The Underground Labor Market, between Social Norms and Economic Incentives

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Abstract – This paper examines the phenomenon of the underground economy. We analyze the choice by firms and workers to carry out their economic activities within the formal economy context (regular economy) or the underground economy context (irregular economy). We assume that there are two types of labor markets, a regular one, and a irregular one; and starting from a *coordinated* interaction between the firm and the worker we show the existence of multiple symmetric equilibria in each market. The proposed game of coordination (2x2), can be interpreted as a pre-contract interaction between the agents through which they determine in which labor market they will "meet". In the model, we insert an exogenous policy parameter ( ) that measures the impact of legislative policy interventions on the regular labor market. The parameter takes on a positive value with respect to those interventions that increase the incentives to operate in the regular market. Through the utilization of evolutionary dynamics we can explicate the mechanism that leads the system towards one of the two equilibria, and explain the fact that these equilibria are sustained among the different populations (firms and workers) by taking on the role of a social norm. In this framework, we show that policy interventions ( ) do not alter the choice dynamics of each actor, nor do they eliminate the probability of having certain dynamics that push the system towards the underground market, even where there are strong incentives for acting in the regular economy.

Key Words – Underground labor market; social norms; evolutionary game; policy incentives.
JEL Classification – J41; J42; O17; Z13

1. Introduction

A large portion of empirical research[1] on the underground economy in Italy has highlighted the local, even district-level, occurrence of this phenomenon.
The localized nature of the Italian underground economy has imposed the need for a more in-depth study of those social relations that define, and thus differentiate, those contexts that are most conducive to the creation of a underground labor market economy. In economics studies[2], labor market analysis has often referred us to the impact of social norms on the choices of firms and workers. Researchers have used the existence of social norms to explain a number of economic behaviors, including the greater commitment of some workers with respect to others, the absence of competition for wages between employed and unemployed workers, the granting, by many firms, of minimum wages whose value is higher than real productivity, etc…
In this economics literature, little attention has been paid to the role that social norms have in explaining the existence of underground economic activities, and to the influence that social norms have on the choices of economic agents. The quantitatively most relevant strand of research on the underground economy has pointed at institutional factors, namely taxation and regulation, as main determinants of firms' behavior in choosing between regularity or irregularity[3].
Through this work I will propose an analysis of the underground economy that lies on interactions within the labor market, making it explicit how the existence of social norms determines the agents' choice to act in irregular ways even where there are policy incentives for regular economic activity.
We assume the existence of two types of labor markets, a regular one and a sunk one; firms and workers have to choose in which market they are willing to, respectively, demand and supply labor. The condition faced by firms is to perform a regular activity of production and distribution of licit goods, while they have option to use either regular or irregular labor force for such activities. At the same time, workers can choose to offer labor either in the regular or in the irregular market. There is thus a sort of pre-contract interaction through which firms and workers have to decide in which of the two markets they will meet, and eventually, perform their activity.
The argument that I will support, is that the choice to resort to the sunk market is sustained, at least partially, by a social norm. A social norm regulates the behavior and expectations of a group of individuals; we expect that others comply with the norm and, similarly, we expect others to expect that we comply. For the same reason, the choice to "meet" in the irregular labor market is based on behavioral rules that are recognized and respected by all the agents that are part of the group[4]. Any type of market, be it a regular or an underground market, is based on a set of shared norms which are, in turn, the result of a learning process that develops through time in a given framework of interaction between the agents.

A social norm can be the result of interactions within a small group of individuals, and be subsequently extended to a larger population through a mechanism of learning/emulation.

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[1] Baculo [1998], Censis[2002] and many papers of the "Comitato per l'emersione del lavoro non regolare" in the site www.emersionelavorononregolare.it.
[2] Akerlof [1980], Fehr and others [1998], Huck, Kubler, Weibull [2003].
[3] A rich and well-documented survey of this literature is available in Schneider [2000].
[4] The studies carried out in this field have clearly highlighted this characteristic. The entrepreneurs facing the possibility to emerge have manifested " the fear of a break of the subtle existing equilibria among the parts, that have been created with difficulty, although illegally" Liberti [2001].

