Credit Constraints in European SMEs: Does Regional Institutional Quality Matter?

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Abstract: We analyze the investment-to-cash flow relationship in Europe using a sample of manufacturing small- and medium-sized enterprises (SME) over the period 2009-2016. We investigate the effect of regional institutional quality on the investment-to-cash flow sensitivity, finding that, although credit constraints remain a serious problem for European SMEs, high-quality regional institutions contribute to mitigate the dependency on internally-generated resources to finance new investments. Improvements in local institutional quality can therefore facilitate SMEs' access to credit —e.g., through inter-firm trade credit relationships—, but are insufficient to overcome the credit restrictions faced by European SMEs.

Keywords: Credit constraints; Small- and medium-sized firms; Manufacturing industry; Institutional quality; Europe.

JEL Codes: C23; D25; R50.

1. Introduction

Small- and medium-sized enterprises (SME) are regarded as engines for job creation and growth (OECD, 2017).[1] However, credit restrictions limit their growth. High idiosyncratic and insolvency risks make SMEs more credit-rationed than large firms (Becchetti *et al.*, 2010). They also depend on the regional financial sector and local bank financing to a greater extent than large firms, which have easier access to national and international capital markets (Alessandrini *et al.*, 2009; Palacín-Sanchez *et al.*, 2013). Credit-rationed SMEs thus rely more on internally- and locally-generated resources to undertake new investments. This negatively affects their productivity (Rodríguez-Pose *et al.*, 2021).

High dependency on local bank lending and credit rationing push SMEs towards non-institutional funding sources to overcome bank credit restrictions (Cainelli *et al.*, 2012). But, can more efficient institutions relax credit constraints for SMEs? Research shows that better institutions provide transparency and stability to the local socio-economic and business ecosystems, reducing corruption and unfair competition, and increasing trust and reciprocity among economic actors (Ganau and Rodríguez-Pose, 2019). Good institutions ease transaction costs, favoring both inter-firm trade credit through repeated production transactions —with local firms being more inclined to grant contracts and delayed payments to business partners facing financial restrictions (Cainelli *et al.*, 2012)— and informal credit lending based on family and friendship ties (Chavis *et al.*, 2011).

There has been considerable scrutiny of how national institutions affect firms' credit access (e.g., Andrieu *et al.*, 2018). The evidence of how this works at subnational level is, however, far weaker. We address this gap by examining whether high-quality regional institutions affect European manufacturing SMEs' investment-to-cash flow sensitivity, and, particularly, their dependency on internally-generated resources.

[1] SMEs are firms with 10 to 249 employees (European Commission Recommendation 2003/361/EC).

2. Data and methodology

We employ firm-level data from the Amadeus database. We consider only active SMEs, providing unconsolidated financial statements and full information on incorporation year, geographical location, industrial sector, tangible fixed assets, depreciations, cash flow, value added, employment, and sales. The panel consists of 14,896 SMEs between 2009-2016, covering 11 European countries —Belgium, Bulgaria, Czechia, Germany, France, Hungary, Italy, Portugal, Romania, Slovakia, Spain.

We enrich the dataset with region-specific institutional quality data from the 2010 and 2013 waves of the European Quality of Government Index (EQGI) dataset, which provides information on citizens' perception and experience with respect to local corruption, government effectiveness, voice and accountability, and rule of law (Charron *et al.*, 2014, 2015). We add country-level data on financial development from the Financial Development Index (International Monetary Fund).[2]

We analyze how firms are affected by credit constraints by estimating their investment-to-cash flow sensitivity. As credit-rationed firms rely more on internally-generated resources to finance new investments, additional cash flows facilitate the optimization of real investment opportunities. Therefore, positive returns of cash flow on real investments can be interpreted as evidence of credit rationing (Bond and van Reenen, 2007).[3] We model investment-to-cash flow sensitivity through an Error Correction Model (ECM) as follows (Bloom *et al.*, 2007):[4]

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[2] Online Appendix A describes the data, cleaning procedure, and sample structure.

[3] Investment-to-cash flow sensitivity is not a perfect proxy for credit constraints (Kaplan and Zingales, 1997). However, and for lack of better alternatives, it has been regularly used to capture credit constraints since Fazzari *et al.* (1988).

[4] The ECM presents several advantages over the alternative Q model (Rodríguez-Pose *et al.*, 2021). Its flexibility reduces misspecification problems. It maintains the long-run properties of the standard value-maximizing investment model, allowing for short-run dynamics in adjustment costs. It can also be estimated for both unlisted and listed firms.

$$\log\left(\frac{I_{isrct}}{Kb_{isrct}}\right) = \alpha + \beta \log\left(\frac{I_{isrct-1}}{Kb_{isrct-1}}\right) + \gamma \log\left(\frac{CF_{isrct}}{Kb_{isrct}}\right) + \delta \Delta Sales_{isrct}$$

$$+\zeta[\log(K_{isrct-1}) - \log(Sales_{isrct-1})] + \sum_{k}^{K} \theta_k X_{isrct}^{k}$$

$$+\vartheta Institutional\ Quality_{rct} + \lambda \left[\log\left(\frac{CF_{isrct}}{Kb_{isrct}}\right) \times Institutional\ Quality_{rct}\right]$$

$$+\mu Financial\ Development_{ct} + \varepsilon_i + \varepsilon_s + \varepsilon_c + \varepsilon_t + \varepsilon_{isrct} \quad (1)$$

where the dependent variable for firm i in the two-digit sector s, in region r in country c, in year t captures real investments in tangible fixed assets (I_{isrct}) scaled by the beginning-of-the-year capital stock (Kb_{isrct}).

Firm-level explanatory variables include the first-order time-lagged investment variable; the cash flow variable (CF_{isrct}/Kb_{isrct}), defined as net income plus depreciations; the log-change in sales between t and $t-1$ ($\Delta Sales_{isrct}$), capturing short-run investment responses to demand shocks; the error correction term, defined as the difference between capital stock (K_{isrct}) and sales ($Sales_{isrct}$) at $t-1$, denoting the adjustment speed of capital stock to its equilibrium level. The vector X_{isrct}^{k} represents the log-transformed variables for size (employment), age (observation year minus firm-specific incorporation year), and labor productivity (deflated value added per employee).[5]

The regional institutional quality variable ($Institutional\ Quality_{rct}$) is normalized in $[0, 1]$ and computed as a synthetic index, interpolating the EQGI survey questions on corruption, government effectiveness, voice and accountability, and rule of law with their corresponding country-level values available for the period 2009-2016 from the World Bank's Worldwide Governance Indicators database (Charron *et al.*, 2014). The variable captures the 'quality', rather than the 'quantity', of public services delivered by regional governments, and

[5] Online Appendix B discusses how the variables for investments and capital stock are calculated, presenting insights on investment-to-cash flow sensitivity.

proxies for governments' capacity to provide and administer public services impartially, effectively, and in a non-corrupt manner, creating a trust-based local environment favorable for inter-firm and inter-personal relationships (Rothstein and Teorell, 2008).[6]

Equation (1) includes the interaction term between cash flow and regional institutional quality to depict the mediating role of institutional quality on the investment-to-cash flow sensitivity. It also includes a country-level variable for financial development ($Financial\ Development_{ct}$), normalized in $[0, 1]$, to control for heterogeneity in formal financial markets, as well as firm (ε_i), sector (ε_s), country (ε_c), and year (ε_t) fixed effects, and the error term ε_{isrct}.[7]

We employ a two-step System Generalized Method of Moments (SGMM) estimator to avoid biased coefficients of the time-lagged dependent variable and account for unobserved heterogeneity and endogeneity of the explanatory variables. The SGMM estimator combines a system of first-differenced variables (removing unobserved heterogeneity), instrumented with lagged levels, and a system of variables in level, instrumented with lags of their own first differences (Arellano and Bond, 1991; Blundell and Bond, 1998). The age variable and the sector-, country-, and time-specific dummies are treated as exogenous and used as instruments for themselves only in levels. The other variables are treated as endogenous and instrumented using their second-order lagged values in both levels and first differences.

We deal with the potential endogeneity of regional institutional quality through an external instrumental variable (IV), in addition to the internally-generated instruments. Our instrument exploits variations in regional precipitation variability during the growing season in the preindustrial period (1500-1750) (Buggle and Durante, 2021).[8] The identification relies on

[6] Online Appendix C discusses the computation and interpretation of the regional institutional quality variable, presenting insights on its geographical distribution.

[7] Online Appendix D reports descriptive statistics and correlation coefficients.

[8] Online Appendix E discusses the computation of the precipitation variability variable.

the logic that climate uncertainty in preindustrial times called for the formation of efficient local institutions to cope with climate-related economic risks. We expect that current institutions reflect the quality of past ones (North, 1990). The validity of the IV is granted by the fact that precipitation variability before 1750 is exogenous to firms' current investment dynamics.

3. Results

Table 1 reports the two-step SGMM estimates of Equation (1). Arellano and Bond's (1991) test identifies the presence (absence) of first- (second-)order serial correlation in the first-differenced residuals. Hansen's (1982) J statistic fails to reject the null hypothesis of instruments' exogeneity.

We find that real investments are positively associated with cash flow, suggesting that European SMEs are affected by credit constraints, and that regional institutional quality positively mediates the investment-to-cash flow sensitivity. The interaction term between cash flow and institutional quality displays a negative and statistically significant coefficient, indicating that high-quality institutions relax SMEs' dependency on internally-generated resources to finance new investments. High-quality institutions thus create a favorable local socio-economic environment that, in turn, improves trade credit through repeated production relationships and other informal credit lending opportunities. From Specification (5), the estimated investment-to-cash flow sensitivity decreases from 0.763 (statistically significant at 0.1%) to 0.071 (statistically negligible), moving from the 1^{st} (low-quality) to the 99^{th} (high-quality) percentile of the regional institutional quality distribution.[9]

[9] Online Appendix F presents robustness exercises.

