International Institute of Social Studies

Erasmus

Working Paper
No. 642

Shedding light on the shadows of informality: A meta-analysis of formalization interventions targeted at informal firms

Andrea Floridi, Binyam Afewerk Demena, and Natascha Wagner

February 2019

ISSN 0921-0210

The Institute of Social Studies is Europe's longest-established centre of higher education and research in development studies. On 1 July 2009, it became a University Institute of the Erasmus University Rotterdam (EUR). Post-graduate teaching programmes range from six-week diploma courses to the PhD programme. Research at ISS is fundamental in the sense of laying a scientific basis for the formulation of appropriate development policies. The academic work of ISS is disseminated in the form of books, journal articles, teaching texts, monographs and working papers. The Working Paper series provides a forum for work in progress which seeks to elicit comments and generate discussion. The series includes academic research by staff, PhD participants and visiting fellows, and award-winning research papers by graduate students.

Working Papers are available in electronic format at www.iss.nl/en/library

Please address comments and/or queries for information to:

Institute of Social Studies
P.O. Box 29776
2502 LT The Hague
The Netherlands

or

E-mail: wpapers@iss.nl

Table of Contents

ABSTRACT 4

1 INTRODUCTION 5

2 LITERATURE REVIEW 8

2.1 Informal firms: four competing models 8

2.2 Empirical literature about the impact of formalization policies 9

3 METHODOLOGY 12

3.1 The meta-dataset 13

3.2 Empirical approach 15

4 MAIN FINDINGS AND DISCUSSION 18

4.1 Genuine effect and publication bias 18

4.2 Accounting for heterogeneity across studies: multivariate analysis 21

4.3 Further analyses and robustness checks 24

5 CONCLUSIONS 28

REFERENCES 29

APPENDICES 29

Appendix 1: Studies included in the meta-analysis 33

Appendix 2: Additional robustness checks excluding working papers 34

Abstract

Governments and policy-makers promote formalization through various interventions ranging from simplifying registration procedures to increasing enforcement of the law. But despite various efforts, not much is known about the effects of interventions aiming at formalizing informal firms. This meta-analysis examines the empirical literature on the impact of such formalization interventions. We systematically assessed the literature on the impact of formalization policies resulting in 568 observations from 18 studies conducted by 33 researchers and published until June 2018. We analyzed the meta-impact of (i) cost, (ii) benefit and (iii) enforcement policy interventions and assessed whether the resulting outcomes are influenced by the type of data, econometric approach, and specification as well as publication bias. The findings suggest that policies increasing the benefits after formalization are associated with the highest formalization rates. Yet, the overall impact of the studied policy interventions remains weak when we control for publication quality and method heterogeneity. Overall, we only find modest evidence for increased formalization associated with the so far implemented interventions suggesting that it is high time to consider new approaches in addressing the informal economy.

Keywords

Meta-regression analysis, informal enterprises, formalization, developing countries.

Shedding light on the shadows of informality [1]
A meta-analysis of formalization interventions targeted at informal firms

1 Introduction

Since the first definition in 1973, the concepts of informal sector and informal economy have been a research concern in labor economics (Hart, 1973). However, only in the late 1980's these concepts took central stage in the debate around policy-making. The renewed attention to the informal economy led policymakers to implement policies that aim at tackling the two main components of the informal economy, i.e. informal employment and informal firms. Governments and policy-makers started including the informal economy in their agenda culminating in the explicit inclusion of informal economy and work as part of the Sustainable Development Goals. To date, there is a large variety of policies and interventions targeting the informal economy. The most common approach in policymaking is formalization (Williams and Round 2007). But policies range from improving access to credit to providing training and other business development services to informal business. Other interventions aim at strengthening the linkages between informal and formal economy.

Formalization is considered to have a positive effect on economic growth, employment creation, labor productivity, labor conditions, and social protection (International Labour Organization, 2015; Fajnzylber et al., 2011; Tijdens et al., 2015; Gatti et al., 2014). In contrast, informal economy is associated with low quality institutions (Loyaza et al. 2005). Informal enterprises are perceived as deleterious for the economy since they often underreport employment, avoid taxes, threaten formal firms by cutting costs of regulation and infringing copyrights (Schneider et al., 2011; USAID, 2005; Farrell 2004, 2008; Baily et al., 2006). Consequently, formalizing informal firms is considered as a strategic step necessary to unlock the potential economic growth, increasing competitiveness, jobs and government revenues from taxation.

Governments and policy-makers promote formalization through various interventions ranging from simplifying registration procedures to increasing enforcement of the law. The various types of interventions can be categorized into three main policy approaches: (i) cutting costs and simplifying procedures, (ii) increasing benefits, and (iii) increasing the level of enforcement and visits by officers. In addition, some interventions are accompanied by information and awareness campaigns.

[1] We thank Tom Stanley, Hristos Doucouliagos and the participants of the 2018 Meta-Analysis in Economic Research Network (MAER-Net) conference in Melbourne (Australia) for their insightful comments and discussions.

Notwithstanding the manifold efforts by policymakers to formalize the informal economy, there is still a knowledge gap concerning systematic evidence about the effects of interventions aiming at formalization. Little is known concerning firm responses to formalization policies and interventions and the literature presents contrasting evidence about their success. While meta-regression analysis (MRA) have been applied in various fields in economics, for instance in labor economics (Card and Krueger, 1995; Doucouliagos and Laroche, 2009; Grimm and Paffhausen; 2015), international economics (Iršová and Havránek, 2013; Demena, 2015; Demena and Bergeijk, 2017) and development economics (Askarov and Doucouliagos, 2015; Havránek et al., 2016), we are not aware of any meta-analysis covering the outcomes of private sector policies on the formalization of firms. There are two reviews focusing on policies that promote formalization (Bruhn and Mc Kenzie, 2014; Grimm and Paffhausen, 2015). Bruhn and McKenzie (2014) reviewed evidence about the effect of entry reforms on firms' formalization selecting nine primary studies without imposing a systematic literature search and not carrying out a meta-analysis. The authors showed that based on their selection of studies there is only a modest increase in formalization. They suggest that increased enforcement efforts could result in higher formalization rates and that there might be a fiscal benefit to formalizing large informal firms. The second study provides a systematic review that analyses the outcomes of private sector interventions on employment generation without an exclusive focus on informality (Grimm and Paffhausen, 2015); the part of the review that zooms in on informality includes five studies about interventions that promote employment formalization. Our focus is not on employment generation as in the study by Grimm and Paffhausen (2015) but on formalization policies as in Bruhn and McKenzie (2014). Compared to Bruhn and McKenzie (2014), the paper at hand expands in terms of scope and rigor of the analysis. We systematically gathered all relevant, accessible studies adding the most recent primary studies to the analysis. Moreover, we use meta-regression analysis techniques to give a quantitative appraisal of the effects of policies promoting formalization. Importantly, we exploit the heterogeneity of the existing primary studies to assess the extent to which the impact of a considered formalization policy varies depending on the chosen formality indicator, the estimation method adopted, the characteristics of the population benefitting from the intervention, and other potential sources of bias. We use meta-regression analysis to synthesize the existing evidence of reported empirical findings for a similar empirical effect, program interventions, and/or phenomenon (Stanley and Doucouliagos, 2012). Unlike the existing qualitative reviews, our meta-analysis enables us to estimate the underlying impact of interventions on formalization after quantitatively accounting for study heterogeneities and potential publication bias. With the meta-regression analysis we can rigorously disentangle the factors driving the reported impacts. To that end, we include all accessible studies published until June 2018. Our analysis rests on 568 observations from 18 econometric studies contributed by 33 researchers dealing with eight developing countries.

We jointly meta-analyze the impact of (i) costs reducing, (ii) benefit increasing, and (iii) enforcement increasing interventions that promote the formalization of informal firms. We consider it high time to produce systematic evidence across interventions to guide policy makers towards the most effective policies. To the best of our knowledge, this study represents the first meta-analysis synthesizing all existing quantitative evidence on formalization policies.

The remainder of this paper is organized as follows. Section 2 contains a review of the literature. Section 3 explains the data and empirical approach. The main findings from the meta-analysis are presented in section 4 and section 5 concludes.

2 Literature review

The process of formalization is a multifaceted phenomenon that aims at the two main components of the informal economy, namely informal firms and informal employment. The two processes of formalization of informal employment and firms are driven by different factors and therefore deserve to be explored separately. This study focuses on the formalization of informal enterprises. When considering the decision of formalizing a business, we can distinguish at least two crucial moments, the start-up phase of an enterprise and already operating informal firms. We focus on the formalization of the latter. Before, starting with the meta-analysis we briefly discuss the theoretical conceptualization of informal firms since it motivates the different policy interventions.

2.1 Informal firms: four competing models

Four main models dominate the theoretical literature concerning the decision of formalizing a business: (i) exclusion model (De Soto, 1990, 2003), (ii) rational exit model (Maloney, 2004), (iii) parasite model (Farrell, 2004, 2006, Baily et al., 2006), and (iv) dual economy model (La Porta and Shleifer, 2008, 2014).

The exclusion model argues that high costs of registration and long bureaucratic procedures prevent the participation of some firms in the formal economy (De Soto, 1990, 2003). Informal enterprises are excluded from engaging with the formal economy since they cannot afford formalization. The obvious resulting policy for promoting firm formalization is a decrease in the costs of formality. The exclusion model had great impact on policymakers including the World Bank; the World Bank promoted regulatory reforms aiming at decreasing direct costs and the time of formally starting-up a business (Bruhn and Mc Kenzie, 2013; Campos et al., 2015; 2018; De Andrade et al., 2013; La Porta and Shleifer, 2014). The World Bank's 'Doing Business Project' recorded reforms of business regulation implemented by 190 countries between 2006 and 2018. Out of the 2,783 reforms recorded in September 2018, 556 (20%) consist of simplifying registration procedures by cutting direct and indirect (time) costs. One-Stop Shop (OSS) programs are a resulting strategy for promoting firm formalization endorsed by World Bank (Campos et al., 2018).

