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and The Informal Sector**

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UNEMPLOYMENT PERSISTENCE AND THE INFORMAL SECTOR*

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Abstract

This paper argues that unemployment persistence in countries like Tunisia is not caused only by labor market rigidities and by population growth. The size of the informal sector and the low level of investment within the formal sector and in public infrastructure and services are other important factors. The main purpose of this paper is to show that the larger the size of the informal sector the more persistent unemployment will be, and that the larger the share of investment allocated to the formal sector the lower and least persistent unemployment will be. We also show that an exogenous increase of the wage rate paid by the informal sector, for instance as a result of the enforcement of some labor regulations within the informal sector, will (paradoxically) reduce unemployment. The reason is that it reduces the gap between work conditions in the formal and the informal sectors and slows down the migration process to the formal sector. The link between unemployment, the size of the informal sector and capital formation is based on many channels and assumptions built in the dynamic theoretical framework of this paper. Although the most crucial of these assumptions are tested empirically using data from a survey of firms conducted in Tunisia, the main results obtained in this paper are confirmed mainly by simulation under various scenarios.

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1. Introduction

In most developing countries unemployment and under employment are high and persistent. Why, and what is to be done? This remains an open question. Would it, in particular, really help to make the labor market more flexible by favoring the development of labor-intensive micro firms within the informal sector where few restrictions seem to hinder employment?

This paper argues that increasing informality does not help, and that the larger the size of the informal sector, the more persistent is unemployment. It is based on a theoretical framework (Boughzala 2000) showing that unemployment persistence in countries like Tunisia is linked not only to labor market rigidities but also to other factors, mainly population growth and the size of the informal sector, whose growth hinders investment within the formal sector and in public infrastructure.

The main reasons for this are:

1. That workers belonging to the informal sectors will remain potential labor suppliers for the formal sector, and, as long as incomes and work conditions are better in the formal sector, migration to the formal sector will add to the rapidly growing labor supply, and
2. Investments allocated to the informal sector do not generate future investments and more public capital needed to produce public services.

The size of the informal sector itself increases when the rate of investment decreases and when the government law enforcement capacity deteriorates. Consequently (and perhaps paradoxically), if the government could make the informal sector in some way more formal, especially by making it abide by the fiscal and labor laws, this would reduce the pressure on the formal sector and would lower unemployment.

Low investment and capital shortage also matter as a determinant of unemployment, not only in the short run but also in the long run. Because capital markets are highly imperfect in developing countries, even in the long run the actual level of capital remains well below the desired level. Modern technologies needed to develop the economy and enlarge the formal sector require a lot more additional capital than the available financial capacity for most developing countries.

The link between unemployment, the size of the informal sector and capital formation is based on many channels and assumptions, the most crucial being the following four assumptions, which also constitute the basic characteristics defining the informal sector:

- The informal sector does not pay taxes,
- It does not abide by the labor market regulation,
- It does not produce tradable goods,
- And it is technically less efficient than the formal market.

In order to show that the size of the informal sector and capital shortage are important explanatory factors of unemployment persistence, simulations using the theoretical model are conducted and will be presented in this paper. Prior to this, the above main assumptions will be tested using a micro data set and other statistics derived from a major survey undertaken in Tunisia in 1997 by the Tunisian National Statistic Institute (INS 1997). The micro data covers approximately 1000 firms, half of which being informal and representing a sub sample from the national survey sample.

The simulation will focus on the level and the allocation of investment between the informal and the formal sector, the size of the informal sector and on the government enforcement capacity with respect to taxes and labor regulation. The interactions between the formal and the informal sectors provide some of the essential mechanisms described in the model.

The theoretical framework used in this paper¹ draws on many previous contributions to the unemployment debate, including Agénor, P.R (1996), Benassy, J.P. (1997), Braumann, Benedikt (1997), Greenwald, B. and Stiglitz, J.(1995), Hunt, J. (1995)...

The idea that capital shortage can generate unemployment persistence, curiously enough, is not commonly emphasized; nevertheless, a number of authors, such as Benassy, J.P. (1997), and Henin & Jobert (1993), Braumann, Benedikt (1997), and Bean (1989), do claim that capital shortage could matter.

- The concepts and the economics of the informal sector are as in Loayza (1997).
- The simulation exercise may be compared with those of Agénor and al (2002).

In the following two sections, the theoretical framework will be rapidly presented, followed by an examination of the empirical and simulation exercises.

2. A Theoretical Framework for A Dual Labor Market

The theoretical framework is based on a general equilibrium dynamic macro model. It is assumed that the economy is constituted of formal and informal firms, households and a government. The government, in particular, collects taxes and produces various public goods and services, which include the public infrastructure and the judicial and security system. All firms use capital, labor and public goods and services. For convenience, we think as if there are two firms: a representative formal firm (F) and a representative informal firm (I).

It is assumed that the formal firm produces only tradable goods, and the informal firm produces only non-tradable goods. The formal firm pays taxes and complies with the legal constraints, especially with the labor regulations. As a counterpart, it gets full access to the capital market and to public goods and services, and it also has a better access to modern technologies. The contrary is true for the informal firm, which does not comply with the usual legal requirements and has only limited access to financial means and to the public infrastructure and services.

The Informal Sector (Firm I)

Informality has benefits and costs as explained by Loaysa (1997). Informal firms avoid the costs of access to the formal sector (administrative and investment costs) and the costs of staying in it. Not only do they not pay all taxes and labor related costs such as social security, they also avoid the bureaucratic procedures, which are often very costly. Consequently, because they have limited access to modern technologies, capital and to government provided goods and services they are technically less efficient.

The informal sector, represented by Firm I, produces according to the following production function, using capital, labor and public goods and services, essentially as in Loaysa (1997). we also assume, for simplicity and while preserving the essential feature, that it is of the Cobb-Douglas type:

$$Y_I = A_I K_I^\alpha L_I^\beta (\delta G)^\gamma \varepsilon_I \quad (1)$$

Y_I is the amount of output produces by the informal firm (Firm I).

A_I indicates the total factor productivity level in Firm I. It reflects its limited access to technology and its efficiency level.

