

WORKING PAPER

# **The labyrinth of the informal economy: measurement strategies and impacts**

Víctor Adame and David Tuesta

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### Summary

One of the factors that is cause of the greatest upheaval to a country' s economic prospects is the substantial presence of the informal economy. Bearing in mind that the areas of causality underlying this problem can be traced back to multidimensional origins, the aim of this paper is to articulate a detailed statistical approach that enables us to identify the significance of such factors by examining key econometric strategies and availing ourselves of several different samples for over 160 countries. The empirical findings underline the importance of the legal framework and government efficiency as stand-out influential factors in terms of the size of the underground economy. We furthermore explore the role of the tax authorities in the informal economy, which is an aspect that has not been sufficiently covered by in the literature, particularly in relation to indirect taxes on consumption. Moreover, the paper contributes by applying estimates that are based on a sample that is considerably larger than those that have been used in other articles on this issue, while also using estimates that are founded on two separate datasets.

**Key words:** Informality, informal economy

**JEL classification:** O17, E26.

## 1. General considerations

Informality is becoming established as one of the biggest burdens on the emerging economies and a reliable reflection of the weakness of the social contract and growth potential. The harmful effects on taxability, contributions to the social security system, the penetration of financial markets and the subsequent impacts on productivity have been amply witnessed in coverage of the subject (Levy, 2008; Tanzi & Zee, 2000). According to Elgin & Oztunali (2012), – one of the databases used in this study, Eastern Europe shows the highest levels of the informal economy, averaging some 40.2%. This is closely followed by Africa and LatAm at 40% and 39.2%. Conversely, the OECD countries indicate an informal economy of 19% on average.

According to the literature on this subject, the factors underlying informality are multidimensional, with origins that can be grouped into institutional, social and economic aspects. It is along these lines that this paper intends to pursue a statistical analysis based on panel data to find patterns that enable identification of the variables that are the most relevant and have the biggest impact with respect to the size of the informal economy.

Following this introductory part, the second section reviews the most significant work on the set of problems associated with informality. The third section describes the data and the econometric approach. The principal empirical findings are presented in the fourth section, and lastly the fifth section sets out the most significant conclusions.

## 2 Current state of the debate

From reviewing the literature one concludes that there are several paths that explain the levels of informality in countries. The purest vision of a frictionless market where decisions depend wholly upon economic agents goes back to the ideas of Smith (1776) with derivatives towards the works of Rosen (1981), Carneiro, Heckman & Vitlacil (2001), where individuals based on their talents and human capital, as well as the comparative advantages of companies, determine equilibrium for workers in the various different areas of the economy. Thus, depending on the characteristics typical of their kinds of productivity, preferences are established for different types of employment (Galiani & Weinsehelbaum, 2006; Straub, 2005; Amaral & Quentin, 2006).

Then, as we progress towards more realistic market situations, where regulation and the presence of the State start to intervene, we can group together prospects which underline the relative significance of excessive taxation and social security burdens on decisions to belong to the formal sector. This becomes clearer when such tax burdens have an impact on low productivity workers or economic units which are not absorbed by the formal economy or decide not to be a part of it (Dell'Anno, 2007; Loayza, 1999; Mortensen and Pissarides, 1994; Levy, 2008).

The problem of economies which have a substantially large informal sector also tends to be attributable to the barriers imposed on the functioning of the labour market, which gnaws away at the freedom for demand and supply in the employment market to interact. These barriers ultimately lead to an increase in labour costs in the formal economy, which acts as a spur to relationships of this kind ending up in the informal world. This means that those sectors with a high degree of regulation that hampers the smooth working of the labour market ultimately produce higher levels of

informality which are hard to allay through efforts to control this (Johnson, Kaufmann & Shleifer, 1997; Johnson, Kaufmann & Zoido-Lobaton, 1998). Associated with this, cost models for searching and finding in the labour market can further complicate conditions for a formal economy to flourish, thereby making the productivity and cost problems facing companies more acute (Mortensen & Pissarides, 1994; Bosch & Maloney, 2005).

Informality can also be due to inconsistency between the low quality of institutions and excessive regulation for the functioning of the economy (De Soto, 2002; Kucera & Roncolato, 2008; Loayza, 1999). All of this is likely to entail a situation where there are disincentives to acting within the confines of formality since the confidence of citizens in the State and its institutions is undermined (Feld & Frey, 2007; Kirchler, 2007).

Another aspect points to the importance of State control activity to avoid informality. Fighting tax evasion and overseeing compliance with regulation on production and recruitment in association with penalties for failure to comply are held to be key to putting off economic units from deciding not to participate in the formal economy (Andreoni et al, 1998; Pedersen, 2003). Besides, the existence of certain economic activities is also associated with the presence of a higher degree of informality, as is the case with agricultural activities, given their strong links with the rural environment and the limited presence of the State in most emerging economies (Vuletin, 2008; De la Roca et al, 2002; Amendola & Dell'Anno, 2012).

Furthermore, the economic literature has also approached the issue of informality from two general standpoints: the structuralist and the institutional schools of thought. The structuralist trend stresses that informality arises as an effect of the modern sector's poor ability to provide jobs that are adequate and sufficient for the relatively unqualified workforce. The need to come by resources to survive drives individuals into informality and characterises the informal sector as somewhere to take refuge. This view thus examines the factors that bring about a mismatch between the labour supply and demand which is caused by the economy's low level of industrial development. The elements that explain such dysfunctionality relate to structural factors of the economy itself, such as marginality, poverty, low productivity and lack of qualification of individuals, and restrictions on access to credit. This is also identified as so-called "informality by exclusion", i.e. the factors are exogenous to individuals which force them into such a situation (Hart, 1973; Tokman, 1992; Fajnzylber & Perry, 2007).

The institutional approach, on the other hand, accounts for informal activities as being a consequence of the legal barriers that exist in the modern sector of the economy. According to De Soto (2009), North (1990) and Williams & Horodnic (2015) informal employment is a result of rigid and incorrect economic regulation, i.e. a scenario where a society's formal frameworks are incapable of leaving any room for the natural informal relations that exist. At the same time, State inefficiency, in both providing services and benefits (Maloney, 2004) and its efforts to supervise markets, helps to create a setting in which individuals perform a cost/benefit analysis and voluntarily decide whether or not to comply with the legal rules (Uribe & Ortiz, 2008; Maloney, 2004). This approach is heavily based on how companies function and takes account of the whole function of costs such as taxes, labour costs, environmental regulations, different payment of public services etc., and sets these in relation to the gains which the company would obtain in a formal environment. From this point of view informal activities have no reason to necessarily belong to low value-added traditional sectors in isolation, but rather can also be part of the most modern sector (Portes & Benton, 1984),

such as certain branches of the services sector. This strand of the literature is identified as informality due to exit according to Fajnzylber & Perry (2007).

