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The rule of law and investment in intangible capital: Evidence for the EU-16, 1996-2017

Hamburg Discussion Papers in International Economics, No. 12

Provided in Cooperation with:
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Suggested Citation: Roth, Felix (2022) : The rule of law and investment in intangible capital: Evidence for the EU-16, 1996-2017, Hamburg Discussion Papers in International Economics, No. 12, University of Hamburg, Chair of International Economics, Hamburg

This Version is available at:
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The rule of law and investment in intangible capital: Evidence for the EU-16, 1996-2017

Felix Roth

Hamburg Discussion Paper in International Economics [No.12]

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ISSN 2625 - 7513 (online)

The rule of law and investment in intangible capital: Evidence for the EU-16, 1996–2017[1]

Felix Roth

Abstract

This paper analyses the relationship between the rule of law (RoL) and intangible capital investment by businesses within a sample of 16 European countries, over the period from 1996 to 2017. Studies on the effects of RoL on intangible capital investment are scarce, hence, the relevance of empirical research in this area. When controlling for endogeneity, the study found a coefficient of 2.0 for the relationship between RoL and investment in intangibles, confirming the significant and positive relationship between the two and highlighting RoL as a driving factor of investment in intangibles and, hence, labour productivity growth in the EU-16.

Keywords: rule of law (RoL), intangible capital investment, labour productivity growth, European Union (EU)

JEL Classifications: E02, E22, O34, O43, O52, P14

[1] The author is grateful for a grant received from the European Commission under the Horizon 2020 program for the GLOBALINTO project (Capturing the value of intangible assets in micro data to promote the EU's growth and competitiveness, contract number 822259). The author wishes to thank Bertha Vallejo and Ali Sen for their support in the preparation of this manuscript.
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1 Introduction

This paper investigates the relationship between the rule of law and investment in intangible capital by businesses in 16 European countries over the time period 1996 to 2017. As societies increasingly move towards a knowledge economy, the role of intangible capital in labour productivity growth becomes even more crucial (Piekkola, 2011). A general definition of intangible capital understands it as a:

> *…useful device for capturing those dimensions of capital that are not tangible in nature but are nevertheless fundamentally important for growth. It encompasses investments in education (human capital) and in informal (social capital) and formal (i.e., rule of law) institutions by the public sector and households, as well as investments by businesses aimed at enhancing their knowledge base, such as software, innovative property, and economic competencies*. (Roth, 2022a, p. v)

Investment in intangible capital by businesses explains a large portion of the variance in labour productivity among countries in the European Union (EU) (Roth and Thum, 2013), the United States (US) (Corrado, Hulten, & Sichel, 2009; Nakamura, 2010), and Japan (Fukao, Miyagawa, Mukai, Shinoda, & Tonogi, 2009). Roth (2020) and Roth and Thum (2013) found that the effect of investment in intangibles explains up to 50% of labour productivity growth in the EU. Hence, understanding the determinants of this type of investment is highly relevant.

Empirical studies in the EU have identified important determinants of intangible capital investment, among which are the educational level of the workforce (Arrighetti, Landini, & Lasagni, 2014; Thum-Thysen, Voigt, Bilbao-Osorio, Maier, & Ognyanova, 2019) and effective legislation on intellectual property rights (Andrews & Crisuolo, 2013; Gros & Roth, 2012; Guo-Fitoussi, Bounfour, & Rekik, 2019), copyright, and trademarks (Gros & Roth, 2012), which both have significant and crucial effects on the propensity of businesses to invest in intangible capital. Although authors like Gros and Roth (2012) and Thum-Thysen et al. (2019)

identify the regulatory framework as critical in the decision of businesses to invest in intangible capital, this driver has not been sufficiently explored in the empirical literature.

The role of government in providing the foundation for economic development shapes the environment in which businesses operate (Meyer & Neethling, 2017; North, 1990). This enabling environment is a critical determinant of businesses and economic growth (Bannock, Gamser, & Juhlin, 2003). Therefore, the effects of this driver on investment in intangible capital – as a factor influencing productivity growth – need to be ascertained.

