Mobile phone penetration and its impact on inequality in the Western Balkan countries

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Abstract: *The aim of this paper is to analyse the effect of the mobile phone penetration rate on inequality in Western Balkan countries and to provide empirical evidence. We explore the question of whether cell phone diffusion helps to decrease inequality and whether it has a positive income equality effect. In the developed conceptual framework, we consider that people with access to mobile telephony also have access to Wi-Fi and GPS and that individuals can perform different activities, such as engaging in e-commerce, e-governance, health, and education; paying bills; saving money; and transferring money to other persons. This represents a good foundation for poor persons exit the cycle of deprivation and leads to the development of equal opportunities. We analyse the impact of mobile phone penetration on inequality in Western Balkan countries by using ordinary least squares and two-stage least squares models (Asongu, 2015). Our results confirm the income-redistributive effect of mobile phone penetration.*

Keywords: Mobile phones; Western Balkan countries; inequality; poverty.

JEL Classification: E00, G20, I303

Introduction

The aim of this chapter is to analyse the impact of mobile phone penetration on inequality in Western Balkan countries. At the academic level, there is a lack of research that analyses the correlation between mobile phone penetration and inequality.

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Recently, we have experienced the tremendous development of the Information Communication Technology (ICT) sector, dominating many areas of our lives. Certain development trends are often associated with both negative and positive impacts. In practice, we need a certain amount of time to pass to assess the impact of technology in our daily lives. In this paper, we analyse inequality from a multidimensional point of view; we explore inequality in terms of opportunity and examine situations when it occurs.

We consider mobile phones as a tool that can help poor people exit the spiral of deprivation. In this respect, before conducting the analytical part of the study, we analyse the main determinants of mobile phone diffusion in different countries. Then, we examine how mobile telephones can improve social and economic outcomes, emphasizing the role of the mobile-finance revolution in poverty alleviation.

Via the developed conceptual framework, we analyse the impact of mobile phone penetration on inequality in Western Balkan countries through an econometric model, which was used by Simplice Asongu in 2015 to analyse the impact of mobile phone penetration on African inequality (Asongu, 2015). We do this by using ordinary least squares and two-stage least squares. We consider the mobile phone as a tool that enables human beings to perform different activities that enhance their everyday life and that gives access to various opportunities (finance, education, health, job, information, etc.).

Inequality is a multidimensional notion. Economists primarily consider the financial aspect of inequality to be related to individual or household income. However, this entails only one dimension, and inequality can be associated with inequality in terms of "skills, education, opportunities, happiness, health, life expectancy, welfare, assets and social mobility" (Heshmati, 2007 pg. 1). Economic inequality, in addition to being unavoidable, is widely distributed. If increasing inequality is not appropriately observed and addressed, it can lead to various types of political, economic and social disasters (World inequality report 2018, pg. 8).

Presented in figures, global wealth has now reached USD 280 trillion (2017) and is 27% higher than a decade ago at the onset of the financial crisis. The wealthiest 1% of the population own 50.1% of all household wealth in the world (CREDIT SUISSE - Research Institute, 2017). The World Inequality Report provides the first estimate since 1980 on the distribution of global income to the world's total population. In addition, it summarizes an important fact "The global top 1% earners has captured twice as much of that growth as the 50% poorest individuals. The bottom 50% has nevertheless enjoyed important growth rates. The global middle class (which contains all of the poorest 90% income groups in the EU and the United States) has been squeezed" (World inequality report 2018, pg. 7).

In a famous article written for Vanity Fair by Joseph Stiglitz, "Of the 1%, for the 1%, by the 1%", puts an emphasis on U.S. inequality. It describes how 1% of Americans receive one quarter of the nation's income each year. In terms of wealth

distribution, the top 1% controls 40% of the wealth. This suggests that their lives have been enhanced tremendously. In fact, 30 years ago, the figures were 12% and 33%, respectively (Stiglitz, 2011).

Household surveys are very suitable for conducting analyses of within-country income inequality. It is much easier to tackle within-country inequality rather than between-country international inequality. There are several factors triggering within-country inequality that are classified as traditional common factors. The list includes land concentration, urban biased development, the ageing population and inequality in education. Another major aspect that has caused inequality to deepen is the privatization process that contributed to the wealth transfer. The list of factors that contribute to wealth inequality is constantly being updated by different authors and include trade and financial liberalization, technological change, stabilization and adjustment programmes (Heshmati, 2007 pg. 25).