Definition – A social norm exists in a given framework if a group of individuals behaves regularly in a certain way and those who deviate from that behavior are punished (support costs)[5] .

The analysis that I am suggesting is in line with that large portion of literature[6] that explains the emergence of norms and conventions through the use of evolutionary dynamics applied to the games of coordination. Such games are characterized by multiple equilibria that face players with the problem of coordinating their choices; in this respect it is possible to view these equilibria as norms.
As such, social norms can be reduced to individual choice functions within a double interaction mechanism: that of *strategic* interaction between firms and workers, and that of *parametric* interaction between each player and the surrounding environment (state of the game).

The type of game on which the model rests is based on the symmetric interaction between the firm and the worker that determines two pure strategy Nash equilibria, one in the regular labor market, and the other in the underground market. The firm prefers the underground market equilibrium, while the worker prefers that of the regular market; this introduces an asymmetry in the positions of the two players that does not alter the structure of the game but implies a substantial differentiation of the incentives between labor demand and labor supply. The two equilibria are equivalent except for a parameter β that represents policy interventions aimed at increasing the incentives for regular labor market activity.

The possibility of a regulatory intervention introduces in the model a normative-type level of analysis. We place the attention on those policies that combat the spread of an underground economy which have recently become a priority on the national and European policy agendas; and like these, they have often been faced with a cultural and economic environment that has, in most instances, rejected them.

The objective of this paper, is to demonstrate how the legislative interventions aimed at the emergence of the black labor, take place in a context where the choice to operate in the underground market is strongly affected by the existence of social norms.

One aspect that is often cited in many research studies, though a hard one to define in terms of policies evaluation, is the role and weight of the social context in the birth and diffusion of black labor. In this respect, the model develops a criterion for evaluating the influence of the context – defined through the predominance of certain behavioral norms – as compared to that of a policy intervention that directly alters the incentives structure of the regular market.

As we will demonstrate later, the result of the effect of social norms on policy will be to reduce its efficacy, thus confirming a known finding of recent policy evaluations, that even in the presence of tight policies to limit the spread of the sunk economy, there still is the possibility for the system to remain in equilibrium in the underground labor market.

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[5] Axelrod [1986].
[6] Young [1993], Sugden [1989].

2. The game of coordination (2x2)

In the first place, we need to define the structure of interaction on which the model rests; to that effect, we consider a pure coordination game with two players G={*F, W*}, in two strategies N={*R, S*}, as shown in *fig.1*.

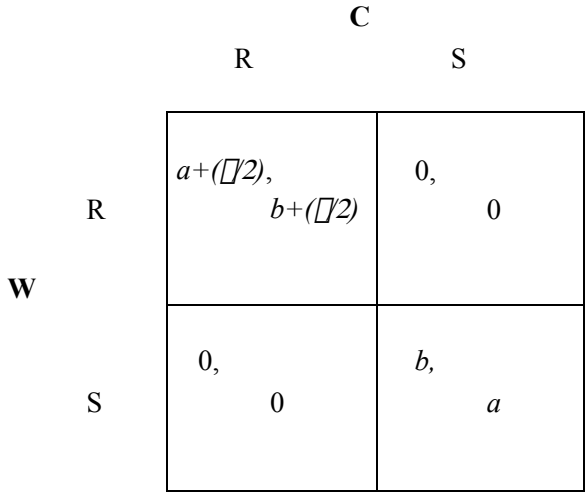

Fig. 1

The game represents a *single-shot* interaction, with no possibility for communication between the firm C and the worker W, whereby the players chose in which labor market to operate.

They choose to respectively demand and supply labor in the regular market (*R*) or in the underground market (*S*). The players cannot communicate with each other and the only information they have is represented by the payoffs functions $\Pi_i = f(n_i, n_{i-1}) \in \{a, b\}$ with $a>b>0$ associated to each combination of choices.

The interaction determines two Nash equilibria in pure strategies (*R, R*) and (*S, S*) in which the worker and the firm make the same choice (in coordination).