The different approaches to what determines informality lead us to examine the subject from a multidimensional view. For the purposes of making headway into this apparent “labyrinth” of cause and effect relationships within this set of problems and identifying the most significant effects, we posit a methodological strategy which we now go on to outline in detail from the next section onwards.

### 3 Data and econometric methodology

The data on the shadow economy has been drawn from two separate sources. The first of these is from the study by Buehn & Schneider (2011) and includes information for 162 countries and a timeframe of nine years, 1999-2007. Buehn & Schneider (2011) use the statistical technique of unobserved variables, where they relate informality to a set of observable variables using the information provided by the covariance matrix. The unobservable variable is linked to the indicator variables selected in a factor analytical model (i.e. a measurement model). Specifically they use a MIMIC model (Multiple Indicators Multiple Causes) for their empirical analysis. According to Breusch (2005), this model is supposed to be inappropriate for the proposed study. Moreover, the authors are aware of the limitations of the methodology used, since there is no clear differentiation between the causal variables which have a direct bearing on the level of informality and the indicator variables where the shadow economy is reflected. Despite all of this, Buehn & Schneider (2011) propose a model which includes several variables instead of using more limited approaches, as had been regularly done in the literature, which were mainly based on an approach focussing on currency demand, electricity consumption or surveys and where achieving a considerable time scale is difficult.

The second source is from Elgin & Oztunali (2012), where the level of informality is estimated for 161 countries and for a time-period of 60 years, 1950-2009. Elgin & Oztunali (2012) put forward a new approach based on micro-foundations and avoiding ad hoc econometric specifications and assumptions. They estimate informality in the economy using a simple deterministic dynamic general equilibrium (DGE) model with two sectors (formal and informal). Even taking account of all of this, they make the assumption that the level of productivity exclusive to informal sector technology grows with respect to the mean growth rate of the household’s stock of capital and the gain in productivity exclusive to formal sector technology. Since this parameter has to be calculated, they choose the value required for their results to coincide with those of Schneider *et al.* (2010) in 2007.

Although estimated informality differs between both studies, when the datasets are compared we observe that they are mostly in keeping with each other and report very similar estimates. Furthermore, because we have quite a large sample, we restrict the datasets so that all the pairs of observations are no more different than  $\pm 5 p.p.$  Thus the final sample (Table 1) is restricted to a total of 1,102 observations for both samples and for an identical period (1999-2007).

**Table 1** Estimated size of the informal economy in the studies

<b>Dataset</b>	<b>Period</b>	<b>Sample</b>	<b>Obs.</b>	<b>Mean</b>	<b>Std. Dev.</b>	<b>Min.</b>	<b>Max.</b>
<b>Elgin &amp; Oztunali (2012)</b>	1999-2008	Complete	1,320	31.634	13.245	8.080	75.420
	1999-2007	Restricted	1,102	31.751	13.085	8.100	70.820
<b>Buehn &amp; Schneider (2011)</b>	1999-2007	Complete	1,134	32.632	13.406	8.100	68.300
	1999-2007	Restricted	1,102	32.172	13.222	8.100	67.700

To evaluate the determinants of informality as well as the robustness of the results and the conclusions from them, the informality levels estimated by Buehn & Schneider (2011), and Elgin & Oztunali (2012) are suggested as explained variables. Table 2 shows the estimated mean size of the underground economy as a percentage of official GDP by geographical areas (restricted sample):

**Table 2** Size of the informal economy by geographical area

<b>Dataset</b>	<b>Region</b>	<b>Mean</b>
<b>Elgin &amp; Oztunali (2012)</b>	Africa	39.595
	Asia	26.280
	Eastern Europe	40.177
	OECD	18.980
	South and Central America	39.237
<b>Buehn &amp; Schneider (2011)</b>	Africa	39.955
	Asia	26.726
	Eastern Europe	40.184
	OECD	18.955
	South and Central America	40.680

As can be seen, the post-socialist economies of Eastern Europe and the economies in South and Central America show the highest levels of informality in contrast to the economies in the Organisation for Economic Co-operation and Development (OECD).

To explain the determinants of informality we identify a vast set of potential explanatory variables in keeping with the different approaches set out in the review of the literature we carried out in the previous section. For the sake of

making the number of variables to include in the regressions more manageable, we have set up various indices which help to reduce the scale of the data using the statistical technique of synthesis that is widely used and known as “principal component analysis”, or PCA (see Wold et al., 1987; and Jolliffe, 2002). On top of this we offer a set of tests of robustness in the results where we include the sub-indices and variables of the composite indicators.

### 3.1. Regulation and legal framework index

We use the regulation and legal framework index as a key source to gauge the quality of governments. This is constructed using citizens’ perceptions as regards their level of confidence in government institutions, while it also takes account of the strength of legal rights and the quality of judicial proceedings. The data has been collated by the World Bank and is among the indicators of Good Governance for 1998-2015.

**(I) Regulatory Quality:** this captures views on the government’s ability to formulate and implement sound policies and regulations that enable and foment the development of the private sector.

**(II) Rule of Law:** this reflects the confidence of social actors in the particular society’s rules and regulations, especially when it comes to the quality of contract performance, property rights, the police and the courts, as well as the likelihood of crime and violence.

**(III) Voice and Accountability:** captures perceptions of the extent to which the citizens of a country can participate in choosing their government, as well as freedom speech, freedom of association and free media.

**(IV) Strength of Legal Rights:** measures the degree to which the laws on security interests in movable property and insolvency protect the rights of borrowers and lenders, thereby making lending smoother. For each economy an analysis is first made of whether a single unified system exists for secured transactions. Afterwards two scenarios are used, scenario A and scenario B, to determine how a non-possessory security right is created, publicised and made to be complied with according to the law.

**(V) Quality of Legal Proceedings:** this evaluates whether the countries have adopted a set of good practices within their judicial system in four separate areas: courts structure and judicial proceedings, handling of lawsuits, automation in courts and alternative dispute settlement arrangements

### 3.2 State Effectiveness Index

We use the State Effectiveness Index as another key determinant in evaluating the capacity and independence of governments. This is constructed using citizens’ perceptions as regards their level of confidence in the degree of autonomy governments have when put under any kind of pressure. The data has been collated by the World Bank and is among the indicators of Good Governance for 1998-2015.

**(I) Control of Corruption:** this captures views on the extent to which the public authorities act with the goal of obtaining private gain, including minor and major forms of corruption, as well as the degree of domination of the State by the elites and private interests.

**(II) Government Effectiveness:** this reflects the perception of the quality of public services, the quality of the performance of public duties and their independence from political pressures, the quality of the formulation and implementation of policies and the credibility of the government's commitment to them.

### 3.3. Ease of doing business index

We use the Ease of Doing Business Index as a factor in determining the degree of over-regulation regarding the requirements for starting up a company. This is constructed based on the number of formal procedures, time, costs and requirements for starting up in business. The data has been collated by the World Bank within its Doing Business project and features information available for 2004-2017.

