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HIRING AND SEPARATION RATES BEFORE AND AFTER THE ARAB SPRING IN THE TUNISIAN LABOR MARKET

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Abstract

We seek to explore the hiring and separation rates in Tunisia before and after the Arab Spring based on quarterly business level data for 503 firms over the span of January 2007 to December 2012. Furthermore, we examine whether employers are willing to dismiss older workers to trigger an effective increase in mobility that will open new opportunities for the youth community. We build our analysis upon six main empirical models to study employment decisions reflected by major indicators such as the number of hiring, number of separations, total employment effects, male-female ratio, age cohorts, labor mobility, and net employment. The results show that the Arab Spring has created structural unemployment trends. In addition, we note that the 2008 global turmoil has fostered the firing level of employment. Our conclusions also indicate that the response of Tunisia's government to high unemployment rates caused by the financial meltdown in 2008 and the events in 2011 was not sufficient to remove the attached lingering effects that still distress the country's labor market. In addition, our findings emphasize the significant challenges faced by Tunisian youth that could be mitigated by efficient policy actions to incentivize training and development geared towards the private sector.

Keywords: hiring; separation; labour mobility; net-employment; informal sector; Tunisia; Arab Spring; global financial crisis;

JEL Classification Codes: E24; J23; J63;

1. INTRODUCTION

The Arab Spring spread rapidly throughout the Middle East and North Africa (MENA) in 2011, and although it might seem like mere social unrest to general observers, academics and policymakers, it was a significant response to structural issues in the MENA labor market. The Arab Spring rocked Tunisia in 2011; it not only symbolized the power of ordinary people but also shed light on the country's structural economic problems. The Arab Spring has introduced an economic necessity and justice problem to the policy agenda, namely, the failure to sustain inclusive growth, with the educated Tunisian labor force facing increasingly longer waiting periods for public sector jobs. According to the Arab governments, the public sector has been considered the main instrument of economic and social development, especially after the Tunisian independence. However, due to the rapid increase of the population and educated labor force, it has been difficult to sustain good working conditions and solid employment growth in the area. In this context, the educated work force is confronted with limited access to employment in the public sector, and the state has failed to honor the employment guarantee (African Development Bank, 2012).

This paper takes a closer look at Tunisia by analyzing the impact of the Arab Spring on hiring and separation rates *ex post* the severe recession in 2011, which pushed the country's unemployment rate near 17%. The real GDP growth rate picked up to about 3.6% in 2012, but there is still pressure on decreasing exports; in addition, the country continues to face high unemployment rates. The government responded with a higher wage bill, job creation programs, and rising subsidies to manage increasing social demands, but the trade-off of higher government spending swelled Tunisia's fiscal deficit in 2012. Higher international prices pushed the overall inflation rate above 6%, which only added to the problem, as noted by the IMF Mission Chief for Tunisia. In this context, Chiraz and Frioui (2014) highlighted the impact of inflation on the purchasing power and investment behavior of the Tunisian consumer.

A previously conducted related study found that before the Arab Spring, the financial crisis had a negative impact on the country's economy, causing a GDP decrease from 6.3% in 2007 to 4.5% in 2008 (Haouas et al., 2012). Additionally, labor market characteristics such as gender and age make certain people more vulnerable to recession because of obstacles they face in the labor market (Tzannatos, 2010; Brosius, 2011). Hassine (2015) assessed the levels and determinants of economic inequality in 12 Arab countries using harmonized household survey micro-data. The study sought to identify the sources of the moderate inequality levels between selected states and described differences in household endowments, such as demographic composition, human capital, and community characteristics, as major drivers. We relied on the research conducted by Malik and Awadallah (2013) for a more recent perspective on the economics of the Arab Spring. The authors stated that although the Arab world is becoming younger and better educated, it is still lacking employment opportunities. Haern (2014) studied the political, institutional, and firm governance determinants of various

liquidity measures, and empirical evidence from North Africa and the Arab Spring showed that the greatest changes in political risks associated with aggregate liquidity are democratic accountability, the military in politics, and law and order.

The results of this paper, which are based on updated data, increase the pressure on the state to more actively address the existing structural problems. Our research credits the point and highlights that age is an important factor in the hiring and separation decision; however, Tunisian youths gain entry into the labor market mainly via small firms. Employment mobility¹ is still greater within smaller firms, but youths have a better chance of sustaining net employment within larger firms, which suggests opportunities to mitigate labor constraints early by tailoring education to the needs of the private sector rather than to those of the public sector. Addressing the concerns of the Arab Spring is a great challenge. The Middle East Monitor (2012) indicated a need for greater reform in states such as Egypt, Tunisia, and Syria, driven by economic necessity. We believe this should not come at a high cost, but the voice of many scholars and frustrated job seekers should be enough to place focus on research. Although our paper is one of many studies that point to continued struggles in Tunisia's labor market, we took a slightly different approach toward understanding the nature of the problem.

This paper examines the dynamics of Tunisia's labor market and quantifies hiring and separation rates *ex ante* and *ex post* the Arab Spring. Most of the results of our specified models confirmed viewpoints from previous academic research, but several interesting trends were analyzed to better understand the impact on hiring and separation based on the estimates and correlation of various variables.

The findings can be summarized as follows:

- According to our hiring model outcomes, age is generally a negative factor in hiring, but with a positive impact on separation. As highlighted by our results, employers are more likely to consider age below 35 as a major driver in both hiring and separation.
- There is a positive and significant relationship between the events in 2011 and mobility levels in the national labor environment, which means that the Arab Spring is a major disruptive factor to net employment.
- There is a positive and significant nexus between the employment size of the firm and the hiring level; hence, enterprises with a relatively large employment size are likely to hire more workers. Our analysis also highlighted a negative and significant link between employment size and separation levels. Differently stated, such businesses are inclined to fire more workers.
- Gender issues are less important in terms of hiring and separation levels.
- We also noticed that top management is more mobile in larger firms, which could stem from increased opportunities, contributing to upward mobility in the corporate sector. Contrary to the top age group, the lower age groups are more mobile in smaller firms,

¹ Labor mobility is measured by the total amount of labor hired and fired over a particular time.

where we find most of the entry into the labor market occurring as youth gain placement with start-ups and small enterprises.