The payoff structure of the regular market equilibrium includes an exogenous parameter Δ that measures the cumulative impact of policy on the choice to operate in the regular market. We assume that the impact of such policies is evenly distributed between the payoffs of the two players by a ratio of ($\Delta/2$), for all positive values between [0, +∞]. The parameter Δ may take on positive values when associated to policy interventions that increase the incentives (payoff) to choose the regular market.

For $\Delta = 0$ (absence of policy), the two strict Nash Equilibria (NE) are symmetrical in aggregate payoff terms, and perfectly equivalent in terms of Pareto-efficiency; on the other hand the individual payoffs of the two players are asymmetrical when the firm prefers the underground market while the worker prefers the regular market. For both players, however, it would be preferable to coordinate and choose one of the two equilibria.

In similar situations, it is likely that both the firm and the worker decide to resort to a casual choice mechanism. In fact, besides the two strict NE, the game allows for an additional equilibrium in mixed strategies $\Delta S^* = (p^*, q^*)$ where the worker and the firm define a set of probability vectors $\Delta_i=\{p_1,p_2,\ldots p_n\}$ and

$\Pi_L=\{q_1,q_2,\ldots q_L\}$ with $\sum p=1$ and $\sum q=1$ to assign to the pure strategies of the other player. For N=2 pure strategies available, the firm C chooses market R with probability *p* and market S with probability *1-p;* the worker W chooses the regular market R with probability *q* and the irregular market S with probability *1-q*.

Through the use of an evolutionary model, I will develop the analysis by showing that it is possible to reach a Nash equilibrium, and that once this is extended to the respective populations it becomes a customary behavioral rule that works in the same direction of a social norm[7].

3. Evolutionary Analysis

The relevance of social relations structures, and of the role and weight of the cultural environment in the birth and spread of the underground economy has often been acknowledged. The major difficulty has often been represented by the lack of criteria and instruments to measure the influence of the external environment on the choices of individuals. Some suggestions have been advanced to classify types of environments, resorting to concepts such as "Mediterranean character" to indicate the social predominance of a behaviors associated with cultural backwardness, tolerance of illegality, anti-state attitudes, etc… Thus the necessity to develop a theoretical-methodological approach that explains the origin and perpetuation of certain behaviors that, in aggregate form, define the very properties of the social context to which they belong.

The evolutionary analysis applied to game theory provides a solid instrument to formalize the dynamic process which through the micro interaction between individual choices determines the characteristics of the external environment.

Along the lines of the model developed by Maynard Smith J. [1982] in biological research, the fundamental idea of evolutionary games lies in a repeated and anonymous interaction between players from the two populations; the strategies with higher payoffs will substitute the lower-performing ones. This dynamic process will move the system towards an *evolutionarily stable* equilibrium, where any player that strays from the equilibrium strategy will attain a worse payoff.

The previous game structure (*fig. 1)* defines an evolutionary dynamics between populations C (companies) and W (workers) that interact through time. At any given time, each individual player will encounter a state of the game (environment) that specifies how the different strategies adopted at that time by each population are distributed, and what are the relative payoffs to each strategy.

I use an asymmetrical evolutionary model with two populations of finite number, **C** = {*1,2,….n*} and **W**= {*1,2,….n*} and for each population I assume a set of pure strategies $N_c = \{n_1, n_2,\ldots..n_i\}$ and $N_w = \{n_1, n_2,\ldots..n_j\}$ con *i* e *j*={*1,2*}.

At any time *t*={*1,2,…n*} of the game there will be a certain combination $S_t = (s_c , s_w)$ of strategies used by each population; where $s_c = (p, 1- p)$ and $s_w = (q, 1- q)$

[7] The thesis according to which an equilibrium can represent a social norm and as that it can coordinate the actors' expectations has been developed by a number of authors. See E. Ullmann-Marglit [1977] and Bicchieri [1990].

represent the distribution of strategies employed by the firms (S_c) and by the workers (S_w) within their respective populations.