**(I) Number of Procedures:** procedures required to open a business, this process being defined as any dealings by the company's founders with third parties (government bodies, lawyers, auditors or notaries public).

**(II) Time to Open:** this measure concerns the average time in days which lawyers that specialise in starting up companies or notaries public estimate is required in practice to complete the mandatory procedures, with a minimum of follow-up in relation to the public bodies and without having to make exceptional payments.

**(III) Opening Costs:** this is posted as a percentage of income per capita in the economy and includes the official rates and fees for legal or professional services if required by law or if they are commonly used in practice.

**(IV) Capital Requirements:** reflects the minimum sum which a business owner needs to deposit in a bank or before a notary public before the registration and up to three months after the incorporation of a company. This is calculated as a percentage of income per capita in the economy.

### 3.4. Labour market rigidities index

We use the employment rigidities index as a determinant of the level of flexibility in employment regulation. Specifically it relates to recruitment under contract and work hours. This is constructed using a maximum of time and any temporary contracts that exist, as well as days worked and bonus payments for night-time work. The data has been collated by the World Bank within its Doing Business project and features information available for 2014-2017.

**(I) Temporary Contracts:** fixed-term contracts are forbidden for ongoing assignments.

**(II) Maximum Time in Temporary Contracts:** maximum cumulative duration of fixed-term contracts

**(III) Days worked per Week:** the maximum number of workdays allowed in the week.

**(IV) Restriction on Night-time Work:** workers receive an over-time bonus for carrying out night-time work (calculated as a percentage of salary per hour worked) and whether there are restrictions on this.

**(V) Holidays:** Regulation of days of holiday per week.



### 3.5. Index of labour costs for business owners

We use the index of costs to business owners as a determinant of the financial burden which the business owner has to bear in taking on workers formally under contract. This is constructed using welfare benefits such as paid holidays, paid days off on maternity leave or the amount of the minimum wage. The data has been collated by the World Bank within its Doing Business project and features information available for 2014-2017.

**(I) Paid Holidays:** average paid holiday per year for workers who have been in service for one, five and ten years.

**(II) Minimum Full-Time Wage:** minimum wage for a person aged 19 with one year's experience.

**(III) Maternity Leave:** minimum duration of paid maternity leave (in calendar days).

**(IV) Trial Period:** maximum duration of trial period (in months) for full-time employees.

We additionally include a set of determinants that could be linked as regards the informality levels in economies<sup>1</sup>, such as: the self-employment level (% of overall employment), direct tax pressure (% of corporate income tax and minimum and maximum rate on labour income), indirect pressure as measured by value added tax (VAT), days of severance compensation for dismissal (workers with over 10 years of service at the company), the percentage of temporary jobs (% of total employment), the level for the middle class (wealth of between 10,000 and 1,000,000 dollars), and the tax burden.

The regressions also contain several control variables, including factors such as economic inequality as measured using the Gini index, GDP per capita in log form, the unemployment level (% of the working population), agriculture's contribution to GDP, and the proportion of the urban population (% of overall population), as well as two dummy variables which differentiate the level of development of economies and the geographical location of countries.

### 3.6. Econometric methodology

Firstly, to check on whether the factors proposed as determinants of informality influence it, we propose a pooled model (a constant coefficients model) which does not pick up on the heterogeneity among countries and/or the time attributable to unobservable variables:

$$y_{it} = \alpha_{it} + \beta_k x_{kit} + u_{it}, \quad u_{it} \sim N(0, \sigma_u^2)$$

where  $x_{kit}$  is a vector containing  $k$  variables,  $\beta_k$  is a vector of  $k$  parameters, and  $i$  and  $t$  refer to countries and time respectively. The  $\alpha_{it}$  parameter reflects the heterogeneity prompted by country/time effects, this being constant for all countries and years, while  $\alpha_{it} = \alpha$ , or, what amounts to the same, there are no individual effects. The parameters are estimated using simple ordinary least squares (OLS) linear regression, as illustrated in Table 3.

The drawback with this model is that it does not pay due attention to the panel structure of data, and moreover the assumptions used are easily picked apart and might not stand up to the hypothesis of no autocorrelation between the

<sup>1</sup>: The appendix to the document offers a table which relates the sources of information with the variables in the study (Table A1).

disturbances. Applying the Breusch-Pagan test we examine whether the estimated variance of the residuals from the OLS pooled regression depends on the values of the variables that are held to be independent. The Breusch-Pagan/Cook-Weisberg test analyses the null hypothesis that the error variances are equal,  $H_0 = \sigma_i^2 = \sigma^2$  para todo  $i$ , as opposed to the alternative that the error variances are a multiplicative function of one or more variables. Were the assumption not to be correct, it could be that the variance had a linear correlation with the independent variables. On top of this we implement a White test which is a more general statistical verification to detect heteroscedasticity in linear regression models. In both cases the null hypothesis of homoscedasticity is rejected (regressions 7 and 14 of Table 3), so the variance of disturbances is not constant (see Table A2 of the Appendix).

An additional way to rule out the pooled model for panel data is by testing the hypothesis that there are no random effects by using the Breusch-Pagan test, which is a Lagrange multiplier test. The null hypothesis is that it is a pooled model, versus the alternative of random effects. Under the normality hypothesis the statistic is defined as:

$$LM = \frac{NT}{2(T-1)} \left( \frac{\sum_{i=1}^N (\sum_{t=1}^T e_{it})^2}{\sum_{i=1}^N \sum_{t=1}^T e_{it}^2} - 1 \right)^2 \sim \chi_1^2$$

The null hypothesis in this test is  $H_0 = \sigma_u^2 = 0$ . If the test is discarded, there is a difference between the pooled model and the random effects model and it is preferable to use the random effects method. Again, the null hypothesis is ruled out, so the correct model to be estimated is the random effects one. Furthermore, the  $F$  test of the significance of fixed effects suggests to us that both the random effects model and the fixed effects model are more efficient than the pooled model.

