

# Self-employment and Unemployment in Egypt: A Cointegration Approach

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## ABSTRACT

This study investigates the behaviour of Egyptian self-employment during the period 1980-2006. In our empirical analysis of the self-employment function for Egypt, cointegration and error correction modeling approaches have been used. Empirical results suggest that there exists long-run or equilibrium relationship among self-employment rate, real GDP and unemployment rate.

**Keywords** Self-employment; unemployment; human resources; entrepreneur; error-correction model.

## I. INTRODUCTION

The relationship between unemployment rate and self-employment dates back at least to Oxenfeldt (1943), who pointed out that human resources confronted with unemployment and low prospects for wage employment turn to self-employment as a feasible option. This was an extension of Knight's view that human resources make a decision among three states – unemployment, self-employment and employment. The actual decision is shaped by the relative prices of these three activities but there was a clear prediction that self-employment would be positively related to unemployment. For more than two decades ago, there has been an intense academic and political debate on the role of self-employment in the developing countries, centered on the controversial issue of whether it is a voluntary or an involuntary. According to the first view, the propagation of self-employment in developing countries is not economically inefficient but absorbs a supply of entrepreneurial talent.

This contrasts with the alternative view of self-employment as an involuntary and transitory employment option that provides low earnings for survival. In the literature, the testing of these two hypotheses has been usually carried out on individual countries, mainly based on household surveys (Blau, 1985; Yamada, 1996). However, in recent years, self-employment has grown in several developed countries, reversing a trend of many decades, and it has begun to be regarded as an important potential source of new employment opportunities and a way of employing the entrepreneurial abilities of population in countries where large and increasing unemployment has become a key economic problem. This reversing trend has been stressed particularly for the United States, attracting the attention of several economists trying to identify the main determinants of self-employment (Blau, 1987; Evans and Leighton, 1989 a and b; de Wit, 1993, Taylor, 1996).

Despite a flourishing literature on the factors fundamental the growth of self-employment in specific countries, particularly in the Anglo-Saxon world, only few studies try to compare and explain self-employment rates across countries. A major exception is a study by Acs, *et al.* (1994), who shed light on the existence of a wide diversity in the level and time-series pattern of the self-employment rate across OECD countries, and tests a series of hypotheses explaining the sources of this diversity. In their study, they focus on the developed countries and conclude that a major

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explanation for the diversity of self-employment rates is the stage of economic development. According to them, the recent resurgence of self-employment in some countries is the consequence of the decline of manufacturing and, possibly, of the increase in unemployment rate (Acs, et al., 1994, p.26).

The aim of current study is to investigate the link between self-employment and unemployment in Egypt for the period 1980-2006. Considering that time-series data usually have time characteristics, the study utilizes tests for stationary and cointegration analysis. These tests to develop a short-run (dynamic) error correction model of self-employment. The remainder of this paper is organized as follows: Section II provides the theoretical framework of self-employment determinants based on the previous research. The empirical results are found in section III. In section IV, variables definitions and data sources are established. Finally, Section V summarizes the paper.

## **II. THE THEORETICAL FRAMEWORK**

### ***Basis Concepts: Unemployment and Self-employment***

Although the earliest efforts to establish international statistical standards of the measurement of unemployment can be traced back to 1895, the definition of unemployment currently recommended by the International labour Organization ILO has its roots in a resolution by the Eighth International Conference of Labor Statisticians (ICLS), convened by the ILO in Geneva in 1954. The ILO approach to defining unemployment depends on what can be termed the ‘labour force framework’, which classifies the working age population into three categories based on a specific set of rules: employed, unemployed, and out of the labour force - where the former two categories constitute the labour force, i.e., essentially a measure of the supply of labour at any given time. (Byrne, D and Eric.S, 2001, pp. 4-5)<sup>1</sup>

Although the definition of unemployment has since 1954 been periodically revised its basic norms remains integral. Consequently, an individual is to be considered unemployed if he/she during the reference period simultaneously satisfies being:

- ‘without work’, i.e., were not in paid employment or self-employment as specified by the international definition;
- ‘currently available for work’, i.e., were available for paid employment or self-employment during the reference period; and
- ‘seeking work’, i.e., had taken specific steps in a specified recent period to seek paid employment or self-employment.

The ‘without work’ condition serves to make a distinction between the employed and the unemployed, and thus guarantees that these are reciprocally restricted categories of the working age population, while the latter two norms separate the non-employed into the unemployed and the out of labour force. The intention of the availability for work condition is to keep out those human resources who are seeking work to start later, and as a result is a test of current eagerness. The intention of the seeking work norm is, on the other hand, to ensure that an individual will have taken certain ‘active’ steps to be classified as unemployed. The ILO itself remarks that its labour force framework used to define unemployment is best appropriated to “situations where the prevailing category of employment is full-time paid employment...(and that in) practice, however, the employment situation in a given country...will to a greater or lesser degree differ from this pattern” (ILO, 1983).

Moreover, the Thirteenth ICLS decision provided a number of amplifications with regard to the measurement of unemployment that were specifically, as noted earlier, aimed to make it possible to measure unemployment more precisely both in developed and developing countries similarly. The one that is of particular interest here is the provision to allow for a relaxation of the search norms which states that in “situations where the conventional means of seeking work are of limited scope, where labour absorption is, at the time, insufficient, or where the labour force is largely self-employed, the standard definition of unemployment...may be applied by relaxing the norm of seeking work” (ILO, 1983, p. xi). In particular, Hussmanns *et al* (1990) show that “seeking work is essentially a process of search for information on the labour market... (and) in this sense, it is particularly meaningful as a defining norm in situations where the bulk of the working population is oriented towards paid employment and where channels for the exchange of labour market information exist and are widely used.....this may not be the case in developing countries” (ILO, 1983, p. 105).

