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Does Regulatory Quality Reduce Informal Economy? A Theoretical and Empirical Framework

Cristian Barra[1] · **Anna Papaccio**[2]

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Abstract
Italy is characterised by a significant dualistic economy, which also includes an extensive underground sector. The aim of this study is to analyse the relationship between the quality of legislation and irregular employment in Italy. Our contribution consists of two components: the theoretical modelling of the impact of regulatory quality on the informal economy and the empirical validation of the predictions of the theoretical model using data from the Italian region between 2004 and 2019. The results confirm the theoretical and empirical arguments in favour of the need for laws to curb the informal sector. The regions with the highest institutional standards tend to have a lower percentage of irregular workers that fosters and encourages the legality of the labor market. Some robustness tests back up the main conclusions which show how important following rules is for strengthening the internal economy and for lowering the number of illegal workers.

Keywords Regulatory quality · Informal economy · Informal labour market

JEL Classification: O17 · E26 · J46

1 Introduction and Literature

Extensive academic research has been conducted to examine the interconnectedness between the informal sector and institutions. However, there is currently no consensus on the exact factors that contribute to this relationship or the mechanisms by which it occurs (Devine, 2021; Loayza & Meza-Cuadra, 2018; Loayza et al., 2006; Torgler & Schneider, 2009). A significant part of the informal economy consists of irregular employment. This form of employment exists outside the legal framework because these regulations do not apply to some jobs (such as casual, part-time, temporary or home-based work). The companies offering these jobs are usually small and/or unregistered

✉ Cristian Barra
cbarra@unisa.it

Anna Papaccio
apapaccio@unisa.it

[1] Department of Economics and Statistics, University of Salerno, Fisciano, Italy

[2] Department of Political and Communication Sciences, University of Salerno, Fisciano, Italy

and can only afford to offer this type of employment. Unfortunately, these jobs (and consequently their owners) are not protected by labour legislation (Hussmanns, 2004).

On average, the 11.6% of total labor input in the private sector of the European Union (EU) is irregular. In particular, analyzing the structure of EU labor market, Williams et al. (2017) find that 61.8% derives from employment relationships, 37.3% comes from self-employment, and only 0.3% derives from family work. Italy, along with Poland and Bulgaria, have 90% of all irregular work coming from an employment relationship. In fact, the use of irregular work by firms and households is a structural feature of the Italian economy. Specifically, the irregular economy is 11.3% of GDP as estimated by ISTAT in 2019; while 14.9% of the total of employed workers were non-regular full-time. Although most work is performed by regularly employed people, they are required to work double or triple time for irregular remuneration; are under-declared as self-employed; or work at occasional services carried out by housewife, students, and retirees (ISTAT, 2021). The conclusion often drawn is that undeclared work arises from a mixture of several causes. Therefore, individual causal elements alone are not sufficient to provide meaningful explanations unless their interaction with local and environmental factors is adequately considered. It is generally assumed that the causes and determinants of undeclared work are influenced by various factors, including market dynamics, institutional relationships (between citizens and public authorities and tax authorities), individual characteristics and other contextual elements (De Gregorio & Giordano, 2016a, 2016b; Pfau-Effinger, 2009).

This study examines the relationship between the quality of regulation and the size of the informal economy from a national perspective, focusing on the situation of the Italian economy. Italy provides an ideal setting to assess the relevance of the subject under discussion. We thus make a valuable contribution to the existing literature in several respects. Firstly, our findings emphasise the persistent inequality between the different regions of Italy. Our research suggests that the informal economy is comparatively less widespread in the northern and central regions than in the southern regions, where it is more pronounced. In regions that adhere strongly to regulations and have high-quality institutions, the proportion of informal workers tends to decline. This trend is attributed to the active promotion and support of legality in the labour market. Furthermore, we establish a theoretical link between the influence of the taxation of capital and labour, the degree of flexibility in the labour market and the probability of facing sanctions in relation to a firm's decision to operate underground. Moreover, in this study, we use Italian regional data from 2004 to 2019 to analyse the relationship between the rate of informal employment and the quality of regulation at both aggregate and sectoral levels.

The Italian context has several factors that make it interesting for an analytical study from our point of view. Italy is characterised by a significant dualistic economy that includes an extensive underground sector (Medina & Schneider, 2018). In addition, the country faces challenges in terms of an unfavourable business environment, as noted by the World Bank (2020). Furthermore, the Italian tax system is burdensome. The tax burden corresponds to 42.9% of gross domestic product (GDP) (as of 2020), making it one of the highest among industrialised countries (OECD, 2021). It is worth noting that the production structure in Italy is predominantly made up of small and medium-sized enterprises (SMEs), which are run at a family level (Carletti et al., 2020). These companies are highly dependent on debt as a means of financing their developments (D'Amato, 2020). Moreover, in the "Report on the unobserved economy and tax and social security evasion in Italy" (2023) by the Italian Ministry of Economy and Finance, it emerged that most tax evasion in Italy is not committed by large companies, but by smaller ones.

Italy is considered a country with a strong presence of the informal economy compared to other European countries, as several estimates show (CASE-CPB, 2013; European Commission, 2020; Kelmanson et al., 2019). Italy has observed high levels of the informal economy across the country, but particularly in the less developed regions of the South, where the share of irregular workers is significantly higher than in other macro-areas.[1] Thus, the problem of the informal economy in Italy is considered to be of great concern. The employment landscape in Italy shows remarkable regional differences in terms of employment opportunities and income levels. According to the European Commission's country report (2022), the informal economy accounted for around 11.3% of gross domestic product (GDP) in 2019, although it has fallen by 4.3% since 2014. Moreover, undeclared work is still widespread. The southern region of Italy continues to show deficits in terms of infrastructure, institutional capacity and socio-economic outcomes. The phenomenon of undeclared work and the informal economy has a particularly strong impact on the southern regions. The European Commission's country report for 2022 emphasises that despite the implementation of specific and temporary measures, such as the reduction of social security contributions for new hires, the problem of heterogeneity between regions persists, including differences in the institutional framework. Despite the implementation of significant measures, tax evasion in Italy remains at a considerable level. In 2019, the introduction of electronic invoicing became mandatory for all transactions, with the sole exception of the self-employed, who operate under simplified rules. As a result, the expected total loss of revenue due to tax evasion and non-payment of social security contributions has decreased significantly with a decrease of EUR 3.1 billion. This decrease follows an earlier decrease of EUR 5 billion in 2018, as reported in the annual government reports on the informal economy. Nevertheless, lost revenue remains at a significantly high level, amounting to 5.5% of gross domestic product (GDP) in 2019, which equates to EUR 99.3 billion. The situation is similar with the VAT gap, which serves as a measure of the effectiveness of VAT enforcement and compliance and shows a downward trend. In Italy, this gap amounted to 21.3% of the total VAT burden in 2019, a figure that more than doubles the EU-wide gap of 10.5% (Giammatteo et al., 2021). The Italian labour market is also highly diverse.[2] The majority of industrial activities are concentrated in the northern regions, while people in the southern regions are mainly employed in agriculture and tourism. The most important economic sectors are, in descending order of their gross domestic product (GDP) for 2022: services (GDP 291,807 million euros), manufacturing (GDP 75,677 million euros), construction (GDP 21,586 million euros) and agriculture (GDP 7609 million euros) (EURES, 2023).