- Mobility is positive in the informal sector, but the net employment effect is greater in the formal sector. Net employment is higher among large firms in the formal sector, with a positive impact on the employment increase in lower age cohorts. The lower age cohorts are more mobile but also face greater separation, as the decision to continue education is likely to result in extra time spent avoiding the feeling of discouragement in the competitive labor market.

Our views were shaped during a thorough analysis of the model results; in addition, we turned to scholarly research to build conclusions and recommendations for labor market policymakers.

We also relied on previous research to show some improvement in the national labor market. It is known that even though employment in exportable sectors mainly rises when employment in importable sectors falls, the supply of labor still increased dramatically in Tunisia as women entered the labor market (Haouas et al., 2005). Our previous papers highlight the signs of strength in the Tunisian labor market, albeit gradual. The growth in the female labor force participation places further emphasis on ensuring equal opportunity and room for sustainable net employment and upward mobility based on skill sets and labor market dynamics. This paper shows that gender is less of a factor in hiring and separation, which is good, but age and level in the organization continues to have an impact on hiring and separation. This means that greater involvement in all areas of the employment population combined with the right education and efficient policies should result in positive gains for all. A more efficient policy that incentivizes training and development that is geared towards the private sector should provide greater opportunities for Tunisian youth. Our results indicate that sluggish hiring and greater separation could discourage many labor market participants. We also believe that the potential for another Arab Spring is greater and significant reforms are needed to reduce the potential negative impacts.

The structure of the paper is as follows. Section 2 briefly summarizes the relevant literature. Section 3 provides a description of the data used in the estimation. Section 4 explains the background of the models and mathematical equations. Section 5 analyzes whether certain groups of employees are more exposed to difficulties caused by the Arab Spring and global economic crisis. The study will be carried out by sector of activity, age of employees, their gender, and employment category. Finally, Section 6 summarizes and provides policy recommendations.

2. LITERATURE REVIEW

Despite many years of economic expansion *ex ante* the Arab Spring, Tunisia is a country affected by rising inequality in the opportunity to obtain a good job, which means high

unemployment, particularly among youths—a context aggravated by the international economic meltdown and the transition to democracy (Ghali et al., 2014; Boughzala and Hamdi, 2014). The absence of inclusive growth has translated into extremely diluted labor market outcomes for the youth population, a key driver of the social unrest that led to the events in 2010–2011.

Unemployment mainly affects new entrants into the labor market, who comprise a large share of the unemployed and an even larger percentage of the long-term unemployed population (Assaad and Krafft, 2016). This represents a labor market insertion phenomenon, with inexperienced young individuals seeking their first formal jobs or public sector work and less willing to accept lower quality employment, which is easier to find in the private business arena. According to Malik and Awadallah (2013), the single failure of the Arab world is the absence of a private sector that is independent, competitive, and integrated with global markets. The forces of private and public enterprises before and after the Arab Spring are central to our study exploring the hiring and separation rates in Tunisia. Private sector development is a challenge in the Arab world, yet it generates incomes independent of rent streams controlled by the state. This is an important reason that the region must overcome the economic barriers that contributed to the rise of the events in 2011 (Malik and Awadallah, 2013). The Arab Spring revolution was fueled by poverty, unemployment, and a lack of economic democracy and opportunity. It came amidst what was hailed by some as the Arab renaissance, where the policymakers had taken steps to ensure economic stability in the region by shifting towards a much more active private sector, promoting privatization and increased private investments. These reforms were put in place by the 1990s and led to economic growth that had not been witnessed before. However, despite these positive efforts the growth rates achieved were the lowest relative to other regions. The ramifications of the global turmoil, coupled with the social unrest in 2011 and exacerbated by episodes of tension in neighboring states such as Libya, deteriorated the labor environment in Tunisia *ex post* 2010.

The Arab governments failed to recognize the lack of social protection and the nonexistence of efficient institutions to promote social dialogue among representatives of public and private partners in the market. The policies had a positive impact upon a certain rich class but did not prove to be beneficial to the middle class and the poor. In addition, the youth bulge dramatically changed the demographic profile of the Middle East (Malik and Awadallah, 2013). Although the unemployment rates have fallen since the 1990s, women in the region, who had become more educated but were unable to find jobs, led to high unemployment. Adding to the frustration of the people, production was still stuck in the phase of low productivity; thus, job opportunities were low paid and not for the highly skilled.

Unemployment was a major driver of the social unrest wave in 2011, mainly affecting highly educated youth between 18 and 30 years of age, an age group without any realistic job prospects in the public arena, which is perceived as the most secure employment source. The unemployment problem is also deeply rooted in the rigid local economic barriers. According

to Malik and Awadallah (2013), 58% of the exports of the GCC (Gulf Cooperation Countries) are with other GCC members, and they are particularly limited between North Africa and the remaining parts of the Arab World. Total Tunisian exports are the second highest (behind Jordan) in the resource-poor group, but intra-MENA exports are far below the group average. Tunisia suffers from a chronic regional socioeconomic imbalance brought about by the promotion of larger cities on the eastern coast, whereas central and western regions, with unemployment rates as high as 20%, have clearly been forsaken by previous governments (Berhouma, 2013).