The literature has examined several definitions and measures of success and performance in self-employment, such as self-employment earnings (Schiller and Crewson, 1997; Burke et al., 2000), enterprise size - employment creation (Brüderl et al., 1992; Burke et al., 2000), enterprise growth (Cooper et al., 1994; Lerner, 1999), stability in self-employment defined either as years of duration in business (Brüderl et al., 1992; Audretsch and Mahmood, 1995; Taylor, 1999; Astebrö and Simons, 2003) or as survival during a particular time interval (Bates, 1990; Cooper et al. 1994; Baptista and Karaöz, 2006). This paper will rely on the definition adopted by the International Labour Office (ILO): Consequently, an individual is to be considered self-employed if he/she during the reference period satisfies being:

- "at work": individuals who during the reference period performed some work for profit or family gain, in cash or in kind;
- "with an enterprise but not at work": individuals with an enterprise, which may be a business enterprise, a farm or a service undertaking, who were temporarily not at work during the reference period for any specific reason.<sup>2</sup>
- in addition, Employers, own-account human resources and members of producers' cooperatives should be considered as in self-employment and classified as "at work" or "not at work", as the case may be.
- unpaid family human resources at work should be considered as in self-employment irrespective of the number of hours worked during the reference period. Countries, which prefer for special reasons to set a minimum time criterion for the inclusion of unpaid family human resources among the employed should identify and separately classify those who worked less than the prescribed time.
- individuals engaged in the production of economic goods and services for own and household consumption should be considered as in self-employment if such production comprises an important contribution to the total consumption of the household.

There is of course a fundamental difference between hiring labour and working only on one's own account, but internationally comparable ILO data do not distinguish between these two categories. This paper will focus on the manufacturing sector and calculate the self-employment rate as the percentage of the manufacturing labour force that is working for themselves, with data from the ILO's Yearbook of Labour Statistics. Despite the severe limitations applying to self-employment data, these are the only available data suitable for international comparisons, also used in

similar exercises (Acs, *et al.*, 1994). Among the limitations stressed by the ILO (1990), it may be worth recalling that self-employment is often treated as a residual, catching-all category, which does not distinguish between skills, earnings and occupations. In very broad terms, self-employment can be considered the residual category of gainful employment not compensated by a wage or salary. In practice in most cases, labour force surveys are based on the self-perception of respondents reporting their status. Moreover, the statistical sources tend to be very different, irregular and of uneven reliability across countries, varying from one census to another, labour force surveys, official estimates and household surveys.

### ***Previous Research***

Self-employment has been linked to both economic and social attributes. The literature has distinguished between the role of institutions, sociological factors, and individual characteristics, with a particular recent interest in psychological factors, in identifying the determinants of the decision to start an entrepreneurial activity (Djankov *et al.*, 2006b). The theoretical debate on self-employment, particularly in the developing countries, is very much related to the analysis of the informal sector, an old and still inconclusive argument. Furthermore, the informal sector is characterized by low-pay and low job security among its employees and large-extent informality in an economy is an indicator of corruption, poor regulatory, financial and labor market environment. However, departing from Lazear's (2004) view of entrepreneurs as "jacks of all trades", one could perceive informal sector as an incubator for formal sector entrepreneurship when the business environment improves. The dichotomy between self-employed human resources, working for themselves and receiving rewards for their labour, their physical capital and their entrepreneurial skills, and wage earners that only get returns to their labour and human resource, is sufficiently clear. By contrast, the definition of informality is much vaguer, being based on tax elusion and other government regulations, as well as on the flexibility of the employment relationship. Yamada (1996) argues that self-employment in the developing countries mainly occurs in the informal sector:

"From the viewpoint of enforcing taxes and regulations, the self-employed in developing countries are almost completely outside government control. Countries with rudimentary administrative systems can concentrate their tax collection efforts only on large national and multinational firms. Likewise, employment flexibility is an important characteristic of self-employment" (Yamada, 1996, p. 291).

In most developing countries, there is a strong association between self-employment and informal activity, as most self-employed human resources tend to be low-skilled, unregistered human resources. In fact, self-employment correlates well with other estimates of informal activity such as the Schneider (2005) measure of informal production: the correlation among non-Eastern European countries equals 0.75. However, the central question on self-employment in the developing countries is the following: do human resources choose to work in this sector, earn competitive incomes and obtain returns to their entrepreneurial abilities, or do they rather stay self-employed because they do not have any better option, waiting for paid employment? This debate between a prosperity pull and an unemployment push argument is very relevant in the development contest, because self-employment is the main employment of at least one out of five members of the urban labour force in developing countries (Turham *et al.*, 1990). Moreover, in many of the developing countries slow economic growth, economic crises and the pursuit of structural adjustment, accompanied by a disappointment with centralized planning and the

public sectors as instruments for promoting growth and full employment, have fuelled the interest in self-employment as a means of creating employment, income and capital (House *et al.*, 1993, Ranis and Stewart, 1995).

