

LINK BETWEEN ENTREPRENEURSHIP AND FORMAL INSTITUTIONS WITH REFERENCE TO THE LEGISLATIVE FRAMEWORK – EVIDENCE FROM META REGRESSION ANALYSIS

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Abstract

Summarising the results from a sample of 71 papers and 328 regressions, this paper provides new insights into the relationship between formal institutions and entrepreneurship. The results of the meta-regression analysis show that the basic effect of institutions on entrepreneurship is positive and statistically significant but becomes progressively weaker over time. However, when the analysis focuses on newly registered enterprises and controls for endogeneity, the results indicate an exceptionally strong, positive, and statistically significant effect of institutions on entrepreneurship in the short and medium term. The effect becomes even stronger if the models are specified without interactions of institutions with other variables. In contrast, this effect is absent in the case of women's entrepreneurship. The paper highlights precisely defined conditions under which formal institutions have the greatest impact on entrepreneurship. The evidence provides policymakers with clear guidelines to help them reshape institutional frameworks to increase the level and efficiency of entrepreneurship in the economy.

Keywords: *Publication bias, entrepreneurship, formal institutions, meta regression analysis, partial correlation*

JEL classification: *A1, E02, L26, G38*

1. Introduction

Since economics was established as a distinct scientific discipline, formal institutions have been researched by various economic thinkers. Their study in the history of economic thought has experienced fluctuations, and the last two Nobel Prizes in economics¹ have returned them to the centre of economic research. Given their potential multiple impacts, this paper will focus on the field of entrepreneurship. Accordingly, the central question of this paper is: do formal institutions play a significant role in stimulating entrepreneurial activity?

The complexity of the concept of institution necessitates certain restrictions, without which it would not

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be possible to provide a relevant answer to the question posed. Under the concept of formal institutions, authors often include a wide range of institutional frameworks, which are typically determined by the time and the availability of data. This paper will focus on those elements of the institutional framework that can directly influence entrepreneurial activity in the economy and are under the jurisdiction of a country's government. The degree of regulation (Boudreaux et al. 2023), the speed of market-oriented reforms (Fuentelsaz, González, and González 2025), the protection of property rights (Tomita and Kimura, 2025; Altin, Memili, and Sönmez 2017), and the tax burden (Dutta and Meierriek 2021; Audretsch et al. 2022) are some of the aspects considered, as they can positively affect entrepreneurial activity. To include all relevant parts of the institutional framework, assess the strength of their effects, and address the uncertainty regarding whether the effect of formal institutions on entrepreneurship is positive (Darnihamedani and Terjesen 2020; Tomita and Kimura 2025; Pham, Cam, and Nguyen 2024) or negative (Zelekha, Avnimelech, and Sharabi 2014; Barreneche García 2014; Muscio and Kitagawa 2025), the paper will apply meta-regression analysis methodology.

Meta-regression analysis is the "analysis of analysis" (Glass, 1976), specifically, "regression analysis of regression analysis" (Stanley and Jarrell, 1989). Its main advantage is the ability to integrate findings from a large collection of individual studies. Combined with the capacity to test for publication bias and various heterogeneous effects on the dependent variable, this makes it a highly effective methodological tool (Glass, 1976; Stanley and Jarrell, 1989). Additionally, it considers all regressions from the identified studies, regardless of whether the effect of certain variables was significant or consistent with theory. Finally, its application is not limited to economics; it is also widely used in other scientific disciplines such as medicine (Egger et al. 1997; Goyal et al. 2016), psychology (Lu and Tsai 2026) or agronomy (Leifheit et al. 2014). This paper draws on the narratives of several scientific studies with clearly identified differences. Unlike Doucouliagos (2005) and Efendic, Pugh and Adnett (2011), the analysis in this paper shifts from the domain of economic growth to that of entrepreneurship. In contrast, a group of papers (Stanley and Jarrell 1989; Stanley 2005; Stanley and Doucouliagos 2012; Stanley 2008) provides the methodological foundations essential for conducting meta-regression analysis. The basic research model will ultimately employ Hong and Reed's (2024) methodology for calculating the partial correlation coefficient, which offers a new approach that differs somewhat from the classic calculation by

Stanley and Doucouliagos (2023).

The paper is structured as follows. Section 2 analyses the challenges related to defining the two key variables of interest: entrepreneurship and formal institutions. The theoretical framework is provided in Section 3, while Section 4 presents the research approach, methodology, and description of variables (moderators). Before highlighting the research results and their robustness (Section 6), Section 5 examines the issue of publication bias. Section 7 compares the results of all models, while the final chapter (Section 8) outlines the main conclusion and limitations of the paper, as well as recommendations for future research.

2. Challenges related to the concept of entrepreneurship and formal institutions

Jean-Baptiste Say was among the first authors to identify entrepreneurship as the fourth factor of production as early as 1803 in his work, "*Traité d'économie politique*". The literature review reveals works that follow Say's perspective (Parkin 2016), as well as those that consider the factors of production to be land, labour, and capital (Samuelson and Nordhaus 2010; Mankiw 2021; Krugman and Wells 2015). The question is technical in nature, as there is no doubt that all the mentioned authors recognised that entrepreneurship organises land, labour, and capital into specific forms of entrepreneurial activity. Credit for this understanding is also due to a series of scientific studies (Bosma et al. 2018; Stel, Carree, and Thurik 2005; Wong, Ho and Autio 2005; Kim et al. 2022; Almodóvar-González, Fernández-Portillo, and Díaz-Casero 2020) that demonstrate the positive effect of entrepreneurship on economic growth and development. Its impact is not limited to GDP measurement but extends much deeper into the overall structure of a given economy. Encouraging entrepreneurship generates a series of positive effects – spreading knowledge, fostering innovation, increasing employment, and raising the private sector's share in the economy – which ultimately lead to a higher standard of living for people. Considering this, the question arises: how should entrepreneurship be defined and measured in economic research?

