A game worth the candle? Meta-analysis of the effects of formalization on firm performance

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Supplement 1: List of keywords employed in the review process

Search Database	Formality indicator	Outcome	Query
Google Scholar, Scopus, World Bank Knowledge Repository	Unspecified	Unspecified	Formalization firms
			Impact formalization firms
			informality
			firm performance
			Informal economy
			self-employment
			regulatory simplification
			small enterprises,
			entry cost informal firms registration
			benefit of formalization
	Formalization Registration License	Revenues	“Firm formalization” AND “revenues”
			“Firm registration” AND “revenues”
			“Firm license” AND “revenues”
		Profits	“Firm formalization” AND “profit”
			“Firm registration” AND “profit”
			“Firm license” AND “profit”
		Credit	“Firm formalization” AND “credit”
			“Firm registration” AND “access credit”
			“Firm license” AND “credit”
		Input	“Firm formalization” AND “input”
			“Firm registration” AND “input”
			“Firm license” AND “input”
		Taxes	"Firms formalization" AND "taxes"
			“Firm registration” AND “taxes”
			“Firm license” AND “taxes”

Source: Authors’ elaboration.

Supplement 2: Studies included in the meta-analysis

- Alcázar, L., and Jaramillo, M. (2016) The Impact of Formality on Microenterprise Performance: A Case Study in Downtown Lima. GRADE Group for the Analysis of Development. Lima, Peru.
- Benhassine, N., McKenzie, D., Pouliquen, V., and Santini, M. (2018) Does inducing informal firms to formalize make sense? Experimental evidence from Benin. *Journal of Public Economics*, *157*, 1-14.
- Berkel, H. (2018) The costs and benefits of formalization for firms: A mixed-methods study on Mozambique. Working Paper N° 159. World Institute for Development Economic Research (UNU-WIDER).
- Bich, T. T., and La, H. A. (2018) Why do household businesses in Viet Nam stay informal? WIDER Working Paper N° 2018/64.
- Boly, A. (2015) *On the benefits of formalization: Panel evidence from Vietnam*. Working Paper N° 2015/038. UNU WIDER. Helsinki.
- Boly, A. (2018) On the short-and medium-term effects of formalisation: Panel evidence from Vietnam. *Journal of Development Studies*, 54(4), 641-656.
- Boly, A. (2020). The Effects of Formalization on Small and Medium-Sized Enterprise Tax Payments: Panel Evidence from Viet Nam. *Asian Development Review*, *37*(1), 140-158.Campos, F., Goldstein, M., and McKenzie, D. (2015) Short-term impacts of formalization assistance and a bank information session on business registration and access to finance in Malawi.
- Campos, F., Goldstein, M., and McKenzie, D. (2018) *How Should the Government Bring Small Firms into the Formal System? Experimental Evidence from Malawi.* Policy Research Working Paper N° 8601. World Bank Group. Washington DC.
- Campos, F, Goldstein, M and McKenzie, D, (2019). *The impacts of formal registration of businesses in Malawi, 3ie Grantee Final Report*. New Delhi: International Initiative for Impact Evaluation (3ie).
- De Mel, S., McKenzie, D., and Woodruff, C. (2011) *What is the Cost of Formality? Experimentally estimating the demand for formalization*. Mimeo.
- De Mel, S., McKenzie, D., and Woodruff, C. (2013) The demand for, and consequences of, formalization among informal firms in Sri Lanka, *American Economic Journal: Applied Economics*, 5(2), 122-50.
- Demenet, A., Razafindrakoto, M., and Roubaud, F. (2016) Do informal businesses gain from registration and how? Panel data evidence from Vietnam. *World Development*, 84, 326-341.
- Fajnzylber, P., Maloney, W.F., and Montes-Rojas, G.V. (2011) Does Formality Improve Micro-Firm Performance? Evidence from the Brazilian SIMPLES Program. *Journal of Development Economics,* 94(2), 262-276.
- Gabrieli, T. and Montes-Rojas, G. A. F. (2011) Who benefits from reducing the cost of formality? Quantile regression discontinuity analysis. In: Informal Employment in Emerging and Transition Economies (pp. 101-133). Emerald Group Publishing Limited
- McCaig, B., and Nanowski, J. (2018) Business Formalization in Vietnam. Working Paper.
- McCaig B., and Nanowski J. (2019) Business Formalisation in Vietnam. *Journal of Development Studies*, 55(5), 805-821.

- Rand, J. (2017) Comparing estimated and self-reported mark-ups for formal and informal firms in an emerging market context. WIDER Working Paper N° 2017/160.
- Rand, J., and Torm, N. (2012) The Benefits of Formalization: Evidence from Vietnamese Manufacturing SMEs. *World Development,* 40(5), 983-998.
- Rocha, R., Ulyssea, G., and Rachter, L. (2014) Do Entry Regulation and Taxes Hinder Firm Creation and Formalization.Evidence from Brazil. Working Paper.
- Rocha, R., Ulyssea, G., and Rachter, L. (2018) Do lower taxes reduce informality? Evidence from Brazil. *Journal of Development Economics*, 134, 28-49.
- Tanaka, K. (2021). *Formal registration and informal firms in Cambodia* (No. 807). Institute of Developing Economies, Japan External Trade Organization (JETRO).