Table 1: Investment-to-cash flow sensitivity and the role of regional institutional quality.

Dependent Variable	$\log(I_{isrct}/Kb_{isrct})$				
	(1)	(2)	(3)	(4)	(5)
$\log(I_{isrct-1}/Kb_{isrct-1})$	0.103****	0.123****	0.123****	0.122****	0.139****
	(0.010)	(0.008)	(0.009)	(0.009)	(0.012)
$\log(CF_{isrct}/Kb_{isrct})$	0.563****	0.664****	0.747****	0.740****	0.819****
	(0.074)	(0.105)	(0.113)	(0.109)	(0.238)
$\Delta Sales_{isrct}$	0.011	0.079	0.071	0.081	0.428
	(0.195)	(0.092)	(0.087)	(0.086)	(0.276)
$\log(K_{isrct-1}) - \log(Sales_{isrct-1})$	-0.275****	-0.214*	-0.195*	-0.205*	-0.243**
	(0.078)	(0.112)	(0.105)	(0.104)	(0.103)
$\text{Institutional Quality}_{rct}$	…	…	-0.180	-0.187	-0.924
			(0.354)	(0.282)	(0.565)
$\log(CF_{isrct}/Kb_{isrct}) \times \text{Institutional Quality}_{rct}$	…	…	…	…	-0.748**
					(0.326)
Control Variables	No	Yes	Yes	Yes	Yes
Observations	58,213	58,213	58,213	58,213	58,213
Firms	14,896	14,896	14,896	14,896	14,896
Model F Statistic [p-value]	94.51 [0.000]	168.32 [0.000]	122.73 [0.000]	132.18 [0.000]	87.31 [0.000]
AR(1) (p-value)	0.000	0.000	0.000	0.000	0.000
AR(2) (p-value)	0.646	0.677	0.663	0.704	0.269
Internally-Generated Instruments	Yes	Yes	Yes	Yes	Yes
External IV for $\text{Institutional Quality}_{rct}$	No	No	No	Yes	Yes
Hansen J Statistic (p-value)	0.286	0.345	0.721	0.730	0.975

Notes: * $p < 0.1$; ** $p < 0.05$; **** $p < 0.001$. Standard errors (in parentheses) clustered at regional level. All specifications include country, industry, and year dummies, and a constant term.

4. Conclusions

High-quality regional institutions contribute to reducing European manufacturing SMEs' dependency on internally-generated resources to finance new investments. Although European SMEs suffer from credit constraints across-the-board, those located in regions with high-quality institutions have greater chances of accessing non-institutional financial resources for expansion thanks to a favorable socio-economic environment characterized by trust and reciprocity among economic actors. High-quality local institutions are, however, insufficient to solve the credit conundrum. Although improvements in regional governance can overcome some credit access barriers, *ad hoc* policy interventions supporting banks' capacity to lend to SMEs, reducing information asymmetry and adverse selection in bank-firm relationships, and easing SMEs' requirements for accessing credit are needed to guarantee that SMEs can fulfil their full growth potential.

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ONLINE APPENDICES

APPENDIX A – Data, cleaning procedure, and sample structure

The firm-level data used in the empirical analysis are drawn from the Amadeus database (Bureau van Dijk), which provides balance sheet data and personal information for European firms. We cleaned the original sample to consider only active manufacturing small- and medium-sized enterprises (SME) —i.e., firms with 10 to 249 employees according to the European Commission Recommendation 2003/361/EC of 6 May 2003— reporting unconsolidated financial statements, as well as firms with available information on incorporation year, geographical location at sub-national level defined according to the *Nomenclature des Unités Territoriales Statistiques* (NUTS) adopted by the European Union (EU), and industrial sector defined at the two-digit level of the EU NACE Rev. 2 Classification. We cleaned the sample by removing also firms reporting missing figures for tangible fixed assets and depreciations over the period 2008-2016 in order to estimate firm-level variables for real investments in tangible fixed assets and capital stock for the years from 2009 to 2016. We further polished the resulting sample to consider only firms reporting strictly positive figures for investments, capital stock, cash flow, sales, value added, and employment for at least three consecutive years during the period 2009-2016. The cleaning procedure left us with an unbalanced panel dataset of 14,896 SMEs observed over the period 2009-2016, and covering 11 European countries, namely Belgium, Bulgaria, Czech Republic, Germany, France, Hungary, Italy, Portugal, Romania, Slovak Republic, and Spain.[10]

We then integrated the firm-level dataset with region-specific data on institutional quality

[10] One of the drawbacks of the Amadeus database is that it does not allow for the identification of multi-establishment firms. This issue, in any case, is partially relaxed by the exclusion from the sample of firms reporting consolidated financial statements, as well as by the fact that we do focus on SMEs, and firms of this size tend to be overwhelmingly mono-establishment (Cainelli and Iacobucci, 2011, 2012).

drawn from the 2010 and 2013 waves of the European Quality of Government Index (EQGI) dataset provided by the Quality of Government Institute at the University of Gothenburg. The EQGI dataset provides information derived from a citizen-based survey conducted in the years 2009 and 2012 on about 34,000 and 85,00 citizens, respectively, and focusing on the perception and experience of individuals in their own region with respect to corruption, quality, and impartiality in terms of education, public health care, and law enforcement —see Charron *et al.* (2013) and Charron *et al.* (2014, 2015) for details.

Finally, we enriched the dataset with country-level data on financial development drawn from the Financial Development Index database provided by the International Monetary Fund. This database, covering the period 1980-2018, provides a country-level synthetic index of financial development capturing the depth, access, and efficiency of a country's financial institutions and financial markets. The synthetic measure of financial development is provided in the form of an index normalized in the interval $[0,1]$, with a higher value indicating greater financial development —see Sahay *et al.* (2015) and Svirydzenka (2016) for details.

Table A1 reports the distribution of firms by country, while Table A2 considers the distribution of sample firms by two-digit industrial sector. The sample includes firms operating in all two-digit manufacturing sectors. As shown in Table A3, the number of observations peaks in the year 2015. Finally, as Table A4 shows, the sample covers all sub-national territories of the countries analyzed, except for the Spanish Canary Islands and the Italian Aosta Valley region due to lack of data. The geographical unit of analysis varies across countries between the NUTS levels 1 and 2. The reason for this is the need to match the geographical level of disaggregation for the available data on regional institutional quality. Accordingly, NUTS-1 regions are used for Belgium, Germany, and Hungary, while NUTS-2 regions are used for the remaining countries.[11]

[11] This sub-national classification identifies regions with an effective devolved power to influence institutional and socio-economic conditions, as well as the economic performance of local firms in each specific country —see,

Table A1: Sample distribution by country.

Country	No. Firms	%
Belgium	468	3.14
Bulgaria	363	2.44
Czech Republic	1,894	12.71
France	2,326	15.61
Germany	2,115	14.20
Hungary	607	4.07
Italy	3,713	24.93
Portugal	699	4.69
Romania	533	3.58
Slovak Republic	641	4.30
Spain	1,537	10.32
Total	14,896	100.00

Notes: Percentage values are defined on the total sample of 14,896 firms.

for example, Ganau and Rodríguez-Pose (2019) and Rodríguez-Pose *et al.* (2021).

Table A2: Sample distribution by two-digit level sector.

Two-Digit Level Sector – NACE Rev. 2	No. Firms	%
10 - Manufacture of food products	1,708	11.47
11 - Manufacture of beverages	270	1.81
12 - Manufacture of tobacco products	4	0.03
13 - Manufacture of textiles	431	2.89
14 - Manufacture of wearing apparel	450	3.02
15 - Manufacture of leather and related products	351	2.36
16 - Manufacture of wood and of products of wood and cork, except furniture; manufacture of articles of straw and painting materials	574	3.85
17 - Manufacture of paper and paper products	375	2.52
18 - Printing and reproduction of recorded media	457	3.07
19 - Manufacture of coke and refined petroleum products	24	0.16
20 - Manufacture of chemicals and chemical products	649	4.36
21 - Manufacture of basic pharmaceutical products and pharmaceutical preparations	124	0.83
22 - Manufacture of rubber and plastic products	1,074	7.21
23 - Manufacture of other non-metallic mineral products	639	4.29
24 - Manufacture of basic metals	348	2.34
25 - Manufacture of fabricated metal products, except machinery and equipment	3,008	20.19
26 - Manufacture of computer, electronic, and optical products	471	3.16
27 - Manufacture of electrical equipment	537	3.60
28 - Manufacture of machinery and equipment N.E.C.	1,570	10.54
29 - Manufacture of motor vehicles, trailers, and semi-trailers	326	2.19
30 - Manufacture of other transport equipment	134	0.90
31 - Manufacture of furniture	404	2.71
32 - Other manufacturing	374	2.51
33 - Repair and installation of machinery and equipment	594	3.99
Total	14,896	100.00

Notes: Percentage values are defined on the total sample of 14,896 firms. The NACE Rev. 2 is the European nomenclature adopted with Regulation No.1893/2006 of the European Parliament and of the Council of 20 December 2006.

Table A3: Temporal distribution of the sample.

Year	No. Observations	%
2010	5,482	9.42
2011	7,178	12.33
2012	8,165	14.03
2013	9,620	16.53
2014	9,759	16.76
2015	9,979	17.14
2016	8,030	13.79
Total	58,213	100.00

Notes: Percentage values are defined on the total number of 58,213 firm-year observations.

Table A4: Geographical structure and regional coverage of the sample.