This study addresses the scarcity of empirical studies in this area by analysing the role that RoL plays in influencing investment in intangible capital in the EU. It contributes to the macroeconomic literature by adding to our understanding of drivers such as RoL in influencing investment in intangible capital by businesses and, therefore, influencing productivity growth. This research builds on my previous work, in which I found a positive relationship between RoL and intangible capital investment in 13 EU countries for the period 1998 to 2005 (Roth, 2022b). It expands on my previous findings (Roth, 2022b) by using a larger country sample (EU-16) for a significantly longer period of time (1995–2017) with more than three times the overall number of country observations (316 versus 98 country observations).

This paper is structured in the following manner. Section 2 explains the concept of RoL used in this study. Section 3 details the study's methodology, including a description of the data, the variables, and the method of analysis. Section 4 presents the descriptive statistics of the 16 European countries (EU-16) sampled. Section 5 presents the econometric results of the analysis and section 6 discusses the findings in terms of the conceptual framework. Finally, section 7 presents the conclusions of this study.

2 The rule of law and business intangible capital

The RoL is understood as the "perceptions of the extent to which agents have confidence in and abide by the rules of society and in particular the quality of contract enforcement, property rights, the police, and the courts…" (Kaufmann, Kraay, and Mastruzzi (2010, p. 4). It is a concept that reflects the way governments implement policy and shape the enabling environment (context) in which businesses operate (Meyer & Neethling, 2017). RoL is a fundamental prerequisite for a nation's economic performance (Agrast, Botero, Martinez, Ponce, & Pratt, 2013; Barro, 2001; World Bank, 2006) as it impacts on productivity growth (Knack & Keefer, 1995) by securing (intellectual) property rights (IPRs) and the enforcement of contracts (Haggard & Tiede, 2011). IPRs and the enforcement of contracts protect the knowledge base of businesses involved in generating patents, trademarks, copyrights, and design rights, as well as specific research and development (R&D) activities (Gould & Gruben, 1996; Park & Ginarte, 1997). Therefore, a RoL securing IPRs is a core incentive for entrepreneurs and businesses to invest in intangible capital (Baumol, 2002; Haskel & Westlake, 2018; Mayer-Schönberger, 2010).

In this study, RoL is proxied by the index built by the Worldwide Governance Indicators project (WGIP), which consists of 84 individual indicators from 23 separate data sources (Kaufmann et al., 2010).[2] The 84 individual questions consist of indicators concerning the enforceability of contracts, the protection of IPR, and the timeliness of judicial decisions, but also cover RoL indexes and indicators concerning the respondents' trust in the justice system. All single indicators are then aggregated to construct the RoL indicator by using an unobserved components model (Kaufmann et al., 2010, p. 9).

[2] The WGI project started to systematically construct an RoL indicator from 1996 onwards. Starting with a two-year base in 1998, 2000, 2002, from 2002 onwards aggregated data on the RoL has been constructed on a yearly basis (Kaufmann et al., 2010).

3 Methodology

3.1 Model specification

This study builds on my previous research (Roth (2022b),[3] in which I found that RoL is positively related to investment in intangible capital. In that study I analysed the impact of RoL on investment in intangibles for an EU-13 country sample over an 8-year period (1998–2005), and used 98 country observations overall, finding a positive coefficient in the range of 1.0 to 1.4 between RoL and investment in intangible capital. In the current study, I slightly modified the model specifications used in Roth (2022b), to the model specification given in Equation (1), in which the impact of RoL on intangible capital investment is expressed as follows:

$$\boldsymbol{N_{i,t} = c + \alpha RoL_{i,t-1} + \beta\, R_{i,t-1} + \gamma H_{i,t-1} + \delta\left(1 - ur_{i,t-1}\right) + \varphi \sum_{j=1}^{k} X_{j,i,t-1} + \mu_t + \varepsilon_{i,t}} \qquad \textbf{(1)}$$

…where $N_{i,t}$, represents the real investment rates for intangible capital by businesses; c displays the constant term, $RoL_{i,t-1}$ is the level of RoL in-country i and for period $t-1$; $R_{i,t-1}$ is the intangible capital stock by businesses, H_{it-1} is the level of human capital; the term $(1 - ur_{it-1})$ takes into account the business cycle effect; the term $\sum_{j=1}^{k} X_{j,i,t-1}$ is a sum of k extra policy variables, which may explain investment rates in intangible capital; year dummies[4] to control are represented by μ_t; and $\varepsilon_{i,t}$ is the error term.

