect of fiscal policy on economic activity, but also to the costs burden it places and the impact it has on the solvency status of borrowers. On the other hand, these results also confirm that banks in Albania are quite sensitive to the effect that a deteriorating fiscal stance has on interest rates, although they have been well-capitalised and on the verge of a lower bank credit leverage government bond instrument that was an investment opportunity.

Concerning pressure from housing market, results show that behaviour HPI has a statistically significant effect on bank stability, even though, by contrast, at a magnitude of nearly -0.0935pp, banks are relatively sensitive to rapid up-turn or/and downturn changes in housing market development, since a great portion of their

lending is concentrated in mortgages loans, but not to the extent of the other risk examined above. This could be explained by the fact that Albania has not suffered any significant asset price bubble or/and any consistent price reduction after the GFC. In addition, banks exposed to an asset price bubble are covered to the extent that they provide mortgage loans though collateral coverage. In general, throughout the banking system, this collateral coverage does not go below 120% of the mortgage loan provided. This means they are well covered against the explosion of real estate patterns.

Surprisingly, we find that increasing MCI is positively associated with CAELS. This means that tightening of monetary conditions would increase bank stability. This effect is found to be statistically significant at conventional level. One possible explanation may be the fact that most bank revenue comes through bank lending to the private sector and to the government. Therefore, this is positive relationship may be due to higher profits that banks have through higher interest rates. On the other hand, we also find that the systemic liquidity risk, as measured by CoBM0, is negatively related to CAELS. However, this effect is statistically insignificant at conventional level.

Among other bank-specific variables, results show that all indicators have the sign expected, but, except for *CAPITAL*, they are estimated to be statistically insignificant and relatively small. The positive sign of DL implies that a higher degree of intermediation level boosts bank confidence, even though the effect is found to be relatively small and statistically insignificant. Similarly, the coefficient of *DEPOSIT* suggests that increasing stock of deposits, which are the main bank funding sources of loans, would enhance bank stability. In addition, we find a positive relationship between *LOAN* and *CAELS*. On the one hand, this is another sign that the credit channel is quite important for bank stability in the case of Albania. On the other hand, this also reveals that credit risk with regards to the extent to which banks support the lending channel and to which they are exposed remains low and positive in regard to their stability conditions.[13] Regarding other variables, the regulatory capital variable is also positive and statistically significant, suggesting that higher excessive capital may raise bank stability. Finally, *NPL* is found to significantly affect *CAELS*. Such a relationship is consistent with *a priori* expectations and in line with previous empirical findings of Cleary and Hebb (2016). The negative coefficient suggests that Albanian banks lack efficiency in their asset quality.

13. Results are similar even when tested for the effect of loan to GDP ratio or the effect of loan concentration to mortgage lending.

4.3 Other Robustness Checks

In this section we present the results of another set of robustness checks. This time, to further scrutinise the robustness of our results, we further augmented Equation [1] by including, similar to Mirzaei *et al.* (2013), an off-balance-sheet activities indicator (*OFFBALANCE*[14]) to evaluate the extent to which non-traditional activities, in which banks are engaging, may have an effect on bank stability.[15] The model is specified at a level based on Unit Root results. The empirical analysis is based on the GMM approach, as before, while the use of diagnostic tests provides strong evidence that supports the consistency of our augmented model and the use of the instrument variables.

The estimated parameters are reported in Tables 8 and 9 in the Appendix. The first column reports the results of our benchmark augmented model. The following columns report the results we include in the set of control variables examined in section 4.2. Similarly to our base line results, we first evaluate our benchmark-augmented model. Overall, we observed that previous empirical findings are insensitive to the inclusion of a set of control variables that do not alter results. The estimated parameters of our core variables are generally qualitatively similar and converge to relatively the same conclusions as before. In addition, most importantly, increasing off-balance sheet activities is found to be associated with a positive effect on bank stability. This suggests that increasing anticipation of off-balance sheet activities, which includes mostly guarantees on mortgage loans, exposes banks to a more secure position. The reason can potentially be explained by the fact that the higher the guarantee commitments a bank gives or/and takes are, the safer its position during turbulent moments is, due to such guarantee commitments. However, by contrast, this relationship is considered to be relatively small and statistically insignificant. The reason is twofold. First, the exposure of banks to such activities is mostly concentrated to commitments made to collateral coverage for mortgage loans. Second, banks' exposure to commitments made constitutes only a relatively small portion, most of which relates to financially consolidated and well-capitalised companies.

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14. Off-balance sheet items include total acceptance and given commitments (namely financial, loans, securities and guarantee commitments), which are then scaled by total assets. They are log-transformed. Then, they enter the model in first difference based on unit root test results.
15. Casu and Girardone, (2005) argue that empirical studies would lead to biased results without the role of off-balance sheet activities. Cleary and Hebb (2016) considered it to be certainly anecdotal evidence (e.g., Leman Brothers) about the truth of which they were not generally clear. However, through their empirical research, they report a statistically significant, even if small, negative relationship. DeYoung and Torna (2009) also find that non-traditional activities influence bank stability.

5. Conclusions

This chapter empirically investigates the effects of macroeconomic, market and bank-specific characteristics on stability conditions of 16 banks operating in Albania during the 2008–2015 period. This study improves existing literature along four crucial dimensions. First, in contrast to other bank-level studies, this is the first study to empirically analyse the extent to which the primary sovereignty risk can be attributed to bank fragility conditions at a time when the Albanian economy and the banking sector, in particular, are still lingering in the negative consequences of the GFC. Second, we introduce a new stability index for the Albanian banking sector based on a set of different indicators generated from a unique supervisory dataset collected by the Bank of Albania, which is the most direct measure of bank stability available that widely reflects the Albanian financial structure, which, at the same time, is meant to provide a continuous rating-based macro-prudential approach for banking supervisors and policy-makers to analyse bank stability conditions developing at a given moment. Third, the adaption of the PCA approach helps us solve any endogeneity problems during empirical estimation. At the same time, the empirical study is based on the difference GMM approach, which is another way of solving for endogeneity problems. Finally, we run a number of robustness checks to control the consistency of our results through a set of different explanatory variables.

In summary, the main results of this study suggest that macroeconomic variables have a significant effect on bank stability. Similarly, results show that the pass-through effect of sovereignty primary risk is relative. In return, both industry-specific and bank-specific variables have a significant effect on stability conditions. It appears that there is little difference in terms of assessing bank stability through the set of control variables. The findings from these regressions also remained robust, albeit with minor variations in significance changes, due to a number of alternative ways in which we ran the regression. Empirical results support the view that stability decreases with higher interest spreads, but the extent of the effects of a higher sovereignty primary risk is relatively small. Findings can be summarised as follows: Bank stability is promoted through better economic performance and diminishes with the deterioration of financial market conditions, fiscal policy and an asset prices bubble. The latter could also be an alternative way to assess the sovereignty risk. Trade-offs with stability are observed in relation to efficiency operations. Our results, however, do not confirm an overall outstanding explanatory power of bank intermediation indicators for the entire Albanian banking system. Nor do findings suggest leading indicator indices with regards to excessive capital. However, credit risk remains a relatively important concern, given its estimated impact and statistically significant level. We also found that the scale of off-balance sheet activities is positive, but relatively small and non-significant. Moreover, stability appears to be promoted in line with a higher market share and a higher capital ratio.

The latter seems to have the highest effect among bank-specific variables.

This paper sheds some light on determinants of bank fragility, which have several implications for policy makers in EME. First, regarding external factors, economic performance is of the highest importance. Therefore, macroeconomic policies that contribute to economic growth would have a positive effect on the Albanian banking sector stability. Second, the implication of this study is to re-emphasise the important role of policy makers in ensuring that sovereignty risk within and outside banks remains low. Therefore, primary sovereignty risk remains low, but the adverse effect of fiscal policy and financial market stance, as well as exposure to an asset price bubble should remain at the focal point and considered sensitive with regards to bank stability concerns. Additionally, internal factors result from a bank's policy and management and banks have means to influence them, which in our case, are operational management and capital structure. This implies the importance of banks to continue their work in two main directions. On the one hand, there is a need to undertake policies that in a way improve cost efficiency. On the other hand, it is of particular importance to continue work on developing appropriate techniques for capital management, and, consequently, on assessing the adequate level of bank capital as well as on improving the capital structure of the bank. However, apart from bank-specific variables, the extent to which banks aim to increase their market shares seems to help them secure a more confident and stable condition.

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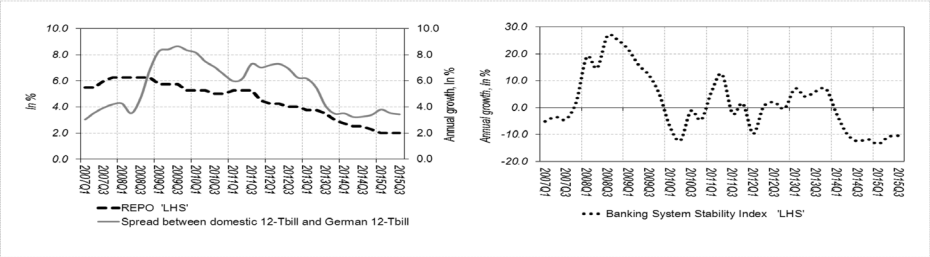
Appendix A

Graph 1. Spread and Banking System Stability

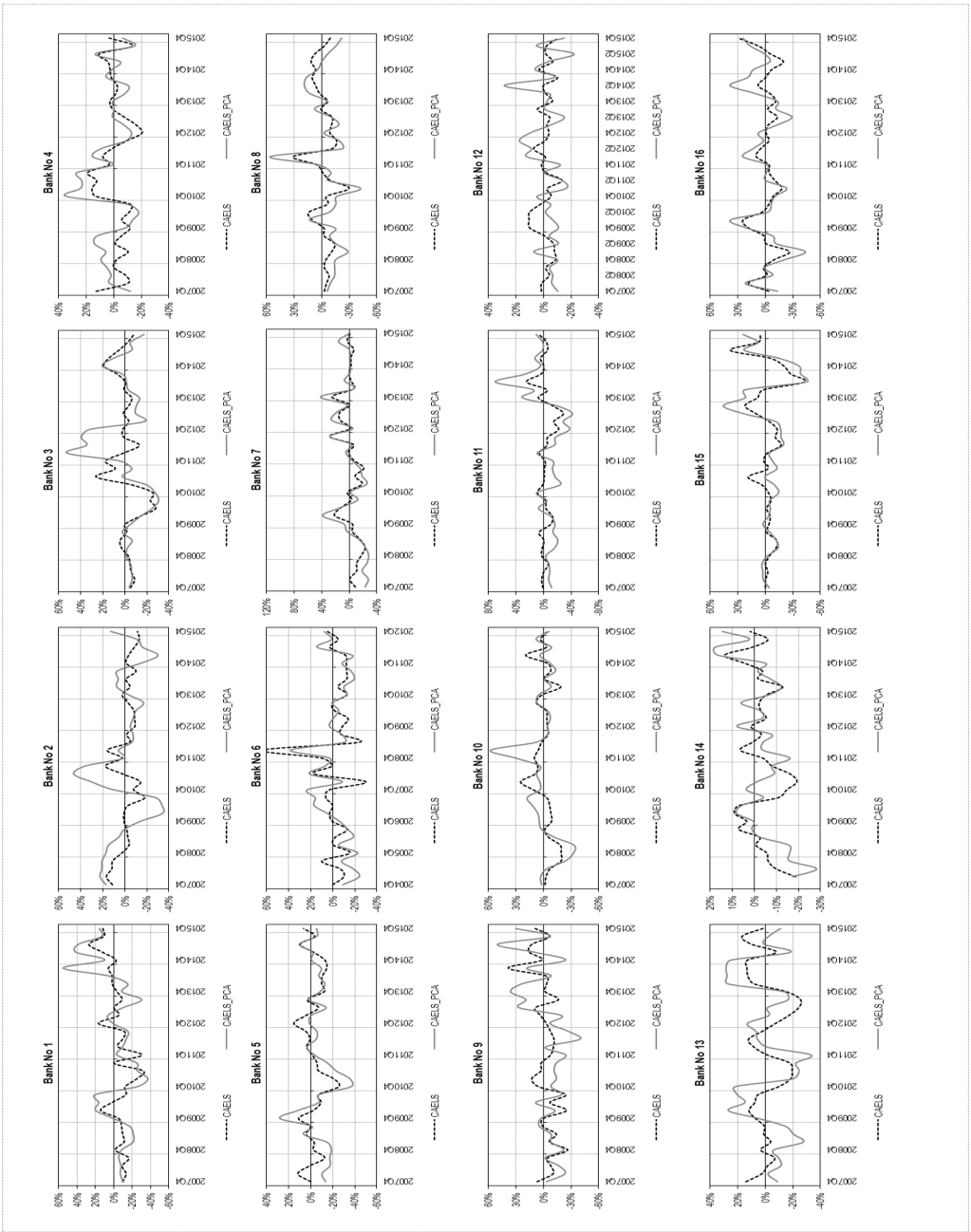


Source: Bank of Albania; Bloomberg; Author's Calculations

Table 1. Indicators of Bank Stability Index

Category	Indicator	Notation	Sub-Index
Capital	Capital Adequacy Ratio	C_1	Z_C
	Core Capital/Total Asset	C_2	
	Equity/Total Asset	C_3	
	Asset growth	C_4	
	Equity Growth	C_5	
	Fixed Asset/Regulatory Capital	C_6	
	ROE	C_7	
	Non-Performing Loan (net)/Regulatory Capital	C^*_8	
Asset Quality	Non-Performing Loan (net)/Total Loan (net)	A^*_1	Z_A
	Total Loan (net)/Total Asset	A_2	
	Growth of Loan Portfolio	A_3	
	Credit Loss (Gross)/Total Loan (Gross)	A^*_4	
	Large Risks (the number of beneficiaries over rate)	A^*_5	
	Provisions for Loan Loss Coverage/Non-Performing Loan (gross)	A^*_6	
Earnings	ROA	E_1	Z_E
	The growth of revenue from interest	E_2	
	Interest revenue/Total Revenue	E_3	
	Net Interest Margin	E_4	
	Efficiency Ratio	E_5	
	Interest Revenue (Net)/Operating Revenues (Gross)	E_6	
	Dividend/Income (Net)	E_7	
	The growth of net interest revenue	E_8	
Liquidity	Net Loan/Average Deposits	L_1	Z_L
	Active Liquid/Total Asset	L_2	
	Asset – Passive with a maturity of three months/Total Asset that provide profit	L_3	
Sensitivity to Market Risk	Asset – Passive sensitive to interest rate with a maturity up to 3 months/Total Assets that Provide Profit	S^*_1	Z_S
	Asset – Passive sensitive to interest rate with a maturity up to 12 months/Total Assets that Provide Profit	S^*_2	
	Net Open Position in foreign currency	S^*_3	
* linked to reverse risk order			

Graph 2. Individual Bank Stability Indicators with and without PCA, Annual Growth Rates



Source: Author's Calculations

Table 2. Banking Sector Patterns

	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016
Total Banks	16	16	16	16	16	16	16	16	16	16
State owned-banks	0	0	0	0	0	0	0	0	0	0
Albanian owned-banks	2	2	2	2	2	2	2	2	3	3
Foreign owned-banks	14	14	14	14	14	14	14	14	14	14
Financial Intermediation	78.6	80.5	82.0	85.8	89.4	95.9	99.1	101.4	101.3	105.1
- Bank assets/ GDP	75.9	76.7	77.5	80.9	84.7	89.6	90.5	91.7	91.3	94.9
- Others' assets/ GDP	2.7	3.8	4.5	4.9	4.7	6.3	8.6	9.7	10	10.2
Bank loan / GDP					40.0	43.6	41.9	42.1	40.6	40.5
Bank Deposits / GDP	63.6	58.4	58.6	64.0	68.3	71.0	72.4	73.0	72.9	74.2
HHI (in %)	16.5	15.1	14.3	14.2	14.3	14.5	13.8	14.1	14.9	15.3
CR-4 (in %)	63.1	60.2	61.4	62.8	63.9	65.4	64.9	66.6	69.3	68.7

Source: Bank of Albania, Financial Stability Report (2016)

Table 3. Descriptive Statistics

Sample: 2008Q3 2015Q4						
Variable	No of Observations	Mean	Median	Standard Deviation	Maximum	Minimum
CAELS	464	99.79865	98.97366	16.80609	153.6974	54.56687
GDP (YoY)	464	0.031	0.025	0.023	0.097	0.005
PSRISK	464	0.059	0.062	0.018	0.086	0.032
SIZE	464	0.063	0.035	0.071	0.301	0.139
EFFICIENCY	464	1.05	0.99	0.21	2.32	0.69
LEVERAGE	464	0.14	0.09	0.14	0.72	0.05
NPL / ASSET	464	0.090	0.063	0.074	0.295	0.0
LOAN / ASSET	464	0.502	0.483	0.182	0.962	0.090
ASSET	464	68779.7	39142.6	80150.0	361152.6	1667.3
ASSET (YoY)	464	0.114	0.072	0.190	1.097	-0.420
CAR	464	0.301	0.165	0.455	2.669	0.041
ROA	464	-0.254	0.209	7.073	76.349	-44.859
ROE	464	-1.567	1.963	18.610	74.427	-70.923
YoY – Annual growth rate						

Source: Bank of Albania, INSTAT, Bloomberg, Author's calculations

Table 4. Correlation - Covariance Analysis: Ordinary*

Sample: 2008Q3 2015Q3 [Observations Included: 464]						
Covariance [*Correlation*]	*CAELS*	*GDPR*	*PSRISK*	*BSIZE*	*EFFICIENCY*	*LEVERAGE*
CAELS	0.005					
	[*1.000*]					
GDP	0.000	0.000				
	[*0.073*]	[*1.000*]				
PSRISK	-0.001	0.001	0.504			
	[*-0.028*]	[*0.042*]	[*1.000*]			
SIZE	0.000	0.000	0.001	0.004		
	[*0.067*]	[*0.032*]	[*0.034*]	[*1.000*]		
EFFICIENCY	-0.002	0.000	-0.006	0.000	0.034	
	[*-0.160*]	[*-0.012*]	[*-0.047*]	[*0.006*]	[*1.000*]	
LEVERAGE	0.001	0.000	0.021	-0.001	0.042	0.342
	[*0.013*]	[*0.002*]	[*0.050*]	[*-0.024*]	[*0.384*]	[*1.000*]
* Balanced sample (listwise missing value deletion).						

Source: Author's calculations

Table 5. Panel Unit Root Test

Variable	ADF - Fisher Chi-square			PP - Fisher Chi-square		
	Intercept	Intercept and Trend	None	Intercept	Intercept and Trend	None
ΔCAELS	[0.0000]	[0.0000]	[0.0000]	[0.0018]	[0.0000]	[0.0000]
ΔGDP	[0.0000]	[0.0000]	[0.0000]	[1.0000]	[0.0000]	[0.0000]
ΔPSRISK	[0.0000]	[0.0000]	[0.0000]	[0.0000]	[1.0000]	[0.0000]
FSI	[0.0071]	[0.0000]	[0.0899]	[0.0000]	[0.0000]	[0.0001]
ΔDEBT	[0.0000]	[0.0000]	[0.0000]	[0.0000]	[0.0000]	[0.0000]
HPI	[0.0000]	[0.0000]	[0.0000]	[0.0000]	[0.0000]	[0.0000]
ΔSIZE	[0.0000]	[0.0000]	[0.0000]	[0.0000]	[0.0000]	[0.0000]
EFFICIENCY	[0.0000]	[0.0000]	[0.9649]	[0.0000]	[0.0000]	[0.8965]
LEVERAGE	[0.0000[	[0.0007]	[0.0001]	[0.0000]	[0.0006]	[0.0010]
ΔDL	[0.0000]	[0.0000]	[0.0000]	[0.0000]	[0.0000]	[0.0000]
ΔDEPOSIT	[0.0000]	[0.0000]	[0.0000]	[0.0000]	[0.0000]	[0.0000]
ΔLOAN	[0.0000]	[0.0000]	[0.0000]	[0.0000]	[0.0000]	[0.0000]
ΔNPL	[0.0000]	[0.0000]	[0.0000]	[0.0000]	[0.0000]	[0.0000]
CAPITAL	[0.0424]	[0.0537]	[0.3042]	[0.0000]	[0.0000]	[0.1607]
OffBALANCE	[0.0002]	[0.0149]	[0.9760]	[0.0000]	[0.0001]	[0.9669]

Note: Δ is a first difference operator. Probabilities for Fisher tests are computed using an asymptotic Chi-square distribution. All other tests assume asymptotic normality.

