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THE IMPACT OF INTELLIGENCE ON ECONOMIC AND FINANCIAL CRIME: A CROSS-COUNTRY STUDY

MONICA VIOLETA ACHIM[*,¶], SORIN NICOLAE BORLEA[†,‡], VIORELA LIGIA VĂIDEAN[*], ALEXANDRA IOANA RUS[*] and FLORIN DOBRE[§]

[*]*Faculty of Economics and Business Administration*
Babes-Bolyai University, No. 58-60, Teodor Mihali Street
400591 Cluj-Napoca, Romania

[†]*Department of Economics, Faculty of Economics*
Informatics and Engineering "Vasile Goldis"
Western University of Arad
No. 94, B-dul Revoluţiei
310025 Arad, Romania

[‡]*Doctoral School of Economics*
Faculty of Economics, University of Oradea, No. 1
Str. Universităţii, Bihor
410087 Oradea, Romania

[§]*Bucharest University of Economic Studies*
No. 6, Piaţa Romană, Sector 1
010374 Bucharest, Romania
[¶]*monica.achim@econ.ubbcluj.ro, monica.achim@ubbcluj.ro*

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The aim of this paper is to explore the relationship between intelligence and economic and financial crimes. For this purpose, we use a cross-sectional sample of 182 countries for the time span of 2012–2017. Our research provides empirical evidence on the existence of a significant impact of intelligence upon economic and financial crimes. When we analyze the entire sample, we find that intelligent people are more prone to comply with the law and thus increase the efficiency of implementing government policies to reduce economic and financial crimes. However, when we conduct our analysis among the two subgroups of high- and low-income countries, different results are obtained. For high-income countries, we obtain evidence of a positive coefficient for the impact of intelligence on economic and financial crimes, meaning that increased intellectual capacities of people from these countries, including high professional knowledge and skills, are used to break the traditional technology in order to get illegal benefits. Our results conducted for the low-income countries' subsample do not support intelligence as being a determining factor for economic and financial crimes; in these countries, other determinants are more important for engaging in such activities. Our study may have important implications for the policymakers who must acknowledge

[¶]Corresponding author.

that various policies in the field of economic and financial crimes need to be differentially adopted depending on the level of development of each country, which offers different ways of involvement in such crimes, related to the level of people's intelligence.

Keywords: Intelligence; economic and financial crime index; corruption; shadow economy; money laundering; high-income countries; low-income countries.

JEL Classification: O17, H11, H26, I25

1. Introduction

The economic and financial crime phenomena[1] still remain a persistent challenge, despite all the toil engaged in order to combat them.[2] Therefore, the corrupting role of big money in political party financing and the undue influence it exerts on the political systems must be urgently addressed by the governments.[3]

The governmental decision makers need to discover the exact causes that may create incentives for engaging in economic and financial crime activities, in order to be able to adopt an effective combat strategy. This paper uses explanatory variables like the level of economic development, tax burden, public governance, audit quality and financial banking development in order to examine whether people's intelligence may affect the size of the economic and financial crimes. With Lynn and Vanhanen's (2002) publication of IQ data for the world countries, researchers started to analyze the role played by intelligence with respect to law compliance, which correlates with better institutional quality (Rindermann, 2008; Potrafke, 2012; Kanyama, 2014), higher economic freedom (Rindermann 2008) and better informed voting (Jones, 2011). The assumption regards the fact that if a government implements policies meant to reduce economic and financial crimes, intelligence may offer a reasonable estimate of the level of acceptance of these public policies.[4] Indeed, better educated people are more likely to recognize and penalize rent-seeking behavior (Delli Carpini and Keeter, 1996; Galston, 2001) and they have longer time horizons, thus the level of corruption decreases (Potrafke, 2012). In addition, the study of Čiutienė *et al.* (2015) conducted over the 2005–2012 period in Lithuania, finds that the human capital education level is an important factor for emerging shadow activities.[5] Higher educated people will better understand the social order and risks related to breaking the law and would be less influenced towards an increase in consumption value on the account of the shadow economy, even when the economic situation becomes worse. Similar results are

[1] Regarding the cost of corruption, Lagarde (2016) reveals that 2% of global gross domestic product (GDP) is annually paid in bribes meaning about US$1.5–2 trillion per year around the world. Furthermore, Achim *et al.* (2019) find that 19% of European countries' GDP is lost within the shadow economy.

[2] According to Global Financial Integrity (2019), the illicit financial value (trade misinvoicing, smuggling, tax evasion, etc.) over the 10-year period in between 2008 and 2017 gets to **US$**8.7 trillion among the world countries. Regarding corruption, the recent data of Transparency International (2020) shows that despite some progress, a wide majority of countries are still failing to tackle public sector corruption effectively.

[3] See, for more details, Transparency International (2020).

[4] The readers can refer to Salahodjaev (2015) for more details.

[5] More exactly, they validate the existence of a positive influence of people on the poverty line depending on education when the level of education is low (up to ISCED97 level 4) and a negative influence of them when the level of education is high (ISCED97 levels 5–6).

found by Salahodjaev (2015)[6] using data from 158 countries over the 1999–2007 period. He also finds a negative influence of intelligence [measured with the IQ score provided by Lynn and Vanhanen (2012)] on the level of shadow economy.

As a main objective of our study, we intend to investigate whether the level of intelligence affects the economic and financial crime levels of a country or not.

To achieve our objective, we build an index for economic and financial crimes which measures the level of economic and financial crimes of each country. Then, we run a panel regression for the 182 world countries over the 2012–2017 time span, in which we examine the influence of intelligence on the size of the economic and financial crimes (controlling for variables such as economic development, rule of law (RL), tax burden, audit quality and financial development). Our results provide evidence on the existence of a significant impact of intelligence upon economic and financial crimes. When we analyze the entire sample; we find that intelligent people are more prone to comply with the law and thus the level of economic and financial crimes decreases. However, we find different results after conducting our research on the two subgroups of high- and low-income countries. We find a positive influence of intelligence on the economic and financial crimes for high-income countries and no significant influence for the subsample of low-income countries.

Regarding the originality of this work, for the first time to our knowledge, a relationship between people's intelligence and economic and financial crimes is investigated. For this analysis a global score of economic and financial crimes is used, in order to get a complete view of these phenomena. Second, for the first time to our knowledge, we conduct our analysis on two income divided subsamples of countries from which we may extract specific findings related to the level of economic development of countries. A third original value of this work compared to the previous findings refers to the use of the most updated and complete version of IQ data provided by Lynn and Becker (2019). Fourth, the analysis of the relationship between intelligence and economic and financial crimes takes new control variables into account such as audit quality and financial bank development, variables which are found to have a significant influence on the economic and financial crimes and that have not been used directly in connection with economic and financial crimes until now.

The remainder of the paper is organized as follows: Section 2 reveals the literature review in the field of the relation between intelligence and economic and financial crimes. Section 3 describes the methodology and data. Section 4 presents the results of our analysis. Section 5 discusses the main empirical results and the relation with other findings from the literature. Section 6 provides the main conclusions and summarizes the policy implications of our research and the limits which represent the directions for future research.

2. Literature Review

There is a large strand in the literature suggesting the reasons why intelligence may be negatively linked to economic and financial crimes.

[6]More exactly, Salahodjaev finds that one-standard-deviation increase in IQ is associated with a reduction of shadow economy in GDP of 8.5 percentage points, on average.

First, Hirschi and Hindelang (1977) and later Mõttus *et al.* (2012) find that IQ is a statistically significant determinant for criminal behavior and negatively influences the antisocial behavior. It is assumed that better educated taxpayers know more about the tax system, they are more aware of the benefits and services that the state offers to citizens from the budget revenues, and therefore the degree of individual compliance increases (Torgler, 2007). In this view, Alm and McClellan (2012) find that improvements in tax morale have a significant and positive impact on tax compliance, on reporting and collecting taxes more exactly. Indeed, Rindermann (2018) finds that there is a positive correlation between cognitive ability and the ethical dimension of behavior ($r = 0.60$), while corruption and cognitive ability correlate with $r = -0.56$. Based on these correlations, he concludes that corruption may be an indicative of cognitive ability.

Second, cognitive skills influence the risk aversion (Frederick, 2005; Dohmen *et al.*, 2010) and moral behavior (Oesterdiekhoff, 2014). Lower cognitive ability is associated with greater risk aversion. Within a high uncertainty culture which faces ambiguous situations, people may perceive larger levels of anxiety (Tsakumis *et al.*, 2007). For these people, corruption can be regarded as a mechanism to decrease uncertainty in order to obtain more certain results (Husted, 1999). Under these circumstances, people tend to consider tax systems as being too complex in nature and therefore they tend to evade taxes (Richardson, 2008) and it is reasonable to expect that engaging in the shadow economy activities can be perceived as a mechanism to reduce uncertainty and ambiguity.