K_I is the amount of capital used by Firm I. Firm I having limited access to capital and credits, K_I is expected to be of modest size.

L_I is the amount of labor used by Firm I, mainly unskilled labor.

¹ It is basically the same as in Boughzala 2000.

G is the amount of public goods available in the economy. δ is positive but smaller than one, that is to say that Firm I does not have full access to these goods and services.

ε_I is a random variable measuring the various types of uncertainties linked to factor productivity that Firm I faces. It is assumed that the informal Firm Faces higher risks than the formal sector.

Firm I operate in a non-regulated labor market, and is a price taker in the capital market and in its output market. Let r_I and w_I denote the prices of capital and labor that materialize in the informal market for a given time period. More specifically, w_I is the equilibrium informal sector wage, it is such that labor demand (L_I) is equal to labor supply (N_I) in the informal sector:

$$L_I = N_I \text{ and } \Delta L_I = \Delta N_I \quad (2)$$

After deriving the labor demand function, and given that the informal sector is a price taker in the capital market, we obtain the variation over time of the equilibrium value of w_I :

$$\Delta w_I = (w_I/\alpha)(\Delta Y_I/Y_I) + \gamma \delta w_I (\Delta G/G) - [(\alpha + \beta)/\alpha] (\Delta N_I/N_I) \quad (3)$$

As to ΔN_I , the incremental supply of labor in the informal sector, partly resulting from migration to the formal sector, it will be specified in the end of this section after studying the characteristics and the behavior of the formal sector.

The formal sector (Firm F)

Firm F (representing the formal sector) produces according to the following Cobb-Douglas production function:

$$Y_F = A_F(K_F)^\kappa [e(w_F/P, u)L_F]^\lambda G^\theta \varepsilon_F \quad (4)$$

Y_F is the amount of output of Firm F.

A_F is the total factor productivity term specific to Firm F.

$$\text{It is assumed that } A_F > A_I, \quad (5)$$

This means that the formal sector is more efficient than the informal one. Actually, this is a sufficient condition for technical efficiency when the capital labor ratio (amount of capital in units of currency per worker) is greater than one and $\kappa > \alpha$. In our context, both of these assumptions are reasonable; indeed, thousands of dollars (as a matter of fact thousands of Tunisian Dinars) are needed to create a single job, and the assumption $\kappa > \alpha$ is supported by the statistical evidence. In some models, the informal sector is assumed to operate without any capital.

ε_F is a random variable measuring the various types of uncertainties that Firm F faces, and which are linked to labor productivity and characteristics. We assume that Firm I is riskier, that is the variance of ε_I is higher than that of ε_F :

$$\sigma_F^2 < \sigma_I^2 \quad (6)$$

K_F is the amount of capital used by Firm F. This is a modern firm using more advanced technology requiring a fixed entry cost. Firm F cannot be started with a capital less than a minimum K_m .

L_F is the amount of labor used by Firm F, including skilled and less skilled labor.

Firm F has full access to public services and infrastructure (G).

$e(w_F/P, u)$ is the effort function giving the average effort exerted by each employee in Firm F, which depends on the real wage rate received and on the level of unemployment indicated by

the rate of unemployment u . In other words, the formal firm pays its employees an efficiency wage to motivate them; otherwise they might shirk their responsibilities. Contrasting this with Firm I, where every employee is closely observed and kept under control by the employer, it would be impossible for the manager in charge of Firm F to continuously and directly monitor every employee's performance. He cannot continually observe efforts of every employee yet needs to motivate the labor force to exert more effort. To this end, he pays efficiency wages. Information distribution between employers and employees is, from this perspective more asymmetrical in the formal sector, but this is not enough to drop the idea that the informal sector operates in a riskier environment.

We do not need to assume that efficiency wage payment is the only wage formation mechanism in the formal labor market; insiders may have an impact, unions may intervene in negotiated deals and the government does impose general rules and requirements concerning the labor market, such as having to pay for health, retirement and social security. All of this is expressed by the need to pay an extra wage cost denoted by c . c and includes all the legal and institutional wage costs.

Workers in Firm F (the formal sector) receive, all in all, a better salary w_F , w_F being the wage rate paid by Firm F

$$w_F \geq w_I + c \quad (7)$$

Given that our data is a cross section, and that all variables are in real terms, inflation is abstracted away in the effort function. We take:

$$w_F/P = w_F/w_I \quad (8)$$

And the effort function is simplified as follows::

$$e(w_F/P, u) = (w_F/w_I) \text{exponential}(u), \quad (9)$$

Hence, if $w_F = w_I$ and $u = 0$, then $e = 1$ and the formal firm production function takes the same form as for the informal firm. Since unemployment is observed only in the formal sector within the informal sector employees do not worry about unemployment, and their effort is not sensitive to unemployment.

Demand for capital and labor

The randomness of production activities is generally quite obvious in real life and this randomness is important in analyzing the labor market as it has a major impact on a firms' behavior.

When returns are uncertain, and given that it is reasonable to assume that firms are adversely at risk (meaning that their income utility function is concave), firms maximize the expected utility of profit and this maximization problem always has a solution. The optimal level of labor and capital will then be a trade off between higher returns and lower risk. However, adjustment to the optimal level of capital and labor is generally not instantaneous. Capital, in particular, will usually remain below its optimal level because of various imperfections in the capital market and of capital shortage.

In practice, what we really need to see is the partial adjustment process yielding, for every time t , the variation of the wage rate and of the levels of capital and labor, ΔK_F and ΔL_F . We will also need to determine the same variations in the informal sector, ΔK_I and ΔL_I , but, for the moment, we will concentrate on the adjustment process in the formal labor market.

The adjustment mechanisms described by the following equations could be viewed as linear approximations and simplification of the real processes, which could be derived from the maximization of expected utility of profit and from the partial adjustment principle. These

approximations also allow for abstraction from the exact form of the utility function and to single out the main factors determining the adjustment of wage and of labor and capital demand. In all cases, they express the trade off between higher expected returns and lower risks².