I indicate respectively $f^c(n_i, s_w)$ and $f^w(n_j, s_c)$ as the payoff functions (or fitness functions) of the players in populations **C** and **W.**

We will have:

$$f^c(n_1, s_w) = (b+\Delta 2)q \quad f^w(n_1, s_c) = (a+\Delta 2)p$$
$$f^c(n_2, s_w) = a(1-q) \quad f^w(n_2, s_c) = b(1-p)$$

It is important to note that each player only interacts with the players of the other population, so that $f^c(n_i, s_w)$ depends exclusively on s_w and not on s_c.

At this stage, we need to introduce in the model a dynamic adjustment mechanism that takes into account the aggregate effects of the process. There are many ways to explicate an evolutionary dynamics[8]; for simplicity, I will consider a given adjustment dynamics that is continuous in time and can be expressed through a series of differential equations.

I represent the process of change in the distribution of strategies within each population through the standard *replicators* dynamic.

$$p^{\bullet} = \Delta p/\Delta t = p[f^c(n_i, s_w) - f^c(s, s)]$$

$$q^{\bullet} = \Delta q/\Delta t = q[f^w(n_j, s_c) - f^w(s, s)]$$

The difference shown in squared brackets represents the relative payoff; that is the difference between the payoff of the n^{th} strategy $f(n_i,s)$, and the average payoff of the population $f(s,s)$

Where:

$$f^c(s, s) = p f^c(n_1, s_w) + (1-p) f^c(n_2, s_w)$$

$$f^w(s, s) = q f^w(n_1, s_c) + (1-q) f^w(n_2, s_c)$$

From the replicators equations it is clear that the sign of the variation of frequencies p and q is directly proportional to the relative payoff.

When $p^{\bullet} > 0$ and $q^{\bullet} > 0$, there will be a positive variation, that is to say a greater number of companies and workers will chose the regular strategy (R).

When $p^{\bullet} < 0$ and $q^{\bullet} < 0$ the variation will be negative, the number of firms and workers that chose (**R**) will decrease, and consequently, the number of those who choose (S) will increase.

When $p^{\bullet} = 0$ and $q^{\bullet} = 0$ the variation is zero the dynamics stops, and the model reaches an evolutionary equilibrium[9] (EE), which means that no firm will be better-off by changing its strategy.

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[8] Friedman [1991], Hofbauer and Sigmund [1998] and Gintis [2000] can be referred to for a detailed analysis.

[9] If $s \in S$ there is an *evolutionary equilibrium* (EE) for the dynamic F only when s is a fixed point of F, thus $F(s) = 0$, and it is asymptotically stable; that is given the set $N \subset S$, every initial status inside N

In the model, the evolutionary equilibria that are asymptotically stable coincide with the strict Nash equilibria (in pure strategies) of the initial game (*fig. 1)*; the third equilibrium in mixed strategies $\Delta(S)$ is not stable due to the dynamics. The latter is not a new finding in asymmetrical evolutionary models where mixed strategies equilibria are never asymptotically stable under the action of the replicators dynamic[10].

4. Dynamics of Strategies

Using a phase diagram I represent the dynamics of the strategies used by the population, and how these move the system towards one of the two equilibria (EE) at points S_1 (1, 1) and S_2 (0, 0).