Source: Author's calculations

Table 6. Results based on GMM approach using additional macroeconomic variables

Model Specification	[1]	[2]	[3]	[4]	[5]	[6]	[7]
ΔGDP	1.0344***	1.3619***	1.2117***	1.0584**	1.048***	1.129***	1.078***
ΔPSRISK	-0.0489*	-0.0225	-0.0287	-0.0610**	-0.044***	-0.023	-0.043**
ΔFSI		-0.2109**					
ΔDEBT			-0.5560*				
ΔHPI				-0.0935***			
REER					-0.344*		
MCI						0.518**	
CoBM0							-0.150
ΔSIZE	0.1496**	0.1207	0.1431	0.1193	0.608***	0.483***	0.151***
EFFICIENCY	-0.4404*	-0.4528*	-0.5055**	-0.4622*	-0.596***	-0.476**	-0.453***
LEVERAGE	0.6121**	0.4141**	0.6533***	0.6217***	0.252*	0.141	0.581**
Cross-sections included:	16	16	16	16	16	16	16
Instrument rank	20	24	24	24	24	24	24
Number of Observations	448	448	448	448	448	448	448
J-Statistics	17.7	21.9	17.4	23.1	12.7	21.2	18.6
Probability of J-Statistics	0.28	0.23	0.50	0.19	0.24	0.27	0.41
AR(1) [p-value]	0.000	0.000	0.000	0.000	0.003	0.000	0.000
AR(2) [p-value]	0.2834	0.025	0.058	0.032	0.152	0.056	0.036

The table shows bank-level GMM regression statistics on the empirical results of estimations using as an alternative the White Period 2nd Step Approach. Sargan and Hansen test (J-Statistics and the Probability of J-Statistics) investigates the validity of the instruments used, and rejection of the null-hypothesis implies that instruments are valid, since they are not correlated with the error term. The Arellano and Bond test results also require significant AR (1) serial correlation and absence of AR (2) serial correlation (See also Kasman and Kasman, 2015). Conventional level of significance as ***1%, **5%, and *10%.

Source: Author's calculations

Table 7. Results based on the GMM approach using additional bank-specific variables

Model Specification	[1]	[2]	[3]	[4]	[5]
ΔGDP	0.9774*	0.9960**	0.9754**	1.1559**	1.1657**
ΔPSRISK	-0.0428	-0.0495*	-0.0436	-0.0402**	-0.0389
ΔSIZE	0.1137	0.1749	0.0813	0.0608	0.1423
EFFICIENCY	-0.4597**	-0.4283*	-0.4478*	-0.6496***	-0.4239*
LEVERAGE	0.4820**	0.4281*	0.6509***	0.0839	0.6403*
ΔDL	0.0974				
ΔDEPOSIT		0.0684			
ΔLOAN			-0.0986		
ΔCAPITAL				0.0215*	
ΔNPL					-0.0826*
Cross-sections included:	16	16	16	16	16
Instrument rank	24	24	24	20	24
Number of Observations	448	448	448	402	428
J-Statistics	21.0	22.7	19.8	23.4	17.6
Probability of J-Statistics	0.28	0.20	0.34	0.17	0.48
AR (1) [p-value]	0.000	0.000	0.000	0.000	0.000
AR (2) [p-value]	0.045	0.042	0.037	0.073	0.042

The table shows bank-level GMM regressions statistics on the empirical results of estimations using as an alternative the White Period 2nd Step Approach. Sargan and Hansen test (J-Statistics and the Probability of J-Statistics) investigates the validity of the instruments used, and rejection of the null-hypothesis implies that instruments are valid, since they are not correlated with the error term. The Arellano and Bond test results also require significant AR (1) serial correlation and absence of AR (2) serial correlation (See also Kasman and Kasman, 2015). Conventional level of significance as ***1%, **5%, and *10%.

Source: Author's calculations

Table 8. Robustness checks using an additional variable (Off-balance sheet activities)

Model Specification	[1]	[2]	[3]	[4]
ΔGDP	1.037**	1.374***	1.191***	1.058***
ΔPSRISK	-0.051*	-0.024	-0.033	-0.063***
ΔFSI		-0.233**		
ΔDEBT			-0.487*	
ΔHPI				-0.096***
ΔSIZE	0.064	0.026	0.049	0.034
EFFICIENCY	-0.346*	-0.355*	-0.401*	-0.355
LEVERAGE	0.537***	0.352**	0.577***	0.596***
ΔOFFBALANCE	0.012	0.014	0.012	0.015
Cross-sections included:	16	16	16	16
Instrument rank	24	28	28	28
Number of Observations	431	431	431	431
J-Statistics	23.4	27.7	23.0	27.2
Probability of J-Statistics	0.18	0.15	0.34	0.17
AR (1) [p-value]	0.000	0.000	0.000	0.000
AR (2) [p-value]	0.031	0.071	0.041	0.022

The table shows bank-level GMM regressions statistics on the empirical results of estimations using as an alternative the White Period 2nd Step Approach. Sargan and Hansen test (J-Statistics and the Probability of J-Statistics) investigates the validity of the instruments used, and rejection of the null-hypothesis implies that instruments are valid, since they are not correlated with the error term. The Arellano and Bond test results also require significant AR (1) serial correlation and absence of AR (2) serial correlation (See also Kasman and Kasman, 2015). Conventional level of significance as ***1%, **5%, and *10%.

Source: Author's calculations

Table 9. Other robustness checks

Model Specification	[1]	[2]	[3]	[4]	[5]
ΔGDP	0.984**	1.043***	1.032**	1.001**	1.168**
ΔPSRISK	-0.043	-0.049*	-0.041	-0.060**	-0.039
ΔSIZE	0.017	0.101	0.025	0.001	0.120
EFFICIENCY	-0.368*	-0.349*	-0.359*	-0.436*	-0.281
LEVERAGE	0.403**	0.345*	0.552**	0.011	0.527**
ΔOFFBALANCE	0.013	0.012	0.009	0.011	0.034
ΔDL	0.119				
ΔDEPOSIT		0.092			
ΔLOAN			-0.070		
ΔCAPITAL				0.011*	
ΔNPL					-0.106*
Cross-sections included:	16	16	16	15	16
Instrument rank	28	28	28	24	28
Number of Observations	431	431	432	385	423
J-Statistics	28.0	28.0	25.9	26.7	28.0
Probability [J-Statistics]	0.14	0.14	0.21	0.08	0.14
AR(1) [p-value]	0.000	0.000	0.000	0.000	0.000
AR(2) [p-value]	0.037	0.035	0.029	0.072	0.031

The table shows bank-level GMM regressions statistics on the empirical results of estimations using as an alternative the White Period 2nd Step Approach. Sargan and Hansen test (J-Statistics and the Probability of J-Statistics) investigates the validity of the instruments used, and rejection of the null-hypothesis implies that instruments are valid, since they are not correlated with the error term. The Arellano and Bond test results also require significant AR (1) serial correlation and absence of AR (2) serial correlation (See also Kasman and Kasman, 2015). Conventional level of significance as ***1%, **5%, and *10%.

Source: Author's calculations

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DRIVERS AND BARRIERS OF ENTREPRENEURIAL INTENTIONS IN TIMES OF ECONOMIC CRISIS: THE GENDER DIMENSION

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Abstract
This paper shows results of a study on entrepreneurial intentions in Greece in times of a major and prolonged economic crisis, with a focus on the dimension of gender. The paper provides insights about drivers and barriers that affect intentions of becoming an entrepreneur. Results show relatively low intention of starting a business, whereas personal attitudes toward becoming an entrepreneur and perceived desirability are high. Furthermore, economic barriers, public policy barriers and business risk barriers towards undertaking entrepreneurial activities are considered to be highly important as compared to personal barriers. As far as gender is concerned, results show that, generally speaking, male and female potential entrepreneurs are quite similar in their motivation towards entrepreneurship during turbulent times.

JEL Classification: M13, M19
Key words: Entrepreneurial Intentions, Gender, Economic Crisis, Drivers, Barriers

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1. Introduction

In recent years, Greece has been undergoing a major economic crisis, which is associated with a deep and prolonged depression period in both economic and social terms. Entrepreneurship in the country has also been affected in multiple ways by the current economic crisis. Greeks show low intentions of starting a business (8.3%) compared to other European countries; this can partly be explained by the fact that few people see any sound opportunities (14.2%) for starting a business (Kelley et al 2016). On the other hand, entrepreneurship is seen as a way out of the economic crisis, since start-ups and entrepreneurial activities have proven to accelerate structural change, to improve the competitiveness of a nation in the global business environment, and to create new jobs (Ripsas, 1998). Compared to established firms, start-ups are less resistant to change, and they are often more flexible and innovative. As stated by Alison Coleman in Forbes, "*While the Euro crisis devastated the Greek economy, it also forced a change in the perception of entrepreneurship, with the need to restore growth through entrepreneurship becoming critical. Potential was identified in various sectors and with a dearth of career options,entrepreneurship was seen as the way forward for Greece*" (Forbes, 2014).

In this unstable economic climate, raising the entrepreneurial intentions of the Greek population is imperative, as the intention of starting a company is pivotal for the entrepreneurial process and an immediate antecedent of actual behaviour (Ajzen, 1991). Meta-analyses on the intentions-behaviour/action gap confirm this, since up to 39% of the variance in actual behaviour can be explained by intentions (Bullough, 2014). Therefore, entrepreneurial intentions are one of the best predictors of planned behaviour (Krueger and Carsrud, 1993).

Identifying drivers and barriers related to entrepreneurial intentions in both males and females, is also very important because of the gender gap in entrepreneurial intentions and activities. Furthermore, measures can be taken in order to foster female entrepreneurship that will eventually lead to bridging the gender gap.

The aim of the paper is twofold. Firstly, to provide a thorough investigation of entrepreneurial intentions in turbulent times and in a business environment that can be characterised –on the basis of entrepreneurial indices for previous years- as hostile. Secondly, this paper aims at offering an integrated model explaining underlying factors that result in decisions to adopt entrepreneurship, with a special focus on women entrepreneurship in the Greek business environment. The paper is structured as follows. First, we provide a literature review on entrepreneurial intention and its antecedents. Second, we detail the research method and present the results. Finally, we discuss our findings and the implications of our study and state its limitations.

2. Literature Review

2.1 Entrepreneurship in Greece

The attitude of Greek society towards entrepreneurship is not characterised as positive and Greeks mainly associate entrepreneurship with large and established companies. Until recently an entrepreneur had often been labelled a "fraudster or an adventurer or a manipulator of the market" and profits resulting from entrepreneurial activities had been perceived as negative and reprehensible. In such a climate, young people were discouraged from engaging in entrepreneurial activities (Sarri and Laspita, 2014).

Naturally, the ongoing economic crisis in Greece drastically affects entrepreneurship in the country. Greeks show low intentions of starting a business (8.3%) as compared to other Europeans, which can partly be explained by the fact that few people see sound opportunities (14.2%) for starting businesses (Kelley *et al.*, 2016). Entrepreneurs in Greece are self-confident about their capabilities towards entrepreneurship (46.8%) when compared to entrepreneurs in other European countries, but, at the same time, they have the lowest view about opportunities for new business and their fear of failure is relatively high in Greece (46.9%) among all the economies of the GEM study (Kelley *et al.*, 2016). Furthermore, more than half of the adults asked (61%) believe entrepreneurship is a good career option and 68% attribute a high status to successful entrepreneurs, whereas fewer (38%) see positive images of entrepreneurs in the media (Kelley *et al.*, 2016).

Data from the Global Entrepreneurship Monitor (2017) on women entrepreneurship show that, in Greece, in addition to the gender gap in entrepreneurial intentions, with men showing higher intentions than women, there is also a gender gap in total early-stage entrepreneurship (TEA) and established activity figures. This trend is consistent throughout all the years Greece has participated in GEM (Kelley *et al.*, 2017). Necessity entrepreneurship in Greece appears stronger for female entrepreneurs than their male counterparts (Kelley *et al.*, 2017). The economic crisis may have pushed women towards entrepreneurship, because of the associated unemployment and the need to earn income to support their families. Women in Greece seem to have lower perceptions as to their capacity and skills for undertaking entrepreneurial initiatives than men and a higher fear of failure (77% for women and 69% for men) (Ioannidis and Giotopoulos, 2014). Women seem to engage in entrepreneurial activities later than men, they have a similar educational background as men and a lower percentage of them (50%) than men (68%) perceive entrepreneurship as a good career option (Ioannidis and Giotopoulos, 2014).

2.2 Entrepreneurial Intentions

The intention to start a company is central to the entrepreneurial process and an

immediate antecedent of actual behaviour (Ajzen, 1991). Meta-analyses on the intentions-behaviour/action gap confirm this, since up to 39% of the variance in actual behaviour can be explained on the basis of intentions (Bullough, 2014). Therefore, entrepreneurial intentions are one of the best predictors of planned behaviour (Krueger and Carsrud, 1993), as opposed to attitudes, beliefs, demographics or personality (Krueger and Carsrud, 1993, Krueger *et al.*, 2000). Intentions capture the extent to which people are willing to make an effort in order to perform and reflect motivational factors that affect behaviour (Ajzen, 1991). Souitaris *et al.* (2007) define entrepreneurial intentions as the state of mind that directs a person's focus and actions towards becoming self-employed, as opposed to becoming an employee.

Factors used to explain differences in entrepreneurial intentions among individuals are related to individual-level aspects, such as demographics and personality traits, as well as socio-cultural factors, such as family background and education. Douglas and Shepherd (2002) found that individuals with a strong risk-taking propensity are particularly oriented towards undertaking entrepreneurial activities. Skills can stimulate creativity and enhance recognition of opportunities; therefore, they may well lead to entrepreneurial activities (Liñán *et al.*, 2011). Parents, as a major source of the socialization process for a child and as people that a child repeatedly observes, have often been pointed to as influencing their children's career choices, through the process of role modelling (Matthews and Moser, 1996), and, in particular, the children's entrepreneurial intentions (Laspita et al., 2012).

2.3 Models of Entrepreneurial Intentions

Several intention models have been developed through the years (Bullough *et al.*, 2014) in relevant literature, three of which have prevailed. Bird's (1988) model of implementing entrepreneurial ideas, Shapero's (1984) model of entrepreneurial event and Ajzen's (1991) theory of planned behaviour. These models are, to a great extent, similar in that they all consider attitudes and the social learning theory, while also including individual and contextual factors that influence one's decision to start a business.

2.3.1 Bird's Model of Implementing Entrepreneurial Ideas

Bird's model, grounded in cognitive psychology theory, illustrates the implementation of entrepreneurial ideas and tries to predict and understand human behaviour. Individuals are predisposed to intention *"based upon a combination of both personal and contextual factors"* (Boyd and Vozikis, 1994, p. 66). Contextual factors include social, political, and economic variables, while personal factors include personal characteristics and abilities, one's personal history, prior experiences and demographics. Personal and social contexts interact with rational analytic

thinking (which includes the preparation of a business plan, opportunity analysis, and resource acquisition) as well as intuitive holistic thinking (which includes the potential entrepreneur's vision, hunches, etc.). The last two set the frame for and structure entrepreneurial intention and action. This model was significantly revised by Boyd and Vozikis (1994) who argue that self-efficacy, *"a person's belief in his or her capability to perform a task"* (p.63), influences the entrepreneurial process and, in particular, entrepreneurial intention and activity.

2.3.2 Model of Entrepreneurial Event

Shapero's work in the early 1980s was the starting point of theoretical and empirical research into entrepreneurial intentions, which led to rapid growth in ensuing years (Fayolle and Linan, 2014). Shapero and Sokol's (1982) theory of entrepreneurial event is a fundamental intention-based model and aims at explaining entrepreneurial intentions; it also tries to offer better understanding of subsequent behaviour. The model presumes that the intention to start a business is influenced by three factors: perceived desirability, perceived feasibility and propensity to act. Perceived desirability refers to the extent to which, an individual feels attracted by a career as an entrepreneur, perceived feasibility refers to the extent to which an individual feels confident to start a business and considers the possibility to be feasible, and the propensity to act refers to the extent to which an individual has the disposition to act on his or her decision (Shapero and Sokol, 1982). Intentions only develop if the person in question experiences something that leads to a change in their behaviour, namely, a positive or negative displacement event (Peterman and Kennedy, 2003).

2.3.3 Theory of Planned Behaviour

According to the theory of planned behaviour (Ajzen, 1991; Ajzen and Fishbein, 1980), an individual's intention becomes the central factor in explaining behaviour and is shaped by three attitudinal antecedents: attitude toward behaviour, subjective norms, and perceived behavioural control. Attitude towards behaviour refers to *"the degree to which a person has a favourable or unfavourable evaluation or appraisal of the behaviour in question"* (Ajzen, 1991, p. 188). Subjective norms refer to *"the perceived normative beliefs about significant others, such as family, relatives, friends, as well as other important individuals and groups of individuals"* (Schlaegel and Koenig, 2014, p.293). Perceived behavioural control refers to *"an individual's belief about being able to execute the planned behaviour and the perception that the behaviour is within the individual's control"* (Schlaegel and Koenig, 2014, p. 294).

2.3.4 Comparison of Models

The models mentioned above have been used by various researchers in order to

establish a better understanding of entrepreneurial intention and the entrepreneurial process itself. For example, Peterman and Kennedy (2003) used Shapero's model of entrepreneurial event to study the effect of participation in an entrepreneurial educational programme on perceptions of the desirability and feasibility of starting a business. Maes *et al.* (2014) used the theory of planned behaviour to ensure better understanding of the origin of gender differences in entrepreneurial behaviour. They found that the effect of gender on entrepreneurial intentions is mediated by personal attitudes and perceived behavioural control, but not by subjective norms. Krueger *et al.* (2000) compared the two main intention-based models (Shapero's model of entrepreneurial event and the theory of planned behaviour) and the ability of these models to predict entrepreneurial intention. The results of their study statistically support both models. Furthermore, both models are largely homologous to one another. Perceived behaviour control reflects the perceived feasibility of performing the behaviour included in the Entrepreneurial Event model and both are conceptually associated with perceived self-efficacy. Attitude towards the behaviour reflects the desirability perceived and the subjective norms (Krueger *et al.*, 2000).

2.4 Antecedents of Entrepreneurial Intentions

Going a step backwards, one can raise a question about what determines or affects entrepreneurial intentions. Therefore, it is necessary to identify factors that precede intentions, so as to better understand the entrepreneurial process (Krueger *et al.*, 2000). There are a number of antecedents of entrepreneurial intentions that could be taken into consideration and that are related, for example, with the person (e.g. demographics, personality, personal factors, etc.), the micro-social environment (e.g., family, education, etc.) and the macro-social environment (e.g. economic climate, etc.). These factors seem to have indirect influence on entrepreneurship through influencing key attitudes (such as perceived behavioural control and the perceived attitude towards entrepreneurship) and one's general motivation to act (Krueger *et al.*, 2000).

2.4.1 Demographics

Demographic characteristics, such as age (individuals' entrepreneurial intentions may change with age (e.g., Matthews and Moser, 1996), gender (entrepreneurial intentions have been found to be gender-dependent [e.g., Wang and Wong, 2004]) and work experience (Kent *et al.*, 1982) have an impact on one's decision to become an entrepreneur. Demographic variables, however, have been found to indirectly influence intentions and only if they change the decision maker's attitudes (Krueger *et al.*, 2000). Here the focus will be on one demographic characteristic, namely, gender.