Country	Regions			
	NUTS Level	In the Country	In the Sample	Percentage Covered
Belgium	1	3	3	100.00
Bulgaria	2	6	6	100.00
Czech Republic	2	8	8	100.00
France	2	22	22	100.00
Germany	1	16	16	100.00
Hungary	1	3	3	100.00
Italy	2	21	20	95.24
Portugal	2	7	7	100.00
Romania	2	8	8	100.00
Slovak Republic	2	4	4	100.00
Spain	2	17	16	94.12
Total		115	113	98.26

Notes: The five French Overseas Departments and the Spanish extra-territorial autonomous cities of Ceuta and Melilla are excluded *à priori* from the analysis, while the Spanish Canary Islands and the Italian region of Aosta Valley are not included in the analysis due to data unavailability.

APPENDIX B – Computation of the variables for real investments in tangible fixed assets and capital stock, and insights on the investment-to-cash flow sensitivity

Let i denote the firm; let s denote the two-digit level sector; let r denote the region of location of a firm; let c denote a firm's country; and let t denote the year of observation. Then, the dependent variable of the dynamic investment equation captures firm-level real investments in tangible fixed assets (I_{isrct}) scaled by the beginning-of-the-period capital stock (Kb_{isrct}).

Real investments in tangible fixed assets (I_{isrct}) are defined as follows:

$$I_{isrct} = (K_{isrct}^{BV} - K_{isrct-1}^{BV} + Depreciation_{isrct}^{BV})/P_{sct} \quad \text{(B1)}$$

where K_{isrct}^{BV} denotes the book value (BV) of tangible fixed assets; $Depreciation_{isrct}^{BV}$ represents the book value of depreciations; and P_{sct} is a sector- and country-specific investments price deflator provided by Eurostat.

The capital stock of a firm at the beginning of the period t (Kb_{isrct}) is defined as the difference between capital stock at the end of period t (K_{isrct}) and capital expenditure in period t, with capital stock defined using the Perpetual Inventory Method as follows:

$$K_{isrct} = K_{isrct-1}(1 - \delta_{isrct}) + I_{isrct}$$
$$\delta_{isrct} = Depreciation_{isrct}^{BV}/K_{isrct-1}^{BV} \quad \text{(B2)}$$

where δ_{isrct} represents the depreciation rate, and $K_{isrct-1} = (K_{isrc0}^{BV}/P_{sc0})$ with $t = 0$ for the first observational period t of a firm in the sample.

Some preliminary interesting insights emerge looking at the within-country regional distribution of the investment-to-cash flow sensitivity. Figure B1 plots the within-country variability of the regional average firm-level investment-to-cash flow sensitivity. In this exercise, firm-level investment-to-cash flow sensitivity is estimated using a heteroskedastic-robust pooled Ordinary Least Squares (OLS) approach on a simple linear regression of scaled real investments in tangible fixed assets on scaled cash flow.

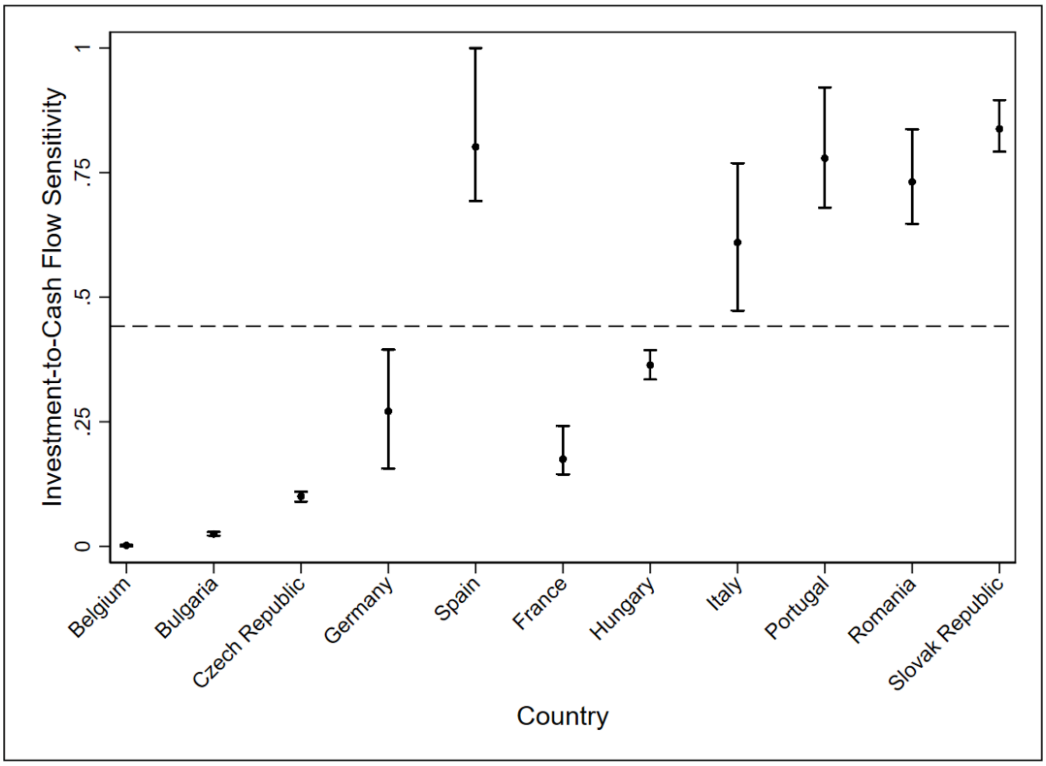
Specifically, the investment-to-cash flow sensitivity of firm i operating in the two-digit sector s, and located in region r in country c at time t is estimated through the following static equation:

$$\log(I_{isrct}/Kb_{isrct}) = \alpha + \beta \log(CF_{isrct}/Kb_{isrct}) + \varepsilon_{isrct} \quad \text{(B3)}$$

where the dependent variable captures real investments in tangible fixed assets (I_{isrct}) scaled by the beginning-of-the-period capital stock (Kb_{isrct}), and the explanatory variable captures scaled cash flow (CF_{isrct}/Kb_{isrct}), with cash flow defined as net income plus depreciations. The parameter β captures the sensitivity of a firm's investments to internally-generated resources, with a positive estimated coefficient providing evidence of firms suffering from credit constraints. We then averaged the firm-year specific estimated elasticities of investments to cash flow at regional level, and subsequently over the observation period 2009-2016. Finally, we normalized the time-averaged region-specific investment-to-cash flow sensitivity measure in the interval $[0, 1]$.

As shown in Figure B1, two key patterns emerge. First, the presence of two groups of countries displaying quite large differences in terms of internal regional variation. The first group, including Belgium, Bulgaria, Czech Republic, and, to a lower extent, also France, Hungary, and the Slovak Republic, presents limited or almost absent heterogeneity across regions. The second group of countries, by contrast, presents much larger cross-regional variation of the average firm-level investment-to-cash flow sensitivity —this is the case, in particular, of Italy and Spain. Second, a clear divide emerges between countries that, on average, lie above and below the sample mean in terms of investment-to-cash flow sensitivity. On the one hand, Belgium, Bulgaria, and Czech Republic, as well as —despite to a lower extent— Germany, France, and Hungary, show very low values of the estimated elasticity, thus signaling that constraints to credit for firms in these countries are, on average, relatively low. On the other hand, Spain, Italy, Portugal, Romania, and the Slovak Republic display very high values of the average estimated investment-to-cash-flow sensitivity.

Figure B1: Within-country regional variability of firms' investment-to-cash flow sensitivity.



Notes: Firm-level investment-to-cash flow sensitivity is estimated via Pooled OLS with robust standard errors — the null hypothesis of homoskedasticity is rejected with p-value equal to 0.000. Firm-year specific estimated elasticities are averaged at regional level, and then over the observation period 2009-2016. Finally, the time-averaged region-specific investment-to-cash flow sensitivity measure is normalized in the interval [0,1]. The dashed line refers to the sample average, while the dots refer to country-level mean values.

APPENDIX C – Regional institutional quality

As discussed in Appendix A, we employ regional data on institutional quality drawn from the 2010 and 2013 waves of the European Quality of Government Index (EQGI) dataset provided by the Quality of Government Institute of the University of Gothenburg. The dataset contains information derived from a citizen-based survey focusing on individuals' perception and experience in their own region with respect to corruption, quality, and impartiality in terms of education, public health care, and law enforcement.

It is worth noting that the EGQI dataset aims at capturing the 'quality', rather than the 'quantity', of public services delivered by regional governments, such that the institutional variable employed in the empirical analysis captures the 'quality' —rather than the 'quantity'— of regional institutions. In particular, the concept of 'institutional quality' encompasses factors such as corruption, rule of law, and the impartiality of the public sector, thus capturing the capacity of regional governments to provide and administer public services impartially, effectively, and in a non-corrupt manner (Rothstein and Teorell, 2008; Charron *et al.*, 2014, 2015).

Following Charron *et al.* (2014), regional institutional quality is defined based on four main 'pillars' capturing the degree of corruption of the local public sector, the strength of the rule of law, the level of voice and accountability in terms of corruption-free local elections and local media freedom, and the effectiveness of the local government in providing high-quality services in an impartial manner. We thus constructed the region-specific institutional quality variable as a synthetic index capturing the four abovementioned dimensions of government effectiveness, control of corruption, rule of law, and government accountability available in both the EQGI dataset and the Worldwide Governance Indicators (WGI) database provided by the World Bank (Kaufmann *et al.*, 2011). First, we averaged at regional level the individual answers to the survey questions available in the 2010 and 2013 waves of the EQGI dataset and concerning the four abovementioned institutional dimensions. Second, following Charron *et al.* (2014, p. 83), we interpolated the four region-specific time-invariant institutional dimensions with the corresponding country-level dimensions of government effectiveness, control of corruption, rule of law, and government accountability available from the WGI database for the entire observation period 2009-2016. This interpolation-based operationalization approach allows us to extend the regional data to the entire observation period, to capture country-level institutional dimensions that are not accounted for in the regional data, and to relax potential biases related to the reduced number of respondents per region in the 2010 and 2013 waves of the regional survey (Charron *et al.*, 2014).[12]

Formally, let $\overline{WGI}_{ct}$ denote the average of the four institutional dimensions considered from the WGI dataset in country c at time t; let $EQGI_{rc}$ represent the region-specific score derived from the regional dataset and averaged over the 2010 and 2013 survey waves; and let $\overline{EQGI}_{c}^{w}$ denote the country-level population-weighted average of the region-specific score. Then, the region-specific time-varying institutional quality index (IQI_{rct}) is defined as follows:

$$IQI_{rct} = \overline{WGI}_{ct} + (EQGI_{rc} - \overline{EQGI}_{c}^{w}) \qquad \text{(C1)}$$

and the index IQI_{rct} is then normalized in the interval $[0, 1]$ to obtain the institutional quality variable ($Institutional\ Quality_{rct}$) included in Equation (1) in the manuscript, such that its interpretation becomes straightforward: institutional quality in a region increases with the value of the variable from 0 to 1 (Ganau and Rodríguez-Pose, 2019).