At time t , for given K_F and G , Firm F first adjusts the wage rate so as to move it from its current level to its new optimal level. As mentioned above, the wage rate adjustment may involve negotiating with labor and government representatives^{and may be parti}¹. Following Stiglitz and Greenwald 1995, wage adjustment may also take place prior to the employment adjustment period because it is less costly to change the wage rate than to change the size of the labor, which involves paying hiring or dismissal costs.

$$\Delta w_F = \alpha_0 \Delta w_1 + (\alpha_1 \Delta e_w^* + \alpha_2 \Delta e_u^*) / \sigma_F^2 + \alpha_4 \Delta c \quad (10)$$

Equation 10 says that Δw_F , the nominal wage paid by Firm F, is increased at time t if the informal sector wage (Δw_1) was previously increased. Taking into account the expected effort increase as a result of this higher wage (Δe_w^*), it also increases as a result of the expected effort increase due to a higher rate of unemployment (Δe_u^*). At the same time, w_F is decreased when labor productivity becomes more uncertain, or when the variance (σ_F^2)³ increases. Δe_w^* indicates the impact of a wage increase on effort and, hence, on productivity. Similarly, Δe_u^* indicates the impact of an increase of the rate of unemployment on effort and on productivity. Both of these effects are positive. The increase in effort expresses the expected return, which is to be weighted against the risk expressed by the variance σ_F^2 .

After adjusting its wage rate, Firm F will also adjust the size of its labor force. For simplicity, we will think of this happening at the same (period of) time t . The following equation can be written to describe the adjustment process of the labor demand:

$$\Delta L_F = \rho_1 \Delta Y_{FL} / \sigma_L^2 - \rho_2 \Delta w_F - \rho_3 \Delta c \quad (11)$$

Again, this is a linear approximation of the actual adjustment equation. Labor demand decreases if labor cost (w_F or Δc) increases or if uncertainty increases. But if Y_{FL} (the expected marginal productivity of labor) increases, the firm has an incentive to recruit additional labor. Labor demand will also increase if the capital increases (ΔK_F) or if the government can produce more public goods and services (ΔG). Indeed, expected productivity increases when workers exert greater efforts or when unemployment increases. Again:

$$\Delta Y_{FL} = (\Delta e_w^* + \Delta e_u^*) + Y_{FLK} \Delta K_F + Y_{FLG} \Delta G \quad (12)$$

$Y_{FLK} \Delta K_F + Y_{FLG} \Delta G$ is the increase in labor productivity generated by ΔK_F and ΔG .

ΔK_F : the accumulation of new capital in the formal sector.

The stock of capital is maintained in the labor demand function, that is to say labor demand does not depend only on price parameters, because the capital stock does not adjust rapidly enough and remains well below its optimal level. The price of capital is not entered into the equation because it is assumed constant over time.

² In approximate terms, maximizing the expected utility of profit with respect to K_F , L_F and w_F is equivalent to maximizing its certainty equivalent, which increases with expected returns and decreases with the level of risk. This maximization problem gives K_F , L_F and w_F and their variations as functions of expected returns and the variance.

³ The variance (σ_F^2) is, implicitly, assumed to depict the risk associated only with labor in order to make the presentation more tractable.

The Government

The Government supplies public goods and services (G). In this economy, with its segmented and imperfect labor market, the government plays a major role. It looks after institutions, produces public goods, raises taxes, acts as a regulator, and is in charge of law enforcement.

For developing countries, this enforcement capacity is rather limited since only part of the population pays taxes and complies with labor rules. Such an injustice contributes to the growth of the informal sector.

ΔG is the variation of the volume of public goods and services; an increase in G facilitates production and leads to more employment.

ΔG is the outcome of public investments, which are financed by taxes paid only by the formal firms. For simplicity, we assume that taxes are proportional to the total output of the formal firm. So, we have:

$$\Delta G = \tau Y_A \quad (13)$$

Capital formation

Firm F's production is also indispensable for capital formation. The idea is that only this firm produces tradable goods and generates the foreign currency necessary for importing the physical capital equipment and machinery, given that in developing countries most of it has to be imported.

So the additional capital will also be a share of Firm F's production:

$$\Delta K = \eta Y_F \quad (14)$$

Households and factor supply

This share η is determined by households' behavior. Households receive the net income generated by the economy and use it to buy goods produced by the formal and the informal sectors, and to buy stocks issued by the formal sector or to create more assets within the informal sector. This determines total savings and investments (ΔK). Accordingly, the formal sector will export a share of its produce allowing for enough equipment to be imported in order to make ΔK possible. ΔK will be distributed by households between the formal and the informal sector:

$$\Delta K = \Delta K_F + \Delta K_I \quad (15)$$

$$\Delta K_F = \phi \Delta K \quad (16)$$

ϕ is the share of the formal sector.

People keep investing in the informal sector mainly when their savings is too small to pay for the entry into the formal sector, or because they are attracted by the advantages of informality, e.g. lower wages, no taxes. Some people could find it attractive to start a small informal business rather than working as an employee in the formal sector.

Households also supply labor, and they prefer work in the formal sector for its better wages and more secure jobs. In particular skilled workers often prefer unemployment to informal sector employment (see for instance Agénor & Montiel(1996) for factual evidence). However, those who cannot afford to wait longer end up working in the informal sector, some of them keep hoping to find work later in the formal sector. Nevertheless, at any given time, each individual decides whether to supply his labor force in the formal sector or in the informal sector but not in both simultaneously. Let N_I denote the labor supply in the informal market and N the total supply of labor at a given time, then the supply of labor to the formal market is:

$$N_F = N - N_I$$

$$\text{And } \Delta N_F = \Delta N - \Delta N_I \quad (17)$$

ΔN is the increase in total labor supply, growing at a given rate n .

ΔN_I is the variation of N_I , and indicates how many people employed by the informal sector decide to migrate from the informal to the formal sector. A decrease in N_I means an increase in N_F .