The implementation of OSS programs has been successful in decreasing the costs of formalization; nonetheless they had limited effects on informal firms (Bruhn and Mc Kenzie, 2013; Campos et al., 2015; 2018; De Andrade et al., 2013). In some case, those policies increased the number of firms registering their business. Yet, this increase was mainly explained by the creation of new formal enterprises rather than by previously informal firms switching to formality (Bruhn, 2011; Klapper et al., 2006; La Porta and Shleifer, 2008; Parga and Mondragón-Vélez, 2008).

In contrast to the exclusion model, which associates formality mainly with excessive costs, the rational exit model incorporates both the costs and benefits of formalizing a business (Maloney 2004; Perry 2007). This model argues that entrepreneurs undertake a cost-benefit analysis about the decision to formalize. Firms operate formally when the benefits of formalizing outweigh the costs. Policies should therefore aim at concurrently decreasing costs and increasing benefits of registration; possible actions range from tax exemptions for newly registered firms, to credit facilitation and business development services.

In a completely different spirit, the parasite model argues that informal enterprises have a deleterious effect on economic growth since they decrease revenues by avoiding taxes and they unfairly compete with formal firms by saving on the costs of legalization. The parasite model ascribes the decision of (not) formalizing the business to the quality of the regulatory framework: enterprises operate informally due to the low level of enforcement and the costs of formalization (Farrell 2004, 2006; Baily et al., 2006). The main factors affecting formalization are the level of enforcement both actual and perceived. Interventions that are motivated by the parasite model increase the level of enforcement (Farrell, 2004). Policy-makers can take actions that range from awareness campaigns about the legal risks of operating informally to a higher frequency of official visits and screenings.

Finally, the dual economy model argues that informal and formal enterprises operate in two distinct spheres with informal activities not damaging formal ones (La Porta and Shleifer 2008, 2014). The model depicts informal activities as exhibiting different characteristics: informal firms are small, unproductive, run by low educated entrepreneurs, use capital and in particular external finance to a limited extent, and have different customers. The dual economy framework argues that the majority of the informal firms carry out unproductive survival activities that are likely to be crowded out following a Walmart theory of economic development that suggests growth is driven by highly productive firms and leading informal enterprises to die out (La Porta and Shleifer 2008, 2014). Informal enterprises are not responsive to formalization policies; therefore, promoters of the dual economy model suggest focusing on formal enterprises and not taking any particular action addressed to informal firms although they acknowledge that regulatory reforms might help those informal entrepreneurs who want to register their business.

2.2 Empirical literature about the impact of formalization policies

Following the theoretical debate on informal firms' formalization, in recent years researchers undertook great efforts to collect evidence about which theory best explains entrepreneurial choices regarding business registration. Existing quantitative evidence derives from impact evaluations of policy reforms and pilot experiments reporting positive as well as negative findings

depending on the design of the intervention and the implemented study design (Bruhn and McKenzie 2014).

Most micro-level studies analyze the effects of regulatory reforms cutting monetary costs and time costs (Bruhn 2011, 2013; Rothenberg 2016). The majority of the studies finds fairly small positive impacts on firm registration; only in a few cases the reduction in costs led to a significant increase in the number of businesses formalizing. The limited impact of cost reduction interventions challenges the exclusion model that argues that costs reductions stimulate business registration.

In an attempt to explore the rational exit model, other studies investigated the effects of increasing benefits on business registration. For instance, the impact of monetary incentives on the decision to formalize has been addressed (De Mel 2013; Jaramillo 2013; Fandl 2016). De Mel (2013) conducted an experiment in Sri Lanka offering monetary incentives for registration and found a large positive impact. Yet, other authors reported no significant change in firm registration after offering various monetary incentives (Jaramillo 2013; Fandl 2016).

Another group of studies investigated the parasite model by conducting field experiments with enforcement activities (De Giorgi et al. 2015, 2018; Galiani et al., 2017). De Giorgi et al. (2018) conducted an experiment in Bangladesh, where firms receive a visit by a tax officer, and found a small increase in registration. Galiani et al. (2017) employed an experimental design to assess the impact of meetings with officers from the chamber of commerce on business licensing. The positive impact of the meetings lasted only for one year as many firms failed to renew their license.

Lastly, several experimental studies compared competing models of formalization (De Andrade et al., 2014; De Giorgi et al., 2013; Galiani et al., 2017). De Andrade et al. (2014) reports that increasing enforcement is more effective compared to increasing the benefits of formalization. In similar vein, De Giorgi et al. (2013) show that firms are more likely to register if they receive information about procedures and benefits compared to firms that do not receive that information. Galiani et al. (2017) provides evidence that firms visited by officers are more likely to register compared to firms that receive information at a workshop about the costs and benefit of formalization.

Overall, the micro-economic evidence shows contrasting outcomes for similar actions that took place in different countries. In some case, scholars report different results even for the same reform; for instance, Piza (2016) demonstrated that the impact of the SIMPLES program in Brazil changed depending on whether the cutoff date in the analysis is November (Fajnzylber et al. 2011) or December (Monteiro and Assunção 2012).

A source of variation that is likely to contribute to the contrasting findings is the unobserved heterogeneity of informal firms (Berner et al. 2012; Floridi et al., 2016; Grimm et al., 2012; Williams and Round, 2007; Williams and Sahid, 2016). Berner et al. (2012) identify the existence of two types of informal activities: survival activities in the lower tier, and growth oriented activities in

the upper tier. Grimm and Knorringa (2012) add a third category represented by informal operate on small scale to avoid larger competitors and government taxes. Floridi et al. (2016) and Williams and Said (2016) focus on the existence of hybrid forms of entrepreneurs consisting of firms neither wholly formal nor wholly informal. The heterogeneity of informal firms cannot be neglected when designing formalization policies; there might be covert characteristics that affect the decision of registering a business. Indeed, some firms could be too small for bearing the costs of formalization or for benefiting from formalization. The few studies in the empirical literature that address the problem of endogeneity show that formalization results might be driven by individual firms' characteristics. Bruhn (2013) combines individual entrepreneurs and business characteristics for identifying two different species of entrepreneurs showing that they are not equally responsive to a regulatory reform cutting the costs and time of licensing. In similar spirit, Monteiro and Assunçao (2012) and Fajnzylber et al. (2011) show that simplifying procedures for registering a business in Brazil had higher impacts on retailing firms compared to firms operating in other sectors.

Evidence gathered at the macro-level suggests that the informal economy persists over time and are associated with government regulations, the tax burden, and quality of the institutions (ILO 2002, 2013; Schneider 2000, 2011; Charmes 2010; Loyaza 2005). The International Labor Organization (ILO) conducted a study showing that the size of the informal economy has increased worldwide in the two decades between 1980 and 2000 (ILO 2002). Recently, ILO published updated statistics recording a positive trend in informality for the period 2000 to 2010 as well (ILO 2013). Similarly, Charmes (2012) estimated global trends of the informal economy for the period 1980 to 2009 and found that the informal economy has constantly grown worldwide in terms of employment generation and contribution to GDP. Likewise, Schneider (2000) estimated that the informal economy has reached a considerable size globally and that the main determinants of the size of the informal economy are heavy tax burdens and social security provisions combined with government regulations. In contrast, Schneider (2011) estimated trends for 162 countries for the years 1999 to 2007 and found a negative trend. Loyaza (2005) conducted a cross-country analysis to explore the relation between the institutional framework and the size of the informal economy and found a positive relation between the size of the informal economy and corruption, and a negative relation with the quality of institutions.

Since the existing studies present a large variety of approaches and results, we consider it high time to systematically consolidate and assess the overall impact of the different policies.

3 Methodology

We collected the relevant documents from the literature following the population-intervention-comparison-outcome-population (PICOC) protocol advocated for by Petticrew and Roberts (2008); concerning the meta-analysis we applied the meta-analysis guidelines by Stanley et al. (2013). The PICOC protocol was adopted as it fits well for policy-oriented systematic reviews. Our *population* consists of informal firms; the considered i*nterventions* are various policies to stimulate the formalization of informal firms; *comparisons* between a treatment and a control group can be made and the considered *outcomes* range from registration, to license, and tax number; the *context* is worldwide, although we found only documents from Latin America, Asia, and Africa. To cover the existing literature as exhaustively as possible, we adopted several queries and alternative strategies for retrieving relevant documents. We started with an internet search using queries that consisted of the following keywords or combinations thereof: "formalization, registration, reform, or policy; informal or unregistered; and firms or enterprises". As further search strategy we used synonyms of the terms adopted in the queries. Since these simple queries resulted in a large amount of possible hits, we employed *allintex*t and *allintitle* before the query to limit the research to those documents using the exact words of the query in the text (*allintext*) or in the title (*allintitle*); for instance: "allintext: formalization firms". We included studies published until June 2018.

Selection of documents and coding have been conducted by two researchers independently to reduce bias due to human error. We searched potential studies using three main databases: Google Scholar, Scopus, and the World Bank Open Knowledge Repository. The collection of the documents followed two stages: internet search and hand searching. Hand searching was added to the internet search to include references that were found in the documents selected in the first stage.

We found 114 articles that seemed to satisfy our criteria. Among the 114 documents initially identified, none of them dates before 1992, 71% (81) came out after 2010. Hence, the empirical literature on firm formalization has a relatively recent history compared to the broader literature on the informal economy. This is not surprising since dualist models dominated the first two decades of the debate and they assumed that the informal economy was likely to disappear over time; only after the realization that the dualist view was not properly capturing the phenomenon of informality, increased attention was paid to formalization processes.

After having collected the potential primary studies, the review proceeded with the selection of articles satisfying the inclusion criteria. First, we searched for relevant information contained in the introduction and conclusions of the identified potential studies. We identified 80 articles satisfying the eligibility criteria, and 34 ineligible articles. Next, we inspected the 80 potential studies concerning their data, considered outcomes, and methods adopted leading to

the identification of 22 studies. The main reason for excluding articles is that the documents do not provide quantitative evidence. Moreover, other studies have been excluded because they analyze outcomes different from formalization of enterprises such as employment creation and profitability. Two of the 22 identified studies only contained descriptive statistics that are not suitable for the meta-analysis. Another two studies were dropped since they were unpublished or previous versions of already selected articles were the reported coefficients are identical. Following the established standards in meta-analysis we kept those working paper versions along with the published papers that report different coefficient estimates in moving from one version to the next (Polanin and Pigott, 2015; Polanin et al., 2016). We gauge the sensitivity of our results to this approach.

