Short, long and spatial dynamics of informal employment

by

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This version: may 2015

Abstract

This paper analyses the determinants and the spatial patterns of regional shadow labour markets. Cross-regional migration flows are introduced in a stochastic two-sector model in order to study the effects of regional interactions on informality. Empirical results show that informal activities across Italian regions are primarily driven by the inefficient provision of public goods and high taxes. Regional connections are found to be significant. Place-specific reactions of informal employment to national shocks in the official economy are investigated, finding that the informal sector can act as a complement to or a substitute for formal activities in different places. The summary of the results and policy conclusions are discussed in the final section.

Keywords: regional shadow economy, informal employment, spatial interactions.
JEL classification: H26, O17, C33.

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I. Introduction

Underground economic activities and irregular workforces are widespread phenomena in today's economic systems in both developing and developed countries. BUEHN and SCHNEIDER (2012) quantified the weighted average of informality across 162 nations standing at about 17% of GDP; SCHNEIDER (2013) estimated that in European countries 48 million people work illicitly, with about 30 million people in the European Union alone. The shadow labour market is a significant component of the overall shadow economy and it includes all market-based legal production of goods and services that are voluntarily concealed from public authorities in order to avoid payment of social security contributions, income and value added taxes, and/or not comply with administrative obligations and legal labour market standards (SCHNEIDER and WILLIAMS, 2013). Informal employment is made up of a heterogeneous set of workers, individuals who do not participate in the official labour market, regular workers having an irregular second job and illegal immigrants excluded from the official economy.

The regional patterns of the shadow economy labour market are progressively attracting the interest of researchers and policymakers (see, for example, the special issue in the *INTERNATIONAL LABOUR REVIEW*, 2013). TAFENAU *et al.* (2010) provided evidence on the regional variation of underground activities across European countries underlying the importance of taking into account local and regional aspects for contrasting the shadow economy and designing better regional development policies. HERWARTZ and THEILEN (2013) studied the relations among the regional distribution of shadow economic activities across the European Union, the national contribution to the EU budget and the allocation of the EU structural funds. HERWARTZ *et al.* (2011, 2013) pointed out the relevance of investigating the within country variation of the shadow economy in order to provide better knowledge of regional and local formal economic activities, reducing endogeneity issues present on a country level, and to provide support for the adoption of regional differentiated policies for limiting the size of informality. Regional issues were introduced by the European Commission within the initiative for creating a 'European Platform to improve cooperation at EU level in order to prevent and deter undeclared work more effectively' launched in April, 2014.

The main aim of this paper is to provide three contributions to the literature studying the regional dimension of the shadow economy labour market and the geography of informality within a country. Firstly, a stochastic two-sector theoretical model is presented

in order to discuss the implications of specific determinants of informality such as the efficient/inefficient provision of public goods and taxes. The model allows for the introduction of spatial linkages across different areas through the explicit incorporation of cross-regional migration flows, which are primarily driven by regional differences in productivity between formal and informal activities. This framework throws some light on why and where people work in the shadow economy, the geographical connections between formal and informal activities, and what the reasons are behind the decision of informal workers to migrate in search of formality.

Secondly, building on the implications of the theoretical model, an empirical investigation on the determinants of the size of informal employment across the twenty Italian regions (NUTS 2-level) over the period 2001 – 2012 is conducted. Italy has one of the largest shares of the shadow economy among OECD countries – SCHNEIDER (2013) estimated the size of the Italian shadow economy in percentage of official GDP at about 27% in 2012 – and Italy presents significant cross-regional variation when looking at the shadow economy *lato sensu*. Recently, ARDIZZI *et al.* (2014) analysed the distribution of the shadow economy among Italian provinces and its interplay with criminal activities at a local level, providing new insights on the spatial dimension of the Italian shadow economy. Our contribution complements the existing analyses for the Italian case by assessing the place-specific patterns of the shadow labour market in combination with regional interactions and interregional migration flows.

Thirdly, we study the cyclical behaviour of informal employment at a regional level, that is, the role of informal activities in particular areas during economic downturns and upturns. Specifically, we analyse the link between country-wide shocks in the official economy and the responses registered in the different regional shadow labour markets in order to find out whether and where informal activities act as a complement to or a substitute for formal ones. BAJADA and SCHNEIDER (2009) pointed out the presence of two counterbalancing effects connecting formal and informal activities: the 'income effect' capturing the procyclical behaviour of informality and the positive relations between the demand for formal and informal jobs; the 'substitution effect' describing the countercyclical behaviour of informal employment and its negative relations with the official economy. The adoption of a regional perspective for analysing the cyclical patterns of the shadow labour market is able to provide new insights into the link between formal and informal employment, given the presence of significant regional inequalities in

economic development and the possibility of exploiting more detailed information about the industrial structure, firm heterogeneity and the distribution of skills available on a territorial level.

The paper is organised as follows. The next section contains a review of the existing literature including a specific discussion on the Italian shadow economy. The third section presents the theoretical framework and the main testable hypotheses. The empirical analysis is developed in the fourth section. The final section provides a summary of the results and a discussion of some policy implications.

II. Related literature

Most of the theoretical contributions studying shadow employment have been built upon the two-sector approach pioneered by HARRIS and TODARO (1970), where the optimal decision of working formally/informally depends on the productivity differentials between the formal and the informal sector, and workers participate in formal/informal activities after comparing the costs and benefits of formality with those of informality (AMARAL and QUINTIN, 2006). RAUCH (1991) and LOAYZA (1996) extended the classical Harris-Todaro framework by incorporating skill differences across sectors and addressing the consequences of regulations and taxes on informality. DE PAULA and SCHEINKMAN (2011) developed a two-sector model with heterogeneous firms finding that informal activities are smaller and face higher costs of capital than formal ones. GALIANI and WEINSCHELBAUM (2012) modelled an economy where preferences of heterogeneous workers determine different employment equilibrium levels across sectors. This approach has been used by JONASSON (2012) for testing the influence of regional government effectiveness on informality across Brazilian municipalities.[1]

Several works have investigated the cyclical properties of the shadow labour market and the potential relations with unemployment. BUSATO and CHIARINI (2004), among others, provided theoretical support for the countercyclical role of the informal sector during recessions given that it operates like an insurance mechanism for reallocating formal labour; this effect depends on the flexibility of irregular jobs and the degree of substitutability between formal and informal occupations. FIESS *et al.* (2010) described the procyclical behaviour of informal activities by assuming that they are mostly concentrated in non-tradable sectors and the demand for irregular jobs positively depends on that for regular occupations. These alternative perspectives were studied by BAJADA and

SCHNEIDER (2009), who pointed out the relevance of analysing the link between shadow employment and unemployment, and the sector-specific composition of the irregular economy in order to understand whether informal activities substitute or complement formal ones. The importance of looking at informality jointly with unemployment was addressed in BOERI and GARIBALDI (2002) for explaining the uneven distribution of shadow employment across Italy. In general, the relationship between the official labour market and shadow employment turns out to be ambiguous depending on particular context-specific characteristics (SCHNEIDER and ENSTE, 2000).