As previously underlined, the institutional variable aims at capturing the 'quality' of

[12] It is worth noting that we tested the robustness of this operationalization choice by considering also a time-invariant and non-interpolated variable for regional institutional quality, i.e., a variable capturing only regional variations in institutional quality. This robustness exercise is discussed subsequently in Online Appendix F.

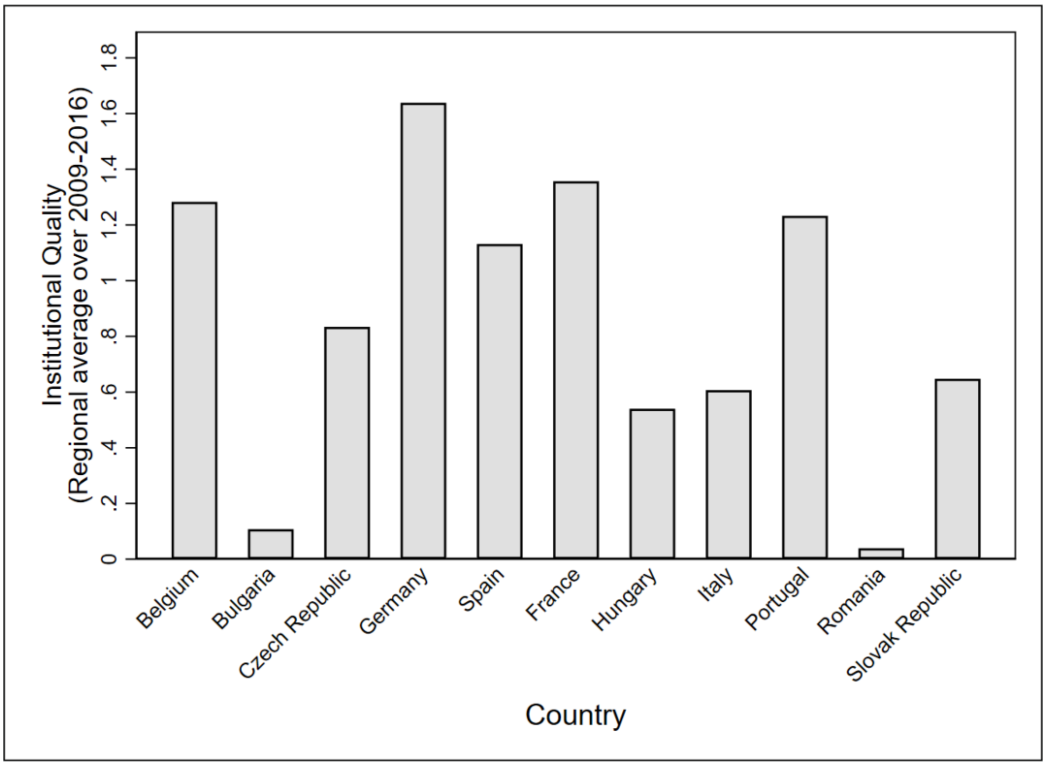
regional institutions. In this respect, and with specific regard to the topic investigated in the paper —i.e., whether high-quality regional institutions contribute to relaxing firms' credit constraints and their dependency on internally-generated resources to finance new investments—, the institutional quality variable captures the extent to which the local government provides and administers public services in an impartial, effective, and non-corrupt manner, thus favoring the emergence of a corruption-free regional socio-economic and business environment characterized by trust and reciprocity among economic actors. This, in turn, can help downsizing firms' credit constraints via two main channels: first, trade credit through inter-firm repeated production relationships, with local firms being more inclined to grant better contracts and delayed payments to business partners facing financial restrictions (e.g., Dei Ottati, 1994; Petersen and Rajan, 1995; Cainelli *et al.*, 2012; Ferrando and Mulier, 2013; Ogawa *et al.*, 2013; Ganau, 2016; McGuinness *et al.*, 2018); second, informal credit lending through family and friendship ties (e.g., Chavis *et al.*, 2011; Hanedar *et al.*, 2014).

It is worth underlining how considerable heterogeneity in institutional quality is in evidence both across and within countries in Europe. Figure C1 plots the cross-country distribution of the non-normalized institutional quality index (IQI_{rct}) defined in Equation (C1) averaged over regions within each country, and then over the observation period 2009-2016. The plot highlights a considerably large gap between a group of countries displaying relatively high levels of institutional quality —namely, Belgium, Germany, France, and Portugal— and a second group of countries characterized by extremely low-quality institutions —namely, Bulgaria, Hungary, Italy, and Romania.

The high degree of geographical heterogeneity in institutional quality characterizing Europe is even more evident looking at Figure C2, which plots the within-country variations of the institutional quality index (IQI_{rct}) averaged over the observation period 2009-2016, and then normalized in the interval $[0, 1]$. Belgian, German, and French regions all hover above the sample mean, while Bulgarian, Hungarian, Romanian, and Slovak regions are all below the sample mean. Italy shows the highest within-country variability in institutional quality, followed by Bulgaria and Romania. By contrast, German regions not only have, on average, the best institutional quality in the sample, but also reveal limited internal variation in what is a relatively homogeneous within-country structure.

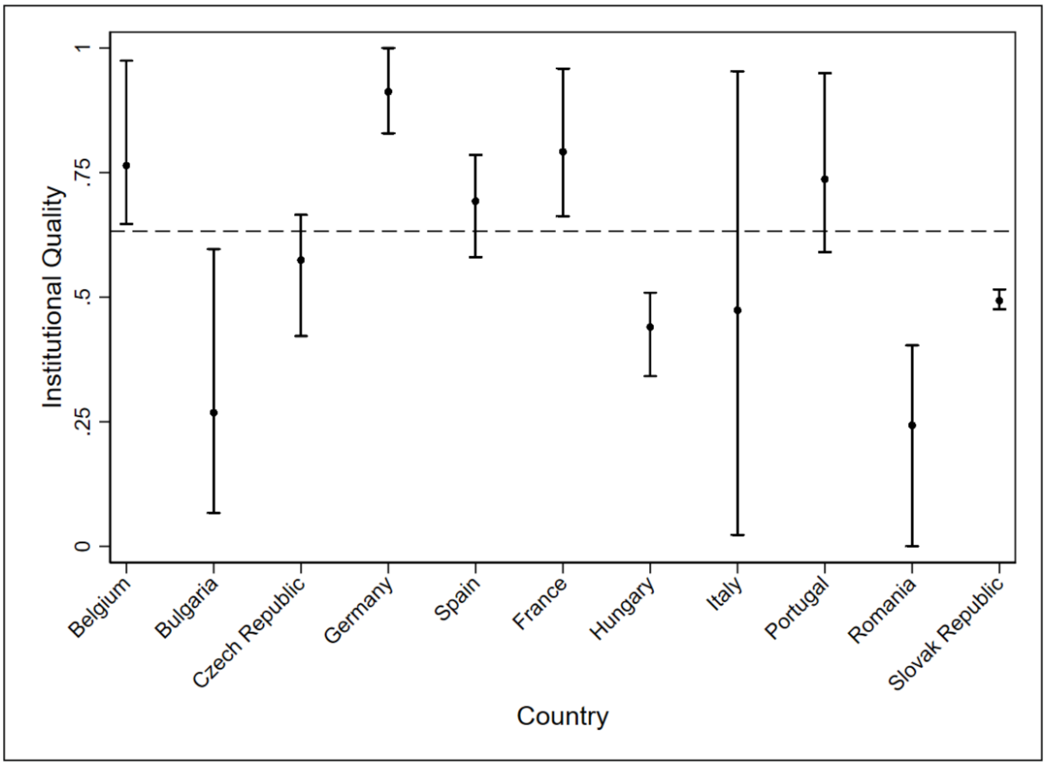
Cross-regional heterogeneity in institutional quality —both within and across countries— appears even clearer looking at Figure C3, which maps the spatial distribution of the institutional quality index (IQI_{rct}) averaged over the observation period 2009-2016, and then normalized in the interval [0,1]. Two key insights emerge. First, while some countries display a clear internal regional divide —such as Germany (Western vs. Eastern regions), Italy (Northern vs. Central vs. Southern regions), and Spain (Northern vs. Southern regions)—, in the remaining countries regions with high-quality institutions tend to coexist with regions characterized by low-quality institutional settings without a well-defined spatial pattern. Second, regional institutional quality is, on average, higher in Central European regions, and tends to diminish moving towards Mediterranean and Eastern peripheral regions.

Figure C1: Cross-country distribution of institutional quality.