3.1 The meta-dataset

As discussed, the heterogeneity in formalization policies and evaluation designs is considerable and therefore it is not a straightforward task to construct the dataset for the meta-analysis. We took the following approach: Concerning study design, the selected articles adopted two types of evaluation approaches: randomized experimental approach, and non-experimental impact assessment. Furthermore, we clustered the interventions into three types of policies, i.e. (i) cost reducing, (ii) benefit enhancing, (iii) enforcement. With each type of policy we can test the empirical validity of a competing theoretical model (compare section 2.1).

The identified primary studies can be summarized mathematically in the following baseline model:

$$\boldsymbol{Y_i = \alpha + \beta_1 T1_i + \beta_2 T2_i + \beta_3 T3_i + \beta_4 X_i + \varepsilon_i} \qquad (1)$$

where *i* denotes firm, *Y* the formalization outcome, and *T1*, *T2* and *T3* are indicators for being assigned to policy 1, 2 or 3, respectively. *X* represents a vector of control variables and ε is the remaining error term.

The heterogeneity of the identified studies is also reflected in the outcome variable used to proxy for formalization. Most articles adopt either registration or licensing, while a few papers use tax registration, tax payment or provision of social security. We clustered indicators in three groups corresponding to registration, licenses, and other indicators. The main difference between registration and license is that the latter is only temporary and needs to be periodically renewed; thus, we can interpret licenses as indicator for the short-term decision to formalize, whereas registration can be understood as a proxy for the decision to formalize in the medium to long run. In this respect it is important to recognize that the proxy adopted for assessing formalization depends on the legal framework at the national and local level as based on the local context some activities do not require any license next to registration.

Next, we did not only extract data on outcome characteristics but also on sample and data features, estimation techniques, the employed specification, and publication characteristics (Table 1). Data characteristics include the number of survey rounds, the number of observations, firm type as defined by

Table 1
Definition and descriptive statistics of collected variables

Moderator Variables	Definition	Mean	Std. Dev.
	Outcome Characteristics		
E	Formalization effect size	0.01	0.63
SE	Standard error of effect size	0.08	0.41
TSTAT	Estimated *t*-stat of effect size	1.92	4.91
PCC	Partial correlation coefficient	0.04	0.09
PCCSE	Standard error of PCC	0.02	0.01
DF	Logarithm of number of degrees of freedom	8.27	1.66
No. Exp.	Number of explanatory variables included	16.92	13.73
Data Characteristics			
No. Time	Logarithm of the number of survey rounds	1.41	0.30
No. Obs.	Logarithm of number of observations	8.28	1.66
Micro firm	=1 if data come from micro firms	0.41	0.49
Small firm	=1 if data come from small firms	0.36	0.48
MSME	=1 if data used any micro, small or medium firms	0.24	0.42
Latin America	=1 if data come from Latin America	0.51	0.50
Africa	=1 if data come from Africa	0.31	0.46
Asia	=1 if data come from Asia	0.18	0.38
Estimation Characteristics			
OLS	=1 if estimation method is OLS	0.55	0.50
Year FE	=1 if year fixed effects are included	0.17	0.38
Sector FE	=1 if sector fixed effects are included	0.21	0.41
Market	=1 if market or location fixed effects are included	0.84	0.37
Econometric Approach	=1 if randomized experimental design	0.62	0.49
Intervention Policy			
Cost	=1 if intervention is reducing cost and time	0.77	0.42
Benefit	=1 if intervention is providing benefit	0.18	0.39
Enforcement	=1 if intervention is threat of punishment	0.14	0.35
Information	=1 if information is provided	0.47	0.50
Specification Characteristics			
Formal	=1 if dependent variable is measured as formalized	0.92	0.28
Registration	=1 if formalization indicator is registration	0.43	0.50
License	=1 if formalization indicator is license	0.37	0.48
Other	=1 if formalization indicator is other	0.21	0.40
Gender	=1 if gender of the business owner is included	0.28	0.45
Age	=1 if age of the business owner is included	0.24	0.42
Education	=1 if education of the business owner is included	0.26	0.44
Household	=1 if specification controls for household size	0.14	0.34
Interaction terms	=1 if coefficient comes from interaction variables	0.19	0.40
Publication Characteristics			
Publication year	Logarithm of the publication year of the study (base, 2008)	1.98	0.40
Published	=1 if published in a peer-reviewed journal	0.48	0.50
Study citations	Logarithm of citations in Google Scholar per age of the study, as of June 2018	1.41	1.07
Journal impact	Recursive journal impact factor from RePEc	0.41	0.46

the World Bank (micro, small, or medium firms), geographical region (we found studies from Latin America, Asia, and Africa). Next, we included information concerning the estimation techniques. We found four types of empirical models: (i) plain vanilla ordinary least square (OLS), (ii) models with year fixed-effects, (iii) models with sector fixed effects, and (iv) models with market fixed effects. We also have information about the study type, i.e. whether the study used a randomized controlled design. As specification features we have an indicator for registration (registration, license, others), whether the regression controls for gender, age, education, and size of the household of the business owner. In addition, we have an indicator for the presence of interaction terms. The publication characteristics include the year of publication, publication status (published vs. unpublished), number of citations, and journal impact factors.

Almost half the estimates employ registration as indicator of formality. Concerning the assessed policy type, the majority of the estimates comes from studies assessing the impact of policies cutting the costs and time needed for registration (77 %). Most studies assess micro (up to five employees) and small (between five and 20 employees) firms, while about a quarter of the studies includes all types of MSMEs. More than half of the total observations in our dataset come from studies conducted in Latin American countries, followed by Africa, and Asia. The great majority of the estimates stems from regressions that include market fixed effect.

3.2 Empirical approach

The empirical approach we employed is based on the existing MAER-Net guidelines provided by Stanley et al. (2013). The assessment follows three stages: First, we present the overall average effects without accounting for publication bias and the nature of heterogeneity in the reported estimates. In line with seminal contributions in meta-regression analysis (Doucouliagos, 2005; Havránek et al., 2016), we compute the partial correlation coefficient (PCC) to make the reported estimates comparable across the studies. We derive the PCC as:

$$PCC_{rs} = \frac{t_{rs}}{\sqrt{t^2_{rs} + df_{rs}}} \qquad (2)$$

where PCC_{rs} denotes the partial correlation coefficient between a policy/regulatory change and formalization. We measure the association in terms of direction and strength of these two variables holding other variable constant; *r* and *s* denote the reported regression specification and the primary study, respectively; t_{rs} represents the reported estimate's *t*-value and *df* are the associated degrees of freedom for each regression specification used in the primary study. Using the PCC, an arithmetic mean is computed with the invers of the variance and the number of reported estimates per study as weights.

In the second step, we use both visual and statistical analyses to investigate the possibility of publication bias and the so-called, overall genuine empirical effect. We employ the Funnel-Asymmetry Test (FAT) and the Precision-Effect Testing (PET) for performing the meta-regression analysis. We start with the funnel plot, a scatter diagram showing the estimated effects on the horizontal axis and their precision on the vertical axis. Precision is usually indicated by the reciprocal of the standard error (Stanley and Doucouliagos, 2010 and 2012; Iršová and Havránek, 2013; Demena, 2017). This graphical analysis of publication bias is subjective as it depends on visual inspection. In addition, we use a formal statistical approach derived by Card and Krueger (1995) and Stanley (2005). The test assesses whether the estimated effects are randomly distributed across the primary studies. Formally, we estimate:

$$PCC_{rs} = \beta_0 + \beta_1 SE_{pccrs} + u_{rs} \quad (3)$$

where PCC_{rs} is the measure of formalization efforts computed for the r^{th} regression specification and the s^{th} study, SE_{pccrs} denotes its standard error, β_0 the overall genuine effect and β_1 publication bias. The underlying intuition of Eq. (3) is that as the sample size increases and thus the quantity of available information increases, SE_{pccrs}will approach zero (Stanley 2005). According to Roberts and Stanley (2005) this implies that for estimates derived from larger sample sizes, PCC_{rs} will approach β_0, i.e., the underlying overall formalization efforts accounting for publication bias. Consequently, in the absence of publication bias the overall effect should vary randomly around β_0 irrespective of SE_{pccrs} (Card and Krueger, 1995; Doucouliagos and Stanley, 2009; Stanley and Doucouliagos, 2010).

Note that Eq. (3) is likely to be measured with heteroscedasticity and within-study dependence. To reduce the first problem weights are employed. Stanley and Doucouliagos (2012) suggest as weighting scheme the inverse of the variance of the estimated PCC_{rs} and thus Eq. (3) can be expressed as weighted least squares (WLS) model:

$$t_{rs} = \beta_1 + \beta_0(1/SE_{pccrs}) + e_{rs} \quad (4)$$

where t_{rs} is the t-statistic of the PCC derived from PCC_{rs}/SE_{pccrs}.

To address the second challenge associated with Eq. (3), i.e. the within-study correlation, we employ the approach chosen by the majority of the meta-analysts and apply study-level clustered standard errors.

As third step, after having detected potential biases and heterogeneity, we explore the underlying sources of heterogeneity to explain the potential reasons behind the divergent results in the reported estimates. In other words, Eq. (4) measures the average effect across the various econometric designs and publication characteristics. In the final model we include potential moderator variables as discussed in section 2 and listed in Table 1:

$$t_{rs} = \beta_1 + \beta_0(1/SE_{pccrs}) + \alpha_k X_{krs}/SE_{pccrs} + e_{rs} \quad (5)$$

where X represents the matrix of moderator variables with the inverse of the variances as weights, α_k is the vector of the associated coefficients and k refers to the specific category of the moderator variable.