Among the factors that influence the labor market, Haouas et al. (2003) mention the rigid wage structure and the limited capability of work force absorption. The International Labor Organization also points to the volatile and low economic growth following the Arab Spring, which prevents improved labor market outcomes and has considerable implications for the youth employment outlook in particular. The World Economic Forum (2012) and the United Nations Department of Economics and Social Affairs (2011) highlight the need to address the 100 million youth and the perspective on their employment. In addition, the period after the Arab Spring has been characterized by reduced employment opportunities, insecurity and political issues, and inefficiency of the labor market in the manufacturing sector (Heshmati and Haouas, 2011).

A recent report by OECD (2015) shows that two in five Tunisian youths are facing unemployment and one in four are neither in employment nor in education or training, almost twice the OECD average rate. In addition, heterogeneity across groups is another major source of concern. However, even when youths are employed, their jobs are often of poor quality; estimates have revealed that one in two employed youths are engaged in informal work, with limited protection and job security. Furthermore, of those working based on a contract, half have temporary arrangements. Unemployment is particularly severe in the case of women, who are highly affected by volatile unemployment rates. Nevertheless, the statistics indicate a declining share of unemployed females and a rising share of new entrants into the labor market.

Youth unemployment rates, falling below 30% in the years preceding the Arab Spring, increased to over 42% in 2011 (OECD, 2015). Since 2011, the rates have showed a further downward trend. The unemployment rate for the prime age bracket also rose after the revolution, although to a moderate extent, while unemployment for older individuals remained low.

Another disturbing factor is the cost of hiring, which has increased due to industry wage agreements and high public sector pay and benefits. In this context, social and labor market policies are important for supporting youth employment. Young individuals are predisposed to falling through the social safety net, with a negative impact on their employability. Furthermore, female labor participation is hindered by the absence of support to assist young families to balance work and household responsibilities (OECD, 2015).

In 2011, the unemployment rate in Tunisia stood at 18%, with youth unemployment even more severe (Mirkin, 2013). Such alarming statistics highlight the difficulty youths face in finding jobs (Ulandssekretariatet, 2014). Similar to other neighboring states, where unemployment was also a determinant of the protests in 2011, the phenomenon is more dramatic among highly educated groups in Tunisia (Euromed, 2013). The figures also reveal geographical disparities in unemployment, with a minimum in the Central East at 11% and a peak in the Midwest at 29%.

The unemployment rate, despite its relative stability over the decade that preceded the Arab Spring, increased massively due to the many negative impacts of the events in January 2011, *inter alia*, social insecurity, the absence of investment, and the exit of a large number of foreign businesses, all leading to a fall in foreign direct investments (FDIs). The activity rate of individuals aged 15 and older shows large gender inequities: 70% of active males compared to only 25% of active females (INS, 2011). The situation is similar for the employment rate (44.3% in 2011): 68% employed males compared to 21% employed females (ETF, 2014). Four months after the events, the overall unemployment rate stood at 18.3%, up from 13% in 2010. Since 2011, it has dropped to 16.9%, 15.8%, and 15.1% in 2012, 2013, and 2014, respectively, but it is still higher compared to pre-revolution official figures (Cuesta and Ibarra, 2015). The data presented would apparently indicate some recovery patterns; however, a deeper analysis emphasizes that the drop can be partly explained by a recruitment drive in the public sector in 2011 and 2012, leading to the creation of nearly 59,000 new jobs (ETF, 2014).

Available numbers indicate that matters have not improved much since the revolution, as the number of unemployed individuals has doubled, the incidence of poverty continues to be high, and geographic disparities are still significant (ETF, 2014).

Despite this sluggish economic recovery, recent data for the first quarter of 2014 show that the overall unemployment rate in Tunisia has declined to 15%. While the development of public recruitment projects has reduced unemployment, it has also caused an inflated wage bill and enlargement of the budget deficit. The implementation of such programs and the control of severe macro-economic disequilibria forced Tunisia to borrow \$16 billion (in addition to signing a stand-by-arrangement for \$1.75 billion) from the IMF in 2013 (Tunisia-Alive.net, 2014). Consequently, the country has scaled back public employment expansion and frozen public sector wages. In 2016, under a new program that builds on the previous agreement, the IMF approved a four-year, \$2.9 billion loan to assist the national government agenda seeking to promote more inclusive economic progress and job creation while protecting the poorest households (IMF, 2016).

According to a recent International Labor Organization (ILO) study (2014) analysis, the youth unemployment rate raised *ex post* the Arab Spring and is estimated to gradually grow to 30% by 2018. The youth unemployment rate in Tunisia stood at 42%, similar to the rates in Palestine (44%) and Libya (49%) (Bardak, 2013). One of the most salient features of unemployment is the higher number of unemployed individuals in the highly educated group;

for illustrative purposes, in 2012 the unemployment rates for individuals with tertiary education were 30% in Tunisia, 22% in Egypt, and 19% in Morocco (World Bank, 2014). Given that individuals under 25 years of age are less likely to have substantial work experience, and considering the scarcity of employment opportunities even for the highly educated, some argue “*the spark that ignited the uprising was not a cry for democracy but a demand for jobs*” (El-Khawas, 2012). The failure of the government to address the difficulties faced by the large youth segment can be largely explained by rampant corruption, repression, a lack of investment in underdeveloped regions of Tunisia, and an obsolete education system, which is incapable of providing the skills needed for the limited employment opportunities available (Silveira, 2015). Five years after the revolution, the youth unemployment rate in Tunisia is 35%, which shows that the socio-economic issues affecting this group remain (IMF, 2016).

In order to decrease youth unemployment, the country needs to improve job generation by crafting a myriad of macroeconomic policies and addressing structural issues that have to date distressed economic growth. More specifically, labor market barriers that impact the willingness of employers to hire young individuals should be removed (OECD, 2015).

The Arab Spring events have placed substantial social pressure on the Tunisian government to create more jobs through the expansion of public sector employment opportunities. Consequently, this market has enlarged directly through the creation of 40,000 additional civil service posts and indirectly via Tunisair, the government-owned aviation company (Belhadj, 2011; Subrahmanyam, 2013).