The cumbersome task of estimating the size of the informal economy has been undertaken by using three main sources: direct measures like survey-based indicators and audit data; indirect measures deriving from national account statistics; and model-based estimates as in the case of the Multiple Indicator Multiple Causes Model (MIMIC). For a more detailed discussion on the empirics of the shadow economy, see SLEMROD and WEBER (2012). Empirical analyses in this area reached agreement on some of the main determinants of informality. Excessive and inefficient administrative and labour regulations contribute to increasing the size of the shadow economy and reducing the incentives to operate formally (JOHNSON *et al.* 1997, 1998; ANTUNES and CAVALCANTI, 2007). High tax rates and social security contributions positively influence the development of informal activities, by introducing distortions in production and labour choices (FORTIN *et al.*, 1997; DAVIS and HENREKSON, 2005; SCHNEIDER, 2005). ORSI *et al.* (2014) confirmed the positive effect of taxes on informality in a dynamic stochastic model applied to the Italian case.

As for the regional patterns of informality, using survey-based indicators WILLIAMS and WINDEBANK (1994) discussed the spatial variation of the informal sector within the countries of the European Union, finding significant territorial differences. MARCELLI (2004) explained the concentration of informal workers in California during the 1990s by the combination of demographic and regional institutional variables. GÓMEZ DE ANTONIO and PARDO (2004) applied the currency demand approach for analysing the geographical distribution of shadow activities in the Spanish provinces. WILLIAMS (2005) assessed the spatial distribution of undeclared work in the UK by highlighting the relevance of urban-rural and sector-specific differences. CHAUDHURI *et al.* (2006) and BUEHN (2012) adopted the MIMIC model in order to assess the distribution of the shadow economy across Indian and German States, respectively.

Unravelling the shadow economy in Italy has been the focus of several contributions due to its relevance to this country. ARDIZZI *et al.* (2015) provided original evidence on the connections of money-laundering, criminal activities and tax evasion for 91 Italian provinces, finding that most of money-laundering in Italy derives from illegal trafficking. The authors broken down the size and the determinants of money-laundering in the Centre-North and the South, making a distinction between the specific criminal activities located in each macro area. Measuring informality from the Survey on Household Income and Wealth (SHIW) conducted by the Bank of Italy, CAPPARIELLO and ZIZZA (2010) found a positive and significant relationship between underground labour and low levels of education, of particular importance for Southern regions where schooling achievements are lower than Northern counterparts.

Data on informal employment obtained from the SHIW databank were used in DI PORTO and ELIA (2011) for evaluating the impact of the Italian tax amnesty laws – a set of regulations set out in 2001-2002 for favouring the regularisation of irregular workers and irregular immigrants – on the wage structure and the wage differentials of regular and irregular workers. These authors found that the reduction of informal jobs following the amnesty laws contributed to increase wage inequality in the formal labour market, given that once regularised, informal workers mostly competed with low-skilled formal workers. CHIARINI *et al.* (2009) explained the scant success of the Italian amnesty laws with the absence of proper incentives, high labour costs and low enforcement commitment by the fiscal authority. With the aim of evaluating the effects of the 2003 Italian labour market reform on informal employment, DI PORTO *et al.* (2013) discussed the potential role of combining tax reforms and enforcement activities for reducing informality in Italy.

Using time-series data at aggregate level and the measurement of informal employment elaborated by the Italian Institute of Statistics (ISTAT), BOVI (2005) estimated a VAR model for analysing the cyclical behaviour of informality during economic downturns, finding a countercyclical behaviour of informal activities in Italy and a decreasing link between informality and regular output over time. CHIARINI and MARZANO (2007a) explored the cyclical patterns of the national informal employment pointing out the role of the informal sector as an adjustment channel of the labour market given its high flexibility, and the presence of significant sector-specific effects. CHIARINI *et al.* (2013) analysed the long-run aspects of VAT tax evasion in Italy by adopting

cointegration and Granger causality techniques, highlighting the occurrence of a vicious circle among tax burden, increasing fiscal pressure and tax evasion. The same dataset was used by BASILE *et al.* (2014) for estimating fiscal policy multipliers in the presence of a sizeable shadow economy.

III. A simple model of informal activity

In this section we describe a two-sector stochastic model of informal activity, which is an adaptation of the framework developed in LOAYZA and RIGOLINI (2011) with two differences - the explicit provision of taxes and the introduction of cross-regional migration flows - in order to lay the groundwork for the empirical analysis and identify the main testable hypotheses. In this framework, every worker has a different skill level s, which can be read as individual human capital or personal abilities, and decides to operate formally/informally on the basis of her expected wage. The skill level of the population follows a log-logistic distribution with parameters $\alpha, \beta = 1$, with resulting density and cumulative distribution functions equal to $f(s) = \frac{1}{(1+s)^2}$ and $F(s) = \frac{s}{(1+s)}$. The formal sector differs from the informal sector in terms of production technologies θ_j, with $j = F, I$, and by assumption operating formally results to be more productive than working informally, namely $\theta_F > \theta_I$, given that formal firms are usually bigger and better equipped than informal ones. The prices of the goods are normalized to one without restricting *a priori* the possibility that each sector can produce a different product.

The output produced in the formal sector by the firm i is obtained by combining the workers' skill level, the sector-specific production technology and a positive externality R^γ, with $0 < \gamma < 1$, denoting the efficiency of the provision of public goods like a set of productivity-enhancing regulations. Formal agents incur in the tax burden $T > 0$, which is used for financing public goods and other public expenditures. The resulting production function for the formal sector is $y_F(i) = \int_0^1 (\theta_F R^\gamma s - T) l_i(s) ds$, where $l_i(s)$ is the distribution of workers' skills for firm i, with $L_i = \int_0^1 l_i(s) ds \leq 1$ be the total workforce per firm.

The production for the informal sector depends on the workers' skill level, the sector-specific production technology and the positive externality deriving from public goods, but it does not include taxes. The case of no taxes paid by the informal firms is

made for simplicity and it can be modified by introducing a fraction τT, with $0 < \tau < 1$, in the production function for the informal sector; the only effect of this modification is that the payment of taxes by informal firms lower the differential between the two sectors, the higher is the parameter τ. Therefore, the production function for the informal sector is: $y_I(i) = \int_0^1 (\theta_I R^\gamma s) l_i(s) ds$.[2] In equilibrium, the skill-specific competitive wage in each sector is equal to the marginal productivity of labour input, namely $w_F(s) = \frac{\partial y_F(i)}{\partial l_s(i)} = \theta_F R^\gamma s - T$ and $w_I(s) = \frac{\partial y_I(i)}{\partial l_s(i)} = \theta_I R^\gamma s$ for the formal and informal sector.