The geographical asymmetry in the spread of the informal economy in Italy is also reflected in the different institutional quality of the Italian regions, which support the north–south divide. For instance, a recent study by Casamonti and Liaci (2021) assessed the quality of Italian institutions at the provincial level from 2004 to 2019. The analysis took into account various factors, including public services, territorial economic activity, justice, corruption, cultural level and citizen participation in public life. The results show that the provinces in the North-East region have the highest quality of institutions, followed by the North-West and Centre regions. Conversely, the provinces in the South region

[1] According to our statistics, the level of the informal economy in the southern Italy is, at minimum, 1.15 larger compared to the agricultural sector in central Italy and, at maximum, 4.33 larger than the mining sector in northwestern Italy.

[2] The two most common types of employment contracts are fixed-term contracts and full-time contracts. Completion of upper secondary education is the most frequently required qualification (EURES, 2023).

consistently score lower in terms of institutional quality. The main factor contributing to the differences between the North and the Centre is the rule of law component. However, there are also significant differences between the two regions in other areas such as voice and accountability, regulatory quality, quality of legislation, corruption and government effectiveness.

Since the presence of informality brings several economic costs, a large and growing literature has emerged in recent years that examines the determinants and causes of the informal sector and the decisions to be irregular workers (e.g., Chepurenko, 2018; Dell'Anno, 2021; Hibbs & Piculescu, 2005; Loayza et al., 2006; Medina et al., 2019; Oviedo et al., 2009; Perry & Maloney, 2007; Ram et al., 2017; Williams, 2019).

For instance, Kosta and Williams (2020) point out that in the developed world, like Italy, competition between formal and informal enterprises has deleterious effects on the annual rates of sales and the productivity growth of the formal economy. According to Loayza (2007), the informal sector generates a negative externality with an adverse effect on efficiency. Also, if the large majority of informal firms stay very small, they may never reach an efficient scale of production. Informality also leads to a situation where providing public goods is always suboptimal, leaving few benefits to the formal sector. For Schneider and Enste (2000), it hampers economic performance via a reduction in tax revenues and in the quality and quantity of public goods. Further, the presence of a large informal economy may lead to incorrect and ineffective policies as it reduces the reliability of official indicators.

According to Williams et al.'s (2017) study, irregular employment is less common in European Union member states with higher levels of public investment in labour market interventions that safeguard disadvantaged populations, higher levels of public spending on social transfers, and lower levels of corruption. Some of the research has focused on the necessity of enhancing governance, reducing corruption in the public sector, and raising the amount of government participation, such as through social assistance. It has been demonstrated that these actions decrease irregular employment and irregular businesses. (Autio & Fu, 2015; Dau & Cuervo-Cazzurra, 2014; Klapper et al., 2007; Thai & Turkina, 2014). The decline in irregular employment and irregular enterprises may be due to the fact that the main motivations for engaging in the informal economy include tax evasion, maintaining access to state benefits, circumventing licensing requirements and what Renooy (1990) called "structural" and "opportunity" factors. Some of the academic literature deals with the issue of irregular labour in Europe and establishes a link between irregular employment and immigration (Reyneri, 2001, 2004; Triandafyllidou & Bartolini, 2020). The acquisition, maintenance or renewal of a person's legal status in the European Union often depends on their employment, in particular on compliance with labour law and the inclusion of social security in their contract. In practise, however, migrants are disproportionately represented in labour market sectors characterised by a high level of informal employment. These sectors include, in particular, construction for men and cleaning and care professions for women. In addition, sectors such as catering, tourism and agriculture are also frequently associated with the irregular employment of migrants.

The importance of institutional and context-specific elements, including labour market structures and regulations, the extent and prevalence of the informal economy, welfare systems and immigration policies, is strongly emphasised, as shown in the work of Piore (1979), Kogan (2006) and Reyneri and Fullin (2011).

There is empirical evidence that the process of labour market integration of migrants is influenced by the degree of segmentation of the target labour markets. This segmentation consists of a primary segment characterised by well-paid, high-skilled and stable jobs that

can support a secondary segment consisting of low-paid, low-skilled and highly volatile jobs. The secondary segment generally relies on migrant labour and offers limited opportunities for advancement (Piore, 1979; Reyneri & Fullin, 2011). Existing research on labour market segmentation, such as that conducted by Doeringer and Piore (1971), Emmenegger et al. (2012) and Lindbeck and Snower (1986), often emphasises the existence of two distinct segments within the labour market. These segments consist of individuals employed under standard contracts, which offer them a considerable degree of job security and protection, and those employed under non-standard contracts, which offer limited or no employment guarantees.

The phenomenon of labour market fragmentation in Europe has recently been studied and confirmed by several authors. For instance, Seo (2021) conducts an analysis of labour market segmentation in Europe to gain insight into the identification of those who are classified as outsiders. This study shows that within the European labour market, which is primarily characterised by two distinct segments, the 'outsider' sector is not homogeneous.

The results of this study therefore confirm the prevailing notion of the dualisation of the labour market. They also emphasise the importance of examining different sub-groups within the precarious work sector. The results of the Seo study indicate that there are differences in the segmentation patterns between the various countries, which can be attributed to different institutional frameworks. This observation is in line with the existing academic literature on dualisation and liberalisation, as shown by the work of Palier and Thelen (2010) and Prosser (2016).

Numerous studies contend that high tax rates and low audit probabilities are the primary causes of cheating on taxes (Baldry, 1987; Clotfelter, 1983). For instance, Thieβen (2003) discovers that as tax complexity rose, the informal economy in Ukraine grew (i.e., the number of taxes, the ambiguous tax laws, and the number and extent of tax exemptions). The academic community has also focused on a hidden construct called "tax morale" to understand why some people consistently comply while others look for evasion methods even when the potential costs outweigh the advantages. The evidence shows that tax morale is a dynamic feature heavily influenced by vertical trust (i.e., trust in state institutions), horizontal trust (trust in other taxpayers), and various personal characteristics. It is defined as an "individual's willingness to pay taxes, in other words, the moral obligation to pay taxes or the belief that paying taxes contributes to society" (Franic, 2022; Frey & Torgler, 2007, p. 140).

Another commonly cited reason for participation in the informal sector is the government's excessive regulation. The transaction costs of participating in the formal economy rise because of overregulation, which makes moving to the informal sector more alluring. According to empirical data uncovered by Johnson et al., (1997, 1998), overregulation does in fact cause the informal sector to grow (Schneider & Enste, 2000). However, bigger, legally registered businesses can also engage in informal activities. In order to avoid paying taxes and other required contributions, some businesses disclose just a portion of their employees to public agencies and routinely underreport their revenues to tax authorities. The source of this behaviour is a combination of overly stringent laws and the persistence of a stable "negative" equilibrium in which everyone acts uniformly due to a deficient legal system (Oviedo et al., 2009). In one cross-country study, Loayza et al. (2006) investigate the possibility that small business owners' efforts are hampered by burdensome rules that force them to operate informally. They discover that the Schneider (2004) informality measure is connected to an excessive regulatory burden. Others, like Gregorio and Giordano (2016a, 2016b) and Pfau-Effinger (2009), view market relations, institutional interactions (of people with public agencies and tax authorities), personal characteristics, and other

environmental factors as the causes and determinants of irregular labor. Moreover, according to certain empirical contributions based on the use of calibrated models (Antunes & Cavalcanti, 2007; D'Erasmo & Moscoso Boedo, 2012; Quintin, 2008), improved contracts and debt enforcement can help to shrink the extent of the informal sector.