Third, cognitive skills influence patience and thus a lower cognitive ability is associated with a more pronounced impatience (Dohmen *et al.*, 2010; Jones, 2011) and impulsive behavioral traits are negatively related to emotional intelligence (Howe *et al.*, 2014). The patience is characterized by risk-taking and long-term planning (Dohmen *et al.*, 2010). In this view, Seruca and Silva (2016) analyze two groups of offenders and non-offenders, in their pursuit of investigation on the neuropsychological causes of criminal behavior.[7] The time orientation of the people may stimulate engaging in shadow activities, because "one of the most important characteristics of long term orientation is thrift and preparation for the future" (Réthi, 2012). Under these assumptions, a short-term orientation enhances the need to ask for gifts and favors in order to get immediate benefits, thus corruption increases (Achim *et al.*, 2019).

Fourth, a higher level of intelligence determines a higher level of understanding and respecting the law and therefore the institutions' efficiency increases (Potrafke, 2012; Kanyama, 2014; Lv, 2017). This happens because informed agents are more likely to solve the problems through institutions rather than through illegal behavior.[8] Similarly, Glaeser *et al.* (2004) find that human capital enhances institutional environment in the short run and later the studies of Potrafke (2012), Kanyama (2014) and Lv (2017) find that higher IQ levels of a nation are related to an improved quality of institutions from that country. In the same view, Jones (2011) reveals that intelligence matters more for nations than for

[7] They find that offenders (referring to violent, property and drug trafficking crimes) performed worse than non-offenders on the mental flexibility and planning measures.
[8] More details can be obtained from Lipset (1960) and Salahodjaev (2015).

individuals, through four channels.[9] In the line of Jones' (2011) findings, Potrafke (2012) empirically demonstrates that intelligence increases the efficiency of institutional quality by reducing the level of corruption.[10] Following this view, Kanyama (2014) also validates that countries with higher IQ levels enjoy a more improved institutional quality than the countries with lower levels of IQ, regarding the dimensions of corruption, government efficiency, regulatory quality and rule of law.

In the same view, there are also studies documenting the influence of education on different types of financial crimes. In this view, the study conducted by Jiménez *et al.* (2015) reveals that formal entrepreneurialism is positively associated with secondary and tertiary education, while informal entrepreneurialism is negatively influenced only by tertiary education. Similarly, Chan *et al.* (2000) and Kasipillai *et al.* (2003) find that the decisions of the American respondents to comply with the tax laws are first determined by their age and education. Furthermore, the study conducted by Kasipillai *et al.* (2003) confirms the prevalence of a relation between education and tax compliance among the students from Malaysia. Education is also mentioned as an important factor for diminishing money laundering (Favarel-Garrigues *et al.*, 2007; Nikoloska and Simonovski, 2012; Isa *et al.*, 2015; Lowe, 2017; McKenna, 2017). Thus, the financial and business sophistication rate hinders the detection of suspect transactions by the financial-banking system employees (McKenna, 2017). Next, the banks should elaborate a set of criteria that would identify suspect transactions related to money laundering (Favarel-Garrigues *et al.*, 2007). Related to this issue, Nikoloska and Simonovski (2012) demonstrate the role played by the education of the bank employees to apply suitable criteria for identifying suspect transactions in order to prevent money laundering. Isa *et al.* (2015) follow the same idea and conclude that human expertise is required to deal with a false alarm and to truly evaluate whether the cases flagged by the system reflect a real threat of the risk of money laundering. Considering these issues, Lowe (2017) dedicates a vast descriptive study to highlight the importance of a predictive intelligence that would support the programs in the fight against money laundering in the financial sector.

On the other hand, the studies of the specialized literature (Leţia, 2014, p. 14; Aniţei and Lazăr, 2016, p. 16; Achim and Borlea, 2020, p. 2) identify another peculiarity of economic and financial crimes: they assume high professional knowledge and competence and a specialization of the knowledge by those who commit such crimes, respectively. Under such circumstances, the economic and financial crimes are closely related to the economic and social changes and development of the society and they can occur as innovations made by the individuals, so they adjust to the societal changes (Merton, 1968). In an ever-changing society, the adjustment to the new economic and social conditions can be carried

[9] First, Jones (2011) validates that intelligence is associated with patience and the more patient nations would save more. Second, Jones finds that intelligent people become more cooperative and trust the officials more, thus causing prosperity through public choice channels. Third, intelligence creates opportunities to use high-value production technologies which create massive differences in cross-country productivity. Finally, intelligence is associated with supporting market-oriented policies which create prosperity.

[10] Potrafke (2012) explains this relation by the fact that more intelligent people have longer time horizons and they are not concerned of getting immediate benefits through bribing the officials.

out in different ways by individuals of the society. Thus, businessmen can invent different forms of white-collar crimes for tax avoidance and money laundering, while poor people can develop illegal activities, such as prostitution, gambling and drug sales (Aniţei and Lazăr, 2016, pp. 17–18). In the age of Internet and artificial intelligence, such innovations are closely linked to cybercrime on financial transfers, requiring "special skills, work and a lot of perseverance" (Şcheau, 2018, p. 17). In this context, the use of modern technologies does not only bring positive effects to the company, but has also attracted fraudsters and criminals to misuse the technology for financial benefits in the form of cybercrime (Gogolin, 2010; McAfee, 2018; Ryman-Tubb *et al.*, 2018; Ali *et al.*, 2019). This way, cybercriminals[11] may use various ways to commit crimes at a long distance, in other jurisdictions, hiding their identities and staying beyond the reach of any prosecutor (Ali *et al.*, 2019). In addition, credit card frauds cause[12] significant financial losses to merchants and banks. Then, the proceeds of this fraud are known to finance the industries of weapons and drugs (Ryman-Tubb *et al.*, 2018). The high level of digital fraud undertaken in the context of increased IT technologies can be explained by the pace of technical change which exceeds the laws' enforcement ability to deal, investigate and prosecute these crimes (Gogolin, 2010). To keep the pace, digital crime investigation requires high investments in training, equipment, laboratory standards, supporting infrastructure and software licenses (Gogolin, 2010) and high investments in digital skills which are very perishable (Bink *et al.*, 2011). In conclusion, the increase in the level of cybercrime is associated with higher professional knowledge and cyber skills.

Under these aforementioned circumstances, however, we formulate the following research-working hypothesis.

Hypothesis. *A higher level of intelligence leads to a smaller size of economic and financial crimes.*

In addition, many researches on economic and financial crimes (Dreher and Schneider, 2010; Aniţei and Lazăr, 2016, p. 16; Achim *et al.*, 2018b, 2019; PricewaterhouseCoopers, 2018; Achim and Borlea, 2020, p. 51) find the level of economic development as being an important determinant for these acts. Also, it may affect the way in which various factors interact. For instance, the study conducted by Aniţei and Lazăr (2016, p. 16) reveals that the economic growth and economic crisis are causing high social changes, stimulating the criminals through the tide effect (created by suspending a legislation and the time elapsed until the promulgation of a new legislation). In this sense, a study conducted by PricewaterhouseCoopers (2018) identifies the existence of a close relation between the economic development level of a country and the occurrence of frauds. It highlights that in developing countries, 15% of the investigated financial societies expect a significant increase of the sources allocated to investments in order to identify the fraud in the next two years, compared to only 9% noticed in developed countries. For these reasons, many researchers on economic and financial crimes (Treisman, 2000; Paldam, 2002; Achim

[11] The cost of global cybercrime has increased from US$445 billion in 2014 to US$608 billion in 2017 as a result of adopting new technologies (McAfee, 2018).

[12] According to Robertson (2016), the worldwide card fraud losses increased three times in 2015 compared to 2010.

et al., 2018a,b) have conducted their studies separately between the two groups of countries, namely high- and low-income countries.

From this perspective, it is reasonable to investigate the extent to which the relationship between intelligence and economic and financial crimes may depend on the level of country development. Therefore, we state the following research question.

Research Question. *How does the impact of intelligence upon the economic and financial crimes differ between high-income and low-income countries*?

3. Methodology and Data

3.1. *Description of the variables*

3.1.1. *Dependent variable: Economic and financial crime index*

According to the definitions provided by both US Legal (2020) and Europol (2020), economic and financial crime "refers to illegal acts committed by an individual or a group of individuals to obtain a financial or professional advantage". Thus, the main reason behind such crimes involves getting economic gains through illegal ways. We may state that both the definitions[13] and especially the measurement of economic and financial crimes are challenging attempts.

Starting from the definitions identified in the literature and the specialized practice, we define economic and financial crimes as a set of illegal acts (crimes) committed by persons or legal entities with the purpose of producing or intermediating the production of economic and financial benefits. The economic and financial crimes are specific to the businesses and may appear in the form of corruption, fraud, tax evasion, money laundering, etc. Also, illegal businesses such as prostitution, gambling, smuggling and trafficking of drugs or human beings produce (or mediate) economic and financial benefits for certain stakeholders, therefore, they are included in the area of economic and financial crimes, as components of the shadow economy.