Supplement 3: List of excluded studies

No	Study	Reasons for exclusion	Main findings
1	Almeida, R., & Carneiro, P. (2012) Enforcement of labor regulation and informality. *American Economic Journal: Applied Economics*, *4*(3), 64-89.	Other comparison (comparing formal and informal firms)	Stricter enforcement of labor regulation in Brazil leads to an increase in formal sector employment, to a reduction of formal wages, and to a decrease of informal sector employment.
2	Aparicio, G., (2014) *Does Formality Improve Firm Performance? Evidence From a quasi-Experiment in Mexico.* Boston University Working Paper. Boston, MA: Boston University.	Missing information (# of observations)	The study assesses the effects of the 2002 reform reducing time and costs of formalization in Mexico. The reform increased business formalization and had a positive impact on firms' profits.
3	Barron, M. (2020) Business training programs and microenterprise formalization in Peru. *Cogent Economics & Finance*, *8*(1), 1791546.	Other outcome (effects of reform on formalization)	The author found positive effects of a business training program targeted at microentrepreneurs in Peru. Business formalization improved by 20-25 percentage points among the participants.
4	Bechara Bitar, A. (2019) *Essays on Economic and Social Policies in Mexico*. PhD Thesis University of Minnesota.	Other outcome (effects of reform on formalization)	The study explores the effects of the 2014 FIR reform in Mexico. The reform offers several fiscal and financial incentives to firms entering the formal sector. The findings indicate null effects on business formalization.
5	Benhassine, N., McKenzie, D., Pouliquen, V., & Santini, M. (2016) *Can enhancing the benefits of formalization induce informal firms to become formal? Experimental evidence from Benin*. The World Bank.	Double version	See Appendix 6
6	Benjamin, N.C., & Mbaye, A.A. (2012) The Informal Sector, Productivity, and Enforcement in West Africa: A Firm-level Analysis. *Review of Development Economics*, *16*(4), 664-680.	Other comparison (comparing formal and informal firms)	After comparing formal and informal firms operating in the three capital cities of Benin, Burkina Faso, and Senegal, the study found that formal firms are more productive. However, the gap decreases when considering larger sized formal and informal firms.
7	Brockmeyer, A., Kettle, S., & Smith, S.D. (2016) *Casting the Tax Net Wider: Experimental Evidence from Costa Rica*. World Bank Policy Research Working Paper, (7850).	Other population (already formal) and comparison (before and after tax reporting)	Using data from an experiment in Costa Rica, the study found that stricter enforcement (i.e. emails of warning) improve tax compliance among formal firms.
8	Calderon, G., Cunha, J.M., & De Giorgi, G. (2013) *Business literacy and development: Evidence from a randomized controlled trial in rural Mexico*. National Bureau of Economic Research (NBER) Working Paper No. 19740.	Other intervention (effects of business training) and outcome (including formalization)	The authors conduct an experiment providing a training to improve business literacy . The results show that the program increased business profits and promoted business formalization.
9	Campos, F., Goldstein, M., McKenzie, D. (2019) Impacts of formal business registration in Malawi.	Double version	See Appendix 6
10	Cardenas, M. and Rozo, S. (2007) *La informalidad empresarial y sus consecuencias:¿ Son los CAE una solución?*. Fedesarrollo, Bogotà, Colombia.	Other language (Spanish) and other comparison (comparing already formal and informal)	Colombian informal firms display lower profits and lower access to credit and government programs. Furthermore, formalization of newly created firms increased by 5.2 percentage points after the introduction of a new program for business formalization in Colombia.