Literature review

When discussions take place about inequality and social welfare, the concept of inequality of opportunity is one of the most important pillars. Inequality of opportunity occurs when persons living in the same society do not have access to the same opportunities. People with different socio-demographic characteristics, such as circumstances at birth, gender, the place where they were born or their parental background, may find that these factors greatly affect their future lives. All these features may determine people's educational qualifications, the type of job they find and their level of income. This might lead to a high degree of inequality of opportunity, which is considered an unjust part of inequality (European Bank for Reconstruction and Development, 2016, pg. 45). Initially, inequality was thought to be an uneven distribution of wealth or income. However, it appears in several modes of discrimination between genders, among races and minorities. Inequality has many different aspects. It consists of an indicator and a cause – of some other form of inequality. What is even worse, multiple inequalities tend to feed on each other. Inequality might keep people confined in the downward spiral of deprivation. Thus, people might even lose their perspective. Some of these people might be able to escape one of the miserable conditions, but they might be caught again because they do not have sufficient opportunities (UNFPA et al., 2017). Roemer's second concept through which he addresses the inequality of opportunity relates to the non-discrimination principle (Roemer, 1998, pg. 1).

Accessible opportunities relate to the available opportunities and the decisions made by different persons. It is very important to conduct research regarding the inequality of opportunity in the critical moments of a person's career, for instance, when choosing a higher education institution or acquiring a general job or job that

pays well that ensures financial security. This would improve our understanding. Countries that pass through the transition process face an unfair distribution of opportunities across different groups. The implementation of reforms bring along changes that can take time to implement. Market-based economies need to be induced to support people who struggle, lack abilities and need support. Government encouragement to undertake reforms is highly needed. If the population fails to benefit from pro-market structures, public trust in market-based reforms will be disrupted. The good functioning of markets enables the creation of opportunities among socioeconomic groups. Appearance of the inequality of opportunity might result in losing faith in the markets and might generate preferences for misleading market policies. Thus, understanding the connection between the inequality of opportunity and beliefs is quite important (Brock, 2018).

For instance, if we look at the education systems of formerly communist countries, market liberalizations have had a tremendous impact. In ex-communist countries, in the past, the education system was free, while with market liberalization, there are now significant fees. However, study programmes offered at higher education institutions are not linked to the job market. The large increase in cost for students has been associated with a decrease in the number of scholarships granted to students. This has resulted in increasing the opportunity cost for students. The transition processes demands a labour force that is equipped with new skills (European Bank for Reconstruction and Development, 2016, pg. 50).

In developing countries, people are faced with the inequality of opportunity, do not have access to formal education and remain uneducated. In this process, youth and women remain alienated from secure livelihoods. Thus, they will be denied a decent living and remain in a bad economic situation characterized by informal, uncertain circumstances. People are deprived of basic services, and labour is misused in the interest of certain private groups (UN-HABITAT, 2010).

Cell phone diffusion and its impact on improvements in social and economic outcomes

In a study on the determinants of mobile phone ownership, the following were found to be quite important: education, informal work, employment status and type of electricity. To increase mobile phone use, especially among youth, governments should support initiatives involving the development of mobile phone content in local languages (Forenbacher et al., 2019). In the last twenty years, the global digital divide has shrunk due to rapid mobile phone adoption. It has been found that mobile phone adoption rates were much faster in poor countries than in rich ones. However, the study confirmed the existence of a gap in mobile phone penetration rates among the rich and poor. The legacy phone system, fixed telephone subscriptions (per 100

inhabitants), population and education were all found to have a positive impact on mobile phone penetration, while GDP per capita was identified as a significant predictor of mobile phone penetration (Zhang, 2017). With an increased mobile phone penetration rate, there is an increase in the mobile penetration rate. Several studies have confirmed the impact of mobile broadband on economic development. One of the recent studies on the effect of mobile broadband networks on global economic development found that mobile broadband has a positive significant impact on GDP. Although the economic effect from mobile broadband decreases over time, a 10 % increase in MBB adoption causes a 0.8 % increase in GDP (Edquist et al., 2018).

Disruptive operators are considered to be important for increasing the competitiveness of a telecommunication market comprised of large companies. An analysis of the disruptive impact of the entry of free mobile into the French mobile telecommunication showed that the conditions of entry as set by the regulator played a major role in the disruption. This has had a major impact on provoking the restructuring of companies operating in the telecommunication market, which is actually controlled by regulatory laws. Moreover, low-cost business models were able to be implemented due to complementary assets (Berne, Vialle and Whalley, 2019).

In an analysis of the factors that have induced mobile phone penetration in Cameroon, the author found that income, represented by GDP, is a major determinant of mobile phone diffusion. Moreover, there are three other important factors that have an impact on mobile phone diffusion: openness to competition; the use of SMS; and the complementarity between the mobile network and the core networks, the first being only the complement of the second and not its substitute. Investment in core and mobile networks increases mobile penetration rates. This induces the growth of public and private incomes but challenges investment in infrastructure network (Honoré, 2019). Whether the use of mobile phones can tackle inequality is a very challenging question. However, there are many studies that have recently proven that it can. A study covering 11 African countries found that the use of mobile phones can offset inequality.(James, 2014) Another determinant of mobile telephone diffusion is mobile communications (Honoré, 2019).

