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New Employment In Post-1990s Algeria: Are Rapidly Added Jobs Positively Affecting Economic Recovery?

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NEW EMPLOYMENT IN POST-1990s ALGERIA: ARE RAPIDLY ADDED JOBS POSITIVELY AFFECTING ECONOMIC RECOVERY?

by

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ABSTRACT

An apparent labor recovery success story since the turn of the century has been the reduction of Algeria's post-war high unemployment rate. However, there are reasons to doubt the effectiveness of government programs that induced the adding of large totals of short-term, low-paying jobs, particularly following new labor legislation in December 2004. By nature, this added employment has not been genuine permanent work for the educated that might be associated with labor productivity and economic growth. We use dynamic panel models with Arellano-Bond estimators by the generalized method of moments to suggest that Algeria has not exhibited the expected positive economic growth associated with its employment growth. We then use interrupted time series regressions to illustrate the behavior of the economy after 2004 and find significant negative level changes in both GDP growth and productivity that are not exhibited by a control group of nations.

CHAPTER I
INTRODUCTION

An apparent labor recovery success story since the turn of the century has been the reduction of Algeria's enormous unemployment rate on the heels of horrific civil and political unrest in the 1990s. The total rate of unemployment has been reduced by two thirds since the troubling 30 percent level of 2000, down to a 10 percent rate by 2012 that is much more in line with Middle East and North African (MENA) regional norms (World Bank, 2015). Additionally, economic growth, in terms of GDP, remained sufficient at near 2 percent or better through the same timespan (World Bank), suggesting that the instability and unpredictability observed during the chaos of the 1990s has subsided. This rapid "stabilization" of sorts offers an unusual opportunity to investigate the impact of the policies that have brought about the various types of added employment within a still-industrializing nation.

Even with the positives in mind, the unemployment rate is still much higher and the GDP growth rate lower than would be desired by a mid-level wealth nation with seemingly sufficient resources at hand to see significant growth in the current age of rapid-growth economies in Algeria's region and in Algeria's mid-level wealth profile grouping (Kpodar, 2008). What's more, the types of added jobs could largely be

considered “low-quality" and potentially non-growth-stimulating. Many new jobs are short-term or low-salary positions provided by the government for individuals (many of them older) with a low frequency of tertiary education (ONS, 2001-14; World Bank). While these positions might potentially contribute to the nation’s accumulation of capital, a key driver in the neoclassical growth models (Solow, 1956); they probably leave something to be desired in terms of promoting labor productivity and skills development, technological advancements [including R & D (Bassanini and Scarpetta, 2001)], and residual efficiency gains—all potentially powerful drivers of economic growth and development (Solow)—that might accompany the allocation of labor to a younger, more educated demographic (Denison, 1962). Unfortunately, even added positions for the young, educated demographic may principally have also been low-quality offerings (i.e. short-term, low-paying) as a means of pacifying restless youth desperate to put their training into practice (Musette, et al, 2014). As we shall see in our analysis, these new jobs may be failing to add much substance to the nation in terms of growth or advancement.

Dissatisfaction and Government Response

Despite the overall lowering of unemployment, the rates of joblessness among youth, women, and the educated have remained high (ONS). The ongoing frustration and unrest surrounding jobs issues (BBC, 2015) is a daily struggle that has still not come close to being solved (Musette). It should not be surprising that unsatisfied youth continue to demonstrate against rigid job market possibilities when the system seems contrived for

accommodating demographics other than themselves, as evidenced by the fact that both their age grouping and that of all individuals with higher education remain unemployed at nearly a 20 percent rate (Furceri, 2012). What's more, even though overall unemployment (10 percent) and male unemployment (8 percent) are down, the search for jobs for women remains a struggle [also around 20 percent are jobless (ONS)].