Following Achim and Borlea (2020, pp. 38–40), we build an *economic and financial crime index* (*CSL*) as an arithmetic averaged score of the main important categories of economic and financial crimes (corruption: C, shadow economy: S and money laundering: L) where: (a) corruption (C) is determined using the Corruption Perception Index, which is provided by Transparency International (2020); it aggregates data regarding the perception of corruption registered in the public sector in different countries of the world. (b) Shadow economy (S) is determined using the database elaborated by Medina and Schneider (2019), in which the size of the shadow economy is calculated as a percentage of the official GDP. (c) Money laundering (L) is measured using Basel AML (i.e., Basel Anti-Money Laundering Index), which measures the risk of money laundering and terrorist financing in over

[13] At the international level, states have not agreed to provide a unified definition for economic and financial crimes (Leţia, 2014, p. 13). For instance, US Legal (2020) reveals that cybercrimes, tax evasion, robbery, selling of controlled substances and abuses of economic aid are all examples of economic crimes. On the other hand, PricewaterhouseCoopers (2016) associates the concept of economic and financial crimes with the followings acts: "asset misappropriation, bribery and corruption, procurement fraud, accounting fraud, human resources fraud, money laundering, IP infringement, tax fraud, mortgage fraud, competition/antitrust law infringement, espionage and others".

129 countries around the world. The Basel AML score is calculated starting from 2012. According to the methodology of Achim and Borlea (2020, pp. 38–40), we will use the standardized values of corruption, shadow economy and money laundering, in order to obtain homogenous data. The resulting CSL score ranges between 0 and 1 reflecting the minimum and maximum levels of economic and financial crimes, respectively. Basically, this score can be used to measure the level of economic and financial crimes that characterizes a particular country, allowing comparative analyses between countries: the closer the values of CSL of the countries are to 0, the less developed the corruption, shadow economy and money laundering are within those particular countries, while the CSL values closer to 1 reveal a more pronounced development of these economic and financial crime phenomena. Appendix C even shows that for the studied time period and sampled countries, the corruption, money laundering and shadow economy deeds have a smaller incidence within high-income countries (the average value of their CSL score is 0.26) and a higher incidence in low-income countries (the average value of their CSL score is 0.48).

3.1.2. *Independent variable: Intelligence*

Intelligence and education are closely related (Lynn and Meisenberg (2010) and Lynn and Vanhanen (2012); Rindermann, 2018). In this view, both the methodologies of building IQs provided by Lynn and Meisenberg (2010) and Rindermann (2018) are based on intelligence and educational attainment in PISA (Programme for International Student Assessment), TIMSS (Trends in International Mathematics and Science Study) and similar studies. According to Lynn and Meisenberg (2010), the correlation between educational attainment and measured IQ is very high, of 0.917. In other words, education boosts intelligence (Ritchie and Tucker-Drob, 2018). However, there is no clear evidence yet on exactly *how* much education might increase the IQ scores (Ritchie and Tucker-Drob, 2018). In addition, for a company, intelligence can be considered a key element for corporate functioning and business performance under the form of intellectual capital[14] (Rus *et al.*, 2019).

Following Rindermann (2008), Potrafke (2012) and Kanyama (2014), we measure the key independent variable through the intelligence score built by Lynn and his collaborators. More exactly, we use the intelligence score from the latest study of Lynn and Becker (2019). It regards national IQs as measures of general intelligence defined as the totality of cognitive abilities.[15] Generally, the IQ scores measure the level of cognitive development on the macroeconomic level and they are determined in total for 201 world nations. This IQ dataset is the most recent and complete version[16] of Lynn and Meisenberg (2010) and Lynn and Vanhanen (2012).

[14] One of the first definitions of intellectual capital refers to it as being "investing in human capital, as well as preparing the individual" (Becker, 1964). This definition is closely related to the concept of intelligence.

[15] They include Spearman's *g* (the general factor present in all cognitive tasks) and other cognitive abilities which are not related to *g*.

[16] The main differences between this latest study of Lynn and Becker (2019) and the previously published studies of Lynn and his co-authors include providing of a higher level of detail on how to build the IQ score and using a much larger amount of secondary data than in the case of their previous studies.

3.1.3. *Control variables*

Following other studies, we control for some determinants of the economic and financial crimes which are used in the literature such as *economic development*, *governance*, *tax burden*, *audit quality* and *financial development*.

The level of economic development of a country is one of the most important factors identified in the literature as a determinant for engaging in economic and financial crimes.[17] Following Salahodjaev (2015) and Medina and Schneider (2018), we measure the economic development using the GDP per capita variable.

Regarding governance, the efficiency of the institutions and the efficiency of the legal system reflected by the rule of law (Chong and López-de-Silanes, 2015; Vaithilingam and Nair, 2009; Ardizzi *et al.*, 2014) together with the quality of the regulations (Chong and López-de-Silanes, 2015; Schwarz, 2011) are identified as having an important role in reducing the size of money laundering.[18] Economic and financial crimes refer to getting economic gains through illegal ways. Illegal acts are determined by the law. Thus, the rule of law becomes incredibly important as a determinant of how people judge the costs and benefits of conducting illegal acts. If laws are inconsistently enforced, it may be rational to break the law. Therefore, having in mind the relationship with the economic and financial crimes and following many authors,[19] we measure the quality of governance through *RL*.

The literature highlights the role of tax burden on economic and financial crimes by the fact that a high rate of taxation may lead to acts of corruption of public officials for circumventing taxation or by engaging in underground activities.[20] It is assumed that tax burden is related to corruption, given that entrepreneurs appeal to bribing the officials in order to obtain some private gains such as avoiding taxation and regulations or winning public contracts (Fjeldstad, 2003; Kaufman, 2010).[21] Tax burden determines the level of money laundering while money laundering is often carried out through tax havens, according to the literature.[22] Following Dreher and Schneider (2010), Torgler and Schneider (2009) and Salahodjaev (2015), we measure tax burden using the fiscal freedom as it is provided by the Heritage Foundation (2019).

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[17] A high standard of living can lead to a better law enforcement and therefore incentives to pay bribes and underground activities are reduced. The highest rates of illegal economic activity and the highest rates of corruption are found in developing countries and countries in transition, while high-income countries have lower sizes of corruption and shadow economy (Husted, 1999; Tsakumis *et al.*, 2007; Achim *et al.*, 2018a; Nastav and Bojnev 2007; Borlea *et al.*, 2017). In addition, a study conducted by PricewaterhouseCoopers (2018) identifies the existence of a close relationship between the level of a country's economic development and the occurrence of fraud.

[18] These papers evidence that fewer laws and regulations and well-established rules lead to lower levels of shadow economy, corruption and money laundering.

[19] See Enste and Schneider (2002), Medina and Schneider (2018), Dreher and Schneider (2010) and Richardson (2008).

[20] See Dreher and Schneider (2010), McGee (2012), Schneider and Klinglmair (2004) and Torgler and Schneider (2009).

[21] The literature on the effect of the taxation systems on corporate behavior reveals that the shadow economy expands as the real and perceived fiscal burden increases (Schneider and Klinglmair, 2004; Torgler and Schneider, 2009). Increasing the total cost of labor can stimulate the reduction of income taxation by migrating to the underground economy.

[22] See Chong and López-de-Silanes (2015) and Schwarz (2011).

Regarding financial banking development, banking institutions represent the first point of contact[23] of the criminals (Isa *et al.*, 2015). In this context, a high level of transparency in the banking and financial sector, a high degree of monitoring of financial transactions and bank accounts and an adequate financial supervision are just some of the measures[24] identified as playing a decisive role in reducing money laundering crimes. A higher quality of the banking supervision means a good soundness of banks and it diminishes the channels through which financial crimes are committed. In this view, we measure the financial banking development using the Soundness of bank variable provided by World Economic Forum.

Various studies highlight the important role of audit quality in preventing economic and financial crimes within entities.[25] Adopting strong auditing and reporting standards has been found to reduce the risk of undetected suspicious transactions and, consequently, the likelihood of engaging in illegal money laundering activities.[26] We measure the audit quality using the Auditing and reporting standards (SAR) variable provided by the World Economic Forum.

The variables and their estimations are presented in Appendix A. We use a sample of 182 countries and the period of analysis is 2012–2017 (six years).

3.2. *The model*

We investigate the impact of intelligence upon the economic and financial crimes controlling for several aspects through variables such as economic development, governance, audit quality, financial banking development and tax burden. The data cover a sample of 182 countries over the 2012–2017 time period. All variables — except for intelligence data, which are time-invariant regressors — are dependent on both time and countries, forming an unbalanced panel dataset.

We estimate the panel linear regression models in which the economic and financial crimes are determined as a function of the intelligence variable and some control variables mentioned above. The general form of our model is

$$\mathrm{CSL}_{it} = \beta_0 + \beta_1 \mathrm{Intelligence}_i + \beta_{(j)2} \mathrm{Controls}(j)_{it} + \alpha_i + \varepsilon_{it}, \tag{1}$$

where CSL_{it} is the aggregation index between the standardized values of corruption, shadow economy and money laundering, for country i in year t; $\mathrm{Intelligence}_i$ is the average national IQ score for country i; $\mathrm{Controls}(j)_{it}$ is the jth control variable for country i in year

[23] Using the banking entities as intermediaries, criminals transfer illegally sourced money to other national or international bank accounts, to somehow confer them a legal appearance. Therefore, the first step in the money laundering process consists of placing the amounts of money provided through illicit activities in the financial and banking system (by making deposits or purchasing financial instruments that are subsequently collected).

[24] See Leţia (2014), Vaithilingam and Nair (2009) and Nikoloska and Simonovski (2012).