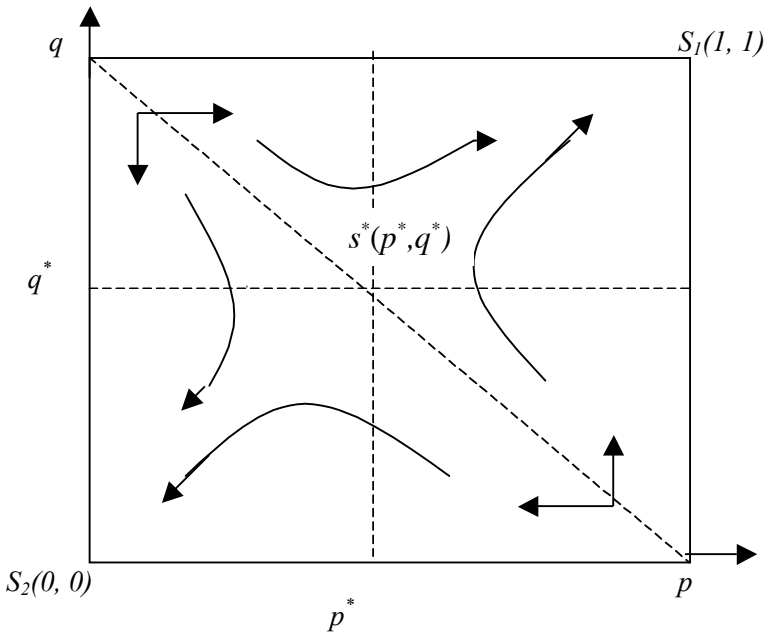

fig. 2

The values (p^*, q^*)[11] of strategies distribution within the populations represent the borders of the basins of attraction for the EE; they divide the space into four regions. As the sign of the replicators changes, so do the dynamics of distributions of the populations.

I examine now the sign of the replicators, beginning with the case where $\beta = 0$; i.e. where there are no policy effects on regular market equilibrium.

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remains in N and converges asymptotically toward the point s. A point EE is an *attractor* of the dynamic F, and the set of points of N × S that converge to s, is its *basin of attraction*.

[10] It is demonstrated by one of Selten's theorems.

[11] $(p^*,q^*) = \left(\frac{b}{a+\frac{\beta}{2}+b}, \frac{a}{b+\frac{\beta}{2}+a} \right)$

1. Top-left region; where $p<p^* \; e \; q>q^*$.

This situation represents the case where there are many firms that choose the underground market (S), as opposed to there being many regular workers (R). In this case the replicators will have the sign $p^{\bullet} > 0$ and $q^{\bullet} < 0$. Will have a combined effect of the dynamics; on the one hand the number of firms that choose the regular market will increase, while on the other the number of workers in the irregular market will also increase. The dynamics will move the system away from this region.

2. Bottom-right region; where $p>p^*$ and $q<q^*$.

In this case, contrary to the previous one, there are many firms in the regular market and many workers in the underground one. The replicators will have the sign $p^{\bullet}< 0$ and $q^{\bullet} > 0$. The dynamics will progressively move the system away from this region, reducing the number of firms in the regular market and, at the same time, increasing the number of regular workers.

3. Top-right region; where $p >p^*$ and $q> q^*$.

In this situation the majority of firms and workers choose the regular market. In this case the replicators will have the same positive sign $p^{\bullet} > 0$ and $q^{\bullet} > 0$ and will move the system towards equilibrium S_1 (1, 1) in the regular market.

4. Bottom-left region; where $p < p^*$ and $q < q^*$.

Both firms and workers increasingly choose the irregular market. The replicators have negative sign $p^{\bullet} < 0$ and $q^{\bullet} < 0$ and this will lead the system to converge towards equilibrium S_2 (0, 0) in the irregular labor market.

The analysis conducted thus far allows us to explicate the mechanism of interaction between demand and supply that explains how the choice to interact in the regular or in the underground labour market is made and stabilized through time in a local economy.

Because every equilibrium is based on the coordination of the choices and expectations of individuals, it takes on the function of a social norm which no one has deliberately chosen but which is the result of an evolutionary process, characterized by the cumulative effect of interactions between many individuals in a long-term dynamics. The model shows that a social norm exists and is necessary to maintain an equilibrium in both the regular labor market and the underground one.