In a study related to mobile telephony on growth spurring in Indian states in the period 2001-2012, this relationship was found to be significant. First, mobile telephones have a positive significant impact on financial inclusion and loan behaviour. Second, areas that have a high penetration rate are associated with an increase in network that beyond a threshold exerts a positive impact on growth (Ghosh, 2016). What drives the broadband penetration rate? What are its main determinants? Broadband diffusion is affected by broadband policies. Actually, it is the fixed broadband that is determined by the policies, while 3G services impact mobile broadband. Finally, broadband diffusion stimulates growth when it is combined with other factors (Ghosh, 2017).

Several factors determine the number of customers and speed of the market diffusion of mobile telephony. Both the number of networks and the history of the market

structure are important elements. In this regard, digital technologies, standardization, privatization and independent regulation are all factors that have a positive impact and that matter to a large extent. The market structure, regulation and the speed of mobile network penetration were studied in a sample of thirty countries over 16 years. It is important to note that in that sample of countries, the mean diffusion rate increased from 2% to 97% of the population (Li and Lyons, 2012).

In terms of the penetration rate, mobile telephone service acts as a substitute for fixed-line service; however, investment in telecommunications, the subscribers of fixed-line services and the number of operators in the mobile market are important factors of mobile diffusion. The gross domestic product appeared to be nonsignificant. Avila, Lee and Kim, 2018, pg. 124 and pg. 125). To analyse the mobile phone penetration rate in Kazakhstan, the following determinants have been used: gross domestic product, the population, fixed-line subscribers, regulated interconnection tariffs, and liberalization. The research results showed that the population and fixed-line subscribers are important factors of penetration rate, while fixed-line service is a replacement for mobile telephony in Kazakhstan (Sultanov et al.,2016, pg. 51). Diffusion of mobile telephony in India is determined by competition, and government intervention that has made technology highly available and cheap (Gupta and Jain, 2012).

Prior research used 25 variables that were grouped into the following categories, the macroeconomy, businesses/banks, the market, the knowledge economy, external flows and human development, to research the determinants of mobile phone penetration and provided panel threshold evidence from Sub-Saharan Africa. Cell phones have been found to have "increasing positive benefits first in regulation quality, human development, foreign investment, education, urban population density, and Internet penetration. Second, there is evidence of decreasing positive effects from patent applications. Third, increasing damaging influences are established for foreign aid and return on equity. Non-threshold tendencies are discussed. Policy implications are also covered with emphasis on policy syndromes to enhance more targeted implications for worst-performing nations" (Asongu, Nwachukwu and Aziz, 2018, pg. 81)

The impact of mobile telephones on improving the social and economic outcomes of households

Modern information and communication technologies, without any dispute, represent a good basis for developing countries to escape from the poverty trap and move to a more contemporary production system (James, 2009). ICTs have the potential to help reduce inequality both within and between countries by enabling access to information and spreading knowledge to disadvantaged segments of society – including those living with disabilities, as well as women and girls. However, by the end of 2016, more than half of the world's population – 3.9 billion people – were not yet

using the Internet, and access was uneven between genders and geographical areas. Reducing inequalities cannot be achieved without addressing these underlying issues (International Telecommunications Union, 2019).

In a study that explored whether the educational quality thresholds in the diffusion of knowledge with mobile phones for inclusive human development in Sub-Saharan Africa, positive marginal effects were found to be consistent across specifications, implying that increasing human development can be traced to the interaction between mobile phones and educational quality, while the net effects, both conditional and unconditional effects, were positively corelated. However, an interesting suggestion derived from this study is that between 15 and 17 pupils per teacher are needed in primary education for mobile phones to enhance inclusive development. Recent information and communication technologies, such as cell phones, can be used for inclusive human development to reach sustainable development goals (Asongu and Nwachukwu 2018). Moreover, mobile phones have been found to have a positive impact on inclusive development, while good governance has a synergistic impact on the established effect (Asongu and Jacinta Nwachukwu, 2016, pg. 105).

The effects of information and communication technology on social and economic outcomes in Africa have been extensively studied in recent years. Special attention has been paid to mobile penetration and its impact. One study addressed the question of whether Africa is a knowledge economy or information society and had some interesting results. Africa appears to be an information society but not a knowledge economy, at least not yet. Without dispute, cell phones have a positive significant effect on social and economic outcomes. Cell phones are being used as tools to develop relational support and manage conflicts. Their impact goes beyond the post-modern concept and they have become powerful instruments that enhance transformation but also reinforce the current relationships among people with power (Carmody 2013) Civic behaviour can be revolutionized by the use of mobile phones and smartphones through mobile information and connectivity. Mobile phone use in South Africa increases civic engagement, while smart phone use appears to foster civic deviance. Moreover, mobile phone use interacts with the crucial factor of civic behaviour, which is social capital. Thus, smartphones can be considered to be obstacles for governments when designing effective e-government services (Ingrams, 2015). The institutional quality can be significantly impacted by mobile phone diffusion. In a study on Sub-Saharan Africa that evaluated mobile phone penetration's impact on improved governance, knowledge diffusion, variables such as innovation, Internet penetration and education were taken into account. Governance can be largely enhanced by mobile phone penetration, especially through knowledge diffusion. Research has also found that the net effects on political, economic, and institutional governance, which are interlinked with mobile phone use and knowledge diffusion variables, are positively correlated with many other variables (Asongu and Nwachukwu, 2016a).