[25] For example, the study by Wijayati *et al.* (2016) in Southeast Asian emerging countries (Indonesia, Malaysia and Thailand) identifies that accounting and auditing standards as well as transparency are the corporate governance mechanisms that can reduce corruption opportunities. Also, the study conducted by Winnie (2016) identifies that the audit committee and the quality of the audit influence the size of tax evasion. Money laundering is also expected to decrease as more auditing and reporting standards are adopted (Vaithilingam and Nair, 2009).

[26] See Drezewski *et al.* (2012), Vaithilingam and Nair (2009) and Nikoloska and Simonovski (2012).

t; β_0 denotes intercept; β_1 is the regression coefficient that will indicate the extent to which the independent variable Intelligence$_i$ is associated with the dependent variable CSL$_{it}$, if β_1 is found to be statistically significant; $\beta_{(j)2}$ is the regression coefficient for the jth variable in the vector of controls; j denotes the ranges, for the vector of control variables, from economic development or governance, to audit quality, financial banking development and tax burden; and ε_{it} is the residual or prediction error for country i at year t.

4. Results

4.1. *Descriptive statistics*

The descriptive statistics are presented in Table 1. This research is further developed to classify the countries by their level of economic development, in high-income and low-income countries. This classification is based on the data provided by World Bank Group (2020) where the countries are classified as high-income, upper-middle-income, lower-middle-income and low-income countries. We follow the classification made by World Bank Group (2020) and split our 182 countries in 126 low-income countries (the low- and middle-income economies) and 56 high-income countries, with a detailed list of the two subsamples in Appendix B.

A large presentation of the economic and financial crime indexes for all the 182 countries may be found in Appendix C. In our sample, the economic and financial crimes make up an average of 0.4124 points for the full sample, ranging from 0.034 points (Finland in 2017) to 0.8394 points (Haiti in 2012). The lowest levels of economic and financial crimes are found among the Northern European countries (Finland, Norway, Sweden, Denmark, Iceland, the Netherlands, United Kingdom and Ireland) and several East Asian and Pacific countries (New Zealand, Australia and Singapore). As opposed to these, the highest levels of economic and financial crimes are found in Afghanistan and the majority of Sub-Saharan African countries (South Sudan, Sudan, Zimbabwe, Guinea-Bissau, Central African Republic, Cambodia, Nigeria, Congo Democratic

Table 1. Descriptive Statistics

Variable	Obs.	Mean	Std. Dev.	Min	Max
CSL	1085	0.4124	0.1786	0.034	0.8394
IQ	744	83.9921	13.8091	42.99	106.48
IQr	1074	84.451	11.218	60.05	107.55
Rule of law	1104	−0.0907	0.9934	−2.45	2.12
GDP	1080	14073.32	19,661.93	252.359	118,823.6
Audit	853	4.6308	0.8715	2.1336	6.7269
Bank	853	4.9323	0.9552	1.4447	6.8173
Tax freedom	1057	77.5285	12.5248	0	100
Freedom of press	1021	34.1103	16.6967	6.38	84.98
Unemployment	1074	7.81674	5.842	0.14	31.016

Source: Authors' calculations.

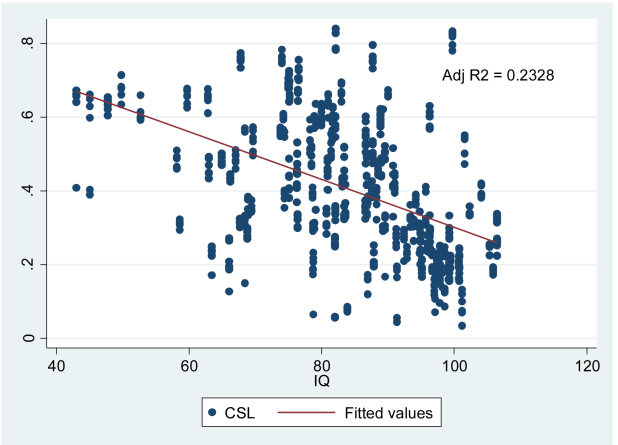

Figure 1. Plot of Economic and Financial Crimes against Intelligence

Republic, Guinea, Kenya and Uganda). We may note that the highest scores for people's intelligence quotient are found in several East Asian and Pacific countries (Singapore, Hong Kong, China, Korea and Japan), Northern European countries (the Netherlands, Finland, Iceland, Norway and Sweden) and some Western European countries (Switzerland, United Kingdom and Austria). The lowest test scores are found in the majority of Sub-Saharan African countries. The high standard deviations for all variables show a high level of heterogeneity, which requires care in interpreting the results. Table 1 contains the summary statistics for our entire sample and it also includes the supplementary variables involved in Section 4.3.

In order to intuit the relation between the economic and financial crimes on the one hand and the intelligence quotient of countries on the other, we plot them against each other (Figure 1). Obviously, Figure 1 suggests a negative correlation between financial crime and intelligence. Also, about a quarter of the variations of economic and financial crimes is explained by people's intelligence ($R^2 = 0.2328$).

The visual correlations are supported by the Pearson correlations (Table 2) showing the pairwise Pearson correlations between the variables. The data reveal a high and negative correlation between the *economic and financial crime index* CSL and the *intelligence quotient* IQ ($c = -0.5979$), thus the lower the level of intelligence of nations, the higher the level of economic and financial crimes.

4.2. *Basic results*

Tables 3–5 present the main econometric results for the estimation of economic and financial crimes as a function of intelligence and additional control variables for the entire sample of 182 countries over the 2012–2017 time period (Table 3), then for the subsample of 56 high-income countries (Table 4) and the subsample of 126 low-income countries (Table 5), respectively. Basically, our estimations reveal the dependency between the economic and financial crimes and certain independent variables, through the ordinary least squares (OLS) method for panel data, simple and multiple regressions. Because

Table 2. Correlation Matrix for $n = 625$ Observations, for the Entire Sample

	CSL	IQ	GDP	Rule of Law	Tax Freedom	Audit	Bank
CSL	1						
IQ	−0.5979	1					
GDP	−0.7251	0.5832	1				
Rule of law	−0.8903	0.6364	0.8267	1			
Tax freedom	0.3511	−0.2921	−0.4097	−0.4404	1		
Audit	−0.6787	0.4012	0.6485	0.7617	−0.2785	1	
Bank	−0.3847	0.1593	0.326	0.4291	−0.0106	0.7167	1

Source: Authors' calculations.

economic development (Log GDP for normality reasons) and governance (Rule of law) are highly correlated and we want to avoid multi-collinearity, these two variables are considered as independent variables in separate models. The multiple regression complex models are also estimated through the Fixed-effects model (FEM) and the Random-effects model (REM). Because the FEM models omit our central variable of intelligence, we have kept the OLS and REM results.

Table 3 presents the main econometric results for the estimation of the economic and financial crimes using intelligence and additional control variables. Basically, our estimations reveal the dependency between the economic and financial crime index and certain independent variables, through the ordinary least squares method for panel data for the entire sample of 182 countries.

Our simple regression analysis [model (1)] reveals a negative and statistically significant influence of the intelligence upon economic and financial crimes. Thus, an increase in the

Table 3. Regression Results for *CSL* as a function of *IQ* and Other Explanatory Variables, for the Entire Sample

	The Entire Sample						
	OLS (1)	OLS (2)	OLS (3)	REM (4)	OLS (5)	OLS (6)	REM (7)
IQ	−0.0064***	−0.0007*	−0.0005	−0.003***	−0.0009**	−0.0009**	−0.0015
Rule of law		−0.1234***	−0.1394***	−0.074***			
Log GDP					−0.0773***	−0.0748***	−0.0769***
Audit					−0.0573***	−0.0546***	−0.0132**
Bank							
Tax freedom			0.0005*	0.0013**		0.001***	0.0014**
Constant term	0.9479***	0.4822***	0.433***	0.5702***	1.466***	1.3475***	1.1924***
Obs.	740	738	711	711	630	625	625
Adj. R^2/ overall R^2	0.2328	0.5561	0.6562	0.6095	0.6912	0.6951	0.6749

Notes: *** designates the 1% significant coefficients, ** designates the 5% significant coefficients and * designates the 10% significant coefficients.

Table 4. Regression Results for *CSL* as a function of *IQ* and Other Explanatory Variables, for the High-Income Countries Subsample

	High-Income Countries Subsample								
	OLS (1)	OLS (2)	OLS (3)	OLS (4)	REM (5)	OLS (6)	OLS (7)	OLS (8)	REM (9)
IQ	−0.0034***	0.0025***	0.0024***	0.0019***	0.0005	−0.0025***	−0.0024***	−0.0017***	−0.0022*
Rule of law		−0.1139***	−0.1189***	−0.108***	−0.069***				
Log GDP						−0.0529***	−0.0256***	−0.0133*	−0.0285**
Audit							−0.0515***	−0.0547***	−0.015**
Bank			−0.002	−0.0059*	−0.0039				
Tax freedom				0.0005**	0.001**			0.0013***	0.0011**
Constant term	0.5726***	0.1345**	0.169***	0.1875***	0.218*	1.0298***	1.0181***	0.7456***	0.7489
Obs.	303	303	294	291	291	297	288	285	285
Adj. R^2/overall R^2	0.0944	0.4617	0.5495	0.6031	0.5746	0.2361	0.3985	0.4755	0.4138

Notes: *** designates the 1% significant coefficients, ** designates the 5% significant coefficients and * designates the 10% significant coefficients.