3.2 The data

The following databases were used in the analysis:

(i) **Intangible capital investment** is proxied by data on real investment rates and stock data on intangible capital. The data concerning real investment in intangible capital and information on intangible capital stocks are based on the first harmonized intangible

[3] This study was based on the approaches of Knack and Keefer (1995) and Benhabib and Spiegel (1994).
[4] This dummy controls a.o. for the economic downturn following the bust of the information technology bubble in 2000, the 9/11 event in 2001, and the global financial crisis in 2008.

capital EUKLEMS dataset released in 2019 (Stehrer, Bykova, Jäger, Reiter, & Schwarzhappel, 2019). The intangible capital data includes investment in: (i) software, (ii) R&D, (iii) design and other product developments, iv) advertising, market research, and branding, (v) vocational training, and (vi) purchased organisational capital. An intangible capital index consisting of these six individual intangible indicators is constructed.

(ii) The data on **RoL** is an index ranging from -2.5 to 2.5 taken from the WGIP (Kaufmann et al., 2010).

(iii) **Human capital** is measured as the percentage of the population who attained at least upper secondary education, which is taken as a proxy for the inherent stock of human capital. This data is taken from Eurostat.

(iv) The **unemployment rate** data is also taken from Eurostat, and is used to calculate the **business cycle** effects.

(v) **Employment protection legislation** (EPL) is taken from the Organisation for Economic Co-operation and Development (OECD).

(vi) **Tertiary education** is measured as the percentage of the population who have attained at least tertiary education. This data is taken from Eurostat.

(vii) The nominal and real **interest rates** are taken from Eurostat.

3.3 Research design

Due to data limitations concerning the information on real investment in intangible capital and information on the stock of intangible capital, the analysis includes 16 European countries, namely, Austria, Czech Republic, Denmark, Estonia, Finland, France, Germany, Hungary, Italy, Lithuania, the Netherlands, Slovakia, Slovenia, Spain, Sweden, and the United Kingdom (UK). Due to data limitations concerning the information on RoL, the study covers the period from 1996 to 2017.

The EU-16 countries are grouped into six typologies: (i) Scandinavian (Finland, Denmark, and Sweden), (ii) coordinated (Austria, the Netherlands, Germany, and France), (iii) liberal (the United Kingdom), (iv) Mediterranean (Italy and Spain), (v) transition (Slovak Republic, Czech Republic, Hungary, and Slovenia), and (vi) Baltic economies (Lithuania, and Estonia). The study focuses on the market sector (i.e., A to K, M to N, R, and S), excluding real estate activities.

3.4 Estimation approach

To compare the empirical results of this study with those of previous studies in the field (Roth 2022b), **Fehler! Verweisquelle konnte nicht gefunden werden.** is estimated using a random-effects approach. The baseline estimation uses all EU-16 countries with an overall number of 316 observations. To control for potential cross-sectional heteroskedasticity, a robust variance-covariance matrix (VCE) estimator is adopted. In addition, a two-stage least-squares random-effects estimator (G2SLS) and system generalized method of moments (GMM) approach to control for endogeneity.

4 Descriptive statistics

Table 1 presents the descriptive statistics for the variables used in the analysis.

Table 1. Descriptive statistics

Variable	Mean	St. Dev.	Min.	Max.	Country	Obs.
Rule of law (index from -2.5 to 2.5)	1.3	0.5	0.3	2.1	16	316
Real investment in intangible capital (%)	9	2.9	3.1	17.3	16	316
Intangible capital stock (% adjusted VA)	28.7	10.4	9.9	56.5	16	316
Upper secondary education (%)	71.3	11.3	35.7	87.6	16	316
Business cycle	0.91	0.39	0.74	0.97	16	316
Tertiary education (%)	23.2	7.4	7	38.7	16	309
Nominal interest rate (%)	4	2	0.9	14	16	303
Real interest rate (%)	4	2	0.9	14	16	303
Employment protection legislation	2.4	0.6	1.3	3.7	16	289