- Gender

Brush's (1992) literature review on female entrepreneurs showed that there are more gender similarities than differences in regard to individual characteristics, such as demography and business skills. However, gender-related differences have been found concerning several entrepreneurship aspects, such as financing strategies, growth patterns, and governance structures (Greene *et al.*, 2003). Females develop different products and pursue different goals (Carter *et al.*, 1997; Chaganti and Parasuraman, 1996). As compared to men, women are less likely to own multiple businesses and are less likely to expand such businesses (Verheul and Thurik 2001). Independence and the need for achievement are strong motivators for both males and females (Cromie, 1987). Women pursue self- employment because it allows them to work at home, which eases the burden of having to find childcare (Boden, 1996). Research indicates there is a relationship between gender and entrepreneurial intention (Kristiansen and Indarti, 2004). Researching into the reasons for gender differences in entrepreneurial intentions will support the understanding of lower entrepreneurial activity among women, when compared to that of men (Ljunggren and Kolvereid, 1996).

2.4.2 Personality Factors

Early research trying to answer the question who the entrepreneur is, paid significant attention to personality traits, since entrepreneurs were believed to be different from the general population. Special attention was given to traits like 'need for achievement' (McClleland, 1961), 'risk-taking propensity' (Brockhaus, 1980), 'locus of control' (Rotter, 1966), etc.

- Need for achievement

One of the earliest motives that drive people to become entrepreneurs has been found to be the 'need for achievement' (McClelland, 1961). The need for achievement *"seems to entail expectations of doing something better or faster than anybody else or better than the persons' own earlier accomplishments"* (Hansemark 2003, p.302). McClelland suggested that people with a high need for achievement probably show preference for tasks associated with effort, set high goals, enjoy facing challenges and are innovative.

- Risk-taking propensity

Entrepreneurs have to assume different risks when engaging in entrepreneurial activities, which can be, among others, financial, social, or, even, health risks (Schaper and Volery, 2007). Investing own capital in a start-up or giving some kind of collateral in order to raise finance is typical of entrepreneurs. The long hours they

have to work often create problems within their family or their social commitments may suffer. Furthermore, in some societies that do not tolerate failure, failed entrepreneurs are often stigmatised (Schaper and Volery, 2007). Therefore, entrepreneurs are considered to be engaging in risky behaviour and risk-taking propensity has been defined as *"the tendency to take or avoid risk"* (Norton and Moore, 2006). This tendency may affect one's intention to start a new business, despite the fact that situational factors may also play a role in a person's risk preference.

- Locus of control

The locus of control *"measures subjects' perceived ability to influence events in their lives"* (Begley and Boyd, 1987). People with an internal locus of control believe that events in their lives derive primarily from their own actions, whereas people with and external locus of control tend to believe that external factors are responsible for what happens in their lives and that they have little or no personal control over matters. Entrepreneurs have been found to be people with an internal locus of control, since they are initiators, they depend more on their own skills rather than others' and they take responsibility for their actions (Mueller and Thomas, 2001).

2.4.3 Personal Factors

A person's specific reactions to a given situation and personal beliefs seem to have an effect on entrepreneurship (Rychlak, 1981).

- Perceived skills

The perception of a person's skills indicates how confident people feel to make the step towards entrepreneurship; this also influences people's self-efficacy, which is gradually gained through experience (Bandura 1982, Boyd and Vozikis 1994, Linan 2008). For example, a person who previously worked as an employee and acquired the necessary skills and experience may be more confident to start their own business (Heilman and Chen, 2003). Specific entrepreneurial skills may also be related to higher personal appeal and subjective norms (Scherer et al., 1991; Carsrud, 1992) and could help a lot in an individual's decision to start a firm (Linan, 2008).

- Perceived barriers

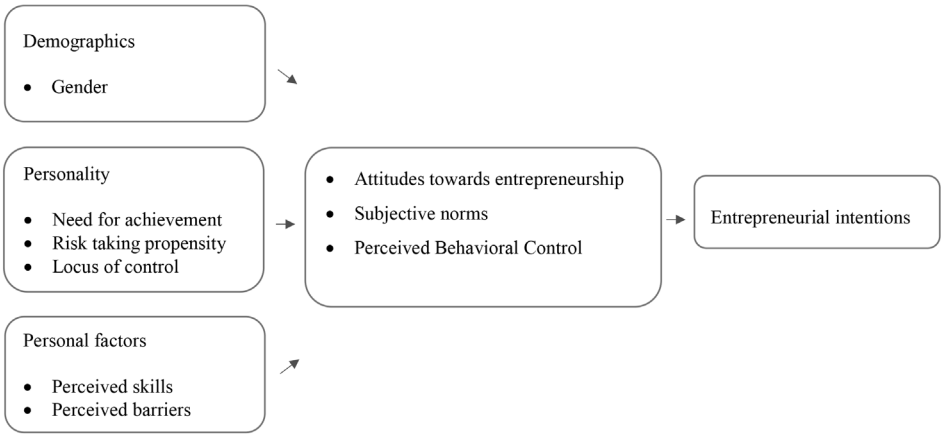
In entrepreneurship-related literature, several factors have been identified and are perceived as barriers to making the step towards entrepreneurship (Kouriloff, 2000). These barriers could be related to personal, social, cultural, psychological, political, or economic factors and may include time for one's family, stress levels, discrimination, political instability, unfavourable economic conditions, etc. Luthje and Franke (2003) found that that the contextual barriers perceived play a signifi-

cant role for the entrepreneurial behaviour of technical students. For example, when students perceive that there is an unfriendly environment for entrepreneurs, (due, for example, to a bank's unwillingness to provide loans), they have lower intention of becoming entrepreneurs.

2.4.4 Integrated Model

The model depicted below provides a holistic view of entrepreneurial intentions and its antecedents. The variables used are those of the planned behaviour theory, since this model is the most frequently one applied to entrepreneurship research and has proven to be of strong predictive value. Various personal and micro-social factors were used as antecedents, in the manner described above in the literature review.

Figure 1. Integrated model



3. Methodology

3.1 Data Collection and Sample Characteristics

The survey was conducted between February and June 2016 throughout Greece. A network of Universities (University of Macedonia, University of Crete, Technical University of Crete) and an NGO (Ergani), which specialises in female entrepreneurship and mentoring, was used to disseminate the questionnaires (in written form) to the target audience.

The questionnaire used was in Greek and a random sample took part in the survey. The language chosen for the questionnaire was Greek, since it would enable the respondents to fully understand the questions asked and would make them feel more comfortable with answering the questionnaire. In order to ensure consistency between the questions of the questionnaire, an independent bilingual expert,

who did not help create the original survey, translated the Greek version back into English (Brislin, 1970). No major differences between the original English and the back-translated version in Greek were found.

A total of 419 people from the whole of Greece participated in the survey, of which 38.4% were male and 61.6% female. The mean age of respondents was 27.6 years, while 63.7% were students, 7.2% unemployed, 10.8% worked for the public sector and 18.2% worked for the private sector. Furthermore, 48.5% of respondents were single, 31.2% were in a relationship and 20.3% were married. Besides, 4.7% of respondents had a monthly family income below 300 Euros, 11.5% were in the 301-700 Euros/month category, 34.6% in the 700-1200 Euros/month category, 28.4% in the 1200-2000 Euros/month category and, 20.8% in the above 2000 Euros/month category. Finally, 72.4% of respondents had no family background in entrepreneurship and 81.9% knew someone who had already started a business.

3.2 Measures

Based on the literature review and personal interviews of men and women entrepreneurs selected by ERGANI, a draft questionnaire was first drafted and then checked for content validity using a focus group. Minor changes were made to the initial questionnaire before its distribution. All main constructs in the questionnaire were assessed with self-reported measures based on multi-item scales; the 7-point Likert scales were used ranging from 1 (I totally disagree) to 7 (I totally agree).

- Entrepreneurial intention

In order to measure entrepreneurial intention, the scale by Linan and Chen (2009) was applied, comprising six items (general sentences indicating different aspects of intention). The six items are the following: I am ready to do anything to be an entrepreneur; My professional goal is to become an entrepreneur; I will make every effort to start and run my own firm; I am determined to create a firm in the future; I have very seriously thought about starting a firm; I have a strong intention of starting a firm someday. These items were averaged to yield an intention score (Cronbach's reliability coefficient = 0.949)

- Attitude towards entrepreneurship

In order to measure attitude towards entrepreneurship, the validated scale by Linan and Chen (2009) was applied. The items used were: For me, being an entrepreneur implies more advantages than disadvantages; A career as an entrepreneur is attractive for me; If I had the opportunity and resources, I'd like to start a firm; Being an entrepreneur would mean great satisfaction for me; Among various options, I would rather choose to be an entrepreneur. These items were averaged to yield an attitude towards entrepreneurship score (Cronbach's reliability coefficient = 0.906)

- Perceived behavioural control

In order to measure perceived behavioural control, the validated scale by Linan and Chen (2009) was applied. The items used were: To start a firm and keep it working would be easy for me; I am prepared to start a viable firm; I can control the creation process of a new firm; I know the necessary practical details to start a firm; I know how to develop an entrepreneurial project; If I tried to start a firm, I would be quite likely to succeed. These items were averaged to yield a perceived behavioural control score (Cronbach's reliability coefficient = 0.898).

- Subjective norms

In order to measure the subjective norms, the validated scale by Linan and Chen (2009) was applied. Respondents were asked: If you decided to create a firm, would people in your close environment approve of that decision? Indicate from 1 (total disapproval) to 7 (total approval). Three target groups were included, namely: Your close family; Your friends; Your colleagues. These items were averaged to yield a subjective norms score (Cronbach's reliability coefficient = 0.813).

- Locus of control

Locus of control was measured according to Chen *et al.* (1998), who followed Levenson. The items that were averaged in order to create the aggregated locus of control score were: I am usually able to protect my personal interests; When I make plans, I am almost certain to make them work; I can pretty much determine what will happen in my life; My life is determined by my own actions; When I get what I want, it's usually because I worked hard for it (Cronbach's reliability coefficient = 0.750).

- Need for achievement

In order to measure one's need for achievement the established scale by McClelland was used. The items that were averaged in order to create the aggregated need for achievement score were: Nothing else in life is a substitute for great achievement; My ambitions and my goals are high; I spend more time thinking about the future despite my previous successes; Usually I push myself and I feel real satisfaction when my work is among the best available (Cronbach's reliability coefficient = 0,694).

- Risk-taking propensity

Risk-taking propensity was measured according to Norton & Moore (2006). The items averaged in order to create the aggregated risk-taking propensity score were: I am not willing to take risks when choosing a work environment; I prefer a low risk/high security work environment with predictable income over a high risk and

high reward environment; I prefer to remain in an environment that has problems that I know about rather than to take the risks of a new environment with unknown problems, even if the new environment offers greater rewards; I view job-related risk as a situation to be avoided at all costs (Cronbach's reliability coefficient = 0,752).

- Perceived skills

Perceived skills were measured according to Linan (2008). Items averaged in order to create the aggregated perceived skills score were: Recognition of opportunity; Creativity; Problem solving skills; Leadership and communication skills; Development of new products and services; Networking skills; Establishing professional contacts (Cronbach's reliability coefficient = 0,814).

- Perceived barriers

Finally, operationalisation of barriers was done based on prior studies conducted using different sources, such as Kourikoff (2000).

4. Results

Table 1 shows descriptive statistics of entrepreneurial intention and its antecedents. Despite the fact that entrepreneurial intentions are rather low, respondents have a rather favourable attitude towards entrepreneurship; they perceive their skills to be high, they have a rather high need for achievement and a high internal locus of control. The subjective norms are also quite high, which means that the social environment has a positive attitude towards entrepreneurship. The low level of entrepreneurial intentions suggests that there may be other variables that affect the relationship between attitude and actual behaviour. For example, people in our sample are quite risk-averse and this finding may, to some extent, explain the low level of entrepreneurial intentions. Findings reveal a very low perceived behavioural control, which means that individuals in Greece, during the economic crisis, perceive that entrepreneurial behaviour is not within their control. So, despite the fact that people may have a positive attitude towards entrepreneurship, the unstable economic climate of the country renders entrepreneurship not a feasible career path.

We also tested for gender differences in the aggregated entrepreneurial intention index, using a two-tailed t-test for the equality of means. The entrepreneurial intention of male respondents (M=3.93, SD=1.746) is higher than that of female respondents (M=3.67, SD= 1.647); however, the difference was not statistically significant ($t(416)=1.508$, $p>0.05$). The following figure provides a more detailed picture of the results.

Table 1. Means for entrepreneurial intention and its antecedents

	N	AM	SD	Cron. a
Entrepreneurial intentions	418	3.77	1.689	0.949
Attitudes towards entrepreneurship	418	4.54	1.416	0.906
Perceived Behavioural Control	417	3.24	1.272	0.898
Subjective norms	417	5.12	1.348	0.813
Locus of control	419	5.11	1.130	0.750
Need for achievement	419	5.09	1.064	0.694
Risk-taking propensity	419	3.89	1.211	0.752
Perceived skills	419	4.99	0.927	0.814

Figure 2. Entrepreneurial intentions by gender

There were no statistically significant differences (except for perceived behavioural control, for which the difference was marginally significant), as can be seen in the tables below. This may be due to the fact that the bad economic conditions in the country affect attitudes, personal factors and personality variables similarly for men and women. However, men regard themselves more able to engage in entrepreneurial activities and they perceive that the entrepreneurial behaviour is more within their control than their female counterparts (see Tables 2 and 3).

Table 2. Gender differences in variables

	Gender	N	Mean	Std. Deviation	Std. Error
Entrepreneurial intentions	Male	161	3.9246	1.74592	.13760
	Female	257	3.6690	1.64762	.10278
Attitudes towards entrepreneurship	Male	161	4.6422	1.43081	.11276
	Female	257	4.4722	1.40523	.08766
Perceived Behavioural Control	Male	161	3.5031	1.34480	.10599
	Female	256	3.0760	1.19805	.07488
Subjective norm	Male	161	5.1159	1.24834	.09838
	Female	256	5.0931	1.40978	.08811
Locus of control	Male	161	5.1146	1.36622	.10767
	Female	258	5.1021	.95561	.05949
Need for Achievement	Male	161	5.0864	1.09782	.08652
	Female	258	5.0901	1.04489	.06505
Risk taking propensity	Male	161	4.0000	1.25437	.09886
	Female	258	3.8253	1.17998	.07346
Perceived Skills	Male	161	4.9832	.93136	.07340
	Female	258	4.9961	.92538	.05761

Table 3. Results of t-tests (gender differences)

Independent Samples Test										
		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
Entrepreneurial intentions	Equal variances assumed	1.035	.310	1.508	416	.132	.25564	.16947	-.07749	.58876
	Equal variances not assumed			1.488	325.088	.138	.25564	.17174	-.08223	.59351
Attitude towards entrepreneurship	Equal variances assumed	.014	.906	1.196	416	.233	.17006	.14223	-.10953	.44964
	Equal variances not assumed			1.191	335.273	.235	.17006	.14283	-.11089	.45100
Perceived behavioral control	Equal variances assumed	3.713	.055	3.379	415	.001	.42706	.12640	.17860	.67553
	Equal variances not assumed			3.291	310.974	.001	.42706	.12977	.17173	.68240

Subjective norm	Equal variances assumed	3.082	.080	.168	415	.866	.02284	.13577	-.24405	.28973
	Equal variances not assumed			.173	370.176	.863	.02284	.13207	-.23686	.28255
Locus of control	Equal variances assumed	.437	.509	.110	417	.913	.01246	.11358	-.21080	.23573
	Equal variances not assumed			.101	257.659	.919	.01246	.12302	-.22978	.25471
Need for achievement	Equal variances assumed	.231	.631	-.034	417	.973	-.00368	.10701	-.21403	.20668
	Equal variances not assumed			-.034	326.978	.973	-.00368	.10825	-.21663	.20927
Risk taking propensity	Equal variances assumed	.634	.426	1.439	417	.151	.17474	.12143	-.06395	.41344
	Equal variances not assumed			1.419	323.991	.157	.17474	.12317	-.06756	.41705
Perceived skills	Equal variances assumed	.003	.959	-.138	417	.890	-.01289	.09317	-.19604	.17025
	Equal variances not assumed			-.138	337.996	.890	-.01289	.09331	-.19644	.17065

A correlation analysis has been conducted to explore the relationship between entrepreneurial intentions and all other variables. The results can be found in the table below.

Table 4. Correlations between entrepreneurial intention and its antecedent

		1	2	3	4	5	6	7
1	Entrepreneurial intentions							
2	Attitudes towards entrepreneurship	.689**						
3	Perceived Behavioural Control	.456**	.507**					
4	Subjective norms	.342**	.426**	.196**				
5	Locus of control	.096*	.231**	.268**	.168**			
6	Need for achievement	.158**	.274**	.294**	.213**	.437**		
7	Risk-taking propensity	-.240**	-.185**	-.084	-.008	-.004	.013	
8	Perceived skills	.301**	.343**	.455**	.146**	.343**	.453**	-.043

*** Correlation is significant at the 0.01 level (2-tailed).*

** Correlation is significant at the 0.05 level (2-tailed).*

The table above shows a significant positive correlation of all variables with entrepreneurial intentions except for the risk-taking propensity, which is significant but reversely negative This means that the more risk-averse people are, the lower their intention to become self-employed. This finding is in accordance with prior research (e.g. Hmieleski and Corbett, 2006). Furthermore, there is rather strong correlation between entrepreneurial intentions and the attitude towards entrepreneurship; there is also modest correlation between entrepreneurial intentions, perceived behavioural control and subjective norms. These findings are similar to those of other studies, which used the theory of planned behaviour to explain entrepreneurial intentions (Ozaralli and Rivenburgh, 2016). Consistent with the trait approach, personality characteristics, such as the need for achievement, appear to be related to entrepreneurial intention, even if the correlation is rather low.

An exploratory factor analysis (varimax rotation, main component analysis) was selected, as far as barriers were concerned, to examine the pairwise relationships between individual variables and extract latent factors from the variables measured. Varimax rotation creates a solution in which factors are orthogonal (uncorrelated with one another), which can make results easier to interpret. The analysis performed brought the 36 different barriers down to nine factors, namely: public policy barriers (a=0.810), personal barriers (a=0.830), social barriers (a=0.772), economic barriers (a=0.661), operation barriers (a=0,809), networking barriers (a=0,791), stress barriers (a=0,633), regulation barriers (a=0,565) and finally business risk barriers (a=0,258). The nine factors as a whole explain a total of 63.38% of the variance.

Table 5 shows descriptive statistics of the barriers perceived. As results show, the economic barriers, the public policy barriers and the business risk barriers are considered to be the most important ones towards undertaking entrepreneurial activities and reflect the difficult economic and political situation in Greece. The least important barriers are personal barriers and operation barriers.

Table 5. Descriptive statistics of the barriers perceived

	N	**AM**	**SD**
Public policy barriers	418	5.76	0.9552
Personal barriers	416	4.12	1.310
Social barriers	415	4.32	1.179
Economic barriers	418	5.89	1.036
Operation barriers	416	4.27	1.322
Networking barriers	417	4.32	1.337
Stress barriers	418	4.82	1.163
Regulation barriers	418	4.97	1.241
Business risk barriers	418	5.45	1.046

Correlation analysis between the barriers perceived and entrepreneurial intention shows that, in almost all cases, there is a very weak negative relationship. In other words, the stronger the inhibiting factors perceived, the lower the intention to become self-employed is. However, the negative relationship with entrepreneurial intentions is significant only for two barriers, namely, stress barriers and business risk barriers. So, surprisingly, the barriers perceived do not seem to influence one's intentions to become an entrepreneur. This may be due to the fact that the economic crisis leaves people without many options (e.g., because of high unemployment), so they are willing to make the step into entrepreneurship even if they perceive that this process will be associated with various barriers. The results show modest or strong correlation between different kinds of barriers.

