THE EMPLOYMENT INTENSITY OF OUTPUT GROWTH IN TUNISIA AND ITS DETERMINANTS

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Abstract

Since January 2011, Tunisia has been implementing a transition to democracy. This paper addresses the issue of unemployment, which underpinned the revolution and has become a nation-wide priority. This research aims to explore the elasticity of employment with respect to growth of Tunisian productive sectors in order to assess their job absorptive capacity. The second stage of the analysis attempts to identify the major determinants influencing total employment elasticity. Data to be used cover the period 1980-2012 and are provided by the Institute of quantitative economy and competitiveness (IQEC).

JEL Classification: E24; J01

Keywords: Growth Employment Elasticity; Structural Change; Tunisia

ملخص

تقوم تونس بعملية الانتقال إلى الديمقراطية منذ يناير 2011. تتناول هذه الورقة قضية البطالة، التي تمركزت حولها الثورة وأصبحت من الأولويات على مستوى الأمة. ويهدف هذا البحث إلى استكشاف مرونة التوظيف بالنسبة للنمو فى القطاعات الإنتاجية التونسية من أجل تقييم القدرة الاستيعابية لوظائفهم. المرحلة الثانية من التحليل هى محاولات لتحديد المحددات الرئيسية التي تؤثر فى إجمالي مرونة العمل. البيانات المستخدمه للفترة 1980-2012 تم توفيرها من قبل معهد الاقتصاد الكمي والقدرة التنافسية (IQEC).

1. Introduction

This research aims to estimate the employment intensity of growth among Tunisian productive sectors in order to identify key sectors that are employment intensive. Furthermore, it attempts to identify the major determinants that might influence their job absorptive capacity.

This research is of great interest from at least two perspectives. First, the main channel through which economic growth is transmitted to the poor is the employment opportunities it generates. Hence, understanding the determinants of employment elasticities is crucial for poverty alleviation and pro-poor economic growth promotion. Second, some stylized facts highlighted by the rare papers exploring world and regional trends of employment intensity of growth seem to be somewhat puzzling. They point out a decline in employment elasticity of growth in developing countries and particularly the MENA region. One would have rather expected a rise in this elasticity as trade liberalization might lead to a shift in low-income countries' industrial structure towards more labor-intensive industries. However, the increase in capital intensity induced by an easier access to capital and new technologies combined with the increased competition seem to be one of the culprits. With that in mind, it is crucial to understand the driving forces behind the evolution of the employment intensity of growth in those countries.

Although researchers have deeply analyzed the impact of various shocks on developing countries labor markets, only a few studies seem to focus on the relationship between employment and output growth in these countries (Islam and Nazara (2000) for Indonesia, Ajilora and Yinusa (2011) for Botswana, N'Zué (2002) for Côte d'Ivoire, Sodipe and Ogunrinola (2011) for Nigeria, Yogo (2008) for sub-Saharan African countries, El Ehwani and Elmegharbel (2009) for Egypt). Furthermore, a limited literature has investigated the determinants of employment-output elasticities (Kapsos (2005), Crivelli et *al*. (2012)). Overall, these studies emphasize the relatively low employment intensity of GDP growth in such countries suggesting that growth performance is "jobless growth".

Regarding the Tunisian case, to our knowledge, little attention has been dedicated to that issue. Nevertheless, to draw a relatively complete picture of labor market trends, it is crucial to examine the elasticity of employment with regard to output growth. This research aims to fill this gap by providing estimates of the employment intensity of growth in Tunisia and identifying its key macroeconomic determinants. To achieve these objectives, the empirical strategy of this study involves two stages of analysis. First, we provide estimates of employment elasticities in different sub-sectors in order to assess the job creation ability of these sectors. Second, we rely on an econometric model to detect factors that might impact the total employment intensity of growth. Data to be used cover the period 1980-2012 and are mainly provided by the Institute of quantitative economy and competitiveness (IQEC).

Sectors that exhibit relatively high and increasing employment-output elasticities appear to be respectively non-manufacturing, construction, trade and tourism and agriculture & fishing. At the aggregate level, we find that total employment elasticity witnesses a significant decrease over the period of study from 0.61 in 1980-1989 to 0.57 in 1991-1999 and 0.48 in 2000-2012. Moreover, results point out a negative and highly significant relationship between employment intensity of growth and respectively inflation rate, openness and real average annual wages.

The rest of the paper is organized as follows. Section 2 provides a brief overview of the literature on the employment-growth relationship. Section 3 presents the data and the different approaches used for calculating employment elasticities. Section 4 explores determinants of the

aggregate employment intensity of growth. Section 5 concludes and outlines the main policy implications of estimation results.

2. The Employment-Growth Relationship

2.1 Theoretical background

The literature on the nature of the relationship between employment and economic growth derives from the so-called Okun's law. In his seminal paper, Okun (1962) defines a coefficient that determines a stable empirical relationship between economic growth and the change in the rate of unemployment. More specifically, he demonstrates that an increase in the economic growth rate by 3% above the potential rate of growth[1] is expected to reduce the unemployment rate by 1% point.

The standard specification for estimating Okun's law is:

$$\Delta U_t = a_0 + a_1 \Delta \ln Y_t + v_t \qquad (1)$$

Where ΔU_t is the yearly change in the unemployment rate, $\Delta \ln Y_t$ is the yearly change in the ln *GDP* and v_t is an error term.

The Okun's law has been the focus of a large body of literature as it has implications for macroeconomic policy, particularly in determining the optimal or desirable growth rate, and as a prescription for reducing unemployment. In the last two decades, a large number of empirical studies have investigated the validity of this law. Many studies introduced the idea of the possible asymmetry of the relationship (Courtney (1991), Palley (1993), Lee (2000), Viren (2001)). In fact, they consider that expansions and contractions in output could not have the same absolute effect on unemployment, which implies that Okun's coefficient might be different over the business cycle. Arguments invoked regard fluctuations in factor capital-labor substitution during cycles, in multi-factor productivity and female labor supply behaviour. Besides, several empirical studies have been carried out to assess the stability of Okun's relationship across time and space criticizing the omission of prices role (e.g., Flaig and Rottman 2000), institutional factors (e.g., Revenga and Bentotila 1995) or exchange rate volatility (e.g., Stirböck and Buscher 2000) that may influence the link between employment and growth. Despite the foregoing, the Okun's law has been considered as useful in forecasting and policy-making.

In the same vein, a growing body of literature has been interested in exploring the employment- growth relationship from the perspective of correlation, rather than causality effect (Kapsos 2005). These studies rely upon the familiar concept of the elasticity of employment with respect to output growth. This elasticity measures the percentage point change in jobs associated with an economic growth of one percentage point and is mainly used in analyzing how economic growth and employment growth develop jointly and the extent to which the labor market is sensitive to changes in overall economic conditions (El Ehwani and Megharbel 2012). According to Perugini (2008), the employment-elasticity of growth has some attractive advantages compared to the Okun's coefficient measurement. First, it avoids some measurement problems of the unemployment rate, particularly those due to different definitions of unemployed person and to potential interactions between unemployment and labor force participation[2]. Second, employment (and employment

[1] The potential rate of growth refers to the rate of growth of real GDP that could be sustained with the economy at full employment and steady inflation.

[2] According to Elmeskov and Pichelmann (1993), the key issue in the measurement of unemployment is the absence of a clear dividing line between unemployment and non-participation in the labour force. They consider that small increases in

intensity) may be distinguished into a wider set of sub-groups in comparison to unemployment: male/female, age class employment, permanent/temporary, part-time/full-time and skilled/unskilled groups. Third, the sector composition of employment can also be used to determine industry-specific elasticity.