The international experience can provide important lessons for the success of labor market reform in Tunisia. To ensure the acquisition of the proper skills, the private business community should actively engage in the design and adoption of various programs. However, this is not a reality in Tunisia *ex post* the Arab Spring Amal (Arabic for *hope*) project, which was crafted as a job activation mechanism for young graduates (Subrahmanyam and Castel, 2014).

Ensuring inclusive economic growth is critical for job creation and decreasing unemployment in Tunisia. Although the country has not been severely affected by the global crisis, the revolution has deteriorated its economic performance indicators, as both tourism and FDIs, added to tensions in Libya, have had strong domino effects (World Bank, 2012). These issues limit the role of migration as a catalyst to narrow domestic unemployment, with many EU states taking aggressive stances on immigration and a large number of migrant workers returning from Libya (African Development Bank, 2013). Such evolutions point out that addressing youth challenges is critical if the government aims to increase the resilience of the national economy to future shocks. However, the Middle East Monitor suggests that there is reason to be optimistic about Tunisia, as smooth elections and a modest return to growth is underway; however, we should remain cautious of the external environment, which includes the risk of conflict on the Libyan border. Furthermore, economic necessity suggests the need

for measures to expand the scope of reform and to introduce greater privatization (Middle East Monitor, 2012).

A broader look at the Tunisian labor market starts with identifying the process of adjustment in employment. This paper analyzes employment mobility and the factors that contribute to hiring and separation, based on firm size. We noticed that the lower age groups are more mobile across the spectrum, but they have a greater chance of sustaining net employment with larger firms. Our previous studies (Haouas et al. 2003; Heshmati and Haouas, 2011) used industry- and time-specific data to determine the factors affecting adjustment in employment, and labor use efficiency provides a strong background for this analysis. The results demonstrated that the impact of wage changes on labor demand is greater than the influence of capital or output. The implementation of new technologies contributes to the job creation/destruction process, and wage increases lead to higher efficiency.

3. THE DATA

The quarterly data used in this study were collected from the Social Security Fund (CNSS) of Tunisia for a large sample of 503 firms with five or more workers, totaling 12,072 observations between January 2007 and December 2012². We focused on the employment status in different sectors, such as Construction, Finance, Manufacturing, Services, and Trade. The main indicators refer to *the number of hirings, number of separations, and total employment effects*. In addition, the analysis includes male-female ratio, age cohorts (from 18–24 up to 55–64), labor mobility, and net employment and time trend. *Age cohort*, and *gender* are expressed in shares of total, whereas *mobility* is defined as the sum of hiring and separation, and *net employment* is the difference between hiring and separation. An employee who will find a job in the firm at time t is counted in the total number of hiring variables, while those leaving the firm at time t will be included in the total number of separation from the labor market (Haouas et al., 2012; Brosius, 2011). Finally, we consider dummy variable for the financial crisis in 2008 and for Arab Spring in 2011 by taking 0 and 1.

Table 1. Variable and Definition

Variable	Definition	Source
hiring*	Hiring	Social Security Fund
hिरerate*	Hiring rate	Social Security Fund
separation*	Separation	Social Security Fund
separate*	Separation rate	Social Security Fund
mobility*	Mobility	Social Security Fund
employee	Employees	Social Security Fund
Male	Male number	Social Security Fund

² The firms in the sample are all formal.

Variable	Definition	Source
Female	Female number	Social Security Fund
netemploy	Net employment	Social Security Fund
malshare	Male share	Social Security Fund
femshare	Female share	Social Security Fund
age1824	Age 18–24 number	Social Security Fund
age2534	Age 25–34 number	Social Security Fund
age3544	Age 35–44 number	Social Security Fund
age4554	Age 45–54 number	Social Security Fund
age5564	Age 55–64 number	Social Security Fund

Table 1 reports the short variable name, definition and source. The data summary statistics are presented in obtained Table 2. The mean for both indicators—*number of hirings* and *number of separations*—is similar at 3.513 and 3.510, respectively, which means that, on average, the number of employees who would find a job in the firm at time t is equal to the number of workers that would leave the firm at time t . The average firm level employment is 118, with the majority of the employment forces in lower management (77.7%, with 73.8% males and 44.6% females, respectively, on average,) with the highest concentration within the 45–54 age bracket (36.5%). The finance, manufacturing, and trade sectors averaged the highest employee count.

Table 2. Summary Statistics of the Tunisian Labor Market

Variable	Mean	Std. Dev	Minimum	Maximum
hiring*	3.513	4.347	0.000	43.000
separation*	3.510	5.425	0.000	121.000
hirerate*	0.029	0.021	0.000	0.333
separate*	0.026	0.023	0.000	0.500
mobility*	0.055	0.027	0.000	0.500
netemploy*	0.003	0.035	-0.500	0.333
employee	118.353	126.366	2.000	604.000
male	73.767	97.291	2.000	584.000
female	44.577	60.738	0.000	432.000
malshare	0.549	0.219	0.116	1.000
femshare	0.451	0.219	0.000	0.884
age1824	13.574	15.102	3.000	173.000
age2534	22.999	24.627	0.000	212.000
age3544	33.578	36.698	1.000	222.000
age4554	36.531	40.143	1.000	182.000
age5564	11.628	12.695	0.000	90.000

Note: * dependent variables

The summary statistics of the data show large variations in the hiring and separations of firms across different industrial sectors, sizes, and over time and seasons. The rate shares differ greatly by gender and managerial categories as well. The analysis of the values of the Pearson correlation coefficients among the variables reported in Table 3 highlights consistent results, as follows: the hiring is positively and significantly correlated with the separation rate. Financial crisis is positively associated with hiring while negatively associated with separation. Table 3 also indicates that the *Arab Spring* dummy is negatively linked with hiring while positively linked with separation.