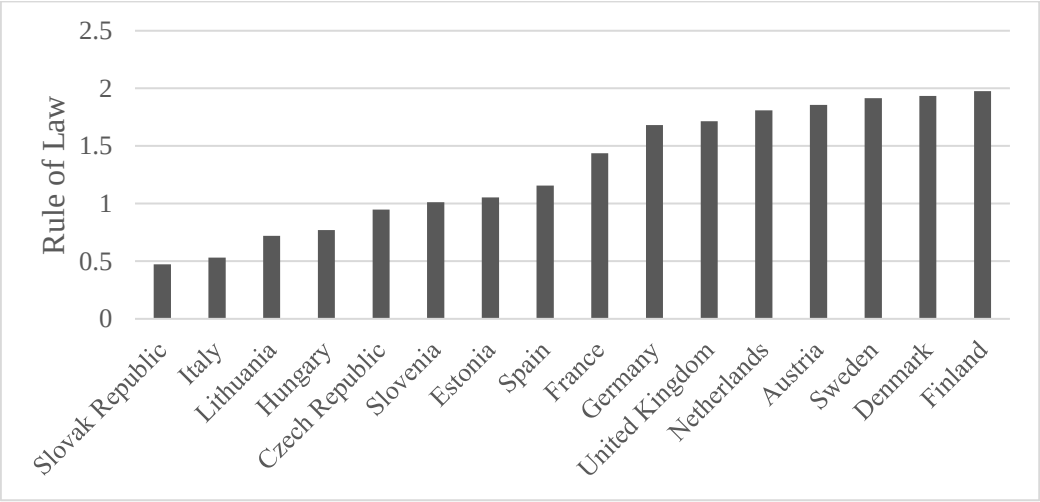
Notes: St. Dev.= standard deviation, Min.= minimum, Max.= maximum; Obs.= observations
Sources: Data are taken from Stehrer et al. (2019), (Kaufmann et al., 2010), and Eurostat.

Figure 1 displays the distribution of the average value of RoL in the EU-16 country sample over the period 1996 to 2017.

Figure 1 clarifies two important issues. First, across the EU-16 a significant variance in RoL exists. Finland, Denmark, and Sweden lead the ranking of countries with a high RoL average value of 1.98, 1.93, and 1.92, respectively, while the Slovakia and Italy are positioned at the end of the ranking with average values of 0.47 and 0.53, respectively. A sizeable standard deviation of 0.5 by a given mean of 1.3 highlights a significant variation among countries.

Italy, the third-largest EU/euro area (EA) economy, is the only EU-16 country positioned in the lower third of the distribution. Italy's value of 0.53 is significantly lower than the largest and second-largest EU/EA economies France (1.44) and Germany (1.68), as well as the UK (1.71). The transition and Baltic countries are located at the lower end of the distribution with values lower than 1.1.

Figure 1. Rule of law in the EU-16, 1996–2017

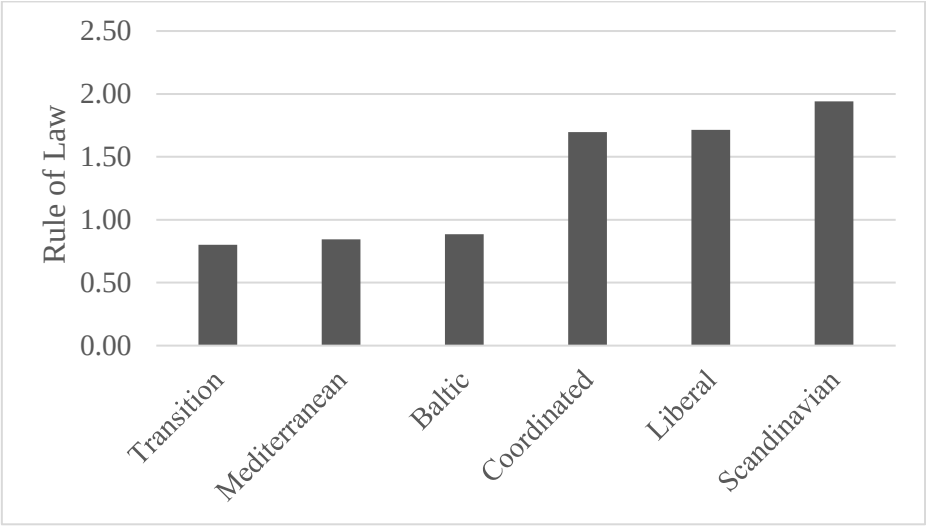


Source: The RoL indicator is taken from the WGIP (Kaufmann et al. 2010).