To gauge the robustness of our findings, we employ three models: (i) the ordinary least squares (OLS), (ii) the mixed-effects multilevel (MEM) and (iii) the fixed effects (FE) model. But we have a clear preference for the MEM approach as it accounts for both the between and within-study dependence (Bateman and Jones, 2003; Doucouliagos and Laroche, 2009). The relevance of accounting for between-study dependence via the MEM model is widely documented in recent meta-analyses in economics (Demena, 2015; Havránek et al., 2016; Demena and Bergeijk, 2017). In additional robustness checks, we use an alternative weighting approach employing the number of reported estimates per study in order to give each study the same weight.

4 Main findings and discussion

4.1 Genuine effect and publication bias

The first and most striking result of the meta-analysis is that the considered interventions had a limited impact on the formalization of informal firms. This finding is in line with Bruhn and McKenzie (2014). Table 2 presents summary statistics of the overall impact of the various reforms and actions taken together. The simple average effect of the formalization efforts is 0.038 with a 95% confidence interval of [0.031–0.045]. This implies a positive and statistically significant impact, while at the same time indicates limited practical significance. Applying the meta-analysis guidelines by Doucouliagos (2011), a meta-regression coefficient is small if it is at most 0.07, it is of medium size if it ranges around 0.17, and large if it is at least 0.33. The summary statistics using inverse variance and frequency weights, suggest a similar picture.

Table 2
Estimates of the overall entry reforms and related policy actions (PCC)

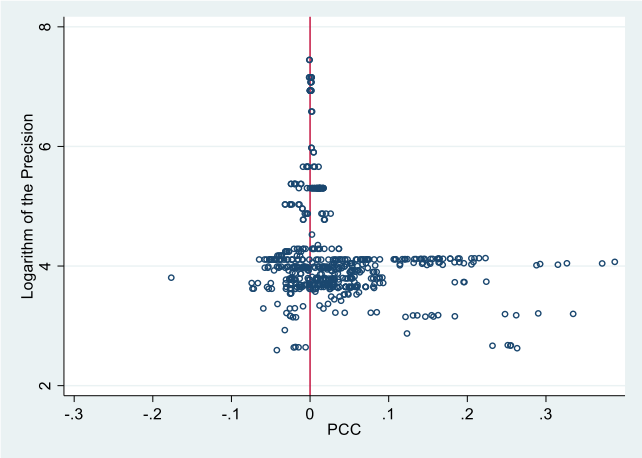
Method	Effect size	S.E	95% confidence interval	
Simple average effect[a]	0.038	0.004	0.031	0.045
Weighted average effect[b]	0.002	0.001	0.0004	0.004
Weighted average effect[c]	0.025	0.003	0.019	0.032

Note: [a]arithmetic mean of the PCC. [b]inverse variance as weight; [c]weighted by the inverse of the number of estimates reported per study.

Thus, at first glance, the data seem to suggest that the dual economy model best explains the decision of non-formalizing the business, since the model argues that informal firms are not responsive to regulatory reforms. However, this simple meta-coefficient has not yet taken into account publication bias and other source of bias.

Next we investigate whether the limited impact is affected by publication bias. We start with the visual approach making use of a funnel plot. In the absence of publication bias, the plot should be symmetrical; an asymmetrical plot suggests publication bias. We use the PCC on the horizontal axis, and the logarithm of the precision of the effect size on the vertical axis (Figure 1). The plot is slightly skewed to the bottom right of the diagram suggesting the presence of an upward bias that is in line with the small positive impact reported in Table 2.

Figure 1
Funnel plot of entry reforms and related policy actions (N=568)



Note: For an improved visualization of the funnel plot, the logarithm of the reciprocal of the SE of the PCC is denoted at the vertical axis.

As elaborated, the visual representation of the publication bias might be misleading. We therefore perform FAT and PET analyses. Table 3 presents results from the FAT-PET bivariate analysis. Across econometric methods, we consistently find upward bias as indicated by the positive and highly statistically significant coefficient estimates that range between 1.556 and 2.095. The PET test suggests a small negative and significant effect in the clustered data analysis (CDA) model, which is not identified with the other two models. Thus, the FAT test provides unanimous and the PET tests supportive evidence for the presence of a weak impact of the studied formalization interventions. As evident from the Q-test and the I^2 test reported in the note to Table 3, however, we need a multivariate MRA that controls for other sources of heterogeneity in the reported estimates (compare Section 3.1).

Table 3
Bivariate Meta-Regression Analysis for the FAT-PET

	All studies					
	CDA		**MEM**		**FE**	
Variables	Coefficient	*t*-value	Coefficient	*t*-value	Coefficient	*t*-value
Bias (FAT)	2.095***	3.12	1.556**	2.88	1.967***	21.36
Genuine effect (PET)	-0.002**	-2.29	-0.001	-0.69	-0.001	-0.55
Observations	568		568		568	
Studies	18		18		18	

Note: ***, **, * indicates significance at 1, 5 and 10%, respectively. CDA - clustered data analysis with study level clustered standard errors; MEM - mixed-effects multilevel estimates derived from restricted maximum likelihood estimation; FE - fixed-effects estimation at the study level. The test for between-study heterogeneity (Q-test) is 15587.94*** on 567 degrees of freedom with a *p*-value of less than 0.001 and the I^2 statistic (variation in reported estimates attributable to heterogeneity) is 96.4%. All estimates use the inverse variance as weights and standard errors are clustered at study level. Reported *t*-values are from cluster-robust standard errors.

Yet, before we move to the multivariate analysis, an important concern is whether the above results are subject to the number of primary studies included in the analysis. Therefore, we analyze whether our results are sensitive to the inclusion or exclusion of any specific, single study. We conduct a Jack-knife experiment re-running the same regressions as for the above FAT and PET tests but excluding one study at a time. To better visualize the reported estimates, we report only results using the CDA and MEM model. Results of the FE are available upon request, but are virtually similar. Table 4 presents the results. The two test results emulate our main findings presented in Table 3. The results are not only comparable and stable in terms of statistical significance, but also in magnitude and direction of the coefficients. This demonstrates that our results are not driven by the influence of any single study.

Table 4
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	
Benhassine et al. (2015)	60	1.734**	-0.001*	1.310**	-0.001	508
Benhassine et al. (2018)	63	1.842**	-0.001*	1.369**	-0.001	505
Bruhn (2008)	11	2.116**	-0.002*	1.556**	-0.001	557
Bruhn (2011)	9	2.118**	-0.002*	1.568**	-0.001	559
Bruhn (2013)	8	2.109**	-0.002**	1.604**	-0.001	560
Bruhn and McKenzie (2013)	32	2.363***	-0.002**	1.886***	-0.001	536
Campos et al. (2015)	54	1.671**	-0.001*	1.216**	-0.001	514
de Andrade et al. (2014)	36	2.252**	-0.002**	1.683**	-0.002	532
de Giorgi and Rahman (2013)	6	2.131**	-0.002**	1.661**	-0.001	562
de Giorgi et al. (2015)	28	2.188**	-0.002**	1.634**	-0.001	540
de Giorgi et al. (2018)	32	2.161**	-0.002**	1.589**	-0.001	536
de Mel et al. (2013)	26	2.065**	-0.002*	1.476**	-0.001	542
Fajnzylber et al. (2011)	36	2.092**	-0.002**	1.528**	-0.001	532
Galiani et al. (2017)	48	2.228**	-0.002**	1.618**	-0.001	520
Monteiros and Assuncao (2012)	33	2.157**	-0.002**	1.583**	-0.001	535
Piza (2016)	39	2.145**	-0.002**	1.564**	-0.001	529
Rocha et al. (2014)	39	2.192**	-0.002**	1.612**	-0.001	529
Rothenberg (2015)	6	2.098**	-0.002*	1.562**	-0.001	560

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

4.2 Accounting for heterogeneity across studies: multivariate analysis

As discussed, the findings presented so far might be driven by other sources of heterogeneity. In a multivariate analysis we explore these sources of heterogeneity (Table 5). Importantly, once we control for the research design and methods of the studies, we do not consistently detect publication bias. This finding is consistent with the slightly skewed funnel plot (Figure 1) and the positive coefficient estimates of the bivariate FAT (Table 3) suggesting that the heterogeneity across the primary studies accounts for the found differences rather than any systematic publication bias.

Consistent with the earlier discussion of the bivariate PET, the findings from the multivariate analysis show a small negative or weak genuine effect. Thus, study heterogeneity seems to be at the base of the weak overall finding suggesting that formalization results as depicted across studies critically depend on the choice of the research design and the methods of the primary studies. In the following section, we discuss important moderator variables in details.