The decision of working formally/informally in a particular area implies comparing the expected wage in the two sectors. By solving the wage differential for the skill level, we obtain the skill threshold $\tilde{s}$ at which the migration from formality to informality and *vice versa* can occur:

$$\tilde{s} = \frac{T}{R^\gamma(\theta_F - \theta_I)}. \qquad (1)$$

Workers with skills higher than the threshold will operate in the formal sector ($s_F > \tilde{s}$), while workers with lower skills will be active in the informal sector ($s_I < \tilde{s}$). The size of the informal sector in a particular time period I_t depends on the cumulative distribution function of the skill density evaluated at the threshold level, namely $I_t(\tilde{s}) = F(\tilde{s}) = \frac{\tilde{s}}{(1+\tilde{s})}$, and it is equal to $I_t = \frac{T}{R^\gamma(\theta_F - \theta_I) + T}$.

The skill threshold and the overall size of the informal economy are negatively influenced by the productivity differential between the formal and informal sector ($\theta_F - \theta_I$). Other things being equal, the more productive formal activities than informal ones, due, for instance, to higher economies of scale or more capital equipment in the formal sector, the lower is the incentive to operate informally. In addition, the following testable hypotheses can be derived:

Hypothesis 1: The more efficient the provision of public goods and regulations, the lower the participation in the informal economy, ceteris paribus.

Hypothesis 2: The higher the tax burden, the higher the participation in the informal economy, ceteris paribus.

Workers in a given region make the decision of operating formally/informally within the same region after evaluating the place-specific trade-off between formality and informality that depends on the tax burden, the efficiency of regional public regulations and the productivity gap between the formal and the informal sector. Informal workers living in a region with a certain level of informality can also decide to migrate towards a different region showing a lower level of informal economy in search of regularisation. In this case, workers will compare the expected wage of staying informal in the home region with that of having a formal job in a different geographical area. This can imply the occurrence of interregional migration flows motivated by the willingness of obtaining a regular occupation and the interdependence of shadow labour markets across regions.

Let's consider a country where there are two different areas, region H and L, with region H showing a higher level of informality than region L. The distribution of skills in each region follows the same pattern as before and the aggregate skills of the population are assumed to be hold fixed. The national skill threshold between formality and informality is obtained by combining the two regional skill thresholds $\tilde{s}^a$ $(a = L, H)$, namely $\tilde{s}^H = \frac{T^H}{R^{\gamma H}(\theta_F{}^H - \theta_I{}^H)}$ and $\tilde{s}^L = \frac{T^L}{R^{\gamma L}(\theta_F{}^L - \theta_I{}^L)}$, with $\tilde{s}^H > \tilde{s}^L$. The size of the informal economy in the two regions is $I_t{}^H(\tilde{s}^H) = F(\tilde{s}^H)$ and $I_t{}^L(\tilde{s}^L) = F(\tilde{s}^L)$, with $I_t{}^H(\tilde{s}^H) > I_t{}^L(\tilde{s}^L)$. In each region, the skill threshold and the size of the informal economy continue to depend on the following determinants: the tax burden (+), the efficiency of public goods (-), and the productivity differential between the formal and the informal sector (-).

When a marginal informal worker living in region H evaluates the opportunity of moving to region L in order to regularise her activity, she looks at the equilibrium wage of the formal sector in the destination region L and compares it with her situation of informality in her home region. In other words, the decision of migrating in search of formality depends on the wage differential between $w_F{}^L(s_F{}^L)$ and $w_I{}^H(s_I{}^H)$, and the migration threshold for the informal worker in region H is equal to:

$$\bar{s}_I{}^H = \frac{\left(R^{\gamma L}\theta_F{}^L s_F{}^L\right) - T^L}{R^{\gamma H}\theta_I{}^H}. \qquad (2)$$

In region H, informal workers with skill level ${s_I}^H > \overline{s_I}^H$ decide to stay at home and to operate informally, while those with skills ${s_I}^H < \overline{s_I}^H$ migrate to region L in search of formality.[3]

Cross-regional migration flows from informality to formality are driven by the productivity of formal activities (+), the overall formal workforce (+) and the taxes (-) in the destination region; and, they are negatively influenced by the productivity of informal activities in the home region. When informality becomes less convenient in region L for whatever reason, as in the case of a rise in the productivity of the formal sector, this may also produce effects in the shadow labour market of region H. The convenience of informal workers living in H to migrate in L in search of formality is higher due to the increased opportunities of obtaining a formal occupation in the destination region. Although this effect can probably describe a subset of the overall informal economy in the home region and it can contribute to explain a small part of cross-regional migration flows, we can expect a positive relation between the sizes of the shadow labour market in regions showing differences in the level of informality. Thus, the hypothesis to be tested in the empirical section is (*Hypothesis 3*): the more convenient operating formally is in the destination region (i.e. the lower is the size of the informal economy), the lower the informal economy is in the home region, due to more cross-regional migration flows, ceteris paribus.

Regional shadow labour markets' reactions to national shocks in the official economy

The presence of significant differences in the economic structure of regions within the same country can have consequences on the cyclical behaviour of regional shadow labour markets and, in particular, on the way regional informal sectors react to national variations in the official economy. In some areas, informal employment can act as a complement to formal occupations, there can be a procyclical relationship between regular and irregular activities, and the shadow labour market can show labour drag effects (CHIARINI and MARZANO, 2007b). This can be the case when informal labour is made up of hours worked in the informal sector (i.e. intensive margin), regular workers having an irregular second job, and the income effect (BAJADA and SCHNEIDER, 2009) is at work. In some other areas, the shadow labour market can be a substitute for the official economy showing a countercyclical pattern in response to variations in regular activities, and

operating in the irregular sector can represent a survival strategy (WILLIAMS and WINDEBANK, 1994). This can occur when informal employment is mostly due to the percentage of informal workers in the economy (i.e. extensive margin), irregular activities are concentrated in particular sectors like agriculture, building and low-skilled services, and the substitution effect (BAJADA and SCHNEIDER, 2009) is in place.