The less complex formulation of the elasticity does not exclude to investigate its major determinants such as labor supply, inflation rate, trade openness, labor market flexibility, etc..

2.2 The measurement of growth-employment elasticity

Two methodologies are frequently used for calculating elasticities. The first is a simple arithmetic method that divides the percentage change in employment (L) by the corresponding percentage change in Gross Domestic Product (Y) during a given period, as given below:

$$\varepsilon = \frac{\left[\frac{L_1 - L_0}{L_0}\right]}{\left[\frac{Y_1 - Y_0}{Y_0}\right]} \tag{2}$$

This is the arc-elasticity of employment computed between two different points in time 0 and 1. Variables to be used could be aggregate or sectoral. While this methodology seems relatively simple, it provides a highly fluctuating elasticity, which prevents comparative and forecasting purposes.

The alternative method, which provides point-elasticity, involves a regression analysis of a double-log linear equation relating employment and GDP. Its basic form is given by the following equation:

$$\ln L = \beta_0 + \beta_1 \ln Y \tag{3}$$

Where *Ln* is the natural logarithm of the variable, and the regression coefficient β_1 refers to the employment elasticity with respect to GDP. It gives the percentage change in employment when GDP changes by values close to zero. This provides more stable values, which is useful from an economic policy perspective.

$$\beta_1 = \frac{d \ln L}{d \ln Y} = \frac{dL/L}{dY/Y} \tag{4}$$

This second method of estimation offers another advantage according to Islam and Nazara (2006). It allows one to control the 'beta coefficients' with other variables z that may affect the employment-growth relationship as it is given by the general form of the above equation:

$$\ln L = f(\ln Y, Z) \tag{5}$$

These variables may take the form of dummy variables (e.g., different degree of industrialization among various regions in a given country) or technological progress indicators, policy relevant variables, etc…

It is also possible to consider employment elasticity at the sectoral level, which implies that equation (5) takes the following form:

$$\ln L_i = f(\ln Y_i, Z) \tag{6}$$

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unemployment in some countries could simply reflect the channeling of excess supply in the labour market into non-participation rather than into measured unemployment.

This means that sectoral GDP, Y_i, and other variables affect employment in sector i. It is possible to interpret the *Z* variable as incorporating the effect of total GDP (*Y*) on sectoral employment. Thus, changes in employment will be related to changes in both *Yi* and *Y*.

2.3 Employment growth versus productivity growth

An elasticity value of 1 implies that every 1% point of GDP growth is associated with a 1% point increase in employment. Hence, the elasticity generated from the methodology described in equation (3) reveals the response of employment in quantity to GDP growth. However, Islam (2004) argues that both the growth of employment and rising productivity contribute to economic growth. Therefore, one needs to be cautious in interpreting the relationship between employment elasticities, employment growth and productivity growth.

In this regard, Kapsos (2005) provides an arithmetic identity to show the proportionality of the economy's total output, Y, to the product of the labor force employed L_t and labor productivity P_t (output per worker), as follows:

$$Y_t = L_t \times P_t \tag{7}$$

Equation (7) implies that for small changes in output, the following holds:

$$\Delta Y = \Delta L + \Delta P \tag{8}$$

Hence, for a given amount of output growth, any increase in the rate of employment growth must be related to an equal and opposite decrease in labor productivity growth.

Dividing equation (8) by output growth yields to:

$$1 = \frac{\Delta L}{\Delta Y} + \frac{\Delta P}{\Delta Y} \tag{9}$$

Therefore Where

$$\varepsilon = 1 - \frac{\Delta P}{\Delta Y} \qquad \varepsilon = \frac{\Delta L}{\Delta Y} \tag{10}$$

Table 1 gives the different scenarios one has to take into consideration when formulating interpretations regarding employment elasticities values. The productivity side of the relationship as emphasized in equation (10) is important especially from an economic policy perspective.

Table 1 points out that in economies with positive GDP growth, employment elasticities ranging between 0 and 1 correspond with an "ideal" scenario where both employment and productivity increase. However, a rise of elasticities beyond this range is associated to a more "employment intensive" growth and to productivity deterioration. This draws attention to an important aspect of growth strategies in developing countries, which is the necessity to balance employment growth and productivity growth.

2.4 Literature review

Although researchers have deeply analyzed the impact of various shocks on developing countries' labor markets, only a few studies seem to focus on the relationship between employment and output growth in these countries.

Investigating the Ivorian modern private sector, N'Zué (2001) finds that employment and economic growth do not move together in the long run which gives evidence for a jobless growth. El Ehwani and Megharbel (2012) focus on the Egyptian case measuring employment elasticities of overall economic growth during 1980/81- 2004/05 as well as in six major

sectors over the same period to analyze both the job-creation capability of these sectors, and the significance of structural change (agriculture, manufacturing, petroleum...). Conclusions suggest that the manufacturing and mining sector has the greatest employment elasticity of growth during the observation period, followed by social services, then construction and building while agriculture ability to generate jobs appears to be relatively weak[3].

Sodipe and Ogunrinola (2011) examine the employment and economic growth relationship in the Nigerian economy using a simple model of employment estimated with the Ordinary Least Squares technique. Results show a negative relationship between employment growth rate and the GDP growth rate.

Pattanaik et *al.* (2011) investigate the employment intensity of service sector growth in India and examine its fundamental macroeconomic determinants. The results indicate that over the years, while output growth rate in service sector has increased, employment growth rate has decelerated significantly leading to considerable fall in employment elasticity. Furthermore, there is predominance of low productive and unskilled labor based activities in the service sector. Regression results based on the time-series data from 1960-61 to 2004-05 point out the importance of an investment friendly environment, better public expenditure management, effective labor policies and proper structural transformation in achieving higher employment elasticity.

Yogo (2008) provides a theoretical and empirical survey on the link between employment and growth in sub-Saharan African countries. Three main conclusions emerge from his study. First, the employment issue in sub-Saharan Africa is mostly a matter of quality than quantity. Secondly the reason of weak employment performances could not be found in labor market rigidities. Third, the observed increase of working poor could be explained by the weakness of growth and downward labor demand.

Regarding the Tunisian case, to our knowledge, little attention has been dedicated to that issue. Nevertheless, to draw a relatively complete picture of labor market trends, it is crucial to examine the elasticity of employment with regard to output growth. This research aims to fill this gap by providing estimates of the employment intensity of growth in Tunisia for different sectors and identifying its key determinants.

3. Tunisian Employment Growth Elasticity Estimation

3.1 Data description and stylized facts

We use industry-level data provided by the Tunisian Institute of Quantitative Economics and competitivity (IQEC) over the period 1980-2012. The dataset covers the whole economy which we classify into 10 sectors as defined by the IQEC classification and the international standard industrial classification: agriculture and fishing, manufacturing, non-manufacturing, public utilities, construction, trade, hotels and restaurants, transport storage, communication and finance. It includes annual data on gross value added at both current and constant prices (1990 prices) and data on employment. Employment is defined as ‘‘all persons employed’’, which accounts for wage earners, but also self-employed and family workers. Tables A and B in the appendix give some descriptive statistics related to our variable of interest.

We start by looking at the dynamics of employment and value added at the national and sector level. Figures 1 and 2 show that employment and GDP display a rapid and steady growth during the observation period excepting in 2011, which corresponds to the Tunisian popular uprising. The GDP increases at a greater rate than employment averaging 5% as against 2%, which reflects an economic growth mainly driven by productivity gains.

[3] Sector elasticities computed do not exceed 0.5.

Figure 2 provides a picture of sector-specific value added and employment trends. Almost all sectors show a faster increase in value added relatively to employment with the exception of non-manufacturing industries, which suggests an important loss of productivity. It is worth noting that this sector involves state owned industries (extractive industries, water, electricity…) suffering from lack of competitiveness and over-staffing. The highest degree of volatility in value added growth is experienced by sectors such as Agriculture & Fishing (largely dependent on volatile weather conditions), non-manufacturing (dependent on price volatility and world economic environment) and telecoms (large privatization plan in 2000s).