Labor mobility

Mobility between the formal and the informal sector is a continuous process; it will be expressed by the following mechanism:

$$\Delta N_I = -a(w_F - w_I)\Delta L_F \quad (18)$$

With $a = a^+$ for $\Delta L_F > 0$

And $a = a^-$ for $\Delta L_F < 0$

Where a^+ is larger than a^-

Movement from the informal sector to the formal sector is prompted by the creation of new jobs in the formal sector or by the wage differential between the two sectors, that is an increase in the formal sector wage or a decrease in the informal sector wage accelerate labor migration. Obviously, if instead of hiring the formal sector is dismissing workers, there will be an opposite movement towards the informal sector, but very likely at a slower speed. This mechanism is of the Harris-Todaro type, since more work opportunities or higher wages in the formal sector increase the expected gain of job search in the formal sector and cause labor migration.

Linking unemployment to the informal sector

Labor mobility between the informal and the formal sectors is a key mechanism for the understanding of unemployment in this type of economy. When the demand for labor increases in the formal sector, essentially as a result of new investments, new jobs are offered to the unemployed already queuing up for formal sector jobs and this will attract more, and maybe larger numbers, of people from the informal sector to the formal sector. This process will persist as long as the informal sector pays lower wages and investment takes place in the formal sector. It will nevertheless slow down as the wage rate in the informal sector catches up inevitably with that of the formal sector. Working in the informal sector is for a lot of people accepted as a transitory occupation they would abandon when the likelihood of finding work in the formal sector increases.

Unemployment and the size of the informal sector

Consequently, implying that creating more jobs in the informal sector may well be like delaying the real solution to the unemployment problem, the following proposition may be stated:

Proposition 1: The more jobs created in the informal sector the more unemployment will persist; that is, given the same initial unemployment rate, unemployment will persist longer if the size of the informal sector is initially larger.

Unemployment is said to be more persistent if the economy takes longer to reach full employment (or any specified employment target). This proposition implies that unemployment may persist longer because of a larger size informal sector even in cases where the initial unemployment rate was lower; in other words, a larger informal sector has the same effect on the persistence of unemployment as does a higher initial unemployment

rate. Before discussing this proposition any further, let us make it clear that our purpose is not at all to argue that the solution is to restrict investment in large modern firms or to destroy the informal sector. What we suggest, at least within the framework of the present theoretical discourse, is to restrict investment in the informal sector to the most viable activities and, most of all, to do everything possible in order to narrow the gap between the two sectors and to reduce $(w_F - w_I)_t$ by enforcing labor regulation that contribute to improving work conditions in the informal sector⁴ and by facilitating access to capital and training for the informal sector firms. The idea is in a way to transform informal sector jobs into more stable and more formal ones. If work in the informal sector is made less precarious and more beneficial from the same legal protection found in the formal sector, the temptation to migrate to the formal sector weakens.

Proof: A formal proof of this conjecture requires solving the model theoretically and examining the dynamic path of the rate of unemployment as a function of the size of the informal sector. This theoretical proof will not be attempted here; instead, the simulation experiments presented in the next section clearly confirm this conjecture. However, two sub-cases regarding the initial size of the informal sector ought to be discussed separately.

In the first case, which corresponds to our basic assumption, both the formal and the informal sector are assumed to be initially quite sizable, that is the formal modern sector already covers an important share of the economy. **In this case, the proposition applies in a straightforward sense: the larger the informal sector the longer it will take to reach full employment, and the more investments going to the formal sector the faster full employment will be achieved.**

In the second case, the informal sector initially dominates, and the formal sector is totally or almost non-existent. In this case, the initial rate of unemployment could not be high, as we assumed that in the informal sector full employment always prevails. Then, obviously, investing in the formal sector would, for a period of time, accelerate the migration process and generate unemployment, not the opposite. This may seem to contradict our proposition. In fact, our main proposition still holds. As long as the development of the formal sector means progress, and as long as the phase of building up a formal sector is necessary, then, to a certain extent, unemployment has to inevitably rise during this phase. It will then reach a peak and, afterwards, it will start decreasing in a second phase. This second phase corresponds to the first case. Nevertheless, even in the first phase, the more resources allocated to the formal sector, and not to the informal sector, the lower the rate of unemployment will be over the cycle and the less persistent unemployment will be. In particular, the unemployment peak will be lower (see next section). Again, this means that, in the long run, unemployment will be more persistent when the informal sector is initially larger and if more resources are attributed to the informal sector instead of the formal sector. All of this will be clearly illustrated in the next section as we present the simulation results.

Unemployment and the allocation of capital

The case against the informal sector, in its current form, can be made even stronger. On the basis of our theoretical model, if we assume that the economy follows the path determined by the mechanisms described above, we can show that unemployment will worsen if a larger share of the available investment capacity is allocated to the informal market, or equivalently that allocating more national investment to the formal sector reduces unemployment persistence. Thus, we obtain the following proposition:

⁴ Reaching such an objective would not be conceivable without a stronger enforcement capacity and without legal and institutional reforms, including making labor market regulations simpler and easier to implement.

Proposition 2: Investing more in the informal sector in order to create more jobs will in fact, at least in the long run, aggravate unemployment.

Unemployment and labor market regulation

We also simulated the effect of a wage shock on the informal market behavior. The following proposition is as a result:

Proposition 3: an exogenous increase in w_1 (the informal sector wage) may well lead to less unemployment.

Such an exogenous increase in the wage rate within the informal sector may be, for instance, the outcome of imposing social security payment on the informal firm. An increase in w_1 would have two opposite effects on employment: a decrease in the informal labor demand due to the increased labor cost and a decrease in labor migration from the informal to the formal sector; the latter effect, which reduces unemployment, may well dominate the former.

Altogether, there may be a trade-off between creating more jobs in the informal sector immediately and creating more and better jobs in the formal sector, but there is no trade off between more employment and better employment, in the formal sector, in the long run. Developing the formal sector is the only way to eliminate structural unemployment. Labor market duality, as long as it lasts, will remain a major cause of unemployment persistence.

3. Empirical Results and Simulations

The main purpose of this section is to use the above theoretical framework and to solve it numerically in order to investigate the dynamic interactions between the development of the informal sector, investment, growth and employment, and, hence, to test the propositions presented in the previous section. Before doing this, we need first to test the crucial assumptions of the theoretical framework and to verify that they are reasonable.