To determine whether the model to be estimated is a fixed effects or random effects one we use the Hausman test, where the test statistic is:

$$(\hat{\beta}_{fe} - \hat{\beta}_{re})' [Var(\hat{\beta}_{fe}) - Var(\hat{\beta}_{re})]^{-1} (\hat{\beta}_{fe} - \hat{\beta}_{re}) \sim \chi_k^2$$

The answer depends on the potential correlation between the individual error component  $u_i$  and the explanatory variables. The random effects model assumes that such a correlation equals zero, but if  $u_i$  and the explanatory variables are correlated, then not including  $u_i$  in the model will give rise to excluded variable bias in the estimated coefficients. Using the Hausman test we examine the null hypothesis that  $u_i$  and the explanatory variables are not correlated. Here the null hypothesis in the test is that the estimators of random effects and fixed effects do not differ significantly. If  $H_0$  is discarded, then the estimators are different, so using fixed effects rather than random effects is more appropriate. On the other hand, if we cannot reject  $H_0$ , there is no bias to worry about and using random effects becomes preferable, which is a more efficient model. According to the results of the test, the null hypothesis cannot be discarded (see Table A2 in the Appendix), so the right model is the random effects one. In the random effects model the y-intercept,  $\alpha_{it}$ , is assumed to be a random variable. If one assumes that  $\alpha_{it}$  can be decomposed into a constant part,  $\alpha$ , and another, random part,  $\varepsilon_i$ , which we assume is dependent on the  $i$ -th country yet is constant time-wise, so:

$$\alpha_{it} = \alpha + \varepsilon_i$$

Then the correct model to be estimated is a random effects model such that:

$$y_{it} = \alpha_{it} + \beta_k x_{kit} + u_{it} = \alpha + \varepsilon_i + \beta_k x_{kit} + u_{it} = \alpha + \beta_k x_{kit} + w_{it}$$

where the two unobservable terms are pooled in  $w_{it} = \varepsilon_i + u_{it}$ . Additionally, the random disturbances in the model are assumed to satisfy the basic hypotheses:

$$\varepsilon_i \sim N(0, \sigma_\varepsilon^2),$$

$$u_{it} \sim N(0, \sigma_u^2).$$

where  $\varepsilon_i$  represents the disturbances for the cross-sectional data and  $u_{it}$  are the disturbances for the combination of time series and cross-sectional data. In such a case the disturbances are homoscedastic since:

$$E(w_{it}^2) = \sigma_\varepsilon^2 + \sigma_u^2$$

OLS estimation of the model is likely to be inefficient since it presents auto-correlated disturbances. To put this problem right we need to estimate the model using Generalized Least Squares (*GLS*). *GLS* is used when the variances of observations are unequal, i.e. when there is heteroscedasticity, or when there is some degree of correlation between the observations.

Estimation using fixed effects and random effects models is an essential point but they need to be completed to the extent that this is possible in order to evaluate the direction of causality between the level of informality and the regulatory quality that stands out as the principal explanatory factor.

The standard technique for correcting endogeneity is to use the two-stage least squares method. Two-stage least squares regression uses instrumental variables that do not correlate with the error terms to calculate the estimated values of the problematic predictors (first stage) and then these calculated values are used to estimate a linear regression model for the dependent variable (second stage). Given that the values calculated are based on variables that have no correlation with the errors, the results from the two-stage model are optimal. This does, however, call for appropriate instruments to be identified. A sound instrumental variable should correlate very closely with the endogenous independent variable that it replaces and should not have a direct influence on the dependent variable (informality). As Torgler & Schneider (2009) note, selecting the right instruments for institutions has not been dealt with very extensively in the literature. The more recent studies stress the importance of taking account of historical and geographical characteristics of countries as instrumental variables, given that they exert an influence via their impact on the institutional and political environment. Studies such as those made by David and Brierly (1985), La Porta *et al.* (1999) and Alesina, *et al.* (2003) offer wide-ranging set of factors to consider, such as the latitude, ethnic fragmentation, language, religion or legal origins. In our case we have opted for the following instruments: legal origins (English, French, socialist, German and Scandinavian), the latitude of the capital (in absolute values), religion (Catholic, Orthodox and Protestant Christians, and Muslims) and the legal system (Anglo-Saxon law or continental European law). Thus, to evaluate the direct effect of the regulatory framework, which considers variables concerning

institutional quality, on the size of the informal economy we propose a more thorough investigation to tackle potential problems of causality. In this regard, based on the random effects model estimated and considered to represent the best approach for estimating the factors which influence informality, we suggest estimating a random effects model using Generalized Two-stage Least Squares (G2SLS) with instrumental variables. Table 4, which we will see below, shows the results of the estimates based on GLS and G2SLS.

## 4. Empirical results

This section reports on the key findings from the study of determinants of informality. To do this, several models have been estimated using two separate samples over an identical time-period so as to evaluate the robustness of the results obtained.

To assess whether the determinants that are proposed as explanatory factors for the level of informality in economies, we suggest the following test equation:

$$Informalidad_{it} = \alpha_{it} + \beta_1 X_{kit} + \beta_2 C_{it} + R_{it} + u_{it}$$

where  $it$  indicates the country and year in the sample, *Informalidad* denotes the level of the shadow economy in each country and year expressed as a percentage of GDP,  $X$  refers to the set of explanatory variables,  $C$  incorporates the set of control variables,  $R$  represents the dummy variables included to distinguish the levels of economic development, and  $u_{it}$  is the error term. The explanatory variables vector includes the legal framework index and components, the state effectiveness index and components, the ease of doing business index, and the indices for labour market rigidities and business-owner costs; the level of self-employment as a percentage of overall employment, the direct pressure index, the tax rate on consumption, the total tax burden, the number of days' of severance compensation, the percentage of temporary workers and the level of middle class which each country has. The control variables include: the Gini economic inequality index, GDP per capita in log form, the unemployment rate, agriculture's share of GDP and the proportion of urban population.

A total of fourteen specifications have been estimated based on the above equation, with seven for each of the samples used. Table 3 shows the initial results. For all specifications, regional dummies have been used. Regressions (1) and (8) look into the impact of the legal framework and the effectiveness of the state as a whole, while in the others the variables which make up the indices mentioned above are introduced separately. This allows us to assess how the estimated coefficients vary, as well as the fit for the model if, instead of inputting composite indices, the variables which they consist of are considered exclusively on an individual basis.

As can be seen, for all the specifications and for both samples, the legal framework emerges as the key determinant of the level of informality. Hence the countries with a solid legal framework enjoy a substantially lower level of informality.

The coefficient of determination for the legal framework almost does not vary at all between the two samples used in estimates. Nonetheless, when we input the variables which make up the state effectiveness index on a separate

basis, the effect of the legal framework is drastically diluted and surpassed by government effectiveness as the factor which most affects the level of informality (specifications 7 and 14). Moreover, we can see how the adjusted R-squared value rises slightly when the variables which make up the state effectiveness index are included separately in the regressions. Turning to the variables which the legal framework index comprises, voice and accountability and the quality of legal proceedings stand out ahead of the others as key determinants of informality. Conversely, the strength of legal rights appears with the opposite sign (positive), which suggests that when this is greater informality increases, even though this is a result which comes as no surprise in advance because it scarcely correlates at all with the level of informality. The ease with which states allow companies to start new businesses emerges with an unexpected sign in the estimates. In all specifications it turns out to be significant and positive to a high degree, thereby evidencing a positive influence on informality, which means that countries which make starting new businesses easier exhibit a greater level of informality. By the same token, the labour market rigidities that might be associated with the employment benefits which workers have emerges with a negative sign in the specifications, where it appears to be a significantly influential determinant with regard to informality.