To describe these asymmetric patterns, the productivity level for the formal sector θ_F can be broken down as the sum of a component $\bar{\theta}$ and a transient element $\varepsilon\bar{\theta}$, with the shock ε having mean zero and affecting the formal sectors in each region in the same way. This shock can be interpreted as an unexpected movement of the national official economy. The productivity level for the informal sector θ_I is the combination of the component $\mu\bar{\theta}$, with $0 < \mu < 1$ denoting the lower average productivity of operating informally, and the region-specific transient element ${\mu_\varepsilon}^a\varepsilon\bar{\theta}$. Thus, the productivity levels in the two sectors are $\theta_F = (1 + \varepsilon)\bar{\theta}$ and $\theta_I = (\mu + {\mu_\varepsilon}^a\varepsilon)\bar{\theta}$, and the only difference between the two regions is the transient element of the productivity of informal activities. By assuming that this component is equal to ${\mu_\varepsilon}^L > 1$ and ${\mu_\varepsilon}^H < 1$ in region L and H, informality in region L will behave pro-cyclically after a common nationwide productivity shock, while informality in region H will show a countercyclical pattern.

Taking into account productivity decompositions and omitting for simplicity the element R^γ, the skill threshold between formality and informality in the region a can be rewritten as follows:

$$\tilde{s}^a(\bar{\theta}, \varepsilon) = \frac{T^a}{[(1-\mu) + (1-{\mu_\varepsilon}^a\varepsilon)]\bar{\theta}}, \qquad (3)$$

with taxes having the same effect as before, and the productivity differential between the two sectors now depending on the parameter μ; the size of the informal economy becomes ${I_t}^a(\bar{\theta}, \varepsilon) = \frac{T^a}{[(1-\mu)+(1-{\mu_\varepsilon}^a\varepsilon)]\bar{\theta}+T^a}$. The direction of the region-specific response of informality depends on the sign of the impact parameter ${\mu_\varepsilon}^a$.

More precisely, we need to investigate the relation ${dI^a}/{d\varepsilon} = -I^a(1-I^a)\phi^a$, where $\phi^a = \frac{(1-{\mu_\varepsilon}^a)}{(1-\mu)+(1-{\mu_\varepsilon}^a)\varepsilon}$, and look at whether a positive/negative productivity shock at national level triggers asymmetric reactions in the different shadow labour markets of

region L and H. In the empirical section, we will address this issue by analysing the consequences of a rise in productivity in the national official economy ($\Delta\varepsilon > 0$) on the size of the informal sector in different regions. A positive (negative) response of the regional informal economy will provide supporting evidence for the idea that regional shadow labour markets show procyclical (countercyclical) patterns with respect to changes in the national official economy, confirming their role as complement to (substitute for) formal activities.

IV. Empirical analysis

IV.1. Data and preliminary statistics

To measure informal employment the index of full time equivalent undeclared work supply elaborated by ISTAT for the 20 Italian regions over the period 2001-2012 can be used, which includes both the number of underground working positions and irregular worked hours. During the time period considered, this index was on average 13.9 with significant differences across regions; in 2012, informal employment in Sicily was about 21.5% of the total workforce, while in Lombardy about 7%. Moreover, the ANOVA F-test rejected the null of equality of the mean level of informal employment across the four Italian macro-areas (North-West, North-East, Centre, South): F-statistics = 247.40, p = 0.000.[4] The distribution of the informal sector across Italy is negatively related to that of regional GDP per-capita as reported in figure 1, with high levels of informality concentrated in those regions, mostly located in the South, registering low economic performance.

Insert about here.
Figure 1. Informality and GDP across Italian regions, 2001-2012.

Such geographical differences are confirmed when looking at the relations between the national official economy and regional shadow labour markets. The correlation between the Italian formal employment growth rate and the level of informal employment across the four Italian macro-areas is: 0.052 (North-West), 0.557 (North-East), 0.517 (Centre) and -0.522 (South). Graphs in figure 2 compare the Italian formal employment growth rate with the share of irregular workers in the Centre-North (left), that is, the average of three macro-areas North-West, North-East and Centre, and in the South (right).

It is worth observing the asymmetric reaction of informal employment during the recent economic crisis, with a sharp increase registered in Southern regions and a progressive reduction observed in the rest of Italy. These preliminary observations suggest that the Italian shadow labour market is quite heterogeneous across the space, given the presence of significant regional differences in terms of economic structure, and that place-specific interactions between formal and informal occupations are likely to be in place.

Insert about here.
Figure 2. Italian official employment growth and informal employment in the Centre-North and the South.

The effect of public regulations on informality at a regional level can be seen in the time-delay in the approval of the regional public budget by regional authorities and provides evidence of the efficiency of regional governments in terms of certainty of financial resources. Before the beginning of a given year (deadline: 31 December of the previous year), by law, Italian regions must approve their budgets in order to be able to allocate resources and make outstanding payments; when this deadline is not respected, regional governments can only partly commit their available resources and payments cannot be made. The dummy variable *RULE* takes value one when regions approve their budgets in time, otherwise it takes value zero. The expected sign of this variable is negative.

For the regional tax burden the regional tax rate on productive activities is used (*IRAP*), which represents about 74% of total regional tax revenues; and almost 95% of Italian regions used their fiscal power to modify the ordinary tax rate indicated by the national government in order to apply different tax rates (BUGLIONE and MARE', 2008). Differences across regions were found, with the lowest tax rate in Trentino A.A. (3.2%) and the highest (5.25%) in some Southern regions during specific years. The expected sign of this variable is positive due to the direct contribution of the tax burden to increasing labour supply in the irregular sector. We use the variable *CREDIT*, that is, the average regional interest rate paid by firms in order to incorporate information on the efficiency of regional credit markets and the accessibility of formal firms to ordinary credit in specific areas. A direct impact between high interest rates and regional irregular jobs is expected, when the more difficult it is to obtain ordinary credit, the higher the probability of becoming and staying informal is so as to be able to generate income and financial resources (La Porta and Shleifer, 2014).

To explore the relevance of cross-regional migration flows the variable IRR^{DEST} is introduced. For a given region *i*, it has been constructed as the weighted average of the size of informal employment observed in the regions of destination of the domestic interregional migration flows from *i*, where the weights have been calculated as the share of migration outflows of people from region *i* to each destination. Data on domestic migration flows for Italian regions are available on annual basis from the *GeoDemo* databank elaborated by ISTAT. This variable describes the shadow labour markets of those regions where people living in a particular area decide to migrate from their home region, and it relies upon the idea that the decision of migrating in search of formality influences total cross-regional migration flows in Italy (SVIMEZ, 2003). Cross-regional migration flows generally occurr from regions having high levels of informality towards regions with low levels of irregular workers: this was true when looking at both the migration patterns from the South to the Centre-North, two areas showing significant differences in terms of informal activities, and the migration of people among Central and Northern regions. The expected sign of this variable is positive: the more convenient operating informally in the destination region is, as in the case after a rise of tax rates, the less valuable it is to work in the formal economy in the same region, the higher the incentive not to migrate in search of formality and continue to operate informally in the home region.