Testing the model hypothesis

The main hypothesis to be tested are, as stated above, that the informal sector does not pay (enough) taxes, it produces mainly non tradable goods, it ignores the labor market regulations, and it is technically less efficient than the formal sector.

The first three assumptions will be tested using mainly descriptive statistics drawn on the results of the 1997 national survey undertaken in Tunisia, covering effectively more than 6000 small firms (no more than 6 employees), most of which are not holding any books and admittedly belong to the informal sector. However, we only had partial access to the database: approximately 1000 firms. This survey data will be completed by other available statistical data produced by the same National Statistic Institute using the same firm survey.

The size of the informal sector

First, this data confirms that, in Tunisia, the informal sector employs approximately half of the labor force, as summarized in Table 1.

Taxes paid by the informal sector

It would of course be an exaggeration to say that the informal sector does not pay any taxes at all; it really cannot for instance avoid paying some indirect taxes through its inputs, and it does pay some income taxes. However, it pays much less than what is due and relatively much less than the formal sector. On the basis of the 1997 survey, the total amount of income taxes contributed by the informal sector in Tunisia is less than 2 percent of the income it generates, compared to a 5 percent national average, and the total the amount of taxes it pays

(direct plus indirect taxes) is around 4 percent, to be compared to the average national tax to GDP rate, which is around 20 percent (Boughzala 2001).

Production of tradable goods and services:

Using the same data source, we find that, in Tunisia more than 80 percent of the informal sector GDP and employment are in activities which produce mainly non tradable goods and services such as construction, commerce, domestic transportation and personal services. This result is strongly confirmed by the share of exporting firms within the informal sector, as indicated in Table 2, revealing that only 1.7 percent of informal firms export some goods or services.

Labor regulation enforcement:

As is widely admitted the available data confirm in many ways that the informal labor market is highly flexible. For instance, the number of hours of work in the informal sector averages 9.14 per day, and 57.8 per week. Moreover, most of the informal firms in the sample do not keep any books, and consequently have no written and well-defined employment contracts.

Technical efficiency:

To show that the formal sector is technically more efficient than the informal sector, micro data from the same source are used to estimate the production functions of the formal and the informal firms: equations (1) and (4). Because of the lack of data measuring the volume of public goods and services available to each observed firm, only a simplified version of these production functions were estimated:

$$\ln Y_i = \ln A_i + a \ln K_i + b \ln L_i + v_i$$

Therefore, the effect of the omitted public good factor is partly captured by the constant term, A . The basic test is that this constant term, corresponding to the $\ln A_i$ coefficient, is higher for the formal sector. This is sufficient to prove that the formal sector is more efficient because, for the range of values taken by K and L , if A_F is greater than A_I , then, for the same given amounts of K and L , production in the formal sector is higher.

After estimating the separate production functions, the results obtained are shown in Tables 3a, 3b and 3c.

The main result to be underlined here is that the estimation for the A_F and A_I coefficients are highly significant and show that A_F is **approximately three times larger than A_I** (A_F equals approximately 300 while A_I equals approximately 100), which is a rather strong indication of the higher technical efficiency of the formal sector⁵. This of course, should not be to surprising. It is indeed consistent with common beliefs and at least two facts which are confirmed by the survey data: first, that the average skill level is higher in the formal sector, and, second, that the informal sector has very limited access to capital (financial sources). Financial institutions in Tunisia provide only 13.6 percent of financial resources needed for investments in the informal sector, while they provide more than two thirds of the funds used by the formal sector.

This result is confirmed by an alternative test, consisting of combining all firms into one sample group and estimating a single production function while adding a dummy for the informal sector firms. The co-efficient of this dummy turned out to be highly and negatively significant.

⁵ The capital elasticity coefficients should also interpreted with more caution because only a proxy could be used to measure the stock of capital.

We may conclude that the empirical evidence validates the four crucial assumptions of the theoretical framework, and we may therefore use it to illustrate the main propositions stated in the previous section regarding the interaction between the formal and informal labor markets and unemployment.

Simulating the interactions between the formal and informal sectors and unemployment

For the simulation purpose, the calibration of the model does not exactly reflect the Tunisian economy but tries nevertheless to generally capture its main characteristics. In particular, the production function coefficients are not exactly the ones obtained economically mainly because it is important to allow for a public good effect and because the increasing returns coming out of the estimated coefficients should not be extrapolated at the aggregate level for many reasons; in particular, a general equilibrium may not exist in case of increasing returns to scale, and calculation problems may arise

$$Y_F = 2.7 \cdot K_F^{0.30} \left(\frac{W_f}{W_I} \exp(u/L) L_F \right)^{0.525} G^{0.15}$$

$$Y_I = K_I^{0.11} L_I^{0.75} (0.10G)^{0.1}$$

u/L indicates the unemployment rate, and u the percentage rate, L being set equal to 100.

Some additional simplifications were made.

First, total population is assumed constant; thus, the focus will be on the effects of informality. Besides, the impact of population growth is quite obvious in the context of this type of economy: it simply increases the rate of unemployment.

Second, the parameters for the formal sector wage and labor demand adjustment equations are set (more or less arbitrarily) as follows:

$$\alpha_0=0.1; \alpha_1=0.2; \alpha_2=0.2; \alpha_3=0 \text{ for equation} \tag{10}$$

$$\rho_1=0.4; \rho_2=0.4; \rho_3=0.3; \rho_4=\rho_5=0.0125 \text{ for equation} \tag{11}$$

We also take, in equation (13), the share of formal sector output allocated to the production of additional public goods and services to be 10 percent:

$$\tau=0.10$$

And the total investment to the formal sector output ratio to be equal to 20 percent: $\eta=0.2$ for equation (14).

Finally, for the migration equation (18), we take:

$$a^+=0.4; a^-=0.1$$

This means that the speed of migration from the informal to the formal sector is four times faster than the speed of reverse migration from the formal to the informal sector in case of recession in the formal sector.