Figure 2 indicates that regime characteristics (Hall and Soskice, 2001) drive the variance in the RoL indicator within the EU-16 countries. The pattern in

Figure 2 indicates that the Scandinavian, liberal, and coordinated regimes are positioned at the upper half of the distribution, with values of 1.5 and higher. The Baltic, Mediterranean, and transition regimes are located at the lower half of the distribution, with a value lower than 1.0. Figure 2 highlights the significant gap between the lower and the upper half of the distribution.

Figure 2. Rule of law by typology of regimes, 1996–2017

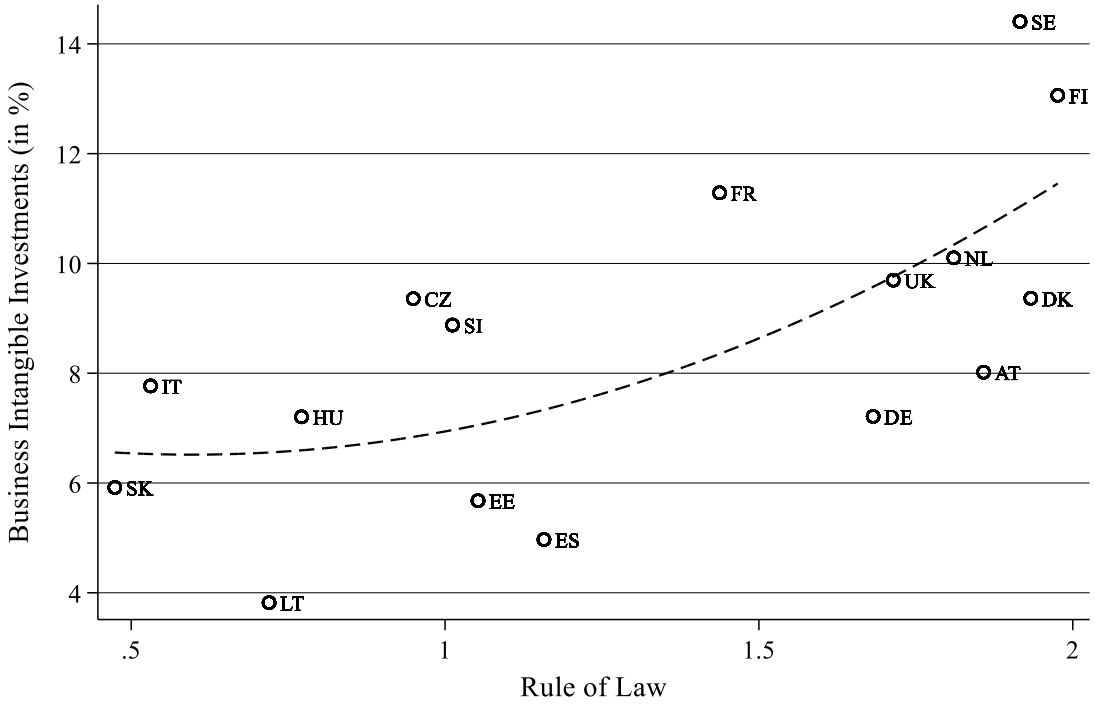


Source: The RoL indicator is taken from the WGIP (Kaufmann et al., 2010).

Figure 3 shows a scatter plot between RoL and businesses' real investment in intangible capital for the EU-16.

Figure 3 suggests a positive bivariate relationship between RoL and business investment in intangible capital. Whereas the relationship shows only a slight positive association among the country observations in the lower half of the distribution, the positive relationship – driven by Sweden and Finland – accelerates in the upper half of the distribution.

Figure 3. Rule of law and intangible capital, EU-16, 1996–2017



Notes: The RoL indicator is taken from the WGIP *(Kaufmann et al., 2010)*. The dashed line represents the fitted linear regression line. Source: *Stehrer et al. (2019)* and *Kaufmann et al. (2010)*