11	Caro, L., Galindo, A., & Meléndez, M. (2012) *Credit, labor informality and firm performance in Colombia* (No. IDB-WP-325). IDB Working Paper Series.	Other comparison (comparing formal and informal firms)	Labor formality is associated with improved access to credit, and higher employment growth.
12	Cid, A., Cabrera, J. M., Bernatzky, M., Ramírez-Michelena, M., & Blanco, M. (2019) *Strategies to increase the take-up of social benefits. Evidence from a field experiment in a deeply vulnerable population* (No. 1908). Facultad de Ciencias Empresariales y Economia. Universidad de Montevideo.	Double version	See Appendix 6
13	Cotler, P. (2018) Firms Informality and Networks in Mexico: A Cross Section Analysis. *Economia*, *41*(82), 61-82.	Other intervention (impact of credit on labor tax payment) and other population (already formal firms)	The findings indicate that a fiscal and regulatory reform cutting the costs of formalization in Mexico had small effects on formalization. When cost reduction is accompanied by benefits tied to formality, formalization becomes more appealing for firms.
14	De Andrade, G.H., Bruhn, M., & McKenzie, D. (2013) *A helping hand or the long arm of the law? Experimental evidence on what governments can do to formalize firms*. The World Bank.	Other intervention (effects of inspections on trust and views of the government)	The authors conducted an experiment in Brazil to test different types of policy actions. The study found that firms formalize only if forced to do so. Although inspections increase firm formalization, they decrease trust in officers and governments.
15	De la Parra, B.S., & Bujanda, L.F. (2020) *Increasing the Cost of Informal Workers: Evidence from Mexico.* No. 2020-19.	Other outcome (effects of reform on formalization)	Increasing the costs of informal employment in the formal sector leads to a reduction of employment growth and formal employment creation. Inspections increase the probability of being formally employed.
16	Dong, S.X., Meisari, D., & Rinaldi, B. (2021) *Out of the shadow: Encouraging online registration of micro and small businesses through a randomized controlled trial.* No. 2021-05.	Other outcome (effects of reform on formalization)	Field experiment in Indonesia that informs entrepreneurs about an easy online business registration. The treatment had null effects on business formalization despite around three per cent of the entrepreneurs visiting the website. The findings imply the need to make the online registration website more user friendly.
17	Fafchamps, M., & Quinn, S. (2018) Networks and manufacturing firms in africa: Results from a randomized field experiment. *The World Bank Economic Review*, *32*(3), 656-675.	Other outcome (effects of reform on formalization)	Field experiment implemented in three African countries and exploring how social networks can affect business practices among young entrepreneurs. The treatment increased the likelihood of being registered and holding a bank account.
18	Fajnzylber, P., Maloney, W.F., & Rojas, G.V.M. (2006) *Releasing constraints to growth or pushing on a string? the impact of credit, training, business associations, and taxes on the performance of Mexican micro-firms*. The World Bank.	Other population (both formal and informal firms; formality captured by tax payment)	The authors examine the impact of participating in societal institutions on business performances. The findings indicate that firms that access credit and training and pay taxes display higher profits.
19	Fajnzylber, P., Maloney, W.F., & Montes-Rojas, G.V. (2009) Releasing constraints to growth or pushing on a string? Policies and performance of Mexican micro-firms. *The Journal of Development Studies*, *45*(7), 1027-1047.	Other population (both formal and informal firms; formality captured by tax payment)	Micro-enterprises that participate in the credit market, receive training, pay taxes and are members of associations exhibit higher profits.
20	Fandl, K., & Bustamante Izquierdo, J. (2016) Incentivizing Gray Market Entrepreneurs in	No regressions (descriptive statistics)	The study assesses the effects of the Law 1429 cutting costs of formalization in Colombia. The authors found that the

	Emerging Markets. *Northwestern Journal of International Law & Business, 37*, 415.		reform did not boost formalization as most micro-enterprises fail to formalize. Furthermore, formalization has small effects on firms' profitability.
21	Gandelman, N., & Rasteletti, A. (2017) Credit constraints, sector informality and firm investments: Evidence from a panel of uruguayan firms. *Journal of applied economics*, *20*(2), 351-372.	Other intervention (impact of credit on investment via sector formality rate) and other population (both formal and informal)	The study analyzes a panel dataset of Uruguayan formal and informal firms. The findings reveal that informality can affect the investment rate through the credit channel.
22	Jaramillo Baanante, M. (2009) *The demand for formality among informal firms. Evidences from downtown Lima*. German Development Institute Working paper No. 12/2009	No regressions (descriptive statistics) and other comparison (comparing already formal and informal firms)	Field experiment implemented in downtown Lima, Peru. The treatments encouraged 25 percent of the treated firms to formalize, which is below the expected rate. Many firms perceive more disadvantages than advantages of formalization.
23	Jaramillo, M. (2013) *Is there demand for formality among informal firms? Evidence from microfirms in downtown Lima*. Grupo de Análisis para el Desarrollo (GRADE) Research Progress Paper.	No regressions (descriptive statistics) and other comparison (comparing already formal and informal firms)	The authors exploit data from a field experiment in downtown Lima, Peru. The findings show that many firms fail to register as the costs of formalization outweigh the benefits.
24	Jouste, M., Nalukwago, M.I., & Waiswa, R. (2021) *Do tax administrative interventions targeted at small businesses improve tax compliance and revenue collection? Evidence from Ugandan administrative tax data* (No. 2021/17). WIDER Working Paper.	Other outcome (effects of reform on formalization)	The paper assesses the impact of two programs targeted to Ugandan enterprises. The efficient coordination between the two programs allowed to successfully promote both firm registration and tax compliance.
25	Kankwamba, H., & Kornher, L. (2020) Business registration and firm performance: a case of maize traders in Malawi. *Development in Practice*, *30*(7), 850-861.	No treatment and other comparison (comparing already formal and informal firms)	The study explores whether formalization is associated with higher profitability of Malawian maize traders. The results show that registered firms display four times smaller profits.
26	Kaplan, D.S., Piedra, E., & Seira, E. (2011) Entry regulation and business start-ups: Evidence from Mexico. *Journal of Public Economics*, 95(11-12), 1501-1515.	Other intervention (impact of reform cutting costs of formality on the creation of new firms) and different outcome (creation of new firms)	The study estimates the effects of a reform decreasing the costs of formalization in Mexico. The analysis indicates that the program increased the creation of new formal enterprises by 5 percentage points and did not spur firms' economic growth.
27	Lay, J., & Tafese, T. (2020) *Formalization and productivity: Firm-level evidence from Viet Nam* (No. 2020/164). WIDER Working Paper.	Other outcome (correlation between number of switchers and total formal sector productivity)	The study exploits a panel data-set of Vietnamese firms. The results show that a higher formalization rate is positively associated with the aggregated productivity level; although the effects are smaller when considering low-productive switchers.
28	Lediga, C., Riedel, N., & Strohmaier, K. (2020 What You Do (and What You Don't) Get When Expanding the Net-Evidence from Forced Taxpayer Registrations in South Africa. *Available at SSRN 3616808*.	Other intervention (effects of tax reform on tax compliance)	The paper analyzes the effects of two tax reforms implemented in South Africa. The results show that the reforms expanded the taxpayer net, but did not improve tax payment of non-compliers.
29	Malesky, E., & Taussig, M. (2009) Out of the gray: The impact of provincial institutions on business formalization in Vietnam. *Journal of East Asian Studies, 9*(2), 249-290.	Other intervention (impact of Vietnamese law on formalization) and	The authors use a panel-dataset of Vietnamese enterprises to explore whether the quality of institutions affects firms' formalization rate. The authors find that