Figures 3 and 4 present the sectoral composition of employment and value added for the years 1980, 1990, and 2010. Tunisia experienced an important decline in agricultural employment and value added shares. The employment share of agriculture in total employment decreased from 31% in 1980 to 21% in 1995 and to 18% in 2012. Manufacturing experienced a modest decrease in employment share from 20% in 1995 to 18% in 2010. Finance services experienced expansion in terms of employment share and value added share. Tourism and retail sectors experienced a modest increase in employment shares while their value added shares stagnated during the same period. This means that these sectors have become less productive over time.

Despite the stagnation in the employment share of the transport sector over the studied period, its value added share increased between 1980 and 2010. The telecom sector registered an increase in its value added share in the 2000s more proportionate to the increase in its employment share. This suggests that these sectors have become more productive over time. Technological innovations and the boom in demand for telecommunication services contribute to explain this evolution.

In sum, Tunisia experienced a modest structural change (a decline in agriculture employment and modest expansions in some services employment) particularly in the late 1980s and early 1990s that continued moderately in the 2000s.

3.2 Employment-Growth elasticities estimation for Tunisia

This section presents results of different estimation methods of the employment growth elasticity. First, we display results of arc elasticity estimation at the national and sector level. This is followed by econometric approach results given by respectively: an Ordinary Least Squares (OLS) estimation of a multivariate log-linear model and a rolling window estimation.

3.2.1 The arc elasticity of employment

The evolution of annual arc employment elasticity regarding the whole economy is shown in Figure 5. Figure 6 presents the employment elasticity by sector. Computation has been performed following equation (2). We can notice that arc elasticity witnesses wide fluctuations from year to year, which prevents the depiction of a clear trend or the formulation of policy recommendation.

3.2.2 Econometric estimates of employment elasticity: ordinary least squares (OLS)-based results

In order to produce a more stable series of sectoral employment elasticity, we rely on OLS estimation of a multivariate log-linear regression model with time dummy variables, D_D, interacted with lnY as given in equation (11) below[4].

$$\ln L_t = \beta_0 + \beta_1 \ln Y_t + \beta_2 (\ln Y_t \times D_D) + \beta_3 D_D + \mu_t \qquad (11)$$

[4] Kapsos (2005) uses a multivariate log-linear regression model with country dummy variables.

Y refers to value added and L to employment. The inclusion of a set of dummy variables for the following decades: 1980's, 1990's and 2000's allows to capture the evolution of employment growth elasticity and makes it easier to compare estimation results with findings of other studies linked to the Tunisian context. Furthermore, the periods of time chosen involve important developments that are expected to influence employment-growth elasticities beginning with the adoption of the structural adjustment plan after the economic crisis, reaching a peak in June 1986. Numerous actions were taken to re-establish the market forces by deregulating the domestic market, removing price controls and increasing efficiency and investments. This "free market" program also included external reforms, especially the reduction of trade barriers, which signed the start of the Tunisian trade liberalization process. In 1990, Tunisia signed the GATT agreements. The adherence to the WTO was achieved in 1995. Reflecting the government's objective to comply with the GATT/WTO negotiated rates; Tunisia witnessed over the period 1990-1998 an increase in the nominal protection rates on agricultural final goods because of non-tariff protection transformation. This led to an increase of the effective rate of protection for a majority of products (the ERP attained 56% in 1995 and 71% in 1998). In 1996, Tunisia also ratified the EUROMED agreements that imply the establishment of a free trade zone including the majority of industrial products over a period of 12 years. The prospect of duty-free admission of European products by 2008 has paved the way for reforms seeking to increase the competitiveness of Tunisian products. Hence, private Tunisian firms have been subject over the period 1996-2006 to an "upgrading program" that provided support to almost 2000 private companies (Bougault and Filipiak 2005). This programme aimed to support modernizing investments, new technologies and know-how adoption, firm competitiveness enhancement and human resources skills improvement. Financial incentives were offered to firms to implement this programme (10% to 20% of investments in physical assets and 70% of intangible investments). The 2000s reflect the strengthening of the Tunisian trade liberalization process given that the effective rate of protection decreased from 71% in 1997 to 49% in 2002.

Equation (11) is estimated for each sector as well as for the whole economy. The elasticity of employment with respect to value added in a given sector is given as $\beta_1 + \beta_2$. In fact, differentiating both sides of equation (11) and solving for $\frac{\partial L}{\partial Y}$ yield to:

$$\frac{\partial L}{L} = (\beta_1 + \beta_2)\left(\frac{\partial Y}{Y}\right)$$
$$\frac{\partial L}{\partial Y}\left(\frac{Y}{L}\right) = \beta_1 + \beta_2 \qquad (12)$$

$\beta_1 + \beta_2$ represents the change in employment associated with a differential change in output with a differential change in output. Thus, an elasticity of 1 implies that every 1% point of value added growth is associated with a 1% point increase in employment.

Results are shown in Table 2.

3.2.3 Econometric estimates of employment elasticity: rolling estimation-based results

We estimate a double-log linear equation relating employment and GDP as specified in equation (3) by using a technique called rolling regressions, which allows us to estimate a relationship over many different sample periods. The periods have the same temporal dimension (or window size). This technique has been performed by many studies (Perman and Tavera (2005), Knotek, (2007)) to assess the Okun's law and estimate the change in the Okun's coefficient over time. If the relationship is stable over time, then the estimated

coefficients are relatively similar. When the estimated parameters are considered to be different from one regression to another, the coefficient of interest can be seen as a time-varying parameter.

We choose a window size corresponding to 14 years[5]. Hence, the first rolling regression would estimate the employment-growth elasticity (given by β coefficient) using the sample period from 1980 to 1993. The sample period is then moved forward one year, and the regression is re-estimated to produce a second set of estimates of β, using data from 1981 to 1994. This process is repeated until the final estimates are made using the sample period from 1999 to 2012. We make the assumption that estimates of β match the last year of each sample period. Consequently, the first estimate of employment-growth elasticity is related to1993 and the last one corresponds to 2012.

3.3 Interpreting the estimation results of growth employment elasticity:

Comparing the three methods used previously to assess the employment-growth elasticity, it is possible to conclude that values turn out to be much more stable using econometric regressions. Results given respectively by OLS and rolling estimations show many similarities. OLS estimates demonstrate that total employment elasticity witnesses a significant decrease over the period of study from 0.61 in 1980-1989 to 0.57 in 1991-1999 and 0.48 in 2000-2012. This means that for every 1% point of additional GDP growth, total employment has grown by 0.61 percentage points during the 1980s, 0.57 percentage points during the 1990's and 0.48 percentage points during 2000s. Therefore, economic growth has been increasingly driven by productivity enhancement rather than by labor supply. On average, the strongest employment growth is registered during 1991-1999, which is also the period that depicts the highest economic growth. The rolling technique confirms the declining trend in employment intensity (0.58 in the 1990's and 0.51 during 2000's). At the sector level, it is worth noting before exploring employment elasticity trends that agriculture and fishing, trade and tourism represent the most labor-intensive sectors. We should also point out that elasticity to output gives an indication of whether growth in the sector's output is primarily attributable to employment growth or productivity growth. In our case, elasticities in the manufacturing sector, public offices, transport, telecommunication and finance, seem to be in constant decline. However, agriculture and fishing, non-manufacturing, construction, trade and tourism exhibit an upswing pattern. Agriculture and fishing show an important increase in the employment intensity of value added in the 1990s from 0.02 to 0.2 corresponding to the adoption of the second generation of integrated rural development plan (1992-2002) aimed to improve living conditions in the rural world whose impact resulted in projects such as the agro-pastoral development program in the south-east, boosting agricultural products competitiveness and reducing rural exodus via the attraction of young people to take up employment in the sector. Manufacturing and non-manufacturing industries also experienced an important upswing in the 1990's. A 1% point change in manufacturing output was associated to 0.04 percentage point change in employment during 1980-1989, which increased to 0.56 in the 1990's. Non-manufacturing industries were characterized by a very poor job absorptive capacity in the 1980's, which dramatically reversed during the 1990's reaching 0.9. The initiation of the structural adjustment plan in 1986, after the intervention of international financial institutions might have largely contributed to such a result.