The need to generate greater self-employment opportunities, and thereby contribute to economic growth, contrasts with the traditional hypothesis of a negative association between the development performance and the share of self-employed human resources in the labour force, firstly put forward by Kuznets (1966). Along the same line, Lucas (1978) proposed a model of the size distribution of enterprises in which human resources have different endowments of managerial 'talent', showing that there is a positive relationship between the average enterprise size and the wealth of the economy if the elasticity of substitution between capital and labour is less than unity. Lucas concludes that: "An increase in capital per capita raises wages relative to marginal managerial rents ... This induces marginal managers to become employees raising the average size of firms." (Lucas, 1978, p. 518).

Moreover, Evans and Jovanovic (1989) argue that borrowing constraints imply that human resources will be positively related to the tendency of human resources to engage in entrepreneurial activities. Survey evidence from Thai households indicates that human resources who switch to self-employment are more likely to be wealthier (Paulson and Townsend, 2004). However, wealth is also likely to be endogenous, since entrepreneurs have greater savings and shareholdings relative to the general population (Bilster, *et al.*, 2005; Heaton and Lucas, 2000). Quadrini (2000) suggests that entrepreneurs might save more in order to finance new and future enterprises as well as to avoid the business risks.

Lucas tests the relationship between wealth and self-employment on time series data for the US during the 20th century by regressing employees per enterprise (as a proxy for average enterprise size) against per capita gross national product (as a proxy for per capita capital stock), and finds a statistically significant and positive relationship. He therefore concludes that increases in capital stock, and the ensuing increasing returns to wage work relative to self-employment, explain the tendency of self-employment rates to fall. Furthermore, the size of the enterprise has shown to be positively related to survival in self-employment (Evans, 1987; Audretsch and Mahmood, 1995). According to Acs, *et al.*, 1994, following Syrquin (1988), suggest that the growth of manufacturing through large enterprises' creation reduces the profitability of small enterprises and increases the returns to wage work, lowering self-employment. In the developed countries, experiencing a decline in manufacturing and an expanding service sector often dominated by small enterprises, self-employment is expected to decrease with the share of the manufacturing sector. On the opposite, in developing countries, where the manufacturing sector is still dominated by small enterprises, self-employment is expected to increase with the share of manufacturing in GDP. Entrepreneurial activity in terms of small enterprises is more likely to happen in urban areas in more developed countries (Parker, 2004).

On the other hand, the empirical evidence linking the development of both physical infrastructures and credit markets with self-employment is very miscellaneous (House *et al.*, 1993); it differs from activity to activity: there are sectors with high and others with low capital requirements, as well as small enterprises, which can take advantage from infrastructural development. If the self-employed are dynamic emerging entrepreneurs, preferring employment on own account to wage employment due to an expectation of increase in their future profits, then better physical and financial infrastructures may offer interesting opportunities to them. In addition, Blanchflower *et al.* (2001) find that there are many human resources who

would prefer to be self-employed with respect to those that are already self-employed and they claim that it is probably lack of capital that holds back potential entrepreneurs. It is therefore not clear what the a priori expectations on the relationship between the level of development of credit markets and the self-employment rate should be. Empirical evidence is also very miscellaneous on self-employment earnings, and therefore on the expected relationship between self-employment and its opportunity cost, i.e. the wage forgone. Thus, the miscellaneous empirical results appear to confirm such 'dual' interpretation. Several studies contrast with the traditional view of self-employment as a temporary low productivity occupation for human resources who are searching for scarce, well-paid wage jobs. For instance Yamada (1996) on Peru and House, *et al.* (1993) on Kenya find that earnings in self-employment are generally well above formal sector wages. Blau (1985) developed a model of individual choice between wage and self-employment in the developing countries context, concluding that under the assumption of a competitive labour market there is a positive correlation between managerial ability and the probability of observing an individual in self-employment. In his model, the self-employed have a (relatively) higher average level of managerial ability, and expect to have (relatively) higher earnings compared to wage employees.

For a review of literature on social capital and economic development, see Woolcock, 2002; 2005. Johnson, Kaufmann and Shleifer, 1997). For instance, in economies under transition, the regulatory environment might not foster formal entrepreneurship and entrepreneurial human resources might choose to operate in the informal sector or shadow economy. In addition, institutions such as labor unions, minimum wage legislation and public sector hiring practices tend to keep formal sector wages in urban areas above market-clearing levels, and the low-productivity informal sector provides a subsistence shelter for unmatched employees (Harris and Todaro, 1970). In recent study about the role of intellectual property protection IPR in encouraging the self-employment, it indicates that a well-developed IPR regime has a net positive effect on the self-employment activity (Burke and Fraser, 2007).

There are many studies have related self-employment to demographic characteristics: age, sex, ethnic group and education. Overall, there is a certain agreement in the literature on self-employment being a more common choice among young human resources (de Wit, 1993; House *et al.*, 1993), men (Evans and Leighton, 1989c), and also depending on the immigrants' ethnic group (Borjas, 1987). It is now well documented that the propensity of human resources to choose to become self-employed differs by age group (Storey, 1994).

The evidence on education is very miscellaneous: from several studies, it appears that self-employment does not recompense investments in formal education (House *et al.*, 1993; Taylor, 1996). A good enterprise idea and self-employment appear to be more crucial than formal education for the primary success of a new enterprise. Nevertheless, management skills are needed to run an enterprise, and their role in self-employment has been stressed in a number of studies (Blau, 1985; de Wit, 1993). Moreover, higher levels of education may raise entrepreneurial ability and improve the rates of self-employment. However, the same increase in human resource is likely to increase labour productivity and hence the wage rate in that way raising the possibility that it may reduce self-employment.