The government's response to the demands of the people has been proactive. Natural post-war recovery followed by government employment programs and business development incentives saw total employment grow by 44 percent from 2000 to 2006 (World Bank) and top out annually at 8.6 percent in 2005 (two and a half times its median rate for 1990-2014)—essentially overwhelming, in a raw statistical sense, all of

Figure 1: Rate of Unemployment in Algeria since 1990 (World Bank; ONS)

the unemployment rise of the 1990s in slightly more than half a decade (Figure 1). As we have already begun to suggest, it raises the question: Is it too good to be true? Did all of the added employment bring genuine benefit to the economy?

Low-Quality Jobs

Research of past "growth events" in other industrializing nations suggests that certain principles are repeated: added low-quality jobs potentially lead to a growth in the number of low-income working class individuals who cannot save or invest, a widening in the gap between rich and poor as more capital is accumulated for the rich at the hands of the aforementioned non-saving/non-investing working class, and decreased long-term per-worker productivity as the rate of technological change is stifled by restrictions on opportunities for educated workers (Melamed, et al, 2011). Meanwhile, adding higher quality jobs (for younger, more educated individuals within meaningful sectors of business) should lead to potential ingenuity in the workplace and therefore greater technological advancement, productivity, and growth (Eicher, 1994; Kelley, 1969).

In the case of Algeria, the perceived jobs needs and the increased ease for implementing federal programs following the end of violence have led to aggressive social policy in the last 15 years as part of the “liberal” or “liberal residual” component of the welfare capitalist system in Algeria (Titmuss, 1974; Merouani, 2015). This portion of the social welfare system attempts to invest in employment as a sort of social protection for the nation’s citizens during economic down times. The most influential policy decision was the passing of a new labor regulation entitled the “Program for

Professional Integration" (in French, "DAIP") in December 2004 (Merouani). The DAIP aimed to integrate first-time employees in the 18 to 35 age range into the formal workforce by granting them jobs and by paying all or most of their wages and benefits. Hundreds of thousands of jobs have been almost fully paid for through this program, but most positions are only one or two-year contracts and the vast majority of contracts are not renewed [Agency for Social Development (ADS) statistics; Merouani]. In the primary program targeting university or trade school graduates (a program formerly known as the CPE, but now called the PID), only 1 to 5 percent of granted positions have been confirmed to have continued to a second year during each annual period (ADS, Merouani). For the portion of the program that targets unemployed individuals who dropped out of school (formerly ESIL, now DAIS), jobs are again temporary and pay very low wages. In total, these two programs alone brought about nearly 2 million new 1- or 2-year work contracts from 2004 to 2012 in a country that only employed 10 and a half million people by 2012.

Beyond the DAIP regulation, two large-scale programs aimed at promoting entrepreneurship among qualified individuals have been responsible for the funding of many small business projects. ANSEJ (the National Agency for Supporting Youth Employment) has granted micro-credit for nearly 300,000 projects since 2007 (ANSEJ statistics; Merouani). Each project creates roughly two and a half jobs in the year it is launched. Additionally, a program for older individuals (ages 35 to 50) is run by the National Agency for Micro Credit (ANGEM). A half a million projects (nearly 750 thousand jobs), for example, were funded by this program in 2012 (ANGEM, Merouani).

However, there is little follow-up or accountability after funding has been dispersed. Only 65 percent of ANGEM participants paid back their micro-credit in 2012 and many have never filed for social insurance—the most basic practice for a new business to be recognized and supported by the government and to have the right to formally hire employees (Merouani). In the end, considering ANGEM and other government programs, well over two thirds of new jobs in 2012 could be credited to government-funded short-term work or project financing from a government agency (Musette).