We need to highlight that in addition to having been found to have a positive impact on governance improvement and civic behaviour, inclusive human development can be used to reach sustainable development goals and to decrease corruption. The outcomes of research using fixed effects regressions for panel data at the country level revealed a meaningful negative association between a country's degree of mobile phone penetration and that country's level of perceived corruption. Another analysis used a multivariate regression and indicated that the degree of mobile phone signal coverage in 13 Namibian provinces is considerably correlated with diminishing corruption at the individual level. Thus, research results have shown that mobile penetration will reduce corruption in Africa by decentralizing control over information and communication. Therefore, this reduces the likelihood that individuals will engage in corrupt acts, thereby increasing the risk of exposure and sentencing (Bailard, 2009).

Currently, mobile phones can be used to build an image within society. For instance, for youth, a mobile phone is considered to be a status device in three ways: as a fashion article, as a popularity display and as a display of one's time poverty. Furthermore, the mobile phones and telecommunications needed to make this type of technology operational may attract investment regardless of the investment climate in a country. This insight is even more interesting because the results of a research paper suggested that insecurity and bad governance may not be impediments to this type of investment (Konkel and Heeks, 2009). Indeed, this has implications for developing countries. These countries, which are facing various problems of poor governance and the lack of security, can still benefit from investment in infrastructure related to digital technologies. Such investment can also boost their development and enhance the social and economic outcomes of their inhabitants.

The power of mobile phones to transform our lives and improve social and economic outcomes is best described by the authors Acker and Mbiti, who highlight the following: "Empirical evidence shows that mobile phones have the potential to benefit consumer and producer welfare, and perhaps broader economic development. As the prices of both handsets and airtime continue to fall, the mobile phone will complete its transformation from an elite status symbol to a necessity for adults at nearly all income levels. Indeed, mobile operators are continuing to innovate in their push to reach more subscribers. The price of handsets has also fallen, and new solar powered phones have recently been introduced into the market. The challenge is now to ensure complementary access to public goods and the development of appropriate policies to evaluate and propagate the benefits of mobile phones throughout the continent" (Aker and Mbiti, 2010, pg. 31-32).

The effect of telecommunications diffusion on the improvement of socio-economic life in Africa has been measured using the endogenous growth model. The research results suggested that fixed-phone lines and mobile telephony have a substantial effect on people's living standards in Africa, while Internet usage does not have a

significant contribution. Overall, the mobile growth effect seems to have the greatest effect among the selected countries in the study (Chavula, 2013). In an assessment of the impact of mobile telecommunications on economic development, it was found that regarding the impact in low-income countries, which have a low mobile diffusion rate, the contribution to GDP growth is 0.11%, while for high-income countries, this contribution is 0.20%. Therefore, to increase the diffusion of mobile technologies, liberalization policies are recommended along with a decent regulatory framework (Gruber and Koutroumpis, 2011).

The mobile-finance revolution and poverty alleviation

There is considerable evidence that different activities can be performed with mobile telephones. For instance, a popular term that is being used is mobile money: "The use of a mobile phone in order to transfer funds between banks or accounts, deposit or withdraw funds, or pay bills. This term is also used for broader realm of electronic commerce; it can refer to the use of a mobile device to purchase items, whether physical or electronic" (Business Dictionary, 2019). Conducting financial transactions via mobile phones has become very popular in recent years. For instance, in Sub-Saharan Africa, there are more mobile phone owners than holders of bank accounts. The frequency of use of cell phones for financial transactions has increased incredibly (IBRD-World Bank Group, 2008, pg. 113).

It is estimated that approximately 2 billion people do not have access to financial transactions, and they are not integrated into the banking system. What is very important to highlight is the fact that, currently, this part of the world's population, who are considered unbanked by having access to cell phones, can also access digital financial services. Therefore, mobile phone diffusion is closely correlated with digital financial inclusion. Digital technologies can help unbanked people satisfy their financial needs starting from granting access to a bank account, conducting financial transactions (saving and transferring money), accessing loans and conducting other types of financial activities (Chu, 2018).

People in different areas who do not have access to specific services, including financial ones, can benefit greatly from access to cell phones. Parts of countries that do not have access to certain services, such as the banking sector, can conduct different financial transactions and can benefit greatly by using mobile phones to perform such activities. Individuals using mobile financial services have a higher possibility of saving at the household level than others. In fact, saving via cell phones can occur in two modes. basic mobile phone savings and bank-integrated mobile savings. This enables savings transfers, particularly among two types groups: the poor and low-income groups, who might not have access to financial services (Ouma, Odongo and Were, 2017).