**Table 3** Pooled OLS estimation of determinants of the size of the informal economy (1999-2007)

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)
	<b>Elgin y Oztunali (2012)</b>							<b>Buehn y Schneider (2011)</b>						
<b>Legal framework</b>	-21.225*** (2.526)	-----	-----	-----	-----	-----	-12.573*** (2.394)	-19.265*** (2.638)	-----	-----	-----	-----	-----	-13.596*** (2.501)
Regulatory quality	-----	-13.081*** (3.107)	-----	-----	-----	-----	-----	-----	-13.505*** (3.200)	-----	-----	-----	-----	-----
Rule of law	-----	-----	-34.271*** (3.464)	-----	-----	-----	-----	-----	-----	-32.895*** (3.630)	-----	-----	-----	-----
Voice & Responsibility	-----	-----	-----	-21.477*** (2.588)	-----	-----	-----	-----	-----	-----	-19.332*** (2.724)	-----	-----	-----
Strenght of legal rights	-----	-----	-----	-----	7.198*** (1.160)	-----	-----	-----	-----	-----	-----	7.264*** (1.187)	-----	-----
Quality of judicial processes	-----	-----	-----	-----	-----	-19.128*** (3.934)	-----	-----	-----	-----	-----	-----	-17.022*** (3.191)	-----
<b>Effectiveness of the state</b>	-0.118 (3.434)	-20.232*** (2.514)	4.119 (3.583)	-1.130 (3.566)	-23.489*** (2.106)	-4.514 (3.934)	-----	-5.424 (3.585)	-23.404*** (2.589)	-0.374 (3.754)	-6.837* (3.754)	-26.644*** (2.157)	-10.093** (4.106)	-----
Corruption control	-----	-----	-----	-----	-----	-----	-3.810 (3.270)	-----	-----	-----	-----	-----	-----	-1.311 (3.416)
Government effectiveness	-----	-----	-----	-----	-----	-----	-14.422*** (4.173)	-----	-----	-----	-----	-----	-----	-17.901*** (4.362)
<b>Ease for business</b>	5.472*** (1.540)	5.533*** (1.720)	4.976*** (1.565)	3.843** (1.625)	3.183* (1.673)	5.299*** (1.674)	7.322*** (1.547)	6.644*** (1.607)	6.539*** (1.772)	5.987*** (1.641)	4.986*** (1.711)	4.253** (1.714)	6.297*** (1.747)	8.250*** (1.617)
<b>Labor rigidity</b>	-3.307*** (1.633)	-0.037 (1.891)	-1.489 (1.646)	-3.661** (1.704)	-6.187*** (1.741)	-3.006* (1.761)	-2.213 (1.591)	-1.744 (1.705)	1.809 (1.947)	0.245 (1.725)	-1.765 (1.794)	-4.607*** (1.784)	-1.169 (1.838)	-0.995 (1.662)
<b>Costs employers</b>	5.986*** (1.780)	2.604 (1.985)	-0.326 (1.837)	7.863*** (1.927)	-0.605 (1.926)	8.161*** (2.059)	2.881 (1.836)	5.822*** (1.858)	2.689 (2.044)	-0.058 (1.925)	7.543*** (2.028)	-0.557 (1.973)	7.763*** (2.149)	2.910 (1.919)
Self-employment	0.285*** (0.035)	0.190*** (0.038)	0.211*** (0.034)	0.277*** (0.036)	0.209*** (0.035)	0.244*** (0.037)	0.217*** (0.035)	0.267*** (0.037)	0.181*** (0.039)	0.203*** (0.036)	0.263*** (0.038)	0.199*** (0.036)	0.233*** (0.038)	0.214*** (0.037)
<b>Direct tax pressure</b>	-10.560*** (1.560)	-11.868*** (1.743)	-8.237*** (1.600)	-10.085*** (1.631)	-12.758*** (1.612)	-12.084*** (1.693)	-10.236*** (1.507)	-11.448*** (1.628)	-12.568*** (1.795)	-9.019*** (1.677)	-10.848*** (1.716)	-13.501*** (1.651)	-12.637*** (1.768)	-10.759*** (1.575)
Indirect tax pressure	4.092 (6.313)	36.684*** (6.922)	39.581*** (6.171)	-1.357 (7.261)	23.229*** (6.325)	1.302 (7.860)	11.150* (6.211)	6.189 (6.590)	38.404*** (7.130)	40.624*** (6.467)	3.140 (7.643)	23.970*** (6.479)	5.818 (8.204)	11.111* (6.490)
Tax burden	0.045** (0.021)	0.086*** (0.024)	0.029 (0.022)	0.023 (0.023)	0.042* (0.022)	0.039* (0.024)	0.020 (0.021)	0.044** (0.022)	0.084*** (0.025)	0.028 (0.023)	0.025 (0.024)	0.039* (0.023)	0.040* (0.025)	0.014 (0.022)
Severance pay	-0.277*** (0.025)	-0.306*** (0.028)	-0.253*** (0.026)	-0.228*** (0.028)	-0.329*** (0.026)	-0.237*** (0.029)	-0.281*** (0.023)	-0.287*** (0.026)	-0.311*** (0.029)	-0.261*** (0.027)	-0.241*** (0.029)	-0.335*** (0.027)	-0.250*** (0.031)	-0.277*** (0.025)
Temporary employment	-0.080*** (0.024)	-0.058*** (0.026)	-0.074*** (0.023)	-0.041* (0.024)	-0.118*** (0.024)	-0.049** (0.025)	-0.073*** (0.023)	-0.110*** (0.025)	-0.080*** (0.026)	-0.097*** (0.024)	-0.068*** (0.025)	-0.145*** (0.025)	-0.075*** (0.026)	-0.106*** (0.024)
Middle class	-0.212*** (0.020)	-0.142*** (0.023)	-0.068*** (0.023)	-0.267*** (0.024)	-0.191*** (0.021)	-0.250*** (0.025)	-0.171*** (0.021)	-0.211*** (0.021)	-0.144*** (0.024)	-0.075*** (0.024)	-0.261*** (0.025)	-0.194*** (0.021)	-0.245*** (0.026)	-0.180*** (0.022)
<b>Control variables</b>														
Gini index	1.011*** (0.240)	1.562*** (0.252)	1.846*** (0.231)	0.891*** (0.250)	1.601*** (0.235)	1.0383*** (0.259)	1.140*** (0.231)	0.814*** (0.250)	1.289*** (0.260)	1.561*** (0.242)	0.685*** (0.264)	1.340*** (0.240)	0.822*** (0.271)	0.872*** (0.242)
GDP (log)	-4.789*** (0.910)	-5.711*** (0.979)	-5.861*** (0.892)	-2.806*** (0.986)	-7.099*** (0.921)	-3.664*** (1.009)	-5.004*** (0.889)	-5.569*** (0.950)	-6.226*** (1.009)	-6.372*** (0.934)	-3.613*** (1.038)	-7.713*** (0.943)	-4.407*** (1.053)	-5.880*** (0.929)
Unemployment rate	0.073 (0.059)	0.201*** (0.065)	0.153*** (0.059)	0.134** (0.061)	0.174*** (0.060)	0.097 (0.064)	0.110* (0.058)	-0.019 (0.062)	.04978 (0.067)	0.050 (0.062)	0.035 (0.064)	0.069 (0.061)	0.003 (0.067)	0.012 (0.061)
Agriculture (% GDP)	-0.479*** (0.038)	-0.486*** (0.043)	-0.420*** (0.039)	-0.425*** (0.041)	-0.459*** (0.040)	-0.441*** (0.042)	-0.460*** (0.037)	-0.502*** (0.0398)	-0.508*** (0.044)	-0.444*** (0.041)	-0.451*** (0.043)	-0.481*** (0.041)	-0.465*** (0.044)	-0.490*** (0.039)
Urban population	0.005 (0.025)	0.056*** (0.028)	0.049* (0.026)	0.037 (0.026)	0.064 (0.028)	0.041 (0.027)	0.045* (0.026)	-0.001 (0.027)	0.054* (0.029)	0.046 (0.027)	0.035 (0.028)	0.060** (0.029)	0.038 (0.028)	0.036 (0.027)
<b>Geography and development</b>	V	V	V	V	V	V	V	V	V	V	V	V	V	V
Observations	381	391	391	391	381	391	381	381	391	391	391	381	391	381
R-square adjusted	0.873	0.834	0.862	0.853	0.862	0.823	0.880	0.874	0.840	0.863	0.852	0.869	0.844	0.881
Prob > F	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000