		different outcome (formalization)	provinces with higher quality of institutions display higher formalization rates.
30	McCulloch, N., Schulze, G., & Voss, J. (2010) *What determines firms decisions to formalize. Evidence from rural Indonesia.* University of Freiburg IEP Discussion Paper, (13).	Other comparison (comparing already formal and informal firms)	The study compares formal and informal firms operating in rural Indonesia. The findings show that formalization reduces tax and corruption payments.
31	McKenzie, D., & Sakho, Y.S. (2010) Does it pay firms to register for taxes? The impact of formality on firm profitability. *Journal of Development Economics*, 91(1), 15-24.	Other comparison (comparing already formal and informal firms)	The study explores the effects of tax registration on firm' profitability in Bolivia. After comparing registered and non-registered firms, the authors found that owners of large informal firms display higher profits compared to large registered firms.
32	Monteiro, J., & Assunção, J.J. (2006) *Outgoing the shadows: estimating the impact of bureaucracy simplification and tax cut on formality and investment.* Pontificia Universidáde Católica, Department of Economics, Rio de Janeiro.	Other intervention (impact of reform simplifying registration on formalization) and other outcome (business profile before and after reform)	The study investigates the effect of the SIMPLES program simplifying business formalization in Brazil. The authors found that the program increased the formalization rate by 13 percentage points.
33	Monteiro, J. C., & Assunção, J.J. (2012) Coming out of the shadows? Estimating the impact of bureaucracy simplification and tax cut on formality in Brazilian microenterprises. *Journal of Development Economics*, *99*(1), 105-115.	Other intervention (impact of reform simplifying registration on formalization) and other outcome (business profile before and after reform)	The paper evaluates the impact of the SIMPLES program on Brazilian microenterprises. The findings indicate that formalization increased by 13 percentage points.
34	Sharma, S. (2014) Benefits of a registration policy for microenterprise performance in India. *Small Business Economics*, *42*(1), 153-164.	Other comparison (comparing already formal and informal firms)	The paper estimates the effects of a voluntary registration policy on firm performance in India. The findings indicate that registered firms display higher sales and value added per employee compared to their informal counterparts.
35	Tanaka, K. (2021) *Formal registration and informal firms in Cambodia* (No. 807). Institute of Developing Economies, Japan External Trade Organization (JETRO).	Double version	See Appendix 6
36	Tanaka, M. (2021) Formalization of manufacturing firms in Bangladesh. *Review of Development Economics*.	Other population and other outcome (characteristics of formal and informal firms)	The study explores characteristics of formal and informal manufacturing firms. The results reveal that formal firms display higher productivity and human capital, and hire more employees.
37	Siba, E. (2015) Returns to physical capital in Ethiopia: Comparative analysis of formal and informal firms. *World Development*, *68*, 215-229.	Other comparison (comparing already formal and informal firms)	The author performs a comparative analysis of formal and informal Ethiopian firms. The results show that informal firms display higher return to capital.
38	Torm, N.E. (2013) *Firms and Workers in Transition: A Series of Micro Studies on Vietnam*. Department of Economics, University of Copenhagen.	Double version	See Appendix 6
39	Tran, T.B., & La, H.A. (2020) Why Do Household Businesses Stay Informal?. In *Micro, Small, and Medium Enterprises in Vietnam* (pp. 134-157). Oxford University Press.	Double version	See Appendix 6