In light of these results, the aim of this study is to analyse the nexus between regulatory quality and irregular employment in Italy. According to the relevant literature on regulatory quality, for example, Dreher and Schneider (2006), people and firms are more likely to participate in the informal economy if they perceive that regulations will not safeguard either contracts or jobs. If the public thinks that corruption is pervasive, their taxes are not being used wisely, their government is not being held accountable, and they are not being protected by the law, they will feel defrauded. This perception makes working in the informal sector more appealing. Also, Torgler and Schneider (2009) argue that a significant factor in grasping the informal economy is institutional design and governance quality. They provide significant robustness tests using international and domestic panel data that demonstrate how enhancing institutional quality, tax morale, and governance may help reduce potential incentives for illegal activity.

The contribution of our study is twofold: we theoretically model the effect of regulatory quality on the percentage of irregular workers chosen by firms (proxy for the informal economy), and we empirically validate the prediction of the theoretical model. For our empirical purposes, we rely on regional Italy for the period from 2004 to 2019. The Italian Statistical Office (ISTAT) gives us information on the informal economy at the aggregate and sectoral levels. The share of irregular workers expressed as a percentage of total regular workers, i.e. (irregular workers/total regular workers)$\times$100, is how we measure this. We also get information on regulatory quality, which includes the degree of openness of the economy, the business environment, and the ability of local officials to support and encourage business activity (Nifo & Vecchione, 2014; p. 1633).

The theoretical model focuses on the firm's decision to hire both regular and irregular workers, also known as "hybrid informal employment" (De Gregorio & Giordano, 2016a, 2016b; Williams, 2010). Our theoretical evidence shows that higher levels of regulatory quality, which serve as a proxy for institutional quality, significantly reduce the size of the informal economy. The results are easily generalisable and can be empirically validated using European data. They show that the optimal number of formal workers is positively related to the availability of institutional services and negatively related to the wage tax rate, the regulatory burden and nominal wage rigidity. Furthermore, the optimal number of informal workers that a firm chooses in equilibrium is inversely related to the probability of being detected in illegal activities and the severity of fines imposed.

The remainder of the study is organized as follows: We develop our theoretical framework in Sect. 2, while we discuss the data and the stylized facts in Sect. 3. Section 4 deals with the benchmark findings,[3] while Sect. 5 provides a battery of robustness checks. In Sect. 6, we conclude and discuss the relevant policy implications.

[3] To save space, the statistical methodology and the associated equations are presented in the supplementary material.

2 Theoretical Model: Regulatory Quality and Irregular Work

A number of direct and indirect reasons may be driving the informal economy, besides irregular labor. Employees are working informally if their employment relationship, in theory or in practice, does not involve national labour laws, income taxation, social protection, or the right to certain employment benefits. Direct reasons are the primary causes of irregular work, while indirect reasons are minor causes that combine with other factors to form informal work. For instance, businesses use irregular workers to avoid the costs of the amount and structure of the tax burden, social security payments, bureaucracy or rigidities resulting from overregulation, the degree of the punishment, and unemployment. Further, cultural acceptability, poverty, state confidence, and employment levels are the factors that drive people to not declare work as indirect reasons (Medina et al., 2019). Economic reasons are perhaps the most compelling motivation for firms, employees, and the self-employed to go informal. Informal work provides the opportunity to increase income while avoiding taxes and contributing to social programmes; to achieve wage flexibility while deviating from the contractual minimum; or to reduce the cost of complying with environmental, occupational safety, and health regulations, among other things. In terms of tax treatment and the contribution system, economic studies have found that the system's total amount of taxes is a key predictor of the informal economy. However, the tax burden does not always drive either the employee or the employer into the informal economy. In Europe, the nations with the highest tax burdens (the Nordic countries) have the lowest proportion of informal labour, while the countries with the lowest tax burdens (Greece and Spain) have the largest informal economies. According to Hassan and Schneider (2016), in nations with a substantial tax base, the informal economy may be small because of the country's effective institutional structure. This effectiveness occurs because taxpayers are ready to pay taxes for high-quality products and services offered by the state. Excessive regulation and bureaucracy are other points that are frequently mentioned as powerful and major elements in explaining the widespread use of informal labor. The scale and complexity of the legislative system as well as administrative problems in integrating into the economy may lead to the choice of carrying out an activity without a commercial licence (Schneider et al., 2010). As a result, the rigour of the regulations as well as the various bureaucratic procedures required to initiate and/or carry out particular operations might cause many subjects to fail to comply. The nature and techniques of labour market regulation are thus significant considerations. However, the informal economy may be the result of the growth in more flexible kinds of labour as well as the rigidity and slowness with which current regulation adapts to change (Enste, 2010). Consequently, poor laws or delays in contracting at various levels of the labour market are one of the primary reasons for informal work.

In our model, we assume that firms produce a good with both regular and irregular labour, with each factor having its own market with different characteristics. This approach is also used by Bouev (2022), Kolm and Larsen (2003), Fugazza and Jacques (2003). Their results show that the imposition of taxes and high social security contributions leads to a decrease in earnings offered by formal companies, thus incentivising potential workers to seek employment in the informal sector. Under these circumstances there can be numerous equilibria, each characterised by a certain share of the informal sector. In contrast to the aforementioned works (based mainly on macroeconomic analysis and job search), a microfoundation of the decisions of companies is presented here. In addition, the existence of 'rigidities' on the regular market is considered.

2.1 Theoretical Setting

According to Nifo and Vecchione (2014, p. 1633), regulatory quality "comprises information concerning the degree of openness of the economy, business environment and, hence, the ability of local administrators to promote and protect business activity".

We account for the impact of taxes on both capital and labor, the flexibility of the labor market, and the probability of being punished in order to reflect the many requirements for regulatory quality in our setting. We consider a firm's objective function that depends only on labor used in two sectors of production: L_r, denoting labor used for official production, and L_i, denoting labor used for unofficial production. According to the literature, the distinction between regular and irregular labour inputs is not clear. In reality, undeclared labour input results not only from obviously irregular employment, whether as a main or secondary occupation, but also from formally regular employment as a result of undeclared working hours, which involve a partial evasion of social security and tax obligations. The relevance of "grey employment", sometimes known as "hybrid informal employment", can also be interpreted as a result of a partial adaptation to legislation to prevent completely illegal employment (De Gregorio & Giordano, 2016a, 2016b; Williams, 2010). In terms of wages, empirical studies by Loayza (1996) and Johnson et al. (1998) have found a possible positive association between the informal economy and restrictive regulation. We then assume that the "official labor market" is characterized by rigidities of a kind that pushes salaries over the point of equilibrium and full employment that lead to unemployment. The "unofficial labor market", however, is perfectly competitive. We suppose that the official wage, which was negotiated through union action, is higher than the unofficial salary, (i.e., $w_r > w_i$). The firm's labor costs are reflected by a labor tax that is the sum of a payroll tax rate and a measure of regulatory burden on employment for the firm: $t_{w_r} = t^L + R^L$. The following technology determines firms' official production, Q_o, which is legally declared and taxed at the rate t_π:

$$Q_{o=} R^\alpha L_r^\beta \quad \text{with} \quad \alpha + \beta \leq 1 \quad \text{and} \quad \alpha, \beta > 0 \tag{1}$$

The term R^α, as proposed by Hibbs and Piculescu (2005), represents the productive value of institutional services available solely from official activity,[4] and it is dependent on firm-specific qualities as well as the availability of these services in each country. Taxes cover the cost of it.