Throughout history, various authors (Schumpeter 1934; Kirzner 1973; Foss and Klein 2015) have offered different definitions, although these do not differ significantly and generally converge on the idea that entrepreneurship is a form of human activity that organises land, labour, and capital (Parkin 2016). On the

other hand, in the approximation of entrepreneurship in economic research, heterogeneity is much greater, as authors use a wide range of measures. These include total entrepreneurial activity (Aparicio, Audretsch and Urbano 2022; Boudreaux et al. 2023; Dove and Dove 2023; Xin and Lee 2025; Pham, Cam and Nguyen 2024) start-ups (Leendertse and Van Rijnsoever 2025; Wennekers et al. 2005; Aidis, Estrin, and Mickiewicz 2009), innovation (Fuentelsaz, González, and González 2025; Hashi and Stojčić 2013; Hechavarría and Welter 2015), the number of new companies (Corradini 2022; Sweidan 2022; Nguyen, Canh, and Thanh 2021; Dutta, Sobel, and Roy 2013), and primary research conducted using questionnaires (Aljarodi, Thatchenkery, and Urbano 2022; Diaz Tautiva et al. 2023; Belitski, Cherkas, and Khlystova 2024; Ye, Su, and Ahlstrom 2022). All the above variables share the ability to approximate the effect of entrepreneurship in the economy closely. Moreover, it is very difficult to determine which would be better or more precise for scientific research in economics. Each realistically reflects the level of entrepreneurship, and it would be difficult to find convincing arguments for or against one variable compared to another. For this reason, this paper's meta-regression analysis will include all the above variables as possible approximations of entrepreneurship.

On the other hand, the question arises whether it is possible to apply the same approach to the other key variable of the meta-regression analysis – formal institutions. When examining the concept of formal institutions, most authors begin their analysis with North (1994), who defines formal institutions as formal constraints (e.g. rules, laws, constitutions) that structure human interaction. Building on North, various authors address the challenge of defining formal institutions, controlling for endogeneity, and mitigating multicollinearity using different types of data. Zdilar et al. (2025) identify 165 distinct institutional variables used by researchers to approximate the effect of formal institutions, as well as 22 papers that addressed the endogeneity problem using five different approaches. This analysis highlights both the complexity of the concept of formal institutions and the lack of consensus in the field. In the context of such complex phenomena, introducing restrictions is a necessary first step to achieve meaningful econometric results. Therefore, in this paper, formal institutions will be considered as a legislative framework managed by the government of a particular country, which can be changed and adjusted in the short and medium term (Zdilar et al. 2025). Due to the complexity of the concept, other types of institutions (religious, organisational, informal, etc.) will not be included in the analysis.

3. Theoretical framework

The relationship between formal institutions and entrepreneurship involves various elements that must be considered, which clearly indicate a high degree of heterogeneity among scientific studies. Research method, measurement of formal institutions, measurement of entrepreneurship, endogeneity control, time frame, and other factors significantly influence the strength and (in)significance of formal institutions for entrepreneurship. The studies in the sample can be divided into three main groups: those that measure entrepreneurship by total early-stage entrepreneurial activity (*TEA*), those that use the number of newly registered enterprises, and those that employ other possible measures of entrepreneurship.

Approximating entrepreneurship by *TEA*, Bosma et al. (2018) emphasise financial stability, small government, and start-up skills as key determinants that positively influence entrepreneurship. Conversely, the results of certain studies (Ovaska and Takashima 2021; Pham, Cam and Nguyen 2024) do not highlight government size and efficiency as significant determinants of entrepreneurship. A similar situation arises when formal institutions are approximated by property rights and the rule of law: in some cases, the effect on *TEA* was significant (Dima, Lobont, and Moldovan 2016), but not in others (Veiga et al. 2020; Tomita and Kimura 2024). Heterogeneity is also present in studies that approximate formal institutions with an index of economic freedom, where its effects were diametrically opposed (Boudreaux and Nikolaev 2019; Ovaska and Takashima 2021). The effect of the tax burden (Veiga et al. 2020) proved to be an insignificant determinant in encouraging entrepreneurship, although the theoretical framework does not support this thesis.

Similar forms of heterogeneity are also present in the remaining two groups of studies. Interestingly, certain components of formal institutions (tax burden, size of government, regulation, rule of law, etc.) become significant when entrepreneurship is measured by the number of newly registered enterprises instead of *TEA* (Dutta and Meierrieks 2021; Altin, Memili, and Sönmez 2017; Luu 2020). However, studies with conflicting research results can still be found. In some cases, reducing business start-up procedures has a positive effect on the number of newly registered enterprises (Harraf et al. 2021), while in others this effect is absent (Dutta, Sobel and Roy 2013).

As expected, the third group of studies, which contains the largest number of different approaches to entrepreneurship, also exhibits the greatest degree of heterogeneity. Sweidan (2022) demonstrates in his

work how closely related elements of the institutional framework can have varying effects on entrepreneurship. The research results showed that tax regulations are not a significant determinant of entrepreneurship, whereas the overall level of regulation, indicating a lower degree of restriction on private sector choices, is significant. A similar situation is observed in other studies, where socio-economic conditions in the economy affect entrepreneurship, while internal conflicts and political risk do not have such effects (Bonini and Alkan 2012). Conversely, Fuentelsaz, González, and Maícas (2021) clearly demonstrates that a market-oriented institutional framework reduces the likelihood of entrepreneurial exit, indicating that the institutional framework itself plays an important role in stimulating entrepreneurial activity.

By conducting meta-regression analysis, it is possible to account for all previously mentioned sources of heterogeneity between studies. This approach allows investigation of which sources are most important, which have the strongest effect, what the differences are between them, and ultimately what the overall effect of formal institutions on entrepreneurship is.

4. Methodology and data description

The process of selecting suitable papers for the meta-regression analysis (henceforth MRA) involved using the Web of Science database. The keywords used for the search were “entrepreneurship and institutions,” and the filter was further restricted to abstracts of scientific papers. This search identified a total of 712 papers containing both keywords – entrepreneurship and institutions – in their abstracts. In the first step, 64 papers not in English were automatically excluded, leaving 648 papers in the sample for further review. After an in-depth analysis of these papers, 71 papers with 328 regressions were identified and included in the MRA.