40	Wellalage, N.H., & Locke, S. (2016) Informality and credit constraints: evidence from Sub-Saharan African MSEs. *Applied Economics*, *48*(29), 2756-2770.	Other intervention (effects of informality on credit constraints) and other population (already formal and informal firms)	The paper conducts a cross-country analysis exploring how informality affects access to credit markets. Firm formality is positively associated with access to credit.
41	Williams, C.C., Martinez–Perez, A., & Kedir, A.M. (2017) Informal entrepreneurship in developing economies: The impacts of starting up unregistered on firm performance. *Entrepreneurship Theory and Practice*, *41*(5), 773-799.	Other comparison (comparing formal firms with other formal firms that were previously informal)	The paper conducts a cross-country analysis exploiting data from the World Bank Enterprise Survey about firms from 127 countries around the World. The results show that firms that started the business in the informal sector display higher annual sales, employment, and productivity growth rates compared to enterprises that started in the formal sector.
42	Zucco, C., Lenz, A.K., Goldszmidt, R., & Valdivia, M. (2020) Face-to-face vs. Virtual assistance to entrepreneurs: evidence from a field experiment in Brazil. *Economics Letters*, *188*, 108922.	Other outcome (effects of reform on formalization)	The authors conducted a field experiment on formalization and tax compliance in Brazil. Providing one-on-one training and assistance to formalization lead to an increase in formalization and tax compliance.

Source: Authors' elaboration.

Supplement 4: Additional Results

Table S1: Average PCC by performance indicator

Panel A: Revenues					
Method	**Effect size**	**SE**	**95% confidence interval**		**Observations**
Simple average effect	0.025	0.002	0.022	0.029	607
Weighted average	0.024	0.001	0.021	0.027	686
Panel B: Access to credit					
Method	**Effect size**	**SE**	**95% confidence interval**		**Observations**
Simple average effect	0.023	0.005	0.013	0.034	206
Weighted average	0.022	0.005	0.012	0.033	206
Panel C: Access to inputs					
Method	**Effect size**	**SE**	**95% confidence interval**		**Observations**
Simple average effect	0.039	0.009	0.022	0.057	112
Weighted average	0.034	0.007	0.020	0.048	112
Panel D: Other performance indicators					
Method	**Effect size**	**SE**	**95% confidence interval**		**Observations**
Simple average effect	0.026	0.003	0.019	0.032	407
Weighted average	0.019	0.002	0.015	0.024	407

Note: See Table 2.

Table S2: Bivariate meta-regression analysis for the FAT-PET: Jack-knife experiment

Dropped individual studies	Dropped observations	CDA		MEM		Total observations
		FAT coefficient	PET coefficient	FAT coefficient	PET coefficient	
Alcázar and Jaramillo (2016)	30	0.188	0.020***	0.347	0.020***	1,302
Benhassine et al. (2018)	108	0.377	0.020***	0.366	0.021***	1,224
Berkel (2018)	42	0.122	0.021***	0.283	0.020***	1,290
Bich and La (2018)	6	0.171	0.020***	0.287	0.020***	1,326
Boly (2015)	96	0.073	0.020***	0.467	0.016***	1,236
Boly (2018)	64	0.077	0.021***	0.239	0.020***	1,268
Boly (2020)	23	0.041	0.021***	0.099	0.020***	1,309
Campos et al. (2015)	144	0.204	0.020***	0.549	0.017***	1,188
Campos et al. (2018)	126	0.207	0.021***	0.381	0.020***	1,206
Campos et al. (2019)	33	0.198	0.021***	0.365	0.021***	1,291
de Mel et al. (2011)	29	0.179	0.020***	0.346	0.020***	1,303
de Mel et al. (2013)	27	0.195	0.020***	0.372	0.019***	1,305
Demenet (2016)	165	0.121	0.020***	0.314	0.020***	1,167
Fajnzylber et al. (2011)	156	0.679	0.011*	0.389	0.019***	1,176
Gabrieli et al. (2012)	36	0.240	0.020***	0.416	0.020***	1,296
Tanaka (2021)	35	0.180	0.02***	0.285	0.021***	1,297
McCaig and Nanowsky (2018)	130	0.249	0.020***	0.290	0.021***	1,202
McCaig and Nanowsky (2019)	42	0.219	0.020***	0.347	0.020***	1,290
Rand (2017)	8	0.177	0.020***	0.293	0.019***	1,324
Rand and Torm (2012)	14	0.162	0.020***	0.273	0.020***	1,318
Rocha et al. (2014)	12	0.199	0.020***	0.384	0.020***	1,320
Rocha et al. (2018)	6	0.180	0.020***	0.373	0.020***	1,326

Note: ***/**/* indicates statistical significance at the 1/5/10% level, respectively. All estimates use the inverse variance as weights and standard errors are clustered at the study level or by authors.

Table S3: Bivariate MRA for FAT-PET: Publication bias and true effect excluding interaction terms

Variables	(1)		(2)		(3)	
	CDA		**Wild bootstrapped**		**MEM**	
	Coefficient	*t*-value	Coefficient	*p*-value	Coefficient	*t*-value
Bias (FAT)	0.338	0.99	0.338	1.00	0.473	0.93
Genuine effect (PET)	0.020***	10.53	0.020***	0.002	0.020***	3.43
Observations	1,218		1,218		1,218	
Studies	22		22		22	

Note: See Table 3.