Table 1: Partial summary of government-induced added employment (ONS, ADS, Merouani, Melamed)

	Example Programs' (CPE/ESIL) Added Jobs	Permanent Salaried Worker Rate	Non-Permanent Salaried Worker Rate
2003:	80,500	**41%**	**21%**
2004:	123,300	38%	21%
2005:	117,600	39%	28%
2006:	145,800	32%	28%
2007:	183,600	33%	30%
2008:	189,800	34%	30%
2009:	158,100	**32%**	**32%**

All told, as we see in Table 1, the percentage of formal wage-earning workers with permanent (i.e. long-term) positions dropped from 41 percent in 2003 to only 32 percent in 2009, while the percentage of non-permanent (i.e. mostly non-renewed contracts) wage-earning workers rose from 21 percent to an identical 32 percent level by 2009 (Musette). Indeed, a broad cross-section of the government-funded programs that have contributed heavily to the decrease in the unemployment rate have been short-term

and/or low-paying—affecting a significant turnover of individuals from year to year that does not seem conducive to promoting the productivity and economic growth that should be associated with employment growth.

With plenty of ground still to be gained in high-quality jobs creation and long-term unemployment reduction--particularly among youth, the educated, and women--areas of recent labor growth are worth exploring in an effort to see the effectiveness of new government jobs creation policies and to evaluate how well the added work might be fueling or slowing growth. Specifically, the rest of this paper aims to use econometric techniques to analyze whether GDP growth and productivity have responded to total employment growth in Algeria at expected levels. If not, we assume the counterfactual condition that the government initiatives have not affected positive economic outcomes. We begin by presenting panel data configurations—primarily dynamic panel models according to Arellano-Bond specifications for generalized method of moments estimators—that isolate the relationship between added labor and our dependent variables of interest for Algeria and other mid-level wealth nations in the MENA region. Then, we examine a series of interrupted time series (ITS) models that allow us to analyze economic trends in Algeria before and after the employment policies that have been rolled out by the government. We extend this analysis to compare the behavior of Algeria to that of economically similar nations in an effort to strengthen the foundation of our hypothesis: that economic growth and labor productivity have not been affected positively by government employment interventions during Algeria's recovery from the unrest of the 1990s.

CHAPTER II
METHODS AND DATA

At the outset of this research, we hoped to construct data sets that would allow us to isolate the marginal impact of various types of jobs that have been added in Algeria since 2000. We planned to consider variables for demographics, business sectors, and types of employment to find which types of jobs have most positively affected the economy. Unfortunately, after much effort, due to the lack of frequency of data collection in the country, the lack of good data from before 2000, and the lack of rich data from similar nations, no time series with enough observations could be constructed or projected for these types of data for the above-mentioned type of analysis to be completed. Instead, we have endeavored to estimate answers to a couple of key questions using other methods: 1) What should be the response of the economy when jobs are added in a country of Algeria's profile and 2) what has been the actual behavior of the Algerian economy following growth in total employment brought on by many short-term and/or low-income positions?

To answer these two questions, we will work in two econometric spheres. First, we present several panel data configurations—namely, dynamic panel data models using Arellano-Bond generalized method of moments estimators—aimed at estimating how an

economy of Algeria's type will typically respond to jobs growth, which we define as the annual rate of change in total employment. We use the results to analyze the specifics of Algeria's economic outcomes following its broadest application of social labor policies (2004).

Second, we further circumvent the issue of short time series by focusing on the mentioned 2004 point of implementation of the labor programs to uncover in-country economic trends before and after the intervention. We do this by constructing numerous interrupted time series (ITS) models. With our ITS models, we intend to reject the null hypothesis that there has been no change in levels and/or trends for GDP growth and labor productivity totals in Algeria since the passing of our concerned employment plan.