Jovanovic has described that entrepreneurs with higher human resources might be faced with less uncertainty and learn faster about market conditions, adjusting capacity therefore reducing the probability of exit from market. Thus, effects of entrepreneurial human resources on the probability of new enterprise success may

occur prior to the founding of the enterprise. Moreover, educated human resources may be better able to detect profitable market opportunities and obtain the information set required to explore them more efficiently.

The available literature also emphasizes the link between the level of self-employment and the extent of inputs and products market functioning, and openness. Thus, for example the burden of tariff barriers or the existence of licensing requirements may distort trade in many imports and negatively affect access to inputs but, at the same time, the availability of cheap imported substitutes may destroy or transform some domestic markets, competing with products made by small local enterprises (House *et al.*, 1993). Therefore, the relationship between self-employment and trade openness can change from country to country and industry to industry.

The fiscal system can also influence self-employment choices, as observed by the OECD (1992) for developed countries. Cross-country analysis in OECD countries suggests that taxation and social security arrangements have an important impact on the development of self-employment. In general, self-employment offers greater opportunities for a reduction in the burden of taxation by means of tax evasion. In fact, the OECD countries where the occurrence of self-employment is particularly high are often those where taxes are higher and job security legislation is more restrictive. In developing countries, Yamada (1996) argues that if economic development enhances the government's capacity to collect taxes, then the size of the self-employment sector is likely to be reduced.

Within the literature, the determinants of self-employment have been generally defined as 'push' and 'pull' factors. High levels of enterprise downsizing and outsourcing, privatization together with government programs to promote self-employments (e.g. the New Enterprise Incentive Scheme which provides training and income support to the unemployed wishing to enter self-employment) constitute some of the 'push' factors. Recognized 'pull' factors might include increasing cleverness and accessibility of computer technology, liberalization and new opportunities for entrepreneurship, attractive taxation arrangements.

The relationship between unemployment and self-employment has been covered with ambiguity. On the one hand, in the simplest neo-classical model developed by de Wit (1993), self-employment may be regarded as income maximization behaviour within a competitive labour market. The decision whether or not to enter into self-employment (having first determined whether to supply labour to the market) is made in relation to expected returns from wage employment. The latter is, in turn, affected a number of other determinants, remarkably managerial ability (e.g. human resource, business experience) (Lucas, 1978) and discrimination. If discrimination lowers earnings, in the wage sector, or lowers the utility derived from wage employment, those most affected will more likely shift into self-employment, other factors being constant.

On the other hand, the unemployed tend to possess lower endowments of human resource and entrepreneurial talent required to start a new enterprise (Lucas, 1978; Jovanovic, 1982), suggesting that high unemployment is associated with a low degree of entrepreneurial activities. A low rate of self-employment may also be a consequence of the low economic growth levels, which also reflect higher levels of unemployment (Audretsch, 1995). Entrepreneurial opportunities are not just the result of the push effect of unemployment but also of the pull effect of produced by a flourishing economy as well as by entrepreneurial activities in the past.<sup>3</sup> Moreover, unemployment leading to more or less entrepreneurial activity, the reverse has also been claimed to hold. On the one hand, new-enterprises startups hires employees,

resulting in subsequent decreases in unemployment (Pfeiffer and Reize, 2000a). On the other hand, the low rates of survival combined with the limited growth of the majority of small enterprises imply that the employment contribution of startups is limited at best, which would argue against entrepreneurial activities reducing unemployment.

However, as Storey (1991) determines, the empirical evidence linking unemployment to entrepreneurship is full of ambiguities. While some studies find that greater unemployment serves as a vehicle for startup activity (Reynolds, Miller and Makai, 1995), still others have found that unemployment reduces the amount of entrepreneurial activity (Audretsch, 1995). For instance, Audretsch and Thurik (2000) show that an increase in the number of enterprises owners reduces the unemployment rate. They recognize a “Schumpeter” effect in terms of the positive impact on employment resulting from the entry of new enterprises, but others have come to the reverse conclusion, that self-employment and unemployment are inversely related. For example, Evans and Leighton (1990) found that unemployment is positively associated with a greater propensity to start a new enterprise, but Garofoli (1994) found that unemployment is negatively related to new-enterprises startups, and Carree (2001) found that no statistically significant relationship exists. In reviewing the empirical evidence relating unemployment rates to new-enterprises startup activity, Storey (1991, p. 177) concludes that, “The broad consensus is that time series analyses point to unemployment being, other factors being constant, positively associated with indices of new-enterprises formation, whereas cross sectional, or pooled cross sectional studies appear to indicate the reverse. Attempts to reconcile these differences have not been wholly successful.” Thus, while there are not just theoretical reasons, but also empirical support as well, that while unemployment leads to increased self-employment, self-employment leads to reduced unemployment.