Table 5
What drives the heterogeneity in the reported results:
Multivariate Meta-Regression Analysis

Moderator	1)	(2)	(3)
Variables	CDA	MEM	FE
Genuine effect (β_0)	-0.094*	-0.095	8.037*
	(0.052)	(0.062)	(2.816)
Bias coefficient (β_1)	-2.929	-2.929**	-2.793
	(2.719)	(1.030)	(4.670)
No. Exp.	0.003	0.003	0.002
	(0.004)	(0.003)	(0.004)
Data			
No. Time	0.026	0.026	-0.635
	(0.023)	(0.021)	(0.348)
No. Obs.	-0.005**	-0.005*	-0.008*
	(0.003)	(0.002)	(0.004)
Micro enterprise	-0.006	-0.006	0.911*
	(0.010)	(0.022)	(0.323)
Small enterprise	0.311**	0.311***	-12.327*
	(0.129)	(0.070)	(4.504)
Latin America	-0.008	-0.008	-3.424**
	(0.019)	(0.023)	(1.169)
Africa	-0.309	-0.309***	9.822*
	(0.185)	(0.070)	(3.452)
Estimation and Interventions			
OLS	-0.093*	-0.093***	-0.019
	(0.052)	(0.016)	(0.020)
Year FE	0.009	0.009	-0.239
	(0.035)	(0.034)	(0.221)
Sector FE	-0.133	-0.134***	0.072
	(0.082)	(0.023)	(0.131)
Market	0.029	0.029	-0.130
	(0.036)	(0.026)	(0.137)
Econometric approach	0.020	0.020	0.610*
	(0.022)	(0.031)	(0.276)
Enforcement	0.012	0.012	0.097*
	(0.030)	(0.028)	(0.054)

Benefit	0.045**	0.045***	0.062***
	(0.016)	(0.013)	(0.007)
Information	0.032	0.032	-0.016
	(0.033)	(0.018)	(0.017)
Specification			
Formal	0.179*	0.179***	-4.073*
	(0.090)	(0.036)	(1.441)
Registration	0.024	0.024***	0.011
	(0.027)	(0.007)	(0.007)
License	-0.002	-0.002	0.000
	(0.008)	(0.008)	(0.004)
Household size	0.067***	0.067**	0.032*
	(0.021)	(0.026)	(0.013)
Age	0.076*	0.076**	0.032*
	(0.036)	(0.026)	(0.013)
Gender (Female=1)	-0.057**	-0.057***	-0.025*
	(0.024)	(0.013)	(0.009)
Education	-0.020	-0.020	-0.008
	(0.021)	(0.021)	(0.009)
Interaction terms	-0.007	-0.007*	-0.007
	(0.007)	(0.003)	(0.007)
Publication			
Publication year	0.015	0.015	-0.658*
	(0.013)	(0.011)	(0.228)
Published	0.012	0.012	-5.314*
	(0.019)	(0.031)	(1.843)
Study citations	-0.004	-0.004	2.237**
	(0.009	(0.011)	(0.726)
Journal impact	-0.035**	-0.035**	-0.869**
	(0.014)	(0.011)	(0.257)
Observations	568	568	568
Studies	18	18	18

Note: The dependent variable is the partial correlation coefficient of the formalization estimates. Figures in parenthesis are standard errors. ***, **, * indicates significance at 1, 5 and 10%, respectively. Panel 1, CDA presents estimates from a clustered data analysis with study level clustered standard errors; Panel 2, MEM shows the results from a mixed-effects multilevel estimation employing restricted maximum likelihood; Panel 3, FE presents results accounting for study level fixed-effects.

We start by looking at data characteristics (Table 5). The effects on formalization vary depending on the size of the study population: coefficients derived from larger study populations tend to suggest smaller impacts on average. The finding suggests that interventions targeting smaller populations are more likely to be tailored to the specific priorities of the entrepreneurs. In the studied small scale interventions there is likely to be closer follow up and a more privileged relationship between the implementer and the informal entrepreneur. Related, the formalization effects vary depending on the type of the firms targeted: the impact on small firms is about 0.311 (p-value<0.05%) implying a large positive meta-effect according to Doucouliagos (2011). On the other hand, micro-enterprises are less responsive to formalization policies. In this regard, it is worth recalling the heterogeneity of the informal sector and the existence of at least two types of informal enterprises: namely survivalist and growth-oriented entrepreneurs (Berner et al. 2012). It is plausible that informal microenterprises are mainly engaging in survivalist activities and such survivalist micro-enterprises have too little capital for shouldering the costs of registration compared to small market oriented firms; hence small firms are more likely to formalize compared to micro enterprises. We consider these two

findings important policy results since they suggest that large-scale intervention targeting the informal sector as a whole and one fits it all approaches might not be effective.

Another source of heterogeneity is the geographic area of the implemented formalization policy. Policy interventions carried out in Africa report PCCs that are 0.309 lower compared to those derived in the Asian context. Note that one-third of the empirical estimates result from Africa. Thus, we have a decent amount of meta-effects to take the finding seriously. The result suggests that the optimal formalization policy for Africa has not yet been found. Note for example that De Giorgi et al. (2018) argue that weak state enforcement is likely to be a main explanation for informality suggesting that problems at the macro level need to be tackled first. Thus, further experimentation with different formalization policies seems to be warranted on the African continent.

Turning to the estimation characteristics, coefficient estimates derived from plain vanilla OLS models are associated with a significantly negative effect (-0.093 according to the CDA and MEM model) compared to other methods. Similarly, controlling for sector specific effects in the primary analysis is also associated with smaller evidence for the success of formalization interventions.

The multivariate analysis further shows that policies that increase the benefits of formalization are most successful. The associated PCC is 0.045 larger compared to interventions that only cut registration and other costs (according to the CDA and MEM model). This finding is in line with McKenzie and Woodruff (2006) who show that the majority of informal firms do not register because they do not perceive any benefits from formalization. Thus, the provision of benefits such as improved access to credit, greater scope of marketing, access to advertisements, as well as participation in government contracts and programs is most likely to be most successful. These results support the rational exit model as compared to the exclusion model because the former indicates the need for immediate and actual advantages of registration.

Concerning the explicit specification characteristics, if registration is chosen as formalization indicator the studies are most likely to report significant positive effects compared to other forms of formalization such as tax payment. The coefficient associated with registration is 0.024 and statistically significant at the 1% level (MEM model). Clearly, tax payments represent an additional cost for formalizing firms beyond the costs of the license or registration per se (Campos et al., 2018). Thus, expected tax payments might outweigh the benefits from formalization policies that cut the costs of formalization or increase the benefits by granting access to other services. Thus, policymakers have to bear in mind that it is likely to be counterproductive to promote an increase of tax revenues via formalization.

Furthermore, also the reported demographic characteristics of the enterprise owners, such as household size, age and gender have a systematic effect on the formalization results. For the first two moderator variables, the

effect is positive, implying that primary studies controlling for household size and age tend to report larger formalization effects. Whereas, controlling for gender, i.e. whether the enterprise owner is female, results in a smaller impact of formalization efforts.

Finally we turn to the publication characteristics. Articles published in higher impact factor journals are less likely to report a positive impact of the assessed formalization policies on the formalization decision of informal firms. This finding further explains why the upward publication bias found in the bivariate analysis disappears once we control for the moderator variables. Other moderator variables are not found to systematically influence the formalization outcome and thus their effects are considered to be non-systematic.

4.3 Further analyses and robustness checks

In addition to the analyses conducted for the sample as a whole, in this section we subdivide the sample and assess the impact per policy type. Table 6 presents the results from the FAT-PET bivariate analysis. We find that cost and enforcement policy interventions suffer from a positive and statistically significant publication bias. This finding is consistent with the one we established for the sample as a whole. The results are robust to the use of the three methods of estimation. In terms of PET, we find negative genuine effects for policies cutting the costs of registration and actions increasing enforcement, but the findings are only statistically significant for the latter.

Table 6
Bivariate Meta-Regression Analysis for the FAT-PET:
Across polices

Panel A: Cost						
Variables	**CDA**		**MEM**		**FE**	
	Coefficient	*t*-value	Coefficient	*t*-value	Coefficient	*t*-value
Bias (FAT)	1.78**	2.26	1.145*	1.91	1.68***	16.28
Genuine effect (PET)	-0.001	-0.63	-0.001	-0.42	-0.001	-0.74
Observations	438		438		438	
Studies	16		16		16	
Panel B: Benefit						
Variables	**CDA**		**MEM**		**FE**	
	Coefficient	*t*-value	Coefficient	*t*-value	Coefficient	*t*-value
Bias (FAT)	1.623***	3.62	1.623	1.10	-1.81	-0.63
Genuine effect (PET)	0.067***	4.09	0.067**	2.37	0.14**	2.36
Observations	104		104		104	
Studies	3		3		3	
Panel C: Enforcement						
Variables	**CDA**		**MEM**		**FE**	
	Coefficient	*t*-value	Coefficient	*t*-value	Coefficient	*t*-value
Bias (FAT)	1.540***	3.41	2.161***	3.49	-0.033***	-13.37
Genuine effect (PET)	-0.016**	-2.77	-0.027**	-2.20	2.284***	20.67
Observations	82		82		82	
Studies	4		4		4	

Note: See the note of Table 3 for details.

In turn, policies increasing the benefits of formalization have a statistically significant positive genuine effect of 0.067 (p-value<0.001, CDA and MEM model). These subsample analyses clearly provide further evidence in favor of policies that increase the benefits of formalization.

Next, we performed further robustness checks for the full sample. In Table 7, we run a bivariate meta-regression analysis for FAT-PET (i) using frequency weights, i.e. the inverse of the number of estimations reported per study and (ii) excluding effects from regressions with interaction variables. The findings are robust and support our main conclusions.

Table 7
Bivariate Meta-Regression Analysis for FAT-PET:
Robustness checks

Weighted by the inverse number of estimations per study						
Variables	**CDA**		**MEM**		**FE**	
	Coefficient	*t*-value	Coefficient	*t*-value	Coefficient	*t*-value
Bias (FAT)	1.157*	1.87	1.157*	1.87	-0.705	-1.51
Genuine effect (PET)	0.004	0.40	0.004	0.40	0.039***	4.43
Observations	568		568		568	
Studies	18		18		18	
Excluding interaction terms						
Variables	**CDA**		**MEM**		**FE**	
	Coefficient	*t*-value	Coefficient	*t*-value	Coefficient	*t*-value
Bias (FAT)	2.741**	2.72	2.143**	2.73	2.546***	30.55
Genuine effect (PET)	-0.003**	-2.24	-0.001	-0.76	-0.001	-0.74
Observations	458		458		458	
Studies	18		18		18	

Note: See the note of Table 3 for details.

Next, in Table 8, we report results of the multivariate meta-regression analysis using unweighted estimates (Columns 1-3) and weighted estimates based on the inverse of the number of estimations reported per study to give each study the same importance rather than weighting by the inverse of the variance (Columns 4-6). Overall, the results corroborate the main findings reported in Table 5. There are two exceptions: (i) combining the policy interventions with information campaigns is identified as having a partial effect for the unweighted estimates and (ii) the OLS estimation approach does no longer yield different outcomes.