Table 5. Regression Results for *CSL* as a Function of *IQ* and Other Explanatory Variables, for the Low-Income Countries Subsample

	Low-Income Countries Subsample				
	OLS (1)	OLS (2)	REM (3)	OLS (4)	REM (5)
IQ	−0.0002	−0.0001	−0.0001	0.0003	0.0008
Rule of law		−0.0738***	−0.0227		
Log GDP				−0.0513***	−0.0574***
Audit				−0.0445***	−0.011
Bank					
Tax freedom					
Constant term	0.5317***	0.4782***	0.5096***	1.1258***	0.992***
Obs.	437	435	435	342	342
Adj. R^2/overall R^2	0.0003	0.0887	0.0923	0.2487	0.2313

Notes: *** designates the 1% significant coefficients, ** designates the 5% significant coefficients and * designates the 10% significant coefficients.

level of intelligence is associated with a smaller dimension of the economic and financial crime phenomena. The variation of CSL is 23.28% according to the nations' intelligence (Adj. $R^2 = 0.2328$) [model (1), Table 3 and Figure 1]. Then, a one-point increase in the level of intelligence leads to a decrease of 0.0064 points in the size of the economic and financial crimes of worldwide countries, with everything else remaining unchanged.

The sequential search method applied in order to build up Equation (1) is the *stepwise estimation*. IQ is our main independent variable so it is added first [model (1)]. When significant, IQ keeps its negative estimated coefficient throughout Table 3. The following variables having greater contribution to the model are further considered, coming with statistically significant additions to the current equation. As such, models (2) and (5) add Rule of law and Log GDP, respectively, boosting the predictive accuracy of the models as compared to model (1). Because the Rule of law and Log GDP are strongly correlated, they cannot be added simultaneously to the model. Further, model (3) adds the Tax freedom, so model (3) finally explicates 65.62% of the variance in CSL_{it} through the impact of IQ_i, the negative impact of $Rule\ of\ law_{it}$ and the positive effect of $Tax\ freedom_{it}$. The indirect relationships between IQ and CSL, between Rule of law and CSL and the direct relationship between Tax freedom and CSL are further strengthened through model (4), REM. Then, model (5) strengthens the indirect relationship between Log GDP and CSL furthermore [up to model (7)], supplementary adding Audit (with a negative effect). Model (6) adds Tax freedom with a positive effect upon CSL. The negative relationship between IQ, Log GDP and Audit on the one hand and CSL on the other hand is also estimated through model (7), REM, that also strengthens the positive effect of Tax freedom upon CSL [its estimated coefficient is positive in model (7), as well as in models (3), (4) and (6)].

Table 4 estimates Equation (1) on the subsample of 56 high-income countries. Using the stepwise estimation, our main model is gradually built from the simple regression of IQ

against CSL. For each additional IQ (i.e., IQ increases by one unit), CSL is higher on average by −0.0034, basically having a statistically significant decrease at a 1% level [model (1)]. Furthermore, model (2) adds Rule of law, boosting the predictive accuracy of the model up to 46.17%; models (3) and (4) add financial banking development (Bank) and Tax freedom to IQ and Rule of law, so model (4) finally explicates 60.31% of the variance in CSL_{it} through the impact of IQ_i, the negative impact of Rule of law_{it} and $Bank_{it}$ and the positive effect of Tax $freedom_{it}$. The indirect relationship between Rule of law and CSL and the direct relationship between Tax freedom and CSL are further strengthened through model (5), REM.

Model (6) estimates a log–linear regression, by adding Log GDP besides IQ, in order to explicate CSL of our subsample of high-income countries. Then, topping model (6) and strengthening the indirect relationship between Log GDP and CSL furthermore, models (7) and (8) supplementarily add Audit (with a negative effect in both models) and Tax freedom [a positive effect in model (8)]. The negative relationship between IQ, Log GDP and Audit on the one hand and CSL on the other hand is also estimated through model (9), REM, that also strengthens the positive effect of Tax freedom upon CSL. We may conclude on the existence of mixed signs for the coefficients of IQ among high-income countries.

Table 5 estimates Equation (1) on the subsample of 126 low-income countries. Regarding the coefficients of intelligence, we may note that for the low-income countries' subsample, they are not statistically significant. Regarding the control variables, once again Rule of law and Log GDP are considered as separate control variables within regressions (2) and (4), having a negative influence upon CSL: the higher the economic development and governance regulations, the lower the financial and economic crimes of those countries, just like in the cases of high-income countries' subsample and the entire sample of worldwide countries. The soundness of audit reports and their quality also has an indirect impact upon CSL: the higher and better they are, the lower the CSL is [model (4)].

4.3. *Robustness checks*

To further strengthen our main results, we conduct a series of robustness checks. We complete our basic results with the following robustness tests, in turn: (1) we consider an alternative measure for our main independent variable; (2) we control for other effects by supplementing our regressions with some other control variables; and (3) we test an additional split sample. Additional descriptions of the control variables are included in Appendix A.

(1) First, we consider *IQr* provided by Lynn and Meisenberg (2010) and Lynn and Vanhanen (2012) as an alternative measure to our main independent variable, *IQ*, in order to explore if the effect of intelligence on CSL is driven by the choice of intelligence proxies, for the entire sample of 182 countries and separately for high-income and low-income countries (Table 6). The estimations reconfirm our main results.

Table 6 re-emphasizes the negative effect of IQr upon CSL for the entire sample of countries, as IQr is significant at the 5–10% level in models (1), (3) and (4). RL and Log GDP, regressed separately, prove their indirect relationship with CSL [models (2) and

Table 6. Robustness Checks

	The Entire Sample				
	OLS (1)	OLS (2)	REM (3)	OLS (4)	REM (5)
Panel (a): Alternative Measure of IQ — Regression Results for *CSL* as a function of an Alternative Measure of Intelligence, *IQr*, and Other Variables, for the Entire Sample					
IQr	−0.0064***	0.0002	−0.0023**	−0.0012**	−0.0013
Rule of law		−0.1264***	−0.0732***		
Log GDP				−0.0559***	−0.0632***
Audit				−0.0532***	−0.0221***
Bank					
Tax freedom		0.0007**	0.0015***	0.0019***	0.0022***
Constant term	0.9515***	0.3341***	0.4889***	1.1199***	1.0218***
Obs.	1050	1004	1004	819	
Adj. R^2/overall R^2	0.1631	0.4878	0.4588	0.5837	0.5744
	High-Income Countries Subsample				
	OLS (1)	OLS (2)	REM (3)	OLS (4)	REM (5)
Panel (b): Alternative Measure of IQ — Regression Results for *CSL* as a function of an Alternative Measure of Intelligence, *IQr*, and Other Variables, for the Subsample of High-income Countries					
IQr	−0.0039***	0.0024***	0.0008*	−0.0023***	−0.0024*
Rule of law		−0.1226***	−0.077***		
Log GDP				−0.0149*	−0.0274**
Audit				−0.0595***	−0.012*
Bank		−0.0009	−0.0018		
Tax freedom		0.0003	0.001**	0.0013***	0.0013**
Constant term	0.6284***	0.1447**	0.199	0.8502***	0.7383***
Obs.	333	317	317	311	311
Adj. R^2/overall R^2	0.0899	0.6425	0.6120	0.4786	0.3975
	Low-Income Countries Subsample				
	OLS (1)	OLS (2)	REM (3)	OLS (4)	REM (5)
Panel (c): Alternative Measure of IQ — Regression Results for *CSL* as a function of an Alternative Measure of Intelligence, *IQr*, and Other Variables, for the Subsample of Low-income Countries					
IQr	−0.0001	0.0001	−0.0001	0.0003	0.0015
Rule of law		−0.0788***	−0.0233		
Log GDP				−0.0322***	−0.0473***
Audit				−0.0383***	−0.0276***
Bank					
Tax freedom					
Constant term	0.4948***	0.428***	0.4799***	0.9132***	0.8921***
Obs.	717	711	711	513	513
Adj. R^2/overall R^2	0.0013	0.0806	0.0821	0.1171	0.1173

Notes: *** designates the 1% significant coefficients, ** designates the 5% significant coefficients and * designates the 10% significant coefficients.

(3) for governance and models (4) and (5) for Log GDP]. Audit, when significant, has an indirect effect upon CSL [models (4) and (5)], while Tax freedom comes with a direct influence [models (2)–(5)].

Table 6 works with the subsample of 56 high-income countries and re-estimates Equation (1) using IQr as an intelligence proxy this time. Similarly to our main results from Table 4, the effect of IQr upon CSL is rather mixed. Rule of law and Log GDP, when significant, prove their negative effect upon CSL [models (2) and (3) for governance, significant at the 1% level, and models (4) and (5) for Log GDP, significant at the 10% and 5% levels, respectively]. Audit quality, when significant, has a negative effect upon CSL [models (4) and (5)], while Tax freedom comes with a positive effect [significant in models (3)–(5)].