Table S4: Multivariate meta-regression analysis - WALS determined specific model

Moderator variables	(1) Specific	(2) CDA	(3) Wild bootstrapped	(4) MEM	(5) MEM
Genuine effect	0.108*	0.136	0.136	0.136**	0.225***
	(0.061)	(0.028)	(0.15)	(0.064)	(0.066)
Bias coefficient	0.442	0.407	0.407	0.407	-0.148
	(0.609)	(0.800)	(0.704)	(0.612)	(0.618)
Data					
No. Years	0.039***	0.043***	0.043***	0.043***	0.037***
	(0.007)	(0.008)	(0.000)	(0.007)	(0.007)
Africa	0.031**	0.041**	0.041	0.041**	0.046**
	(0.014)	(0.018)	(0.138)	(0.015)	(0.015)
Micro firm	-0.006	-0.009	-0.009	-0.009	-0.005
	(0.006)	(0.006)	(0.272)	(0.006)	(0.006)
No. Exp	-0.001	-0.001	-0.001	-0.001	-0.002**
	(0.001)	(0.001)	(0.374)	(0.001)	(0.001)
No. Obs.	-0.005	-0.007	-0.007	-0.007	-0.013**
	(0.005)	(0.007)	(0.358)	(0.005)	(0.006)
Estimation and Interventions					
Sector FE	-0.049***	-0.063**	-0.063	-0.063***	-0.064***
	(0.011)	(0.024)	(0.224)	(0.012)	(0.012)
Year FE	0.054***	0.066***	0.066*	0.066***	0.068***
	(0.010)	(0.017)	(0.062)	(0.011)	(0.011)
Market FE	-0.026***	-0.024	-0.024	-0.024**	-0.024**
	(0.009)	(0.021)	(0.534)	(0.010)	(0.010)
OLS	-0.005	-0.007	-0.007	-0.007	-0.008*
	(0.005)	(0.005)	(0.264)	(0.005)	(0.005)
Randomized experiment	-0.029*	-0.024*	-0.024	-0.024**	-0.029*
	(0.017)	(0.014)	(0.424)	(0.009)	(0.015)
Policy	-0.026**	-0.029**	-0.029**	-0.029**	-0.031**
	(0.011)	(0.024)	(0.038)	(0.011)	(0.011)
Information	0.032***	0.037***	0.040***	0.040***	0.037***
	(0.004)	(0.008)	(0.000)	(0.004)	(0.004)
Performance indicator and Specification					
Revenue	0.005**	0.005	0.005	0.005**	0.007**
	(0.002)	(0.004)	(0.506)	(0.002)	(0.002)
License	-0.016**	-0.016**	-0.016*	-0.016*	-0.021**
	(0.008)	(0.007)	(0.072)	(0.008)	(0.008)
Gender	-0.032***	-0.036***	-0.036***	-0.036***	-0.035***
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
Education	0.034***	0.036*	0.036	0.036***	0.035***
	(0.009)	(0.018)	(0.298)	(0.010)	(0.002)
Age	0.021	0.026	0.006	0.026*	0.029**
	(0.013)	(0.026)	(0.43)	(0.014)	(0.014)
Interaction terms					-0.022***
					(0.005)
Publication					
Publication year	-0.037***	-0.044***	-0.044**	-0.044***	-0.048***
	(0.010)	(0.011)	(0.02)	(0.011)	(0.011)
Observations	1,329	1,329	1,329	1,329	1,329
Studies	22	22	22	22	22

Note: The results are obtained using Eq. (5). Figures in parentheses are standard errors, except for Column (3), where *p*-values are presented. ***/**/* indicates statistical significance at the 1/5/10% level, respectively. Column (1) reports estimates using the WALS modelling approach from including all potential moderator variables in the general specification without adjusting standard errors. Following the WALS modelling, the excluded moderator variables are: log-linear specification (0.06), credit (0.33), input (0.89), registration (0.32), published (0.02), study citations (0.52) and journal impact (0.87), for which the absolute *t*-values are in all cases less than 1. For details about Columns (2) to (5) see the note to Table 5.

Table S5: Bivariate MRA for FAT-PET: Publication bias and true effect – by performance indicator

Variables	(1) CDA		(2) Wild bootstrapped		(3) MEM	
	Coefficient	*t*-value	Coefficient	*p*-value	Coefficient	*t*-value
Panel A - Revenues						
Bias (FAT)	-0.075	-0.12	-0.075**	0.05	-0.021	-0.04
Genuine effect (PET)	0.025***	5.68	0.025	0.18	0.023***	4.01
Observations	607		607		607	
Studies	18		18		18	
Panel B - Access to credit						
Bias (FAT)	0.831	1.08	0.831	1.00	0.831	1.21
Genuine effect (PET)	0.010	0.67	0.010	0.48	0.010	1.15
Observations	206		206		206	
Studies	12		12		12	
Panel C - Access to inputs						
Bias (FAT)	0.363	1.77	0.363	0.47	0.363	0.73
Genuine effect (PET)	0.024**	2.90	0.024*	0.06	0.024*	1.84
Observations	112		112		112	
Studies	5		5		5	
Panel D - Other indicators						
Bias (FAT)	0.108	0.19	0.108	1.00	0.702	0.97
Genuine effect (PET)	0.018***	3.85	0.018	0.35	0.010	1.12
Observations	407		407		407	
Studies	17		17		17	

Note: See Table 3.

