Cognitive abilities, institutions and software piracy: a note

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Abstract:

The aim of this research note is to explore the correlation between cognitive abilities and software piracy rates in a sample of more than 100 nations. The results reported in this paper suggest that cognitive capital has significant and negative effect on software piracy rates. Moreover, the effect of democracy on software piracy is stronger in high-IQ societies.

Keywords: cognitive abilities, software piracy, democracy

Introduction

With the publication of national IQs dataset by Lynn and Vanhanen (2002) the related literature on the socio-economic correlates of intelligence at the national level has mushroomed. By now, there is strong evidence that national IQs are significant predictors of economic growth (Jones & Schneider, 2006), life satisfaction (Nikolaev & Salahodjaev, 2016; Salahodjaev, 2015c), environmental outcomes (Salahodjaev, 2015d; Salahodjaev, 2016), gender inequality (Salahodjaev & Azam, 2015), quality of business environment (Salahodjaev, 2016) and generalized trust (Carl, 2014).

In addition, a separate strand of studies has shown that intelligence is an important antecedent of the quality of institutions. For example, Kanyama (2014) explores the effect of cognitive abilities on the quality of institutions using data for 113 nations. The results of this study show that average IQ is positively and significantly related to a number of measures of quality of institutions such as government efficiency, rule of law, political stability and voice and accountability. Moreover, this effect remains robust once other determinants of institutions are considered such as economic development, regional dummies or legal origins. In an earlier study, Potrafke (2012) tested the hypothesis that corruption level is lower in cognitively able societies. Indeed, the study proposes that IQ influences economic growth by an indirect effect working through the reduction of corruption. Using cross national data for intelligence and corruption perceptions index the study finds that

intelligence is negatively and significantly related to the average corruption levels. In another study, Salahodjaev (2015a) empirically explores the effect of intelligence on a shadow economy, using data from 158 countries, over the period 1999–2007. The results provide strong support for the claim that intelligence is negatively associated with an underground economy. This paper document that, on average, a one standard deviation increase in IQ is associated with an 8.5 percentage point reduction in a underground economy relative to GDP. The negative effect of intelligence remains intact when controlled for conventional antecedents of a shadow economy. While there is evidence that intelligence is robustly related to economic development, quality of legal systems and size of underground economy, there is no established association between intelligence and the size of illegal software piracy rates. Thus, the goal of this study is two bridge two strands of empirical literature, namely the literature on the correlates of intelligence and the literature on the antecedents of software piracy rates. Moreover, considering the existing evidence that intelligence moderates the effects of democracy on economic growth (Salahodjaev, 2015b) and institutional commitment to environment (Obydenkova & Salahodjaev, 2016) we explore whether the effect of democracy on software piracy is conditional on the level of intelligence.

There are a number of arguments to anticipate that intelligence is an important antecedent of software piracy. First, as discussed above intelligence of nations predicts the quality of institutions. For example, Meisenberg (2012) shows that IQs positively correlated with economic freedom and democracy, and negatively with corruption. In a similar vein, Odilova (2016) shows that intelligence is positively associated with intellectual property rights (IPR) protection and moderates the effect of IPR on economic growth.

Moreover, software piracy arises in societies with low discounts rates where people prefer short run befits rather than long run gains. On the other hand, there is evidence that high-IQ individuals have longer time horizons (Potrafke, 2012) and "more intelligent people demonstrate less of a preference for smaller, immediate rewards versus larger, delayed rewards" (Shamosh & Gray, 2008; p. 296). Moreover, Jones & Podemska (2010) show that countries with higher levels of national cognitive abilities have longer time preferences and higher savings rates. This may suggest that intelligence is inversely related to software piracy rates.

Data and methods

The data on software piracy rate is obtained from BSA (2012). It measures the percentage of software that is being used illegally, without the purchase of a license. This variable ranges from 0 % (no piracy) to 100 % (i.e. all software installed is pirated). The BSA measures the piracy of commercial software. These estimates are one of the most reliable ones and have been used largely in empirical papers (Goel & Nelson, 2012; Gomes et al., 2013).

In line with related literature published in the field of intelligence, we use Lynn & Vanhanen (2012) national IQs dataset as measure of intelligence. In their first study Lynn & Vanhanen (2002) have compiled country specific studies in which intelligence tests had been administered. Based on the results in these studies they estimated national IQs for 81 countries. In their follow up studies, Lynn & Vanhanen (2012) estimated national IQs for 111 additional countries, bringing their dataset in which national IQs were measured to 192. For the interpretation purposes Lynn & Vanhanen (2002) rescaled the IQ scores by setting the IQ in Britain at 100 (standard deviation =15) and the IQs for remaining countries adjusted for this scale.

Considering that cross-national literature is in general agreement that software piracy rates are explained by economic, political and legal factors, in this study we control for the GDP per capita, democracy levels, a binary variable for countries with British legal origins and economic freedoms index. In addition to explore, whether the effect of democracy on software piracy rates in conditional on the level of cognitive abilities we add interaction term between intelligence and democracy. Based on the discussion above we estimate the following empirical model:

$$Piracy = \alpha_0 + \alpha_1 IQ + \alpha_2 DEMOC + \alpha_3 IQ * DEMOC + \alpha_4 UK + \alpha_5 FREE + \alpha_6 GDP + \varepsilon$$

where Piracy is national software piracy rates, IQ is national IQs, DEMOC is democracy index measured by average of civil rights and political liberties from Freedom House, GDP is logged GDP per person from World Bank, UK is a binary variable for countries with British legal origins from Odilova (2016) and FREE is index of economic freedom from

Heritage Foundation. The descriptive statistics are presented in Table 1. We estimate this model by the ordinary least squares method using Stata 13.