Mobile banking can be effectively used to address growth, inequality and poverty in developing countries. To achieve this goal, countries should pay more attention to improving the environment for rapid mobile phone diffusion. By doing so, a country can create the foundation for the development of mobile banking applications. Moreover, applications that can be used by mobile phones can play a crucial role in inclusive development, which is a considerable goal and is specifically challenging for developing countries. To foster increased access to mobile phones, market liberalization and the privatization of the information and communication technology sector is considered to be very important (Asongu and Odhiambo, 2019). In Ghana, where the literacy rate is quite low (57.9 % of Ghanaians do not receive formal education), mobile banking can help address this problem. This can be achieved through voice recognition technology. The poor can conduct different financial activities through mobile phones using this technology. Thus, many benefits are at the disposal of the poor and the banking sector. A cell phone-banking platform can link banks with unbanked consumers living in different parts of developing countries. We might consider as a backbone the linkage between the consumer and financial services through cell phones; this helps the poor, especially poor uneducated consumers, manage their finances (Hinson 201, pg. 328).

In an analysis of the comparative human development thresholds for absolute and relative pro-poor mobile banking in developing countries, Simplice and Nwachukwu provided some interesting highlights. First, in terms of the linkages between 'mobile banking, poverty and human development', increased use of mobile phones to pay bills decreases poverty in lower-middle-income countries, upper-middle-income countries and Latin American countries. Second, an increased use of mobile phones to send/receive money reduces poverty in lower-middle-income countries, upper-middle-income countries and Central & Eastern European countries (Asongu and Nwachukwu, 2018b, pg. 12).

Developing countries are faced with different problems, including the lack of infrastructure, and are usually confronted with a small number of bank branches and fixed-phone lines. In contrast, the number of cell phones appears to be high. This enables the mobile phone to be used for mobile money transactions. First, it can be used to buy minutes, which then can be converted into money (Söderberg and Bångens, 2014).

Mobile money has indeed played a major role in poverty reduction, as was the case with Kenya:

"Mobile money, a service that allows monetary value to be stored on a mobile phone and sent to other users via text messages, has been adopted by the vast majority of Kenyan households. We estimate that access to the Kenyan mobile money system M-PESA increased per capita consumption levels and lifted 194,000 households, or 2% of Kenyan households, out of poverty. The impacts, which are more pronounced for female-headed households, appear to be driven by changes in financial behavior—
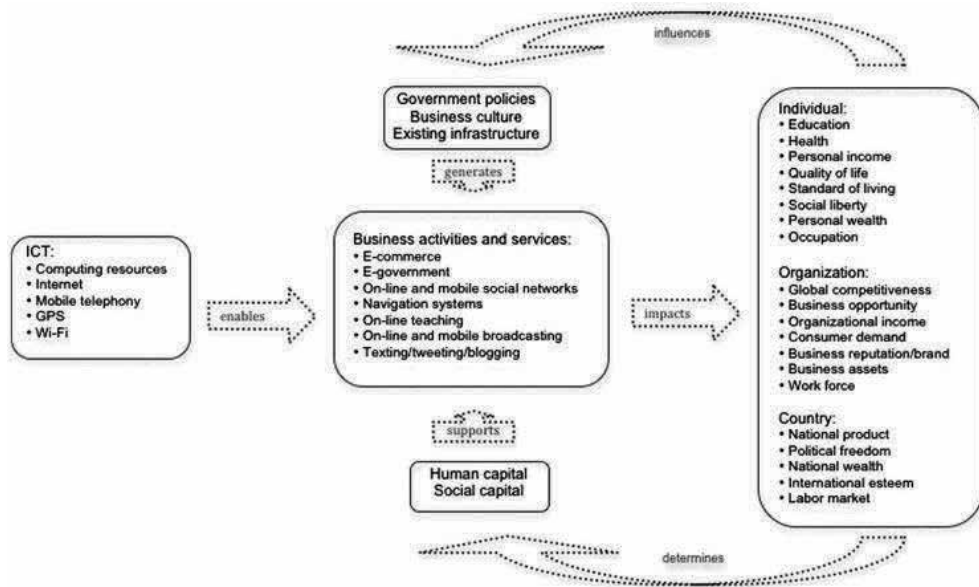
in particular, increased financial resilience and saving—and labor market outcomes, such as occupational choice, especially for women, who moved out of agriculture and into business. Mobile money has therefore increased the efficiency of the allocation of consumption over time while allowing a more efficient allocation of labor, resulting in a meaningful reduction of poverty in Kenya". (Suri and Jack, 2016, pg. 1288). In India, mobile money can facilitate the process of achieving financial inclusion, but it has to be supported and welcomed without reserve and enthusiastically. Developing countries can benefit greatly due to low-cost transactions and the fast speed of money transfers via cell phones (Chauhan, 2015). The diffusion of mobile money innovations is quite high, as determined by the legal framework and market infrastructure (Lashitew, van Tulder and Liasse, 2019). In addition, digital technologies can help overcome the issue of information asymmetry between creditors and debtors in developing countries. This can improve monetary access, which will improve social and economic (Asongu, Anyanwu and Tchamyou, 2017) outcomes.