Looking closely at the first category of sectors that demonstrate a decrease in employment intensity and computing the productivity elasticity to value added as (1-employment elasticity in the sector), one could notice they are among the most productive sectors in Tunisia while

[5] Knotek (2007) uses 13-year moving window and consider that selecting a different length for the moving window, such as 10 or 15 years, has a minimal impact on the results.

those with the lowest productivity face an increase in the employment-growth elasticity. This suggests a low level of structural change. However, to confirm this finding, we should compute another index, which is the sectoral elasticity to GDP that shows the percentage change in sector employment associated with a one percent change in Total GDP. This allows to rule on if employment is growing or contracting in a given sector, in general and in relation to other sectors due to changes in total GDP, i.e. as a result of reallocation process. Table 4 reports sectoral elasticity to GDP using OLS estimations. It indicates similar trends than those previously reported for employment elasticities with respect to value added. However, a decreasing value is observed for agriculture and fishing and tourism. Reallocation movements induced by a decline in total GDP might have outweighed the rising employment-value added elasticity effect. Overall, one can observe the contraction of the main high-productivity activities, which gives further evidence regarding the weakness of structural change.

Many reasons might be invoked to explain these stylized facts. In manufacturing for instance, the decreasing value added, the absence of large productivity differences between firms within the industrial sector enhancing the ability of labor reallocation from less efficient to more efficient enterprises as well as the lack of diversity and sophistication in industrial products are the main culprits (African Development Bank Report 2012). In other sectors such as financial services, regulations put up obstacles to free entry (World Bank 2007), which impede firms and job creation and have also a negative impact on the rest of the economy as they induce higher production costs (Marouani and Mouelhi 2012). Furthermore, the rigidity of the labor market, the lack of access to credit and its high cost and the deficit of structures supporting good governance could also explain the limited extent of structural change in Tunisia.

4. Determinants of Tunisian Employment Intensity of Growth

This section takes advantage of employment-growth elasticities estimates performed previously in order to investigate the macroeconomic determinants that might influence the Tunisian employment intensity of growth. By identifying robust correlates, we would be able in a next step to address the impending challenges and figure out the relevant policies to implement towards promoting employment.

A recent, though limited literature has investigated the determinants of employment-output elasticities in developed countries (Kapsos 2005, Crivelli et *al*. 2012). Furthermore, the wide literature regarding employment and labor productivity growth provides a broad set of relevant theoretical determinants of employment intensity.

Focusing on the European Union, Walterskirchen (1999) finds out that a more rapidly expanding supply of labor should lead to a more employment-intensive growth as it induces lower average wages and hence, an increase in demand for labor following the classic economic notion. Döpke (2001) and Palino and Vivarelli (1997) give evidence that the greater the share of services in real GDP, the higher is the employment intensity of growth.

The impact of openness on employment intensity is addressed by Bruno et al. (2001) who argue that economic openness can allow firms to use more capital equipment in production, which may lead to a reduction in the responsiveness of labor demand to economic growth. However, this relationship appears to be not statistically significant within OECD countries context. Döpke (2001) has given growth volatility and inflation as potential macroeconomic determinants of total employment intensity as uncertainty in respect of prices and economic activity may have a significant impact on growth and employment (Ramey and Ramey 1995; Judson and Orphanides 1999; Imbs 2007; Furceri 2010). Though, exchange rate fluctuations do not seem to be related to lower employment intensity.

Labor market institutions are also put forth as a possible explanation for the varying employment intensity of growth across countries ((Siebert 1997, Revenga and Bentolina, 1995). In fact, more rigid labor market institutions are expected to obstruct job creation and the response of employment to economic activity. Nevertheless, related empirical results seem to be weakly significant (Nickell and Layard 1999, Döpke 2001).

For the purpose of the current empirical exercise, explanatory variables are chosen in the light of literature findings. Equation (13) presents the model specification as follows:

$$\ln \varepsilon_t = \alpha + \theta \ln lf_t + \beta \ln sces_t + \rho \ln Infl_t + \phi \ln exch_t + \nu \ln openness_t + \tau \ln wage_t + \mu_t \qquad (13)$$

ε_t is the dependent variable and denotes overall growth-employment elasticity at time t previously performed through rolling estimation. We deliberately choose the rolling estimation output as it provides a time variability, which was not feasible with (OLS) estimates. Explanatory variables are respectively: the growth rate of the labor force (lf), the share of employment in services (sces), the annual inflation rate (Infl), the nominal exchange rate (exch) (Tunisian dinar/US dollar), a trade openness proxy (openness) which is the percentage of (exports + imports) in total GDP and the average annual real wage (wage) which is supposed to capture labor market features. All variables are expressed in logarithm. μ_t is an error term. More details on these variables are provided in appendix (see Table C).

OLS estimations are performed over the period 1993-2012. Despite our relatively limited observation period, we apply the Arellano-Bond test, which confirms the absence of serial auto-correlation. All standard errors are adjusted for heteroskedasticity using Huber–White correction.

Column (1) introduces the first set of variables representing macroeconomic features. The annual rate of inflation appears to be negatively associated with employment elasticity. This relationship is statistically significant at 1% level. As expected, inflation decreases the responsiveness of employment to growth by increasing volatility and price uncertainty. All else equal, an increase by 10% of the inflation rate yields to a decline of employment elasticity to growth by 0.3%. The coefficient associated to the logarithm of TND/USD nominal exchange rate is negative and highly statistically significant across all specifications. The impact of exchange rate[6] on employment intensity of growth is transmitted through many channels: 1. The macroeconomic channel that affects competitivity and hence, output and formal jobs. 2. The labor intensity channel, which influences the cost of labor relative to capital. 3. The development channel that controls longer-term effects of exchange rate on employment via the economic competitiveness and the potential profitability of businesses. Column (2) includes the share of employment in services. While this variable is supposed to exert a positive effect on job intensity of growth[7], its coefficient does not seem to be statistically significant in 2 out of 4 specifications. Column (3) introduces a proxy for labor supply, which is the growth rate of the labor force. This variable does not show a statistically significant relationship with employment intensity. Columns (4) and (5) give evidence that all else equal, an increase by 10% of the openness ratio implies an employment elasticity to growth that is 1.6% lower. An easier access to more productive capital goods and superior technology could explain this result. Column (5) suggests that lower average wages induce higher employment-growth elasticity as it is expected to increase labor demand.

[6] We should note that we include the exchange rate TND/USD as a macroeconomic determinant of employment growth elasticity and not a measure of the exchange rate volatility, which would be a proxy for macroeconomic uncertainty.

[7] This would reflect according to Kapsos (2005) greater flexibility and dynamism of this sector.