Table 6. Correlations between entrepreneurial intention and barriers perceived

		1	2	3	4	5	6	7	8	9
1	Entrepreneurial intentions									
2	Public policy barriers	-.075								
3	Personal barriers	.000	.213**							
4	Social barriers	-.060	.422**	.462**						
5	Economic barriers	-.047	.530**	.187**	.260**					
6	Operation barriers	-.008	.302**	.284**	.456**	.256**				
7	Networking barriers	-.046	.260**	.459**	.410**	.245**	.500**			
8	Stress barriers	-.152**	.378**	.244**	.367**	.294**	.291**	.313**		
9	Regulation barriers	.012	.465**	.197**	.331**	.355**	.325**	.341**	.231**	
10	Business risk barriers	-.153**	.384**	.282**	.308**	.332**	.290**	.304**	.389**	.235**

*** Correlation is significant at the 0.01 level (2-tailed).*
** Correlation is significant at the 0.05 level (2-tailed).*

We also tested for gender differences in the barriers perceived. Differences were found in the perception of personal barriers that include self-confidence and ambition, the perception of operations barriers that include finding business opportunities, and marketing methods, the perception of networking barriers that include business contacts, and the perception of stress barriers that include work stress. Men regard these barriers as less problematic than women do.

Table 7. Gender differences in barriers perceived

	Gender	N	Mean	SD	Std. Error
Public policy barriers	Male	160	5.7372	1.05479	.08339
	Female	258	5.7674	.88981	.05540
Personal barriers	Male	158	3.8443	1.28557	.10227
	Female	258	4.2920	1.29758	.08078
Social barriers	Male	158	4.2282	1.14856	.09137
	Female	257	4.3718	1.19677	.07465
Economic barriers	Male	160	5.7828	1.20581	.09533
	Female	258	5.9551	.91107	.05672
Operation barriers	Male	159	4.0681	1.30874	.10379
	Female	257	4.3995	1.31644	.08212
Networking barriers	Male	159	4.0818	1.29098	.10238
	Female	258	4.4683	1.34551	.08377
Stress barriers	Male	160	4.5771	1.25989	.09960
	Female	258	4.9677	1.07502	.06693
Regulation barriers	Male	160	4.9875	1.28115	.10128
	Female	258	4.9612	1.21855	.07586
Business risk barriers	Male	160	5.3875	1.11303	.08799
	Female	258	5.4845	1.00182	.06237

Table 8. Gender differences (t-tests)

Independent Samples Test										
		Levene's Test for Equality of Variances		t-test for Equality of Means						
		F	Sig.	t	df	Sig. (2-tailed)	Mean Difference	Std. Error Difference	95% Confidence Interval of the Difference	
									Lower	Upper
Public policy barriers	Equal variances assumed	3.488	.063	-.314	416	.753	-.03024	.09622	-.21938	.15891
	Equal variances not assumed			-.302	294.787	.763	-.03024	.10011	-.22726	.16679
Personal barriers	Equal variances assumed	.016	.899	-3.427	414	.001	-.44769	.13062	-.70445	-.19092
	Equal variances not assumed			-3.435	334.479	.001	-.44769	.13033	-.70406	-.19131
Social barriers	Equal variances assumed	.731	.393	-1.205	413	.229	-.14363	.11916	-.37786	.09061

	Equal variances not assumed			-1.217	342.857	.224	-.14363	.11799	-.37571	.08846
Economic barriers	Equal variances assumed	3.522	.061	-1.656	416	.098	-.17229	.10402	-.37676	.03218
	Equal variances not assumed			-1.553	270.533	.122	-.17229	.11093	-.39068	.04610
Operation barriers	Equal variances assumed	.003	.955	-2.500	414	0.13	-.33135	.13253	-.59186	-.07083
	Equal variances not assumed			-2.504	336.372	0.13	-.33135	.13235	-.59168	-.07102
Networking barriers	Equal variances assumed	1.569	.211	-.2894	415	.004	-.38659	.13359	-.64919	-.12398
	Equal variances not assumed			-.2922	345.233	.004	-.38659	.13228	-.64677	-.12640
Stress barriers	Equal variances assumed	9.506	.002	-3.378	416	0.01	-.39062	.11564	-.61793	-.16330
	Equal variances not assumed			-3.255	297.477	0.01	-.39062	.12000	-.62677	-.15446
Regulation barriers	Equal variances assumed	.293	.589	.210	416	.834	-.02626	.12507	-21958	.27210
	Equal variances not assumed			.208	324.302	.836	-.02626	.12655	-22269	.27521
Business risk barriers	Equal variances assumed	1.756	.186	-.922	416	.357	-.09700	.10523	-.30384	.10985
	Equal variances not assumed			-.899	310.426	.369	-.09700	.10786	-.30922	.11522

5. Summary and discussion of the results

The main goal of this paper was to examine the entrepreneurial intention of people in Greece in an era of economic crisis, but also to explore antecedents that may enhance or hinder entrepreneurial intentions. Another goal was to identify gender similarities or differences concerning the entrepreneurial intention, but also its antecedents, drawing mainly on the theory of planned behaviour. This paper offers preliminary results of a study that took place between February and June 2016 and consists of 419 respondents.

An important finding is that respondents showed relatively low intention to start their own business, although their personal attitudes toward becoming an entrepreneur and perceived desirability were high. One explanation could be that the perceived risks associated with a new business creation, and the unstable economic and political climate, render entrepreneurship an unfeasible career choice. Similar levels of entrepreneurial intentions in Greece were also shown in the Greek data of the GUESSS study that took place in 2013 (Sarri and Laspita, 2014). However, the lack of potential entrepreneurs or entrepreneurs in the first steps of

their activities could be an obstacle to the fast revival of the economy in the country, since, especially during times of financial instability, new businesses generate jobs, disseminate innovation and provide support to the local economy and the economy as a whole (Engle *et al.*, 2010). In our study, the attitude towards entrepreneurship was higher than perceived behavioural control and Fitzsimmons and Douglas (2011) have found that individuals reporting high perceived desirability but low feasibility were less likely to report entrepreneurial intentions, which may also explain the low level of entrepreneurial intention of respondents in our sample.

The negative relationship between risk preference and entrepreneurial intentions is in accordance with other studies (e.g., Hmieleski and Corbett, 2006; Barbosa *et al.*, 2007). Similar to our results, Kennedy *et al.* (2003) also found that subjective norms positively correlated with entrepreneurial intentions. Finally, there was a rather small positive correlation between entrepreneurial intentions and one's need for achievement and locus of control. The positive correlation is in agreement with previous studies conducted by Brockhaus (1975) and Borland (1974).

Another interesting result is that the economic barriers, the public policy barriers and the business risk barriers are considered the most important barriers towards undertaking entrepreneurial activities rather than, for example, barriers related to the individual (such as stress caused by undertaking entrepreneurial activities or networking). This is in accordance with the findings of Kouriloff (2000) who pointed out that, instead of being the key-player in fostering entrepreneurship, the government may, in fact, be a source of several important barriers to entrepreneurship. This is why the role of the government and that of society as a whole, in creating an entrepreneurship-friendly environment, is essential for boosting entrepreneurial activity in the current period. Policy makers could use measures that include facilitation of access to financial services and funding, which are particularly important in times of economic recession, as well as reduction of bureaucracy, regulations and taxation (OECD, 2009). Such measures not only can render entrepreneurship a feasible (people in our study entrepreneurship is regarded as desirable, but less feasible) career path, but could also restore long-term growth for current businesses.

Our results show that, generally speaking, male and female potential entrepreneurs are quite similar in their motivation towards becoming self-employed during this period of economic crisis in Greece, as also indicated in literature on existing entrepreneurs (Brush, 1992; Veena and Nagaraja, 2013). Similarities were found, for example, in the risk-taking propensity, the skills perceived, the need for achievement, the locus of control, etc. If, however, both prospective and existing male and female entrepreneurs do not differ in their basic motivation to become entrepreneurs, the question of the gender gap in entrepreneurial activity still remains open and should be investigated by future research. For example, Pines *et al.* (2010) found gender similarities in motivation for starting a business, the sense of significance it provided and male/female entrepreneurial traits. The authors argue that women's inferior position in entrepreneurship is a result of social and economic

exclusion and lack of equality, and their inferior role is reinforced in times of economic crisis. "*In times of crisis money 'talks' and women have no money. Financial organizations are reluctant to lend money to small and vulnerable businesses (that tend to characterize women) and they are reluctant to lend money to new businesses (that tend to characterize women*" (Pines *et al.*, 2010, p. 192). The small differences that we found in motives and hurdles could be influenced by socialization. *"Society requires women to take on the mothering role, which often leads to unsatisfactory, truncated careers, while men are expected to be bread-winners. As a result of different socialization, what one might expect would simply be fewer independent businesswomen than independent businessmen*" (Cromie, 1987, p.259).

In our study, we did not identify significant differences in the entrepreneurial intentions of men and women (even if men show higher intention than women). However, in times of economic crisis, when there is a need for women to earn money for the survival of their families, stereotypes concerning women as members of the workforce may be overcome; however, obstacles regarding, for example, access to bank financing for women may still persist, since banks may face females who try to become entrepreneurs with some incredulity. These matters should be taken into consideration in order to reduce the gender gap in entrepreneurial intentions and activity. However, a gender gap in entrepreneurial activity still exists in the country and this has important implications for policy makers and educators, since measures need to be taken in order to raise female interest in entrepreneurship. Policy makers could use measures that include facilitation of access to financial services, legal protection of women entrepreneurs, a combination of mentoring and practical sessions, through which women can improve their business knowledge and their self-efficacy. In all measures taken, women's special needs (e.g. children, care of older family members, etc.) should be taken into consideration. Educators could bring in class successful female entrepreneurs or organise excursions to companies founded by women in order to increase students' perception of female entrepreneurship as something feasible and desirable.

The outcome of the study is limited by the cultural environment of the sample, since it was only tested in the Greek business context (thus, there could be a case of potential bias), during a specific period of time, which means cannot be projected into the future or compared to the process of adopting entrepreneurship in other countries or in other business sectors.

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EVALUATING POLICY APPROACHES TOWARDS UNDECLARED WORK: SOME LESSONS FROM FYR OF MACEDONIA

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Abstract
To tackle undeclared work, the conventional rational economic actor approach uses deterrents to ensure that the costs of engaging in undeclared work outweigh the benefits. Recent years have seen the emergence of a social actor approach which focuses upon improving tax morale. To analyse the association between participation in undeclared work and these policy approaches, 2,014 face-to-face interviews, conducted in FYROM in 2015, are reported. Logistic regression analysis reveals no association between participation in undeclared work and the perceived level of penalties and risk of detection, but there is an association with the level of tax morale. The paper concludes by discussing the implications for theory and policy.

JEL Classification: H26, J46, K34, K42, O17
Key words: Informal Sector; Tax Morale; Tax Evasion; FYROM; South-East Europe

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Introduction

Undeclared work refers to paid work which is legal in all respects other than not being declared to the authorities for tax, social security or labour law purposes (Aliyev, 2015; Barsoum, 2015; Boels, 2014; European Commission, 2007; Hodosi, 2015; OECD, 2012; Williams, 2014a,b; Williams *et al.*, 2012). This paper evaluates different approaches for tackling undeclared work. Conventionally, the dominant approach has been to view participants as rational economic actors who participate in undeclared work when the pay-off is greater than the expected cost of being caught and punished (Allingham and Sandmo, 1972). Therefore, to tackle undeclared work, efforts are pursued to increase the actual or perceived risks of detection and costs. However, over the past decade or so, a new emergent 'social actor' approach has claimed that participation in undeclared work occurs when tax morale is low, which is often narrowly defined as the intrinsic motivation to pay taxes (Alm *et al.*, 2010; Cummings *et al.*, 2009; Kirchler, 2007; Murphy, 2008; Torgler, 2007). In this case, though, following Luttmer and Singhal (2014), the term refers to non-pecuniary motivation reasons for tax compliance, including factors falling outside the standard utility framework. Thus, the social actor approach seeks to improve tax morale by bringing informal institutions (i.e., norms, values and citizens' beliefs) into symmetry with codified laws and regulations of formal institutions (Alm *et al.*, 2012a; Alm and Torgler, 2011; Torgler, 2012). The aim of this paper is to evaluate the association between participation in undeclared work and these policy approaches. To this end, a survey is reported, which was conducted in 2015 in FYR of Macedonia (FYROM), a country with one of the highest levels of undeclared work in South-East Europe (Williams and Schneider, 2016).

This paper advances knowledge in three ways: First, and empirically, it not only reports the first survey on tax morale in FYROM conducted after the fourth wave of the European Values Survey in 2008, which is now outdated, but also the first survey in FYROM that evaluates the association between participation in undeclared work and perceived level of sanctions, detection and tax morale. Secondly, this paper results in advanced understanding by evaluating the rational economic actor and social actor approaches towards undeclared work, and, particularly, the assumption in relevant literature that the social actor approach is merely an extension of the rational economic actor approach, which explains the residual non-compliance not explained by the rational economic actor approach (Alm *et al.*, 2012b). Finally, the third way knowledge is advanced is by revealing that there is no association between participation in undeclared work and perceived level of penalties and risk of detection, whereas there is an association with the level of tax morale, which contributes to policy by revealing the need for greater emphasis on improving tax morale when tackling undeclared work.

Consequently, in section 2, these rational economic actor and social actor approaches are reviewed in order to formulate hypotheses for evaluation. Section 3 then introduces the data and methodology to evaluate these hypotheses, namely a logit regression analysis of 2,014 face-to-face interviews conducted in 2015 in FYROM. The results are reported in section 4, while section 5 concludes by discussing theoretical and policy implications.

1. Tackling undeclared work: literature review and hypotheses development

Recently, it has been widely recognised that even if the undeclared economy is more prevalent in the developing rather than the developed world, it is extensive and persistent in all global regions and not decreasing in scale over time (ILO, 2013; Jütting and Laiglesia, 2009; Williams and Schneider, 2016). Indeed, with some estimates suggesting that 60% of the global workforce have their main job in the undeclared economy (Jütting and Laiglesia, 2009), tackling undeclared work has moved nearer the top of policy agendas of supra-national agencies and governments across the globe (European Commission, 2007; OECD, 2012; Williams, 2014a, 2017).

How can undeclared work be tackled? Reviewing the literature, it is apparent that there are two distinct policy approaches, each grounded on different explanations for participation in undeclared work. These are the rational economic actor approach, which tackles undeclared work by ensuring that the benefits from undeclared work are lower than the costs, and the social actor approach based on a view that undeclared work arises when tax morale is low. Below, each one is considered in turn.

Rational economic actor policy approach

This rational actor approach came to the fore in the late 1960s, when it was popularised by Becker (1968) when explaining crime. In the early 1970s, Allingham and Sandmo (1972) then applied it to tax non-compliance, viewing the non-compliant as rational economic actors who evade tax when the pay-off is greater than the expected cost of being caught and punished. The goal for governments was, thus, to change the cost/benefit ratio perceived by those considering non-compliance. This was to be achieved by increasing the actual and/or perceived penalties and risks of detection, and, consequently, costs. Such an approach was subsequently widely adopted (e.g., Grabiner, 2000; Hasseldine and Li, 1999; Job *et al.*, 2007; Richardson and Sawyer, 2001; Williams, 2017).

Indeed, this is also the dominant policy approach in FYROM, the country studied in this paper. Amendment to the Law on Labour Relations (Official Gazette of the Republic of Macedonia, No. 54/2013) increased penalties for undeclared work to €7,000 and since 2012, there has been a focus on improving the likelihood of detection, using not only wider electronic data exchange across government

agencies, but also more targeted inspections in high-risk sectors (Dzhekova *et al.*, 2014).

Despite its widespread adoption, the evidence-base that increasing the risks of detection reduces undeclared work is less than conclusive (Alm *et al.*, 1992, 1995; Slemrod *et al.*, 2001; Varma and Doob, 1998). Therefore, in order to evaluate the validity of this rational economic actor approach, the following hypothesis can be tested:

Rational economic actor hypothesis (H1): the greater the perceived penalties and risk of detection, the lower the likelihood of participation in undeclared work, *ceteris paribus*.

H1a: the greater the penalties perceived, the lower the likelihood of participation in undeclared work.

H1b: the greater the risks of detection perceived, the lower the likelihood of participation in undeclared work.

Social actor policy approach

During the past decade or so, a new policy approach has emerged which recognises that citizens are not always rational economic actors, given that many operate voluntarily on a declared basis even when the benefit/cost ratio suggests that they should work in the undeclared economy (Alm *et al.*, 2010; Kirchler, 2007; Murphy, 2008; Murphy and Harris, 2007). A 'social actor' model has, thus, emerged, which views participation in undeclared work as resulting from low tax morale.

This approach has its origins in the classic work of Georg von Schanz (1890), who drew attention to the relevance of the tax contract that exists between the state and its citizens. More than six decades later, the German 'Cologne school of tax psychology' sought to measure tax morale (see Schmölders, 1952, 1960, 1962; Strümpel, 1969) and viewed it as strongly correlated with tax non-compliance (Schmölders, 1960). Although the rise of the rational economic actor approach from the 1970s onwards led to the demise of this social actor approach, over the past decade or so, it has re-emerged (Alm *et al.*, 2012a; Kirchler, 2007; Torgler, 2007, 2011). At the heart of this approach lies the objective of improving tax morale in order to elicit greater self-regulation (Alm and Torgler, 2011; Kirchler, 2007; Torgler, 2007, 2011, 2012; Williams, 2014a; Williams, 2017). This is sometimes seen as an extension of the rational economic actor approach and explains the residual non-compliance not explained by the rational economic actor approach (Alm *et al.*, 2012b).

Reading this tax morale approach through the lens of institutional theory (Baumol and Blinder, 2008; North, 1990), all societies are viewed as having both formal institutions, which are codified laws and regulations that define the legal rules of the game, and informal institutions, which are 'socially shared rules, usually unwritten, that are created, communicated and enforced outside of officially sanctioned channels'

(Helmke and Levitsky, 2004: 727). When adopting this institutional lens, tax morale measures the extent to which formal institutions (which we term as 'state morale' here) and informal institutions (here termed as 'civic morale') are aligned. When there is asymmetry, tax morale will be low and engagement in undeclared work rife (Williams and Horodnic, 2017a, b). Therefore, to evaluate the validity of this policy approach towards tackling participation in undeclared work, the following hypothesis can be evaluated:

Social actor hypothesis (H2): the greater the tax morale, the lower the likelihood of participation in undeclared work.

2. Data and Variables

Data

To evaluate these hypotheses on tackling undeclared work, the data reported here come from 2,014 face-to-face interviews conducted in FYROM in late 2015. This survey was collected by the private, independent Macedonian research agency BRIMA for the purpose of the European Commission's Framework 7 Industry-Academia Partnerships Programme (IAPP) research project titled 'Out of the shadows: developing capacities and capabilities for tackling undeclared work in Bulgaria, Croatia and FYROM'.[1] The survey analysed not only attitudes towards undeclared work, but also who purchases and supplies undeclared work, and the relationship between participation in undeclared work and the perceived penalties and risk of detection, as well as level of tax morale.

To collect these data, a multi-stage random (probability) sampling methodology was used to ensure that issues of gender, age, region and locality size, the national level sample, as well as each level of the sample, were representative as proportions of the country's population size. Furthermore, to balance the random error, the database is additionally weighted based on age and gender characteristics.[2] In every household the 'closest birthday' rule was applied to select respondents, while every subsequent address was determined by the standard 'random route' procedure used in Eurobarometer surveys. Interviewing was performed using the face-to-face methodology (TAPI – Tablet Assisted Personal Interview) by trained professional interviewers.

Given the sensitive topic being investigated, the reliability of the data collected needs to be briefly discussed. In 93% of the interviews, interviewers reported good or excellent cooperation from the participant when answering questions, and average cooperation in 6% of the cases. Cooperation was found to be poor in only 1% of cases. No evidence was, therefore, identified of reticence on the part of respond-

1. For more about BRIMA agency please see: http://www.brima.com.mk/eng/index.html
2. A total of 2,014 effective interviews were completed yielding an overall margin of error of ± 2.18% at the midrange of the 95% confidence level. Consequently, population weights based on age and gender are additionally applied to balance this random error.

ents in answering the questions, perhaps reflecting how undeclared work, although formally illegal, is widely deemed a socially legitimate activity in FYROM.