The unofficial output, Q_u is untaxed and is determined by the level of informal labor as well as an unofficial alternative for institutional services B, such as illegal benefits and bribery, which has a cost c.

$$Q_{u=} B^\alpha L_i^\beta \quad \text{with} \quad \alpha + \beta \leq 1 \quad \text{and} \quad \alpha, \beta > 0 \tag{2}$$

We now assume that the firm has a probability ρ of being checked, caught, and fined. If $0 < F < 1$ is the fine to be paid (for the number of irregular workers) if the firm is discovered, then the expected payoff of the firm is a weighted sum of two states of the world; one in which the firm gains from informal labor and the other in which its profits are reduced by public contributions.

[4] Institutional services comprise contract enforcement by courts, access to credit from financial institutions, and police protection of property, as well as custom services (Hibbs and Piculescu 2005).

$$E(U) = \rho\left(\Pi_r + \Pi_i - FL_i\right) + (1-\rho)\left(\Pi_r + \Pi_i\right) \tag{3}$$

where Π_r and Π_i represent profits from official and unofficial activities, respectively.

$$\Pi_r = \left(1 - t_\pi\right)\left(Q_o - \left(1 + t_{w_r}\right)w_r L_r\right) \tag{4}$$

$$\Pi_i = Q_i - w_i L_i - cB \tag{5}$$

By combining Eqs. (4) and (5) with Eq. (3), we get:

$$E(U) = \left(1 - t_\pi\right)\left(Q_o - \left(1 + t_{w_r}\right)w_r L_r\right) + \left(Q_i - w_i L_i - cB\right) - \rho F L_i \tag{6}$$

The firm maximizes the expected utility in (6) by choosing how much labor to use in the two sectors.

$$\max_{L_i, L_r} E(U) = \left(1 - t_\pi\right)\left(Q_o - \left(1 + t_{w_r}\right)w_r L_r\right) + \left(Q_i - w_i L_i - cB\right) - \rho F L_i \tag{7}$$

s.t. $L_r, L_i \geq 0$

From the first-order conditions of the firm's maximization problem represented in (7), we find the optimal level of workers in the two sectors:

$$\frac{\partial E(U)}{\partial L_r} : L_r^* = \left(\frac{\beta R^\alpha}{\left(1 + t_{w_r}\right)w_r}\right)^{\frac{1}{1-\beta}} \tag{8}$$

$$\frac{\partial E(U)}{\partial L_i} : L_i^* = \left(\frac{\beta B^\alpha}{w_i + \rho F}\right)^{\frac{1}{1-\beta}} \tag{9}$$

Equation 10 demonstrates that the optimal number of formal workers is positively connected to the availability of institutional services and adversely related to the payroll tax rate, regulatory burden, and nominal wage rigidity:

$$\frac{\partial L_r^*}{\partial R} = \frac{\alpha\left(\frac{R^\alpha \beta}{(1+t_{w_r})w_r}\right)^{\frac{1}{1-\beta}}}{R(1-\beta)} > 0;\ \frac{\partial L_r^*}{\partial t_{w_r}} = -\frac{\left(\frac{R^\alpha \beta}{(1+t_{w_r})w_r}\right)^{\frac{1}{1-\beta}}}{\left(1 + t_{w_r}\right)(1-\beta)} < 0;\ \frac{\partial L_r^*}{\partial w_r} = -\frac{\left(\frac{R^\alpha \beta}{(1+t_{w_r})w_r}\right)^{\frac{1}{1-\beta}}}{w_r(1-\beta)} < 0 \tag{10}$$

Furthermore, the optimal number of informal workers selected by the firm in equilibrium is negatively related to the likelihood of getting caught due to illegal activities and the level of penalties levied.

$$\frac{\partial L_i^*}{\partial \rho} = -\frac{F\left(\frac{B^\alpha \beta}{w_i + F\rho}\right)^{\frac{1}{1-\beta}}}{(1-\beta)\left(w_i + F\rho\right)} < 0;\ \frac{\partial L_i^*}{\partial F} = -\frac{\rho\left(\frac{B^\alpha \beta}{w_i + F\rho}\right)^{\frac{1}{1-\beta}}}{(1-\beta)\left(w_i + F\rho\right)} < 0 \tag{11}$$

The following theoretical predictions are derived from the solutions of our model:

Proposition 1. *Regulatory quality, as manifested by good institutional services for official activities, a low regulatory burden, and less rigidity in the labor market, raises the number of formal workers chosen in equilibrium by the firm.*

Proposition 2. *Increased probability of inspection, strong monitoring quality, and high penalties for unofficial activity reduce the number of informal employees in equilibrium.*

3 Application to Regional Italy

3.1 Data and Variables

In order to validate the prediction of our theoretical model, we rely on regional data for Italy over the period from 2004 to 2019.[5] Table 1 presents the descriptive statistics by macro-area to assess how the informal economy and regulatory quality are distributed throughout the country. Accordingly, the North-East has a smaller informal economy, followed by the North-West, Central, and South Islands. Compared to the North-East and the North-West, the size of the total informal economy in the South Islands is 1.88 and 1.74 times larger, respectively. The dualism between the core macro-areas and the peripheral areas of the South and the Islands becomes even more marked once we consider the sectoral-level statistics. In particular, the South and the Islands display significant shares of informality, especially in the agriculture and building sectors, where almost 24% and more than 20% of workers are informal, respectively.

With respect to regulatory quality, there is again a significant dualism between the less developed regions of the South and those located in Central and Northern Italy. The evaluation of each stand-alone dimension of the quality of institutions shows that the North-East performs better compared to the other macro-areas. While the central area shows higher scores in terms of regulatory quality compared to the north-west, On the one hand, the South lags behind all other macro-areas in all the stand-alone dimensions of governance, which are then reflected in a lower efficacy of the overall institutional environment.

The statistics on population age show that, despite the fact that the North-West has a higher population density, the South and the Islands have younger populations. The levels of social capital, the disposable income, and the long-term unemployment rate reflect the general divides of the country in which the core regions are relatively more involved in non-market activities, have higher incomes, and have more efficient labour markets.

All in all, the descriptive statistics in Table 1 confirm the existence of significant regional divides in the country, in which the South has both a larger informal economy and a lower-quality institutional system.

3.2 Stylized Facts

Figure 1 displays the time-series of the various dimensions of the informal economy considered in this study. Over the sample period, all the economic sectors experienced an increase in the size of the informal economy, which has been particularly marked in the building sector. In particular, the evidence indicates that at the sectoral level, the share of informal workers is higher in the agricultural and building sectors. The observed

[5] This availability of regulatory quality based on the Nifo and Vecchione (2014) database explains why our research concludes in 2019. In fact, information for this variable is no longer updated after 2019. The statistical approach based on OLS regression and equation used to validate the theoretical model's predictions between informal economy and regulatory quality are included in the Supplementary Material.