Table 6 works with the subsample of 126 low-income countries and re-estimates Equation (1) using IQr as an intelligence proxy this time. Similarly to our main results from Table 5, the effect of IQr upon CSL is not significant, unfortunately. Rule of law and Log GDP, when significant, prove their negative effect upon CSL [model (2) for governance and models (4) and (5) for Log GDP], just like in our basic results. Audit has a negative effect upon CSL [models (4) and (5)], similar to what we obtain within Section 4.2 (Table 5 for low-income countries).[27]

(2) To confirm our main findings, we further control for other effects by supplementing our initial regression model [Equation (1)] with some other control variables. As such, we supplementarily add the dimensions of *Freedom of Press* and *Unemployment*, in turn, as they are detailed in Appendix A. Table 7 contains the estimations of models with added Freedom of press or Unemployment on top of the complex multiple regression with the highest explanatory power from Table 3 for the entire sample [model (6) with Log GDP more precisely], from Table 4 for the subsample of high-income countries [model (4) with Rule of law] and from Table 5 for the subsample of low-income countries [model (2) with Rule of law]. Our main results remain strong and stable.

Table 7 adds the supplementary controls of Press Freedom and Unemployment, previously validated through the specialized literature in the field, preserving the stability and reliability of our main results. As such, the relationship between IQ and CSL remains negative for the entire sample of countries [models (1) and (2)] and the subsample of low-income countries [models (1″) and (2″)], and positive for the subsample of high-income countries [model (1′)]. Log GDP keeps its indirect relationship with CSL [models (1) and (2)] and so does RL [models (1′), (2′), (1″) and (2″)]. When significant, audit quality preserves its negative effect upon CSL [models (1), (2), (1′) and (2″)]. Tax freedom reconfirms the previously obtained positive influence upon CSL, when significant [models (2) and (2″)]. The newly considered controls namely Freedom of press and Unemployment are generally significant and their signs are supported by the literature. As such, for the entire sample of countries and the high-income countries, the more freedom does the press have, the lower the financial and economic crimes are [positive coefficient in models (1)

[27] As a novelty element compared to all the estimations we have obtained so far, this time the Hausman test validates the REM estimation technique as being optimal [bolded out, model (5), Table 6(c)].

Table 7. Robustness Checks, with the Addition of Supplementary Controls — Regression Results for *CSL* Index as a Function of IQ

	The Entire Sample		High-Income Countries Subsample		Low-Income Countries Subsample	
	Add Press Freedom (1)	Add Unemployment (2)	Add Press Freedom (1′)	Add Unemployment (2′)	Add Press Freedom (1″)	Add Unemployment (2″)
IQ	−0.001**	−0.0013***	0.0016***	0.0003	−0.0011***	−0.0011***
RL	—	—	−0.0911***	−0.0926***	−0.1754***	−0.1579***
Log GDP	−0.0694***	−0.068***	—	—	—	—
Audit	−0.0473***	−0.0644***	−0.0147*	−0.0153**	—	—
Bank	—	—	—	—	0.0026	−0.0003
Tax freedom	0.0002	0.0007**	0.0002	0.0005**	0.0003	0.00008
Freedom of press	0.002***		0.0009***		−0.00004	
Unemployment		−0.0035***		0.0012*		−0.0058***
Constant term	1.2756***	1.4159***	0.2382***	0.3642***	0.5067***	0.5973***
Obs.	621	620	283	280	344	344
Adj. R^2	0.7138	0.7132	0.6173	0.6803	0.4586	0.5192

Notes: *** designates the 1% significant coefficients, ** designates the 5% significant coefficients and * designates the 10% significant coefficients.

Table 8. Robustness Checks, with Random Subsample from the Entire Sample — Regression Results for *CSL* Index as a Function of IQ

	Randomly Halved Subsample with IQ as a Dependent Variable			
	OLS (1)	REM (2)	OLS (3)	REM (4)
IQ	−0.0003	−0.0021**	−0.0005	−0.0009
Rule of law	−0.143***	−0.1062***		
Log GDP			−0.0843***	−0.0858***
Audit			−0.0554***	−0.0217**
Bank				
Tax freedom	0.0007	0.0008	0.0005	0.0008
Constant term	0.3961***	0.5483***	1.4439***	1.3084***
Obs.	351	351	303	303
Adj. R^2/overall R^2	0.6633	0.6516	0.6911	0.6832

Notes: *** designates the 1% significant coefficients, ** designates the 5% significant coefficients and * designates the 10% significant coefficients.

and (1′)]. Unemployment has a negative effect upon CSL in low-income countries [model (2″)] and for the entire sample of countries as well [model (2)], while for the subsample of high-income countries, it has a positive effect [model (2′)].

(3) To re-emphasize our basic findings, additional or split samples may be used (Hair *et al.*, 2010). We further randomly split the entire sample into half and re-estimate our models, as shown in Table 8.

Table 8 estimates Equation (1) for a randomly halved sample from our initial sample of worldwide countries. The estimated coefficient of IQ is negative and significant in model (2), re-emphasizing our main results from Table 3. Rule of law and Log GDP, included as control variables in separate regressions due to their multi-collinearity, keep their indirect impacts upon CSL: the higher the rule of law and the economic prosperity, the lower the financial and economic crimes [models (1)–(4)]. The indirect impact of audit quality upon CSL is again strengthened through models (3) and (4), as expected.

5. Discussion

Our research confirms interesting findings regarding the way in which the intelligence quotient of people may affect the size of economic and financial crimes. Thus, for the entire sample of analyzed countries, our findings validate negative coefficients for the IQ variable, meaning that higher levels of intelligence are associated with lower levels of economic and financial criminality. For the entire sample of countries, we find that about 23.28% of the variation of economic and financial crimes is due to the level of intelligence [Table 3, model (1)]. Similar results are found by Potrafke (2012) and Salahodjaev (2015) who find that about 38% and respectively 35%, from the variation of corruption and respectively shadow economy, are also explicated by the level of people's intelligence.

Thus, it is obvious that a higher level of intelligence directs to a higher level of understanding and respecting the law which is designed to reduce the involvement in economic and financial crimes. Thus, our results are in line with other studies who find that a higher level of population's intelligence is connected with less shadow economy (Salahodjaev, 2015), less corruption (Potrafke, 2012) and less money laundering (Lowe, 2017). Similarly, our findings are in line with Mõttus *et al.* (2012) who find that intelligence negatively determines the criminal and antisocial behavior.

However, when we conduct our analysis on the two subgroups of countries classified according to their level of development, the results significantly differ. Thus, our sets of results (main results and robustness checks) conducted for the high-income countries highlight mixed signs for the intelligence proxy's coefficients, while for the low-income countries, the coefficients are not significant, even though generally they are negative. In other words, high-income countries face, on average, higher scores of intelligence for their people compared to low-income countries.[28] Thus, our findings provide evidences on the existence of a positive impact of IQ upon CSL. We find that at the latter stage of cognitive development, an increase in the nation's IQ increases its level of economic and financial crimes. Indeed the results are interesting, but they may be explained by the fact that highly intelligent people have high professional knowledge and competences which help them understand the technology better and know how to put it to best use, even for getting illegal benefits. Thus, intelligent businessmen are those who invent different forms of white-collar crimes such as tax avoidance, money laundering, bank fraud and cybercrime (Aniţei and Lazăr, 2016, pp. 17–18; Şcheau, 2018, p. 17; Achim and Borlea, 2020, p. 57) because of those special skills. These indeed intelligent people generate various constructive or destructive innovations within the economic and social changes and development of the society (Merton, 1968). The evolution of technology and that of the rules would not be possible without the existence of skimming, card frauds, new ways of tax avoidance or money laundering. Thus, we may say that white-collar crimes are generally performed by intelligent people and they represent the starting point for a new stage of the economy and society.

Under such circumstances, the economic and financial crimes are closely related to the economic and social changes and the development of the society, and they can occur as innovations made by individuals, so they adjust to the societal changes (Merton, 1968). Regarding corruption, some similar results are obtained by Lv (2017) who finds an inverted U-shaped relationship between intelligence and corruption. More exactly, he finds that an increase in the nations' IQ reduces the level of corruption up to a certain threshold after which the level of corruption starts to increase back again. Indeed, individuals with higher IQ do a better job for judging the rules of the situation. For instance, because of the institutional situation, people with a high IQ are more likely to pay bribes. Thus, high IQ people should better understand when courts are vulnerable in their decision. Such a

[28] We may see from Table 1 that the average value of the IQ score is 94.62 for high-income countries, while for the low-income countries it is only 79.69.

correct understanding could easily lead to more bribes. Similar findings are highlighted by Kanazawa and Fontaine (2013).[29]

A brief discussion is also required with respect to the results obtained for the control variables we use. Regarding the influence of the rule of law, our findings report a negative coefficient, which is generally significant in all the models presented in Tables 3–8. Thus, our findings confirm that high confidence on and compliance with the rules of the society, property rights, the police and the courts meaning a well-established rule of law, tend to diminish the size of the economic and financial crimes. Other studies (Enste and Schneider, 2002; Dreher and Schneider, 2010; Medina and Schneider, 2018; Achim *et al.*, 2018a) obtain similar findings, confirming for instance the main role of the rule of law in a person's decision to choose to operate within a formal or informal economy.