### ***Unemployment and Self-employment in Egypt: An Overview***

Egypt started its Economic Reform and Structural Adjustment Program (ERSAP) in 1991 with the support of the International Monetary Fund and the World Bank. The first phase of ERSAP addressed macro-economic stabilization policies to reduce the large budget and balance of payments deficits. In January 1996, efforts were intensified to include structural reforms in the economy. Many agree that Egypt’s Economic Reform and Structural Adjustment Program was successful in its stabilization objectives. The budget deficit was reduced to a sustainable level (from 15 percent of GDP in 1991 to 4 percent in 1992 and reaching less than 1 percent in 1997), and inflation dropped from 21 percent in 1991 to 6 percent in 1997. While it is still too early to determine success, adjustment policies have had a considerable impact on the Egyptian economy. Local currency was devalued and exchange rates unified; government controls on prices and quantitative import restrictions were dismantled. Tariffs and subsidies were reduced. Interest rates were liberalized and credit restricted, which succeeded in raising the interest rate from negative values to high positive values (Karshenas, 1994, p.27). Despite these positive signs, serious concerns remain regarding the social implications of economic reforms, especially in terms of livelihood opportunities and poverty. Estimates of unemployment and poverty in Egypt show a rising trend since the late 1980s.

The change in the character of unemployment in Egypt since 1972 was not limited. The composition of the unemployed has also been significantly altered. In the early years, unemployment rates were in inverse relation to education. For instance, the 1961 Labor Force Sample Survey (LFSS) reports an unemployment rate of 7.4



percent for those with less than intermediate (secondary) education, 5.8 percent for those with intermediate education, and 3.2 percent for university education (Mohie-El Din 1977). On the contrary, in one of the recent reports on the Egyptian education system calls attention to the diminishing rate of return on education because of a number of issues (Aubert et al, 2004, pp.10-11):

- The qualification is often sanctioned by a general diploma, which is based on a system in which the number of years of schooling counts more than the development of specific competencies. In other words, the education system focuses too much on quantity and too little on quality.
- Professional education and the validation of professional achievements are rare.
- The education system is inefficient. Students repeat classes at high rates at the primary and secondary levels. The first university cycles have high failure rates. Failure at school creates the conditions of further social exclusion.
- Educational institutions are largely isolated from the rest of society, are not systematically evaluated for performance, and do not address the market and its needs (increasing in unemployment rates).
- The private sector is underrepresented in educational institutions.
- Quality of education suffers due to budget constraints: teachers' salaries are decreasing in real terms and multimedia facilities are under-equipped.

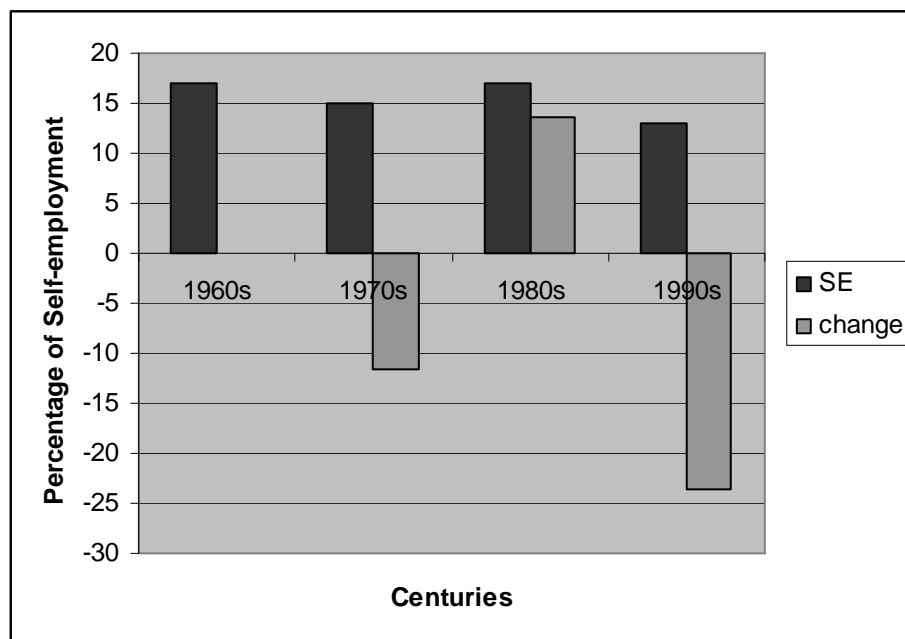
Based on official statistics, the unemployment rate increased from 8% in 1990 to 11% in 1995 and settled around 9% in 2001. This is widely agreed to be an understatement of the unemployment rate. Open unemployment is heavily concentrated among educated human resources, especially those with secondary school certificates. Of 1.8 million unemployed in 2001, 97% had a secondary education or above, of which 69% were secondary school graduates. Real wages fell significantly between 1985 and 1995, a period of slow growth and painful macroeconomic reforms. Real wages appeared to have recovered somewhat since then, but most of the improvement was for human resources in state-owned enterprises rather than in the private sector (Handoussa and Kheir-El-Din, 1998).

The Egyptian informal sector has been growing significantly during the past decade, absorbing the increasing numbers of new entrants into the labor market, especially new graduates waiting for a government job (self-employment). Estimates of its size vary due to the different definitions and estimation methods used by different authors. This sector, which includes small establishments (less than 10 employees) and employment outside establishments, has shown increasing importance in livelihood opportunities since the early 1980s. According to the 1995 LFSS, it constituted 18 percent of total wage employment. The Egypt Human Development Report 1996 stated that the informal sector grew from 22 to 24 percent between 1977 and 1992. Informal employment opportunities in urban areas grew to 1.9 million, constituting around 60 percent of the total workforce in the private sector. If establishments employing less than five human resources are considered as part of the informal economy, then the total number of human resources operating within the informal economy was estimated to be around 3 million people in the early 1990s (UNDP, 1996).