To obtain a consistent sample of papers for MRA, in-depth scanning and selection of regressions were conducted in accordance with the recommendations of Doucouliagos and Stanley (2009). In each paper, all institutional variables that could approximate the previously defined effect of formal institutions on entrepreneurship were identified. For each identified institutional variable, the standard error values from the model the author considered most appropriate were used. In cases where this was not clearly stated, we made a subjective assessment of the most appropriate model. Using the same logic, the regressions also included variants in which formal institutions interacted with another variable. In this way, we aimed to investigate whether different model specifications (with

and without interactions) affect the impact of formal institutions on entrepreneurship. To ensure complete consistency, the regressions included all institutional variables and their interactions (if any), regardless of whether they were significant or non-significant, and whether they aligned with the theory or not. As a result, the papers (71) included ranged from a minimum of one regression (e.g. as in Lee et al. 2021; Vu 2022; Barreneche García 2014) to a maximum of 23 regressions (e.g. as in Dove and Dove 2023). The oldest papers dated from 2011 (Estrin and Mickiewicz 2011; Troilo 2011), while several papers were published in 2025 (e.g. Xin and Lee 2025; Bilan and Apostoae 2025; Fuentelsaz, González, and González 2025).²

The next step required the creation of a partial correlation coefficient (hereinafter PCC), which represents a standard effect size capturing the relationship between formal institutions and entrepreneurship (Stanley and Jarrell, 1989). The calculation of the PCC is based on data from primary studies and therefore represents a key component in calculating the t-statistic (TSTAT), that is, the dependent variable obtained as the ratio of the PCC to its standard error. Following the logic of the meta-regression framework, the basic model is as follows:

$$PCC_{i,j} = \alpha + \beta_0 * sePCC_{i,j} + \varepsilon_{i,j} \quad (1)$$

where $i = 1 \dots 71$ is the number of identified papers, $j = 1 \dots 328$ is the number of regressions in the papers. The main purpose of the model is to test publication bias, where β_0 captures potential publication bias and α captures the actual effect beyond this bias. Random error ($\varepsilon_{i,j}$) captures random variations across estimates. To give greater weight to more precise estimates and eliminate the problem of heteroskedasticity, Stanley (2008) recommends dividing the entire equation by the standard error of the PCC, which transforms equation (1) as follows:

$$TSTAT_{i,j} = \alpha * \left(\frac{1}{sePCC_{i,j}} \right) + \beta_0 + \varepsilon_{i,j} * \left(\frac{1}{sePCC_{i,j}} \right) \quad (2)$$

where $TSTAT_{i,j}$ is simply the ratio of PCC and the standard error of PCC. It should be noted that the interpretation of β_0 and α remains the same as in the previous case, although the coefficients in equation (2) have exchanged places. However, a literature review identified two alternative weighting approaches (Stanley and Doucouliagos 2023; Hong and Reed 2024) relating to the dependent variable $TSTAT_{i,j}$. Hong and Reed (2024) state that inverse variance weighting can yield better results in meta-analyses than using the “correct” sampling variance estimator, giving their approach a certain advantage over that of Stanley and

Doucouliaos (2023). Nevertheless, in this paper, the Hong and Reed (2024) approach will be used in the base model, while the Stanley and Doucouliagos (2023) approach will be employed to test the robustness of the results. Although important for testing publication bias and giving greater weight to more precise estimates, equation (2) does not represent the final form of the estimated model. Conducting a meta-analysis with only the dependent variable and the key independent variable can lead to incomplete estimates. Furthermore, this approach omits other potentially useful information that could be obtained by investigating the relationship between institutions and entrepreneurship. Doucouliagos and Laroche (2009) show in their work that adding a moderator can greatly improve the robustness of estimation results. For this reason, equation (2) takes the following form:

$$TSTAT_{i,j} = \alpha * \left(\frac{1}{sePCC_{i,j}} \right) + \beta_0 + \sum_1^z \varphi_z * \left(\frac{1}{sePCC_{i,j}} \right) \theta_{z,i,j} + \mu_{i,j} * \left(\frac{1}{sePCC_{i,j}} \right) \quad (3)$$

where $\theta_{z,i,j} z=1 \dots Z$ are moderator variables weighted

by $\left(\frac{1}{sePCC_{i,j}} \right)$; φ_z coefficients related to the moderator variables to be estimated; $\mu_{i,j}$ standard error of the MRA. A list of all used moderator variables can be seen in Table 1. The original values represent the actual values of the moderator variables, while the transformed values are obtained by multiplying the original values by the inverse of the standard error of the partial correlation coefficient.

The first two variables (*PCC* and *sePCCinv*) are standard variables according to the standard methodology for conducting MRA, as explained in the text above. The squared time horizon was used to improve model specification determine its functional form, which is common practice in MRA (Nelson and Kennedy 2009; Stanley and Doucouliagos 2012; Havránek 2015). The simultaneous inclusion of the time horizon and the squared time horizon caused a multicollinearity problem (mean VIF value: 22.3), which limited the analysis to including only the squared time horizon. The remaining dummy moderators were selected based on a literature review, and their purpose is to identify whether factors other than formal institutions affect entrepreneurship and, if so, what differences exist between them. The initial research design assumed the inclusion of additional

Table 1. List of moderator variables

Variables	Short explanation of moderator variables	Original		Transformed	
		Mean	Std. Dev.	Mean	Std. Dev.
<i>PCC</i>	Partial correlation coefficient between the dependent variable and the institutional variable	0.035	0.153	-	-
<i>sePCCinv</i>	The inverse standard error of the partial correlation coefficient	0.049	0.042	119.245	218.759
<i>Timed2</i>	Squared time horizon of the dependent variable	156.48	148.683	11344.75	20536.03
<i>Wom</i>	Dummy, 1 if the subject of the study is women's entrepreneurship, 0 otherwise	0.064	0.245	23.275	119.148
<i>End</i>	Dummy, 1 if the study controls the endogeneity problem, 0 otherwise	0.463	0.5	65.447	212.80
<i>Panel</i>	Dummy, 1 if the study uses panel analysis, 0 otherwise	0.655	0.476	16.659	26.850
<i>Tea</i>	Dummy, 1 if the study uses Total Early-Stage Entrepreneurial Activity as the dependent variable, 0 otherwise	0.247	0.432	32.460	192.634
<i>Interaction_coefficient</i>	Dummy, 1 if the reported coefficient corresponds to an interaction term between the institutional variable and another variable, 0 if it corresponds to the main effect of the institutional variable.	0.253	0.435	32.940	128.555
<i>Interaction_in_model</i>	Dummy, 1 if the reported coefficient is estimated from a regression model that includes an interaction term involving the institutional variable, 0 otherwise.	0.485	0.500	62.985	174.428
<i>Statend</i>	Dummy, 1 if the study controls the endogeneity problem and if the institutional variable is statistically significant, 0 otherwise	0.286	0.453	36.962	125.991