Mobile phones and their impact on inequality: a conceptual framework

Despite efforts to combat poverty, inequality continues to exist in terms of access to health and education services and other assets. The international community has played a major role in lifting people out of poverty. Progress towards poverty eradication is being made in developing countries; however, it is characterized by large discrepancies and the presence of high levels of inequality. Policymakers should design universal and non-discriminatory policies. In addition, three approaches to sustainable development have to be taken into account: economic, social and environmental. The per capita income of 60 out of 94 countries has increased at a faster rate than the national average (United Nations, 2019).

Roztocki and Westroffer 2016 considered all macroeconomic and microeconomic factors to be important and that they impact the activities performed by individuals, business organizations and countries. In this regard, in their conceptual framework, they considered that all types of ICTs play a central role in supporting individual and business activities. Some of the ICTs considered relevant in their framework are the Internet, mobile telephony, geographic positioning systems, wireless technology, and the ever-increasing power and speed of computing resources (Roztocki and Weistroffer, 2016).

Figure 1: Conceptual framework of ICT-supported socio-economic development

ICT may potentially help disadvantaged persons as well as women and girls. It can facilitate a reduction in inequality by granting access to information and knowledge. When individuals and households do not have access to bank accounts, education systems, proper health care, or governmental services, individuals are more prone to constant deprivation, and the possibility for discrimination increases. Prior studies have shown that people with access to mobile telephones and Internet connection can surf through various types of information and knowledge; moreover, they can also use it to make payments. Access to mobile telephony enables access to Wi-Fi and access to GPS, and individuals can perform different activities, such as e-commerce, e-governance, health, education, paying the bills, saving money, and transferring money to other persons. This creates a good basis for poor people to break the cycle of deprivation and enable them more equal opportunities. Based on the literature review and the conceptual framework of Roztocki & Westroffer 2016 on ICT-supported socioeconomic development, we design our own conceptual framework.

Figure 2: Theoretical framework.
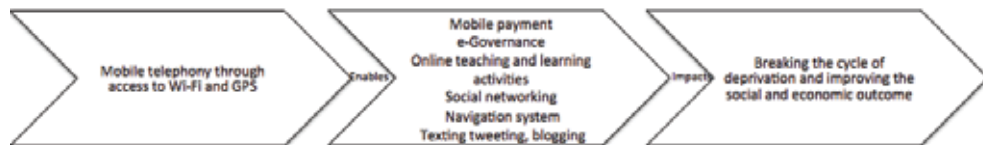
Source: The author

Although many people relate inequality to unfair wealth or income dispersion, it is actually a phenomenon that appears in the form of divergence among genders, races and communities. What is even worse, a person might be deprived of a certain right and also faced with multiple inequalities. This is because multiple inequalities tend to feed on each other (UNFPA et al., 2017). Cell phones, through access to Wi-Fi and GPS, enable people access to perform different activities and to various opportunities. In particular, the performance of mobile payment transfers and payments is another form that can enable supporting the poor. By supporting the poor, they might more easily exit the spiral of deprivation.

The econometric model

To study the effect of cell phone diffusion on inequality in Western Balkan countries, we follow the methodology applied by Simplice Asongu in his research regarding "The impact of mobile phone penetration on African inequality" in 2015. This is one of the first studies that analysed the relationship between mobile phones and inequality from a macroeconomic point of view (Asongu, 2015). The methodology that Asongu used in this paper was based on a previous methodology he used to study how mobile phone penetration stimulated financial development in Africa (Asongu, 2013) and was first used by Andrés, who investigated software piracy and income inequality (Andrés, 2006). We develop the following econometric model to analyse the effect of mobile phone penetration on Western Balkan inequality:

$$Inequality = \sigma_0 + \sigma_1 Mobile + \sigma_2 Trade + \sigma_3 Inflation + \sigma_4 M2$$
$$+ \sigma_5 NODA + \sigma_6 RL + \sigma_7 GDPg + \varepsilon$$

Inequality represents the Gini coefficient; Mobile represents the mobile phone penetration rate; Trade represents trade openness; Inflation stands for the inflation rate; M2 signifies financial depth; NODA is the acronym used for net official development assistance; RL signifies the rule of law; GDPg stands for economic prosperity , and ε is the error term. We follow the same empirical strategy as Asongu 2015. We

conduct correlation analysis to avoid problems related to multicollinearity and over-parameterization. The robustness of the analysis is ensured by the following: first, we use alternative specifications; second, we conduct modelling with heteroscedasticity and autocorrelation consistent (HAC) standard errors; third, we use the Ramsey regression equation specification error test (RESET) to check the validity of the model specification; and fourth, we conduct modelling with two-stage least squares (2SLS) to control for endogeneity. Since the baseline modelling is conducted with ordinary least squares (OLS), the four basic concerns of this approach are addressed. While the autocorrelations in residuals and heteroscedasticity are approached with HAC standard errors, the assumption of linearity is verified with the RESET (Asongu, 2015, pg. 710).