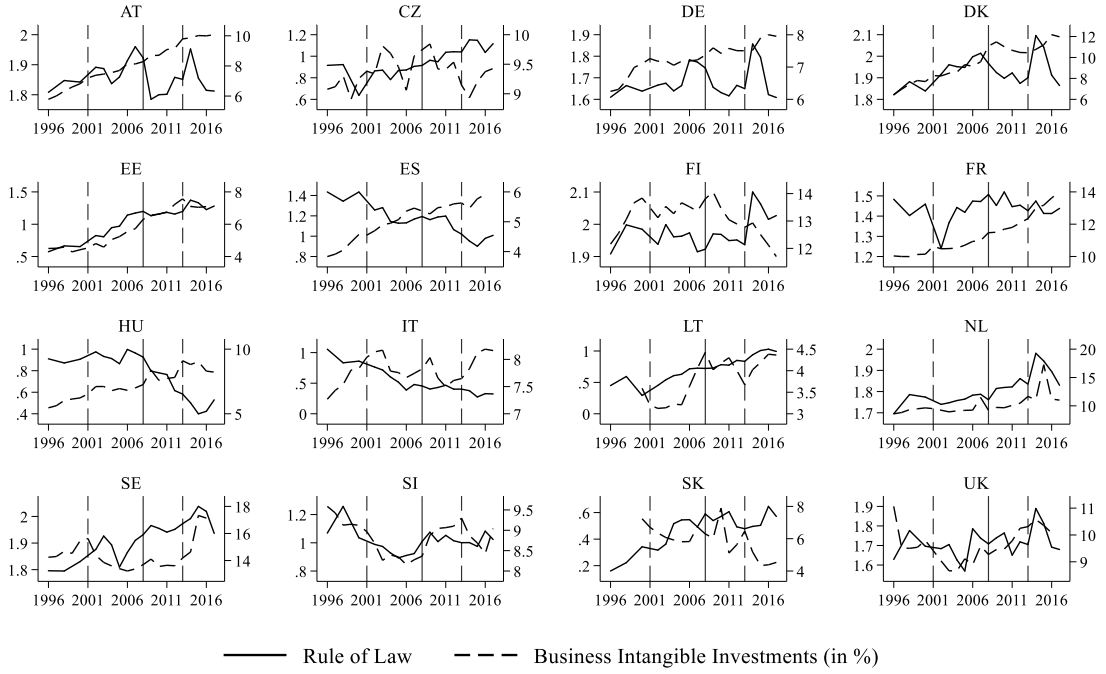
Figure 4 analyses the time series patterns between RoL and intangible capital investment within the EU-16 between 1996 and 2017. **Figure 4** indicates significant pronounced declines in RoL in Italy and Spain from 1996 to 2017, from 1.06 to 0.33 in Italy and 1.44 to 1.01 in Spain. Such a large decline is also present in the transition country Hungary from 0.91 to 0.53. On the other hand, we see marked increases in the other two transition countries, the Czech Republic and Slovakia, and in the Baltic countries, Estonia, and Lithuania.

Figure 4 shows mixed empirical evidence on the two-time series patterns. On the one hand, there are strong positive associations in Estonia and the Netherlands with correlation coefficients of 0.89 and 0.72, respectively.[5] On the other hand, there is a strong negative

[5] The correlation coefficients for the time series patterns for all EU-16 countries are as follows: Estonia (0.89), the Netherlands (0.72), Lithuania (0.71), Slovenia (0.58), Sweden (0.41), Denmark (0.30), United Kingdom (0.24), France (0.13), Germany (0.13), Austria (-0.01), Czech Republic (-0.25), Finland (-0.28), Italy (-0.37), Slovakia (-0.40), Hungary (-0.80), Spain (-0.85).

association in Hungary and Spain with correlation coefficients of -0.80 and -0.85, respectively. Therefore, compared to the positive between-variation found in **Figure** 43, the positive within-variation in some countries is cancelled out by the negative within-variation in other countries. This indicates that a fixed-effects estimation approach should yield an insignificant coefficient.

Figure 4. ***Trends in*** **rule of law** ***and intangible capital investment in EU-16, 1996–2017***



Notes: Time trends display the period from 1996 to 2017. The dashed lines represent the period of the dot-com bubble in 2001 and the economic recovery in 2013. The solid line represents the global financial crisis in 2008. Source: Stehrer et al. (2019) and Kaufmann et al. (2010).

5 Empirical analysis

5.1 Estimation results

Table 2 shows the estimation results when estimating **Fehler! Verweisquelle konnte nicht gefunden werden.** with random effects and controlling for cross-sectional heteroscedasticity and using the first lag for all independent variables. Following the economic theory, Regression

(1) finds that with a coefficient of 1.7, the RoL indicator is positively and significantly related to investment in intangible capital on a 99%-confidence level. The high between R-square of 0.77 indicates that the significant association is foremost driven by the cross-sectional variance (see

Figure 3).