Source: author's calculation

sources of heterogeneity, but in some cases these had to be omitted from the model due to lack of data (firm size, informal institutions, sectoral differences, etc.) or their excessive effect (dummy for binary models, dummy for institutional indices, dummy for results consistent with the theoretical framework, etc.) on the variance inflation factor (VIF). Before addressing publication bias and the research results, it is necessary to take one further methodological step: assigning equal weight to all studies. As previously stated, the meta-analysis comprises 71 papers and 328 regressions, meaning some papers include only one regression while others include several. Without equal weighting, the meta-analysis results would be biased, as studies with multiple regressions would have disproportionate influence. For this reason, equations 2 and 3 must be additionally weighted, with the weight set to 1 divided by the number of regressions from each study included in the meta-regression analysis (Efendic, Pugh, and Adnett 2011). This approach is standard practice in MRA and eliminates the risk of biased results.³

5. Testing publication bias

Creating a representative and heterogeneous sample is a key step in conducting MRA. Using a small sample of research, analysing only statistically significant studies, or omitting the highest quality empirical research are some of the risks that can lead to MRA producing biased estimates, that is, coefficients that may be overestimated or underestimated. A literature review identified several publication bias testing techniques, the most relevant being: analysis of funnel plots (Light and Pillemer 1984), Egger's publication bias test (Egger et al. 1997), the Funnel asymmetry test (henceforth FAT), the Precision-effect test (henceforth PET), and the Precision effect estimate with standard error (henceforth PEESE) test as a logical complement to the FAT-PET test (Stanley and Doucouliagos 2014; 2012). The analysis of funnel plots requires caution, as graphical representations can be interpreted in various ways, particularly given the potential subjectivity of the author (Stanley 2005). Publication bias is generally assessed based on the asymmetry of the plot, with symmetry suggesting the absence of publication bias. In this case, the funnel plots were created to show the relationship between the partial correlation coefficient (*PCC*) and a measure of its precision (*sePCCinv*). The vertical red line (θ_{IV}) represents the estimated average effect size, while the grey lines (Pseudo 95% confidence intervals) indicate the 95% intervals of expected distributions around the average effect size,

assuming no bias. At first glance, it is difficult to draw any conclusions, as the studies do not display clear symmetry or asymmetry (plot a). However, examining the vertical axis (*sePCCinv*) reveals that it spans a very wide range of values, from 0 to 1500, raising the question of what happens to the symmetry of the graph at different levels of *sePCCinv*. By adjusting the *sePCCinv* values, it becomes apparent that the funnel plots appear more symmetric, which is most evident in plots (f), (g), and (h), that is, for *sePCCinv* values between 50 and 0. Although it is not possible to draw a definitive conclusion regarding publication bias based solely on the graphical analysis of funnel plots, the analysis suggests two possible conclusions: a) most studies fall within the *sePCCinv* value range of 50 to 0; b) the wide range of values in the first graph (a) may indicate heterogeneity within the entire sample. The second step in testing for publication bias involves conducting the Egger test, the equation for which takes the following form:

$$TSTAT_i = \beta_0 + \beta_1 * sePCCinv_i + \varepsilon_i \quad (4)$$

Egger's test, with the hypothesis H_0 ($H_0 : \beta_1 = 0$), assumes that the effect of small studies is much greater than that of large ones, i.e., there is no evidence of publication bias (Egger et al. 1997). In Table 2, the p-value (0.9988) of the Egger test clearly indicates the absence of publication bias in our MRA. However, Stanley and Doucouliagos (2014) clearly point out that the FAT-PET test, in combination with PEESE test, represents the most reliable technique for assessing publication bias. Likewise, the authors in addition to the classic FAT-PET test, recommend presenting a weighted version of the test, that is, a version which considers that individual papers may include multiple regressions. The FAT - PET model takes the following form:

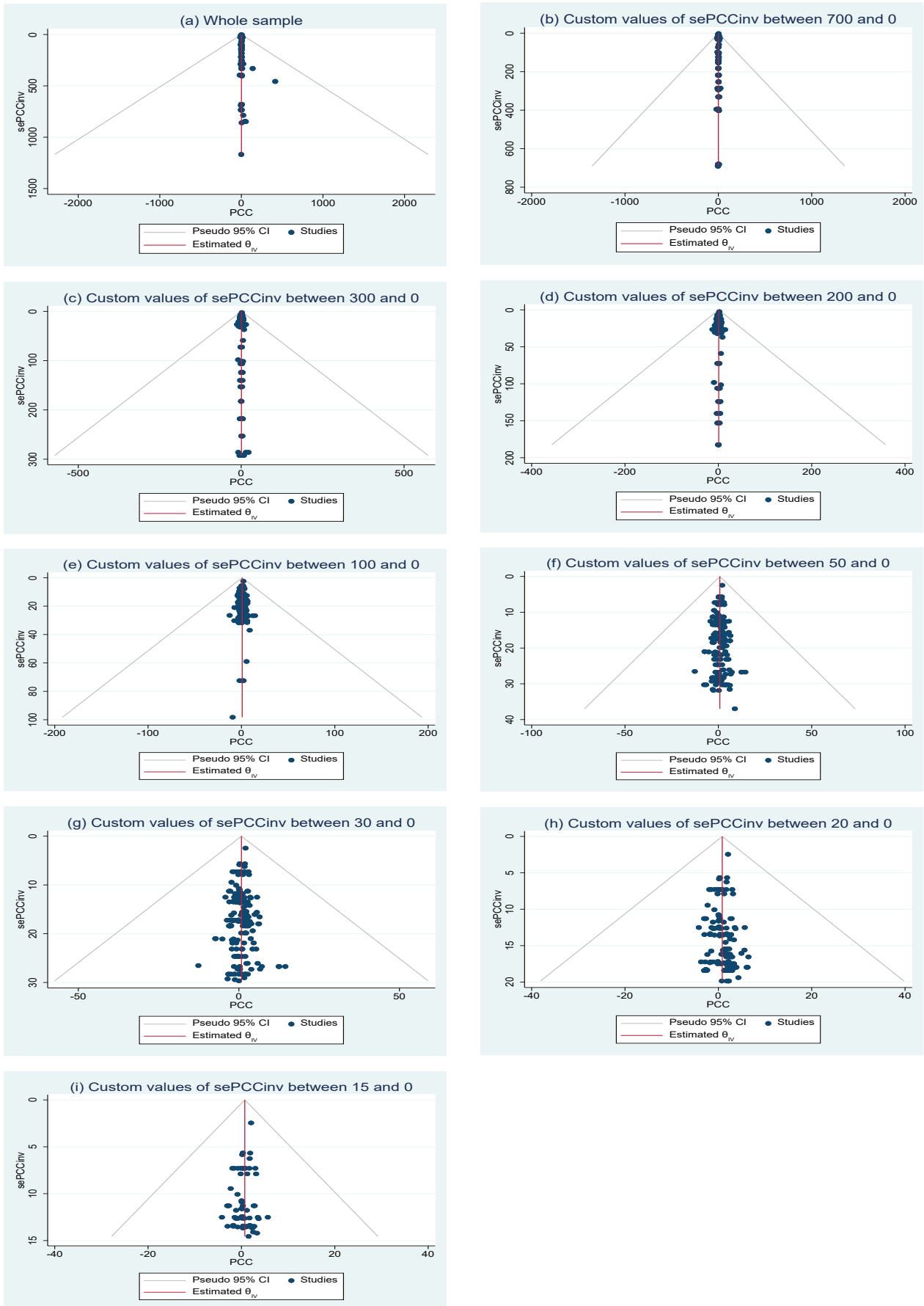
$$TSTAT_i = \alpha + \beta_0 * sePCCinv_i + \varepsilon_i \quad (5)$$