Table 3. Pearson's Correlation Coefficients

	hiring	Separation	mobility	netemp	Total-effec~s	mens	y18_25	y25_34	y35_44	y45_54	y55	crisis	Arab SP
hiring	1.000												
separation	0.621*	1.000											
mobility	0.875*	0.922*	1.000										
netemp	0.224*	-0.624*	-0.274*	1.000									
totaleffec~s	0.904*	0.794*	0.935*	-0.087*	1.000								
mens	0.823*	0.697*	0.8356*	-0.046*	0.884*	1.000							
y18_25	0.890*	0.808*	0.9369*	-0.118*	0.984*	0.872*	1.000						
y25_34	0.879*	0.762*	0.903*	-0.071*	0.960*	0.771*	0.9409*	1.000					
y35_44	0.898*	0.8069*	0.940*	-0.108*	0.997*	0.881*	0.9858*	0.952*	1.000				
y45_54	0.888*	0.7792*	0.918*	-0.084*	0.993*	0.879*	0.9708*	0.938*	0.9915*	1.000			
y55	0.818*	0.679*	0.821*	-0.029*	0.890*	0.935*	0.862*	0.776*	0.878*	0.883*	1.000		
crisis	0.049*	-0.038*	0.0003	0.097*	0.012	0.007	-0.001	0.028*	0.000	0.0025	0.061*	1.000	
Arab SP	-0.070*	0.069*	0.007	-0.156*	0.003	-0.004	0.002	0.0117	-0.000	-0.004	0.018	-0.316*	1.0

4. MODELS AND ESTIMATION PROCEDURE

The labor market outcome (Y) is determined by individual (X), industry (Z), labor environment (M) characteristics, and the state of technology (T). This theoretical model is written as:

$$(1) \quad Y = f(X, Z, M, T)$$

We constructed an integrated database to offer a better comparison of the factors contributing to the hiring and separation rates in Tunisia before and after the Arab Spring. We worked with six main models, including outcomes of hiring and separation levels, hiring and separation rates, mobility, and net employment. Each model was estimated five times using pooled data, *small firms* (fewer than 55 employees, which is the median of the data), *large firms* (55 or more employees), *formal firms* (manufacturing, trade, and finance), and *informal firms* (construction and services, assuming they can absorb informal activities easier). This resulted in a total of 30 models based on the fixed effects estimation method³, with robust standard errors controlling for all possible firm, industry, and labor market heterogeneity effects. The six basic models with different dependent variables are not nested, but for each

³ We considered random effects, but rejected them in statistical tests.

model the pooled and those size and formal related specifications are nested and can be tested to establish possible response heterogeneity. The result of the comprehensive sensitivity analysis is expected to shed light on actual labor market conditions in Tunisia and its evolution during the global economic recession and Arab Spring events. Since there have been too many model combinations, we have decided to drop several and focus on the remaining important ones with the best fit, considering the trade-off between R^2 and the number of estimated parameters. The trade-off is a richer model specification that produces a higher R^2 value; however, specification with many parameters could also reduce the usefulness of the model because of over-parameterization and multicollinearity.

We specified and estimated level models of hiring and separation but then changed the specification to hiring and separation rates (shares) in order to emphasize the best way to model hiring and separation rates. In specifying the mobility and net employment models, we looked at the level and shares of the total hiring and separation or their difference. We continued to explore the firm size and formality of sectors. The size classification is based on the number of employees; for the threshold, we use the median, while for the formal informal we have no direct information. We treat sectors with less tied regulations as informal sectors. Several models are non-nested but jointly provide useful information about the Tunisian labor market and about how to improve the employment conditions for youths specifically.

We apply Poisson's fixed effect approach to estimate our Arab Spring and the hiring and separation rates in the Tunisian labor market. A standard technique for regression models with discrete data assumes a number of occurrences of an event y_i , given a vector x_i of exogenous variables. This also assumes the observation follows the Poisson distribution for the i^{th} of N individuals (Cameron and Trivedi, 1986):

$$(3) \quad \Pr(Y_i = y_i) = \frac{\exp(-\lambda_i) \lambda_i^{y_i}}{y_i!}, y_i = 0, 1, 2, \dots$$

Here, y_i is an observation of the random variable and λ_i is the parameter distribution equal to the average value and variance of the event Y_i . The equation assumes the mean value of Y_i is conditional with x_i :

$$(3) \quad \lambda_i = E(y_i | x_i) = \exp(x_i \beta)$$

In equation 3, x_i is the $(1 \times K)$ vector of exogenous variables and β is the $(K \times 1)$ vector of parameters that are measured by maximizing the following log-likelihood function:

$$(4) \quad L(\beta) = \sum [y_i \log(\lambda_i) - \lambda_i]$$

Equation 4 proves consistent and efficient under the assumptions of independence of the event or observation over time and equality of the mean and variance of Y_i given x_i . These assumptions are violations of the number of applications, as dependence between successive events and an over-dispersion of the variance with respect to the mean would be observed in the data (Cameron and Trivedi, 1986). Our model follows the Poisson regression approach for panel data, which overcomes the potential violation of the distributional assumptions and offers the estimation of a consistent and efficient estimator. In our setup, the discrete variable represents the number Y_{it} of job hiring or separation for the i^{th} organization for the t period of time. We employ panel time series data for 503 firms over the first quarter of 2007 and up to last quarter of 2012. Based on the data characteristics, we argue that the assumption of a Poisson distribution cannot be rejected and the Poisson regression model is appropriate for this analysis. The Poisson regression approach with fixed effect for panel data (Hausman et al., 1984) can be written as:

$$(5) \quad E(Y_{it} | x_{i1}, \dots, x_{iT}, c_i) = c_i m(x_{it}, \beta), t = 1, 2, \dots, T$$

$$(6) \quad m(x_{it}, \beta) = \exp(x_{it}, \beta)$$

Here, y_{it} the Poisson is distributed with the conditional mean highlighted in Eq. (3) and y_{it} and y_{is} ($t = s$) are independent and conditional on x_{it} , whereas c_i is an unobserved effect that is constant over time. This technique allows for arbitrary dependence between c_i and x_{it} . The parameters β are estimated using conditional maximum likelihood methodology (Hausman et al., 1984):

$$(7) \quad L(\beta) = \sum_{i=1}^N \sum_{t=1}^T y_{it} \log[p_t(x_{it}, \beta)]$$