This being said, these simulations did provide a tangible proof that the theoretical propositions presented above are valid. Several scenarios have been envisaged and simulated in order to capture the interactions between the dynamics of the informal sector and unemployment. The simulations focus on the case where the formal sector is already quite developed, but the case where it is newly created and the informal sector initially dominates is also considered.

For all these scenarios, a common computational procedure was followed. It involves the following steps:

- Starting with the informal sector we specify its initial size in terms of labor supply in this sector, N_I , and then determine its equilibrium wage rate (w_I) by equating this labor supply to labor demand obtained from expected profit maximization.
- Given this equilibrium value of w_I and the observed initial unemployment rate and their initial stock of capital and the stock of public goods, the formal sector adjusts its wage rate and labor demand according to equations (10) and (11).
- This change in w_F and L_F will prompt a migration movement according to the specified migration mechanism. This leads to a change in the unemployment rate and in the size of labor supply in the informal sector, and consequently to a change in its equilibrium wage rate. And so on.

Unemployment and the investment rate

The first preliminary idea that we investigated is the most obvious and least controversial; it is that a higher rate of total investment leads to lower unemployment and accelerates the tendency to full employment. In our framework, the rate of investment is given by the investment to the formal sector GDP ratio. Four values are given to this parameter: $\eta=0.15;0.20;0.25;0.3$. The numbers and the graphic representation Figure 1 show clearly that unemployment decreases as the investment rate increases.

Starting from a 15 percent unemployment rate⁶, we see that when the investment rate is 30 percent, unemployment is reduced to 5 percent in less than 10 years, and full employment is reached in the 13th year. Whereas, it almost takes 15 years to bring the unemployment rate to the 5 percent target when the investment rate is equal to 15 percent.

Investment allocation to the informal sector and unemployment

The second proposition, which was formulated in this paper, is that investing more in the informal sector and less in the formal sector, may generate more low quality jobs in the short run but will cause future higher unemployment rates.

Four cases are again envisaged for the share of the formal sector in investment, ϕ is taken to equal 0.75, 0.8, 0.85 and 0.90. The outcome is seen in Figure 2.

From Figure 2, we notice that even in the short run the unemployment rate hardly increases, and that it falls significantly in the long run as the share of investment allocated to the informal (formal) decreases (increases); that is when the share of capital allocated to the formal sector increases unemployment decreases. The lowest unemployment curve corresponds to the highest share of new capital allocated to the formal sector. For instance, the 4 percent unemployment target is reached almost one and a half year earlier when this share increases from 75 % to 90 %.

The size of the informal sector and unemployment

Given the same initial unemployment rate, unemployment will persist longer for a country inheriting a larger informal sector. A higher L_I leads to a more persistent unemployment. This is the substance of our first proposition. To verify that it is valid, four values for the share of L_I are envisaged: $\frac{L_I}{L_I+L_F}=\frac{2}{17};\frac{4}{17};\frac{6}{17};\frac{8}{17};\eta=0.2\phi=0.8$. The result is shown by Figure 3.

The curve u_1 corresponds to the lowest unemployment curve and is yielded by the smallest initial informal sector size (2/17). Full employment is also achieved the fastest (in 14 years).

⁶ 15% is approximately the unemployment rate in Tunisia (employment survey 2000)

On the opposite the curve u_4 corresponds to the largest initial informal sector size (8/17) and to the highest and most persistent unemployment case (approximately 20 years to reach full employment).

As it was observed in the previous section, a different picture comes out if the formal sector has not yet been developed and is just being created. In this case, more unemployment will be inevitable over a certain period; at first it will increase along with the formal sector, and later on will start decreasing again. However, even in this case, the rate of unemployment will be systematically lower, and the entire process will be faster, when more capital goes to the formal sector.

In order to show that investing more in the formal sector, and less in the informal sector, even when starting with a non-existing formal sector, it is assumed that an initial capital is exogenously put in the formal sector, such as an initial development program. Then we can see that when this initial capital increases, or the share of investment attributed to the formal sector increases then unemployment decreases over the entire cycle and the cycle takes less time to be completed. This is clearly indicated in Figure 4, which was obtained as a result of a simulation exercise.

$\phi=0.05;0.15;0.25;0.35;0.45\phi=0.70$

Figure 4 shows, indeed, that the lowest unemployment curve and the least persistent unemployment are obtained when more capital goes to the formal sector.

Exogenous wage increase in the informal sector

Our final idea is that, although the informal sector may weigh heavily upon the rest of the economy, the solution is not to eliminate it but to transform it, namely through enforcement of labor market regulations (and eventually the design of proper reforms of these market regulations) and by extending the benefits of formality to the informal sector. It is interesting to verify that such a transformation within the informal sector produces a beneficial impact on unemployment. We found indeed that imposing an exogenous increase in the informal wage rate actually lowers unemployment and not the opposite, as it could at first intuitively appear. A lower wage in the informal sector generates more unemployment in the long run and thus more volatility in the labor market.

In Figure 5, the u_1 curve corresponds to the lowest pay in the informal sector where it does not accept to pay for any labor cost in addition to the regular equilibrium wage. It is the highest curve with the highest unemployment rate. The other curves correspond to situations where the informal sector concedes an exogenous wage increase, e.g. for income tax, or social security or training. When this happens the gap between the formal and the informal sector is narrowed; u_4 corresponds to the narrowest wage gap.

It is quite remarkable that such change in labor cost lowers unemployment (roughly speaking) and not the opposite. The force behind this phenomenon is that when the wage gap is reduced the incentive to migrate from the informal to the formal sector is reduced and hence the pressure on the formal market is dampened.

It is worth mentioning at this final stage that a larger informal sector costs more not only in terms of future employment, but also in terms of future growth. A country with a large informal sector will suffer from more unemployment and experience slower growth in the future.

The final conclusion is that it is wise and in the interest of the type of dualistic economy described by the theoretical framework to not let the informal sector grow without any restrictions. The economy would benefit if measures were taken and implemented to enforce labor regulations and formalize the informal sector.