5. Conclusion and Policy Implications

It has never been more important than it is now to perform research addressing employment issues in Tunisia. Since 2011, Tunisia has experienced an unprecedented revolution after decades of profit-capture and repression by the political elite leading to a regime collapse. This uprising has been motivated by serious economic problems and social frustration: the rate of unemployment of young workers in 2008 was estimated to be above 30%, and the unemployment rate among university graduates in 2007 was 40%. Although claiming a relatively high GDP growth in the years preceding 2011 (3.1% in 2009, 6.3% in 2007, 5.6% in 2006), the government had failed at turning this growth performance into job prospects (as youth employment has not grown beyond 2.6% in best cases).

The aim of the present research, which is still at a preliminary stage, is to contribute to the understanding of the evolution of aggregate and sector employment growth elasticity in Tunisia. We start by providing estimates of employment intensity of growth in order to assess the job creation ability of these sectors over 1980-2012. We first use an arithmetic method consisting on dividing the proportionate change in employment by the proportionate change in output. Second, we rely on an econometric approach (regression of a multivariate log-linear model and a rolling window estimation). Sectors that exhibit relatively high and increasing employment-output elasticities are respectively non-manufacturing, construction, trade and tourism and agriculture and fishing. One should be cautious about considering that investments should be directed toward all of these sectors for the sake of absorbing new entrants on the labor market. In fact, construction, agriculture and fishing for example are among the less productive in Tunisia. Instead, it is necessary to direct investments to sectors that are capable of creating productive and decent jobs. Labor productivity in the less productive activities should be raised through focusing on training and skill-enhancement.

At the aggregate level, we find that total employment elasticity witnesses a significant decrease over the period of study from 0.61 in 1980-1989 to 0.57 in 1991-1999 and 0.48 in 2000-2012. This converges with Kapsos (2005) that emphasizes a decline in the world employment intensity of growth since 1999 due to poor employment performance following the global economic slowdown that took shape in 2001.

This study points out also the weakness of the structural change observed from the 1990s as it entails a shift of the economy towards low productivity activities. Service sectors such as trade and tourism as well as agriculture & fishing, construction and non-manufacturing seem to generate value added and employment. However, they fail to create “good jobs” and to initiate “the virtuous circle of links between growth, employment and poverty reduction” emphasized by Islam (2004). Therefore, economic leaders need to think about making a tradeoff between employment growth and productivity growth, i.e. creating decent, high-productivity jobs that improves living standards.

In a second step, we investigate the linkages between the growth-employment elasticities produced by rolling estimations and a set of variables such as the annual inflation rate, the nominal exchange rate, a trade openness proxy, the share of employment in services, the growth rate of the labor force and the average annual real wage over 1993-2012. Results point out a negative and highly significant coefficient associated to inflation rate. All else being equal, an increase by 10% of the inflation rate yields a decline of employment elasticity to growth by 0.3%. Therefore, policy makers should take into consideration that a macroeconomic climate of uncertainty dampens employment through many channels of which employment intensity of growth. Urgently needed are measures to control inflation. Findings also support the notion of a positive relationship between the employment share in services and employment elasticity with respect to output growth. Results also show that all

else being equal, an increase by 10% of the openness ratio implies an employment elasticity to growth ratio that is 1.6% lower. This might explain the decline of Tunisian total employment intensity of growth as well as export-oriented sectors' elasticity such as manufacturing as Tunisia has initiated an active trade liberalization process since mid 1980's. Moreover, findings confirm that higher average annual real wages reduce employment-growth elasticity. The pressure exerted by Tunisian trade union delegates to increase wages and provide generous nonwage benefits to workers in all sectors could be a serious brake on further growth-induced employment opportunities.

Much additional work is needed to identify macroeconomic and institutional determinants of overall employment intensity of growth as well as to distinguish and estimate female, skilled and unskilled employment elasticities.

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Figure 1: Employment and GDP Evolution at the National Level, 1980-2012