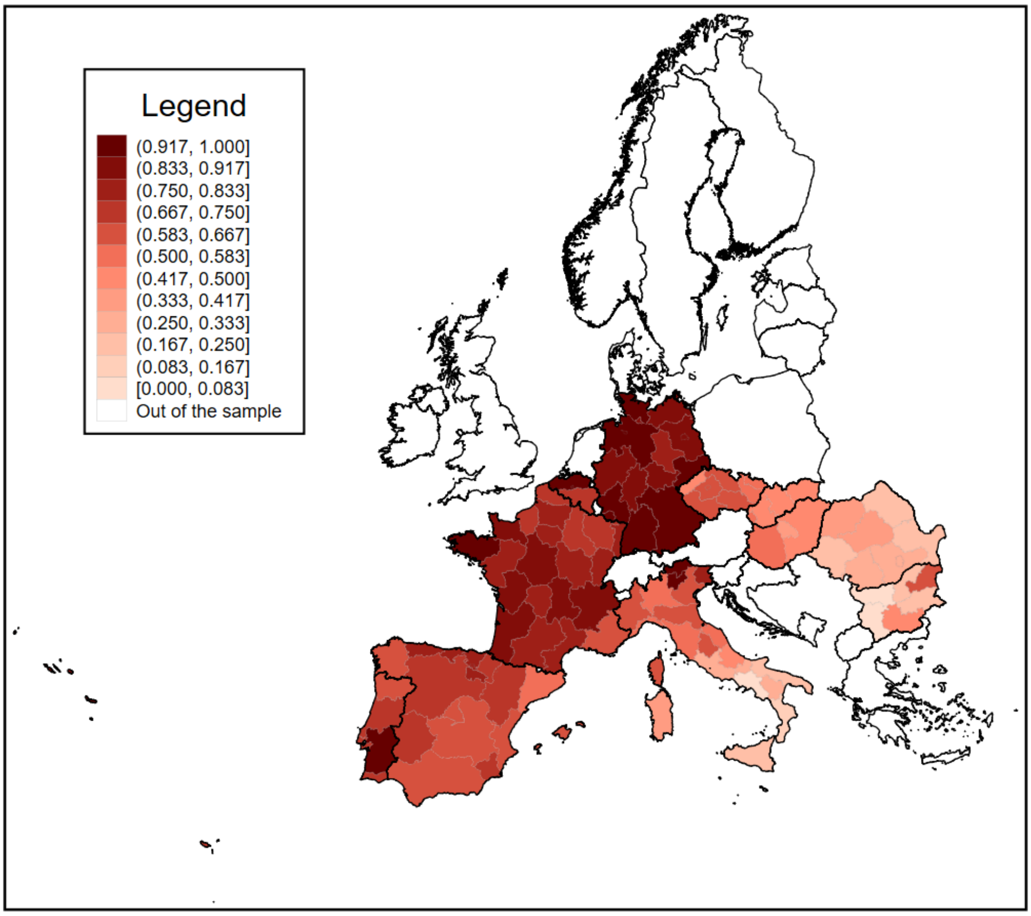
Notes: The non-normalized yearly institutional quality index is averaged over regions within each country, and then over the observation period 2009-2016.

Figure C2: Within-country regional variability of institutional quality.



Notes: The non-normalized yearly institutional quality index is averaged over the observation period 2009-2016, and then normalized in the interval [0,1]. The dashed line refers to the sample average, while the dots refer to country-level mean values.

Figure C3: Spatial distribution of regional institutional quality.



Notes: The non-normalized yearly institutional quality index is averaged over the observation period 2009-2016, and then normalized in the interval [0,1]. Darker areas denote higher values of the index.

APPENDIX D – Descriptive statistics and correlation matrix of variables

Tables D1 and D2 report some descriptive statistics of the dependent and the explanatory variables, and the correlation matrix of the explanatory variables used in the empirical analysis, respectively.

Table D1: Descriptive statistics of the dependent and explanatory variables.

Variable	Mean	Std. Dev.	Min.	Max.
$\log(I_{isrct}/Kb_{isrct})$	-2.045	1.387	-17.557	4.695
$\log(I_{isrct-1}/Kb_{isrct-1})$	-1.938	1.444	-17.557	7.381
$\log(CF_{isrct}/Kb_{isrct})$	-1.048	1.054	-10.553	6.938
$\Delta Sales_{isrct}$	0.044	0.222	-10.656	7.546
$\log(K_{isrct-1}) - \log(Sales_{isrct-1})$	-5.296	1.372	-14.820	2.382
$\log(Size_{isrct})$	3.701	0.893	2.303	5.517
$\log(\text{Labor Productivity}_{isrct})$	10.636	0.797	5.845	15.569
$\log(Age_{isrct})$	2.963	0.687	0.693	6.455
$\text{Institutional Quality}_{rct}$	0.651	0.195	0	1
$\text{Financial Development}_{ct}$	0.640	0.277	0	1

Notes: Descriptive statistics refer to a sample of 58,213 firm-year observations.

Table D2: Correlation matrix of the explanatory variables.

Explanatory Variable		[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]	[9]
$\log(I_{isrct-1}/Kb_{isrct-1})$	[1]	1								
$\log(CF_{isrct}/Kb_{isrct})$	[2]	0.23	1							
$\Delta Sales_{isrct}$	[3]	0.04	0.15	1						
$\log(K_{isrct-1}) - \log(Sales_{isrct-1})$	[4]	-0.19	-0.52	0.07	1					
$\log(Size_{isrct})$	[5]	0.06	0.02	0.02	-0.62	1				
$\log(\text{Labor Productivity}_{isrct})$	[6]	0.05	0.26	0.02	-0.17	0.05	1			
$\log(Age_{isrct})$	[7]	-0.11	-0.06	-0.07	-0.11	0.18	0.30	1		
$\text{Institutional Quality}_{rct}$	[8]	0.06	0.16	-0.03	-0.32	0.22	0.48	0.24	1	
$\text{Financial Development}_{ct}$	[9]	-0.01	0.05	-0.04	-0.02	-0.19	0.65	0.26	0.41	1.00

Notes: Correlation coefficients refer to a sample of 58,213 firm-year observations.

APPENDIX E – External instrumental variable capturing precipitation variability

We computed the instrumental variable (IV) capturing regional precipitation variability during the growing season in the preindustrial period 1500-1750 using reconstructed paleoclimatic data drawn from the European Seasonal Temperature and Precipitation Reconstruction (ESTPR) database. The database provides grid cells of 0.5° width containing yearly seasonal observations for the period 1500-2000 —see Luterbacher *et al.* (2004) and Pauling *et al.* (2006) for details.

Following Buggle and Durante (2021), the IV is constructed as follows. First, season-specific inter-annual standard deviation measures of precipitations are calculated at the cell level for all years from 1500 —i.e., the first available year in the database— to 1750, that can be considered the starting year of the Industrial Revolution. Second, the cell-level standard deviation measures are averaged for all cells within a region r to obtain region- and season-specific measures of precipitation variability. Third, the region- and season-specific inter-annual standard deviation measures defined over the period 1500-1750 are averaged with respect to the spring and summer seasons, that are the growing seasons in Europe.

APPENDIX F – Robustness exercises

We performed a series of exercises to test the robustness of the main results reported in Table 1 in the manuscript. First, we tested the robustness of the estimation strategy based on the two-step System Generalized Method of Moments (SGMM) estimation of a dynamic investment equation by relying on a static version of Equation (1) in the manuscript, that is specified by removing the first-order time-lagged investment variable from the right-hand side of the equation. This static version of the investment equation is estimated using a two-way Fixed Effects (FE) estimator to account for firm- and year-specific fixed effects. Formally, we modified Equation (1) in the manuscript as follows:

$$\log\left(\frac{I_{isrct}}{Kb_{isrct}}\right) = \alpha + \beta \log\left(\frac{CF_{isrct}}{Kb_{isrct}}\right) + \gamma \Delta Sales_{isrct} + \delta[\log(K_{isrct-1}) - \log(Sales_{isrct-1})]$$

$$+ \sum_{k}^{K} \theta_k X_{isrct}^{k} + \vartheta Institutional\ Quality_{rct}$$

$$+\lambda \left[\log\left(\frac{CF_{isrct}}{Kb_{isrct}}\right) \times Institutional\ Quality_{rct}\right]$$

$$+\mu Financial\ Development_{ct} + \pi_i + \rho_t + \varepsilon_{isrct} \qquad \text{(F1)}$$

where the dependent variable denotes real investments in tangible fixed assets (I_{isrct}) scaled by the beginning-of-the-period capital stock (Kb_{isrct}), and the right-hand side of Equation (F1) includes: the scaled cash flow variable (CF_{isrct}/Kb_{isrct}) to assess firms' investments sensitivity to internally-generated resources; the log-change in sales between periods t and $t-1$ ($\Delta Sales_{isrct}$) to capture short-run responses of investments to demand shocks; the error correction term, defined as the difference between capital stock (K_{isrct}) and sales ($Sales_{isrct}$) at time $t-1$, to capture the adjustment speed of capital stock to its equilibrium level; the vector

X_{isrct}^{k} of log-transformed variables for firm size (employment), age (observation year minus the year of a firm's incorporation), and labor productivity (deflated value added per employee); the region-specific variable for institutional quality ($Institutional\ Quality_{rct}$), defined in the interval $[0, 1]$; the interaction term between firm-level cash flow and regional institutional quality; the country-specific variable for financial development ($Financial\ Development_{ct}$), defined in the interval $[0, 1]$; the term π_i capturing firm-specific fixed effects; the term ρ_t capturing year-specific fixed effects; and the error term ε_{isrct}.

Table F1 reports the two-way FE estimation of Equation (F1), both with and without including the interaction term between the variables for cash flow and regional institutional quality. In addition, we simplified Equation (F1) by removing the control variable for changes in sales and the error correction term —see Specifications (1) and (2). The results fully confirm the main ones reported in Table 1 in the manuscript. First, we find evidence of European manufacturing SMEs suffering from credit constraints, as highlighted by the positive and statistically significant estimated investment-to-cash flow sensitivity. Second, the results suggest that high-quality regional institutions help relaxing firms' dependency on internally-generated resources. This last result clearly emerges from Figure F1, which plots the estimated investment-to-cash flow sensitivity at the different levels of regional institutional quality — referring to Specification (4) in Table F1. Despite the estimated elasticity remains positive, the negatively sloped curve clearly suggests a positive mediating role played by high-quality regional institutions.