Assaad argues that with the small size of the formal private sector and the limited availability of jobs in the public sector, the informal sector has become “by default the leading sector of labor absorption in the Egyptian economy” (Assaad, 1997:61). Handoussa and Potter further argue that the informal sector in Egypt is “resilient, dynamic and successful enough to become an engine of growth” because

not only does it absorb youth labor, but it also offers market skills such as entrepreneurship and individualism which may empower young human resources to participate more effectively and also promote sound economic progress. (Handoussa and Potter, 1992).

Figure 1 shows the evolution of the percentage of manufacturing labour force that is self-employed in Egypt since the 1960s until 1990s. The changes from 1960s to 1970s were by -11.50% and from 1980s to 1990s by -23.33%. The main reason of that decline may due to the decrease in the unemployment rates from 10.6% (1986) to 5.1% (1996) for those with higher education for example. On the other hand, changes in self-employment were positive from 1970s to 1980s reflecting high unemployment rates in those periods.



**Note:** Data from ILO, Yearbook of Labour Statistics (several years)

**Fig. 1: The Percentage of Manufacturing Self-employed Labour Force in Egypt**

This means that self-employment may constitute the appropriate solution to decrease the high unemployment rate in Egypt in the meantime. Consequently, this study will investigate the statistical relationship between self-employment and unemployment on a time series data. However, based on the concluded set of wide determinants of self-employment as the above-mentioned, it is not possible to put it together as explanatory variables for self-employment into one model in the current study.<sup>4</sup> It is therefore, the self-employment equation used can be specified as follow:

$$SE_t = \alpha_0 + \alpha_1 UNEM_t + \alpha_2 RGDP_t + \mu_t \quad (1)$$

where *SE* stands for self-employment, *UNEM* for unemployment rate, *RGDP* for real gross domestic product, and  $\alpha_1, \alpha_2$  are slopes coefficients with respect to the variables *UNEM*, and *RGDP* respectively,  $\alpha_0$  is the intercept term, and  $\mu$  is the disturbance (error) term. The linear form was chosen based on the graphical representation for the variables, and because it was found to be the most appropriate functional in different studies (Lucas, 1978; Jovanovic, 1982, Audretsch, 1995). The a priori sign

expectations are as follows. The impact of the two explanatory variables is derived from the empirical studies referred above and the economic theory. The coefficients of unemployment and real gross domestic product are expected to have a positive sign ( $\alpha_1, \alpha_2 > 0$ ). In other word, the aim of study is to test whether unemployment encourages self-employment in Egypt.

### III. THE EMPIRICAL FRAMEWORK

Equation (1) could be estimated by the standard regression method if the variables **SE**, **UNEM**, and **RGDP** are stationary and the residual term ' $u$ ' is uncorrelated and homoscedastic. However, if the variables are nonstationary in their levels, the standard regression method could be inappropriate because the usual  $t$  and  $F$  tests may give misleading results (Engle and Granger, 1987). More importantly, the estimated regression coefficients could be 'spurious' (Granger and Newbold, 1974). In this situation, it must be taken the first difference of the variables (as in equation 2) in order to obtain a stationary series:

$$\Delta SE_t = \alpha_0 + \alpha_1 \Delta UNEM_t + \alpha_2 \Delta RGDP_t + \mu_t \quad (2)$$

Equation (2) ignores any reference to the long-run aspects of decision-making. That is, this procedures of differencing results in a loss of valuable "long-run information" in the data (Maddala, 1992). The theory of cointegration addresses this issue by introducing an error-correction (EC) term. The EC term lagged one period (ie.,  $EC_{t-1}$ ) integrates short-run dynamics in the long-run self-employment function. This leads to the specification of a general error-correction model (ECM):

$$\Delta SE_t = \beta_0 + \sum_{i=1}^n \beta_{1i} \Delta SE_{t-i} + \sum_{i=0}^n \beta_{2i} \Delta UNEM_{t-i} + \sum_{i=0}^n \beta_{3i} \Delta RGDP_{t-i} + \beta_4 EC_{t-1} + \varepsilon_t \quad (3)$$

where  $EC_{t-1}$  stands for error-correction term lagged one period.

The modeling strategy adopted in this study involves three steps:

- Determining the order of integration of the variables by employing Augmented Dickey-Fuller (ADF) and Phillips–Perron (PP) (1988) unit-root tests;
- If the variables are integrated of the same order, one needs to apply the Johansen–Juselius (1990, 1992, 1994) maximum likelihood method of cointegration to obtain the number of cointegrating vector(s), and
- If the variables are cointegrated, it is necessary to specify an error correction model and estimate it using standard methods and diagnostic tests.

The empirical analysis that follows was conducted using the EViews software.

### IV. VARIABLES DEFINITIONS AND DATA SOURCES

In the empirical analysis of the link between self-employment and unemployment in Egypt, it uses annual data for the period 1980-2006. All the variables are expressed in real terms.

**SE:** Self-employment rate as the percentage of the manufacturing labour force that is working for themselves.

**Source:** ILO's Yearbook of Labour Statistics, and ILO's database.

**UNEM:** Unemployment rate as the percentage of labor force.

**Source:** CAPMAS, Labor Force Sample Survey, Egypt.

**RGDP:** Real Gross Domestic Product at prices 1980. It is calculated as the divided GDP in current prices by GDP deflator.