Table 2. Rule of law and investment in intangible capital by businesses

Dependent variable	Intangible capital investment		
Estimation method	RE	G2SLS	SYSGMM
Regression	(1)	(2)	(3)
Rule of law	1.7***	2.0***	2.1**
	(3.89)	(4.33)	(2.15)
Model controls	yes	yes	yes
Year dummies	yes	yes	yes
Observations	316	292	316
Number of countries	16	16	16
Number of instruments	-	17	29
R-square within	0.35	0.29	0.29
R-square between	0.77	0.78	0.78
R-square overall	0.71	0.72	0.72

Notes: IC = intangible capital investment by businesses; RE = random effects; SYSGMM = system generalized method of moments; robust standard errors are provided between brackets; R-squared values for the SYSGMM estimator are taken from the 2GLS estimator; *** p<0.01, ** p< 0.05, * p < 0.1

When running regressions, such as Regression (1), one must be aware of the possibility that the left-hand side and the right-hand side variables will affect each other. More specifically, RoL might be endogenous, affected by a common event such as an economic shock or a bi-directional relationship with investment in intangible capital.

In order to address this issue, Regression (2) controls for endogeneity by using the second and third lagged value of the RoL indicator as an internally derived instrument resulting in a highly significant coefficient of 2.0.[6] It is comforting that when controlling for endogeneity

[6] Overall, we use 17 instrumental variables in Regression (2). Instruments included the lagged values of the intangible capital stock, lagged values of upper-secondary education, lagged values of the business cycle, year

with the help of a system GMM estimation approach, Regression (3) retrieves a similar coefficient of 2.1 to the one from the G2SLS of 2.0.[7]

Given that the cross-sectional variance drives the significant positive association between the RoL and intangible capital investment, the coefficient in Regression (2) in

Table 2 could be interpreted as such: if Italy, with an average value of 0.53 (see

Figure 1), would hypothetically be able to reach the same level of RoL as Finland, with an average value of 1.98 (as displayed in

Figure 1), this increase would be associated with an increase in intangible capital investment of approximately 2.9% (1.45*2.0) more.

This is a greater increase in intangible investment than derived in the previous study by Roth (2022b), in which a smaller country sample (EU-13) was analysed over a shorter period of time (1998–2005), retrieving smaller coefficients in the range of 1.0 to 1.4. This is in line with the reported coefficient of 1.3 in Regression (11) in

Table 2 when analysing a pre-crisis sample (before 2009).

5.2 Sensitivity analysis

Table presents the robustness analysis based on Regression (2). The benchmark Regression (1) in

Table 2 is the same as Regression (2) in Table 2. As already indicated by **Figure 4**, when analysing the within-variation by incorporating country-fixed-effects and estimating a

dummies from 1999 to 2016, and the second and third lag of RoL. With a p-value of 0.78, an override command clarifies that that the instruments used are valid.

[7] Our system GMM estimation approach uses the xtabond2 command (see (Roodman, 2009) and the following specifications: i) it uses the two-period lags of the instrument set, ii) collapses the instrument, iii) applies Windmeijer (2005) corrected standard errors, and iv) requests the forward orthogonal-deviations transform instead of first differencing. However, given the fact the Hansen test returns a perfect p-value of 1.00 instrument, proliferation might still exist.

difference GMM procedure, we retrieve insignificant associations between RoL and intangible investment, as displayed in Regressions (2) and (3).

Table shows that neither the exclusion of potential outliers such as Sweden and Slovak Republic (see

Figure 3) in Regressions (4) and (5), the analysis of the sub-sample of the EU-10 in Regression (6), nor the inclusion of further control variables such as employment protection legislation (EPL) in Regression (7), tertiary education in Regression (8), nominal and real interest rate in Regressions (9–10) alter the coefficient in a significant manner.[8] However, it is interesting to note that the strength of the coefficient increases for an EU-10 country sample and the inclusion of EPL. When analysing the two sub-time periods before and after the 2008 global financial crisis, in Regressions (11–12), we retrieve weaker coefficients, in particular with regard to the pre-crisis period (before 2009).