Figure 2: Employment and GDP Growth Evolution in Tunisia, 1980-2012

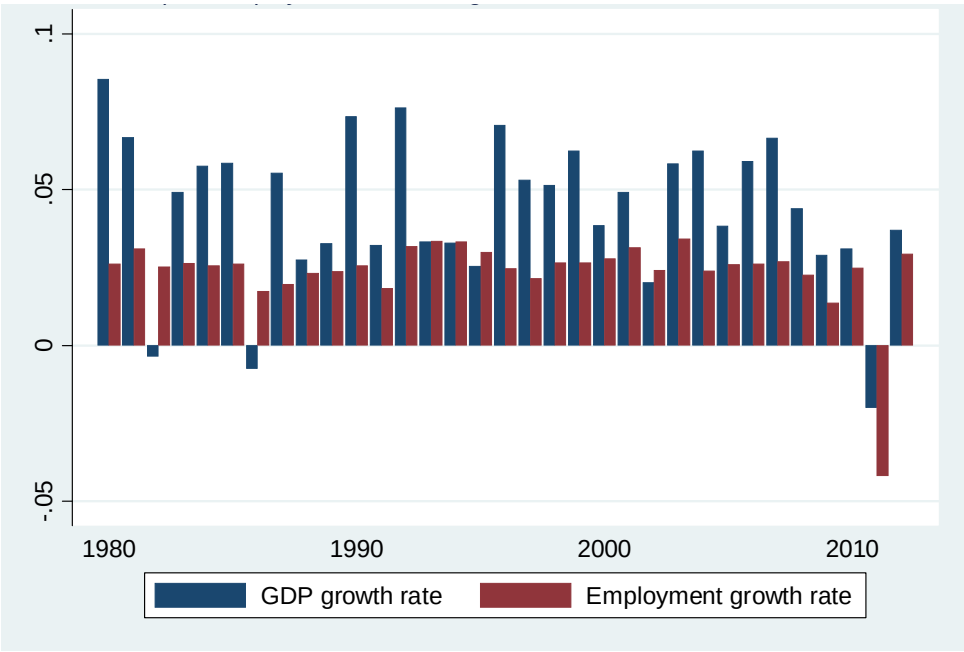

Figure 3: Sectoral Composition of Value Added 1980-2012

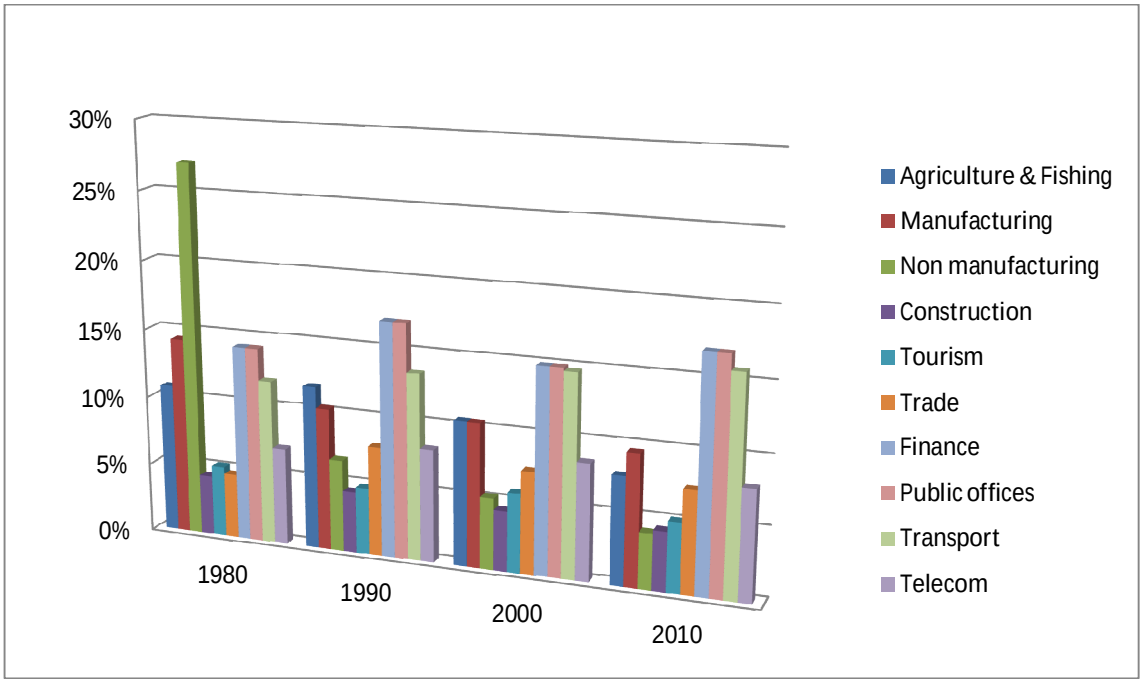

Figure 4 : Sectoral Composition of Employment 1980-2012

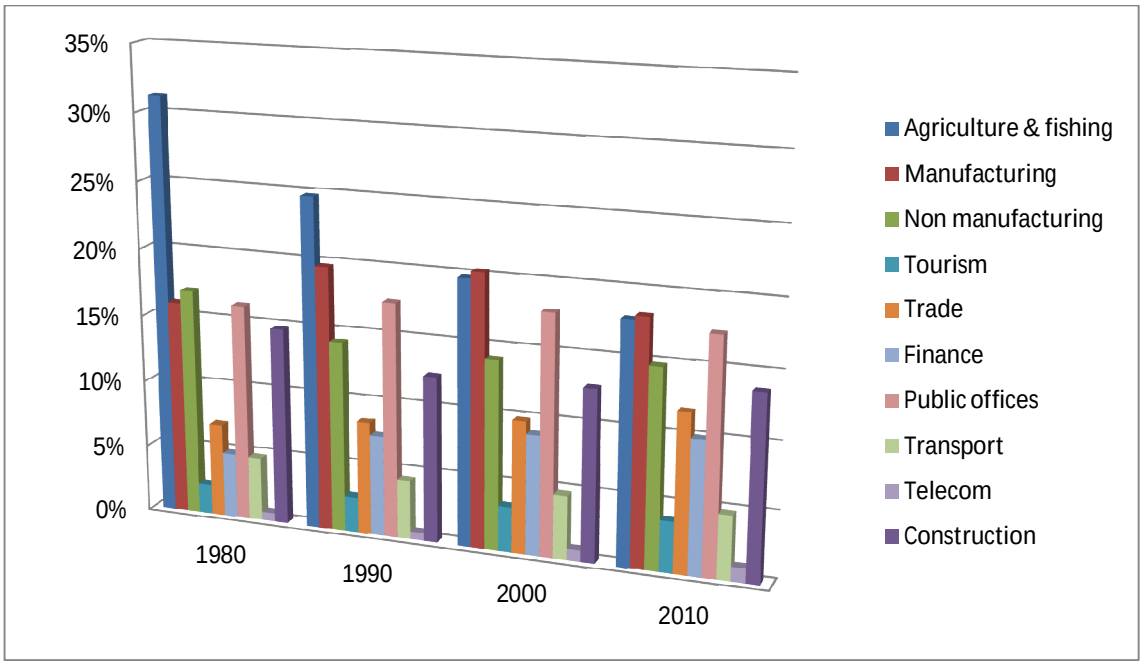

Figure 5: Arc Elasticity of Employment in Tunisia, 1980-2012

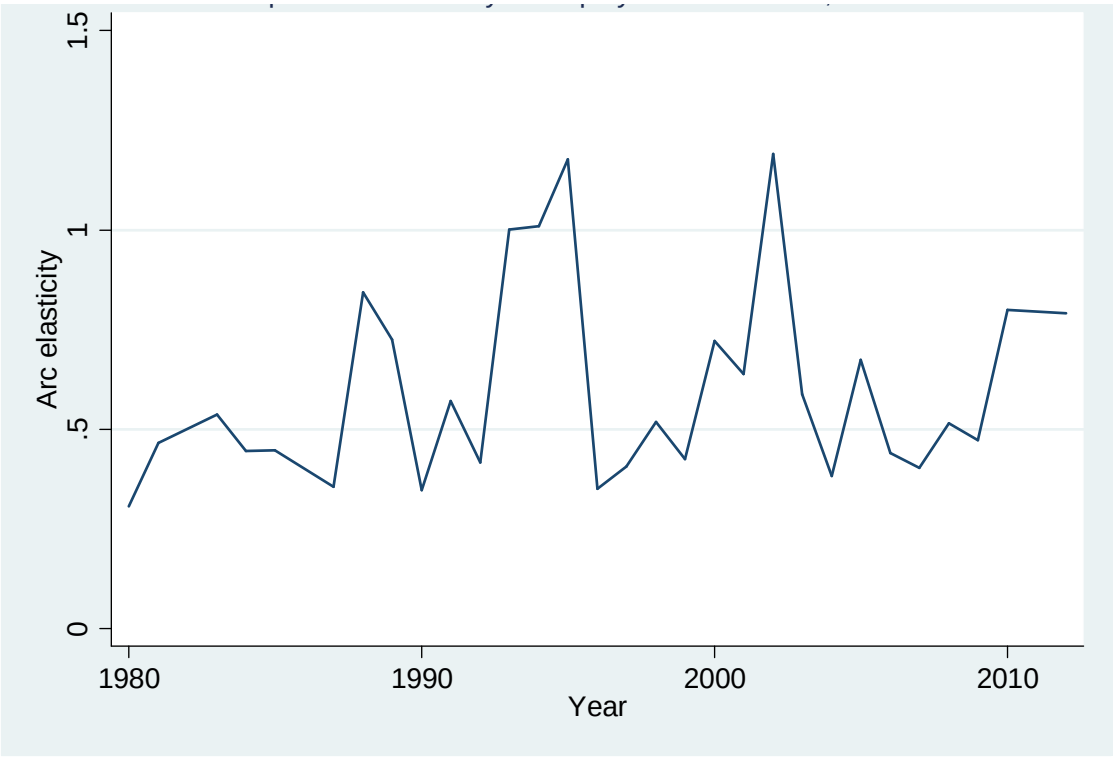

Figure 6: Arc Elasticity of Employment by Sector in Tunisia, 1980-2012

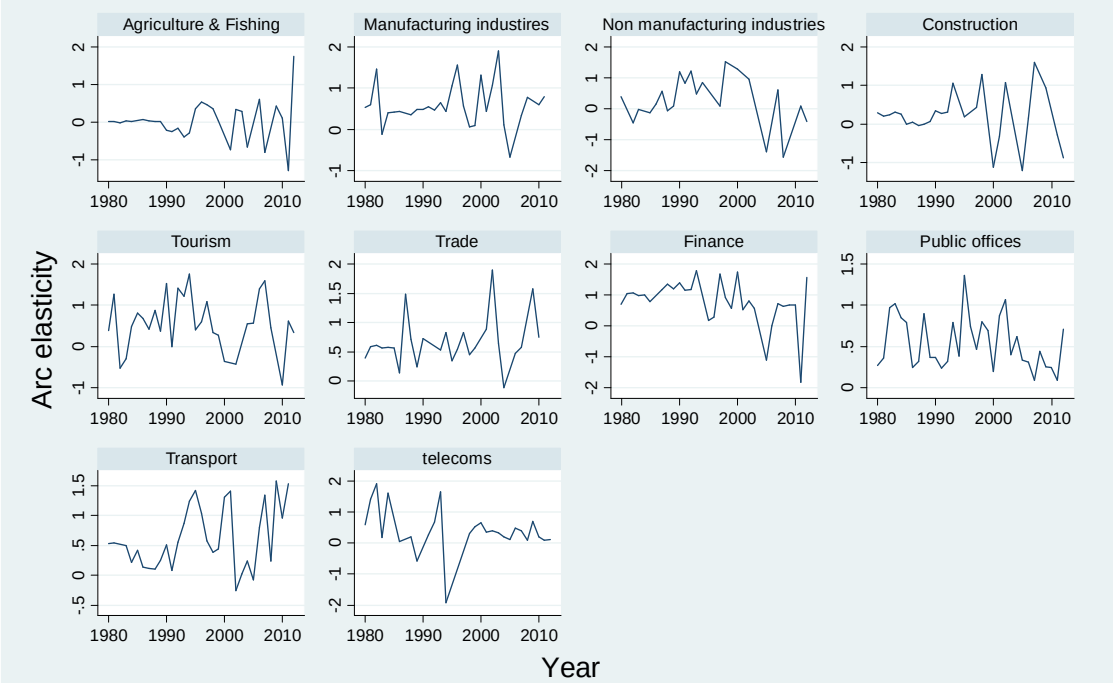

Figure 7: Employment and Value Added Evolution at the Sector Level

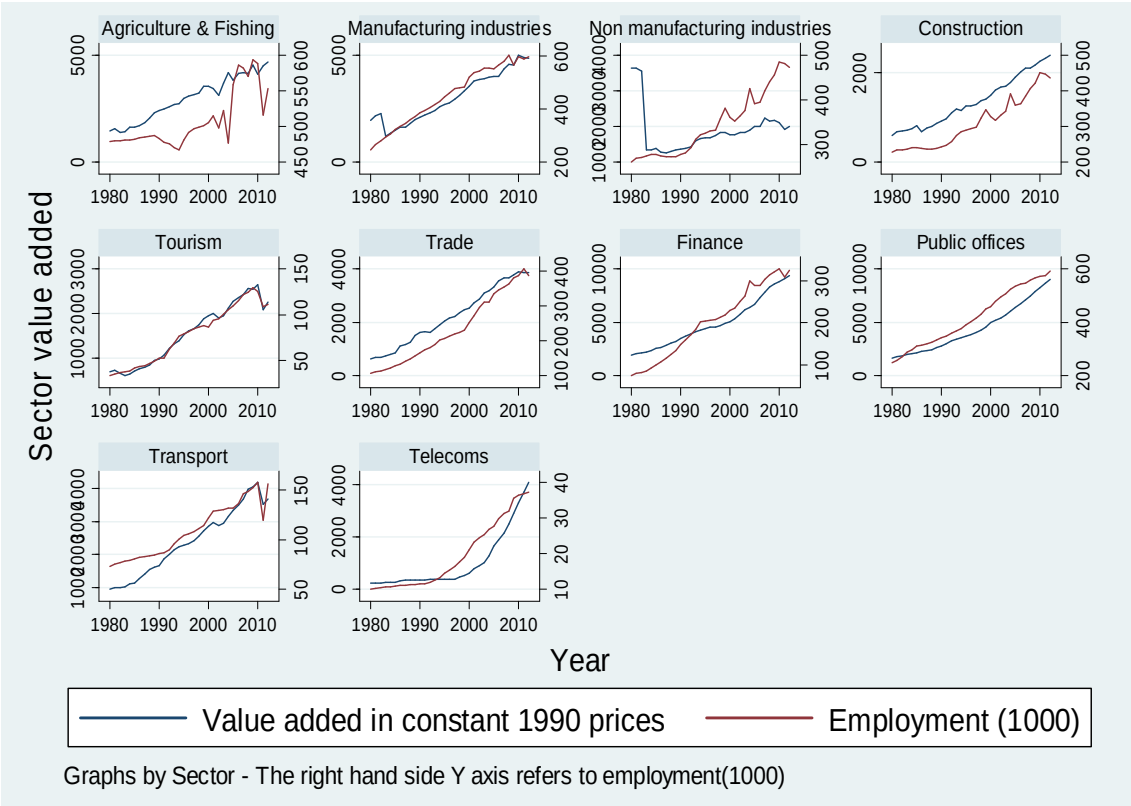

Table 1: Employment Elasticities and Productivity Evolution

	GDP Growth	
Employment elasticity	**Positive GDP growth**	**Negative GDP growth**
$\varepsilon < 0$	(-) employment growth	(+) employment growth
	(+) productivity growth	(-) productivity growth
$0 \leq \varepsilon \leq 1$	(+) employment growth	(-) employment growth
	(+) productivity growth	(-) productivity growth
$\varepsilon \succ 1$	(+) employment growth	(-) employment growth
	(-) productivity growth	(+) productivity growth

Source: Kapsos (2005)

Table 2: OLS Estimations of Employment Elasticities to Value Added, 1980-2012

	Period		
Sector	**1980-1989**	**1990-1999**	**2000-2012**
Agriculture and Fishing	0.02	0.2	0.28
Manufacturing	0.04	0.56	0.36
Non manufacturing	-0.02	0.90	0.91
Public offices	0.61	0.60	0.35
Telecoms	0.21	0.93	0.29
Trade	0.42	0.69	0.98
Transport	0.21	0.79	0.53
Finance	1.2	1.1	0.51
Construction	0.08	0.80	0.80
Tourism	0.75	0.82	0.89
Overall economy (estimations based on GDP)	0.61	0.57	0.48