5.Policy interventions

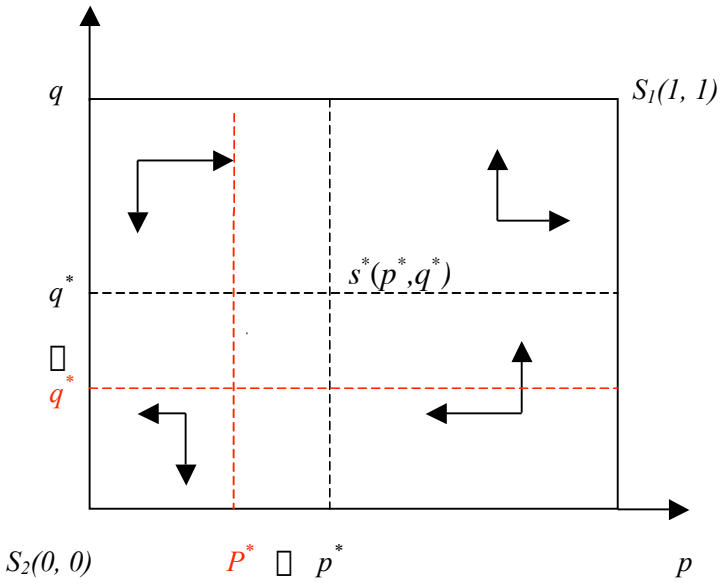
Thus far, I have focused the attention on a positive type of analysis, describing the local process that drives firms and workers to choose the underground labor market. In what follows, I will develop the analysis at a normative level, introducing in the model the effects of policy interventions on the choices of agents throughout the evolutionary process.

In several instances, both at the national and European level, it has been highlighted that the main problem associated with the underground economy lies in its convenience. It is thus necessary to individuate a strategy that makes it less appealing for entrepreneurs and workers: the majority of recent policy interventions against the irregular economy have indeed acted in this direction.

The exogenous parameter $\square$ that is an element of the game, represents the impact of legislative policy on regular market equilibrium (R, R). The policy $\square$ corresponds to positive values that incentive the agents to choose the regular labor market; the effects of such policy evenly distributed between the payoffs of workers and firms by a ratio of $\square$2.

5.1 Consequences

When $\square > 0$ the effect is to increase the incentive of workers and firms to choose the regular market (R,R). We will obtain that the distribution of equilibrium strategies that determines the model's dynamics regions $(p^*, q^*) = \left[\frac{b}{(a+\frac{\square}{2})+b}, \frac{a}{(b+\frac{\square}{2})+a}\right]$, will decrease, thus narrowing the basin of attraction associated with equilibrium S_2 *(0, 0)* in the underground market (*fig.3)*.



(*fig.3*)

It is important to note that for increasing values of $\square$ the levels of strategies distribution (p^*, q^*) decrease but do not reach zero. This implies that, even in the presence of strong incentives (with $\square \to +\infty$) for the emergence of irregular activities there will always be an infinitesimal probability, with positive value, for the convergence of the dynamics towards the underground market.

What I have just described represents the normative result of the model: it entails that for any policy intervention there will always be the possibility that the system converges towards the irregular equilibrium. If interpreted as an impossibility element, the result establishes that no exogenous legislative intervention can exclude an equilibrium of opposite sign from the same intervention, from the system dynamics.

This almost obvious result finds a punctual formal description in the model and confirms, once again, the requirement to integrate policy interventions the knowledge about the properties that define the functioning of the social system where one intervenes.

6. Considerations

This paper defines a mechanism of interaction that enables us to explain the formation and perpetuation through time of a social norm that coordinates the agents' choices and keep the system in the underground labor market. Through an evolutionary model we can represent the process in which groups of workers and firms manage, by *coordinating* their behavior, to select the labor market where they want to bargain.

The attainment of every equilibrium is based on a behavioral rule that works as a social norm; one that no individual agent has deliberately chosen, but that is the result of an evolutionary process characterized by the cumulative effect of interactions between many individuals through a long-term dynamics.

The model demonstrates that a social norm underlies as much the regular labor market as the irregular market. It is important to highlight that with the same structure of interaction it is possible to select different social norms for each equilibrium.

The evolution of the system towards one of the equilibria is mainly determined by the initial state of the game, that is by the distributions of strategies at time $t=1$. Accordingly, the initial state of the game is in turn itself the result of a process of interaction between the agents at previous times. The model excludes this backward looking process that would require assuming the initial state of the game as based itself on social norms which are in turn the outcome of previous interactions. In light of this simplification, it would be more precise to talk about the perpetuation and strengthening than of the establishment/emergence of social norms that regulate the labor market.