This study uses data from five Balkan countries: Albania, Bosnia and Herzegovina, Kosovo, Montenegro and Serbia. The data were mainly collected from World Development Indicators, International Telecommunication Union, and Financial Development and Structure Database (FDSD) of the World Bank. Data on the Gini coefficients, trade, inflation, rule of law, population and GDP per capita growth for economic prosperity were obtained from the World Development Indicators, data on mobile cellular subscriptions were obtained from the International Telecommunication Union, and data on financial depth and net official development assistance were obtained from the FDSD of the World Bank. The mobile phone penetration rate was calculated by dividing the number of mobile cellular subscriptions per population.

Results

This section has two aims: the first aim is to test the capability of cell phone diffusion to describe income inequality conditional on other independent variables, and the second is to test the possibility of non-linear combinations of the fitted values that explain the control variables. The ability of mobile phone diffusion to describe income-distribution effects is explained via significance and the signs of the estimated coefficients, and the second is addressed via the RESET.

Effect of mobile penetration on inequality (HAC standard errors are consistent)

In statistics, the Ramsey Regression Equation Specification Error Test (RESET) test is a general specification test used for the linear regression model. The test was developed by James B. Ramsey as part of his Ph.D. thesis at the University of Wisconsin–Madison in 1968 and later published in the Journal of the Royal Statistical Society in 1969. More specifically, the RESET tests whether non-linear combinations of the fitted values help explain the response variable. The intuition behind the

test is that if non-linear combinations of the explanatory variables have any power in explaining the response variable, the model is misspecified in the sense that the data generating the process might be better approximated by a polynomial or another non-linear functional form (Ramsey, 1969). The p-value of our F-stat is 0.803 for model one, 0.885 for model two and 0.106 for model three. Therefore, at the 5% significance level, we fail to reject the null hypothesis of the correct specification. This indicates that our model does not suffer from a functional form of misspecification and has no omitted variables.

Instead of using White's Test, which was used by Asongu, we use the Breusch-Pagan test for heteroscedasticity. Trevor Pagan and Adrian Pagan developed the Breusch-Pagan test in 1979. This is used to test heteroscedasticity in a linear regression model. It tests whether the variance of the errors from a regression is dependent on the values of the independent variables. On that occasion, heteroskedasticity is present (Breusch and Pagan, 2006). As per the results of the Breusch–Pagan test for all three models, there is no heteroscedasticity present. Consistent with Asongu's results (Asongu, 2015), our research outcome indicates that cell phone penetration is pro-poor and has a positive income equality effect. Overall, we conclude that most of the variables are significant except trade, which in our case appears to be nonsignificant. As per the authors, (Asongu, 2015) and (Kai and Hamori, 2009) financial depth has a positive income-redistributive effect, while trade openness has a negative income-redistributive effect in Africa. Consistent with both authors, in our case, financial depth appears to be significant, while trade openness does not. In the table below, the results of the ordinary least squares are presented. There are three econometric models conducted. The regressions were conducted with and without HAC standard errors.

Table 1: Effect of the mobile penetration rate on inequality (HAC standard errors are consistent)

	Dependent variable: Gini index					
	Regressions without HAC standard errors			Regressions with HAC standard errors		
	Model 1	Model 2	Model 3	Model 1*	Model 2*	Model 3*
Constant	28.346***	30.507***	34.433***	28.346***	30.507***	3.621***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.834)
Mobile penetration	-0.049**	-0.055***	-0.059**	-0.049***	-0.055***	0.050
	(0.018)	(0.010)	(0.015)	(0.001)	(0.002)	(0.239)
Trade	0.026	0.015	-0.006	0.026	0.015	-0.144*
	(0.454)	(0.658)	(0.898)	(0.266)	(0.501)	(0.096)
Inflation	0.194*	0.315**	0.350**	0.194**	0.315*	0.454*
	(0.088)	(0.035)	(0.031)	(0.185)	(0.065)	(0.089)
Financial depth	0.106**	0.107**	0.091	0.106***	0.107***	0.033
	(0.037)	(0.034)	(0.106)	(0.002)	(0.004)	(0.765)
NODA	-	-0.002	-0.001	-	-0.002*	8.89e-06
		(0.198)	(0.294)		(0.061)	(0.998)
Rule of law	-	-	3.527	-	-	-5.038
			(0.450)			(0.750)
GDP growth	-	-	0.020	-	-	0.603
			(0.906)			(0.102)
RESET	0.33	0.21	2.30	0.33	0.21	2.30
	(0.803)	(0.885)	(0.106)	(0.803)	(0.885)	(0.106)
Breusch-Pagan test	(0.092)	(0.403)	(0.328)	(0.092)	(0.403)	(0.328)
R-squared	0.264	0.311	0.327	0.015	0.311	0.262
Observations	32	32	32	32	32	32
Notes	Notes: HAC: heteroscedasticity and the autocorrelations are consistent; NODA: net official development assistance. p-values appear in brackets. *,**,*** indicate significance at the 10, 5 and 1 percent levels, respectively					