Supplement 5: Detailed discussion of the additional robustness and sensitivity analyses

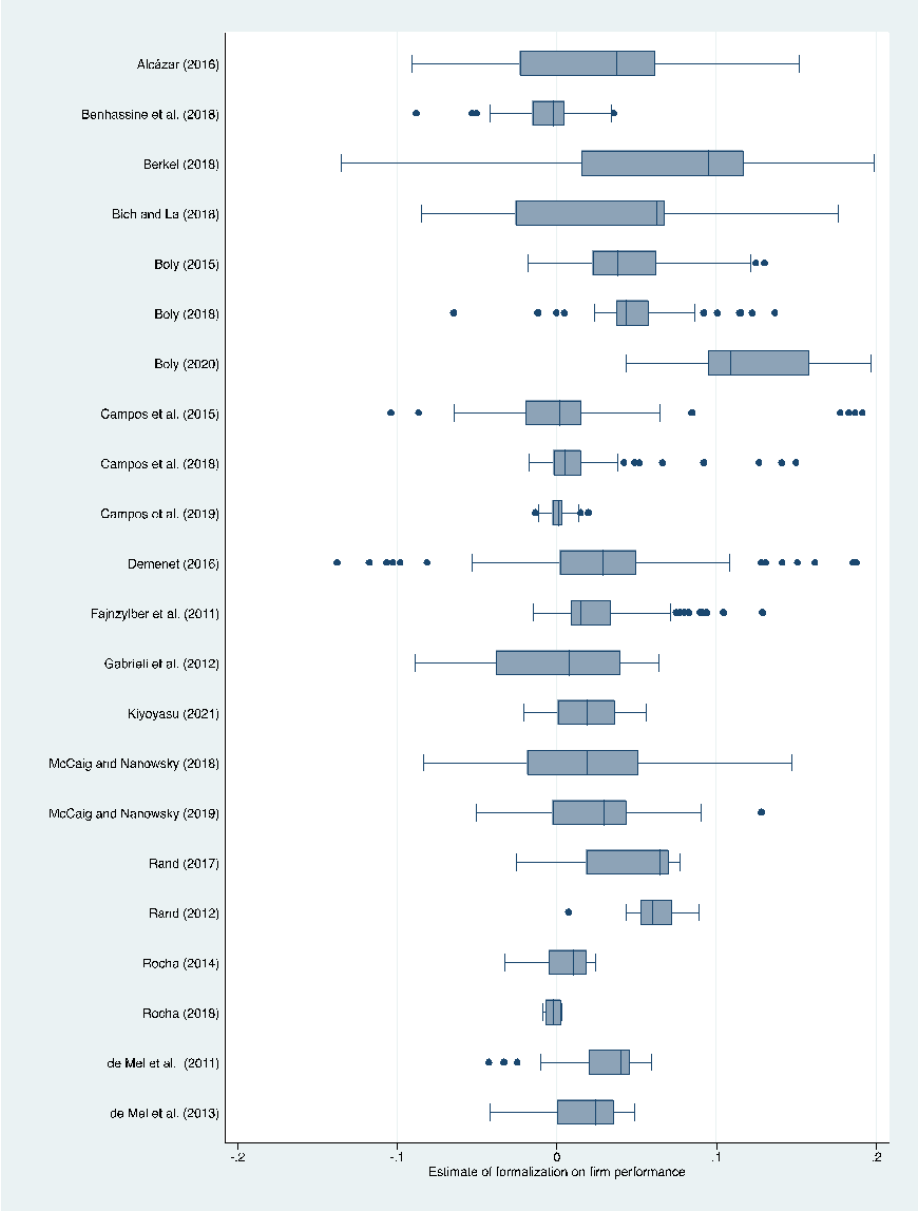
So far, we base our analysis on the G-to-S modeling approach to address modeling uncertainties on the inclusion of the moderator variables. In line with recent studies (Floridi et al., 2020), we further address this issue applying the weighted-average least squares (WALS). The focus is precision whilst the other moderator variables are auxiliary covariates that are included in the MRA when the *t*-value ≥ 1 (Magnus et al., 2010). The results presented in Table S4 (Online Supplement 4) are consistent with those presented in Table 4 except for the following two minor deviations. First, publication bias is no longer statistically significant which is consistent with the earlier identified limited selectivity (Table 4) and the lack of publication bias found in the basic FAT-PET analysis (Table 3). Second, the detected genuine effects are still positive although the statistical significance is not consistent across specifications. Importantly, the results are consistent with the MEM, which is our preferred model. As for the moderator variables, the findings are consistent with those reported in Table 4. Overall, the notion that formalization policies have at most a moderate impact on firm performance is supported.