The second robustness exercise considers an alternative measure for regional institutional quality employed in the context of the dynamic investment Equation (1) presented in the manuscript. Specifically, we considered a time-invariant version of the institutional quality variable constructed without interpolating the region-specific score derived from the 2010 and 2013 waves of the European Quality of Government Index dataset provided by the Quality of

Government Institute of the University of Gothenburg with the country-specific institutional data drawn from the Worldwide Governance Indicators database provided by World Bank. The rationale of this exercise is to test the robustness and reliability of our operationalization choice in constructing the regional institutional quality variable via interpolation with country-level institutional data.

We defined the time-invariant region-specific institutional quality variable ($Institutional\ Quality_{rc}$) as the average value of the four institutional pillars for government effectiveness, control of corruption, rule of law, and government accountability from the two wases, and we then normalized it in the interval $[0, 1]$. Formally, we modified Equation (1) in the manuscript as follows:

$$\log\left(\frac{I_{isrct}}{Kb_{isrct}}\right) = \alpha + \beta \log\left(\frac{I_{isrct-1}}{Kb_{isrct-1}}\right) + \gamma \log\left(\frac{CF_{isrct}}{Kb_{isrct}}\right) + \delta \Delta Sales_{isrct}$$
$$+\zeta[\log(K_{isrct-1}) - \log(Sales_{isrct-1})] + \sum_{k}^{K} \theta_k X_{isrct}^{k}$$
$$+\vartheta Institutional\ Quality_{rc} + \lambda \left[\log\left(\frac{CF_{isrct}}{Kb_{isrct}}\right) \times Institutional\ Quality_{rc}\right]$$
$$+\mu Financial\ Development_{ct} + \varepsilon_i + \varepsilon_s + \varepsilon_c + \varepsilon_t + \varepsilon_{isrct} \qquad \text{(F2)}$$

where the dependent variable denotes real investments in tangible fixed assets (I_{isrct}) scaled by the beginning-of-the-period capital stock (Kb_{isrct}). The right-hand side of Equation (F2) includes: the first-order time-lagged scaled investment variable; the scaled cash flow variable (CF_{isrct}/Kb_{isrct}); the log-change in sales between periods t and $t-1$ ($\Delta Sales_{isrct}$); the error correction term, defined as the difference between capital stock (K_{isrct}) and sales ($Sales_{isrct}$) at time $t-1$; the vector X_{isrct}^{k} of log-transformed variables for firm size, age, and labor productivity; the time-invariant region-specific variable for institutional quality

($Institutional\ Quality_{rc}$), defined in the interval $[0, 1]$; the interaction term between cash flow and regional institutional quality; the country-specific variable for financial development ($Financial\ Development_{ct}$), defined in the interval $[0, 1]$; a series of fixed effects at firm (ε_i), two-digit sector (ε_s), country (ε_c), and year level (ε_t); and the error term ε_{isrct}. We estimated Equation (F2) through a two-step SGMM estimator, also relying on the external instrumental variable (IV) capturing regional variability in precipitations during the growing season in the preindustrial period 1500-1750 to instrument for current regional institutional quality.

Table F2 reports the results of the estimation of Equation (F2), both with and without including the interaction term between the firm-level cash flow variable and the time-invariant regional institutional quality variable. The results fully confirm those reported in Table 1 in the manuscript, and corroborate both the evidence of SMEs' relying on internally-generated resources to finance new investment opportunities, and the role played by regional institutional quality as a factor able to relax this internal dependency by favoring the recourse to alternative, non-institutional sources of funding such as, for example, inter-firm trade credit through production linkages and credit lending through family and friendship ties. This last result clearly emerges from Figure F2, which plots the estimated investment-to-cash flow sensitivity at the different levels of regional institutional quality —referring to Specification (2) in Table F2. The plot suggests how investment-to-cash flow sensitivity diminishes up to the point of becoming statistically insignificant for very high levels of regional institutional quality.

As a third robustness exercise, we augmented the dynamic investment Equation (1) presented in the manuscript by adding to its right-hand side a variable capturing a region' socio-economic structure. Specifically, we constructed a synthetic measure based on four region-specific dimensions, namely: gross domestic product (GDP) per capita, as a proxy for regional wealth; population density (population per square kilometer), as a proxy for agglomeration-related forces; the percentage of population aged 25-64 years with tertiary education to capture a region's human capital endowment; and unemployment rate, to capture regional labor market conditions. In particular, we considered the inversion of the unemployment rate variable in order to have all the four dimensions ranging from a 'poor' to a 'good' regional structural condition. First, we standardized the four variables to have zero mean and unitary standard deviation, given their different measurement scales. Second, we calculated the region-specific average value of the four standardized variables to obtain a single index of socio-economic conditions. Finally, we normalized this index in the interval $[0, 1]$, such that a higher value of the index denotes a better regional socio-economic structure.

Formally, we modified Equation (1) in the manuscript as follows:

$$\log\left(\frac{I_{isrct}}{Kb_{isrct}}\right) = \alpha + \beta \log\left(\frac{I_{isrct-1}}{Kb_{isrct-1}}\right) + \gamma \log\left(\frac{CF_{isrct}}{Kb_{isrct}}\right) + \delta \Delta Sales_{isrct}$$
$$+\zeta[\log(K_{isrct-1}) - \log(Sales_{isrct-1})] + \sum_{k}^{K} \theta_k X_{isrct}^k$$
$$+\vartheta Institutional\ Quality_{rct} + \lambda \left[\log\left(\frac{CF_{isrct}}{Kb_{isrct}}\right) \times Institutional\ Quality_{rct}\right]$$
$$+\mu Financial\ Development_{ct} + \xi Regional\ Score_{rct}$$
$$+\varepsilon_i + \varepsilon_s + \varepsilon_c + \varepsilon_t + \varepsilon_{isrct} \quad \text{(F3)}$$

where the dependent variable denotes real investments in tangible fixed assets (I_{isrct}) scaled by the beginning-of-the-period capital stock (Kb_{isrct}). The right-hand side of Equation (F3) includes: the first-order time-lagged scaled investment variable; the scaled cash flow variable (CF_{isrct}/Kb_{isrct}); the log-change in sales between periods t and $t-1$ ($\Delta Sales_{isrct}$); the error correction term, defined as the difference between capital stock (K_{isrct}) and sales ($Sales_{isrct}$) at time $t-1$; the vector X_{isrct}^k of log-transformed variables for firm size, age, and labor productivity; the region-specific time-varying variable for institutional quality

($Institutional\ Quality_{rct}$), defined in the interval $[0, 1]$; the interaction term between cash flow and regional institutional quality; the country-specific variable for financial development ($Financial\ Development_{ct}$), defined in the interval $[0, 1]$; the variable capturing regions' socio-economic structure ($Regional\ Score_{rct}$), defined in the interval $[0, 1]$; a series of fixed effects at firm (ε_i), two-digit sector (ε_s), country (ε_c), and year level (ε_t); and the error term ε_{isrct}. We estimated Equation (F3) through a two-step SGMM estimator, also relying on the external IV capturing regional variability in precipitations during the growing season in the preindustrial period 1500-1750 to instrument for current regional institutional quality.

Table F3 reports the results of the estimation of Equation (F3), both with and without including the interaction term between the variables for cash flow and regional institutional quality. Once again, the results confirm those reported in Table 1 in the manuscript: first, we find evidence of firms relying on internally-generated resources to finance new investment opportunities; second, we find evidence of the role played by regional institutional quality as a factor relaxing firms' dependency on internally-generated resources. This last result clearly emerges from Figure F3, which plots the estimated investment-to-cash flow sensitivity at the different levels of regional institutional quality —referring to Specification (2) in Table F3. The plot suggests how investment-to-cash flow sensitivity diminishes up to the point of becoming statistically insignificant for very high levels of regional institutional quality.

The fourth and final exercise aims at testing the robustness of the main results reported in Table 1 in the manuscript against potential spurious correlation due to the use of the same (and contemporaneous) deflator —i.e., the variable for capital stock at the beginning of the period (Kb_{isrct})— for both the dependent variable capturing investments in tangible fixed assets and the main explanatory variable for cash flow (e.g., Kuh and Meyer, 1955). It is worth noting, however, that the use of the same denominator to scale both the dependent variable for investments in tangible fixed assets and the explanatory variable for cash flow is a standard approach in the literature, where firm-level investments scaled by capital stock at the beginning of the period are regressed on contemporaneous firm-level cash flow scaled by the same capital stock variable (e.g., Fazzari *et al.*, 1988; Bond *et al.*, 2003; Bloom *et al.*, 2007; Guariglia, 2008; Alessandrini *et al.*, 2009; D'Espallier and Guariglia, 2015).

In order to check the robustness of our results, we estimated Equation (1) in the manuscript through a two-step SGMM estimator —also relying on the external IV capturing regional variability in precipitations during the growing season in the preindustrial period 1500-1750 to instrument for current regional institutional quality— by making a series of modifications to the operationalization of the dependent variable for investments in tangible fixed assets and the explanatory variable for cash flow. First, following Becchetti *et al.* (2010), Antonietti *et al.* (2015) and Bucă and Vermeulen (2017), among others, we considered the first-order time lag —rather than the contemporaneous value— of the scaled cash flow variable ($CF_{isrct-1}/Kb_{isrct-1}$). The results of this exercise are reported in Specifications (1) and (2) in Table F4. Second, following Benito (2003) and Hernando and Martínez-Carrascal (2008), we scaled the cash flow variable using a firm's total assets (TA_{isrct}) rather than the capital stock at the beginning of the period (Kb_{isrct}) —which is, instead, still used to scale the dependent variable capturing investments in tangible fixed assets. The results of this exercise are reported in Specifications (3) and (4) in Table F4. Third, we regressed the dependent variable for investments in tangible fixed assets scaled by the capital stock at the beginning of the period on the un-scaled cash flow variable (CF_{isrct}). The results of this exercise are reported in Specifications (5) and (6) in Table F4. Finally, we considered both the dependent variable for investments in tangible fixed assets (I_{isrct}) and the cash flow variable (CF_{isrct}) without scaling them. The results of this exercise are reported in Specifications (7) and (8) in Table F4.