Table 3. Robustness analysis (G2SLS)

Regression	Alteration	IC coeff.	Z-value	Obs.
(1)	Benchmark	2.0***	(4.33)	292
Alternative estimation approach				
(2)	Fixed-effects	1.0	(0.87)	292
(3)	Difference GMM	1.8	(0.91)	300
Country/sector exclusions/inclusions				
(4)	Excluding Sweden	2***	(3.80)	274
(5)	Excluding Slovak Republic	2***	(4.21)	275
(6)	EU-10	2.8***	(6.16)	187
Control variables				
(7)	Employment protection legislation	2.7***	(5.49)	187
(8)	Tertiary education	2.1***	(3.38)	287
(9)	Nominal interest rate	2***	(4.10)	283
(10)	Real interest rate	2***	(4.10)	283
Across different time periods				
(11)	Before 2009	1.3**	(2.08)	152
(12)	After 2008	1.7**	(2.52)	140

Notes: IC = intangible capital investment by businesses; Obs.= observations; coeff.= coefficients; robust standard errors are provided between brackets; *** p<0.01, ** p< 0.05, * p < 0.1

[8] For a line of argument about why these control variables influence investment in intangible capital, see Thum-Thysen et al. (2019)

6 Discussion of findings

This study adds robustness to previous empirical findings on the influence of RoL on investment in intangible capital by businesses (Roth, 2022b). Analysing an EU-16 country sample over the time period 1996–2017 and controlling for endogeneity with the help of a G2SLS estimation approach, it finds a positive coefficient of approximately 2.0 between RoL and investment in intangible capital by businesses. This result is driven by the significant between-variance in the RoL across the EU-16 sample. The result indicates that the average-low level of RoL in the transition, Mediterranean and Baltic countries hampers intangible capital investment by their businesses and, hence, labour productivity growth in their market sectors. In order to increase intangible capital investments by businesses and, hence, labour productivity growth in their market sectors, these countries would benefit from either continuing to increase their RoL, such as in the Baltic countries of Estonia and Lithuania and the transition country Slovakia, or trying to reverse the pronounced decline in RoL, such as in the Mediterranean and countries of Italy and Spain and in the transition country Hungary.

7 Conclusion

This paper investigated the relationship between the rule of law and investment in intangible capital by businesses in an EU-16 context. The results highlight two empirical findings of particular relevance.

First, considerable variance exists concerning the rule of law within the EU-16 country sample. The transition, Mediterranean and Baltic countries have significantly lower levels of rule of law than the Scandinavian, liberal, and coordinated countries, e.g., the third largest EU/EA economy Italy has a significantly lower level of RoL than the two largest economies in the EU/EA, France and Germany. Second, using a random-effects estimation among an EU-16 country sample over the time period 1996 to 2017, with 316 overall country observations, and

controlling for endogeneity with the help of a G2SLS estimation approach, RoL is significantly and positively related to investment in intangible capital by businesses. This result indicates that the average-low levels of RoL in the transition, Mediterranean and Baltic economies hampers intangible capital investments by businesses and, hence, labour productivity growth in their market sectors.

It should be highlighted that more empirical research is needed to corroborate these initial findings. It would be of particular interest to corroborate the findings by using an external instrumental variable to address potential endogeneity issues.

These findings suggest three policy recommendations. First, in order to enhance investment by businesses in intangible capital — in line with the Europe 2020 strategy (European Commission 2010) — it would be beneficial to enhance the level of RoL in those countries that perform relatively worse in the EU-16 context. Mediterranean countries, such as Italy and Spain, and transition countries, such as Hungary, should try to reverse the pronounced decline in RoL detected in this analysis. Second, the low level of RoL in the third-largest economy in the Eurozone, Italy, needs to be taken into consideration, particularly when trying to ameliorate the governance of the EA. The significant difference in RoL among the two largest EA economies, France and Germany, and the third largest economy, Italy, will lead to continued divergence in investment in intangible capital by businesses and, hence, labour productivity growth. Thus, in the long run, in order to even out economic divergences between the three largest EA economies, Italy's level of RoL would ideally need to converge towards the other two countries. Third, following the initial theoretical arguments advanced by the World Bank (2006, p. 98), future research endeavours should evaluate how much of the expenditure on national justice systems should be considered investment in public intangible capital. In this regard, it can easily be concluded that a share of public expenditure on the justice system represents an investment by its very nature, as the existence of an efficient judicial

system is a prerequisite for the protection and enforcement of property and contractual rights, which are an essential prerequisite for the conduct of economic activities within a functioning market economy.

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