Table 1 Summary of statistics (2004–2019)

Variables	Source	North-West	North-East	Centre	South and Islands	Italy
Total activity	ISTAT	9.6229	8.9152	11.8883	16.7384	12.7806
		(1.4851)	(0.9478)	(2.0584)	(3.7885)	(4.3136)
Agriculture activity	ISTAT	12.6893	12.4502	14.9390	23.9578	17.5988
		(3.8285)	(3.3707)	(5.7271)	(7.4938)	(7.8595)
Mining activity	ISTAT	3.9046	4.1888	6.8685	10.5895	7.2282
		(1.9705)	(0.6315)	(1.8537)	(2.9762)	(3.6986)
Building activity	ISTAT	10.0756	6.7692	13.0906	19.7047	13.8689
		(3.0664)	(2.2505)	(5.9558)	(7.0323)	(7.5058)
Services activity	ISTAT	10.7097	10.5068	13.0737	16.7317	13.5507
		(1.5125)	(0.9717)	(1.6009)	(3.3965)	(3.6498)
Regulatory quality	Nifo and Vecchione (2014)	0.6358	0.7107	0.6477	0.3410	0.5352
		(0.1112)	(0.1159)	(0.0945)	(0.1301)	(0.1987)
Population density	ISTAT	363.9740	263.1478	268.5670	238.4470	274.5165
		(340.8016)	(162.0414)	(171.9437)	(180.5392)	(221.5837)
Population age	ISTAT	45.5047	44.3891	45.0594	43.0273	44.2016
		(1.7528)	(1.7025)	(1.1666)	(1.9239)	(1.9925)
Social capital	AVIS	4118.6622	4002.8119	3783.5866	2587.9072	3416.1750
		(1363.1069)	(1908.3512)	(1853.2851)	(1003.6706)	(1623.5616)
Graduates 25–64 (%)	ISTAT	8.7299	8.6505	9.9667	7.6502	8.5302
		(1.5687)	(1.5800)	(1.8287)	(1.3449)	(1.7589)
Disposable income	ISTAT	80,449.2580	55,666.9563	52,937.6954	32,768.5133	50,918.1872
		(78,114.1262)	(33,779.2554)	(35,028.8452)	(23,890.8515)	(47,036.7187)
Unemployment rate	ISTAT	5.5828	6.0344	7.9625	14.4836	9.7094
		(2.4066)	(1.9687)	(2.3143)	(4.2097)	(5.0898)
Observations		64	64	64	128	320

Table 1 (continued)

Variables' Definition: *Total activity* Total share of irregular workers expressed as a percentage of total regular workers; *Agriculture activity* Share of irregular workers expressed as a percentage of total regular workers in the agricultural sector; *Mining activity* Share of irregular workers as a percentage of total regular workers in the agricultural sector; *Building activity* Share of irregular workers as a percentage of total regular workers in the building sector; *Services activity* Share of irregular workers as a percentage of total regular workers in the services sector; *Regulatory quality* capacity of governments to protect the private sector activities; *Population density* Ratio of population to square kilometre; *Population age* Average age of the population, in years; *Social capital* Number of blood donors per 100,000 individuals; *Graduates* percentage of graduates (25–64 years old); *Disposable income* Disposable income, in current prices; *Unemployment rate* long-term unemployment rate; *Regulatory quality* "comprises information concerning the degree of openness of the economy, business environment and, hence, the ability of local administrators to promote and protect business activity", (Nifo & Vecchione, 2014; p. 1633). Standard deviation in parenthesis

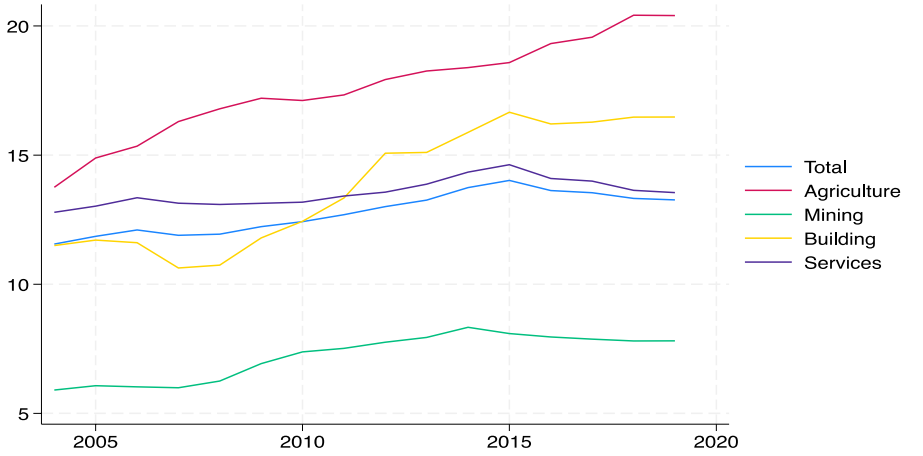

Fig. 1 Time-series of the various dimensions of the informal economy. *Source* Own elaborations on Istat data

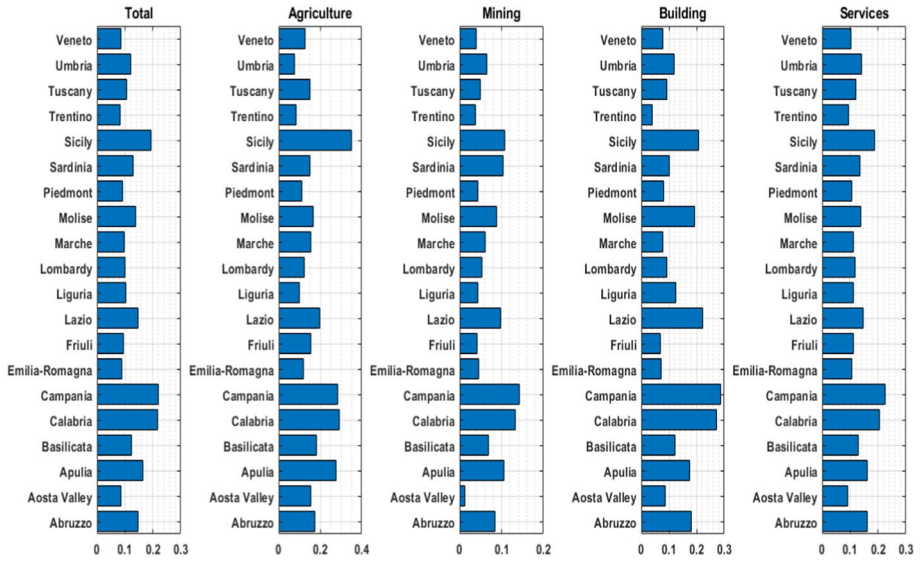

Fig. 2 Distribution of the informal economy at the regional level. *Source* Own elaborations on Istat data

sectoral-level increase is then reflected in an increasing pattern of the total informal economy that showed a mild contraction after 2015.

Figure 2 shows the distribution of the informal economy at the regional level. The evidence indicates that the size of the informal economy is larger in the peripheral and less developed regions of the South, most notably Campania, Calabria, Sicily, and Apulia; while it is significantly lower in some core regions in the North like Trentino, Piedmont,

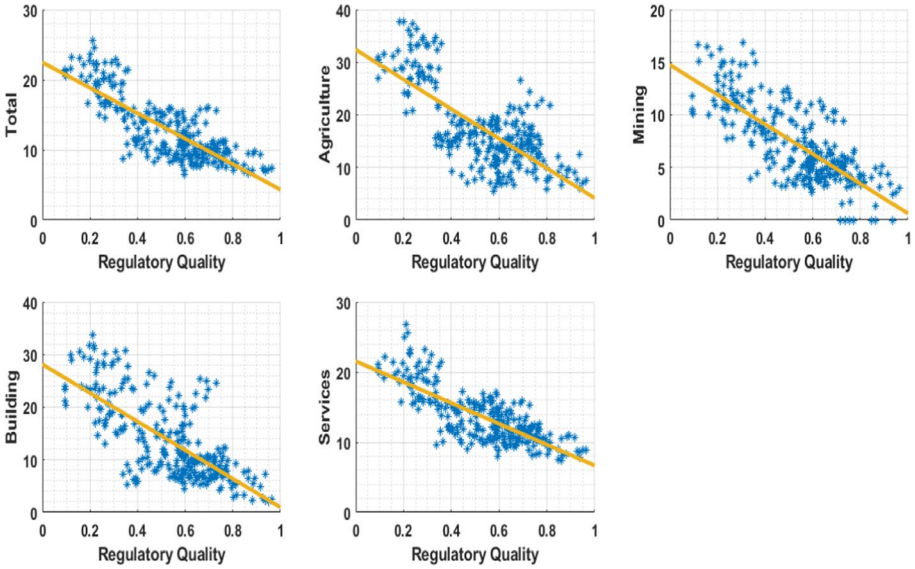

Fig. 3 Time series behaviour of the regulatory quality. *Source* Own elaborations on Nifo and Vecchione (2014) data

Emilia-Romagna and Aosta Valley. Further, the evidence displayed in Fig. 2 indicates that the larger shares of informal economy are mostly concentrated in agriculture and buildings in the aforementioned Southern regions.