A further limitation of the model is constituted by the use of a determined and continuous system of differential equations (*replicators dynamic*). In fact, the latter does not represent the most adequate way to describe the mechanism of emulation/transmission of strategies among the populations. This limitation however can easily be overcome. On the example of Young's work [1993] it would be useful to introduce a stochastic dynamics that takes into account the variability of agents' behavior in reproducing strategies over time.

Finally, it is useful to underline once again the positive-model thrust of the work that constitutes the initial structure for the analysis of specific, localized, underground systems in light of eventual policy interventions. The underground economy phenomenon manifests itself in a multiplicity of ways and it is necessary to take into

account the local cost-opportunity conditions in which both firms and workers operate. The model, which aims at a theoretical analysis of the phenomenon, reduces these specificities while focusing on the common properties of interaction between individual choices and external environment that characterize the various forms of irregular economies.

7. Conclusions

This paper responds to the broader requirement to provide a formal representation of the complex network of social relations through which firms and workers interact, even in the underground economy level, and that are in turn affected by historic-cultural variable, such as exchange rules, reciprocity, conventions, habits….

The outcome of the model highlights the two-fold level of analysis applied to the underground economy: the first level is determined by a self-generating social order which stems from the interaction, over time, among a large number of agents and that leads to the establishment of social norms; the second level is determined by the fundamental idea of an ordered societal structure that underlies the regulations implemented by policy interventions. These are two different levels in which difference types of rules and/or laws are manifest. The notion that the underground economy is merely a negative performance of economic activity thus appears to be a partial one.

The underground is one component of the whole economic system. Specifically, it is an economic manifestation based on the plurality of interactions between individuals that define the cultural, social, and economic context as determinant variables of the development and existence over time of a sunk economy.

Bibliography

Akerlof G. (1980), *A Theory of Social Custom, of which unemployment may be one consequence,* Quarterly Journal of Economics, 84, pp.749-775.

Axelrod R. (1986), *An Evolutionary Approach to Norms*, American Political Science Review, 80, pp.1095-1111.

Baculo L.(1998), *Patti territoriali, sistemi locali e distretti industriali*, in Nord e Sud, n. 9

Bicchieri C. (1990), *Norms of Cooperation*, Ethics, vol. 100, pp.838-861.

Censis,(2002), *L'indagine sulle Imprese. Il contesto economico: relazioni locali, infrastrutture e peso del sommerso di lavoro e d'impresa,* in Censis – note e commenti, n. 631-633

Fehr E, Kirchler E, Weichbold A., Gatcher S. (1998), *When Social Norms overpower competition: gift exchange in Experimental Labor Markets*, Journal of Labor Economics, vol 16, pp.324-351.

Gintis H. (2000) *Game Theory Evolving*. Princeton University Press, Princeton, New Jersey.

Hofbauer J, Sigmund K (1998) *Evolutionary Games and Population Dynamics*. Cambridge University Press, Cambridge, UK.

Huck S., Kubler D., Weibull J., (2003), *Social Norms and Economic*

incentives in Firms. I.U.I. Working Papers 565 (www.iui.se).
Liberti M.(2001), recensione del lavoro di R. De Ruggero-*La calzetteria Racalina: rilevazione di una realtà sconosciuta che compete con il nord*. Tesi di laurea. Fac. Di Economia- Università degli studi di Napoli II-2000/2001.
Maynard Smith J. (1982), *Evolution and the Theory of Games*, Cambridge, Cambridge University Press.
Peyton Young H. (1993) *The Evolution of Conventions*. Econometrica, vol.61, number 1, pp.57-84
Schneider F. Enste D. (2000), *Shadow Economies: size, causes and consequence,* Journal of Economic Literature.
Selten R (1980) *A note on evolutionary stable strategies in asymmetric animal conflicts*. Journal of Theoretical Biology, vol.84, pp.93-101
Sugden R. (1989), *Spountaneus Order,* Journal of Economic Perspectives, vol.3, pp.85-97.
Ullmann-Margalit E. (1977), *The emergence of Norms*, Oxford, Oxford University Press.