Source: authors' computations

Table 3: Rolling Estimations of Employment Growth Elasticities, 1993-2012

	1993	1994	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012
Agriculture and	-0.01	-0.02	-0.02	-0.01	-0.00	0.01	0.03	0.06	0.1	0.15	0.21	0.14	0.21	0.31	0.37	0.40	0.43	0.46	0.37	0.33
Fishing	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.02)	(0.02)	(0.03)	(0.03)	(0.04)	(0.04)	(0.03)	(0.03)	(0.05)	(0.08)	(0.09)	(0.1)	(0.11)	(0.11)	(0.12)
Manufacturing	0.25	0.34	0.44	0.53	0.55	0.56	0.54	0.54	0.55	0.56	0.56	0.56	0.56	0.56	0.55	0.54	0.50	0.49	0.49	0.46
	(0.2)	(0.16)	(0.11)	(0.01)	(0.01)	(0.01)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.03)	(0.03)	(0.04)	(0.04)	(0.04)	(0.05)	(0.05)
Non manufacturing	-0.03	-0.01	0.03	0.69	0.68	0.71	0.77	0.81	0.86	0.89	0.92	1.06	1.08	1.2	0.98	0.99	1.02	1.11	1	0.98
	(0.02)	(0.04)	(0.07)	(0.04)	(0.03)	(0.03)	(0.03)	(0.05)	(0.06)	(0.06)	(0.06)	(0.07)	(0.12)	(0.14)	(0.16)	(0.15)	(0.14)	(0.14)	(0.27)	(0.30)
Public offices	0.51	0.48	0.45	0.44	0.44	0.46	0.49	0.5	0.52	0.55	0.58	0.6	0.6	0.58	0.55	0.51	0.48	0.46	0.42	0.39
	(0.03)	(0.03)	(0.02)	(0.01)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.01)	(0.01)	(0.02)	(0.02)	(0.01)	(0.02)	(0.02)	(0.02)	(0.03)	(0.02)	(0.02)
Telecoms	0.31	0.34	0.42	0.54	0.67	0.99	1.3	1.1	0.88	0.78	0.70	0.61	0.52	0.46	0.42	0.38	0.36	0.34	0.33	0.31
	(0.04)	(0.06)	(0.11)	(0.18)	(0.27)	(0.28)	(0.24)	(0.17)	(0.13)	(0.14)	(0.08)	(0.07)	(0.06)	(0.05)	(0.03)	(0.02)	(0.02)	(0.01)	(0.01)	(0.01)
Trade	0.49	0.51	0.53	0.55	0.58	0.62	0.69	0.70	0.76	0.85	0.87	0.86	0.88	0.93	0.95	0.99	1.02	1.03	1.06	1.04
	(0.02)	(0.03)	(0.03)	(0.04)	(0.04)	(0.04)	(0.05)	(0.05)	(0.05)	(0.05)	(0.04)	(0.04)	(0.04)	(0.04)	(0.04)	(0.05)	(0.04)	(0.04)	(0.04)	(0.05)
Transport	0.24	0.26	0.29	0.33	0.37	0.42	0.49	0.57	0.65	0.71	0.78	0.84	0.79	0.72	0.69	0.65	0.64	0.64	0.59	0.6
	(0.02)	(0.02)	(0.03)	(0.04)	(0.04)	(0.05)	(0.04)	(0.04)	(0.05)	(0.05)	(0.04)	(0.05)	(0.05)	(0.05)	(0.05)	(0.04)	(0.04)	(0.09)	(0.1)	(0.1)
Finance	1.2	1.24	1.26	1.28	1.29	1.25	1.23	1.18	1.10	1.1	0.99	0.99	0.92	0.81	0.74	0.72	0.70	0.68	0.62	0.58
	(0.02)	(0.03)	(0.03)	(0.03)	(0.03)	(0.04)	(0.05)	(0.06)	(0.05)	(0.05)	(0.05)	(0.05)	(0.05)	(0.05)	(0.05)	(0.05)	(0.06)	(0.05)	(0.05)	(0.05)
Construction	0.22	0.28	0.32	0.35	0.39	0.44	0.49	0.57	0.57	0.57	0.58	0.63	0.59	0.50	0.48	0.50	0.52	0.56	0.59	0.62
	(0.03)	(0.04)	(0.04)	(0.04)	(0.05)	(0.06)	(0.05)	(0.06)	(0.06)	(0.07)	(0.08)	(0.08)	(0.07)	(0.07)	(0.09)	(0.07)	(0.08)	(0.08)	(0.08)	(0.08)
Tourism	0.83	0.84	0.82	0.82	0.84	0.85	0.85	0.83	0.83	0.86	0.86	0.87	0.81	0.80	0.84	0.91	0.98	0.98	1.02	1.03
	(0.08)	(0.06)	(0.03)	(0.03)	0.03)	(0.03)	(0.04)	(0.04)	(0.05)	(0.06)	(0.06)	(0.07)	(0.07)	(0.07)	(0.07)	(0.09)	(0.1)	(0.1)	(0.1)	(0.1)
Overall economy	0.58	0.58	0.59	0.6	0.6	0.59	0.57	0.57	0.57	0.58	0.59	0.59	0.58	0.56	0.55	0.54	0.55	0.55	0.53	0.52
(based on GDP)	(0.02)	(0.02)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.02)	(0.02)	(0.01)	(0.02)	(0.01)	(0.01)	(0.02)

Note: standard errors between parentheses
Source: authors' computations

Table 4: OLS Estimations of Employment Elasticities to GDP, 1980-2012

	1980-1989	1990-1999	2000-2012
Agriculture and Fishing	0.04	0.57	0.31
Manufacturing	1.08	0.61	0.25
Non manufacturing	0.05	0.61	0.68
Public offices	0.77	0.64	0.42
Telecoms	0.31	1.41	1.1
Trade	1.2	0.79	0.79
Transport	0.38	0.71	0.37
Finance	1.88	0.73	0.66
Construction	0.07	0.71	0.72
Tourism	1.17	1.02	0.58

Source: authors' computations

Table 5: Regression Results with Overall Employment Growth Elasticity As Dependent Variable

	1993-2012 Dependent Variable: Ln employment growth elasticity				
	(1)	(2)	(3)	(4)	(5)
Ln average annual inflation rate	-0.073 (0.013)***	-0.066 (0.013)***	-0.052 (0.016)***	-0.021 (0.012)*	-0.035 (0.012)**
Ln nominal exchange rate TND/USD	-0.235 (0.029)***	-0.195 (0.048)***	-0.151 (0.052)**	-0.090 (0.033)**	-0.064 (0.034)*
Ln Share of employment in services		-0.098 (0.129)			
LnGrowth rate of the labor force			-0.107 (0.161)	0.192 (0.182)**	0.498 (0.190)**
			0.003 (0.03)	0.021 (0.036)	
Ln (X+M)/GDP				-0.233 (0.064)***	-0.169 (0.069)**
Ln average annual real wage					-0.278 (0.121)**
Observations	20	20	18	18	20
R^2	0.69	0.70	0.57	0.72	0.85

Note: Standard errors between parentheses: * Significant at10%; ** significant at 5%; *** significant at 1%.
All standard errors are adjusted for heteroskedasticity using Huber–White correction.
Arellano-Bond test of no-serial autocorrelation has been performed. It confirms the null hypothesis of no autocorrelation in the Arellano-Bond test for AR(1): z = -0.17 Pr > z = 0.8666

Appendix

Table A: Descriptive Statistics on Value Added Variable, 1980-2012

	Observations	Mean	Std. Dev	Min	Max
Agriculture and Fishing	33	2965.567	1044.577	1391.185	4685.628
Manufacturing	33	3003.047	1157.352	1197.402	4987.327
Non manufacturing	33	1873.49	626.0363	1257.662	3637.229
Construction	33	1348.712	564.0036	587.1618	2382.91
Tourism	33	1540.133	674.5744	606.924	2648.297
Trade	33	2217.219	1107.222	632.1204	3886.625
Finance	33	4913.349	2279.437	1910.932	9393.023
Public offices	33	4427.986	2245.091	1600.382	9021.457
Transport	33	2392.599	1009.502	944.891	4177.09
Telecoms	33	1019.632	1109.8	239.1855	4074.234
Overall economy	33	27512.48	11554.4	12820.01	48194.49

Note: the value added variable is given in millions of Tunisian dinar.
Source: authors' computation

Table B: Descriptive Statistics on Employment Variable, 1980-2012

	Observations	Mean	Std. Dev	Min	Max
Agriculture and Fishing	33	506.8298	39.10976	466.453	593.3
Manufacturing	33	449.7493	112.3201	245.271	602.613
Non manufacturing	33	343.656	71.48355	260.641	485
Construction	33	308.7728	72.30596	226.176	451.5
Tourism	33	77.88333	31.24366	33.57	129.6
Trade	33	232.6962	96.69718	107.458	405.717
Finance	33	201.7492	84.25789	74.246	327.6
Public offices	33	418.1025	107.9867	249.022	592.1
Transport	33	108.9447	26.93266	73.202	157.64
Telecoms	33	19.40258	9.469618	9.987	37.36
Overall economy	33	2359.014	565.2097	1531.948	3277.4

Note: employment is given in thousands (1000)
Source: authors' computation

Table C: Descriptive Statistics on Employment Variable, 1980-2012

Variable	Data source	Mean	Std. Dev	Min	Max
Average annual inflation rate (%)	Central Bank of Tunisia	5.53	2.62	1.9	14
Average annual exchange rate TND/USD	Central Bank of Tunisia	1.04	0.40	0.64	2.47
Share of employment in services	Tunisian Institute of Quantitative Economics and competitivity (IQEC)	0.24	0.05	0.01	0.03
Growth rate of the labor force	Tunisian Institute of Quantitative Economics and competitivity (IQEC)	0.02	0.005	0.01	0.03
Percentage of trade in total GDP	Central Bank of Tunisia and Tunisian Institute of Quantitative Economics and competitivity (IQEC)	0.75	0.12	0.53	1.05
Average annual real wage (TND)	Tunisian Institute of Quantitative Economics and competitively (IQEC)	3778.42	636.5	2734.11	5059.89

Source: authors' computation