Table 8
Source of heterogeneity: Robustness check

Moderator	(1)	(2)	(3)	(4)	(5)	(6)
Variables	**CDA**	**MEM**	**FE**	**CDA**	**MEM**	**FE**
Genuine effect (β_0)	0.049	0.100	0.331	-0.080	-0.080	0.147
	(0.166)	(0.129)	(0.214)	(0.09)	(0.09)	(0.09)
Bias coefficient (β_1)	-3.298	-3.126**	-2.992	-2.261	-2.261	-1.088
	(3.347)	(1.251)	(3.646)	(1.99)	(1.94)	(1.72)
No. Exp.	-0.017	-0.015	-0.003	-0.002	-0.002	0.014
	(0.019)	(0.013)	(0.014)	(0.02)	(0.02)	(0.01)
Data						
No. Time	0.037	-0.007	-0.065***	0.051	0.051	-0.065***
	(0.045)	(0.036)	(0.004)	(0.04)	(0.03)	(0.002)
No. Obs.	-0.018	-0.022*	-0.032	-0.006	-0.006	-0.010
	(0.017)	(0.009)	(0.028)	(0.01)	(0.01)	(0.01)
Micro	0.038	0.060		0.041*	0.041*	
	(0.049)	(0.055)		(0.02)	(0.02)	
Small	0.303*	0.337***		0.266*	0.266*	
	(0.176)	(0.086)		(0.15)	(0.15)	
Latin America	-0.005	-0.010		-0.006	-0.006	
	(0.053)	(0.050)		(0.02)	(0.02)	
Africa	-0.227	-0.283***		-0.181	-0.181	
	(0.211)	(0.085)		(0.15)	(0.15)	
Estimation and Interventions						
OLS	-0.031	-0.018	-0.014	-0.028	-0.028	-0.015
	(0.023)	(0.014)	(0.013)	(0.02)	(0.02)	(0.01)
Year FE	0.037	0.094*	0.084*	0.016	0.016	0.058*
	(0.042)	(0.039)	(0.043)	(0.02)	(0.02)	(0.03)
Sector FE	-0.096*	-0.102***	-0.057	-0.077*	-0.076*	-0.040
	(0.053)	(0.028)	(0.034)	(0.04)	(0.04)	(0.03)
Market	-0.008	0.018	0.021	-0.000	-0.000	-0.015
	(0.036)	(0.028)	(0.026)	(0.03)	(0.02)	(0.02)
Econometric approach	0.021	0.014		0.006	0.006	
	(0.023)	(0.037)		(0.02)	(0.02)	
Enforcement	0.034	0.054*	0.073***	0.034	0.034	0.072***
	(0.025)	(0.024)	(0.017)	(0.03)	(0.03)	(0.01)
Benefit	0.061**	0.071***	0.075***	0.074**	0.074**	0.092**
	(0.019)	(0.011)	(0.018)	(0.03)	(0.03)	(0.03)
Information	0.004	0.031*	0.044***	-0.003	-0.003	0.044***
	(0.025)	(0.017)	(0.007)	(0.03)	(0.03)	(0.01)
Specification						
Formal	0.147	0.132**	0.059	0.098	0.098	0.018
	(0.114)	(0.041)	(0.101)	(0.08)	(0.07)	(0.05)
Registration	0.052	0.077***	0.092	0.021	0.021	0.063
	(0.054)	(0.011)	(0.072)	(0.03)	(0.03)	(0.06)
License	-0.003	-0.018	-0.030	0.004	0.004	-0.027
	(0.016)	(0.013)	(0.023)	(0.01)	(0.01)	(0.03)
Household size	0.013	0.031	0.037***	0.029**	0.029***	0.036***
	(0.017)	(0.008)	(0.024)	(0.01)	(0.01)	(0.01)
Age	0.115*	0.114***	0.059	0.082*	0.082**	0.051*
	(0.049)	(0.032)	(0.029)	(0.04)	(0.04)	(0.03)
Gender (Female=1)	-0.023*	-0.024*	-0.025	-0.034**	-0.034**	-0.038**
	(0.013)	(0.012)	(0.013)	(0.01)	(0.01)	(0.02)
Education	-0.001	0.003	0.006	-0.009	-0.009	-0.001
	(0.011)	(0.018)	(0.007)	(0.01)	(0.01)	(0.01)
Interaction terms	-0.092***	-0.095***	-0.098**	-0.063**	-0.063**	-0.071**
	(0.026)	(0.008)	(0.025)	(0.03)	(0.03)	(0.03)

Publication						
Publication year	-0.005	-0.006		0.008	0.008	
	(0.030)	(0.028)		(0.01)	(0.01)	
Published	-0.017	-0.063		0.004	0.004	
	(0.038)	(0.052)		(0.02)	(0.02)	
Study citations	0.017	0.036		0.002	0.002	
	(0.024)	(0.023)		(0.01)	(0.01)	
Journal impact	-0.039*	-0.074*		-0.045*	-0.045**	
	(0.023)	(0.035)		(0.02)	(0.02)	
Observations	568	568	568	568	568	568
Studies	18	18	18	18	18	18

Note: See the note of Table 5 for details. Columns 1-3 show unweighted results; Columns 4-6 employ frequency weights, i.e. the inverse of the number of estimates per study as weights.

Finally, in the Appendix we present additional analyses and robustness checks. According to Stanley and Doucouliagos (2012), the *same* reported estimates from the same author(s) using the same data as previously published in an earlier version of a paper should be excluded from the analysis. In our case, we identified three papers published in peer-reviewed journals from the same authors with *different* reported estimates compared to the previously published working papers. Due to the differences across versions we include both the working paper and the peer-reviewed paper in our main analysis, as the *same* authors use similar data but produced *different* estimates. Yet, to assess the robustness of our results, we exclude the three working papers. This results in a drop in observations from 568 to 469. Results are presented in the Appendix. In Table 1A we present the estimates of the overall entry reforms. Results are almost identical to those presented in Table 2. In Table 2A we show the bivariate meta-regression analysis for the FAT-PET again corroborating our earlier findings presented in Table 3. Finally, in Table 3A we present the heterogeneity analysis, which is again supporting the earlier drawn conclusions.

5 Conclusions

The empirical literature providing evidence on the formalization of informal firms is limited and recent. We retrieved the relevant documents using the PICOC protocol (Petticrew and Roberts, 2008), and analyzed the studies performing a meta-regression analysis based on the MAER-Net guidelines (Stanley et al., 2013). We identified a total of 18 primary studies that empirically assess the impact of policy interventions on the formalization of informal firms. The first study was published in 2008 suggesting that only recently scholars and policymakers have started assessing quantitatively which type of intervention works best to achieve the formalization of informal firms. Therefore, we consider it important to consolidate the existing evidence and draw some first lessons learned. If the current trend in testing formalization interventions continues we can expect that the number of studies per year increases further and the topic gains further importance. This is desirable since there are evident gaps: currently the literature on formalization interventions mainly focuses on Latin American (51%) and African countries (31%).

What can be concluded so far? The meta-analysis reveals that currently a wide range of policies and interventions is put in place to promote the formalization of informal firms. The most popular interventions are (i) cost and time reducing, (ii) benefit increasing and (iii) enforcement increasing. We found a very modest genuine effect across all three types of interventions suggesting that in practical terms the interventions implemented so far had hardly any impact on firm formalization. At a first glance, this finding seems to suggest that informal firms are insensitive to formalization policies, which is consistent with theoretical considerations such as the dual economy model (La Porta and Shleifer 2008; 2014). However, when accounting for the different types of formalization policies, the results suggest a more nuanced picture: interventions increasing the benefits of formalization tend to have positive effects compared to the other two types of interventions. Thus, restricting the sample according to the type of policy implemented, the rational exit model (Maloney 2004) seems to best explain the decision of formalizing a business. The findings are robust to various tests, and different regression methods using alternative weights.

Based on these meta-results we can draw the following initial conclusions for policy making. First, the limited impact of policies seeking formalization strongly challenges the formalization paradigm and underlines the need for elaborating new policies that might even be different from systematic formalization. The current evidence suggests that if we subscribe to the principle of promoting informal firms' registration, policies increasing benefits should be the intervention of choice. Policies based uniquely on increasing enforcement are particularly discouraged, since they even decrease formalization rates. Second, concerning the different types of formality indicators, the meta-analysis indicates that firm registration is likely not the most suitable tool for promoting tax compliance and increasing tax revenues.

Third and most importantly for governments that aim at implementing formalization policies at large scale, the type of the target population plays a key role in determining the success of the interventions: small enterprises are more likely to respond positively to external interventions compared to micro enterprises. Therefore, tailoring policies to the priorities of the target groups is key for interventions to be effective. Policymakers who are in need of quick fixes should focus on interventions that increase the benefits of formalization and if possible try to design new policies that go beyond the formalization of informal entrepreneurs. A first step could be to strengthen the existing links between the formal and informal economy (Guha-Kasnobis et al., 2007). In this perspective, involving informal actors in the policymaking process could be a feasible choice for designing tailored policies and for elaborating innovative strategies addressed to informal entrepreneurs. In similar vein, new policy reforms and additional field experiments testing innovative interventions might help bring further light to the shadows of informality.

References

Askarov, Z. and H. Doucouliagos (2015) 'Development aid and growth in transition Countries', *World Development*, 66: 383-399.

Baily, M., D. Farrell and J. Remes (2006) 'The hidden key to growth', *The International Economy*, 20(1): 48.

Berner, E., Gomez, G., and P. Knorringa (2012) 'Helping a large number of people become a little less poor: The logic of survival entrepreneurs', *The European Journal of Development Research,* 24(3): 382-396.

Bruhn, M. (2011) 'License to sell: the effect of business registration reform on entrepreneurial activity in Mexico', *Review of Economics and Statistics*, 93(1): 382-386.

Bruhn, M. (2013) 'A tale of two species: Revisiting the effect of registration reform on informal business owners in Mexico', *Journal of Development Economics*, 103: 275-283.

Bruhn, M. and D.J. McKenzie (2014) 'Entry regulation and formalization of microenterprises in developing countries', *World Bank Research Observer*, 29: 186–201.