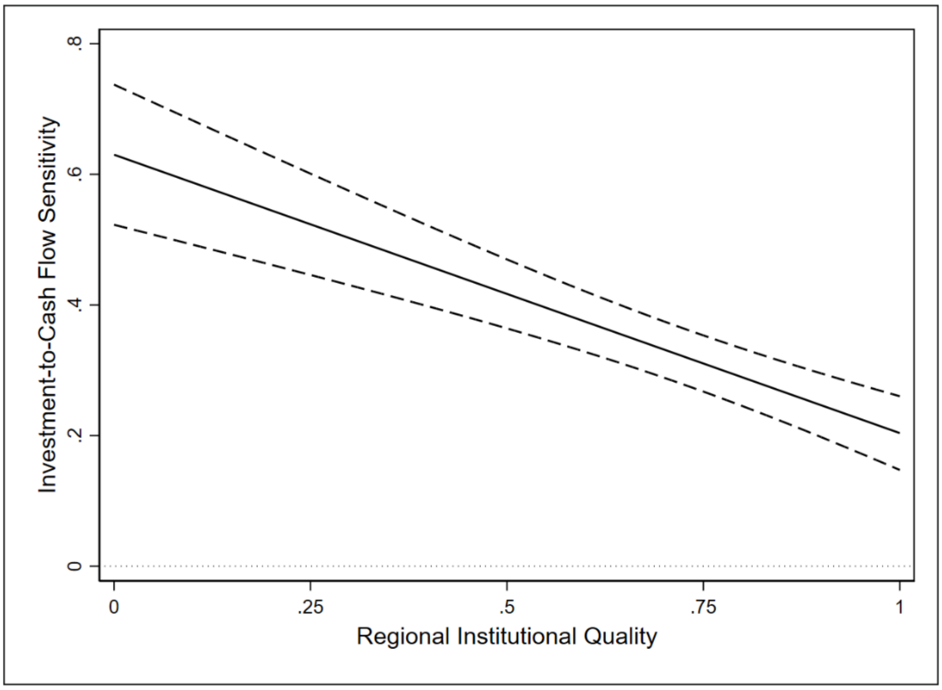
Overall, the results reported in Table F4 —obtained by estimating the dynamic investment equation both with and without including the interaction term between the variables for cash flow and regional institutional quality— fully confirm those reported in Table 1 in the manuscript. Indeed, we find evidence of firms relying on internally-generated resources to finance new investments, as well as that high-quality regional institutions contribute to relaxing firms' dependency on internally-generated resources. This last result clearly emerges from Figure F4, which plots the estimated investment-to-cash flow sensitivity at different levels of regional institutional quality —referring to Specifications (2), (4), (6), and (8) in Table F4. The plots suggest how investment-to-cash flow sensitivity diminishes as the quality of regional institutions improves.

Table F1: Two-way FE estimates.

Dependent Variable	$\log(\text{I}_{\text{isrct}}/\text{Kb}_{\text{isrct}})$			
	(1)	(2)	(3)	(4)
$\log(\text{CF}_{\text{isrct}}/\text{Kb}_{\text{isrct}})$	0.685****	1.055****	0.344****	0.630****
	(0.026)	(0.059)	(0.023)	(0.055)
$\Delta\text{Sales}_{\text{isrct}}$	…	…	0.936****	0.922****
			(0.058)	(0.058)
$\log(\text{K}_{\text{isrct}-1}) - \log(\text{Sales}_{\text{isrct}-1})$	…	…	-1.168****	-1.161****
			(0.034)	(0.034)
$\text{Institutional Quality}_{\text{rct}}$	0.203	-0.463	0.302	-0.210
	(0.287)	(0.300)	(0.317)	(0.334)
$\log(\text{CF}_{\text{isrct}}/\text{Kb}_{\text{isrct}}) \times \text{Institutional Quality}_{\text{rct}}$	…	-0.555****	…	-0.426****
		(0.074)		(0.069)
Control Variables	Yes	Yes	Yes	Yes
Firm FE	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes
Observations	58,213	58,213	58,213	58,213
Firms	14,896	14,896	14,896	14,896
Model F Statistic [p-value]	161.07 [0.000]	193.97 [0.000]	305.63 [0.000]	304.15 [0.000]

Notes: **** $p < 0.001$. Standard errors (in parentheses) clustered at regional level.

Figure F1: The mediating role of regional institutional quality – Two-way FE estimates.



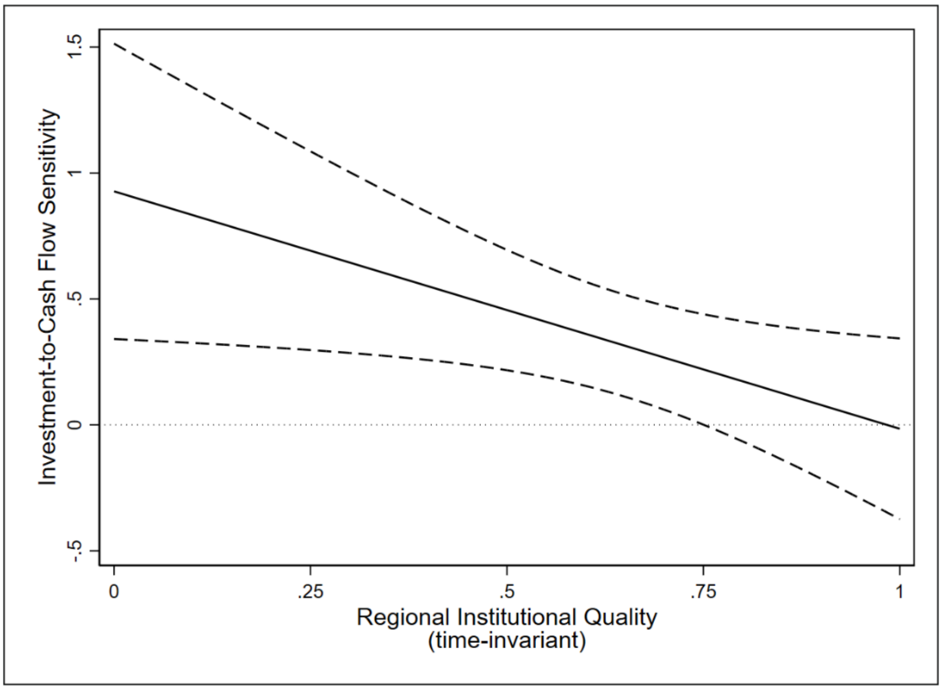
Notes: Estimated investment-to-cash flow sensitivity (solid line) at different levels of regional institutional quality from Specification (4) in Table F1. Dashed lines refer to 95% confidence intervals.

Table F2: Two-step SGMM estimates using the time-invariant regional institutional quality variable.

Dependent Variable	$\log(I_{isrct}/Kb_{isrct})$	
	(1)	(2)
$\log(I_{isrct-1}/Kb_{isrct-1})$	0.118****	0.134****
	(0.012)	(0.013)
$\log(CF_{isrct}/Kb_{isrct})$	0.664****	0.927***
	(0.100)	(0.299)
$\Delta Sales_{isrct}$	0.507	0.409
	(0.354)	(0.309)
$\log(K_{isrct-1}) - \log(Sales_{isrct-1})$	-0.238**	-0.252**
	(0.109)	(0.107)
Institutional $Quality_{rc}$	0.050	-1.179**
	(0.236)	(0.571)
$\log(CF_{isrct}/Kb_{isrct}) \times$ Institutional $Quality_{rc}$	…	-0.943**
		(0.432)
Control Variables	Yes	Yes
Industry Dummies	Yes	Yes
Country Dummies	Yes	Yes
Year Dummies	Yes	Yes
Observations	58,213	58,213
Firms	14,896	14,896
Model F Statistic [p-value]	116.35 [0.000]	62.99 [0.000]
AR(1) (p-value)	0.000	0.000
AR(2) (p-value)	0.619	0.280
Internally-Generated Instruments	Yes	Yes
External IV for Institutional $Quality_{rc}$	Yes	Yes
Hansen J Statistic (p-value)	0.757	0.943

Notes: ** $p < 0.05$; *** $p < 0.01$; **** $p < 0.001$. Standard errors (in parentheses) clustered at regional level. All specifications include a constant term.

Figure F2: The mediating role of regional institutional quality – Two-step SGMM estimates using the time-invariant regional institutional quality variable.