The regional GDP per-capita at constant prices (in logs) and the share of public employment on a regional level are used as control variables. The former allows for the consideration of structural economic differences across Italian regions and a negative sign is expected. The latter captures the place-specific effects of public sector jobs on informality and a positive relationship is expected for three main reasons. Firstly, DEL MONTE and GIANNOLA (1997) discussed the role of irregular jobs as a waiting room before having access to public occupations when the public sector is conceived as a relevant formal employer and individuals decide to not undertake riskier productive activities. Secondly, public employees can have easier access to a second irregular job than private workers as a consequence of slack control mechanisms in the public sector. Thirdly, if the share of public employment in a given region is thought of as a measure of public sector inefficiency people are less motivated to operate formally, and they are likely not to pay taxes for financing an over large public sector (HERWARTZ *et al.*, 2011). Table 1 shows the descriptive statistics of all the variables used.

Insert about here.
Table 1. Descriptive statistics.

IV.2. Estimation results

Before specifying the empirical model, some preliminary issues need to be addressed. The variables describing the regional tax burden and credit availability at a regional level can be affected by endogeneity problems that need to be solved in order to produce reliable estimates. SCHNEIDER and WILLIAMS (2013) discussed the vicious circle for public finances deriving from the presence of shadow activities: high tax rates may imply more informal employment and less tax revenues due to a smaller tax base, as a consequence regional governments may decide to further increase tax rates in order to balance their budget, activating a self-reinforcing mechanism between the tax burden and informality. GOBBI and ZIZZA (2012) and CAPASSO and JAPPELLI (2013) observed that the size of the underground economy can have a negative effect on the financial development of a particular area suggesting a reverse causality channel between informality and credit availability. In the presence of a relevant share of informal activities, financial institutions are not able to observe the whole set of information and, therefore, they can decide to reduce their exposure to risks by limiting the availability of credit. To overcome these endogeneity issues – confirmed after performing preliminary tests on endogeneity – in the regression equation we introduce the two variables in lagged form.

The error structure of our panel needs to be correctly specified for ruling out inefficiency problems. Test results show the presence of heteroskedasticity, autocorrelation and contemporaneous cross-sectional dependence (BALTAGI and PESARAN, 2007).[5] To deal with these aspects our results have been obtained by applying the Prais-Winsten estimator with panel- and autocorrelation-corrected standard errors, which is more appropriate in short panels and less anticonservative than the Feasible Generalized Least Squares (FGLS) estimator (BECK and KATZ, 1995; ARDIZZI *et al.*, 2015). Thus, the following relation has been estimated:

$$Y_{it} = \beta X_{it} + \gamma Z_{it-1} + \varepsilon_{it}, \qquad (4)$$

where Y_{it} is the size of the informal sector in region i ($i = 1, \dots, 20$) at time t ($t = 2001, \dots, 2012$), X_{it} is the set of covariates $RULE$, GDP, $PUBEMP$, Z_{it-1} is the set of covariates $CREDIT$, TAX, β and γ are coefficients to be estimated, and ε_{it} is the error term. Regional fixed effects and time dummies for the years 2002 and 2003 have been also introduced in the specification in order to control for residual unobserved heterogeneity across regions and the effects of the Italian tax amnesty laws.

Insert about here.
Table 2. Estimation results.

Table 2 reports estimation results. Model 1 investigates the impact of the tax burden on informal employment, model 2 adds the effect of regional public regulations, model 3 introduces the variable IRR^{DEST} (in lagged form) in order to assess the validity of our *Hypothesis 3*. The three specifications are quite satisfying in terms of statistical significance and R-squared. The expected sign of the determinants of informality are confirmed: informal employment is positively driven by the regional tax burden, tighter credit markets, and the relevance of public employment for the regional economy. Better economic conditions, described by the level of regional GDP, and more efficient regional regulatory frameworks contribute to reducing the size of the shadow labour market. The positive and significant coefficient of the variable IRR^{DEST} supports the view that cross-regional migration flows matter for explaining the distribution of informality across Italy. Other things being equal, the higher the size of the shadow labour market in the destination regions, the lower the incentive to migrate to regularise the activity, the higher the informal economy at home.

Comparing the coefficients obtained from the estimation of the model 3 including all the covariates provides some insights into the different impact of each of the determinants of informality. The relevance of public regulations and taxes – *Hypothesis 1* and *Hypothesis 2* – on the size of the regional informal economy is worth observing, with the tax burden being more than twice as important as regional GDP. This is in line with the view that high taxes increase the convenience of operating informally and it reflects the fact that the Italian *IRAP* tax hampers the demand for formal occupations given that its tax base incorporates labour costs. The different timing in the approval of the regional budgets contributes to amplify regional differences in terms of the provision of public goods: the

regional budget was approved on average with 3 and 9 days of delay in Lombardy and Emilia Romagna, two regions where informal employment is relatively low in comparison to the rest of the country, while it was approved after 115 and 88 days in Campania and Calabria, where the size of the informal sector is high. Differences in credit availability and financial development also explain the uneven spatial distribution of informal activities across Italy: the underground economy probably produces financial resources for firms and households not available through the ordinary credit market.

IV.3. Robustness Checks

The robustness of our results has been checked by performing several alternative specifications. The models were estimated by using a different dependent variable, namely the measure of irregularity obtained from the SHIW databank elaborated by the Bank of Italy (CAPPARIELLO and ZIZZA, 2010). SHIW is a biannual representative sample of the Italian population including about 8,000 households and 24,000 individuals, and it provides detailed information that can be aggregated on a regional level. Building on the works of DI PORTO and ELIA (2011) and CAPASSO and JAPPELLI (2013), where this measure was discussed in depth, an index of regional underground workforce for the period 2000-2012 has been obtained. From the SHIW questionnaire, we have extracted individual information on the number of years of social security contribution payments and the approximate length of working life. Dividing the number of years when social security contributions were paid by the duration of working life, an index ranging from 0 (full informality) to 1 (full formality) has been obtained. Then, the size of the informal sector in a given region has been defined as the share of individuals below the 25th percentile, which can approximate those individuals operating informally for a relevant period of their working life.[6] The correlation between the SHIW index and the ISTAT measure was about 0.62, in line with the findings of previous analyses for the Italian case.

Insert about here.
Table 3. Estimation results, SHIW index.

Table 3 reports estimation results using the SHIW index for irregularity as a dependent variable. Cross-regional migration flows are captured by the variable $SHIW^{DEST}$, where the size of informality in the destination regions has been obtained from the SHIW

databank and the weights have been constructed as discussed beforehand. Our main hypotheses are confirmed providing support for the implications of the model described in the theoretical section. Taxes increase the size of the shadow labour market much more than the other factors, it can be observed that the coefficient of the variable tax rate is more than three times higher than that of regional GDP. The negative sign of the explanatory variable *RULE* means that the lower the efficiency of the regional regulatory framework, the higher the presence of underground activities in a given area. The positive coefficient of the variable $SHIW^{DEST}$ sustains the view that regional shadow labour markets are linked by cross-regional migration flows, which can be motivated by the desire to find a regular job in a different region where the opportunity of becoming a formal worker is higher. The expected sign of the other factors influencing informality is confirmed.