Economic development has a stable influence on the size of the economic and financial crimes in all our models. Increasing economic development in a country is associated with a lower propensity to engage in economic and financial crimes. This result is in line with those of Torgler and Schneider (2009) and confirms for instance that the largest shadow economies are located in low-income countries, as an expression of the population's disagreement over the provision of public goods and assurance of welfare benefits by the state. Moreover, other findings of Husted (1999), Medina and Schneider (2018) and Achim *et al.* (2018b) confirm this theory showing that low-income countries face high levels of corruption.

Regarding tax burden, we obtain clear evidence that a higher fiscal freedom leads to a higher level of economic and financial crimes, for the entire sample and for the high-income countries subsample as well. No significant coefficients for tax freedom are found for low-income countries. Different influences of taxation on high- and low-income countries are also found by Achim *et al.* (2018a, b), Yanikkaya and Turan (2020), Carden and Verdon (2010), Graeff and Mehlkop (2003) and Kumar (2011). More precisely, they state that some types of regulations and different levels of institutional quality increase or decrease corruption or shadow economy. We find positive and significant coefficients of tax freedom for high-income countries meaning that the higher the fiscal freedom (and thus, the lower the tax burden) is, the higher the levels of economic and financial crimes. Our findings are supported by various studies that point out such similar results. For example, Friedman *et al.* (2000), Dreher and Schneider (2010), McGee (2012) and later Achim *et al.* (2018a, b) find evidence that a higher tax burden implies a smaller level of the shadow economy and corruption. We may explain these positive influences of tax freedom on the economic and financial crimes from the high-income countries subsample through the fact that even if the tax freedom is generally lower in high-income countries than in low-income countries (see Table 1), in the high-income countries, the high level of institutions leads to a strong control by the state. Therefore, the lower fiscal freedom (higher fiscal burden) may determine a decrease of the incentives for economic and financial crimes, under a strong control by the state which characterizes high-income countries.

[29] Kanazawa and Fontaine (2013) document that intelligent people defect more in a one-shot prisoner's dilemma game, because they are more likely to understand the new evolutionarily features of the situation that perceive defection as being rational.

Furthermore, we get clear evidences on the role of audit quality in preventing economic and financial crimes. Thus, the coefficient of Audit is negative and significant in the majority of our main results and robustness check models. Numerous studies highlight the important role of audit quality in preventing economic and financial crimes. For example, the study of Wijayati *et al.* (2016) in emerging countries in Southeast Asia (Indonesia, Malaysia and Thailand) identifies that accounting and auditing standards as well as transparency are the corporate governance mechanisms that can reduce corruption opportunities. Also, the study conducted by Winnie (2016) identifies that the audit committee and the quality of the audit influence the size of tax evasion. Money laundering is also expected to decrease as more auditing and reporting standards are adopted (Vaithilingam and Nair, 2009). Similar results (Vaithilingam and Nair, 2009; Nikoloska and Simonovski, 2012) also show that adopting strong auditing and reporting standards reduces the risk of undetected suspicious transactions and, consequently, the likelihood of engaging in illegal money laundering activities. Our findings confirm clear evidence of the fact that a strong audit within an entity plays an extremely important role in discouraging economic and financial crimes.

We find little evidence that the level of soundness of banks (Bank) may reduce the level of economic and financial crimes. However, its coefficients are generally negative and they even have a little statistical significance. We may note that, especially in high-income countries, the significance of the soundness of banks variable is the highest [Table 4, model (4)]. Similar findings of Leţia (2014), Vaithilingam and Nair (2009) and Nikoloska and Simonovski (2012) document the important role of the solidity of the banking system in reducing the crime in the form of money laundering. They find that a high level of solidity of the banking system leads to a decrease in money laundering offenses.

Referring to the Freedom of press and the Unemployment controls, they are generally significant and their signs are supported by the literature (Dell'Anno and Solomon, 2008; Kalenborn and Lessmann, 2013; Schneider and Williams, 2013; Bouzid, 2016; Williams and Schneider, 2016; Medina and Schneider, 2018; Florescu and Cuceu, 2019).

6. Conclusions

The aim of this paper is to explore the relationship between intelligence and economic and financial crimes. For this purpose, we use an unbalanced panel dataset of 185 countries for the 2012–2017 time span. Our research provides empirical evidence on the existence of a significant impact of intelligence upon economic and financial crimes. When we analyze the entire sample, we find that intelligent people are more prone to comply with the law and thus increase the efficiency of implementing governmental policies to reduce economic and financial crimes. However, when we conduct our analysis among the two groups of high- and low-income countries, different results are found. For high-income countries, we obtain evidence of a positive relationship between intelligence and financial crimes, meaning that highly intelligent people from these countries own high professional knowledge and skills which are used to break the traditional technologies in order to get illegal benefits. Indeed, the first five biggest money laundering scandals in the history were registered in highly developed countries such as Luxembourg, Denmark, UK and the US

(KassaiLaw, 2020) and this, as previously mentioned, is due to the fact that white-collar crimes are generated by intelligent people, who generally live in these high-income countries. Our results from the low-income countries' subsample do not support intelligence as being a determinant factor for the economic and financial crimes, because it seems that in these countries other determinants play an important role.

Our study may have crucial implications for the national or international policymakers who must know that by increasing people's intelligence through various adopted policies, they may increase the level of law compliance and the governmental efficiency, which finally results in reducing the size of the economic and financial crimes of a country. However, the policies need to be differentially adopted depending on the level of development of each country. Thus, in high-income countries the policies against economic and financial crimes need to be adjusted against the white-collar types of crimes through adopting the strongest possible regulations for these transactions, without leaving any room for ideas of violation.

Our research has an important limitation. Due to the lack of transparent data in the area of economic and financial crimes, we estimate them using average indexes for the levels of corruption, shadow economy and money laundering. As Rider (2015, p. 4) assumes, if the concept of economic and financial crimes is to be operable it needs to be narrower. We are aware that some types of frauds (such as various types of cybercrimes, business or accounting frauds) are not found in the areas of corruption, shadow economy and money laundering. Thus, they are not included in our economic and financial crime index and this way our findings may be somehow altered. Another limit concerns the way we have built this index as an arithmetic average of corruption, shadow economy and money laundering indexes. Thus, in order to calculate an easily understandable score, we have paid the same attention to each component even if in practice the weights of these components are not necessarily the same. However, in practice the illegal acts of corruption, shadow economy and money laundering frequently interfere, thus making the use of this kind of score justifiable. In addition, we may add as a limit of our study the fact that we only use the IQ scores provided by Lynn and his collaborators in order to measure intelligence. In other future studies, we have in view some other measures for intelligence in the form of education or intellectual capital. All in all, in order to substantiate our findings, for future research studies we intend to surpass these limits by using a much more refined estimation of the level of economic and financial crimes of a country.

Conflict of Interest

No potential conflict of interest was reported by the authors.

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Appendix A

Table A.1. Variables and Data.

Variables	Way of Expressing	Units/Scale	Source (s)
Dependent Variable			
Economic and financial crime (CSL)	CSL is determined as an aggregation index between the standardized values of corruption, shadow economy and money laundering, where:	The score ranges from 0 (lowest level of financial crime) to 1 (highest level of financial crime).	Own calculations
	Corruption is determined starting from the *Corruption Perception Index* (C) which measures the perceived levels of corruption in the public sector for the world countries.	The score ranges from 0 (highly corrupt) to 100 (very clean).	Transparency International (2019)
	Shadow economy (S) is determined as a percentage of shadow economy in GDP determined for the world countries.	% in GDP.	Medina and Schneider (2018)
	Money laundering (L) is determined as the risk of money laundering and terrorist financing. Basel AML Index determined for the world countries.	The score ranges from 0 (low risk level) to 10 (high risk level) in money laundering/ terrorist financing.	Basel Institute on Governance (2019)
Independent Variables			
Intelligence (IQ)	*Intelligence* as the average national IQ score which measures the level of cognitive development on the macroeconomic level for a total of 160 nations of the world.	Score ranges between minimum and maximum in the level of intelligence of the countries.	Lynn and Meisenberg (2010); Lynn and Vanhanen (2012)
Intelligence (IQr)	*Intelligence* as the average national IQ score which measures the level of cognitive development on the macroeconomic level for a total of 201 nations of the world.	Score ranges between minimum and maximum in the level of intelligence of the countries.	Lynn and Becker (2019)
Control Variables			
Economic development (GDP)	*GDP per capita* (*GDP*)	In US dollars	World Bank Group (2020)
Tax burden (Tax freedom)	*Fiscal freedom*provided from the Index of Business Freedom.	The score ranges from 0 to 100, where 0 denotes the least fiscal freedom and 100 is the maximum degree of fiscal freedom.	Heritage Foundation (2019)

Table A.1. (*Continued*)