Equation 7 represents a multinomial log-likelihood function that suits the distribution of y_{it} conditional on n_i , x_i , and c_i (where n_i is the sum of the counts across time t), and the probability term assumes the following form:

$$(8) \quad p_t(x_{it}, \beta) = \frac{m(x_{it}, \beta)}{\sum_{s=1}^T m(x_{is}, \beta)}$$

The fixed-effect Poisson estimator follows a maximum log likelihood function, shows very strong robustness, and is consistent under the conditional mean. The distribution of y_{it} given x_{it} and c_i is unrestricted and allows for over-dispersion or under-dispersion in the model as well as dependence between y_{it} and y_{is} (Wooldridge, 2002). We use the popular STATA statistical software to estimate the Poisson regression models:

$$(9) \quad E(y_{it}|x_{i1}, \dots, x_{iT}, c_i) = c_i m(x_{it}, \beta)$$

Here, y_{it} indicates our dependent variables of hiring, separation, mobility, and net employment for the i^{th} firm for t time. In addition, x_{iT} are the conditional vectors, such as the number of employees, gender ratio, different age groups (18-24, 25-34, 35-44, 45-54, and 55-64), Arab Spring (after 1, before 0), and financial crisis (during crisis 1, otherwise 0).

5. ANALYSIS OF THE RESULTS

5.1 Arab Spring and Hiring and Separation Levels

We apply Poisson fixed effect approach to measure the impact of the Arab Spring on the employment hiring and separation level models. Regarding the impact of the Arab Spring, Table 4 clearly shows that this event is negatively and significantly associated with hiring levels in the Tunisian labor market. We argue that the Arab Spring brought about structural political and economic changes, and that the benefits are not immediately reflected in the hiring rate. Our finding is consistent, as the Arab Spring is positively and significantly linked with separation levels. This finding indicates that the Arab Spring created some structural unemployment, which is echoed in our analysis. Financial crisis in 2008 is positively and significantly associated with separation level while insignificantly associated with hiring level. The finding indicates that financial crisis foster the firing level of employment.

Table 4. Arab Spring and Hiring and Separation Levels

Variables	Hiring level	Separation level
	Poisson Fixed Effect	Poisson Fixed Effect
Employee	0.0076*** (0.00135)	-0.0171*** (0.00106)
Maleshare	-0.0233 (0.104)	0.0105 (0.0892)
age1824	-0.00129 (0.00190)	0.00287** (0.00132)
age2534	0.00175 (0.00146)	0.00847*** (0.00120)
age3544	-0.00464** (0.00233)	0.00537*** (0.00131)
age4554	-0.00376*** (0.00138)	0.00294*** (0.00111)
age5564	-0.00274* (0.00154)	0.00716*** (0.00135)
Arab Spring	-0.207***	0.200***

	(0.0117)	(0.0110)
crisis	0.0117	0.0306*
	(0.0141)	(0.0157)
Observations	12,072	12,072
Number of firms	503	503
<hr/>		
$R^2 = 0.56, Adjusted R^2 = 0.56, SE = 3.56, MDV = 3.509$	$R^2 = 0.56, Adjusted R^2 = 0.56, SE = 3.56, MDV = 3.309$	$R^2 = 0.56, Adjusted R^2 = 0.56, SE = 3.56, MDV = 3.309$
$AIC = 3.734, SIC = 3.739, DW = 1.176, F = 7.793$	$AIC = 3.73, SIC = 3.73, DW = 1.507, F = 12.39$	$AIC = 3.73, SIC = 3.73, DW = 1.507, F = 12.39$
<hr/>		

Table 4 shows that the employment size of the firm is positively and significantly associated with the hiring level. This implies that enterprises with a relatively large employment size are inclined to hire more workers. Nevertheless, employment size is negatively and significantly linked with separation levels in Tunisia. This means that such businesses are also predisposed to fire more workers. The results show that gender, represented by males, is an inconclusive variable in both hiring and separation models. This indicates that the gender issue has less influence in terms of hiring and separation levels.

The hiring model outcomes show that although age is generally a negative factor in hiring, it has a positive impact on separation. The reference age cohort is the 18–24 segments. We conclude that employers are more likely to consider age below 35 as a determinant factor in hiring as well as in separation. The latter could be a variable affected by labor market regulations, committed employment contract time, and the level of experience in the field. Our research question is whether employers are willing to dismiss older workers in order to trigger an effective increase in mobility that will open new opportunities for youths to establish a sustainable presence in the labor market.

5.2 Arab Spring and Hiring and Separation Rates

Table 5 displays the results of the employment share models—namely, the hiring and separation rates—utilizing Poisson fixed effect approach. Table 5 shows that the Arab Spring is negatively and significantly associated with hiring parameters in the Tunisian labor market. This finding is in line with our previous model. We assume that the Arab Spring caused a structural change in the political and economic paradigm. Our results are consistent, as the Arab Spring is positively and significantly linked with separation levels, which indicates that the events in 2011 created structural unemployment, and this is reflected in our analysis.