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Figure 1: Unemployment and the Investment Rate



Figure 2: Investment Allocation to the Formal Sector and Unemployment

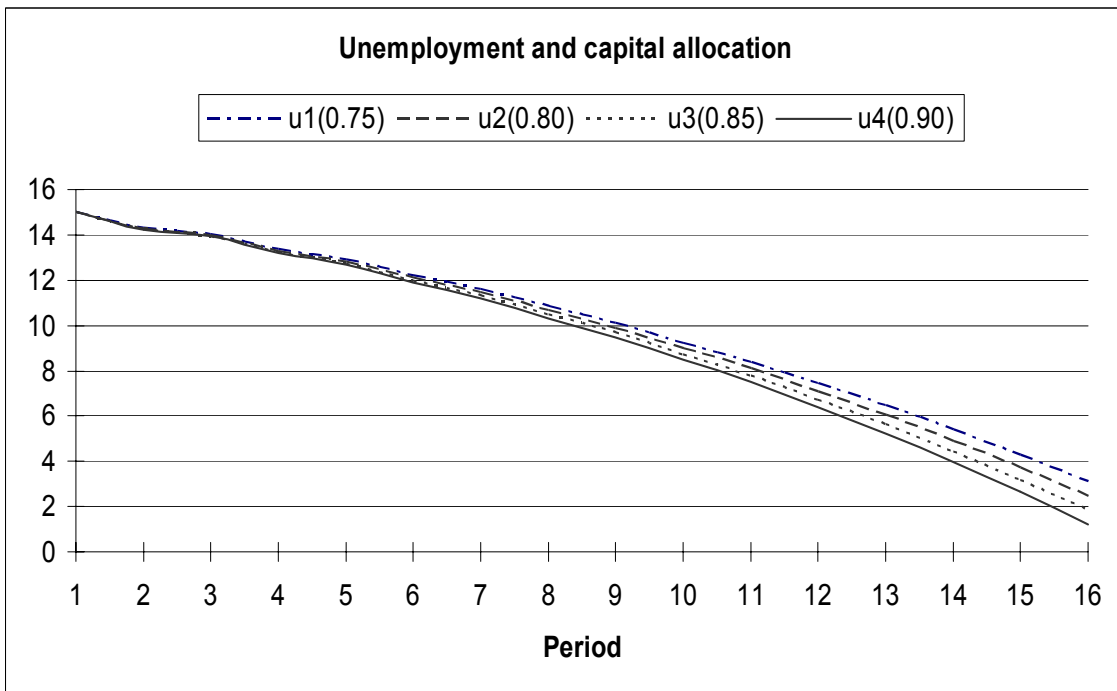


Figure 3: The Size of the Informal Sector and Unemployment

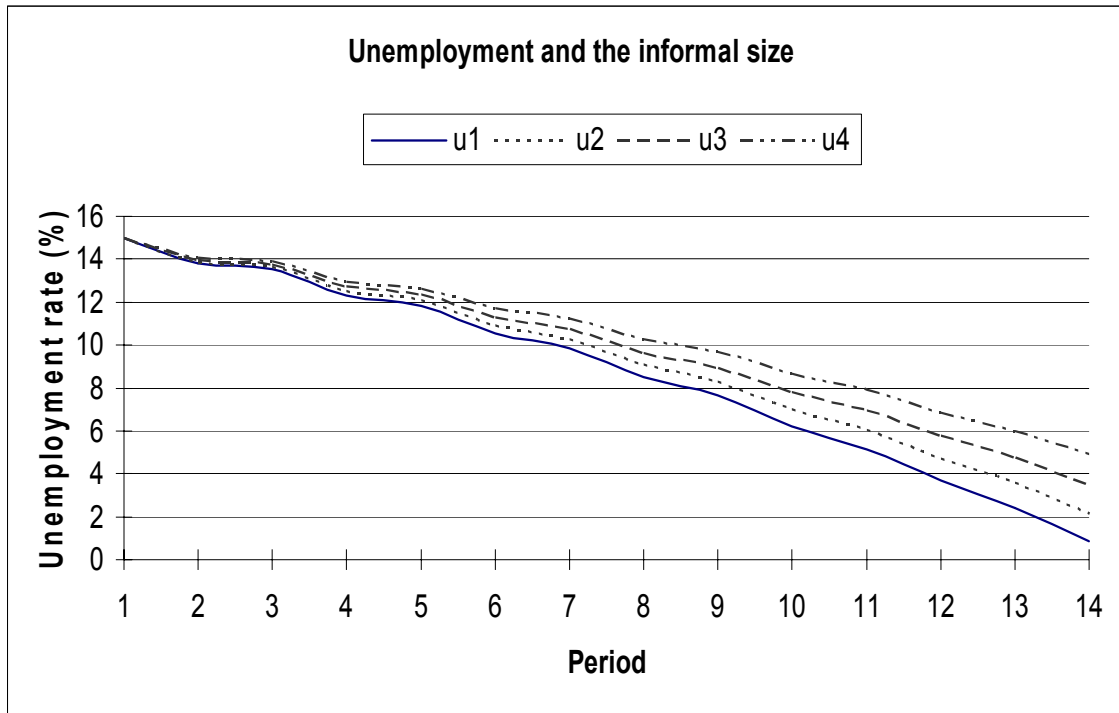


Figure 4: Investing in the Informal Sector

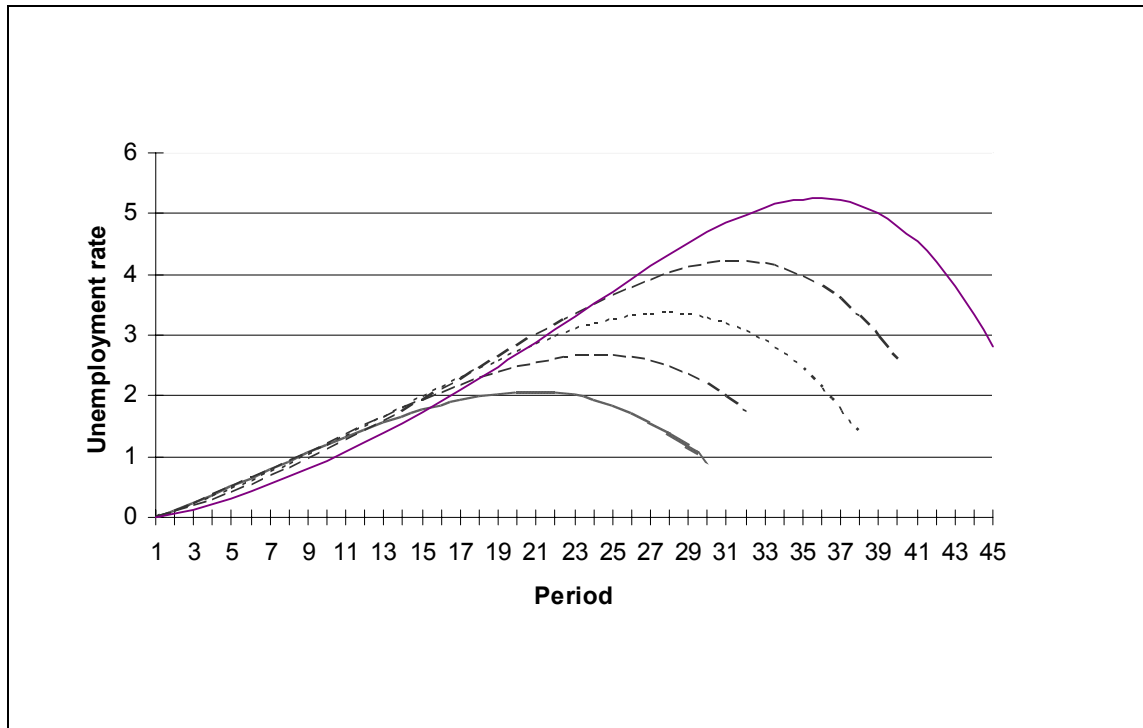


Figure 5: Reducing the Wage Differential and Unemployment

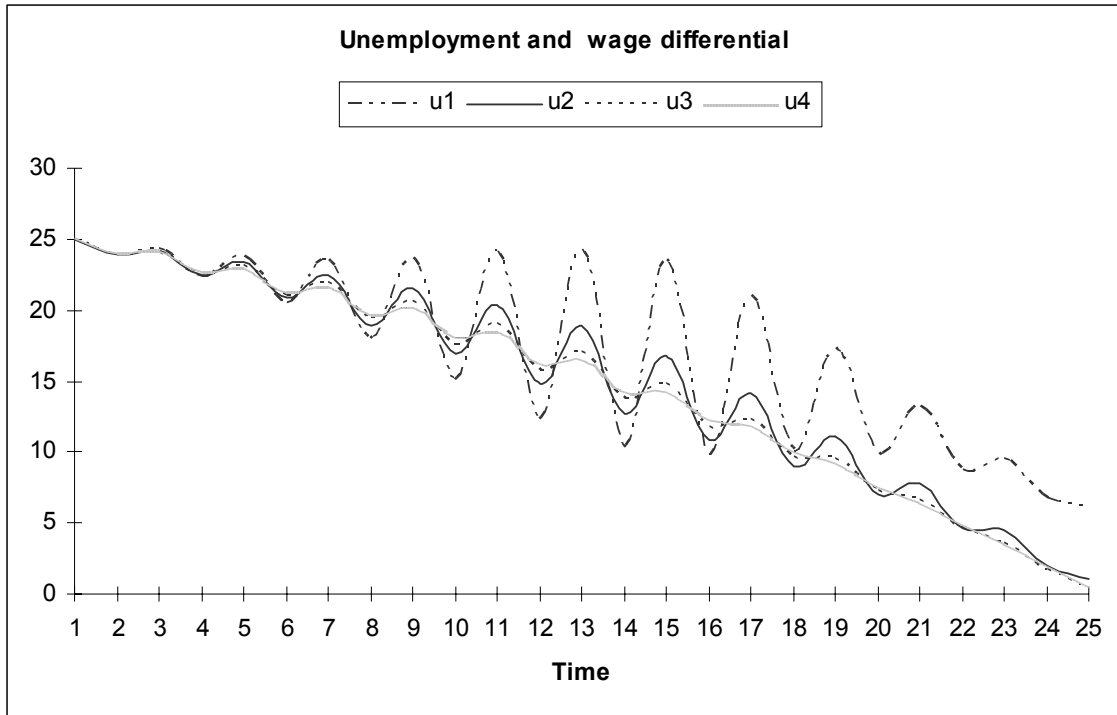


Table 1: Composition of Non-Agricultural Employment in 1997

	Number of employed (in 1000S)	Percentage
Informal and precarious	976	49.9
• Micro firms	423	43.3
• Home labor and non declared (out of establishments)	553	56.7
Formal (modern) sector	981	50.1
• On shore (Private & Public enterprises)	455	46.4
• Off shore firms	156	15.9
• Civil servants	370	37.7
Total	1957	100

Source: INS (1997), p66

Table 2: Share of Exporting Informal Firms (Micro Firms)

Type of activity	Percentage of exporting firms
Food	1.3
Textile, clothing and leather work	0.7
Articles of wood	0.3
Printing and editing	1.9
Metallic industries	0.6
Commerce	1.7
Hotels and restaurants	1.9
Transportation	1.8
Services to other firms	2.1
Health and social services	7.3
Personal services	0.6
All Activities	1.7

Source: INS (1997), p64

Table 3a: Dependent Variable: LnY_F

	LnA _F	LnK _F	LnL _F
Coefficients	5.62	0.41	0.62
t coefficient	29.7	21.3	19.4

Table 3b: Dependent Variable: LnY_I

	LnA _I	LnK _I	LnL _I
Coefficients	4.66	0.11	1.15
t coefficient	14.5	1.6	25.1

Table 3c: Dependent Variable: LnY

	LnA	LnK	LnL	Dummy (informal)
Coefficients	5.83	0.375	0.653	-1.964
t coefficient	30.845	20.558	19.472	-14.09

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