Campos, F., M.P. Goldstein and D.J. McKenzie (2015) *Short-term impacts of formalization assistance and a bank information session on business registration and access to finance in Malawi (English)*, Impact Evaluation series; Policy Research Working Paper; no. WPS 7183. World Bank Group. Washington DC.

Campos, F., Goldstein, M., and D. McKenzie (2018) *How Should the Government Bring Small Firms into the Formal System? Experimental Evidence from Malawi (English)*, Policy Research Working Paper; no. WPS 8601. World Bank Group. Washington DC.

Card, D. and A.B. Krueger (1995) 'Time-series Minimum-wage Studies: A Meta-Analysis', *American Economic Review*, 85(2): 238-243.

Charmes, J. (2012) 'The Informal Economy Worldwide: Trends and Characteristics', *Margin: The Journal of Applied Economic Research* 6(2): 103-132.

De Andrade, G.H., M. Bruhn and D. McKenzie (2014) 'A Helping Hand Or the Long Arm of the Law? Experimental Evidence on what Governments can do to Formalize Firms', *The World Bank Economic Review* 30(1): 24-54.

De Giorgi, G., and A. Rahman (2013) 'SME's Registration: Evidence from an RCT in Bangladesh.' *Economics Letters* 120.3 (2013): 573-578.

De Giorgi, G., Ploenzke, M., and A. Rahman (2018) 'Small Firms' Formalisation: The Stick Treatment', *The Journal of Development Studies,* 54(6): 983-1001.

De Soto, H. (1990) 'The Other Path: The Invisible Revolution in the Third World'. Basic Books, New York

De Soto, H. (2003) 'Mystery of Capital: Why Capitalism Triumphs in the West and Fails Everywhere Else'. Basic books, New York.

De Mel, S., McKenzie, D., and C. Woodruff (2013) 'The demand for, and consequences of, formalization among informal firms in Sri Lanka', *American Economic Journal: Applied Economics*, 5(2): 122-50.

De Vries, G.J. (2010). 'Small retailers in Brazil: Are formal firms really more productive?', *Journal of Development Studies*, 46(8): 1345-1366.

Demena, B.A. (2015) 'Publication bias in FDI spillovers in developing countries: a meta-regression analysis', *Applied Economics Letters*, 22(14): 1170-1174.

Demena, B.A. (2017) Essays on Intra-Industry Spillovers from FDI in Developing Countries: A Firm-Level Analysis with a Focus on Sub-Saharan Africa. PhD diss., Erasmus University, The Hague.

Demena, B.A., and P.A. van Bergeijk (2017) 'A meta-analysis of FDI and productivity spillovers in developing countries', *Journal of Economic Surveys*, 31(2): 546-571.

Doucouliagos, C. (2005) 'Publication bias in the economic freedom and economic growth Literature', *Journal of Economic Surveys*, 19(3): 367-387.

Doucouliagos, H. and P. Laroche (2009) 'Unions and Profits: a meta-regression Analysis', *Industrial relations: A Journal of Economy and Society*, 48(1): 146-184.

Doucouliagos, H. and T.D. Stanley (2009) 'Publication selection bias in minimum-wage research? A meta-regression analysis', *British Journal of Industrial Relations*, 47(2), 406-428.

Doucouliagos, H. (2011) How large is large? Preliminary and relative guidelines for interpreting partial correlations in economics. School Working Paper no. SWP 2011/5, Economics Series. Deakin University. Victoria, Australia.

Doucouliagos, C. and T.D. Stanley (2013) 'Are all economic facts greatly exaggerated? Theory competition and selectivity. *Journal of Economic Surveys*, 27(2): 316-339.

Fajnzylber, P., W.F. Maloney and G.V. Montes-Rojas (2011) 'Does Formality Improve Micro-Firm Performance? Evidence from the Brazilian SIMPLES Program', *Journal of Development Economics* 94(2): 262-276.

Fandl, K. J., and J. Bustamante Izquierdo (2016) 'Incentivizing Gray Market Entrepreneurs in Emerging Markets', *Northwestern Journal of International Law & Business* 37(3).

Farrell, D. (2004) 'The Hidden Dangers of the Informal Economy', *McKinsey Quarterly:* 26-37.

Farrell, D. (2006) 'Tackling the Informal Economy', *Business Week*, May 10(3): 262-276.

Floridi, A., Wagner, N., and J. Cameron (2016) '*A study of Egyptian and Palestine trans-formal firms–A neglected category operating in the borderland between formality and informality*', ISS Working Paper Series/General Series, 619: 1-25.

Galiani, S., M. Meléndez and C.N. Ahumada (2017) 'On the Effect of the Costs of Operating Formally: New Experimental Evidence', *Labour Economics* 45: 143-157.

Gatti, R., D.F. Angel-Urdinola, J. Silva and A. Bodor (2014). 'Striving for Better Jobs: The Challenge of Informality in the Middle East and North Africa'. Directions in development; human development. Washington DC. World Bank Group.

Grimm, M., Knorringa, P., and J. Lay (2012) '*Constrained gazelles: High potentials in West Africa's informal economy*'. World Bank Working Paper. World Bank, Washington DC.

Grimm, M., and A.L. Paffhausen (2015) 'Do interventions targeted at micro-entrepreneurs and small and medium-sized firms create jobs? A systematic review of the evidence for low and middle income countries' *Labour Economics*, 32: 67-85.

Guha-Khasnobis, B., R. Kanbur and E. Ostrom (2007) *Linking the Formal and Informal Economy: Concepts and Policies,* Oxford University Press. Oxford.

Hart, K. (1973) 'Informal Income Opportunities and Urban Employment in Ghana', *Journal of Modern African Studies* 11(01): 61-89.

Havránek , T., Horvath, R., and A. Zeynalov (2016) 'Natural resources and economic growth: A meta-analysis' *World Development*, 88: 134-151.

International Labour Organization (2015) 'Recommendation no. 204 Concerning the Transition from the Informal to the Formal Economy', International Labour Organization, Geneva.

International Labour Organization (2002) 'Women and Men in the Informal Economy', International Labour Organization, Geneva.

International Labour Organization and WIEGO (2013) 'Women and Men in the Informal Economy: A Statistical Picture. Second Edition', International Labour Organization, Geneva.

Iršová, Z. and T. Havránek (2013) 'Determinants of Horizontal Spillovers from FDI: Evidence from a large Meta-Analysis', *World Development*, 42: 1-15.

Jaramillo, M. (2013). '*Is there demand for formality among informal firms? Evidence from microfirms in downtown Lima'*. Discussion Paper no. Avances de Investigaciones 13. GRADE Group for the Analysis of Development. Lima, Peru.

Klapper, L., Laeven, L., and R. Rajan (2006) 'Entry regulation as a barrier to entrepreneurship', *Journal of Financial Economics*, 82(3): 591-629.

La Porta, R. and A. Shleifer (2008) '*The unofficial economy and economic development*' Working Paper no. W14520. NBER Working Paper Series. National Bureau of Economic Research. Cambridge.

La Porta, R. and A. Shleifer (2014) 'Informality and Development', *Journal of Economic Perspectives* 28(3): 109-126.

Loayza, N., A.M. Oviedo and L. Serven (2005) '*The Impact of Regulation on Growth and Informality Cross-Country Evidenc*e', World Bank Policy Research Working Paper (3623).

Maloney, W.F. (2004) 'Informality Revisited', *World Development* 32(7): 1159-1178.

Monteiro, J.C. and J.J. Assunção (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.

Parga, X. P., and C. Mondragón-Vélez (2008) '*Business Ownership and Self-Employment in Developing Economies: The Colombian Case*.'. Documentos CEDE 004672, Universidad De Los Andes-Cede. Bogota.

Petticrew, M. and H. Roberts (2008) *Systematic Reviews in the Social Sciences: A Practical Guide*. John Wiley & Sons.

Perry, G. E., Arias, O., Fajnzylber, P., Maloney, W. F., Mason, A., & Saavedra-Chanduvi, J. (2007). 'Informality: Exit and Exclusion'. World Bank Latin American and Caribbean studies. World Bank. Washington DC.

Piza, C. (2016) '*Revisiting the Impact of the Brazilian SIMPLES Program on Firms*'

Formalization Rates, Policy Research Working Paper 7605, World Bank Group.

Polanin, J.R. and T.D. Pigott (2015) 'The use of meta-analytic statistical significance testing', *Research Synthesis Methods* 6: 63–73.

Polanin, J.R., Tanner-Smith, E.E., and E.A. Hennessy (2016) 'Estimating the Difference Between Published and Unpublished Effect Sizes: A Meta-Review', *Review of Educational Research* 86(1): 207–236.

Rand, J. and N. Torm (2012) 'The Benefits of Formalization: Evidence from Vietnamese Manufacturing SME's, *World Development* 40(5): 983-998.

Roberts, C. and T.D. Stanley (2005) *Meta-regression analysis: issues of publication bias in economics*, Wiley-Blackwell: London.

Rocha, R., Rachter, L., and G. Ulyssea (2014). '*Do entry regulation and taxes hinder firm creation and formalization? Evidence from Brazil*'. Discussion Paper no. 11. Instituto de Economia, Universidade Federal Do Rio de Janeiro. Rio de Janeiro, Brazil.

Rothenberg, A.D., Gaduh, A., Burger, N.E., Chazali, C., Tjandraningsih, I., Radikun, R., Sutera, C. and S. Weilant (2016) 'Rethinking Indonesia's informal sector'. *World Development*, 80: 96-113.

Schmidt, F.L., and J.E. Hunter, (2014) *Methods of meta-analysis: Correcting error and bias in research findings*, Sage publications.

Schneider, F., A. Buehn and C.E. Montenegro (2011) 'Shadow Economies all Over the World: New Estimates for 162 Countries from 1999 to 2007', Handbook on the shadow economy: 9-77.

Schneider, F. and D. Enste (2000) '*Shadow Economies Around the World-Size, Causes, and Consequences'*. IMF Working Paper no. WP/00/26. International Monetary Fund. Washington DC.