The opposite appears to be the case for the burdens which business owners have to assume in formal recruitment, given that when this is specified as a significant variable with regard to the level of formality it appears to be positive as expected, and evidences that as costs rise for business owners, the incentives to hire workers informally increase, which produces a greater degree of informality.

In all the specifications the level of self-employment throws up a positive sign and is highly significant, thereby identifying itself as a factor that is quite closely related to a higher level of informality. The number of days' severance compensation and the percentage of temporary contracts (labour market duality) are associated with a lower level of informality. Although it is true that the degree of the effect varies depending on the specification, both determinants emerge as highly significant. Severance compensation is associated with greater protection for workers, prompting a bigger incentive to them to accept formal contract terms. It should be remembered that this variable is constructed on the basis of information reported by workers with over 10 years of service at the company behind them, for which reason it is only to be expected that to the extent that a worker contributes a more skill or expertise in their job they are better placed to obtain contract terms under the protection of the law. With respect to temporary recruitment (a form of employment undertaking that is more beneficial for business owners), it should come as no surprise that, given that this form of employment exists, the incentives to business owners to employ people informally are less substantial than the cost or fine that recruitment outside tax control would imply.

As for the tax burden, the countries with greater direct pressure (taxes on personal and corporate income) show a lower degree of informality and in all specifications this proves to be a factor that exerts a considerable influence. On the other hand, the tax rate associated with the charge on consumption points to an increase in informality, even though this does not always appear to be a significant determinant. Similarly, the overall tax burden only has a statistically positive coefficient in eight of the 14 specifications in the estimated model.

The percentage of the middle class (the adult population that has amassed wealth of \$10,000-\$1,000,000 stands out as another factor to note as a major determinant that is associated with a lower level of informality. The estimated coefficient in all the specifications is significantly negative, which shows that those countries which have a larger segment of their population that is held to be "middle class" exhibit a smaller size of their informal economy. Besides this, all the control variables with the exception of agriculture's contribution to GDP give us an expected coefficient, although the unemployment rate and the urban population only stand apart as determining factors in five specifications.

Table 4 shows the final results. In all the specifications based on both the random effects model (15-18) and the random effects model with instrumental variables (19-22) regional dummy variables have been included. Based on the results previously produced, where we conclude that there are several different determinants that have a bearing on the level of informality, we propose a supplementary analysis using the random effects model, which, by means of the various tests we view as the approach that is best suited to estimating the factors that influence the informality which countries possess. We furthermore include an exercise where we tackle potential problems of causality which is aimed at estimating the direct effect of the regulatory framework on informality, given that the previous analysis shows that it is a hugely important factor in accounting for differences among countries.