Table 1

Descriptive data

Variables	Mean	Std. Dev.	Min	Max
Software piracy rates	58.92	21.52	19	92
national IQs	84.10	10.85	60.1	107.1
GDP per capita (log)	8.20	1.57	5.02	11.31
British legal origins, dummy	0.34	0.47	0	1
Democracy index	3.67	1.97	0	6
Economic freedom index	59.75	11.78	1	89.7

Notes: Democracy index ranges from (0) authoritarian to 6 (democratic)

Empirical results

The econometric results are reported in Table 2. Column 1 presents simple bivariate association between cognitive abilities and software piracy rates. In this specification, a 10 points increase in cognitive abilities index is followed by a 16 percentage point reduction in software piracy rates. Moreover, it seems that cognitive abilities explain nearly 41% of cross-national differences in software piracy rates.

Column 2 reports the estimates when we control for antecedents of software piracy: GDP per capita, type of legal origins, democracy and economic freedom. The results are in line with theoretical expectations:

- Economic development is negatively and significantly related to software piracy rates. For example, a 10 percent increase in GDP per capita is associated with nearly 3 percentage point decrease in software piracy rates
- Countries with British legal origins tend to have lower software piracy rates by nearly 8 percentage points
- Democracy and economic freedom are negatively and significantly related to software piracy rates

Turning to the effect of intelligence, we find that intelligence is significantly related to software piracy rates (at 5% level) although its magnitude has significantly decreased.

Finally, in column 3 we include interaction term between intelligence and democracy index. The interaction effect is negative and significant at the 1% level suggesting that the effect of democracy on software piracy is stronger in cognitively able societies.

Table 2

Main results

	(1)	(2)	(3)
IQ	-1.6021***	-0.3709**	0.4581**
	(0.2074)	(0.1542)	(0.2201)
GDP per capita		-8.3667***	-7.2828***
		(1.1005)	(1.6427)
British legal origins		-8.3169***	-7.7768***
		(2.3883)	(2.5929)
Democracy		-2.3794***	19.6135**
		(0.6759)	(8.1720)
Economic freedom		-0.3764***	-0.4078***
		(0.1364)	(0.1462)
IQ * Democracy			-0.2437***
			(0.0874)
Constant	202.3961***	201.4361***	120.7641***
	(18.5453)	(10.9875)	(22.3764)
N	108	102	102
adj. R^2	0.4096	0.8011	0.8256

Standard errors in parentheses; * p<0.1, ** p<0.05, *** p<0.01

However, one may argue that intelligence may be indirectly related to software piracy via economic and institutional factors. Moreover, the sharp decrease in the IQ estimate from column 1 to column 2 lends support for this argument. Therefore, we have carried out the

path analysis. Figure 1 presents the results from the path analysis and suggests that indirect effect of intelligence runs via economic freedom, economic development and democracy. In line with Bagchi et al (2006) we find that economic freedom is also instrumental in reducing the software piracy rates. Moreover, if government pursues to establish institutions that may reduce copyright infringement then "a measure of national intelligence such as IQ provides a good approximation of the degree of the support to such policies." (Kanyama, 2014).

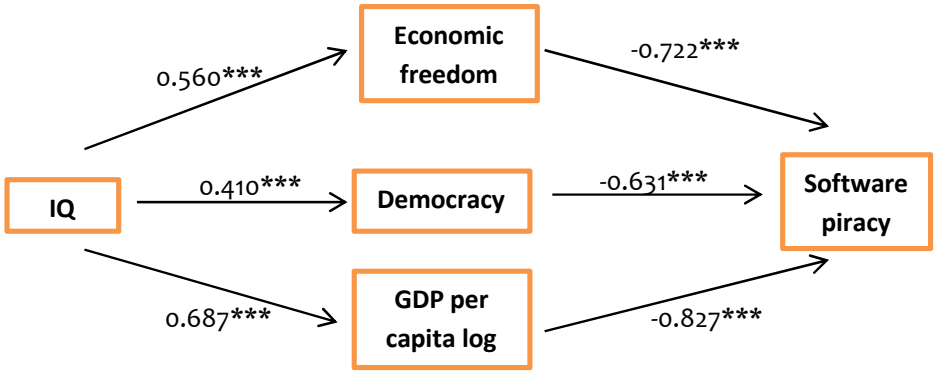

Fig. 1. Standardized path estimates between intelligence, GDP per capita, democracy and economic freedom and software piracy. Significance at the 1% level is denoted by ***.

Conclusion

This study is based on growing evidence that intelligence has numerous positive implications for society. The findings in this study present a number of important conclusions. First, we find that intelligence is negatively and significantly related to software piracy rates. In particular, a 10 points increase in cognitive abilities index is followed by a 16 percentage point reduction in software piracy rates. Moreover, it seems that cognitive abilities explain nearly 41% of cross-national differences in software piracy rates.

Second, we find that the effect of democracy on software piracy is moderated by cognitive abilities. The findings presents in this study suggest the need for reconceptualization of heterogeneous association between political regimes, intelligence and copyright protection. Extant literature on the political antecedents of software piracy has overlooked the importance of cultural variables such as intelligence. However, we find that the relationship between intelligence, democracy and software piracy is very complex.

Third, we document that intelligence has a strong indirect effect on software piracy. The path analysis presented in this study further highlights the robustness of extant literature on the effect of intelligence on institutions. For example, Rindermann (2008) shows that intelligence has a direct effect on political development of nations. Our study further shows that political development as a function of intelligence is significantly related to software piracy rates across nations.

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