To assess the potential role of immigration on the size of informal labour (DI PORTO and ELIA, 2011; SCHNEIDER and WILLIAMS, 2013), we have controlled the share of non-native migrants at a regional level using annual observations obtained from the *GeoDemo* databank. This measure describes immigrants living in a particular region that are officially recorded by ISTAT and it probably reflects non-native individuals mostly operating in the formal sector; while undocumented immigrants, who are likely to be the majority of non-native people working in the informal sector, are not fully recorded given their illegal status. In Italy, the share of recorded non-native migrants is higher in those regions showing low levels of informality given that these regions also provide better economic conditions for both domestic and non-native migrants. This measure has been introduced in lagged form for ruling out endogeneity problems and it does not affect our results. The reliability of the variable describing regional financial development in our regressions has been checked by adopting the same instrumental approach discussed in GUISO *et al.* (2004), where the indicators of the regional supply of credit in 1936 were used as instruments; these additional estimates confirm the validity of our results.[7] Finally, estimation results are not affected by the introduction of dummies for each macro-area and interaction terms describing regional GDP dynamics.

IV.4 National shocks and regional responses of the informal sector

The idea that spatial economic inequalities across Italy can have consequences on the specific nature of underground activities and informal employment on a regional level is not a new one (MINGIONE, 1980; MATTERA, 1988; REY, 1995). In the presence of

significant regional differences regarding the industrial structure, firm size and unemployment levels, regional shadow labour markets can show distinctive features and, more importantly, their interactions with the official economy can follow different patterns. During the recent economic crisis, for instance, Italian regions registered significant asymmetric effects when looking at the size of the informal sector: in 2012, the level of informality in Veneto was about 5% lower than in 2008 when the global financial crisis started; in Sardinia, the size of the informal economy increased of about 24% over the same time period. As discussed in Section III, the region-specific dynamics of shadow labour markets can be the consequence of the different role of informal activities in particular places.

To provide evidence on the question whether and where informality is a complement to or a substitute for formal activities, we explore the relationships between regional informal employment and the national official economy, by using impulse-response functions obtained from the estimation of vector autoregression models (VAR). For each Italian region, we have estimated a VAR model including two variables: the regional irregularity index elaborated by ISTAT and the Italian real GDP per-capita that represents the measure of the national official economy.[8] This specification allows us to identify the way regional shadow labour markets react to variations in the aggregate economy, where changes in the national GDP can be interpreted as common productivity shocks. Regions showing positive responses to one-unit positive variations in the national GDP represent places where informal activities are complementary to formal ones; and informality plays a procyclical role during booms and busts. Conversely, in those regions registering negative responses informal occupations operate as a substitute for formal jobs and the informal sector is likely to play a countercyclical role. Graphs in figure 3 report orthogonalized impulse-response functions (OIRFs) for every regional informality series over periods 1-10.

Insert about here.
Figure 3. Impulse-Responses regional informal employment.

Observing the results, the view that the informal sector plays a different role in different places finds support. With the only exception of Trentino A.A., where the incidence of informal jobs in tourism and seasonal activities can be relevant, regions located in the Centre-North show a positive relation between informality and the national

official economy. In this macro area, where economic conditions are better and unemployment levels are lower than the rest of Italy, a country-wide improvement in productivity will stimulate the demand for both formal and informal jobs, the latter being probably characterized by the intensive margin and second irregular occupations. The relevance of manufacturing activities in these regions – that need to operate formally for benefiting from economies of scale and export opportunities – provides further justifications for understanding why in this macro area informality interacts with formality in order to reduce labour costs and sustain more flexible organisational choices.

In Southern regions, where unemployment is high and sectors like agriculture and building are relevant components of regional economies, there is a negative relation between informal employment and the national productivity shocks. In this macro area, the decision to operate informally can be seen as a survival strategy and a way to enter into the weak labour market. Noteworthy, in these regions informal workers have been traditionally represented by unskilled people that encounter several problems in obtaining a formal job, remaining at the margins of the official labour market. It is worth noting that the ANOVA F-test rejected (at the 1% significance level) the null of equality of the mean level of the OIRFs observed in the Centre-North and the South; but, it failed to reject the null of equality of the mean level of the OIRFs among the three areas located in the Centre-North (North-West, North-East, Centre). This can be interpreted as supporting exploratory evidence on the distinctive features of the informal sector in the Centre-North and the South.

V. Conclusion

This paper has tried to shed light on the spatial patterns of the shadow labour market in Italy by pointing out the relevance of investigating informal employment from a regional perspective. On theoretical grounds, it has introduced cross-regional migration flows in a two-sector model in order to take into account regional interactions and analyse the decision of migrating in search of formality. Moreover, it has provided a framework that is able to identify the presence of asymmetric regional shadow labour markets' reactions to national shocks in the official economy and investigate whether in particular areas the informal sector is a complement to or a substitute for the formal one. On the empirical side, three main results have been achieved. Novel evidence about the geographical distribution and the determinants of the shadow labour market across Italian regions has

been provided by discussing the prominent role of public regulations and taxes among other factors. The importance of regional connections has been detected finding a positive link between the size of informal employment in a given region and that in the destination regions. This pattern can contribute to explaining, at least in part, the growing internal migration flow of highly skilled young workers over the last few years in Italy, particularly from Southern to Northern regions, which can be related to the willingness to find a regular occupation in a different region when staying at home will imply operating at the margin of the official labour market. The heterogeneous consequences of common shocks in the official economy on regional informality have been illustrated, by distinguishing the effects on the regions located in the Centre-North, where the informal sector plays a procyclical role, from those in the South where a countercyclical behaviour has been found.

The context-specific features of shadow employment claim for the adoption of a two-tier approach that relies upon the combination of national and place-based policies. The former should focus on the creation of an economic environment in which activities can be formalised. This task can be achieved by promoting the productive allocation of factors and financial resources, reducing the tax burden, and improving the efficiency of public goods and services. The evaluation of the impact of taxation on informal employment needs to take into account the effects of taxes on working hours, firms' decisions and the different consequences for the demand of low and high skilled workers. In a complementary way, policies need to be diversified according to the particular economic structure and labour market conditions of the different regions. In Italy, this implies recognizing the existence of two distinct *models* of informality - one for the Centre-North and one for the South (REY, 2007) -, as we have documented in this paper, and undertaking place-tailored policies to counterbalance the structural factors that feed shadow employment in different areas. Therefore, the collection of detailed information on a regional level and the coordination among policy levels become essential: both aspects sustained the creation of the Italian network for the emersion of informal activities *'Rete per l'emersione'* in the second half of 1990s.