Table 2. Egger test results

Regression-based Egger test for small-study effects	
Random-effects model	
Method: REML	
H0: beta1 = 0; no small-study effects	
beta1 =	-0.00
z =	-0.00
Prob > z	0.9988

Source: author's calculation

Figure 1. Funnel plots



Source: author's calculation

Table 3. The results of unweighted and weighted FAT - PET model

Dependent variable: TSTAT						
Variables	Unweighted method			Weighted method		
	Coeff.	t - stat	p - value	Coeff.	t - stat	p - value
constant	.552	1.32	.188	6.63	0.97	.333
sePCCinv	.020	2.06	.040	.008	1.21	.228
Model diagnostic						
Observations	328			328		
R-squared	0.0324			0.0036		
F-test	F(1, 326) = 4.23			F(1, 300) = 1.46		
H0: sePCCinv = 0	Prob > F = 0.0404			Prob > F = 0.2285		

Source: author's calculation

The FAT test, with the null hypothesis ($H_0 : \alpha = 0$), assumes the absence of publication bias, which is confirmed if the constant α is not significant. Conversely, if α is significant, this indicates a biased result, either upwards or downwards, depending on whether the coefficient is positive (upwards) or negative (downwards). Furthermore, the PET test, with the null hypothesis ($H_0 : \beta_0 = 0$), tests the real effect corrected for publication bias, and the significance of the coefficient β_0 confirms a strong real effect.

Table 3 presents the results of the FAT-PET test for both the weighted and unweighted versions of the paper. In both versions of the model, the constant (α) is insignificant, while the value of the real effect (β_0) is also insignificant in the weighted version. These results clearly demonstrate the absence of publication bias and support the use of the weighted version of the model. Ultimately, the absence of publication bias and the real effect in the weighted version, as well as the absence of publication bias in the previous two methods, provide strong arguments for proceeding to MRA with moderators.⁴

6. Meta regression analysis

In addition to serving as the final step in demonstrating the absence of publication bias, Table 3 also provides insight into another notable result. Specifically, the independent variable of interest (*sePCCinv*) is marginally significant at the 10% level in the unweighted version but becomes insignificant in the weighted version of the model. These results indicate a weakness in the model (low R-squared values) and highlight the need to include additional variables (moderators), i.e., the application of multivariate MRA.

Besides the constant and the independent variable of interest (*sePCCinv*), our baseline model includes

seven moderator variables (Table 4). An examination of the baseline model diagnostics leads to several important conclusions. The baseline model comprises 328 regressions with clustered robust standard errors and an R^2 at a satisfactory level of 0.78. The variance inflation factor (VIF) values clearly indicate the absence of potential multicollinearity among the moderator variables, as the highest value is 6.14 and the average is 3.07. Conversely, the F-test results (p-value = 0.00) suggest that the moderators significantly explain the heterogeneity among the studies, further confirming the importance of their inclusion in the analysis. To achieve an even greater degree of robustness, the model diagnostics also include the results of *Testparm*, which, unlike the F-test, can assess the significance of one, two, or a selected group of moderators. In our case, *Testparm* includes the independent variable of interest and the two most significant moderators, both in terms of significance, strength, and expected signs. The p-values from *Testparm* indicate that all three variables significantly affect the dependent variable, whether tested individually or together.

However, it is important to note that in multivariate MRA, the effect size, unlike in bivariate MRA (Table 3), is not determined solely by the value of the coefficient on *sePCCinv*. Multivariate MRA, when estimating the overall effect, requires the interaction of the key independent variable of interest (*sePCCinv*) with other important moderators included in the analysis. The MRA results (Table 4) highlight the statistical significance of different signs at the 1% level in five of the six moderator variables: *Timed2*, *Wom*, *End*, *Tea*, *Interaction_coef* and *Interaction_model*. Additionally, as multiple estimates per study were considered, clustered robust standard errors were used in the model. This approach allows for correlation of standard errors within studies while assuming independence between studies.