Figure 3 displays the scatter plot between the regulatory quality against each dimension of the informal economy considered in this study. The evidence points to a clear inverse relationship between the regulatory quality and each dimension of the informal economy that indicates the regions characterized by regulatory quality also have a smaller informal economy.

4 Empirical Results

4.1 Baseline Results: OLS Method

Table 2 shows the outcomes of our benchmark OLS specifications (column 1, with no lags of regulatory quality; column 2, with one lag of regulatory quality to see if there is a long-term or persistent effect) for all economic activity in the informal economy. Our evidence supports the theoretical prediction. The higher level of regulatory quality significantly reduces the informal economy. Our findings are consistent with the body of research linking regulatory quality to a country's level of informal economy (Dreher & Schneider, 2006; Enste, 2010; Schneider et al., 2010). With respect to the other controls included in the econometric analysis, there is evidence of a positive and significant relationship between the long-term unemployment rate and the total informal economy, a result that indicates the incentives to hire workers illegally are higher as the conditions in the labour market deteriorate (see especially column 2). Disposable income and population density,

Table 2 Informal economy and regulatory quality: OLS regression

	(1) ln(Total activity) OLS	(2) ln(Total activity) OLS	(3) ln(Total activity) IV	(4) ln(Total activity) IV
$(\text{Regulatory quality})_t$	−0.550***		−1.351***	
	[0.102]		[0.478]	
$(\text{Regulatory quality})_{t-1}$		−0.527***		−1.557**
		[0.106]		[0.645]
Unemployment rate	0.00863	0.0128**	0.000405	0.00465
	[0.00546]	[0.00504]	[0.00657]	[0.00734]
ln(Disposable income)	−0.0280	−0.0296	0.805	1.088
	[0.176]	[0.165]	[0.510]	[0.727]
Graduates 25–64 (%)	0.0611***	0.0611***	0.0430***	0.0349**
	[0.00910]	[0.00903]	[0.0126]	[0.0177]
ln(Population density)	0.0994	0.0875	−0.802	−1.127
	[0.182]	[0.171]	[0.554]	[0.790]
ln(Social capital)	−0.0601***	−0.0532***	−0.0187	0.00712
	[0.0148]	[0.0166]	[0.0322]	[0.0450]
ln(Age of the population)	−95.98***	−102.7***	−95.95***	−101.0***
	[19.36]	[18.57]	[22.56]	[25.78]
$\ln(\text{Age of the population})^2$	12.44***	13.34***	12.40***	13.08***
	[2.567]	[2.462]	[2.991]	[3.417]
North-West	−0.233***	−0.229***	−0.408***	−0.468***
	[0.0533]	[0.0503]	[0.104]	[0.161]
North-East	−0.278***	−0.269***	−0.383***	−0.410***
	[0.0539]	[0.0510]	[0.0707]	[0.109]
Centre	−0.0966**	−0.104***	−0.133***	−0.158**
	[0.0398]	[0.0396]	[0.0433]	[0.0618]
Constant	187.7***	200.2***	184.5***	192.8***
	[36.29]	[34.84]	[42.12]	[48.06]
1st stage (IV)				
Ethnic Fractionalization	–	–	−0.054*	−0.385
Latitude × 1000	–	–	−1531.908***	−1227.506***
Time dummies	Yes	Yes	Yes	Yes
F-test on first stage instruments	–	–	23.17***	14.08***
Test of over-identifying restrictions (p)	–	–	0.8312	0.6729
Exogeneity test (p)	–	–	0.0967	0.0931
Period	2004–2019	2004–2019	2004–2019	2004–2019
Observations	320	300	320	300

Standard errors in brackets; *$p < 0.10$, **$p < 0.05$, ***$p < 0.01$; see Table 1 for more details about variables' definition

on the other hand, do not have a significant effect on the informal economy. Furthermore, social capital has a detrimental and highly statistically significant effect on the informal

economy by encouraging legal hiring. There is a positive relationship between graduates and the informal economy. This result indicates that many graduates who cannot find a job are willing to work illegally. There is, however, evidence of a U-shaped relationship between the age of the population and the informal economy that indicates that as their age increases, workers might have less bargaining power and may be more likely to work illegally. Consequently, the evidence further indicates that the Northern and Central regions suffer less from the informal economy than the Southern regions, where the phenomenon is more evident.

5 Robustness Analysis

In order to validate our theoretical prediction, we apply two different robustness tests. We initially replicate the estimates performed in Table 2 by proposing an instrumental variable (IV) to deal with the likely simultaneity between the regulatory quality and the informal economy.[6] In a second step, we propose a set of econometric specifications considering different dimensions of informal economy to confirm that the effect of regulatory quality holds. We discuss each test separately.

5.1 Dealing with Endogeneity: IV Method

The aforementioned evidence is confirmed with the IV but with some differences in the size of the coefficients (Table 2, column 3, with zero lags in the regulatory quality; and column 4, with one lag in the regulatory quality).

As usual, we also conduct a series of diagnostic statistics in order to understand whether the instruments used (i.e. the EFR index and latitude) solve the endogeneity problem. In fact, as indicated by the exogeneity test, endogeneity does exist. In our context, the F-test on the first-stage instruments eliminates the weaker instruments (as the test should be more than 10% as per rule of thumb to validate the exclusion of weak instruments), while the test with the over-identifying restriction confirms the validity of the instruments used.

5.2 How Does Regulatory Quality Affect the Different Dimensions of the Informal Economy?

Table 3 presents the results of our robustness tests that use OLS (columns 1–8) and IV (columns 9–16) specifications for different sectors of the informal economy. Except for agriculture (columns 1 and 2) and mining (columns 11 and 12), the evidence indicates that higher regulatory quality significantly reduces the size of the informal economy. With respect to the other controls included in the econometric analysis, there is evidence of a positive and significant relationship between the long-term unemployment rate and the size of the informal economy that indicates the incentives to illegally hire workers are greater as the labor market conditions deteriorate (especially in the column 2). The disposable income and population density, on the other hand, do not have a significant effect on the informal economy. There is a positive relationship between graduates (%) and the informal

[6] See the Supplementary Material for more technical details on the application of the IV approach.