**Source:** IMF, World Economic Outlook Database, April 2007

## V. THE EMPIRICAL RESULTS

### *Summary Statistics*

Data on SE, UNEM and RGDP for the 1980-2006 period are shown in table 1 as are their means, standard deviations (SD), coefficients of variation (CV), and annual compound growth rate.

**Table1: Summary Statistics of Variables Used**

Variable	Description	Mean	SD	CV	Annual compound growth rate (%)
SE	Self-employment	12.3	1.89	0.7	-1.8
UNEM	Unemployment rate	9.3	1.02	0.7	0.8
RGDP	Real gross domestic product	2.7	0.91	0.4	4.2

**Note:** Annual compound growth rates are trends values significance at 1 per cent level.

**Source:** Author's calculation based on the specified data above and using E-views.

### *Unit-Root Tests*

Table 2 reports the unit-root tests using the ADF and Phillips-Perron procedures for nonstationarity of the variables in the model. These tests are performed on both levels and first differences of all the three variables. The ADF and Phillips-Perron tests reveal that the null hypothesis of unit-root is accepted for all variables at 1% or 5% levels. For above-mentioned two tests, McKinnon critical values at 1%, 5%, and 10% significance levels were used. Based on the different tests above, it is concluded that the variables are nonstationary. Consequently, the standard regression model was considers not appropriate in examining the relationship between self-employment and unemployment in Egypt as the above-mentioned. In this situation, one would use the cointegration techniques.

**Table 2: Unit Root Tests for Stationery**

Variables	Level/ First Diff.	ADF Test		Phillips-Perron Test	
		Without Trend	With Trend	Without Trend	With Trend
SE	Level	-2.53 <sup>a</sup>	-2.34	-5.49	-3.02
	First Diff.	-2.21 <sup>a</sup>	-4.1 <sup>a</sup>	-2.46 <sup>a</sup>	-4.22 <sup>a</sup>
UNEM	Level	0.32	-3.22	0.40	-2.95
	First Diff.	-4.07	-3.98 <sup>b</sup>	-5.01	-4.85
RGDP	Level	2.94	0.26	9.23	0.023
	First Diff.	1.13	-1.54	0.553	-1.83

**Notes:**

- (1) The McKinnon critical values (with intercept and trend) are: (a) 1% = -4.37; (b) 5% = -3.60; and (c) 10% = -3.24 respectively.
- (2) Without intercept and trend are: (a) 1% = -2.66; (b) 5% = -1.95; and (c) 10% = -1.622 respectively.
- (3) a = significant at 1% level; b = significant at 5% level; and c significant at 10% level.
- (4) The tests were performed using E-views.

### Cointegration Tests

Before undertaking cointegration tests, one needs to specify the relevant order of lags ( $\rho$ ) of the Vector Autoregression (VAR) model. In this data set, an optimal lag length of  $\rho = 3$  were adequate to make the residuals uncorrelated and homoscedastic. Table 3 presents the maximal eigenvalue test developed by Johansen-Juselius (1990; 1992) for the model along with their 99% critical values in order to provide further evidence on the rank determination. This table shows that the null hypothesis of  $r = 0$  is clearly rejected by maximal eigenvalue test statistic at the 1% level of significance. The null hypothesis that  $r \leq 1$  and  $r \leq 2$  are rejected by the two test statistics. Consequently, it is concluded that there exactly three cointegrating vectors ( $r = 3$ ) in the VAR system. This result on the optimal rank ( $r = 3$ ) is used in conducting further empirical analysis in the paper.

**Table 3: Johansen-Juselius Maximum Likelihood Cointegration Test**

Null	Eigenvalue	Statistic	99% Critical Value
$r = 0$	<b>0.74</b>	<b>56.59</b>	<b>35.65</b>
$r \leq 1$	<b>0.49</b>	<b>25.83</b>	<b>20.04</b>
$r \leq 2$	<b>0.36</b>	<b>10.39</b>	<b>6.65</b>

**Note:**

- 1- The test was performed using EViews.
- 2- (r) stands for the number of cointegrating vectors.

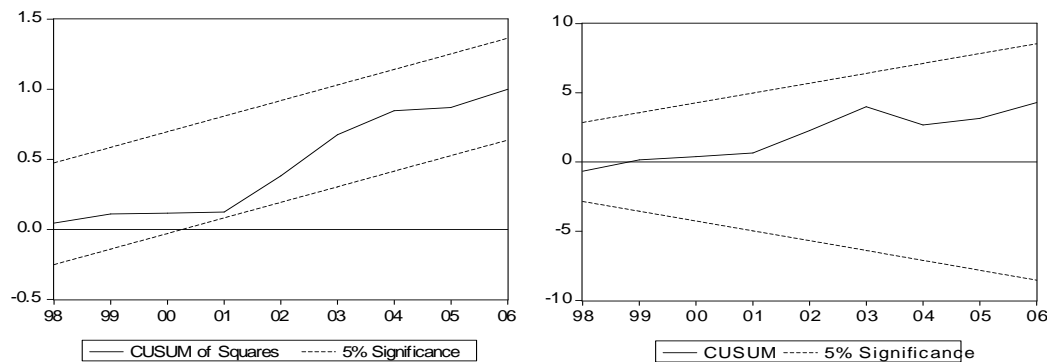
Once a cointegrating relationship is established, then an Error- Correction Model (ECM) can be estimated to determine the dynamic behaviour of self-employment. Following Hendry's (1995) general-to-specific modeling approach, we first 4 lags of the explanatory variables and one lag of the error correction (EC) term, and then gradually eliminate the insignificant variables. After experimenting with the general form of the ECM (equation 3), the following model is found to fit the data set (table 4).