Table 4. Multivariate MRA - results of the baseline model

Dependent variable: TSTAT, which is the t – statistic on the institutional variable of interest				
Hong and Reed (2024) approach				
Moderator variables used in MRA (short description)	Coef.	Cl. – rob. SE	t-value	p-value
sePCCinv (the inverse standard error of the partial correlation coefficients)	0.086	0.030	2.82	0.006
Timede2 (squared time horizon of the dependent variable)	-0.002	0.0005	-4.38	0.000
Wom (dummy, 1 if the subject of the study is women’s entrepreneurship, 0 otherwise)	-0.217	0.049	-4.41	0.000
End (dummy, 1 if the study controls the endogeneity problem, 0 otherwise)	0.262	0.061	4.25	0.000
Panel (dummy, 1 if the study uses panel analysis, 0 otherwise)	-0.104	0.072	-1.44	0.154
Tea (dummy, 1 if the study uses Total Early-Stage Entrepreneurial Activity as the dependent variable, 0 otherwise)	0.395	0.08	4.66	0.000
Interaction_coefficient (Dummy, 1 if the reported coefficient corresponds to an interaction term between the institutional variable and another variable, 0 if it corresponds to the main effect of the institutional variable.)	0.013	0.09	1.44	0.155
Interaction_in_model (Dummy, 1 if the reported coefficient is estimated from a regression model that includes an interaction term involving the institutional variable, 0 otherwise.)	-0.137	0.036	-3.74	0.000
Con (intercept term)	9.518	2.694	3.53	0.001
Model diagnostics				
Number of observations	No.obs. = 328			
Number of clusters (studies)	No. of clusters = 71			
R - squared	R – squared = 0.78			
Variance Inflation Factor (VIF)	Max: 6.14; Mean: 3.07			
F – test	F (8, 70) = 5.32			
Ho: independent variables are jointly equal to zero	Prob > F = 0.00			
Testparm	F (1, 70) = 7.94			
Ho: seINVpc = 0	Prob > F = 0.0063			
Testparm	F (1, 70) = 18.08			
Ho: End = 0	Prob > F = 0.0001			
Testparm	F (1, 70) = 21.75			
Ho: Tea = 0	Prob > F = 0.0000			
Testparm	F (3, 70) = 7.48			
Ho: seINVpc = End = Tea = 0	Prob > F = 0.0002			
Ramsey RESET test	F (3, 316) = 674.57			
H0: Model has no omitted variables	Prob > F = 0.0000			

Source: author’s calculation

The first variable (Timede2) represents the squared time horizon of the dependent variable, and its statistically significant negative coefficient is -0.002 . This result aligns with theory, as one would expect a weaker effect of institutions on entrepreneurship in the long term, especially given the way formal institutions

are defined in this paper (see section 2). Furthermore, the results indicate that the effect of institutions on entrepreneurship is significantly weaker when considering only women’s entrepreneurship (Wom) compared to the total category of entrepreneurship in the economy. These findings are consistent with

the existence of a wage gender gap (Blau and Kahn 2017; Card, Cardoso, and Kline 2016; Bertrand, Goldin and Katz 2010), insufficient institutional support for women's entrepreneurship (Minniti and Naudé 2010; Klapper and Parker 2011; Deng, Orbes and Ma 2024), or their marginalised position within society in certain regions of the world (AlAzzawi et al. 2023; Madi et al. 2023; World Bank 2025). However, caution is warranted when interpreting these results, as the sample includes only 21 regressions from 5 papers.

One of the moderator variables for which we expected a statistically significant and positive sign is the *End* variable. Our sample covers the period from 2011 to 2025, during which authors were aware of the problem of endogeneity in institutional economics and attempted to control it using various sophisticated techniques, such as lags and instrumental variables. This is supported by the fact that endogeneity was controlled in some way in 152 out of 328 regressions. The research results show that the effect of institutions on entrepreneurship is significantly stronger when the problem of endogeneity is controlled than when it is neglected. The coefficient value proved to be strong both statistically (1%) and numerically (0.262). These results are consistent with a series of scientific studies (Ben Ali 2023; Munemo 2022; Operti 2018; Sweidan 2022; Vu 2022; Aparicio, Urbano, and Audretsch 2022) in which the effect of institutions in the economy was much greater in models where the problem of endogeneity was controlled compared to models where this problem was neglected.

The results for the moderator variable *Panel* show a surprisingly weak effect. Covering 215 of the 328 regressions, the research suggests that institutions have a weak effect on entrepreneurship in studies using panel data. In addition to the moderate effect size (-0.104), the coefficient was also statistically non-significant.

The moderator that most significantly enhances the impact of institutions on entrepreneurship is *Tea*. The research shows that institutions most strongly stimulate entrepreneurship in studies where it is measured as Total Early-Stage Entrepreneurial Activity. The results align with expectations and the theoretical background. Providing institutional support to entrepreneurs is most important during the early stage of a firm's establishment, as the company mortality rate is highest in the first five years (Arcuri, Russo, and Gandolfi 2025; Soto-Simeone, Siren and Antretter 2020; Dunne, Roberts, and Samuelson 1989), with particularly high risk of failure in the first and second years (Bartelsman, Scarpetta, and Schivardi 2005; Cook, Campbell and Kelly 2012, Calvino, Criscuolo and Menon 2015). This is supported by the fact that *Tea* is

defined as "the percentage of adults (aged 18–64) who are starting or running a new business, i.e. one that has not yet paid wages or salaries for 42 months or more." (GEM 2025). The results gain further significance considering that *Tea* was identified in only 81 out of 328 regressions.

When interpreting the last two moderator variables (*Interaction_coefficient* and *Interaction_in_model*), certain limitations must be considered. Specifically, due to the lack of data in the primary studies (mainly data related to the distribution of interacting variables, covariance terms, or standard errors), it was not possible to include marginal effects in the coding procedure. Given this limitation, we decided to investigate whether the effect of institutions on entrepreneurship depends on model specification, that is, whether the effect of institutions differs in models that use interactions compared to those that do not. The non-significance of the *interaction_coefficient* variable (0.144) clearly indicates that interaction coefficients do not systematically differ from baseline institutional coefficients. Furthermore, the significant (0.00) result for the last moderator variable implies that the effect of institutions on entrepreneurship is significantly weaker (-0.137) in models that use interactions of institutional variables with other variables. These results clearly indicate that the impact of institutions on entrepreneurship largely depends on the model specification, which is consistent with what was identified in the previous two important moderator variables (*End* and *Tea*).