Table 5. Arab Spring and Hiring and Separation Rates

Variables	Hiring Rate Poisson Fixed Effect	Separation Rate Poisson Fixed Effect
Employee	0.00674** (0.00303)	-0.0267*** (0.00233)
Maleshare	0.774*** (0.136)	1.796*** (0.119)
Age1824	0.00390 (0.00398)	0.00612** (0.00282)
age2534	-0.000511 (0.00318)	0.0137*** (0.00259)
age3544	-0.00268 (0.00514)	0.0152*** (0.00276)
age4554	-0.00249 (0.00306)	0.0102*** (0.00243)
age5564	-0.0094*** (0.00327)	0.0075*** (0.00280)
Arab Spring	-0.329*** (0.0128)	0.237*** (0.0125)
Crisis	-0.0254* (0.0153)	0.0746*** (0.0180)
Observations	12,072	12,072
Number of firms	503	503
$R^2 = 0.25, \text{Adjusted } R^2 = 0.22, SE = 1.83, MDV = 2.901, AIC = 4.089, SIC = 4.402, DW = 1.176, F = 7.793$		
$R^2 = 0.35, \text{Adjusted } R^2 = 0.32, SE = 1.92, MDV = 2.622, AIC = 4.187, SIC = 4.499, DW = 1.507, F = 12.39$		

Table 5 shows that employment size is positively and significantly associated with the hiring rate. This implies that firms with a relatively large employment size are inclined to hire more workers. Nevertheless, employment size is negatively and significantly linked with the separation rates in Tunisia, meaning that businesses with a relatively large employment size are also inclined to fire more workers. Financial crisis in 2008 is negatively and significantly associated with hiring while positively and significantly associated with separation rate. The finding indicates that financial crisis foster the firing level of employment.

We observe that age groups are sensitive to hiring and separation rates in the selected firms in Tunisia. Almost all age brackets are negatively associated with the hiring rate but positively associated with the separation rate.

5.3 Arab Spring and Labor Mobility and Net Employment Levels

The estimation results for the labor mobility and net employment models are reported in Table 6. Table 6 indicates that the Arab Spring is positively and significantly associated with mobility levels in the labor market of Tunisia. This finding is consistent with our previous model. Table 6 also highlights that the Arab Spring impedes net employment significantly. Our results confirm the anecdotal evidence that the post-Arab spring period saw Tunisia's unemployment rate soar to nearly 17%.

Table 6. Arab Spring and Labor Mobility and Net Employment Levels

	Mobility	Net Employment
Variables	Poisson Fixed Effect	Poisson Fixed Effect
Employee	-0.0089*** (0.0008)	0.0119 (0.007)
Maleshare	-0.0204 (0.067)	-0.166 (0.318)
Age1824	0.00159 (0.001)	0.0059 (0.008)
age2534	0.0079*** (0.0009)	-0.0069 (0.007)
age3544	-0.0006 (0.001)	0.00165 (0.0160)
age4554	0.0005 (0.0008)	0.0015 (0.0060)
age5564	0.0058*** (0.0010)	-0.0182** (0.0081)
Arab Spring	0.0104 (0.007)	-0.197*** (0.026)
Crisis	0.0352*** (0.010)	-0.0813*** (0.0288)
Observations	12,072	9,466
Number of firms	503	503
$R^2 = 0.73, \text{Adjusted } R^2 = 0.73, SE = 4.50, MDV = 7.022, AIC = 4.567, SIC = 4.572, DW = 1.486, F = 20.793$		$R^2 = 0.55, \text{Adjusted } R^2 = 0.52, SE = 1.434, MDV = 1.019, AIC = 1.221, SIC = 1.607, DW = 1.492, F = 21.39$

Table 6 shows that employment size is negatively and significantly associated with mobility levels. This implies that firms with a relatively large employment size are inclined to experience higher labor mobility. Nevertheless, employment size is positively and significantly linked with net employment levels in Tunisia. Arab spring is negatively and significantly associated with net employment level while insignificantly related to mobility. However, financial crisis fosters mobility but impedes net employment rate.

Table 6 also highlights that age groups are sensitive to mobility but less sensitive to net employment. The 25–34 and 55–64 age brackets are positively and significantly associated with the mobility level, while the 35–44 and 45–54 age cohorts are negatively associated with mobility levels. Nevertheless, the 55–64 age groups is negatively and significantly linked with net employment levels, which is sensible since many employees are retiring at these ages. The covariance matrix of coefficients of fixed effects poisson models of hiring and firing are presented in Appendix 1 and 2.

6. SUMMARY AND RECOMMENDATIONS

One fact that remained consistent in all of our models is that hiring was relatively unchanged from 2008 to 2012, which suggests that Tunisia still has lingering effects from the financial crisis and Arab Spring that place a burden on the country's labor market. We believe that Tunisians will need to implement significant reforms, or further frustration with labor market constraints will lead to renewed protests, and similar structural issues resulted from the Arab Spring will come to light once again. Our results indicate that there are significant challenges faced by Tunisian youths that could be mitigated by efficient policy actions that incentivize training and development geared towards the private sector. The background problem is that labor market conditions influencing the rise of the Arab Spring continue to weigh on the potential employment gains. Even though Tunisia's labor market is improving, it is still performing below its potential, as several groups such as the youth population continue to struggle with sustained job placement. We know that targeted reform helps to address these concerns and provides support for sustainable employment growth in the labor market. Adjustment occurred faster during the liberalization from 1986 to 1994 and post-liberalization from 1995 to 1996 (7.5%). The slower adjustment (6.8%) from 1972 to 1985 during pre-liberalization times shows that there is much room for improvement with efficient economic policies (Haouas et al., 2003).

One of the results of our study is that age is a negative factor in hiring, with a positive impact on separation. We argue that employers are more likely to consider age as a factor in hiring and separation decisions. This paper further implies that age can represent years of experience, skill sets, and training. The results suggest that age is still a factor that is less favorable to the younger generation of job seekers, while gender is less of a factor, especially as female participation in the labor force increases. We saw evidence that females continue to face some difficulties in the job market, but the additional labor supply will help, especially with more efficient policies aimed at matching skill sets with private sector demand. We also noticed that top management is more mobile in larger firms, which could stem from increased opportunities, contributing to upward mobility in the corporate sector. Contrary to the top age group, the lower age groups are more mobile in smaller firms, where we see most of the entry to the labor market occurring, as youths find employment with start-ups and small enterprises.