Variables

To evaluate whether increasing penalties and risks of detection and having greater tax morale reduce the likelihood of participation in undeclared work, the dependent variable used is a dummy variable with recorded value 1 for those who answered 'yes' to the question: 'Did you yourself carry out any undeclared paid activities in the last 12 months?' Here we mean again activities which you were paid for and which were not or not fully reported to tax authorities.'

Drawing upon previous studies evaluating participation in undeclared economy (Williams and Horodnic, 2015a, b, 2017a; Williams and Padmore, 2013a, b), Table 1 illustrates these explanatory variables along with the control variables used in the analysis.

Given that there were a considerable number of missing values and answers (i.e., refusal and 'don't know') across dependent and independent variables, multiple imputation was used to predict values. This is done using a system of chained equations for each variable with missing values, with twenty five imputations simulated for each missing value.

To evaluate the relationship between participation in undeclared work and perceived penalties and risk of detection, as well as the level of tax morale, a logit regression analysis is here conducted and then the average marginal effects are calculated.[3] The following equation is estimated:

$$\Pr(Un\_work_i = 1) = \beta_0 + \beta_1 Exp\_sanc_i + \beta_2 Det\_risk_i + \beta_3 Tax\_mor_i + \mathbf{Con\_var}_i\boldsymbol{\gamma} + \varepsilon_i,$$

where i indicates the individuals observed in the sample (i=1,...,n) and n the total number of individuals in the sample. Furthermore, Pr represents probability of engagement in undeclared economy, Un_work_i denotes participation in undeclared work, Exp_sanc_i denotes the level of perceived penalties, Det_risk_i denotes the level of detection risk, Tax_mor_i denotes the level of tax morale, and $\mathbf{Con\_var}_i$ denotes all control variables defined in Table 1.

3. For more details about the logit model, please, see Green (2008) and Maddala (2001).

Table 1. Summary of variables used in the analysis

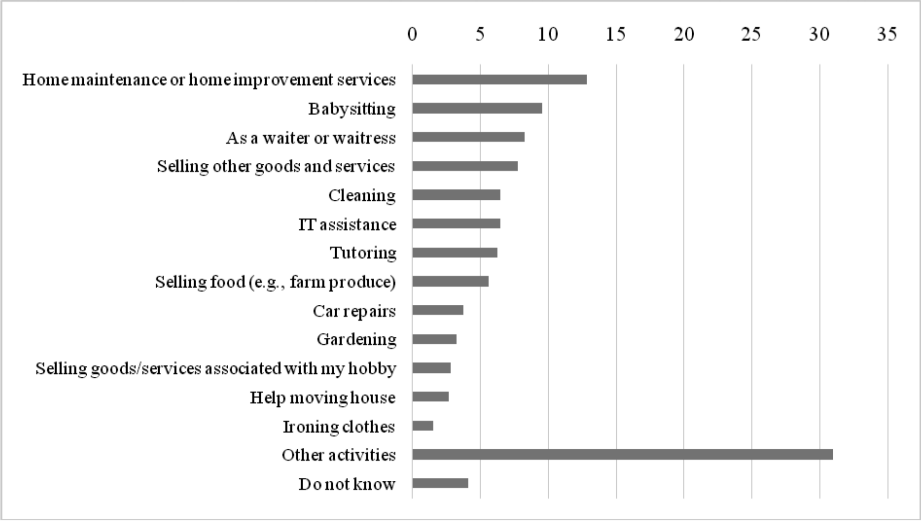
Variables	Definition	Number of missing values
Participation in undeclared work	A dummy variable with recorded value 1 for those who answered 'yes' to the question: '*Did you yourself carry out any undeclared paid activities in the last 12 months?'* and with recorded value 0 otherwise.	108
Earnings from undeclared work	A categorical variable measuring undeclared worker's earnings from the undeclared activities in the last 12 months with value 1 for 1-100 Euros, value 2 for 101-200 Euros, value 3 for 201-500 Euros, value 4 for 501-1000 Euros, and value 5 for more than 1000 Euros.	34
Control variables:		
Gender	A dummy variable with value 0 for men and 1 for women.	0
Age	An interval variable indicating the exact age of the respondent.	0
Nationality	A dummy variable with value 0 for Macedonian and value 1 for Albanian.	0
Employment status	A categorical variable for the employment status of respondents with value 1 for employed, value 2 for self-employed, value 3 for unemployed, value 4 for retired, and value 5 for students and inactive persons.	0
Financial situation	A categorical variable for the respondent's financial situation with value 1 for struggling, value 2 for maintaining, value 3 for just comfortable, and value 4 for no money problems.	82
Estimated share	A categorical variable in which every respondent estimated the proportion of the population engaged in undeclared work with value 1 for less than 5 percent, value 2 for 5 to 10 percent, value 3 for 10 to 20 percent, value 4 for 20 to 50 percent, and value 5 for over 50 percent.	150
Type of locality	A categorical variable for the type of locality where a respondent lives with value 1 for rural area or village, value 2 for small or middle-sized town, and value 3 for large town.	0
Region	A categorical variable for region where a respondent lives with value 1 for Vardar, value 2 for Eastern, value 3 for Southwestern, value 4 for Southeastern, value 5 for Pelagoni, value 6 for Polog, value 7 for Northeastern and value 8 for Skopje.	0
Explanatory variables:		
Detection risk	A categorical variable describing the perceived risk of being detected when someone is engaged in unregistered activities with value 1 for very small risk, value 2 for fairly small risk, value 3 for fairly high risk and value 4 for very high risk	136
Expected sanctions	A categorical variable describing the expected scale of sanctions when someone is engaged in unregistered activities with value 1 for those asserting that the normal tax or social security contributions would be due, value 2 for those stating that the normal tax or social security contributions due, plus there would be a fine or value 3 for imprisonment	218
Tax morale	A dummy variable which estimates the level of tax morale using the following question: "Now I would like to know how you assess various behaviour patterns. For each of them, please tell me to what extent you find it acceptable or not. Please use the following 10-point Likert scale: '1' means that you find it "absolutely unacceptable" and '10' means that you find it "absolutely acceptable":... *Someone evades taxes by not or only partially declaring income."* The variable takes value 1 for high tax morale (absolutely unacceptable for someone to evade taxes by not declaring or only partially declaring her income) and value 0 otherwise.	74

Source: Own representation based on the representative survey of 2,014 individuals in FYROM

3. Findings

Of the 2,014 respondents interviewed in 2015 in FYROM, 6.6 percent reported having participated in undeclared work in the last 12 months, which is 1 in 15, and they reported earning a mean income of 393 Euros per annum from their undeclared work.[4] Examining the type of activities in which they had engaged, Figure 1 illustrates that 13% of these undeclared workers had provided home maintenance and improvement services, 10% baby-sitting, 8% had worked as a waiters or waitresses, 8% had sold other goods or services, 7% had engaged in domestic cleaning, 6% in IT assistance, 6% in tutoring, 6% had sold food produce, 4% engaged in car repairs, 3% in gardening services, 3% had sold goods or services associated with their hobby, 3% had undertaken home removal, and 2% had ironed clothes.

Figure 1. Type of activities carried out on an undeclared basis in FYROM, % of undeclared workers

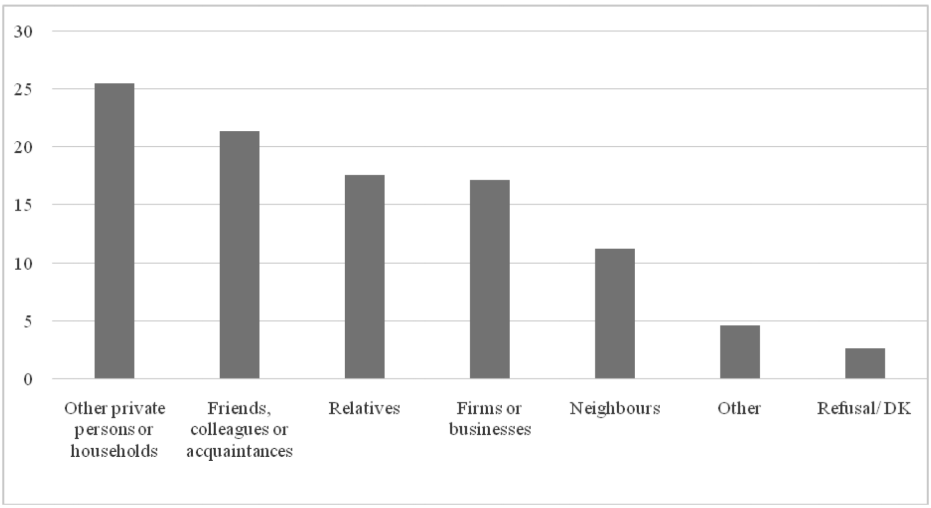


Source: Authors' own calculations based on the representative survey of 2,014 individuals in FYROM

4. Respondents who admitted participation in undeclared work were asked how much money they received in total from the undeclared activities which they had carried out in the last 12 months.

Figure 2 reveals that only 17% of this undeclared work was conducted as waged employment for businesses. The remaining 83% was conducted on a self-employed basis, with 21% conducted for friends, colleagues or acquaintances, 18% for relatives, 11% for neighbours, and the remaining 26% on a self-employed basis for people previously unknown to them. Some 7% either refused to answer or answered 'I do not know'. The important finding, therefore, is that half of all undeclared work in FYROM is conducted for close social relations. This is a similar proportion to findings in previous studies in the EU28 as a whole (Williams, 2014).

Figure 2. The structure of buyers of undeclared goods and services in FYROM, % of undeclared workers



Source: Authors' own calculations based on the representative survey of 2,014 individuals in FYROM

Which population groups, therefore, more frequently participate in undeclared work? And what are their views on penalties, risks of detection and acceptability of operating in the undeclared economy (i.e., their tax morale)? Table 2 reports these descriptive statistics, which reveals that men participate in undeclared work more frequently than women (and also earn a higher mean income from their work in the undeclared economy); those aged 25-39 engage in undeclared work more frequently, and the proportion participating then decreases as age increases; those of Albanian ethnicity participate in undeclared work far more frequently than Macedonians (11.8% compared to 4.7%); 15.1% of the self-employed and 9.0% of the unemployed engage in undeclared work. Other groups, such as employees, the retired and students do so less frequently. There is also a slight tendency for those struggling to

cope financially to participate in undeclared work more often. Those who perceive the rest of the population to be more likely to engage in undeclared work, often do so more themselves, reflecting that, where 'horizontal trust' is low (i.e., trust in other citizens to operate legitimately), undeclared work is more frequent. Undeclared work also appears to be more prevalent in rural areas and villages than in 'more urban' areas, and much more prevalent in some regions (i.e., the Southwestern and Polog regions) than the rest of the country.

Table 2. Participation in undeclared work in FYROM

	Participation in undeclared work (%)		Earnings from undeclared work:						
	Yes	No	€1-100 (%)	€101-200 (%)	€201- 500 (%)	€501-100 0 (%)	€1000+ (%)	Refusal/ Don`t know (%)	Mean income (EUR)
Total	6.6	93.4	27.1	15.6	11.3	11.4	6.4	28.2	393
Gender									
Male	8.6	91.4	23.5	12.8	13.0	10.0	8.3	32.4	433
Female	4.3	95.7	34.2	20.9	7.9	14.2	2.7	20.0	329
Age									
15-24	5.5	94.5	54.8	13.0	13.4	6.3	0.0	12.4	185
25-39	9.9	90.1	16.3	21.9	12.1	6.4	11.3	32.0	481
40-54	6.1	93.9	21.8	12.2	14.0	20.5	3.3	28.3	421
55-64	5.2	94.8	27.7	10.7	0.0	16.9	6.0	38.6	477
65+	2.7	97.3	57.9	0.0	11.9	11.9	0.0	18.4	189
Nationality									
Macedonian	4.7	95.3	29.7	10.2	12.8	14.3	9.7	23.3	477
Albanian	11.8	88.2	23.9	22.2	9.4	7.9	2.3	34.4	271
Employment status									
Employed	5.9	94.1	15.3	20.7	12.5	8.7	8.5	34.2	497
Self-employed	15.1	84.9	19.5	7.0	22.4	7.1	7.8	36.2	439
Unemployed	9.0	91.0	22.3	16.5	8.4	15.3	7.7	29.7	458
Retired	2.6	97.4	57.3	0.0	0.0	9.0	0.0	33.7	128
Student and inactive	5.2	94.8	57.9	17.6	11.1	13.5	0.0	0.0	187
Financial situation									
Struggling	5.9	94.1	23.6	20.8	9.2	19.4	9.2	17.9	484
Maintaining	6.9	93.1	20.1	14.1	16.1	9.9	6.9	33.0	428
Just comfortable	5.2	94.8	36.8	19.4	0.0	9.9	4.8	29.1	296
No money problems	4.8	95.2	100.0	0.0	0.0	0.0	0.0	0.0	57
Estimated share									
less than 5%	4.5	95.5	64.3	0.0	0.0	17.3	0.0	18.3	196
5 to 10%	2.6	97.4	8.7	41.1	0.0	17.3	0.0	33.0	326
10 to 20%	5.2	94.8	35.1	6.3	8.0	0.0	5.7	45.0	247
20 to 50%	7.6	92.4	22.8	11.8	11.6	17.6	7.4	28.7	483
50% or more	12.2	87.8	27.1	25.5	16.9	3.8	7.3	19.3	351
Type of locality									
Rural area or village	8.0	92.0	26.2	24.8	13.2	5.0	5.2	25.7	297
Small or middle sized town	5.3	94.7	25.2	0.0	25.1	29.7	0.0	20.1	412
Large town	5.3	94.7	29.0	6.2	5.3	16.2	9.6	33.7	540
Region									
Vardar	3.9	96.1	36.4	0.0	0.0	24.6	0.0	39.0	367
Eastern	2.9	97.1	71.5	0.0	28.5	0.0	0.0	0.0	119
Southwestern	13.1	86.9	12.7	29.9	25.9	7.6	13.5	10.4	495
Southeastern	3.0	97.0	55.0	0.0	0.0	0.0	0.0	45.1	100
Pelagoni	4.5	95.5	53.0	0.0	8.6	18.0	0.0	20.3	272
Polog	13.0	87.0	20.9	29.8	5.6	3.0	5.8	35.0	276
Northeastern	1.0	99.0	0.0	0.0	0.0	0.0	0.0	0.0	0
Skopje	5.8	94.2	25.2	0.0	7.6	23.3	6.3	37.6	575
Detection risk									
Very low	7.9	92.1	26.1	11.6	19.0	9.8	4.7	28.8	355
Fairly low	6.2	93.8	29.9	14.8	7.6	3.6	7.7	36.5	406
Fairly high	7.9	92.1	28.6	19.6	10.6	11.5	9.6	20.2	417
Very high	4.9	95.1	23.0	13.2	8.7	19.6	0.0	35.6	325
Expected sanctions									
Normal tax or social security contributions due, but no fine	7.9	92.1	18.2	21.5	15.2	14.7	5.6	24.8	415
Normal tax or social security contributions due, plus a fine	5.4	94.7	34.4	11.4	4.6	11.4	7.2	31.1	409
Imprisonment	7.2	92.8	55.5	0.0	0.0	0.0	14.5	30.0	289
Tax morale									
High tax morale	4.7	95.3	35.0	6.8	13.6	12.2	9.3	23.0	429
Otherwise	8.4	91.6	23.1	19.9	10.2	11.3	4.8	30.7	375

Source: Authors' own calculations based on the representative survey of 2,014 individuals in FYROM

Examining the possible association of participation in undeclared work with the risk of detection perceived, no discernible trend appears to be apparent and so far as sanctions are concerned, there appears to be a slightly greater possibility that those who perceive sanctions as lower engage in undeclared work more often. There does, however, appear to be a possible relatonship between participation in undeclared work and tax morale. The higher the level of tax morale, the lower the likelihood of participating in undeclared work. However, to examine this, logit regression model has to be applied.

To evaluate whether there is statistically significant association between participation in undeclared work and these explanatory variables when control variables are introduced and held constant, as well as whether any of these control variables are significantly associated with participation in undeclared work, Table 3 reports the average marginal effects after estimation of the logit model. To do this, a staged approach was adopted. In model 1, the socio-demographic variables were analysed, in model 2 socio-economic characteristics were added, in model 3 spatial variables were added as well, before model 4 added variables evaluating policy approaches, namely penalties and detection risks perceived, and tax morale.

Starting with the control variables and, therefore, which employee groups should perhaps be targeted by inspectors seeking to tackle participation in undeclared work, the finding in model 1 is that gender is strongly statistically significant; women are less likely to participate in undeclared work by between 3.7 and 4.2 percentage points than men. Ethnicity is also statistically significant with those of Albanian ethnicity being more likely than Macedonians to participate in undeclared work. Age, however, is not found to be associated with participation in undeclared work. When socio-economic variables are added in the case of model 2, the signs and significance levels of these socio-demographic variables remain the same. The additional finding is that the unemployed are significantly more likely to participate in undeclared work than those employed, those retired, students and the economically inactive. For example, the marginal effect indicates that being employed, rather than unemployed, reduces the probability of participation in undeclared work by between 3.0 and 3.2 percentage points. This is similar for those who perceive that more than 50% of the population are engaged in undeclared work: they are significantly more likely to participate in undeclared work than groups believing that small proportions of the population are engaged in the undeclared economy. Furthermore, the marginal effect indicates that those who perceive that less than 5 percent of the population are engaged in undeclared work are between 5.3 and 5.8% less likely to participate in undeclared work than those perceiving that more than half of the population are engaged in undeclared work. 'Horizontal trust', therefore, appears to play a significant role in determining participation in undeclared work. There is no statistically significant relationship, however, between participation in undeclared work and one's financial status.

Table 3. Average marginal effects after logit estimate of the likelihood of participation in undeclared work in FYROM

	Model 1 Marginal effect (Standard error)	Model 2 Marginal effect (Standard error)	Model 3 Marginal effect (Standard error)	Model 4 Marginal effect (Standard error)
Female	-0.042 (0.013)***	-0.037 (0.013)***	-0.037 (0.013)***	-0.037 (0.013)***
Age	-0.001 (0.000)	0.000 (0.000)	0.000 (0.000)	0.000 (0.000)
Nationality (RC: Macedonian)				
Albanian	0.053 (0.013)***	0.052 (0.013)***	0.024 (0.016)	0.016 (0.017)
Employment status (RC: Unemployed)				
Employed		-0.031 (0.018)*	-0.032 (0.018)*	-0.030 (0.018)*
Self-employed		0.036 (0.035)	0.042 (0.037)	0.036 (0.036)
Retired		-0.052 (0.021)**	-0.052 (0.020)***	-0.051 (0.020)**
Student and inactive		-0.046 (0.017)***	-0.041 (0.017)**	-0.039 (0.017)**
Financial situation (RC: Struggling)				
Maintaining		0.007 (0.015)	0.003 (0.015)	0.006 (0.015)
Just comfortable		-0.008 (0.016)	-0.011 (0.016)	-0.004 (0.016)
No money problems		-0.022 (0.033)	-0.013 (0.041)	-0.016 (0.041)
Estimated share (RC: 50% or more)				
Less than 5%		-0.055 (0.024)**	-0.053 (0.024)**	-0.058 (0.026)**
5 to 10%		-0.075 (0.019)***	-0.073 (0.019)***	-0.079 (0.020)***
10 to 20%		-0.043 (0.022)**	-0.036 (0.023)	-0.043 (0.023)*
20 to 50%		-0.028 (0.019)	-0.026 (0.018)	-0.032 (0.020)
Type of locality (RC: Rural area or village)				
Small or middle sized town			0.033 (0.032)	0.034 (0.033)
Large town			-0.001 (0.013)	0.001 (0.013)
Region (RC: Vardar)				
Eastern			-0.009 (0.024)	-0.011 (0.027)
Southwestern			0.065 (0.029)**	0.062 (0.031)**
Southeastern			-0.019 (0.022)	-0.023 (0.023)
Pelagoni			0.006 (0.026)	0.005 (0.028)
Polog			0.057 (0.030)*	0.053 (0.032)*
Northeastern			-0.032 (0.022)	-0.036 (0.024)
Skopje			0.032 (0.024)	0.026 (0.026)
Detection risk (RC: Very low)				
Fairly low				-0.009 (0.018)
Fairly high				0.012 (0.018)
Very high				-0.022 (0.017)
Expected sanctions (RC: Normal tax or social security contributions due, but no fine)				
Normal tax or social security contributions due, plus a fine				-0.020 (0.013)
Imprisonment				0.000 (0.027)
High tax morale				-0.022 (0.013)**
Number of observations	2,014	2,014	2,014	2,014
Number of imputations	25	25	25	25
Prob > F	0.000	0.000	0.000	0.000
Pseudo R2	0.051	0.089	0.116	0.130
Area under ROC	0.680	0.727	0.756	0.764

Significance: *p<0.1, **p<0.05, ***p<0.01

Source: Authors' own calculations based on the representative survey of 2,014 individuals in FYROM

When spatial variables are added in the case of model 3, the signs and significance levels remain the same for the socio-demographic and socio-economic variables, with the exception of ethnicity. Once spatial variables are introduced, the significance of ethnicity disappears, largely because of the spatial concentration of these ethnic groups. Indeed, although there was moderate correlation between ethnicity and spatial variables, they remained within the limits required and, therefore, both predictors were retained in the model. The finding is that there is no statistically significant correlation between participation in undeclared work and urban/rural characteristics, but those from Southwestern and Polog regions are more likely to participate in undeclared work than others.