Table 3 Different dimensions of informal economy and regulatory quality: OLS and IV regression

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)
	ln(Agriculture Activity)	ln(Agriculture Activity)	ln(Mining activity)	ln(Mining activity)	ln(Building activity)	ln(Building activity)	ln(Services Activity)	ln(Services Activity)	ln(Agriculture)	ln(Agriculture)	ln(Mining activity)	ln(Mining activity)	ln(Building activity)	ln(Building activity)	ln(Services Activity)	ln(Services Activity)
	OLS	OLS	OLS	OLS	OLS	OLS	OLS	OLS	IV	IV	IV	IV	IV	IV	IV	IV
(Regulatory quality)$_t$	0.220		−0.828***		−0.938***		−0.460***		−1.576**		−0.631		−4.475***		−1.344***	
	[0.190]		[0.147]		[0.218]		[0.106]		[0.674]		[0.498]		[1.518]		[0.460]	
(Regulatory quality)$_{t-1}$		0.270		−0.846***		−0.836***		−0.433***		−1.393**		−0.539		−3.031**		−1.832***
		[0.203]		[0.151]		[0.212]		[0.109]		[0.662]		[0.597]		[1.473]		[0.660]
ln(Unemployment rate)	−0.00280	−0.00561	0.0228***	0.0264***	−0.00483	0.00142	−0.00402	0.000751	−0.0197	−0.0133	0.0256***	0.0318***	−0.0424*	−0.0149	−0.0136**	−0.00755
	[0.00799]	[0.00772]	[0.00822]	[0.00775]	[0.0115]	[0.0107]	[0.00572]	[0.00539]	[0.0129]	[0.00972]	[0.00858]	[0.00792]	[0.0217]	[0.0175]	[0.00640]	[0.00806]
ln(Disposable income)	−2.492***	−2.571***	0.427	0.506	−1.570***	−1.656***	−0.0132	−0.0143	−0.584	−0.654	0.217	0.283	2.132	0.752	0.930*	1.531**
	[0.422]	[0.439]	[0.308]	[0.310]	[0.478]	[0.473]	[0.176]	[0.168]	[0.805]	[0.890]	[0.578]	[0.729]	[1.657]	[1.742]	[0.488]	[0.759]
Graduates 25–64 (%)	0.0216	0.0278	0.119***	0.111***	0.203***	0.203***	0.0396***	0.0403***	−0.0200	−0.0165	0.122***	0.105***	0.125***	0.142***	0.0201	0.00626
	[0.0198]	[0.0211]	[0.0191]	[0.0203]	[0.0215]	[0.0215]	[0.00940]	[0.00934]	[0.0261]	[0.0277]	[0.0210]	[0.0249]	[0.0378]	[0.0441]	[0.0124]	[0.0187]
ln(Population density)	2.809***	2.898***	−0.334	−0.429	1.735***	1.801***	0.0881	0.0763	0.736	0.800	−0.108	−0.180	−2.269	−0.813	−0.932*	−1.602*
	[0.446]	[0.468]	[0.322]	[0.324]	[0.490]	[0.487]	[0.183]	[0.176]	[0.851]	[0.953]	[0.620]	[0.784]	[1.784]	[1.878]	[0.532]	[0.823]
ln(Social Capital)	−0.249***	−0.256***	0.0481*	0.0529*	−0.171***	−0.157***	−0.0394***	−0.0325*	−0.149***	−0.143**	0.0369	0.0285	0.0131	−0.0310	0.00659	0.0507
	[0.0360]	[0.0393]	[0.0264]	[0.0284]	[0.0362]	[0.0394]	[0.0149]	[0.0165]	[0.0475]	[0.0574]	[0.0365]	[0.0453]	[0.0921]	[0.0978]	[0.0316]	[0.0456]
ln(Age of the population)	227.1***	253.6***	−102.8***	−102.7**	1.195	−11.27	−109.6***	−115.1***	219.2***	235.3***	−100.2***	−94.80**	−7.832	2.392	−112.6***	−122.7***
	[34.21]	[39.44]	[38.20]	[40.61]	[50.61]	[52.88]	[22.93]	[22.07]	[40.03]	[39.93]	[35.51]	[37.04]	[56.20]	[58.22]	[23.24]	[27.56]
ln(Age of the population)^2	−30.41***	−33.92***	13.50***	13.49**	−0.512	1.173	14.32***	15.07***	−29.45***	−31.54***	13.16***	12.46**	0.506	−0.715	14.68***	16.02***
	[4.549]	[5.238]	[5.083]	[5.407]	[6.706]	[6.999]	[3.036]	[2.923]	[5.339]	[5.307]	[4.726]	[4.933]	[7.448]	[7.728]	[3.077]	[3.653]
North-West	0.583***	0.602***	−0.916***	−0.927***	0.295**	0.302**	−0.287***	−0.280***	0.176	0.187	−0.861***	−0.852***	−0.503	−0.212	−0.495***	−0.586***
	[0.127]	[0.132]	[0.116]	[0.119]	[0.143]	[0.142]	[0.0555]	[0.0533]	[0.215]	[0.239]	[0.151]	[0.190]	[0.367]	[0.393]	[0.0994]	[0.174]
North-East	0.367***	0.369***	−0.663***	−0.668***	−0.143	−0.132	−0.290***	−0.276***	0.122	0.132	−0.626***	−0.626***	−0.631**	−0.440	−0.422***	−0.441***
	[0.0984]	[0.0993]	[0.0947]	[0.0933]	[0.131]	[0.127]	[0.0579]	[0.0562]	[0.148]	[0.154]	[0.109]	[0.128]	[0.261]	[0.279]	[0.0683]	[0.122]
Centre	0.334***	0.312***	−0.379***	−0.387***	0.103	0.0832	−0.116***	−0.121***	0.266**	0.252**	−0.359***	−0.338***	−0.0750	−0.0258	−0.166***	−0.164**
	[0.0782]	[0.0768]	[0.0748]	[0.0747]	[0.0960]	[0.0957]	[0.0441]	[0.0452]	[0.114]	[0.116]	[0.0709]	[0.0804]	[0.135]	[0.149]	[0.0450]	[0.0706]
Constant	−408.2***	−457.3***	194.0***	193.2**	13.17	36.63	212.2***	222.5***	−400.5***	−430.7***	189.9***	179.2***	16.35	1.475	214.3***	230.9***
	[63.28]	[73.12]	[71.40]	[75.87]	[95.45]	[99.73]	[43.05]	[41.50]	[74.16]	[72.81]	[66.38]	[69.03]	[104.2]	[108.0]	[43.40]	[51.52]
1st stage (IV)																−0.385
Ethnic Fractionalization	–	–	–	–	–	–	–	–	−0.054*	−0.385	−0.054*	−0.385	−0.054*	−0.385	−0.054*	−0.385
Latitude × 1000	–	–	–	–	–	–	–	–	−1531.908***	−1227.506***	−1531.908***	−1227.506***	−1531.908***	−1227.506***	−1531.908***	−1227.506***
Time dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
F-test on first stage instruments	–	–	–	–	–	–	–	–	23.17***	14.08***	23.17***	14.08***	23.17***	14.08***	23.17***	14.08***

Table 3 (continued)

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)	(14)	(15)	(16)
	ln(Agriculture Activity)	ln(Agriculture Activity)	ln(Mining activity)	ln(Mining activity)	ln(Building activity)	ln(Building activity)	ln(Services Activity)	ln(Services Activity)	ln(Agriculture)	ln(Agriculture)	ln(Mining activity)	ln(Mining activity)	ln(Building activity)	ln(Building activity)	ln(Services Activity)	ln(Services Activity)
	OLS	OLS	OLS	OLS	OLS	OLS	OLS	OLS	IV	IV	IV	IV	IV	IV	IV	IV
Test of over-identifying restrictions (*p*)	–	–	–	–	–	–	–	–	0.2455	0.2353	0.6906	0.1202	0.5882	0.3134	0.5882	0.2569
Exogeneity test (*p*)	–	–	–	–	–	–	–	–	0.0976	0.0269	0.6651	0.5954	0.0702	0.1891	0.0702	0.0175
Period	2004–2019	2004–2019	2004–2019	2004–2019	2004–2019	2004–2019	2004–2019	2004–2019	2004–2019	2004–2019	2004–2019	2004–2019	2004–2019	2004–2019	2004–2019	2004–2019
Observations	320	300	320	300	320	300	320	300	320	300	320	300	320	300	320	300

Standard errors in brackets; *$p < 0.10$, **$p < 0.05$, ***$p < 0.01$; see Table 1 for more details about variables' definition

economy. Such a result could mean that graduates who cannot find jobs are willing to work illegally.