National policymakers should be aware of two further policy concerns. The asymmetric behaviour of regional shadow labour markets over economic cycles needs to be considered for designing more effective counterbalancing policies in the aftermath of economic crises. In many Italian regions, national growth-enhancing policies will probably contribute to reducing the size of informality and, consequently, to increasing the amount

of aggregate public revenues with benefits for the whole country. In addition, the uneven worsening of economic conditions occurring in different areas of Italy during the Great Recession is making the decision of operating informally a constrained job option for many people living in specific areas. This means that several individuals risk remaining at the margins of the labour market for long time with lasting consequences on the distribution of skills, social security benefits and intergenerational mobility across places.

[1] The two-sector approach has been extended by many authors by using the search-matching framework for modelling labour markets in order to analyse the relations between informality and factors like unemployment insurance schemes, variations in matching technologies, labour turnover and sorting (BOERI and GARIBALDI, 2005).

[2] The production function can be extended by introducing additional elements such as the costs of concealment that are sustained for reducing the probability of being caught. In this case, the skill threshold is lower than the case with no concealment costs given that now informal firms maximise their output net of concealment activities.

[3] A different migration pattern may also occur when formal workers in region L decide to move to region H for becoming informal; in this case, the threshold is $\overline{s_F}^L = \frac{\left(R^{\gamma^H}{\theta_I}^H {s_I}^H\right) + T^L}{R^{\gamma^L}{\theta_F}^L}$. However, this different migration flows is less likely to occur given that people can reduce their welfare rather than increase it after migrating in search of informality due, for instance, to the reduced firm size.

[4] The four macro areas are defined by ISTAT as follows: i) North-West: Valle d'Aosta, Piemonte, Lombardia, Liguria; ii) North-East: Trentino A.A., Friuli V.G., Veneto, Emilia Romagna; iii) Centre: Toscana, Marche, Umbria, Lazio; iv) South: Abruzzo, Molise, Campania, Puglia, Basilicata, Calabria, Sardegna, Sicilia.

[5] Test results are available from the authors upon request.

[6] We have used different threshold levels for this index obtaining similar results that are available from the authors upon request. The SHIW index can be decomposed by sector, gender and level of education providing further insights on the overall shadow labour market in Italy. The task of exploiting these additional features is left for future research.

[7] We wish to thank Salvatore Capasso and Luigi Guiso for sharing their dataset on the Italian regional supply of credit in 1936.

[8] The traditional VAR modelling procedure has been adopted by preliminary testing for the optimal lag length of the system and the presence of cointegration. Tests and estimation results are available upon request.

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Tables and Figures

Table 1. Descriptive Statistics

Variable	Mean	Stand. Dev.	Min	Max
IRREGULAR	13.885	5.565	7.10	30.90
RULE	0.416	0.494	0	1
TAX	4.312	0.405	3.21	5.25
CREDIT	8.068	1.464	4.080	11.140
GDP (logs)	10.041	0.260	9.587	10.419
PUBEMP	20.873	4.756	13.410	36.650
IRR^{DEST}	9.345	1.797	0	13.10

Table 2. Estimation Results

Dependent variable: *IRREGULAR*			
Variables	(1)	(2)	(3)
TAX	3.1674***	2.9775***	2.9387***
	(0.5522)	(0.5554)	(0.5499)
RULE	-	-1.0634***	-0.8689***
		(0.3705)	(0.3705)
CREDIT	0.4912***	0.4475***	0.4520***
	(0.1314)	(0.1355)	(0.1334)
GDP (in logs)	-1.242***	-0.9924***	-1.0780***
	(0.2149)	(0.2252)	(0.2272)
PUBEMP	0.3693***	0.3310***	0.3093***
	(0.0395)	(0.0395)	(0.0380)
IRR^{DEST}	-	-	0.1342**
			(0.0635)
Observations	240	240	240
Wald statistics $(\chi^2_{(k)})$	3190.35	2794.89	2877.67
	[0.000]	[0.000]	[0.000]
R^2	0.94	0.93	0.93

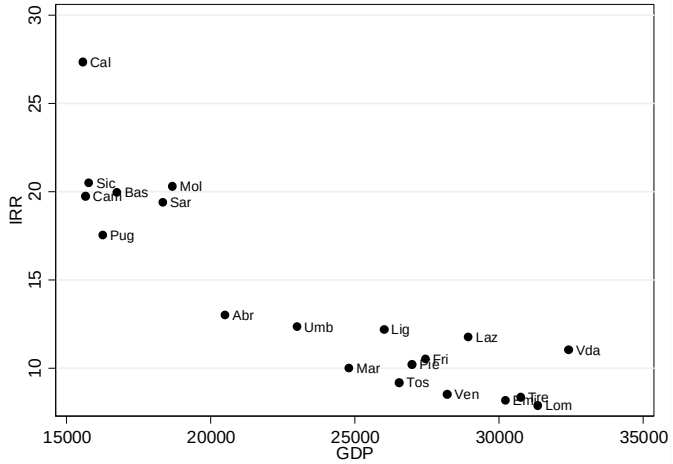
Note: Estimates obtained with regional fixed effects and time dummies for the years 2002 and 2003. Errors are in parentheses ().* implies significance at 10%, ** implies significance at 5%, *** implies significance at 1%. Figures in brackets are p-values.

Table 3. Estimation Results, SHIW index

Dependent variable: *SHIW*			
Variables	(1)	(2)	(3)
TAX	6.5211***	5.9281***	5.6118***
	(2.0147)	(1.8997)	(1.8367)
RULE	-	-2.7388**	-2.4457*
		(1.4000)	(1.3742)
CREDIT	0.6839	0.5038	0.3292
	(0.4866)	(0.5004)	(0.5295)
GDP (in logs)	-1.7557**	-1.2290*	-1.3275*
	(0.7577)	(0.7224)	(0.7202)
PUBEMP	0.3498***	0.3488***	0.3326***
	(0.1295)	(0.1325)	(0.1231)
$SHIW^{DEST}$	-	-	0.1978*
			(0.1017)
Observations	140	140	140
Wald statistics $(\chi^2_{(k)})$	1442.90	1500.53	1547.02
	[0.000]	[0.000]	[0.000]
R^2	0.92	0.92	0.92