In model 4, the same socio-demographic, socio-economic and spatial signs and significance levels as in model 3 persist. However, the important finding is that there is no statistically significant relationship between participation in undeclared work and either the scale of penalties (refuting H1a) or the risk of detection (refuting H1b). However, tax morale is a significant predictor of the propensity to participate in undeclared work (confirming H2). The higher the tax morale, the lower the likelihood of participation in undeclared work is. Furthermore, those with high level of tax morale are 2.2% less likely to participate in undeclared work than others. These results, therefore, refute the rational economic actor deterrence approach adopted by many governments and validate the emergent social actor approach.

4. Discussion and Conclusions

Evaluating the association between participation in undeclared work and the conventional rational economic actor approach, which seeks to increase the penalties and risks of detection, and the social actor approach, which seeks to improve tax morale, the finding is that participation in undeclared work in FYROM is not influenced by penalties or risk of detection, but is significantly associated with the level of tax morale. Viewed through the lens of institutional theory, therefore, when norms, values and citizens' beliefs do not adhere to those of the state in terms of codified laws and regulations, there is greater likelihood for people to participate in undeclared work. Increasing the perceived or actual level of penalties and risk of detection citizens may be facing has no impact on the probability of undeclared work. Therefore, the current, widely used deterrence approach needs to be at least complemented by a tax morale approach.

What can, therefore, be done to improve tax morale? Given that tax morale is a measure of the lack of alignment of laws, codes and regulations of formal institutions and norms, beliefs and values of informal institutions (Helmke and Levitsky, 2004; Webb *et al.*, 2009), two sets of policy initiatives can be used to reduce the asymmetry between formal institutions ('state morale') and informal ones ('civic morale'), thus improving tax morale and, in doing so, reducing participation in undeclared work.

On the one hand, policy initiatives can be pursued to change norms, values and beliefs regarding the acceptability of participating in undeclared work. Firstly, campaigns can be designed to raise awareness about the benefits of working in the declared economy and the costs of participating in undeclared work, and secondly, policy initiatives can be pursued to educate citizens about the benefits of taxation in terms of public goods and services received for the taxes they pay. These measures might range from introducing the issue of taxation in the Civics syllabus of school curriculum through sending letters to taxpayers about how their taxes are spent, to putting up signs in hospitals, roads and schools, such as, for instance, 'Paid for by your taxes'.

On the other hand, however, reform of formal institutions is also required, especially in countries such as FYROM, where formal institutional deficiencies lead to lack of trust in the government. Firstly, this requires changes in the macro-economic level and social conditions that lead to lower tax morale, such as increasing the level of expenditure on active labour market policies to support vulnerable groups and the level of expenditure on social protection (Autio and Fu, 2015; Dau and Cuervo-Cazzurra, 2014; Thai and Turkina, 2014). Secondly, it requires changes to the way formal institutions operate in the form of governance modernisation. As previous studies have revealed, tax morale improves when citizens view the government as treating them in a respectful, impartial and responsible manner (Gangl *et al.*, 2013; Murphy, 2005), i.e., when citizens view themselves as paying their fair share compared to others (Kirchgässner, 2010, 2011; Molero and Pujol, 2012), and they believe they receive the goods and services they deserve given the taxes they pay (McGee, 2005). Ensuring citizens perceive themselves as receiving their fair share, when compared to others, and as being treated equitably and impartially is, therefore, a necessary perquisite condition for tackling participation in undeclared work.

However, these findings about the need for a social actor approach and for greater emphasis on tax morale are based on just one dataset in one country and are, therefore, very tentative. Further studies in other countries regarding the effectiveness of different policy approaches are required. So, if this paper stimulates further evaluations, in a wider range of countries, of the effectiveness of these contrasting policy approaches in reducing the likelihood of participating in undeclared work, then it will have fulfilled one of its intentions. And if this, then, stimulates governments to consider alternative approaches, other than simply deterring participation in undeclared work by increasing penalties and the risk of detection, then this paper will have fulfilled its broader aim.

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THE IMPACT OF DISAGGREGATED SOCIAL CAPITAL ON HOUSEHOLD ELECTRICITY INTENSITY

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Abstract
This paper aims, firstly, to analyse the dynamics of electricity efficiency measured by electricity intensity in the household sector in Croatia at the subnational level, in the period 2001-2013. Then, to shed more light on determinants affecting electricity intensity, it evaluates the effect of social capital thereon by conducting the stepwise and quantile regression methods. The results of the former indicate support for a negative effect of generalised trust and reciprocity on household electricity intensity. The results of the latter show that social capital does not influence electricity intensity uniformly; in other words, its influence is more significant in tourism-oriented regions and regions lagging behind. The findings are briefly discussed within the social study findings aimed at encouraging energy efficiency and sustainable behaviour of households through collective action for which generalised trust and reciprocity, as well as social trust in general, are crucial.

JEL Classification: A13, P28, R11
Key Words: Electricity Intensity, Generalised Trust, Social Capital, Croatia

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1. Introduction

Electricity intensity is an indicator of electricity efficiency in the economy that measures the amount of electricity necessary to produce a Euro's worth of economic output. A reduction in electricity intensity may indicate greater electricity efficiency and generate positive effects on all three EU energy policy challenges – namely, security of supply, climate change and affordability - as well as better quality of life in general. Hence, exploring the intensity of electricity use is also important from an energy policy-making perspective.

Recently, there has been growing interest in explaining the dynamics and determinants of energy and electricity intensity, in particular (Bodger and Mohamed, 2005; Liddle, 2009; Inglesi-Lotz and Blignaut, 2012; De Cian *et al.*, 2014; Pickenpaugh and Balash, 2015). The results of these studies indicate that energy/electricity intensity has been declining and will decline further over years, due to the adoption of more efficient technologies and practices, structural changes, new and more demanded efficiency standards, behavioural changes, as well as financial incentives for energy improvements (see, e.g., IEA, 2015 or EIA, 2016). The value of electricity intensity varies significantly between countries and regions (e.g., Bodger and Mohamed, 2005; De Cian *et al.*, 2014), depending on their development stage, the composition of their gross domestic product (GDP), the share of the electricity sector in gross output and total energy use, the state of technology, the price of electricity, demographics, and the like. Thereby, Industrialized Asia, Western Europe and North America have the lowest electricity intensity, while Eastern Europe and developing countries the highest (Bodger and Mohamed, 2005).

Although considerable research has been devoted to investigating electricity intensity at the national or cross-national level, rather less attention has been paid to the sub-national level, particularly in Central and Eastern Europe. However, this level plays a key role in implementing energy policies and action plans. It also has important correctional functions, since energy programs, plans and actions can be supplemented and corrected to better align with the specifics of sub-national areas. Moreover, bearing in mind that electricity consumption may cause economic growth and development, and that households make up an important electricity-consuming sector, it is worth explaining, determining and monitoring how efficiently electricity is used by this sector at the sub-national level.

While previous studies mostly stress the importance of demographic characteristics of consumer units in energy use (e.g., age or educational level), physical characteristics of dwellings (e.g., type of building, residence size or its age, building materials, and the like), economic variables (such as available income or GDP) and contextual variables (e.g., climate and weather); very little attention has been paid to social context and social capital, in particular. However, Georg already (1999) illuminated that many issues related to consumption are deeply rooted in

the social context, and Briceno and Stagl (2006) stressed that social capital itself can enhance the quality of life, while making the consumption process more efficient and, therefore, reducing consumption.

The main aim of this paper is twofold; first, to analyse the dynamics of electricity efficiency measured by electricity intensity in the household sector in 21 NUTS-3 (the Nomenclature of Territorial Units for Statistics) Croatian counties (hereafter: regions) over the period 2001-2013, and second, to evaluate the effects of social capital variables on electricity intensity in the household sector by conducting the stepwise regression method. The paper follows Borozan and Radman-Funaric (2016a), who defined social capital as a hierarchical construct with three main dimensions: social trust (composed of three sub-dimensions: generalised trust and reciprocity, institutional trust and trustworthiness [an individual's civic commitment and moral principles]), participation (membership in various associations, organisations and clubs) and civism (the perceived absence of opportunistic, predatory behaviour by fellow citizens, such as corruption, tax evasion or use of influential connections).

The stepwise regression method, described by Hinkle *et al.* (2003), is used to determine the set of social capital dimension and sub-dimension variables that make a statistically significant contribution to the explanation of variability in household electricity intensity. Namely, although the shortcomings of stepwise multiple regression are well known, the method is beneficial when there is little theory to guide the selection of determinants for a model (see Whittingham *et al.*, 2006). Quantile regression, proposed by Koenker and Bassett (1978), is further used to check the stepwise regression results and provides more in-depth insights into the effects of social capital variables on electricity intensity at different quantiles of electricity intensity.

Results obtained in this paper advance the energy and environment related literature in two ways. First, results show that a regional perspective in electricity conservation programs and action is not only justified but necessary, since electricity efficiency is unevenly distributed across regions and, also, dependent on economic conditions. Thereby, electricity intensity is generally higher in tourism-oriented regions and regions lagging behind, while it is lower in more developed regions. Second, social capital variables, generalised trust and reciprocity and social trust, in particular, play an important role in explaining energy intensity variability, indicating, this way, the possibility of enhancing electricity efficiency and conserving household electricity consumption by influencing social interaction in the population. This influence is particularly present in tourism-oriented regions and regions lagging behind.

The remainder of this paper is divided into four sections. Section 2 briefly reviews relevant literature on the relationships between social capital and energy efficiency. Section 3 explains the main trends in electricity intensity in Croatia and

its regions, and describes the data used and the method applied. Section 4 presents and discusses empirical results, while Section 5 concludes with a brief look at some possible directions for further research.

2. A Review of Social Studies of the Relationship between Social Capital and Energy Efficiency

A positive effect of social capital and its particular dimensions on common goals of a certain group of people has been explored and corroborated in many studies (Ostrom, 1990; Putnam *et al.*, 1993; Inglehart, 1997). The aim of this paper is to find out whether social capital also affects electricity intensity in the household sector.

Allcott (2011) observed that economists, in general, and energy policymakers, in particular, have historically focused on how economic variables, such as prices or financial incentives, affect demand. However, he demonstrated that non-price interventions, like sending a letter to consumers on their electricity consumption over the past twelve months compared with the mean of their comparison group, together with suggestions on energy saving actions, can affect consumer behaviour and encourage people to conserve energy. Nolan *et al.* (2008) and Schultz *et al.* (2007) also corroborated that social norms have a significant effect on energy conservation. To that end, Nolan *et al.* (2008) showed that descriptive norm messages (e.g., information about energy consumption of neighbouring households) have a greater effect on electricity consumption than mere advice on energy conservation, while Schultz *et al.* (2007) showed that descriptive norm messages should be combined with injunctive messages so as to have a greater effect and prevent the occurrence of the so-called boomerang effect. Goldstein *et al.* (2008) explained this effect of descriptive norms on people behaviour. They emphasised that a social group adapts its behaviour to the behaviour of people in its neighbourhood, and that descriptive norm messages may have a greater effect on the individual rather than global norms. Zak and Knock (2001) demonstrated that trust is lower when the social distance between people is larger.

Empirical literature in this field also illuminates that energy conservation produces two side effects on electricity consumers: lower electricity costs and a good feeling that they contribute to environmental conservation. Frederiks *et al.* (2015) clarified that cognitive biases and motivational factors in household energy consumption and conservation behaviour are necessary in order to bridge the gap between pro-environmental knowledge, values, attitudes and intentions, and everyday energy-related behaviour of consumers. Sanditov and Arora (2016) underlined that an individual is more willing to invest in a global public good within a 'cohesive' network structure, which is rich in social ties spanning across families, neighbourhoods and circles of close friends.

Kavousian *et al.* (2013) analysed household electricity consumption and its structural and behavioural determinants for 1,628 households in the U.S.

They found out that external conditions (e.g., weather and location), physical characteristics of dwellings (e.g., residence size), appliances and electronics stocks, as well as occupants, are significant drivers of electricity consumption. Moreover, they found out that weather and physical characteristics of dwellings influence more considerably household electricity consumption compared to, e.g., occupant behaviour, a finding consistent with those by Guerra Santin *et al.* (2009). However, in terms of the impact of behavioural factors, their results agree with some previous studies (Cramer *et al.*, 1985; Gouveia *et al.*, 2012), which showed that household electricity consumption is primarily determined through the way households use electricity, rather than by the way they value energy efficiency.

Georg (1999) already found that many issues related to consumption are deeply embedded in social context. A number of factors influence, directly or indirectly, the household level of energy consumption, and from a sociological point of view, increase in consumption may be reduced to a common denominator: the trend towards individualisation. The most noticeable physical indication of individualisation is the trend towards a decreasing number of people per household, which, according to Vercalsteren and Geerken (2003), leads to the creation of new preferences and patterns of consumption centred more and more on the individual. Thus, according to Briceno and Stagl (2006: 1542), "Consumption as the search for comfort and stimulation has been substituting for some of the voids created in increasingly more individualised societies. Thus, the lack of social relations and coordinated action seems to have the potential to intensify the demands being made from the world of material consumption."

To sum up, the previous studies confirm the importance of social context and social norms and trust, in particular, as important drivers of household electricity consumption, and therefore, indirectly energy intensity. However, it does not consider social capital in its complexity; so, the importance of other social capital dimensions and sub-dimensions have remained unexplored. The aim of this paper is to address this gap in the literature.

3. Data, Electricity Intensity Trends and Method

3.1 Data

In the present study, data are related to social capital variables and electricity intensity for 21 Croatian NUTS-3 regions. The former were obtained by Borozan and Radman-Funaric (2016a), who conducted primary research through a questionnaire on a convenience sample (N = 1,695) in the period from 20 June to 20 December 2012 in Croatia. The details of the questionnaire, the collection process, methodology and the model are described in their papers. Based on their database, Borozan *et al.* (2016b) calculated the average value of social capital variables for each Croatian region, which are also used in this paper.

Electricity intensity may be measured in different ways: as the ratio of energy consumption to a unit of measurement (e.g., GDP, GDP per capita, number of workers, floor space, disposable income) (EIA, 1999). The paper follows Mukherjee (2008), Inglesi-Lotz and Blignaut (2012) and others, who defined electricity intensity as the ratio of electricity consumption to GDP. To study trends and exclude the impact of inflation, GDP is given in constant Euro prices using 2010 as the base year. Since electricity consumption is measured in GWh and GDP in million EUR, this ratio is measured in GWh per million EUR (GWh/MEUR). GDP and household electricity consumption data for the period 2001-2013 were obtained from the Croatian Bureau of Statistics (CBS) and Hrvatska elektroprivreda (HEP), respectively. HEP is a leading Croatian electricity company. Electricity consumption data are related to 21 Croatian distribution districts used as proxies for the Croatian 21 NUTS-3 regions. Household consumption covers the total usage of electricity for space and water heating, lighting and for all electrical appliances.

In this paper, social capital dimension and sub-dimension variables are used as predictor variables, while electricity intensity of the household sector is used as the dependent variable. Besides them, per capita GDP and professional and university qualifications will be used as control variables, as described in Section 4.1.

3.2 The Dynamics of Electricity Intensity in Croatia

As an EU Member State, Croatia is committed to more efficient energy use at every stage of the energy chain. To reach the EU energy target of at least 27% energy efficiency improvement by 2030, the country set its own indicative national energy efficiency targets and designed numerous programmes, plans and actions (for the national energy efficiency policy background, see EIHP, 2015). For example, by 2020, the national energy efficiency target expressed as the absolute amount of final energy consumption amounts to 293.04 PJ.

Average per capita household electricity consumption in Croatia in 2013 was 1.5 MWh, which is slightly below the EU-28 average in 2013 (1.6 MWh per capita; Eurostat data, 2015). Above-average consumption is recorded in nine Croatian regions, which are more developed and more tourism-oriented and use electricity for space and water heating, but also for cooking and cooling. For this sector, the share of electricity in final energy consumption remained approximately the same over the period considered (i.e., 22%).

Household electricity consumption increased annually by 2.73% in the period 2001-2008, when the economy and living standards progressed, and when winter periods were colder, but decreased in the period of economic recession (2009-2013) by an annual rate of 9.92% (see Table 1). In the same periods of time, electricity intensity, measured in GWh/MEUR of GDP at 2010 prices, changed at an annual rate of -2.10% and +1.19%, respectively.

Table 1. Annual rates of household electricity consumption and intensity changes

	Annual rates of change (in %)					
	Electricity consumption			Electricity intensity		
Region	2001-2013	2001-2008	2009-2013	2001-2013	2001-2008	2009-2013
City of Zagreb	0.822	2.661	-1.214	-1.269	-2.919	0.018
Krapina-Zagorje	-0.074	1.180	-1.521	0.954	-0.426	0.772
Varazdin	0.453	1.419	-1.121	0.269	-1.644	1.604
Medjimurje	0.435	1.707	-0.885	-0.949	-2.894	0.887
Koprivnica-Krizevci	0.529	2.203	-1.895	1.645	1.477	2.555
Bjelovar-bilogora	0.546	1.999	-1.313	0.862	-1.373	3.812
Zagreb	0.752	2.257	-1.314	-1.659	-4.100	1.159
Osijek-Baranja	-0.344	0.685	-1.562	-1.513	-4.596	1.791
Vukovar-Syrmia	-0.266	1.110	-1.836	-0.762	-3.479	2.151
Brod-Posavina	0.013	1.302	-1.567	-0.033	-1.770	0.856
Istria*	1.425	3.434	-0.432	0.345	-0.623	1.991
Primorje-Gorski Kotar*	0.974	2.863	-0.996	-0.992	-2.329	-0.518
Split-Dalmatia*	1.821	3.985	0.251	0.461	-1.519	3.092
Zadar*	2.789	5.405	-0.010	0.400	-2.001	2.715
Sibenik-Knin*	1.757	3.733	-0.858	-0.550	-2.632	-0.834
Dubrovnik-Neretva*	2.598	4.881	-0.264	0.136	-1.909	2.046
Karlovac	0.329	1.758	-1.190	0.785	-0.456	0.650
Sisak-Moslavina	0.279	2.110	-2.233	0.386	-0.102	0.639
Lika-Senj*	2.072	4.228	-0.498	1.527	-1.431	4.517
Virovitica-Podravina	0.228	1.546	-1.456	1.599	-0.379	2.283
Pozega-Slavonia	0.392	2.003	-1.749	1.275	-0.217	1.747
Croatia	0.963	2.726	-0.920	-0.376	-2.103	1.188

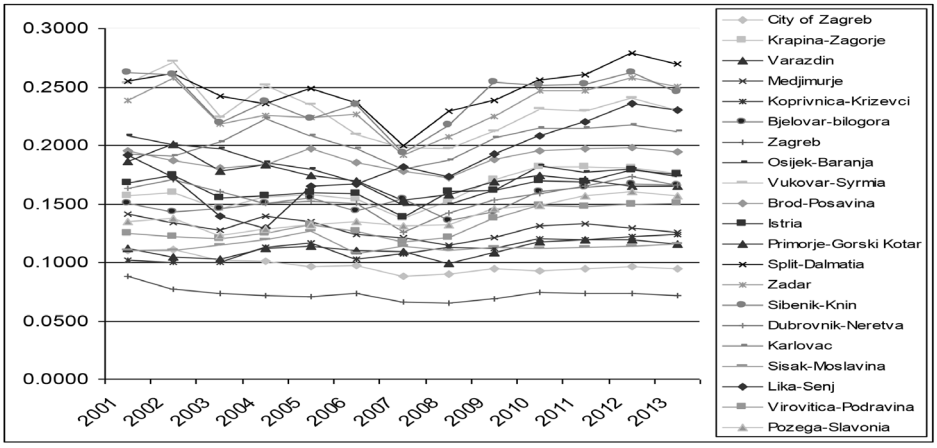
Note:
* denotes regions of Adriatic Croatia;
the other regions (without *) belong to Continental Croatia

The same pattern of behaviour can be noticed at the NUTS-3 level, although there are significant differences in electricity intensity. Over the period under consideration, electricity intensity ranges between the lowest value at 0.1394 GWh/MEUR 2010 in 2008 and the highest of 0.2138 GWh/MEUR 2010 in 2001. Figure 1 illustrates the evolution of energy intensity across Croatian NUTS-3 regions.