Stanley, T.D. (2001) 'Wheat from chaff: meta-analysis as quantitative literature review', *The Journal of Economic Perspectives*, 15(3): 131-150.

Stanley, T.D. (2005) 'Beyond publication bias', *Journal of Economic Surveys*, 19(3): 309-345.

Stanley, T.D. and H. Doucouliagos (2010) 'Picture this: a simple graph that reveals much ado about research', *Journal of Economic Surveys*, 24(1): 170-191.

Stanley, T.D. and H. Doucouliagos (2012) *Meta-Regression Analysis in Economics and Business*, Oxford: Routledge.

Stanley, T.D., H. Doucouliagos, M. Giles, J.H. Heckemeyer, R.J. Johnston, P. Laroche and K. Rost (2013) 'Meta-Analysis of Economics Research Reporting Guidelines', *Journal of Economic Surveys*, 27(2), 390-394.

Tijdens, K., J. Besamusca and M. Van Klaveren (2015) 'Workers and Labour Market Outcomes of Informal Jobs in Formal Establishments. A Job-Based Informality Index for Nine Sub-Saharan African Countries', *European Journal of Development Research* 27(5): 868-886.

USAID (2005) '*Removing Barriers to Formalization. The Case for Reform and Emerging Best Practices'*. Policy Report. USAID. Washington DC.

Williams, C.C. and J. Round (2007) 'Re-thinking the Nature of the Informal Economy: Some Lessons from Ukraine', *International Journal of Urban and Regional Research* 31(2): 425-441.

Williams, C.C., and M.S. Shahid (2016) 'Informal entrepreneurship and institutional theory: explaining the varying degrees of (in) formalization of entrepreneurs in Pakistan', *Entrepreneurship & Regional Development*, 28(1-2): 1-25.

Appendices

Appendix 1: Studies included in the meta-analysis

Benhassine, N., McKenzie, D., Pouliquen, V., and M. Santini (2018) 'Does inducing informal firms to formalize make sense? Experimental evidence from Benin', *Journal of Public Economics*, 157: 1-14.

Benhassine, N., McKenzie, D., Pouliquen, V., and M. Santini (2015) '*Finding a path to formalization in Benin: early results after the introduction of the entreprenant legal status*.' Policy Research Working Paper; no. WPS 7510. World Bank Group. Washington DC.

Bruhn, M. (2008) '*License to sell: the effect of business registration reform on entrepreneurial activity in Mexico'*. Policy Research Working Paper; no. WPS 4538. World Bank Group. Washington DC.

Bruhn, M. (2011) 'License to sell: the effect of business registration reform on entrepreneurial activity in Mexico', *Review of Economics and Statistics*, 93(1): 382-386.

Bruhn, M. and D.J. McKenzie (2013) 'Using administrative data to evaluate municipal reforms: an evaluation of the impact of Minas Fácil Expresso'. *Journal of Development Effectiveness*, 5(3): 319-338.

Campos, F., M.P. Goldstein and D.J. McKenzie (2015) *Short-term impacts of formalization assistance and a bank information session on business registration and access to finance in Malawi (English)*, Impact Evaluation series; Policy Research Working Paper; no. WPS 7183. World Bank Group. Washington DC.

De Andrade, G.H., M. Bruhn and D. McKenzie (2014) 'A Helping Hand Or the Long Arm of the Law? Experimental Evidence on what Governments can do to Formalize Firms', *The World Bank Economic Review* 30(1): 24-54.

De Giorgi, G., and A. Rahman (2013) 'SME's Registration: Evidence from an RCT in Bangladesh' *Economics Letters* 120.3 (2013): 573-578.

De Giorgi, G., Ploenzke, M., and A. Rahman (2015) '*Small Firms' Formalization: The Stick Treatment*'. The World Bank. Policy Research Working Paper; no. WPS 7318. World Bank Group. Washington DC.

De Giorgi, G., Ploenzke, M., and A. Rahman (2018) 'Small Firms' Formalisation: The Stick Treatment', *The Journal of Development Studies*, 54(6): 983-1001.

De Mel, S., McKenzie, D., and C. Woodruff (2013) 'The demand for, and consequences of, formalization among informal firms in Sri Lanka', *American Economic Journal: Applied Economics*, 5(2): 122-50.

Fajnzylber, P., W.F. Maloney and G.V. Montes-Rojas (2011) 'Does Formality Improve Micro-Firm Performance? Evidence from the Brazilian SIMPLES Program', *Journal of Development Economics* 94(2): 262-276.

Galiani, S., M. Meléndez and C.N. Ahumada (2017) 'On the Effect of the Costs of Operating Formally: New Experimental Evidence', *Labour Economics* 45: 143-157.

Monteiro, J.C. and J.J. Assunção (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.

Piza, C. (2016) '*Revisiting the Impact of the Brazilian SIMPLES Program on Firms' Formalization Rates*,' Policy Research Working Paper 7605, World Bank Group.

Rocha, R., Rachter, L., and G. Ulyssea (2014) '*Do entry regulation and taxes hinder firm creation and formalization? Evidence from Brazil*'. Discussion Paper no. 11. Instituto de Economia, Universidade Federal Do Rio de Janeiro. Rio de Janeiro, Brazil.

Rothenberg, A. D., Gaduh, A., Burger, N. E., Chazali, C., Tjandraningsih, I., Radikun, R., Sutera,C. and S. Weilant (2016) 'Rethinking Indonesia's informal sector' *World Development*, 80: 96-113.

Appendix 2: Additional robustness checks excluding working papers

Table 1A
Estimates of the overall entry reforms – a robustness checks

Method	Effect size	S.E	95% confidence interval	
Simple average effect[a]	0.035	0.004	0.027	0.043
Weighted average effect[b]	0.002	0.001	0.0003	0.004
Weighted average effect[c]	0.024	0.004	0.017	0.031

Note: See the note of Table 2 for details.

Table 2A
Bivariate Meta-Regression Analysis for the FAT-PET – a robustness checks

	All studies					
	CDA		**MEM**		**FE**	
Variables	Coefficient	*t*-value	Coefficient	*t*-value	Coefficient	*t*-value
Bias (FAT)	1.837***	2.59	1.376**	2.39	1.714***	18.62
Genuine effect (PET)	-0.002*	-1.80	-0.001	-0.60	-0.001	-0.52
Observations	469		469		469	
Studies	15		15		15	

Note: ***, **, * indicates significance at 1, 5 and 10%, respectively. CDA - clustered data analysis with study level clustered standard errors; MEM - mixed-effects multilevel estimates derived from restricted maximum likelihood estimation; FE - fixed-effects estimation at the study level. The test for between-study heterogeneity (Q-test) is 12846.96*** on 468 degrees of freedom with a *p*-value of less than 0.000 and the I^2 statistic (variation in reported estimates attributable to heterogeneity) is 96.4%. All estimates use the inverse variance as weights and standard errors are clustered at study level. Reported *t*-values are from cluster-robust standard errors.

Table 3A
What drives the heterogeneity in the reported results:
Multivariate Meta-Regression Analysis – a robustness checks

Moderator Variables	(1) CDA	(2) MEM	(3) FE
Genuine effect (β_0)	-0.215	-3.019***	-3.184***
	(0.247)	(0.690)	(0.255)
Bias coefficient (β_1)	-2.580	14.933	-25.079***
	(2.428)	(12.949)	(1.871)
No. Exp.	0.004	-0.002	-0.004
	(0.007)	(0.003)	(0.004)
Data			
No. Time	-0.029	-0.038	-0.027
	(0.020)	(0.067)	(0.031)
No. Obs.	-0.004**	-0.006*	-0.005***
	(0.003)	(0.003)	(0.001)
Micro enterprise	-0.004	0.176**	0.185***
	(0.040)	(0.077)	(0.053)
Small enterprise	0.504***	9.224***	9.535***
	(0.156)	(1.068)	(0.714)
Latin America	0.038	1.597***	1.661***
	(0.046)	(0.234)	(0.136)
Africa	-0.349*	-4.092***	-4.261***
	(0.163)	(0.739)	(0.508)
Estimation and Interventions			
OLS	-0.015	-0.001	-0.000
	(0.017)	(0.016)	(0.002)
Year FE	-0.001	0.069	0.072*
	(0.043)	(0.052)	(0.040)
Sector FE	-0.072*	-0.056	-0.058
	(0.042)	(0.044)	(0.037)
Market	0.004	0.035	0.041
	(0.021)	(0.039)	(0.035)
Econometric approach	-0.069**	0.098	0.101***
	(0.031)	(0.081)	(0.277)
Enforcement	0.076***	0.032	0.030***
	(0.021)	(0.029)	(0.004)
Benefit	0.057***	0.057***	0.057***
	(0.006)	(0.011)	(0.004)
Information	0.034***	-0.034**	-0.035***
	(0.009)	(0.013)	(0.001)
Specification			
Formal	0.209***	2.202***	2.278***
	(0.064)	(0.328)	(0.216)
Registration	0.033	0.008*	0.008
	(0.038)	(0.004)	(0.005)
License	-0.007	0.002	0.003
	(0.012)	(0.005)	(0.002)
Household size	0.046**	0.029	0.029***
	(0.018)	(0.023)	(0.001)
Age	0.075*	0.012	0.001
	(0.039)	(0.020)	(0.010)
Gender (Female=1)	-0.069**	-0.017*	-0.016
	(0.032)	(0.010)	(0.009)

Education	-0.008	0.007	0.007**
	(0.007)	(0.017)	(0.002)
Interaction terms	-0.008	-0.009***	-0.011
	(0.010)	(0.002)	(0.014)
Publication			
Publication year	0.057	-0.335	-0.331***
	(0.098)	(0.244)	(0.095)
Published	0.012		2.785***
		2.663***	
	(0.042)	(0.423)	(0.309)
Study citations	0.029	-0.308*	-0.342**
	(0.031)	(0.175)	(0.133)
Journal impact	-0.164***	-2.894***	-2.949***
	(0.046)	(0.117)	(0.048)
Observations	469	469	469
Studies	15	15	15

Note: See the note of Table 5 for details.