Finally, to develop a better understanding of the type of performance indicator that shows the most impact, we carry out the analysis by type of indicator knowing that for some performance indicators the sample of primary estimates is rather small. The results are available in Tables S1 and S5 (Online Supplement 7). All average effects are positive, demonstrating that our main findings are not driven by one type of performance indicator (Table S1); the effects are largest for access to inputs and followed by revenues. Table S5 shows the FAT-PET results. The identified genuine effects and publication biases are consistent across the different specifications that we employ. Across outcome indicators the genuine effects range from an average PCC of 0.010 to 0.024. Although small, the genuine effects are statistically significant for all indicators except for access to credit. Similar to the simple average, the PET effect is again largest for access to inputs and revenues/profits. Concerning the lack of an impact on access to credit, the existing literature suggests that this finding is not unlikely. According to Joshi et al. (2014), formalization benefits firms through various transmission channels including access to credit and financial services. In turn, Bruhn and McKenzie (2014) argue that most newly formalized firms are unlikely to receive credit or government contracting, as their legal status is not the main barrier. For instance, many credit institutions ask borrowers to provide information about their accountability (via books, financial statements or earlier banking operations). Furthermore, access to credit might depend on characteristics such as the ability of the entrepreneur, gender and age (Kira and He, 2012; Fatoki and Odeyemi, 2010; Straub, 2005). Therefore, it is not unsurprising to find an insignificant average effect for access to credit.

Concerning publication bias, the FAT is positive for access to credit and access to inputs, whereas revenues and other indicators display a negative publication bias. Although the sign of the FAT changes depending on the outcome indicator, the detected publication bias is not statistically significant for any of the considered outcomes. Thus, overall the sub-sample analyses corroborate the results presented in the main FAT-PET analysis (Table 3).

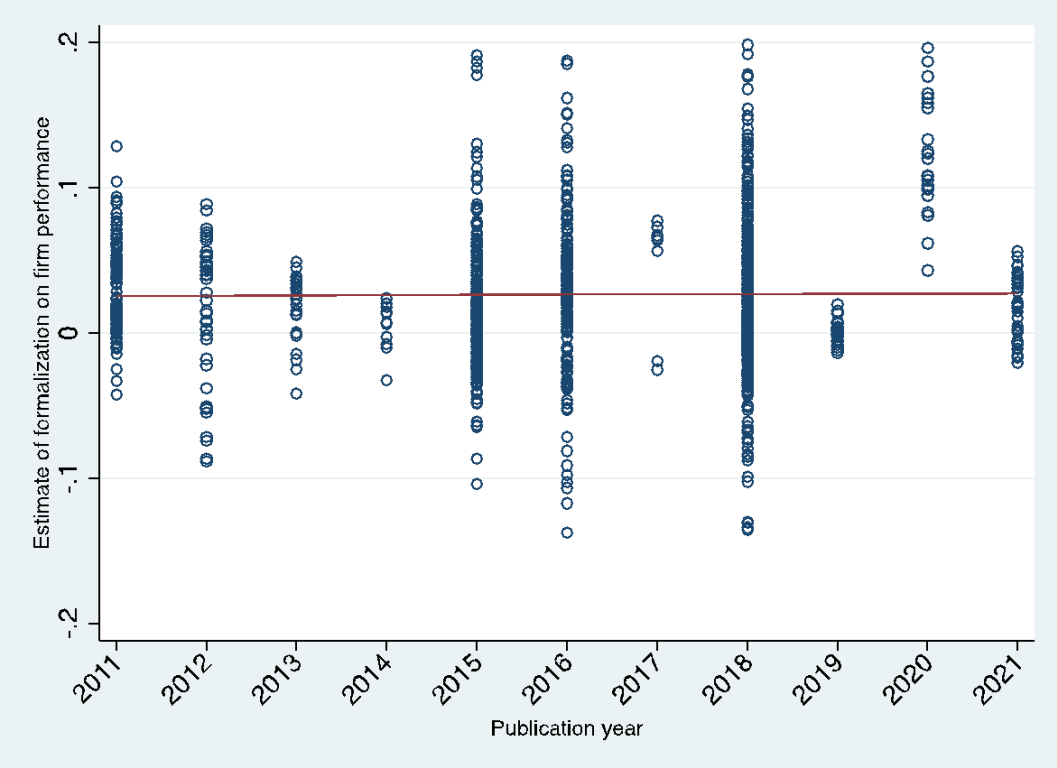
Supplement 6: Graphical representations of the key findings

Figure S1. Estimated formalization-firm performance effects vary both within and across studies



Note: The figure gives a box plot of the computed PCC from the estimated formalization-firm performance effects reported in the included primary studies that vary both within and across studies. The studies are sorted alphabetically.

Figure S2. The reported formalization-firm performance effects vary widely, but the average is constant over time



Note: The figure shows the impact of formalization on the performance of formalized firms over time: the computed PCC from the estimated formalization-firm performance effects reported in the included primary studies. In the horizontal axis, the studies are sorted by the year when the first drafts of studies appeared in Google Scholar.

Figure S1 shows graphically that most confidence intervals contain zero and thus point to null effects. Another striking feature of the existing studies on the impact of formalization on performance is that the reported estimates of the primary studies are, on average, constant over time (Figure S2, below). Thus, despite various methodological improvements, the existing evidence identifies a small positive average effect that does not even hint at the possibility of a positive trend. Moreover, the most recent studies, in particular those published in the last five years, exhibit more variation in outcomes, suggesting that instead of converging to a general consensus about the impact of formalization on firm performance, the existing interventions have not resulted in generalizable results across contexts, methods, designs and outcome indicators.