While there is a similar pattern in electricity intensity for the Croatian NUTS-3 regions, the evolution in some of the regions shows heterogeneity in the series and across regions, and also the possible existence of significant structural break(s) occurring mostly at the beginning of the recession. Hence, at least two time periods can be noticed in the dynamics of the series, namely, before and during the recession (see Table 1). In Croatia, the recession started in the last quarter of 2008 and lasted until the end of 2014. Before the recession (2001-2008), which was particularly severe (GDP declined by approximately 13%), household electricity consumption increased, while electricity intensity decreased. However, during the recession, these behaviour patterns changed in most regions. In fact, household electricity consumption declined due to increasing electricity rates and food prices, decreasing disposable income and rising economic uncertainty in general, as well as due to warmer winter periods (particularly in the period 2011-2013), while electricity

intensity increased due to both a decrease in the electricity nominator and the GDP denominator. This is a common effect of economic downturns, already noticed in many other countries going through a similar economic situation (e.g., IEA, 2012; Nelder, 2013).

Figure 1. The evolution of energy intensity across Croatian NUTS-3 regions 2001-2013



However, there is a distinguishing pattern in energy intensities of Continental and Adriatic regions and more and less developed regions in Croatia. Electricity intensity is generally higher in tourism-oriented regions, i.e., regions belonging to the so-called Adriatic Croatia (e.g., Split-Dalmatia, Zadar, Sibenik-Knin or Lika-Senj), and regions lagging behind (e.g., Vukovar-Syrmia or Brod-Posavina), while it is lower in more developed regions of the so-called Continental Croatia (e.g., the City of Zagreb or Varazdin). The former use more electricity per capita for space and water heating, cooking and cooling over the year (Adriatic Croatia) or generate less GDP while, at the same time, they use less electricity (regions lagging behind located in Continental Croatia). The latter use mostly natural gas for space & water heating and cooking, while they also generate more GDP.

3.3 Method

Considering that there is little theoretical background to guide the selection of social capital variables for the household electricity intensity model, the stepwise regression method is chosen. It has already been used in energy or environmental modelling aiming to identify the most influential explanatory variables (e.g., Hygh *et al.*, 2012 or Kavousian *et al.*, 2013). To determine the best combination of social capital dimension and sub-dimension predictor variables, three variable selection

procedures were used: forward selection, backward elimination, and stepwise selection procedure. As usual, threshold values for *F*-to-enter and *F*-to-remove are set at 0.05 and 0.10, respectively. These procedures are briefly explained below, while more information about them may be found in Hinkle *et al.* (2003).

The forward selection procedure starts with no candidate variables in the model. Then, it selects the variable that has the highest *F*-to-enter statistics. At each further step, it selects the candidate variables that have an *F*-to-enter test higher than the threshold value. When none of the remaining variables is significant, the procedure stops adding variables. During this process, once a predictor variable enters the model, it cannot be deleted. In the backward elimination procedure, all predictor variables are entered into the regression equation. Then, the regression procedure successively removes variables with the smallest *F*-to-remove statistics, provided that this is below the threshold value for *F*-to-remove. In the case of the stepwise procedure that combines the forward and the backward selection one, predictor variables are entered into the regression equation one at a time, based on *F*-to-enter statistics. More precisely, a particular predictor variable that demonstrates the highest bivariate correlation with the dependent variable (i.e., the highest *F*-to-enter statistics) is entered first in the regression equation. The regression procedure then looks for the next significant variable, if any, at step two, and then produces regression results based on these two variables. This procedure is continued until all independent variables, with *F*-to-enter statistics above the threshold, have been entered into the equation. The method also examines whether the *F*-to-remove statistics of any variable previously added has fallen below the *F*-to-remove threshold. If so, the worst of them are removed, and then the procedure attempts to continue. It ends when no variable, either in or out of the model, has *F*-statistics on the wrong side of their respective thresholds.

In addition to the stepwise regression method, the quantile regression method is employed. As stated by Koenker and Hallock (2001: 143), it is "an extension of ordinary least squares estimation of conditional mean models to the estimation of an ensemble of models for several conditional quantile functions". The method enables the estimation of a linear relationship between regressors and a specified quantile of the dependent variable. This method provides deeper insights into the conditional distribution of the dependent variable by allowing the estimation of various quantile functions of a conditional distribution rather than using conditional mean analysis alone. Putting different quantile regressions together, the method also provides a more complete description of the underlying conditional distribution (Kuan, 2007). Moreover, no strong distributional assumptions are required, which makes this a robust method for modelling the relationship between regressors and a specified quantile of the dependent variable (Buchinsky, 1998; Kuan, 2007). For a detailed discussion of quantile regressions, one may refer to Koenker and Bassett (1978)

or Kuan (2007). Recently, quantile regression has gained much attention and wide applications in different fields, including energy and environmental economics (e.g., Kaza, 2010; Frondel *et al.*, 2012; Aydin, 2017).

The general linear specification for conditional quantiles of the dependent variable of interest (y_i) of an object *i* can be defined as follows

$$y_i = x_i^{'}\beta + e_i, \tag{1}$$

where x_i is a k x 1 vector of independent variables, e_t is an unknown error term and β is an unknown k x 1 vector of regression parameters that has to be estimated for different conditional quantile functions. To estimate them, the boostrap resampling method may be used, since it is more efficient in small samples and is robust to heteroscedasticity (Buchinsky, 1998).

The basic empirical model we estimate includes the following social capital variables: generalised trust and reciprocity (*g_trust*), institutional trust (*i_trust*), trustworthiness (*t_trust*), participation (*part*) and civism (*civism*). It is given by the following expression

$$intensity_i = f\,(g\_trust_i,\ i\_trust_i,\ t\_trust_i,\ part_i,\ civism_i), \tag{2}$$

where *intenstiy* denotes electricity intensity, the dependent variable in a region *i* (*i* = 1,…, 21). Data are related to the year 2012. Descriptive statistics of the data used in the analysis is given in Table A1 of the Appendix.

4. Results and Discussion

4.1 Results

There is a statistically significant negative bivariate correlation between electricity intensity and generalised trust and reciprocity (-0.382; p = 0.10), which means that, if households have more trust in other people in general, and, hence, if they believe more in honesty and others' intentions to cooperate, they are more likely to use energy more efficiently. The dependent variable shows no statistically significant correlation with any other social capital variables.

To assess the effect of the main social capital variables on household electricity intensity, stepwise regressions with three different selection procedures (stepwise, forward and backward) were run.

Table 2 summarises the results using the stepwise procedure, including the raw and the standardised regression coefficients of social capital variables together with their t-statistics and significance. It should be made clear that results are the same regardless of the selection procedure chosen, and there is no evidence of multicollinearity.

Table 2. Stepwise regression results

Dependent variable: electricity intensity					
Predictor variable	Unstandardised coefficient		Standardised coefficient	t	Significance
	b	SE	beta		
Constant	0.165	0.011		15.243	0.000
g_trust	-0.149	0.058	-0.507	-2.562	0.019

Note: $R^2 = 0.257$; F (1, 19) = 6.556, p = 0.019. Forward (Criterion: Probability-of-*F*-to-enter ≤ 0.05); Backward (criterion: Probability of *F*-to-remove ≥ 0.1); Stepwise (Criteria: Probability-of-*F*-to-enter ≤ 0.05, Probability-of-*F*-to-remove ≥ 0.1). SE = Standard Error.

Energy literature has shown that besides social capital variables, economic and human capital variables may be important determinants for energy consumption and, therefore, electricity intensity. Hence, we introduced two additional variables: per capita GDP (*GDP*) and professional and university qualifications per 100,000 inhabitants (*graduates*) as the control variables in our regression. Thereby, the former is used as a proxy for the level of economic development, while the latter is used as a proxy for human capital. The source of both variables is the CBS and descriptive statistics is given in Table A1 of the Appendix. Stepwise regression with three different selection procedures (stepwise, forward and backward) was run again; however, the final results remained the same as shown in Table 2. Nevertheless, since the method enables a model specification that strictly relies on statistical criteria, its results should be treated as preliminary, since further research is required.

To gain additional knowledge concerning the effect of social capital variables on electricity intensity, quantile regression with bootstrapped standard error was employed. This method allows us to estimate different parameter estimates for various conditional quantiles of electricity intensity distribution. In view of the heterogeneity of electricity intensity shown in Figure 1, this method can be particularly beneficial. The method is a generalisation of median regression analysis to other quantiles, and, particularly, the 0.25 quantile, median (0.5), and 0.75 quantile, in our case.

The results of the 0.25 quantile, 0.5, and 0.75 quantile regressions for two models are shown in Table 2. Thereby, Model I, which refers to the social trust sub-dimension variables, is

$$intensity_i = f\,(g\_trust_i, i\_trust_i, t\_trust_i, GDP_i, graduates_i), \quad (3)$$

while Model II, which refers to social capital dimension variables, is

$$intensity_i = f(s\_trust_i, part_i, civism_i, GDP_i, graduates_i), \quad (4)$$

where *s_trust* denotes social trust.

Table 3. Quantile regression results

	Model I						Model II					
	Q0.25		Q0.50		Q0.75		Q0.25		Q0.50		Q0.75	
	Coeff	Bootstrap Std. Err.	Coeff	Bootstrap Std. Err.	Coeff	Bootstrap Std. Err.	Coeff	Bootstrap Std. Err.	Coeff	Bootstrap Std. Err.	Coeff	Bootstrap Std. Err.
g_trust	-0.191	0.163	-0.259	0.054*	-0.193	0.062*						
i_trust	0.072	0.086	0.048	0.076	0.010	0.059						
t_trust	-0.048	0.199	0.056	0.180	0.028	0.093						
s_trust							0.039	0.230	-0.061	0.113	-0.232	0.121***
part							0.031	0.139	0.061	0.070	0.057	0.059
civism							-0.140	0.070***	-0.128	0.070***	-0.030	0.092
graduates	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
GDP	-0.000	0.000	-0.000	0.000	-0.000	0.000	-0.000	0.000	-0.000	0.000***	-0.000	0.000***
Constant	0.165	0.173	0.185	0.075**	0.241	0.083**	0.159	0.177	0.135	0.089	0.241	0.083*
Pseudo R^2	0.321		0.393		0.495		0.317		0.298		0.421	

Note: * p < 0.01; ** p < 0.05; *** p < 001. Coef = coefficient; Std. Err. = standard error.

According to the results shown for Model I in Table 2, generalised trust and reciprocity affect electricity intensity at median (0.5) and 0.75 quantile of electricity intensity at 1% significance level. In Model II, civism is statistically significant at 10% significance level in the 0.25 and 0.5 quantile regression models, while social trust is statistically significant at the same significance level in the 0.75 quantile model. In addition to social capital variables in the median and 0.75 quantile regression models, per capita GDP is significant at 10% significance level.

4.2 Discussion

The stepwise model is statistically significant, F (1, 19) = 6.556, p = 0.019, and accounts for approximately 26% of household electricity intensity variance. This suggests that generalised trust and reciprocity can predict the dependent variable in a statistically significant manner. The impact of other social capital variables turned out to be insignificant. Additionally, the perception of generalised trust and reciprocity is negatively correlated with household electricity intensity. Furthermore, we find, from the quantile regression analysis, that social capital variables do not have a uniform impact on electricity intensity. Model I shows that generalised trust and reciprocity have a significant effect on electricity intensity at median and 0.75 quantile, i.e. in tourism-oriented regions and regions lagging behind. In these two regressions, selected variables account for 39% (Q0.5 regression) and 50% (Q0.75 regression) of household electricity intensity variance. In Model II, social trust turned out to be an important determinant of electricity intensity in the same regions, i.e., tourism-oriented regions and regions lagging behind, indicating that these regions use electricity in a less efficient way. This can be indirectly supported by Bohdanowicz *et al.* (2015), who claim that tourism uses significant amounts of energy for providing comfort and services to guests, but, typically, at an alarmingly

low level of energy-efficiency; besides, Irsag *et al.* (2012) as well as Borozan and Borozan (2017) have shown that there is significant margin for energy savings in the tourism sector in Croatia. In addition, many other authors (for a review, see Bjornskov, 2017) confirmed that trust is more important in less developed countries and regions.

Generalised trust may be defined as generalised expectation that other people are generally trustworthy and honest, while its level is determined by general expectations of individuals related to social motives of other people or the nature of the world (Jones *et al.*, 1997). Reciprocity implies that people are obliged to repay in kind what another person will provide for them in the future (Cialdini, 2006). Hence, it represents a basis for building a continuing relationships and mutual exchanges, as well as social norms.

An important role of trust and reciprocity in energy efficient behaviour has already been recognised in promoting cooperation among individuals and groups of people, contributing to the economic performance of firms (Cooke and Clifton, 2002) and countries (Inglehart, 1997; Norris, 2002), as well as in coserving the environment (Ostrom, 1990; Ostrom and Ahn, 2003; Carattini *et al.*, 2015). At a micro level, social capital reduces transaction costs (Zak and Knack, 2001) and generally promotes collective action (Coleman, 1988; Putman *et al.*, 1993).

When it comes to the role of generalised trust and reciprocity and social trust, in general, in energy efficiency behaviour and pro-environmental behaviour, the results observed in our study are in line with previous studies (for a review, see Volland, 2016); namely, other studies confirm that more trusting people tend to buy environmentally friendly products (Gupta and Ogden, 2009), use more collectively desirable commuting options (van Lange *et al.*, 1998) or support pro-environmental policies (Irwin and Berigan, 2013). Moreover, Carattini *et al.* (2015) demonstrated that countries with a higher share of trusting citizens have lower per capita energy consumption and, subsequently, emit considerably fewer greenhouse gases per capita, while Volland (2016) revealed that trust is negatively correlated with household energy demand.

According to the result of the 0.25 quantile and median regressions, civism, i.e., the perceived absence of opportunistic, self-interest behaviour by fellow citizens, such as corruption or tax evasion, turned out to be an important determinant of electricity intensity only in more developed regions. This is not unusual; for example, Ruth (2002), as well as Fortelny (2014) highlighted that the energy sector is a prime target for corruption and that theft and other kinds of corrupt activities are more intensive in less developed countries. Furthermore, Fredriksson *et al.* (2004) demonstrated that corruption reduces energy efficiency. For the same sample, Borozan *et al.* (2016b) revealed that the perception of civism represents a strong direct predictor of relative per capita household electricity consumption in Croatian NUTS-3 regions.

The absence of a statistically significant relationship between other social capital variables and energy intensity is not consistent with some research findings. For example, Allcott (2011) observed that adjustment of norms conditioned by consumption of neighbours leads to reduction in electricity consumption in one's own household. Marbuah and Gren (2015) showed that trust in national government helps reduce CO_2 emission levels in 21 counties in Sweden. McMichael and Shipworth (2013) emphasised the role of social networks for informing community-based energy-efficiency programmes. Borozan and Radman-Funaric (2016a) found out that social capital variables show strong mutual correlation. So, further research should shed more light on the causal relationship between such variables, and the mechanism that enables the transformation of their influence on energy efficiency.

The paper indicates that per capita GDP is a statistically significant determinant of electricity intensity in the median and 0.75-quantile model, i.e. in tourism-oriented and less developed regions. However, the estimated value is very low, indicating that per capita GDP had little influence on electricity intensity even in these regions. Generally, poorer regions have fewer opportunities to build new energy-saving buildings, buy new low energy-consuming equipment or products or invest in energy-saving innovations. However, increased income may lead to a decrease in household electricity intensity. Recent studies have also shown that energy efficiency generally improves as an economy develops (World Bank, 2001; Wu, 2012). On the contrary, human capital, operationalised by means of the number of highly educated people, does not seem to matter much at each quantile regression in this study. Certainly, one should expect that educational level significantly influences electricity intensity, i.e. that people with tertiary education are more aware of and concerned about efficiency and other pro-environmental issues. However, this study is related to the recession year, when even highly educated people were less inclined to undertake investment in new energy-saving appliances and innovation in general. Hence, it might be worthwhile to conduct the same research when the economy is going through an expansionary phase.

The values of the coefficient of determination indicate that social capital and other selected variables, albeit not negligible, are not the only determinants of energy intensity; hence, further research should extend the list of considered predictor variables. Moreover, bearing in mind the disadvantages of stepwise methods, alternative methods may also be used to select an optimal model for energy intensity. Finally, further research should take into consideration the fact that electricity intensity may be calculated in different ways (Nelder, 2013).

5. Conclusions

Electricity efficiency has become an important topic for energy policy authorities since it contributes to reaching EU energy policy targets. It has also attracted a

growing interest by researchers trying to explain the dynamics and determinants of energy and, particularly, electricity efficiency. Their results indicate that electricity intensity has been reduced over the last years, but, also, that its values vary significantly between countries and regions, depending on development stage, composition of GDP, share of the electricity sector in gross output and energy use, state of technology, price of electricity, and the like. They also indicate that energy efficiency behaviour and decisions are framed within a given social context and driven by social norms.

Bearing in mind that electricity consumption may cause economic growth and development, and that the household sector is an important electricity-consuming sector, this paper analysed the dynamics of electricity efficiency measured by electricity intensity in the household sector in 21 NUTS-3 Croatian regions during the period 2001-2013. The results show that household electricity efficiency in Croatia is unevenly distributed and also dependent on economic conditions. They reveal that electricity intensity is generally higher in tourism-oriented regions and regions lagging behind, while it is lower in more developed regions. Furthermore, household electricity behaviour in Croatia confirms the known effect of economic downturns: electricity consumption decreases during a severe economic downturn, while, at the same time, electricity intensity increases.

The present paper followed the assumption that consumption is deeply rooted in the social context and that social capital may contribute to its reduction. Consequently, it evaluated the effects of social capital variables on electricity intensity in the household sector by using the stepwise regression method. Results suggest that generalised trust and reciprocity have statistically significant influence on electricity intensity, implying that, if household members have more trust in other people, descriptive and injunctive norm messages of electricity consumption of their neighbours may contribute to their more pro-environmental consumption and behaviour, in general. In addition to the stepwise regression method, the paper employed the quantile regression method to gain new knowledge on the effects of social capital variables on electricity intensity. We find that they do not have a uniform impact on electricity intensity. While social capital variables, except for civism, do not have much effect on electricity intensity in more developed regions, they do have a statistically significant effect on electricity intensity in tourism-oriented regions and less developed regions. This influence is primarily associated with social trust (generalised trust and reciprocity, in particular) and civism.