Source: The author

The two-stage least squares approach

The table below reports the results of robustness checks conducted with the two-stage least squares approach. To check for model endogeneity, we conduct the Durbin-Watson test and the Wu-Hausman test. In all three models, the variables are exogenous, and endogeneity does not appear to be an issue in our models. This confirms that we could have used only the OLS simple regression. Tests to check for overidentifying restrictions are used to check the validity of the models. The p-values of the

instrumental variables in the Sargan test and the Basman test are valid, and all three models are well specified.

Table 2: Robustness checks with the two-stage least squares approach

	Dependent variable: Gini index					
	Regressions without HAC standard errors			Regressions with HAC standard errors		
	Model 1	Model 2	Model 3	Model 1*	Model 2*	Model 3*
Constant	30.885 (0.000)	31.327 (0.000)	29.261 (0.000)	30.885 (0.000)	31.327 (0.000)	29.261 (0.000)
Mobile penetration	-0.005 (0.601)	-0.009 (0.310)	-0.069 (0.059)	-0.005 (0.615)	-0.009 (0.168)	-0.069 (0.055)
Inflation	-	0.000 (0.999)	0.274 (0.016)	-	0.000 (0.999)	0.274 (0.023)
Financial depth	-	-	0.190 (0.088)	-	-	0.190 (0.114)
Durbin-Watson test	1.375 (0.240)	2.530 (0.111)	0.705 (0.408)	1.375 (0.240)	2.530 (0.111)	0.705 (0.408)
Hausman test	1.308 (0.261)	2.404 (0.132)	0.608 (0.442)	1.308 (0.261)	2.404 (0.132)	0.608 (0.442)
Sargan OIR	1.353 (0.508)	2.196 (0.333)	2.381 (0.304)	1.35 (0.508)	2.196 (0.333)	2.381 (0.304)
Basman OIR	1.246 (0.536)	1.989 (0.369)	2.090 (0.351)	1.246 (0.536)	1.989 (0.369)	2.090 (0.351)
Observations	35	32	32	35	32	32
Notes:	HAC: heteroscedasticity and the autocorrelations are consistent; OIR: overidentification restrictions test. p-Values appear in brackets. *,**,*** indicate significance at the 10, 5 and 1 % levels, respectively					

Source: The author

Conclusions

The aim of this research paper is to analyse the impact of mobile phone penetration on inequality in Western Balkan countries. Our aim is to complement the literature gap regarding analyses that correlate mobile phone penetration and inequality, considering the tremendous development of the ICT sector, dominating many areas of our lives.

Using the conceptual framework of ICT-supported socioeconomic development developed by Narcyz Roztocki & H. Roland Westroffer in 2016, we develop our own conceptual framework. Cell phones, through access to Wi-Fi and GPS, allow people to perform different activities and provide various opportunities. In particular, mobi-

le payment transfers and payments is one of the forms that can enable supporting the poor so they can exit the spiral of deprivation.

Our results confirm the income-redistributive effect of cell phone diffusion. The research outcome indicates that mobile penetration is good for the poor, considering its positive income-redistributive effect. The findings are consistent with the results of Asongu 2015 (Asongu, 2015).

Appendix

Annex 1: Summary statistics

Variable	Mean	Standard deviation	Min	Max
Gini coefficient	30.397	2.344	26.3	36.5
Mobile penetration	95.207	48.077	0.964	209.312
Trade	87.192	17.697	52.166	132.340
Inflation	5.662	13.685	-2.418	95.005
Financial depth	36.158	16.825	4.118	83.214
Rule of law	-0.399	0.302	-1.271	0.335
GDP growth	3.956	3.707	3.707	26.887
NODA	517.697	409.079	409.079	2084.67

Table Annex 2: Correlation matrix

	GC	MP	Trade	Inflation	M2	RL	GDPg	NODA
GC	1.000							
MP	-0.2160	1.000						
Trade	0.0261	0.5189	1.0000					
Inflation	0.3259	0.0303	-0.0366	1.000				
M2	-0.0652	0.7134	0.5442	-0.1670	1.0000			
RL	-0.1042	0.8412	0.6019	-0.3888	0.6844	1.0000		
GDPg	0.2120	-0.4927	-0.0884	0.2073	-0.4919	-0.2532	1.000	
NODA	0.1905	-0.2291	-0.0115	0.4588	-0.1938	-0.5237	0.1593	1.000

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