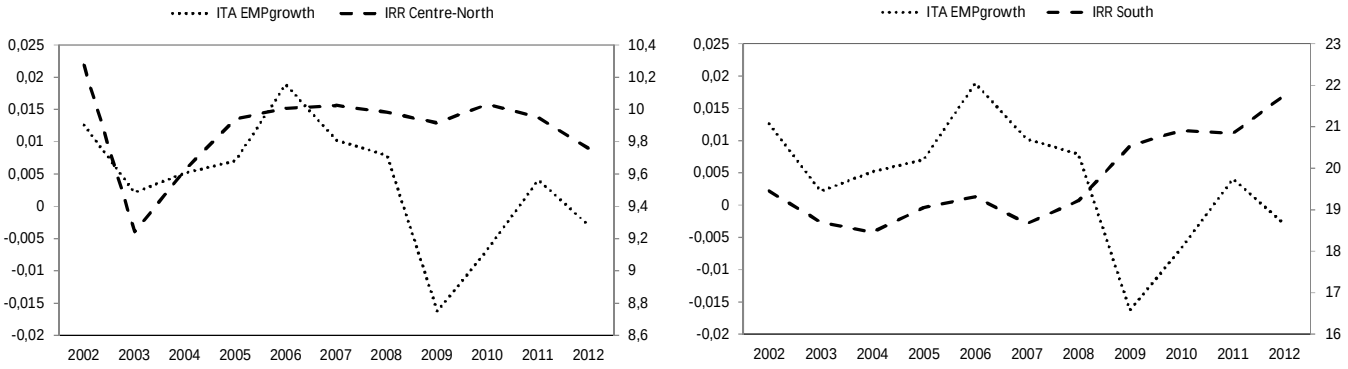
Note: Estimates obtained with regional fixed effects and time dummies for the years 2002 and 2003. Errors are in parentheses ().* implies significance at 10%, ** implies significance at 5%, *** implies significance at 1%. Figures in brackets are p-values.

Figure 1. Informality and GDP across Italian regions, 2001-2012



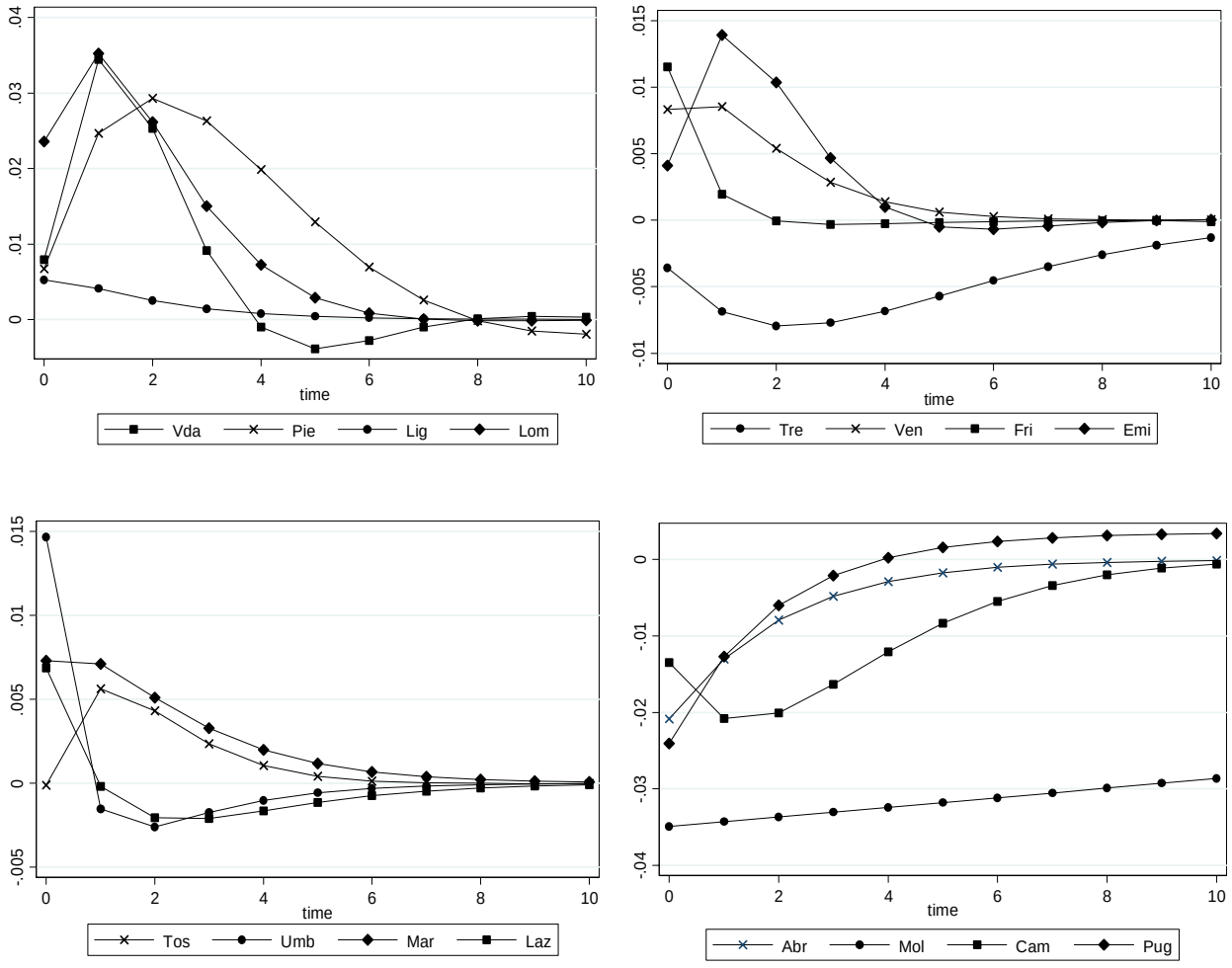
Note: Irregularity and GDP-per capita, 20 Italian regions, average period 2001-2012.

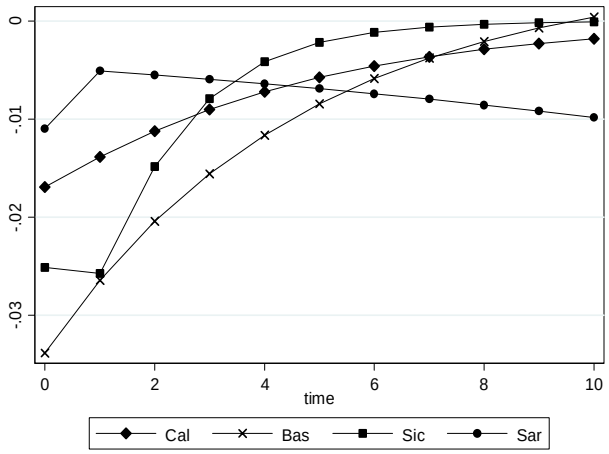
Figure 2. Italian official employment growth and informal employment in the Centre-North and South



Note: the Italian employment growth rate is measured on the left-axis, the share of irregular labour in the Centre-North and the South is measured on the right-axis.

Figure 3. Impulse-Responses regional informal employment





Note: Graphs report the orthogonalized impulse-response functions OIRFs (y axis) of regional informality to one-unit positive shock in the Italian GDP per-capita over periods 1-10 (x axis).