Variables	Way of Expressing	Units/Scale	Source (s)
Governance (Rule of law)	*Rule of law* reflects the extent to which agents have confidence in and comply with the rules of society, property rights, the police and the courts, as well as the likelihood of crime and violence.	Ranges from −2.5 points (weak) to 2.5 points (strong) in the governance performance.	World Bank (2009)
Audit quality (Audit)	*Strength auditing and reporting standards* from the Global Competitiveness Index. It is rated by answering to the following question: "In your country, how strong are financial auditing and reporting standards? [1 = extremely weak; 7 = extremely strong]."	The score ranges from 1 (worst) to 7 (best).	World Economic Forum (2019)
Financial banking development (Bank)	*Soundness of bank* from the Global Competitiveness Index. It is rated by answering to the following question: "In your country, how would you assess the soundness of banks? [1 = extremely low-banks may require recapitalization; 7 = extremely high-banks are generally healthy with sound balance sheets]."	The score ranges from 1 (worst) to 7 (best)	World Economic Forum (2019)
Unemployment rate (Unemployment)	Total unemployment (modeled ILO estimate). Unemployment refers to the share of the labor force that is without work but available for and seeking employment.	Percentage of total labor force	World Bank Group (2020)
Press freedom (Freedom of press)	*Freedom of the press.*	The score measures the ranked countries on a scale from 0 to 100, with the freest media scoring close to 0. Basically, the higher the score, the less freedom the press has in that country.	Freedom House (2020)

Appendix B. The Sample Countries Classified as "High-income" and "Low-income" Ones

High-income countries (56)	Countries with high income	Australia, Austria, Bahamas, Bahrain, Barbados, Belgium, Brunei, Canada, Chile, Croatia, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hong Kong, Hungary, Iceland, Ireland, Israel, Italy, Japan, Kuwait, Latvia, Lithuania, Luxembourg, Malta, Mauritius, the Netherlands, New Zealand, Norway, Oman, Panama, Poland, Portugal, Puerto Rico, Qatar, Romania, Saudi Arabia, Seychelles, Singapore, Slovakia, Slovenia, South Korea, Spain, Sweden, Switzerland, Taiwan, Trinidad and Tobago, United Arab Emirates, United Kingdom, United States and Uruguay
Low-income countries (126)	Countries with upper middle income, lower middle income and low income	Afghanistan, Albania, Algeria, Angola, Argentina, Armenia, Azerbaijan, Bangladesh, Belarus, Belize, Benin, Bhutan, Bolivia, Bosnia and Herzegovina, Botswana, Brazil, Bulgaria, Burkina Faso, Burundi, Côte d'Ivoire, Cambodia, Cameroon, Cape Verde, Central African Republic, Chad, China, Colombia, Comoros, Congo Democratic Republic, Congo Republic, Costa Rica, Cuba, Djibouti, Dominica, Dominican Republic, Ecuador, Egypt, El Salvador, Equatorial Guinea, Eritrea, Ethiopia, Gabon, Gambia, Georgia, Ghana, Grenada, Guatemala, Guinea, Guinea-Bissau, Guyana, Haiti, Honduras, India, Indonesia, Iran, Iraq, Jamaica, Jordan, Kazakhstan, Kenya, Korea (North), Kosovo, Kyrgyzstan, Laos, Lebanon, Lesotho, Liberia, Libya, Macedonia, Madagascar, Malawi, Malaysia, Maldives, Mali, Mauritania, Mexico, Moldova, Mongolia, Montenegro, Morocco, Mozambique, Myanmar, Namibia, Nepal, Nicaragua, Niger, Nigeria, Pakistan, Papua New Guinea, Paraguay, Peru, Philippines, Russia, Rwanda, Saint Lucia, Saint Vincent and the Grenadines, Samoa, São Tomé and Príncipe, Senegal, Serbia, Sierra Leone, Somalia, South Africa, South Sudan, Sri Lanka, Sudan, Suriname, Swaziland, Syria, Tajikistan, Tanzania, Thailand, Timor-Leste, Togo, Tunisia, Turkey, Turkmenistan, Uganda, Ukraine, Uzbekistan, Vanuatu, Venezuela, Vietnam, Yemen, Zambia and Zimbabwe

Source: Authors' processing using data from: https://datahelpdesk.worldbank.org/knowledgebase/articles/906519-world-bank-country-and-lending-groups (accessed on August 14, 2020).

Appendix C. Clusters of Countries and Mean Values of Their Financial and Economic Criminality Score (CSL_i), 2012–2017

Low-Income Countries	CSL_i	Low-Income Countries	CSL_i	High-Income Countries	CSL_i
Afghanistan	0.5827	Lebanon	0.6025	Australia	0.1857
Albania	0.4786	Lesotho	0.4555	Austria	0.2202
Algeria	0.5403	Liberia	0.6157	Bahamas	0.2269
Angola	0.6947	Libya	0.4531	Bahrain	0.3531
Argentina	0.5210	Macedonia	0.2918	Barbados	0.1387
Armenia	0.4964	Madagascar	0.4169	Belgium	0.2095
Azerbaijan	0.6335	Malawi	0.5359	Brunei	0.294
Bangladesh	0.5943	Malaysia	0.3962	Canada	0.2101
Belarus	0.5260	Maldives	0.169	Chile	0.2149
Belize	0.2434	Mali	0.6538	Croatia	0.3435
Benin	0.6124	Mauritania	0.6027	Cyprus	0.3274
Bhutan	0.1348	Mexico	0.5046	Czech Republic	0.2566
Bolivia	0.7208	Moldova	0.5330	Denmark	0.1477
Bosnia and Herzegovina	0.4568	Mongolia	0.4192	Estonia	0.1970
Botswana	0.3525	Montenegro	0.2598	Finland	0.0880
Brazil	0.4753	Morocco	0.4870	France	0.2079
Bulgaria	0.3374	Mozambique	0.6344	Germany	0.2214
Burkina Faso	0.5599	Myanmar	0.6347	Greece	0.4298
Burundi	0.4413	Namibia	0.4373	Hong Kong	0.2466
Côte d'Ivoire	0.5729	Nepal	0.6134	Hungary	0.2908
Cambodia	0.8130	Nicaragua	0.6093	Iceland	0.1742
Cameroon	0.3782	Niger	0.5805	Ireland	0.1907
Cape Verde	0.4462	Nigeria	0.7554	Israel	0.2699
Central African Republic	0.4326	Pakistan	0.5946	Italy	0.3653
Chad	0.4580	Papua New Guinea	0.5626	Japan	0.2540
China	0.3966	Paraguay	0.6745	Kuwait	0.3934
Colombia	0.4213	Peru	0.5118	Latvia	0.2983
Comoros	0.4556	Philippines	0.5611	Lithuania	0.2493
Congo Democratic Republic	0.4844	Russia	0.5986	Luxembourg	0.2345
Congo Republic	0.4629	Rwanda	0.2933	Malta	0.274
Costa Rica	0.3792	Saint Lucia	0.2130	Mauritius	0.3516
Cuba	0.0802	Saint Vincent and the Grenadines	0.2274	The Netherlands	0.1858
Djibouti	0.1908	Samoa	0.2275	New Zealand	0.1209

(*Continued*)

Low-Income Countries	CSL_i	Low-Income Countries	CSL_i	High-Income Countries	CSL_i
Dominica	0.2086	São Tomé and Príncipe	0.3038	Norway	0.1405
Dominican Republic	0.5785	Senegal	0.4488	Oman	0.2409
Ecuador	0.5413	Serbia	0.2650	Panama	0.3978
Egypt	0.4870	Sierra Leone	0.554731	Poland	0.2606
El Salvador	0.4959	Somalia	0.31401	Portugal	0.2342
Equatorial Guinea	0.2378	South Africa	0.367273	Puerto Rico	0.0567
Eritrea	0.2877	South Sudan	0.310145	Qatar	0.2628
Ethiopia	0.3733	Sri Lanka	0.565611	Romania	0.3488
Gabon	0.4224	Sudan	0.449589	Saudi Arabia	0.3153
Gambia	0.6746	Suriname	0.444841	Seychelles	0.2048
Georgia	0.4955	Swaziland	0.421411	Singapore	0.1848
Ghana	0.4792	Syria	0.43827	Slovakia	0.2866
Grenada	0.2014	Tajikistan	0.757592	Slovenia	0.2237
Guatemala	0.6331	Tanzania	0.688442	South Korea	0.34379
Guinea	0.5499	Thailand	0.601651	Spain	0.30615
Guinea-Bissau	0.684	Timor-Leste	0.376992	Sweden	0.13447
Guyana	0.5388	Togo	0.434802	Switzerland	0.18977
Haiti	0.8007	Tunisia	0.422032	Taiwan	0.3149
Honduras	0.6431	Turkey	0.449362	Trinidad and Tobago	0.4999
India	0.4179	Turkmenistan	0.294686	United Arab Emirates	0.3428
Indonesia	0.4888	Uganda	0.677655	United Kingdom	0.1839
Iran	0.6277	Ukraine	0.665656	United States	0.1971
Iraq	0.4064	Uzbekistan	0.467811	Uruguay	0.3722
Jamaica	0.4258	Vanuatu	0.238032		
Jordan	0.3150	Venezuela	0.669929		
Kazakhstan	0.5871	Vietnam	0.501365		
Kenya	0.66353	Yemen	0.650853		
Korea (North)	0.31068	Zambia	0.596192		
Kosovo	0.18176	Zimbabwe	0.759091		
Kyrgyzstan	0.55528				
Laos	0.5985				
	Average $CSL_i \approx 0.48$			Average $CSL_i \approx 0.26$	

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