**Table 4** Pooled OLS estimation of determinants of the size of the informal economy (1999-2007)

Variables	GMM random effects				G2SLS (IV) random effects			
	(15)	(16)	(17)	(18)	(19)	(20)	(21)	(22)
	Elgin y Oztunali (2012)	Buehn y Schneider (2011)	Elgin y Oztunali (2012)	Buehn y Schneider (2011)	Elgin y Oztunali (2012)	Buehn y Schneider (2011)	Elgin y Oztunali (2012)	Buehn y Schneider (2011)
<b>Legal framework</b>	-14.375*** (2.756)	-14.585*** (2.779)	-20.233*** (2.850)	-19.629*** (2.859)	-22.625*** (4.242)	-22.337*** (4.039)	-21.110*** (4.254)	-19.148*** (3.050)
<b>Effectiveness of the state</b>	-0.869 (1.130)	-----	1.248 (1.161)	-----	-0.779 (1.159)	-----	1.195 (1.185)	-----
Corruption control	-----	-1.220* (0.726)	-----	-0.398 (0.745)	-----	-1.356* (0.750)	-----	-0.467 (0.874)
Government effectiveness	-----	0.096 (0.729)	-----	-1.540** (0.749)	-----	0.256 (0.762)	-----	-1.928** (0.897)
<b>Ease for business</b>	0.050 (0.899)	0.028 (0.896)	-2.927*** (0.924)	-2.873*** (0.921)	0.274 (0.923)	0.227 (0.925)	-2.886*** (0.942)	-2.687*** (1.031)
<b>Labor rigidity</b>	0.124 (0.311)	0.034 (0.311)	0.039 (0.320)	0.113 (0.319)	0.159 (0.320)	0.060 (0.322)	0.053 (0.327)	0.201 (0.378)
<b>Costs employers</b>	2.842 (5.618)	2.791 (5.664)	3.931 (5.838)	3.796 (5.833)	4.362 (5.350)	4.220 (5.114)	4.081 (5.358)	3.543 (3.721)
Self-employment	0.005 (0.007)	0.004 (0.007)	0.024*** (0.007)	0.028*** (0.007)	0.006 (0.007)	0.005 (0.008)	0.024*** (0.008)	0.030*** (0.009)
<b>Direct tax pressure</b>	-3.575 (4.576)	-3.668 (4.613)	-5.792 (4.755)	-5.990 (4.752)	-4.604 (4.349)	-4.686 (4.158)	-5.932 (4.356)	-6.154** (3.032)
Indirect tax pressure	33.454** (17.375)	33.014** (17.518)	21.208 (18.050)	20.734 (18.044)	23.382 (16.922)	23.382 (16.169)	19.981 (16.948)	19.958* (11.784)
Tax burden	-0.006 (0.005)	-0.007 (0.005)	0.024*** (0.005)	0.021*** (0.005)	-0.006 (0.005)	-0.007 (0.005)	0.024*** (0.005)	0.018*** (0.006)
Severance pay	-0.270*** (0.078)	-0.271*** (0.078)	-0.282*** (0.081)	-0.288*** (0.081)	-0.285*** (0.074)	-0.285*** (0.071)	-0.283*** (0.074)	-0.278*** (0.051)
Temporary employment	0.009 (0.017)	0.006 (0.017)	-0.073*** (0.018)	-0.076*** (0.018)	0.014 (0.0180)	0.010 (0.018)	-0.073*** (0.018)	-0.085*** (0.020)
Middle class	-0.081** (0.036)	-0.075** (0.037)	-0.031 (0.037)	-0.021 (0.037)	-0.042 (0.038)	-0.039 (0.037)	-0.029 (0.038)	-0.0421* (0.018)
<b>Control variables</b>								
Gini index	0.183*** (0.060)	0.186*** (0.060)	-0.035 (0.062)	-0.027 (0.062)	0.193*** (0.062)	0.196*** (0.063)	-0.034 (0.063)	-0.025 (0.073)
GDP (log)	-4.947*** (0.433)	-5.056*** (0.418)	-6.014*** (0.445)	-5.848*** (0.429)	-4.653*** (0.457)	-4.777*** (0.445)	-5.976*** (0.466)	-5.873*** (0.503)
Unemployment rate	0.030 (0.019)	0.028 (0.019)	0.056*** (0.020)	0.059*** (0.020)	0.025 (0.020)	0.024 (0.020)	0.056 (0.020)	0.067*** (0.023)
Agriculture (% GDP)	-0.008 (0.019)	-0.010 (0.019)	-0.001 (0.020)	-0.005 (0.020)	-0.017 (0.020)	-0.019 (0.020)	-0.005 (0.020)	-0.035 (0.023)
Urban population	0.008 (0.013)	0.007 (0.012)	-0.019 (0.013)	-0.018 (0.013)	0.008 (0.013)	0.008 (0.013)	-0.018 (0.014)	-0.007 (0.015)
<b>Geography and development</b>	V	V	V	V	V	V	V	V
Observations	381	381	381	381	381	381	381	381
R-square adjusted	0.743	0.746	0.772	0.778	0.772	0.773	0.776	0.793
Prob > F	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000



In the first four regressions in Table 4 we explore the impact of the state effectiveness index and the variables which it is prepared with. In the others, a random effects model with instrumental variables has been estimated to evaluate the causal effect of the legal framework.

Analysis of the results produced in the table above again reveals that the legal framework has a negative influence on the level of informality, thus confirming itself as the principal determinant, since in all of the specifications it shows itself to be very highly significant. Here it is worth noting that in the specification based on the sample used by Elgin & Oztunali (2012) the effect of the legal framework is one quarter less than in the estimate based on the sample used by Buehn & Schneider (2011). Looking at state effectiveness, in neither of the two estimates does this turn out to be a significant variable, although if we include control over corruption and government effectiveness separately, the former emerges as significant and with an expected sign in specification 16, while the latter does the same in number 18.

Ease of doing business appears with the sign as expected and significant in specifications 17 and 18, contrary to the results obtained in the regressions set out in Table 3. This bears testimony to a negative correlation between ease of starting up companies and the level of informality, as when there is diminished economic freedom to take part in business activities owing to a high number of regulatory controls, this could induce business owners to participate in illegal activities to achieve the business start-up in a less stifling manner.

Contrary to the results obtained in Table 3, labour market rigidities and costs for business owners do not play a significant role in any of the estimates as regards determining the level of informality. The level of self-employment only appears as an influential factor in specifications 17 and 18. Although the sign is the right one, the magnitude differs substantially when compared to the results obtained via pooled *OLS* estimation. As far as direct and indirect tax pressure is concerned, only the latter stands out as a factor that influences informality, albeit just in specifications 15 and 16. With respect to the indirect tax rate, it may be noted that when this is very substantial, the positive effect on informality is very big, exhibiting the largest coefficient estimated, meaning that an increase in indirect taxation would lead to a higher level of informality. The overall tax burden only appears as a determinant to take into account in 17 and 18, although the size and direction of the coefficient estimated neatly coincides with those reported in Table 3. On top of this, the number of days' severance compensation, the percentage of temporary contracts (17 and 18) and the level of the middle class (15 and 16) have significant correlation with less informality. The degree of the impact remains unchanged regardless of the specification for severance compensation and the percentage of temporary contracts, while shrinking to half in the case of the middle class.

In terms of the control variables, GDP per capita is prominent in a negative sense as a determining factor in accounting for the differences among countries regarding informality levels. Conversely, economic inequality (specifications 15 and 16) affects informality positively and the latter increases as economic disparities become more pronounced in states. The unemployment rate (specifications 17 and 18) affects informality in a positive sense, meaning that those countries with a higher level of unemployment show greater informality. Even so, this fact is not widely substantiated and has, to say the least, been criticised using empirical evidence. In our case the result is plain to see, although this is not a determining factor in all of the specifications, the sign is always positive, which would suggest that, for example, if a worker were to lose their formal job, they might be accommodated in the informal sector. Furthermore, both agriculture's contribution to GDP and the percentage of the urban population, unlike in the

results given in Table 3, are not statistically different from zero, and they therefore do not affect the degree of informality in the economy. In addition to this, the best fit for the model is obtained when the determinants of informality are considered on the basis of the sample obtained from Buehn & Schneider (2011), with an adjusted R-squared value of a little over 0.77.

Looking at our analysis of causality now, where we assess the direct effect of the regulatory framework on informality levels, the best fit is achieved when the sub-indices which represent state effectiveness are included separately for the sample taken from Buehn & Schneider (2011). The last of the specifications proposed (22), which was obtained from the sample used by Buehn & Schneider (2011), provides the best fit with an adjusted R-squared value of a little over 0.79. The empirical results strongly point to the legal framework playing a significant role in determining shadow economy levels, with an estimated coefficient (specification 22) of -19.15. Thus, a robust legal framework leads to a smaller underground economy. The beta coefficients of the other factors also reveal that the quantitative impact of the legal framework is considerably greater than that of the other determinants. Control of corruption stands apart as a prominent factor as regards informality when we use the sample employed by Elgin & Oztunali (2012) for estimation. Government efficiency also stands out as a major factor influencing informality levels, where these decrease as the opinion of public service quality, the quality of the civil service and their independence from political pressures increases (22). This is also the case with ease of doing business, which gives us a beta coefficient of -2.7 (22). In other words, the less over-regulation there is in the requirements for starting up a company, the less is the informality that arises. Labour market rigidities and costs for business owners are discarded as determinants of the level of the underground economy and, even though they show positive coefficients and reveal a sign as anticipated, these are not statistically different from zero.