6 Conclusions and Discussions

Consistent with the ISTAT report of 2019, the informal economy in Italy accounts for 11.3% of the country's GDP, and 14.9% of the employed workers are non-regular full-time. Since the existence of informality entails a number of economic costs, a sizable and expanding body of literature has emerged in recent years that has investigated the factors that influence the decision to engage in informal work and with enterprises in the informal economy. According to a number of studies, the main factors contributing to tax fraud are high tax rates and limited chances of an audit. Along with tax evasion, the overregulation of the government is a further justification for working in the informal economy. According to the literature on regulatory quality, such as Dreher and Schneider (2006), if people and businesses believe that the government does not protect either contracts or jobs, they are more likely to engage in the informal economy.

In this study, we contribute to the literature by exploring the nexus between regulatory quality and the informal economy in two ways. First, we develop a theoretical model that explicitly links the choice to hire informal employees to the level of regulatory quality along three dimensions: the impact of taxes on both capital and labour, the flexibility of the labour market, and the probability of being punished.

The theoretical findings highlight the following pattern: the optimal number of official workers is positively linked to the availability of institutional services and adversely related to the payroll tax rate, regulatory burden, and nominal wage rigidity. As we predicted, the optimal number of unofficial workers selected by the firm in equilibrium is negatively related to the likelihood of getting caught due to illegal activities and the level of penalties levied. As a result, regulatory quality, as seen in good institutional services, a light regulatory burden, and less labor market rigidity, increases the number of formal workers that the firm chooses in equilibrium. On the other hand, an increase in inspection probability, strong monitoring quality, and high penalties for unofficial activity reduce the number of informal employees to equilibrium.

Second, we empirically examine the relationship between regulatory quality and the share of informal workers in order to confirm our theoretical hypothesis. The informal economy is measured as the informal job rate in total and at the sectoral level, as in Arezzo (2014) and Capasso and Jappelli (2013), while regulatory quality is measured as the capacity of governments to protect private sector activities, as in Nifo and Vecchione (2014). The long-term unemployment rate, social capital, population density, average population age, and disposable income are all included in the vector of controls, which is similar to the approach taken by Capasso and Jappelli (2013). Our data support the theoretical hypothesis behind the influence of rules on reducing the informal economy. Basically, the most virtuous regions that follow the rules and have good-quality institutions tend to decrease the share of informal workers by promoting and encouraging legality in the labour market. Some robustness analyses also confirm the main findings.

Improved regulatory quality is the mechanism that emerges to greatly reduce the informal economy. There is evidence of a positive and significant relationship between the long-term unemployment rate and the total informal economy for the other controls included in

the econometric analysis. This finding indicates that the incentives to hire workers illegally increase as the state of the labour market deteriorates.

Because it is a widespread phenomenon at odds with the European ideals of solidarity and social fairness, the informal economy is a problem that affects Italy and all of Europe. As such, it is one of the employment-related concerns of shared interest. The irregular employment in the informal economy lessens funding for social services, lowers social protection levels and employment prospects, and affects competitiveness. As a result of the decline in tax revenues, the state is unable to provide the same level of services, which turns into a vicious cycle whereby taxes must be raised in order to maintain service levels, increasing the incentives for illegal employment. The benefits of a formal employment contract, such as training, a specified career profile, income raises, a sense of belonging to the company, and the freedom to move on to other positions, are generally unavailable to irregular workers who are formally inactive and run the risk of being forgotten. A more accurate view of labour regulation is that it has a stimulating effect on economic activity rather than being a cause of informality. Regulation is necessary to fix market flaws, and the absence of labour regulation fosters an environment in which chronic inequality, unemployment, and economic inefficiency are prevalent (Deakin & Wilkinson, 2000; Sengenberger, 2005).

Our theoretical and empirical findings lead to a deeper understanding of the role of institutional quality and how it may influence circumstances in the labour market and elsewhere. The definition of "regulatory quality" demonstrates the necessity of adopting regulations in order to enhance internal operations to support the real economy. In order to achieve this support, an improvement in the labour market's conditions would permit an improvement in economic growth. In order to combat the rise of the informal economy, authorities and policymakers must therefore draft increasingly effective regulations. The home economy and state revenues would both gain from the absence of the informal economy as well as from the ensuing improvement in living standards and local growth.

Clearly, the impacts of the regulation will differ among industries, regions, and nations, and societal norms and customs will inevitably affect how the law is actually implemented. Therefore, in order to assess the law's real impact, an understanding of both the specific environment in which it is applied and the larger political and economic backdrop is needed. Certain empirical studies have examined the consequences of various labour laws through the long-term collection and analysis of data on a wide range of institutional and legal aspects (Deakin, 2009; Deakin & Sarkar, 2008). For instance, because they promote training and innovation at the corporate level, employee protection regulations may increase productivity.

The informal economy is varied and complex. It is made up of three groups: (1) self-employed workers; (2) informal employees of formal firms, whether they are directly contracted or have no formal rights to social security; and (3) informal domestic workers employed by homes. This is why policies addressing the informal economy should include a well-balanced mix of coercive requirements and incentives that account for the diversity and heterogeneity of the informal economy. Taxing informal activities, improving informal activities along the value chain, and organising people reliant on the informal economy must all be part of the overarching strategy. Our findings lead us to the conclusion that government policies should be targeted in three different ways to effectively combat the informal economy. First, the improvement of institutional quality should focus on more controls, especially in the areas most affected by crime, such as the southern regions. As Friedman et al. (2000) also emphasise, the ability of the state to govern and corruption are more important for curbing the informal economy than the incentive to evade taxes, which

is created by the tax rate itself. Second, policymakers should work to increase the incentive for companies to hire formal workers, prioritising the economic benefits. This is because, according to Fugazza and Jacques (2003), the individual benefits of engaging in the formal sector are preferable to a policy of deterrence to combat the informal economy. Thirdly, policy should also focus on regional inequalities, particularly in relation to employment. Measures to increase employment in the southern regions are therefore crucial to reduce economic inequality and incentivise growth of the formal labour force in Italy. A new and inclusive agenda for regional economic development should prioritise people's search for more and better jobs. This means combining more employment opportunities across age, gender, social and regional differences with better quality jobs in terms of wages, productivity, promotion and working conditions. In conclusion, we believe that future extensions of this analysis could be interesting. On the theoretical side, for example, it would be interesting to extend the analysis to the supply side. In other words, to also focus on the workers' perspective. The microeconomic approach could also take into account workers who have to decide in which labour market they seek employment: the regular or the irregular one, as in Fugazza and Jacques (2003), Kolm and Larsen (2003) and Bouev (2022). Workers' decision would depend on the expected benefits of the two available options. A future empirical extension should instead focus on European countries. This extension could shed light not only on the institutional quality differences between European countries, but also on the extent of the various factors influencing the informal economy. For example, in some countries, strict control might have a greater impact due to the level of corruption and the historical structure of the economic environment. On the other hand, other countries may see the firm-benefits side (such as reduction in tax burden) as key to reducing the informal economy.

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Declarations

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