7. Robustness analysis

Ultimately, the question arises as to whether the obtained research results are consistent, that is, whether our model remains robust under certain modifications. Table 5 presents an overview of the results for four different variants of the model, in which our key moderators remained significant with the expected signs. In the first variant, all studies considering women's entrepreneurship were excluded, reducing the number of observations from 328 to 307. Comparing these results with the basic model (Table 4), all variables except *Panel*, which became significant, maintained the same level of significance and expected signs, though with slightly different effect strengths. The coefficients for *sePCCinv*, *End*, *Panel*, and *Interaction_in_model* increased to 0.097, 0.269, -0.120, and -0.156, respectively. Conversely, the coefficients for *Tea* and *Interaction_coefficient* decreased to 0.393 and 0.012, while the coefficient for *Timede2* remained unchanged. Model diagnostics (F-test, R^2 , VIF,

Testparm) correspond to those of the base model, indicating good specificity, absence of multicollinearity, and an appropriate choice of moderators.

In the second version of the model, there is a significant reduction in the number of observations compared to the base model (from 328 to 220). This model excluded studies that considered women's entrepreneurship, as well as studies in which the relationship between the independent institutional variable and the dependent entrepreneurial variable did not align with the theory. In this version of the model, some differences can be found compared to the baseline model. Three key moderators (*sePCCinv*, *End*, and *Tea*) remained significant with the same signs as in the base model, although their effects were stronger for *sePCCinv* and *End* (increasing from 0.086 to 0.093, and from 0.262 to 0.302, respectively), and weaker for *Tea* (decreasing from 0.395 to 0.381). On the other hand, the effect of *Timed2* remained unchanged (-0.002), while the most differences are recorded in the case of *Panel*, *Interaction_coefficient*, and *Interaction_in_model*. All three variables became significant with the same sign as in the baseline model. Results show that studies which include women's entrepreneurship and interactions significantly decrease (-0.168 and -0.173 respectively) the effect of institutions on entrepreneurship, while *Interaction_coefficient* systematically differs from baseline institutional coefficients. The model diagnostics remained at approximately the same level as in the base model, with a slightly higher R^2 value (0.8292).

The third variant of the model excluded studies that used interactions, reducing the number of observations from 328 to 169. Regarding robustness, the results of the third model are significant. The three most important moderators (*sePCCinv*, *End*, and *TEA*) maintained the same level of significance and the expected signs as in the base model. The effects of *sePCCinv* and *TEA* were somewhat weaker (decreasing from 0.086 to 0.06 and from 0.395 to 0.376, respectively), while the effect of *End* increased from 0.262 to 0.427. The effects of *Panel* and *Timed2* remained at approximately the same level of significance and strength as in the base model, while the effect of *Wom* became stronger (increasing from -0.217 to -0.411) and significant. The overall diagnostic performance of the model is consistent with the other models, with a slightly higher R^2 value (0.9143).

The final variant of the model included the entire sample, but with one important difference. The estimation of the coefficients and the entire MRA was conducted according to the approach of Stanley and Doucouliagos (2023), whereas all previous variants followed the approach of Hong and Reed (2024).

Additionally, this variant did not include the moderator *End*; instead, a new moderator, *Statend*, was introduced into the analysis. This moderator is a dummy variable that takes the value 1 if the study controls for the endogeneity problem and the institutional variable is statistically significant, and 0 otherwise. Compared to the base model, the key moderators with the expected signs were again *Tea* and *Statend*. However, in this variant, there is a change in the strength of the *sePCCinv* effect. Specifically, using the approach of Stanley and Doucouliagos (2023), the *sePCCinv* effect increases to 0.359, which is a significant difference compared to the base model (0.086). The group of moderators (*Panel*, *Interaction_coefficient*, *Interaction_in_model*) is statistically insignificant, while *Timed2* remains the same as in the baseline model. In contrast to the baseline model, *Wom* becomes statistically significant with a value of -0.267. Finally, model diagnostics are consistent with both the base model and the previous three variants.

In conclusion, the effect of institutions on entrepreneurship is statistically significant (*sePCCinv* - 0.006) but varies between the short and long run. In the long run (*Timede2* - 0.000), the effect of institutions on entrepreneurship persists but gradually diminishes. In contrast, the short run produces opposite results. The research has shown that controlling for endogeneity (*End* - 0.000) and focusing the analysis on newly registered enterprises (*Tea* - 0.000) results in a statistically very strong, significant, and positive effect of institutions on entrepreneurship. Model specification is also important. The research indicates that the overall effect of institutions on entrepreneurship is greater in models that do not include interactions between institutions and other variables (*interaction_in_model* - 0.000). Although these are different meta-regression analyses that are difficult to compare, the results are consistent with those of Efendic, Pugh, and Adnett (2011) and Doucouliagos (2005), which confirmed the positive relationship between institutions and economic growth.

However, our models do have limitations. To test the assumption of linearity, the results of the Ramsey test are presented at the bottom of Tables 4 and 5. The significant values (0.00) indicate a failure of the linearity assumption. To address this issue, we applied various techniques: introducing new variables into the model (such as the number of independent variables, the number of years since an article was published, and their squared terms), adding new dummy variables (for binary models, aggregated institutional indices, and studies whose results aligned with the theory), applying logarithmic transformations, including the squared key independent variable of interest