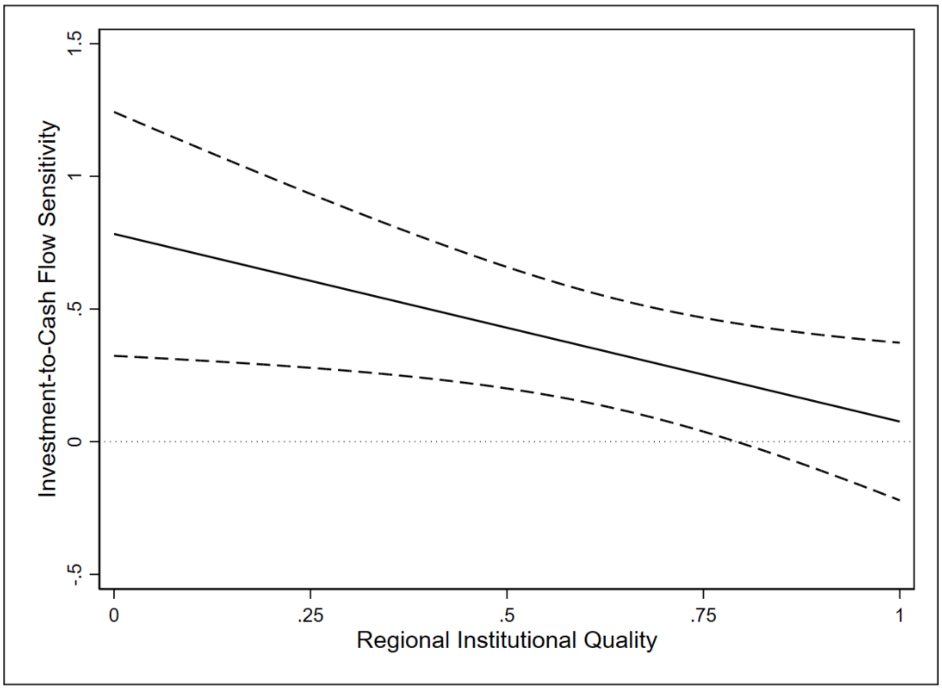
Notes: Estimated investment-to-cash flow sensitivity (solid line) at different levels of regional institutional quality from Specification (2) in Table F2. Dashed lines refer to 95% confidence intervals.

Table F3: Two-step SGMM estimates controlling for regional socio-economic structure.

Dependent Variable	$\log(I_{isrct}/Kb_{isrct})$	
	(1)	(2)
$\log(I_{isrct-1}/Kb_{isrct-1})$	0.124****	0.139****
	(0.009)	(0.012)
$\log(CF_{isrct}/Kb_{isrct})$	0.737****	0.783***
	(0.110)	(0.234)
$\Delta Sales_{isrct}$	0.073	0.422
	(0.088)	(0.274)
$\log(K_{isrct-1}) - \log(Sales_{isrct-1})$	-0.200*	-0.257**
	(0.106)	(0.107)
Institutional Quality_{rct}	-0.150	-0.864
	(0.276)	(0.555)
$\log(CF_{isrct}/Kb_{isrct}) \times$ Institutional Quality_{rct}	…	-0.707**
		(0.318)
Control Variables	Yes	Yes
Industry Dummies	Yes	Yes
Country Dummies	Yes	Yes
Year Dummies	Yes	Yes
Observations	58,213	58,213
Firms	14,896	14,896
Model F Statistic [p-value]	130.03 [0.000]	80.48 [0.000]
AR(1) (p-value)	0.000	0.000
AR(2) (p-value)	0.654	0.268
Internally-Generated Instruments	Yes	Yes
External IV for Institutional Quality_{rct}	Yes	Yes
Hansen J Statistic (p-value)	0.771	0.981

Notes: * $p < 0.1$; ** $p < 0.05$; *** $p < 0.01$; **** $p < 0.001$. Standard errors (in parentheses) clustered at regional level. All specifications include a constant term.

Figure F3: The mediating role of regional institutional quality – Two-step SGMM estimates controlling for regional socio-economic structure.



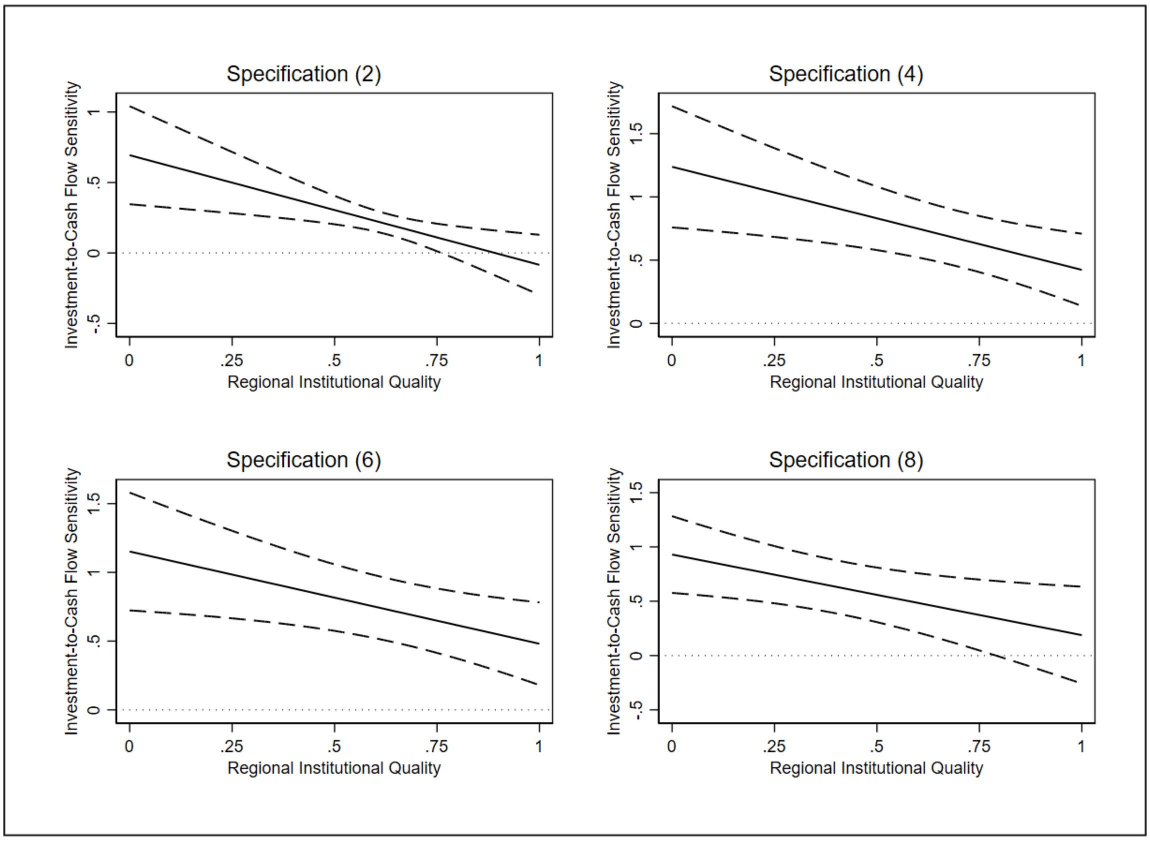
Notes: Estimated investment-to-cash flow sensitivity (solid line) at different levels of regional institutional quality from Specification (2) in Table F3. Dashed lines refer to 95% confidence intervals.

Table F4: Two-step SGMM estimates using alternative definitions of the variables for real investments in tangible fixed assets and cash flow.

Dependent Variable	$\log(I_{isrct}/Kb_{isrct})$						$\log(I_{isrct})$	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
$\log(I_{isrct-1}/Kb_{isrct-1})$	0.086****	0.093****	0.120****	0.125****	0.129****	0.115****	…	…
	(0.011)	(0.013)	(0.008)	(0.010)	(0.009)	(0.009)		
$\log(I_{isrct-1})$	…	…	…	…	…	…	0.142****	0.125****
							(0.011)	(0.014)
$\log(CF_{isrct-1}/Kb_{isrct-1})$	0.265****	0.694****	…	…	…	…	…	…
	(0.031)	(0.177)						
$\log(CF_{isrct}/TA_{isrct})$	…	…	0.732****	1.238****	…	…	…	…
			(0.098)	(0.244)				
$\log(CF_{isrct})$	…	…	…	…	1.152****	0.696****	0.730****	0.930****
					(0.218)	(0.112)	(0.122)	(0.180)
Institutional Quality_{rct}	-0.288	-1.044***	-0.214	-0.588	-0.479	-0.536	-0.179	-0.716
	(0.290)	(0.366)	(0.278)	(0.902)	(0.323)	(0.428)	(0.271)	(0.494)
$\log(CF_{isrct-1}/Kb_{isrct-1}) \times$ Institutional Quality_{rct}	…	-0.778***	…	…	…	…	…	…
		(0.276)						
$\log(CF_{isrct}/TA_{isrct}) \times$ Institutional Quality_{rct}	…	…	…	-0.815***	…	…	…	…
				(0.311)				
$\log(CF_{isrct}) \times$ Institutional Quality_{rct}	…	…	…	…	…	-0.671**	…	-0.742**
						(0.286)		(0.321)
Control Variables	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Industry Dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Country Dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year Dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Observations	58,213	58,213	58,213	58,213	58,213	58,213	58,213	58,213
Firms	14,896	14,896	14,896	14,896	14,896	14,896	14,896	14,896
Model F Statistic [p-value]	97.15 [0.000]	61.57 [0.000]	185.99 [0.000]	151.80 [0.000]	146.57 [0.000]	121.92 [0.000]	128.70 [0.000]	109.17 [0.000]
AR(1) (p-value)	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000
AR(2) (p-value)	0.562	0.418	0.739	0.544	0.700	0.795	0.653	0.852
Internally-Generated Instruments	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
External IV for Institutional Quality_{rct}	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Hansen J Statistic (p-value)	0.980	0.994	0.712	0.862	0.658	0.729	0.648	0.979

Notes: ** $p < 0.05$; *** $p < 0.01$; **** $p < 0.001$. Standard errors (in parentheses) clustered at regional level. The set of control variables includes also the log-change in sales between periods t and $t-1$, and the error correction term. All specifications include a constant term.

Figure F4: The mediating role of regional institutional quality – Two-step SGMM estimates using alternative definitions of the variables for real investments in tangible fixed assets and cash flow.



Notes: Estimated investment-to-cash flow sensitivity (solid line) at different levels of regional institutional quality from Specifications (2), (4), (6), and (8) in Table F4. Dashed lines refer to 95% confidence intervals.

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