The mobility and separation among firms with limited resources could be a challenge to policies focusing on training and continued efforts to retain employees. We suggest that a revamped educational framework is needed in order to shift the focus towards private sector employment upon graduation. This could enable many younger Tunisians to engage in entrepreneurial ventures of their own and thereby sustain hiring. Such firms would continue to grow and develop into larger firms, eventually sustaining net employment.

The fourth quarter continued to show a seasonality effect within our results, as hiring starts to taper off in many sectors. We also noticed that mobility is positive in the informal sector, but the net employment effect is greater in the formal sector. Seasonality was less noticeable in the formal vs. informal sector analysis. Our results provide evidence of the reasons and factors behind the continued struggles in Tunisia's labor market, which demand more policy action. Tunisia will need to focus on balancing its economy to avoid the heavy seasonal impact on hiring in sectors such as manufacturing and services. Our findings show that net employment is greater among large firms in the formal sector, which increases employment in the lower age cohorts. We learned that lower age cohorts are more mobile but also face greater separation, as the decision to continue education is likely to result in extra time spent avoiding the feeling of discouragement in the competitive labor market. Tunisian youths will need to be trained early and continue to acquire developing skills that are in line with market demands via co-ops and internships, which could lead to sustainable, positive net employment.

We note that the response of Tunisia's government to high unemployment rates resulting from the financial crisis in 2008 and Arab Spring in 2012 was not sufficient. A higher wage bill, job creation programs, and rising subsidies in response to increasing social welfare demands were welcomed, but the trade-off of higher government spending swelled the country's fiscal deficit in 2012. Using the results in this paper, Tunisia's government could focus on allocating resources more efficiently based on the direct impact public labor market programs that results in higher or lower estimates in hiring and separation rates. There is evidence that the unemployment rate of educated youths is higher than that provided in official statistics, increasing from 14.8% in 2005 to 21.6% in 2008. Our previous study found that in Tunisia, unemployment is essentially a youth issue (Haouas et al., 2012). The results in this paper show that age is generally a negative factor in hiring, and it has a positive impact on separation. We conclude that employers are more likely to consider age as a factor in separation, which could lead to further discouragement. Young people who delay labor market entry by way of continuing education may be discouraged by low wages. In addition, the emigration of skilled workers, who historically reduced labor market pressures, is no doubt concerning (Haouas et al., 2012). In fact, a recent Gallup study conducted by Abu Dhabi Gallup Centre shows the growing public distrust in the Tunisian government. While Tunisia's GDP continued to show a small positive growth rate in recent years, life evaluations continued to plummet by 10% from 2008 to 2010, compared to an approximate 1% rise in GDP per capita

over the same time period. The survey data also show a significant lack of trust in the government to provide basic services and infrastructure. The findings of the Gallup study, which polled 1,000 Tunisian nationals, should provide sufficient motivation to get to the heart of the matter.

Sustainable public policy action starts with an in-depth study of the structural problems that led to the Arab Spring as well as the impact of the actual event on hiring and separation rates. We will see if more efforts are required to efficiently expand employment opportunities for the youth of Tunisia while reducing the strain of public sector crowd out. This will ease the constraints of an impatient majority in the labor force and thereby allow the private sector to organically break away from the recessionary past and increase its recruitment efforts to attract skillful and talented employees. It is crucial for the new government to use the research presented in our study to address the concerns of the people of Tunisia, who have justifiably high expectations.

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Appendix

Appendix 1. Covariance matrix of coefficients of fixed effects poisson model Hiring

	totaleff~s	Top- manager	Middle- ma~r	Lower- man~r	mens	womens	y25	y25_34	y35_4 4	y45_54	y55	asd
totaleffec~s	0.00132											
topmanager	-0.00062	0.00098										
middlemana~r	-0.00062	0.00090	0.00098									
lowermanager	-0.00062	0.00098	0.00098	0.00098								
mens	-0.00069	-0.00035	-0.00035	-0.00035	0.0010							
womens	-0.00069	-0.00035	-0.00035	-0.00035	0.0010	0.0010						
y25	-0.00001	-0.00003	0.00020	0.00004	-0.0000	-0.0000	0.00003					
y25_34	-0.00008	-0.00006	0.00003	-0.00010	-0.0000	-0.0001	0.00020	0.00002				
y35_44	-0.00020	0.00008	-0.00005	0.00020	-0.0000	-0.0001	0.00002	0.00010	0.0005			
y45_54	-0.00001	0.00001	0.00001	0.00005	-0.0060	-0.0006	0.00002	0.00001	0.0001	0.00002		
y55	0.00004	-0.00002	-0.00020	-0.00002	-0.0000	-0.0004	0.00010	0.000001	0.0004	0.00001	0.00002	
asd	0.00002	-0.00070	-0.00007	-0.00007	-0.0000	-0.00001	0.00008	0.00002	0.0006	0.00090	-0.00030	0.0001

Appendix 2. Covariance matrix of coefficients of fixed effects poisson model Firing

	totaleff~s	Top- manager	Middle- ma~r	Lower- man~r	mens	womens	y25	y25_34	y35_44	y45_54	y55	asd
totaleffec~s	0.003											
topmanager	0.000	0.002										
middlemana~r	0.000	0.002	0.002									
lowermanager	0.000	0.002	0.002	0.002								
mens	-0.003	-0.001	-0.001	-0.001	0.004							
womens	-0.003	-0.001	-0.001	-0.001	0.004	0.004						
y25	0.000	0.000	0.000	0.000	0.000	0.000	0.000					
y25_34	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000				
y35_44	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000			
y45_54	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000		
y55	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	
asd	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000