Table 5. Robustness analysis

Dependent variable: TSTAT, which is the t – statistic on the institutional variable of interest																
	Hong and Reed (2024) approach				Hong and Reed (2024) approach				Hong and Reed (2024) approach				Stanley and Doucouliagos (2023) approach			
	Without women's entrepreneurship studies				Without studies of women's entrepreneurship and studies whose results are not in line with the theory				Without studies that used interactions				Entire sample			
Mod. variables used in MRA	Coef.	Cl. rob. SE	t-stat.	p-val.	Coef.	Cl. rob. SE	t-stat.	p-val.	Coef.	Cl. rob. SE	t-stat.	p-val.	Coef.	Cl. rob. SE	t-stat.	p-val.
sePCCinv	0.097	0.034	2.87	0.006	0.093	0.032	2.85	0.006	0.060	0.027	2.19	0.033	0.359	0.116	3.07	0.003
Timede2	-0.002	0.0005	-4.67	0.00	-0.002	0.0004	-5.02	0.000	-0.002	0.0004	-5.32	0.00	-0.004	0.0003	-13.29	0.000
Wom	-	-	-	-	-	-	-	-	-0.411	0.056	-7.34	0.00	-0.267	0.054	-4.90	0.000
End	0.269	0.059	4.57	0.00	0.302	0.055	5.44	0.000	0.427	0.059	7.18	0.00	-	-	-	-
Panel	-0.120	0.071	-1.69	0.096	-0.168	0.071	-2.34	0.022	-0.19	0.117	-1.63	0.110	0.288	0.218	1.32	0.192
Tea	0.393	0.077	5.09	0.000	0.381	0.069	5.51	0.000	0.376	0.060	6.20	0.00	0.600	0.116	5.15	0.000
Interaction_coefficient	0.012	0.009	1.38	0.171	0.067	0.023	2.90	0.005	-	-	-	-	-0.124	0.077	-1.60	0.114
Interaction_in_model	-0.156	0.035	-4.37	0.000	-0.173	0.035	-4.89	0.000	-	-	-	-	-0.104	0.123	-0.85	0.400
Con (intercept term)	9.321	2.683	3.47	0.001	11.203	2.927	3.83	0.000	5.716	2.072	2.76	0.08	1.42	4.52	0.31	0.754
Statend	-	-	-	-	-	-	-	-	-	-	-	-	0.256	0.076	3.37	0.001
Model diagnostics																
Number of observations	No.obs. = 307				No.obs. = 220				No.obs. = 169				No.obs. = 328			
Number of clusters (studies)	No. of clusters = 67				No. of clusters = 64				No. of clusters = 54				No. of clusters = 71			
R - squared	R – squared = 0.8004				R – squared = 0.8292				R – squared = 0.9143				R – squared = 0.9731			
Variance Inflation Factor (VIF)	Max: 5.77; Mean: 3.19				Max: 4.86; Mean: 2.92				Max: 5.01; Mean: 3.10				Max: 9.31; Mean: 3.67			
F – test	F (7, 66) = 5.26				F (7, 63) = 5.43				F(6, 53) = 27.09				F (8, 70) = 161.16			
Ho: independent variables are jointly equal to zero	Prob > F = 0.0001				Prob > F = 0.0001				Prob > F = 0.0000				Prob > F = 0.0000			
Testparm	F (1, 66) = 8.24				F (1, 63) = 8.12				F (1, 53) = 4.78				F (1, 70) = 9.45			
Ho: selNVpc = 0	Prob > F = 0.0055				Prob > F = 0.0059				Prob > F = 0.0332				Prob > F = 0.0030			
Testparm	F (1, 66) = 20.84				F (1, 63) = 29.56				F (1, 53) = 51.48				-			
Ho: End = 0	Prob > F = 0.0000				Prob > F = 0.0000				Prob > F = 0.0000				-			
Testparm	F (1, 66) = 25.86				F (1, 63) = 30.35				F (1, 53) = 38.38				F (1, 70) = 16.55			
Ho: Tea = 0	Prob > F = 0.0000				Prob > F = 0.0000				Prob > F = 0.0000				Prob > F = 0.0000			
Testparm	-				-				-				F (1, 70) = 11.38			
Ho: Statend = 0	-				-				-				Prob > F = 0.0012			
Testparm	F (3, 66) = 8.74				F (3, 63) = 11.47				F (3, 53) = 53.39				-			
Ho: selNVpc = End = Tea = 0	Prob > F = 0.0001				Prob > F = 0.0000				Prob > F = 0.0000				-			
Testparm	-				-				-				F (3, 70) = 413.46			
Ho: selNVpc = Statend = Tea = 0	-				-				-				Prob > F = 0.0000			
Ramsey reset test	F (3, 296) = 583.97				F(3, 209) = 405.65				F(3, 159) = 187.26				F(3, 316) = 2173.84			
	Prob > F = 0.0000				Prob > F = 0.0000				Prob > F = 0.0000				Prob > F = 0.0000			

Source: Author' calculation

($sePCCinv^2$), and using alternative tests such as the link test. Despite these approaches, the Ramsey test remained significant, and other model diagnostics (R^2 , F-test, and VIF) were significantly impaired. Therefore, we decided to retain the existing model specifications, and the results should be interpreted in the context of the failure of the linearity assumption.

8. Conclusion

The research results clearly show that economic policymakers, by adjusting the existing institutional framework and providing other forms of institutional support, can significantly influence the establishment and survival of new companies in the market (Boudreaux and Nikolaev 2019; Chowdhury, Audretsch, and Belitski 2019; Fuentelsaz, González, and González 2025; Fuentelsaz, González, and Maicas 2021). In the context of digital transformation, institutional frameworks require continuous adjustment, making it increasingly difficult for them to remain fixed in the long term. Freelancing, remote work, digital forms of payment, and the liberalization of transport and other services are just one of many examples of “rules of the game” that were unthinkable 10 - 15 years ago. As a rule, economic policymakers should adapt future institutional frameworks to newly registered companies, since companies already operating in the market can gradually, and much more easily, adapt their operations to new circumstances.

However, this paper has several limitations that must be considered. It includes scientific research only from the Web of Science database, while other relevant databases may also contain high-quality research on this topic. Furthermore, the paper does not include the component of informal institutions, although some research indicates their close connection with formal institutions. Finally, the results of the Ramsey test indicate a failure of the linearity assumption, meaning that the inclusion of additional moderators remains a constant challenge when conducting meta-regression analysis.

Recommendations for future research align with the identified limitations. Future studies should include a broader range of papers, incorporating databases such as SCOPUS and EconLit, which would provide a wider selection of moderators and enable consideration of the informal institutions component. Ultimately, a larger sample would allow analysis of whether the effects of institutions on entrepreneurship are consistent across all countries or if there are differences depending on the level of economic development.

Endnotes

- 1 Primarily, this refers to the contributions of Daron Acemoglu, Simon Johnson, and James A. Robinson (2024 winners), as well as Mokyr's (one of the 2025 winners) contribution to connecting institutions with innovation
- 2 Due to a lack of space, a list of all studies used in MRA is available in a separate document attached to the paper.
- 3 A study with one regression is weighted in its entirety; in a study with two regressions, each is weighted at 0.5; in a study with four regressions, each is weighted at 0.25; in a study with five regressions, each is weighted at 0.20, and so on.
- 4 Stanley and Doucouliagos (2012; 2014) clearly point out that it is not necessary to conduct an additional PEESE test if the constant and B1 in the weighted version of the model are not significant.

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