**Table 4: Estimated Error-Correction Model**

Dependent Variable: $\Delta SE$			
Repressors	Parameter Estimates	T-Ratio	P-Value
<b>Intercept</b>	<b>-0.34</b>	<b>-3.4</b>	<b>0.00</b>
$\Delta RGDP(-3)$	<b>1.52</b>	<b>2.13</b>	<b>0.04</b>
$\Delta UNEM(-3)$	<b>0.13</b>	<b>3.02</b>	<b>0.00</b>
$\Delta SE(-3)$	<b>0.26</b>	<b>1.78</b>	<b>0.09</b>
$EC(-1)$	<b>-0.11</b>	<b>-1.7</b>	<b>0.10</b>
$AdjR^2 = 0.38$			
$D.W = 1.92$			
$F - test = 4.34$			
$LM = 1.98(0.17)$			
$RESET = 0.42(0.52)$			
$ARCH = 6.52(0.01)$			

In the above estimated model, real GDP, unemployment rate and self-employment (lagged three years) have significant positive influence on self-

employment in Egypt. The estimated coefficient of the error correction term (-0.11) is significantly at the 10% level and with the appropriate (negative sign). This suggests the validity of a long-run equilibrium relationship among the variables in equation (1). The estimated coefficient value of -0.11 indicates that the system corrects its previous period's disequilibrium by 11% a year. With reference to the diagnostic test statistics, The Breusch-Godfrey's LM test rejects the presence of serial correlation up to third order, while ARCH test reject first and second order heteroscedasticity in the disturbance term at 5% level. No general specification error in Ramsey RESET test. Finally, the plot of CUSUM and CUSUM of squares (Fig.2) reveal that the estimated parameters are stable over the sample period.



**Fig. 2: Plot of CUSUM and Squares and CUSUM Test**

## V. SUMMARY AND CONCLUSIONS

This study estimated the main determinants of self-employment based on the previous research in that field. In the empirical analysis of the relationship between self-employment and unemployment in Egypt, cointegration and error correction modeling approaches have been used based on annual data for the period 1980-2006. Unit-root tests confirmed that the explanatory variables were nonstationary. In the estimated ECM, real GDP, unemployment and self-employment (lagged three years) have all emerged as important determinants of the self-employment in Egypt. These results are quite consistent with the paper hypothesis and with those reported by other empirical studies. The estimated coefficient of the error correction term (-0.11) indicates a slow speed of adjustment to equilibrium. The econometric estimates of the self-employment equation in Egypt suggest that self-employment is sensitive to absolute unemployment rate lagged three years by 0.13. This means that increasing of unemployment rate in Egypt by unit in 2008 will lead to increase of the self-employment rate by 0.13 (less sensitive) in 2011. As far as the coefficient of real GDP, it reflects a high sensitivity (1.5) with support to Audretsch, 1995 and Storey, 1991 studies that low rate of self-employment may also be a consequence of the low economic growth levels, which reflect higher levels of unemployment and vice versa.

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## Endnote:

- 1 This set of rules is characterized by three features: (a) a reference period, (b) an activity status which allows the categorization of the working age population into the aforementioned three categories on the basis of activities performed during the reference period, and (c) a set of priority regulations to ensure that individuals can only be classified into one of these three categories.
- 2 The notion "some work" may be interpreted as work for at least one hour, while individuals temporarily not at work because of illness or injury, holiday or vacation, strike or lockout, educational or training leave, maternity or parental leave, reduction in economic activity, temporary disorganization or suspension of work due to such reasons as bad weather, mechanical or electrical breakdown, or shortage of raw materials or fuels, or other temporary absence with or without leave should be considered as in paid employment provided they had a formal job attachment.
- 3 Entrepreneurial capability (Lucas, 1978; Oi, 1983) and risk attitude (Kihlstrom and Laffont, 1979) are two determinants of entrepreneurship often found in models endogenizing entrepreneurial supply (Verheul et al., 2001). See also Parker (1996) for support of both push and pull effects.
- 4 Including number of variables in the model may lead to the well-known econometric problems. In addition, limit information on the data does not allow putting some variables for a time series data.

## التوظيف الذاتي والبطالة في مصر: تحليل التكامل المشترك

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### ملخص:

تستهدف هذه الدراسة تناول سلوك التوظيف الذاتي في الاقتصاد المصري في الفترة (1980-2006). ويعتمد التحليل التطبيقي لدالة التوظيف الذاتي في مصر في هذه الدراسة على استخدام نماذج التكامل المشترك و تصحيح الخطأ. وتستعرض الدراسة مجموعة المحددات الاقتصادية والاجتماعية للتوظيف الذاتي عبر عينة من الدراسات النظرية والتطبيقية التي أجريت في هذا الشأن. ولقد أظهرت نتائج التحليل القياسي وجود علاقة توازن (أي علاقة في الأجل الطويل) بين التوظيف الذاتي ومعدل البطالة والنتائج المحلى الإجمالي الحقيقي. وهو ما يؤكد صحة فرضية الدراسة من وجود علاقة طردية بين التوظيف الذاتي ومعدل البطالة في الاقتصاد المصري.