With respect to the variables that are associated with the labour market, the level of self-employment offers us a positive and strongly significant sign in specifications 21 and 22, clearly showing itself to be a factor that correlates quite closely with a higher level of informality. On top of this, the number of days' severance compensation and the percentage of temporary contracts are associated with a lower level of informality, with their degree of influence being relatively consistent for both specifications.

As regards tax pressure, the direct side is notable as a factor that influences informality, albeit only in specification 22. Here it is worth noting that greater taxation of labour income and corporate earnings correlates with a smaller informal economy. The opposite is true of the indirect tax rate, which appears as significant in specification 22. This has a very pronounced positive effect on informality levels, producing the biggest estimated coefficient and being linked in such a way that those countries with higher indirect tax rates exhibit a greater level of informality. Nonetheless, the degree of significance associated with the beta coefficient of -19.96 is low. This is not the case with the overall tax burden, which emerges as a determinant to take into account in 21 and 22, and although it has little influence on informality, this is strongly significant. Besides this, the size of the middle class only correlates significantly with lower levels of informality in specification 22 and the beta coefficient associated with this is weakly significant. The estimated coefficient for GDP per capita is significantly negative in all of the specifications, which shows that the countries that are more economically developed (in terms of this variable) present smaller-sized informal economies. On the other hand, in specification 22 the unemployment level is correlated with a larger incidence of the underground economy.

To summarise, the empirical results provided in this section suggest that there are other determinants involved beyond those that have previously been examined in the literature. The legal framework and government effectiveness play a major role in determining the size of the shadow economy. The legal framework suggests that the position of the government authorities in relation to citizens is important when it comes to laws being observed, which leads to greater willingness to abide by them and underlies less informality. Likewise, over-regulation in starting up new businesses encourages a rise in informality by creating incentives to act outside the law to lighten the load of official steps and costs required to set up in a new economic activity. We have furthermore explored the role of the tax authorities, which is an aspect that had not been sufficiently covered by commentators on the subject and here we suggest that tax pressure may affect the level of informality, particularly as regards indirect taxes on consumption which might be more easily avoidable when compared with direct taxation. Conversely, variables relating to the labour market also evidence that they are influential as regards informality. These include self-employment, severance compensation and temporary job levels.

## 5. Conclusions

The article shows that improving social institutions (or at least bringing about a more positive impression of them among the public) leads to a smaller informal economy. If the public's view of how the authorities behave and how well institutions do their job is a suitable one, this is conducive to a shrinking of the underground economy. Moreover, regulatory and legal quality, as well as less over-regulation of businesses, are major factors that influence the size of the shadow economy. This does not imply that employment regulation tends towards informal activity. We actually demonstrate that severance compensation (job security) incentivises the supply of labour to be hired in the formal sector or applies pressure in this direction to the extent that it increases time in service at companies, which boosts the qualifications and skills of workers. By the same token, a broader range of forms of employment contract has a direct impact on bringing down informality levels.

The results and conclusions related in this paper are in keeping with other articles that have come before, in which the authors determine what factors exert an influence on the underground or informal economy (see Friedman et al., 2000, as well as Torgler & Schneider, 2009, among others). On the other hand, in our study we find evidence of a negative effect between the tax burden and the informal economy, in contrast to Friedman et al. (2000), where higher marginal tax rates do not appear to be linked to a larger shadow economy. Nevertheless, despite the fact that the estimation techniques do not differ to any great extent, the type of data to which they are applied actually do. In this regard we make our contribution to study of this subject by running estimates that are based on a sample that is considerably larger than those that have been used in the other articles on this topic, while also using estimates that are founded on two separate datasets. By the same token, a greater wealth of factors considered *a priori* as determinants of informality has been used in this paper than has been the case in other articles within the literature on this subject.

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## Appendix

**Table A1** Sources of information relating to the study variables

Variable	Source of information
<b>Legal frame work</b>	
Regulatory quality	
Rule of law	
Voice & Responsibility	Good Governance indicators (World Bank)
Strenght of legal rights	
Quality of judicial processes	
<b>Effectiveness of the state</b>	
Corruption control	Good Governance indicators (World Bank)
Government effectiveness	
<b>Ease for business</b>	
Number of procedures	
Time for opening	Doing Business (World Bank)
Opening costs	
Capital requirements	
<b>Labor rigidity</b>	
Temporary contract	
Maximum time in temporary contracts	
Days of work per week	Doing Business (World Bank)
Night work restriction	
Holidays	
<b>Costs employers</b>	
Paid vacations	
Full-time minimum wage	Doing Business (World Bank)
Maternity leave	
Time trial period	
<b>Self-employment</b>	International Labour Organization (ILO), Worl Bank and other sources
<b>Direct tax pressure</b>	
Corporation tax	
Minimum type of work income	
Maximum type of work income	Varius sources
<b>Indirect tax pressure</b>	Various sources
<b>Tax burden</b>	The Heritage Foundation
<b>Severance pay</b>	Doing Business (World Bank)
<b>Temporary employment</b>	International Labour Organization (ILO)
<b>Middle class</b>	Global Wealth Report (Credit Suisse Research Institute)
<b>Gini index</b>	
<b>GDP per capita</b>	
<b>Unemployment rate</b>	World Bank
<b>Agriculture (% GDP)</b>	
<b>Urban population</b>	

**Table A2** Tests and hypothesis testing

<b>Homoscedasticity test</b>	<b>Fixed effects significance</b>
<b>Buehn y Schneider (2011)</b> chi2 (22) = 135.46 Prob > chi2 = 0.000	<b>Buehn y Schneider (2011)</b> F (45, 321) = 1024.86 Prob > F = 0.000
<b>Elgin y Oztunali (2012)</b> chi2 (22) = 106.22 Prob > chi2 = 0.000	<b>Elgin y Oztunali (2012)</b> F (45, 321) = 1053.73 Prob > F = 0.000
<b>Random effects significance</b>	<b>Hausman test</b>
<b>Buehn y Schneider (2011)</b> chibar2 (01) = 1074.69 Prob > chibar2 = 0.000	<b>Buehn y Schneider (2011)</b> $chi2 (11) = (b-B)'[(V_b - V_B)^{-1}](b-B) = 9.82$ Prob > chi2 = 0.708
<b>Elgin y Oztunali (2012)</b> chibar2 (01) = 1075.02 Prob > chibar2 = 0.000	<b>Elgin y Oztunali (2012)</b> $chi2 (11) = (b-B)'[(V_b - V_B)^{-1}](b-B) = 7.61$ Prob > chi2 = 0.7482



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