Further research should shed more light onto the causal relationship between variables, as well as the mechanism that enables the transformation of their influence on energy efficiency. Certainly, social capital variables, although not negligible, are not the only determinants of energy intensity. Hence, further research should also extend the list of predictor variables considered, and use alternative methods to select an optimal model for energy intensity.

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Appendix

Table A1. Descriptive statistics

:

Variable	Obs	Mean	Std. Dev.	Minimum	Maximum
Generalised trust and reciprocity	21	-0.036	0.188	-0.468	0.249
Institutional trust	21	0.026	0.168	-0.332	0.317
Trustworthiness	21	-0.016	0.153	-0.299	0.239
Social trust	21	-0.010	0.166	-0.327	0.273
Participation	21	0.040	0.242	-0.371	0.461
Civism	21	0.007	0.200	-0.560	0.367
Per capita GDP (in EUR)	21	8,602.381	2,966.189	5,853.000	18,506.000
Graduates*	21	782.409	119.245	600.429	1,077.476
Electricity intensity (in GWh/MEUR)	21	0.171	0.055	0.071	0.270

Note: * Graduates from professional and university study programs per 100,000 inhabitants; Obs = Observation; Std. Dev. = Standard Deviation.

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PIRATED ECONOMICS

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Abstract
I argue that the impact of piracy engines for scholarly content on science depends on the nature of the research. Social sciences are more likely to reap benefits from such engines without inflicting much damage on journal publishers' revenues. To validate the claim, I examine the data from illegal downloads of economics content from Sci-Hub over a five-month period. I conclude that: (a) the extent of piracy in economics is not pervasive; (b) downloads mostly occur in under-developed countries; (c) users pirate even content that is freely available online. As a result, publishers are not losing much revenue, while exposure to generated knowledge is extended.

JEL Classification: A1
Key Words: Economics, Scientific Research, Open-access Publishing, Online Piracy

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1. Introduction

The idea of open science has challenged many science and publishing stake-holders for years. Many have argued that pricing practices by mainstream scientific journal publishers have built walls around knowledge precluding a large number of researchers and members of the general public from accessing a public good. Some have even compared this 'paywall' to the Berlin Wall, dividing east and west, during the Cold War period (Oxenham 2016).

This becomes particularly problematic in regards to knowledge generated through publicly funded research. Some claim that eliminating scientific journal publication from the knowledge creation process will lead to annual savings of $9.8bln of public money (Brembs 2016). Many years of contemplation by public funding bodies have resulted in clear actions concerning institutionalising open access. Best examples of such cases are the NIH Public Access Policy (National Institutes of Health 2009) and the Guidelines for Open Access to Publications and Data in Horizon 2020 (European Commission 2016).

One of the major arguments made for open access science is the fact that scientific journal publishers have high profit margins. However, the problem is somewhat more complex and involves understanding the incentives of various stakeholders in the knowledge creation process. Discussions around the 'new economics of science' have advanced in the last two decades and demonstrate the subtleties of the problem (Partha and David 1994; David 1998). This stream of literature provides a framework for thinking about complex inter-dependencies between academic science and technological progress, which pass through private and public R&D efforts and the organisation of science.

In any case, the rise of 'open science' is a fact. This move can be illustrated by three distinct developments: the first one is the emergence of open access journals. A good example of this development is *PLoS* suite of journals, the highest impact one among them being PLoS One, which has managed to dramatically increase its attractiveness since its establishment in 2007. The number of articles published by the journal has increased over 20 times in the 10 years of its existence and it has managed to achieve an impact factor of 2.8. In a similar vein, many non-open access journals have also joined the initiative to provide authors with the option of making the published article open access (for a fee). For example, Springer provides this option for most of titles it publishes. There are current collective efforts to further such arrangements between publishers and content consumers (Vogel and Kupferschmidt 2017).

Open access to publication is believed to increase the impact of research. As a result, the number of open access articles published has skyrocketed over the last two decades (Laasko *et al.* 2011). However, evidence supporting the greater impact of open access research is not clear-cut. While some researchers find a positive impact through open access reflected on their citation count (Antelman 2004,

Eysenbach 2006), others find no evidence of open access advantage (Davis *et al.* 2008, Gaule and Maystre 2011). Nevertheless, open access publications do seem to have a clear-cut advantage in terms of non-academic dissemination, (Tennant *et al.* 2016).

The second development along the lines of open science development is the trend of journals pushing for openly sharing data contained in scientific publications. This has become an all-encompassing phenomenon, covering journals from both open and closed access sides of the spectrum, as well as universities and other public and private institutions. Similar to open access publishing, open access data is thought to facilitate the advancement of science by promoting further research and innovation (Nature 2015, Silva 2014). However, significant challenges faced by main actors have been identified in this direction, too (Perkmann and Schildt 2015, Wainwright *et al.* 2016). The main challenge here is to overcome the disincentive of private institutions to share their scientific output, because of their unwillingness to share their proprietary data.

The third and perhaps most controversial and radical development has been the development of channels to circumvent paywalls, which usually entails a violation of copyright laws. These range from crowd-sourced research sharing (e.g. using a hashtag #icanhazpdf to ask other researchers to download and send an article to which not all individuals have access) (Caffrey Gardner and Gardner 2016) all the way to creating digital piracy engines that provide free access to scientific content illegally. Publishers have pushed back hard on such developments (Singh Chawla 2017).

The most famous of this sort of services is Sci-Hub. Sci-Hub was created in 2011 and now notches tens of thousands illegal downloads a day. Among researchers, the service is seen as a portal giving a chance to scholars from poorer countries to access cutting-edge research in all fields of study (Greshake 2016).

Up until very recently not much has been known about the size and geographical breakdown of Sci-Hub operations. Thus, the poor-country enabler status of Sci-Hub could not have been verified. However, recently the data on five months of downloads from the Sci-Hub service have emerged (Elbakyan and Bohannon 2016). These data show that Sci-Hub contains 68.9% of all published scholarly articles (Himmelstein *et al.* 2017).[1]

1. According to the interactive browser available at https://greenelab.github.io/scihub/, the coverage of the top five economics journals (which are at the focal point of this article), comes to around 73.1%. Four journals (*American Economic Review, Econometrica, Quarterly Journal of Economics* and *Review of Economic Studies*) have coverage rates above 97%. The coverage of the *Journal of Political Economy* is estimated at 36.4%, which is relatively low. However, due to the complications presented by the DOI assignment policy of the publisher, which is discussed later in the paper, this coverage value might be severely under-estimated.

The analysis of raw server data allows Bohannon (2016) to conclude that the service is used not only by researchers in less-developed countries, but also in the developed world, where researchers usually have institutionally-paid access to scientific content. Based on this finding, the author advances another reason for Sci-Hub popularity – simplicity of use when compared to legal alternatives.

This sheds new light on the ongoing discussion about the positive and negative impacts of Sci-Hub on science and publishers' revenue. To clarify the matter, it is useful to make a clear distinction between two types of research. The first part of the scientific research can be commercialised. These are studies that report scientific advances which companies can use to generate revenue streams. As a result, owning (and enforcing) copyright for these studies and charging high fees for accessing the content is justified. Most of this research focuses on natural sciences. The second part of scientific knowledge is not for commercial purposes and becomes the basis for further (public) knowledge generation.[2] These are findings which do not have immediate revenue-generating applications. Such research only creates footing for further advances, yielding higher future research output and possible monetising opportunities. Most research in social sciences belongs to the latter category.

Therefore, I argue that the positive effects of Sci-Hub on research and potential damage inflicted on publishers will strongly depend on whether the research in question concerns natural or social sciences. Social science has a lot to potentially gain from such piracy engines, while publishers in natural science journals have a lot to lose.

Bohannon's (2016) analysis makes no distinction between natural and social sciences. He uses all download requests received by Sci-Hub servers. Given that natural science publications are more numerous, when compared to their social science counterparts (by, perhaps, as much as one order of a magnitude), these findings may be hiding interesting details, when it comes to social science. The analysis of Sci-Hub data by Gershake (2017) further reveals that there is no single social science journal that appears among the top 20 most pirated journals.

Here, I examine Sci-Hub download data in order to get a sense of the scale of piracy in social sciences as an example of economics. Identifying all social science publications is virtually impossible, but problem can be approached by concentrating on one sub-field. I chose economics, due to the clear and long-standing ranking of relevant top scientific journals, which allows us to identify the most pirated content and draw conclusions about the overall extent of piracy. I also analyse the geographical decomposition of download requests in order to shed some light on the convenience hypothesis concerning Sci-Hub usage by economics researchers.

2. Of course, commercially useful knowledge also constitutes such a basis.

2. Data

I use the data comprising all download requests received by Sci-Hub servers between October 2015 and February 2016 (Elbakyan and Bohannon 2016). This entails a total of 22,915,621 download requests. Data have been anonymised in order to protect users' identity. To this end, IP addresses have been aggregated to the nearest city location. Thus, data contain the city and the country from which the download request was received. The data contains the Digital Object Identifier (DOI) of the article requested. There is no other information about the article requested.

Therefore, identifying articles from the economics field is a challenge. Clearly, not all economic articles can be identified. Therefore, I proceeded as follows. The field of economics is dominated by few highly regarded journals. The general consensus is that these top journals contain the most robust and cutting-edge research. Therefore, the quality of these articles is the highest in the entire relevant field. They also represent general interest journals, as opposed to narrow field-specific journals, such as the *Journal of Economic Growth* or the *Journal of Labor Economics*. Therefore, all else being equal, if a researcher wants to download a paper, they are more likely to opt for the piece that has been published in a top journal.

Therefore, I argue that content downloads from top economic articles will fairly approximate downloads received by the field of economics. This is definitely so for top economic content downloads, i.e. top journals pirated, which is very likely emerging from analysing the origin of the download. As a consequence, I concentrated on downloads from the top five economics journals. These journals are *American Economic Review* (AER), *Quarterly Journal of Economics* (QJE), *Journal of Political Economy* (JPE), *Econometrica* (ECTA) and *Review of Economic Studies* (REStud). The publishers of four of these five journals use a journal-specific DOI assignment procedure, which allows us to identify articles belonging to these journals fairly easily. One publisher, The Chicago University Press, which publishes JPE, assigns DOI across all of its journals, in what seems to be a random manner. This complicates the identification of JPE articles. To overcome this, I generated citation reports for all JPE articles available on ISI Web of Science, which collects all articles starting from 1956. These reports include the DOI for each article, which allows us to identify JPE articles in the data.[3]

This clearly reduces the working dataset drastically to 2,147 observations and represents only less than 0.01% of the entire dataset.

3. I am still missing JPE articles prior to 1956. However, our analysis shows that researchers are overwhelmingly interested in recent articles in Economics. This confirms Greshake's observation (2016) about the level of all scientific fields; he finds that Sci-Hub searches are dominated by recent content. Therefore, missing articles published over 60 years ago are not likely to generate a significant number of illegal downloads.

Before carrying out the analysis I removed duplicate downloads from the raw data, something that had not been done by Bohannon (2016), as confirmed by the author in a private e-mail. It should be noted that these are raw server log file data. They contain all page load requests received by Sci-Hub servers. Because Sci-Hub operation directly depends on the operation of the Internet, which is known to be problematic in many under-developed countries, duplicate downloads are likely. When the user refreshes the browser that is still in the process of loading the article, the server registers an additional download request. If I had the original IP data, these kinds of downloads could have been completely screened out. However, given the data anonymisation, I had to work with the download time-download location pair of variables. In order to screen out multiple records for one actual download, I identified groups of downloads for the same paper that occurred from the same city within five minutes from one another. When the most downloaded economics article has only been downloaded 18 times during the five-month period, with three downloads from a small town in Iran within a few seconds from each other, it is clearly suspicious. For each of these identified groups I retained only one download in our final dataset. This eliminated 64 observations and left us with the final dataset of 2,083 downloads for 1,096 distinct papers.

3. Analysis

A number of 2,083 downloads over the span of five months implies an average of about 417 downloads per month for all the content generated by the five economics journals in our sample. This means that economics piracy numbers are not all that impressive. This can be explained by the fact that researchers in economics do not need to pirate (much). A large portion of published economic content is available in pre-print versions on SSRN or exists in the public domain in various working paper formats aggregated by RePEc. However, it might also be that Sci-Hub is not that widespread in the field under investigation.

Table 1 presents the ranking of the most downloaded papers. The most pirated economics article (Helpman *et al.* 2010) has only been downloaded 18 times over a five-month period. It is also noticeable that people pirate recent articles. Four out of nine papers on the list are from 2015 and the oldest paper is from 2004. *Quarterly Journal of Economics* accounts for four papers on the list, *Journal of Political Economy* accounts for three.

Table 2 presents the analysis at the journal level. In order to compare journals properly, I have to acknowledge that journals have generated different sizes of article stock. Obviously, more articles imply more potential downloads. In order to take this into account, I gathered data from ISI Web of Science (WoS) about the total number of articles published by each journal to date. Even though the WoS coverage is not complete, it is rather extensive for all five journals. I used the number of articles on

WoS platform to estimate the total output of each of the journals, assuming that journal output has stayed constant over time. As JSTOR completely covers all five journals and the moving wall is rather short in all cases, I can be certain that one has access to all publications from these five journals on Sci-Hub. The last two columns normalise downloaded data by using information on the journals' total output.

It is apparent from Table 2 that users are not interested in the great majority of articles published by the top five economics journals. This is not surprising, as most scientific articles (even in top journals) do not receive any citations. Even though *American Economic Review*'s piracy numbers are the highest in absolute terms (365 articles downloaded at least once during the period between October 2015 and February 2016), the *Journal of Political Economy* seems to be the most attractive outlet for Sci-Hub users (over 0.4% of the journal's output has been downloaded at least once during the five-month period).

Numbers show that JPE tops the rankings in both relevant measures, namely, the number of downloads per published article and the pirated articles as a share of the journal's total output.

Table 1. Top downloaded economics articles

Authors	Year	Title	Journal	# of downloads
E. Helpman, O. Itskhoki & S. Redding	2010	Inequality and Unemployment in a Global Economy	ECTA	18
M. Gentzkow & J. Shapiro	2011	Ideological Segregation Online and Offline	QJE	17
D. Acemoglu, G. Egorov & K. Sonin	2015	Political Economy in a Changing World	JPE	15
I. Welch	2004	Capital Structure and Stock Returns	JPE	15
K. Manova	2012	Credit Constraints, Heterogeneous Firms, and International Trade	REStud	13
N. Voigtlander & H.-J. Voth	2012	Persecution Perpetuated: The Medieval Origins of Anti-Semitic Violence in Nazi Germany	QJE	12
H. Cronqvist & S. Siegel	2015	The Origins of Savings Behavior	JPE	12
M. Aguiar, M. Amador, E. Farhi & G. Gopinath	2015	Coordination and Crisis in Monetary Unions	QJE	11
A. Akerman, I. Gaarder & M. Mogstad	2015	The Skill Complementarity of Broadband Internet	QJE	11

Table 2. Top downloaded economics journals

Journal	# of downloads	# of articles downloaded	# of downloads / journal's total output (%)	# of downloaded articles / journal's total output (%)
American Economic Review	527	365	0,018	0,012
Journal of Political Economy	463	226	0,838	0,409
Econometrica	450	227	0,770	0,389
Quarterly Journal of Economics	415	154	0,815	0,302
Review of Economic Studies	228	124	0,448	0,244

Table 3 presents the countries where the content has most frequently been downloaded from. As one can see, similar to the aggregate analysis by Bohannon (2016), developed countries like the US, Germany and France, make it into the top 10 countries pirating economic content. Gershake (2016) also reports the positive correlation between a country's GDP level and piracy activity on Sci-Hub.

Tabel 3. Top downloading countries

Country	# of downloads	# of yearly downloads / 1mln inhabitants	# of yearly downloads / # of registered economics institutions
China	266	0,470	2,014
Indonesia	264	2,535	5,510
United States	160	1,204	0,122
Iran	140	4,338	5,695
Russia	131	2,191	0,847
Brazil	83	0,994	0,862
Pakistan	83	1,094	2,075
Malaysia	65	5,249	2,137
France	64	2,326	0,354
Germany	60	1,786	0,201

Therefore, the analysis based on absolute numbers points to the same direction as that indicated by Bohannon (2016) – everyone is downloading pirated papers. However, a more accurate picture has to take into account the size of the research bodies in each of the countries. The best measure for this would be the number of economics researchers in each country. However, such data is not available. We can follow Gershake (2016) and use country population to proxy such a measure. The yearly downloads normalised by the population are presented in Table 3.

We also have to acknowledge that developed countries spend more on education and, therefore, are likely to have more scientists per inhabitant. Therefore, I created another proxy, which is the number of economic institutions registered with the RePEc service. These measures clearly show that downloads from the US, Germany and France are a tiny fraction of their scientific operations. However, downloads from Iran and Indonesia, as well as those from Malaysia, Pakistan and China are one order of magnitude higher.

4. Discussion

All in all, even if there are a few downloads in virtually every country in the world, I see that Sci-Hub is beneficial to, mostly, developing countries, when it comes to economics. This is in some contrast to the overall findings reported by Bohannon

(2016). Downloads in developed countries arguably occur because Sci-Hub is very easy to use, when compared to usual university subscriptions. In order to examine the validity of this claim, I also looked into the download activity generated by the content of the *Journal of Economic Perspectives* (JEP). JEP is an open access journal and, therefore, requires no piracy. Yet, over the five-month period, Sci-Hub users requested its content 177 times, which is comparable to similar statistics from the top five economics journals shown in Table 2. This seems to confirm the hypothesis of convenience usage.

In fact, a quick Google search for the nine most pirated economics articles from Table 1 also points to convenience as the main motivator behind Sci-Hub usage. Google search results, presented in Table 4, reveal that either journal typeset articles or working paper versions are freely available online for all top pirated economics articles.

Table 4. Online accessibility of most pirated economics articles

Article	Availability online
Helpman et al. (2010)	pdf freely available on Stephen Redding's webpage
Gentzkow and Shapiro (2011)	pdf of a version freely available as an NBER working paper
Acemoglu et al. (2015)	pdf freely available on MIT economics department webpage
Welch (2004)	pdf freely available on Ivo Welch's webpage
Manova (2012)	pdf freely available on Kalina Manova's webpage
Voigtlander and Voth (2012)	pdf freely available on Nico Voigtlander's webpage
Cronqvist and Siegel (2015)	pdf of a working paper version freely available on SSRN
Aguiar et al. (2015)	pdf of a working paper version freely available on Minneapolis FED website
Akerman et al. (2015)	pdf of a working paper version freely available on IZA website

Ultimately, the overall impact of Sci-Hub on economics can be evaluated as positive. Researchers in under-developed parts of the world get access to important content. At the same time, there is no indication that publishers are not losing (much) revenues. Firstly, elimination of Sci-Hub would hardly result in any subscriptions from underdeveloped country university libraries. Secondly, the extent of downloading is very low, perhaps due to a large number of popular working paper distribution services. Economics is not the only sub-discipline in which advantages of Sci-Hub hugely exceed its costs. Similar findings were reported by Timus and Babutsidze (2016) with respect to European Studies. One could argue that this is a general pattern for social sciences.

Yet, Sci-Hub does not discriminate between social and natural sciences and weighing its costs and benefits should take into account natural sciences. In this respect, it is important to be precise about what sort of service Sci-Hub provides to its users. It allows them to view and download the article, but the right for any legal use of the content remains with the publisher (Priego 2016). Therefore, Sci-Hub cannot inflict any losses on publishers other than un-sold journal subscriptions. As a result, one may argue that Sci-Hub is beneficial to scientific journal publishers (not only authors) by popularising their content and creating an additional dissemination channel (Priego 2016), much like Google's book previews or journals' free access issues.

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