Finally, it should be discussed that we employ a control group of five nations similar to Algeria for construction of the panel data and for the establishment of baseline economic behavior at the time of the interruption in our ITS analysis of labor productivity. The control group is made up of the only five nations in the world (a) who are in Algeria's regional grouping (Middle East and North Africa) and (b) who have been (and are currently) in Algeria's upper middle income classification for all or the majority of our studied period of 1989 to 2014 (World Bank). These nations are Iran, Iraq, Jordan, Lebanon, and Tunisia. In addition to the general kinship mentioned, we use these nations because their "pre-treatment" (prior to the post-2004 period of deepest analysis) collective demographic and economic statistics demonstrate no statistically significant differences from those of Algeria (Table 2); also, the concerning shocks of

Table 2: Difference in means T-test of control group characteristics and Algerian characteristics in 2003 (ONS, World Bank)

Statistic	Algeria	Control Group Mean	P > |t|
Population:	32.4 million	22.6 million	(.354)
Total GDP (*2005 $)*:	$93.4 billion	$53.0 billion	(.273)
Total Employment:	7.4 million	5.8 million	(.415)
Productivity: (*GDP/worker/hr in 2005 $*)	$6.90	$5.85	(.318)
Unemployment Rate:	23.7%	16.1%	(.178)

unrest, war, and sanctions in the control group and Algeria can be statistically diminished through robustness controls.

Models and Data: Panel Data

For our panel series models, we use panels of annual time series data for 1989 to 2014 for Algeria and the five control group nations. With this selection of data, we collect 156 observations from national accounts data of the World Bank and OECD and 130 labor-related observations available based on the World Bank's projections from International Labour Organization (ILO) surveys and research. All Algeria-related data from the ILO match the original survey results published in-country by the National Office of Statistics (ONS), which we verified extensively to be sure that research here corresponds with that of Algerian researchers.

In attempting to establish the inference of causality between past values of x on the dependent y with cross-sectional time series data, we typically must incorporate

lagged values of both variables as we attempt to minimize unobserved confounders. However, incorporating lagged values of our dependent variable and our independent variable of interest will almost certainly involve some level of correlation between lagged regressors and error terms when we employ standard fixed effects dynamic panel models. Thankfully, we have a solution that largely minimizes this issue while maintaining efficient estimations of coefficients: using the generalized method of moments (GMM) and its reliance on lagged variables as instruments for calculating what is referred to as an Arellano-Bond estimator. This type of estimation for dynamic panel data fits our needs well for establishing the nature of the relationship between employment growth and periods-ahead GDP growth in Algeria and our control group nations, as it is specifically designed for data sets with low *T* values. As such, we use the following model as an example of our base fixed effects problem:

$$y_{ct} = \alpha_1 y_{c,t-1} + \alpha_2 y_{c,t-2} + \beta_1 x_{c,t-1} + \beta_2 x_{c,t-2} + \upsilon_c + \varepsilon_{ct} \ ,$$

where *y* is our dependent growth variable for a specific country *c* in year *t.* The coefficients β are the estimates of the impact of lagged values of *x,* the independent variable for labor growth for country *c* in year *t,* on our dependent variable *y*. The independent variable υ is in fact a series of dummy variables coinciding with existence in group *c* that each represent the time-invariant fixed effects of the country *c* on the dependent variable. The coefficients α are the estimates of the impact of lagged values of *y*, of which we will maintain the significant values in our Arellano-Bond estimation.

We also include whichever lagged values of x that are BOTH individually significant and jointly significant according to an F-test or Wald test. The error term here is ε_{ct}.

Taking the first difference of our base fixed effects equation and simplifying it leaves us with,

$$\Delta y = \Delta R\pi + \Delta v \ ,$$

where R represents our regressors and π is the parameters. We then generate the Efficient Generalized Method of Moments estimator as,

$$\pi_{\text{EGMM}} = [\Delta R'Z(Z'\Omega Z)^{-1}Z'\Delta R]^{-1}\Delta R'Z(Z'\Omega Z)^{-1}Z'y \ ,$$

where Z is the instrument matrix for ΔR. The matrix Ω for the standard one-step Arellano-Bond estimator (Arellano, 2003) is computed from the variance of the error terms ε_{ct}. We choose not to use log transformed variables here to manage the existence of many negative growth observations. The outputs will allow for estimates for Algeria and its counterparts' GDP and labor relationship, for which our results will suggest a positive impact of diminishing returns from lags of total employment growth on GDP growth.

To take one more small step in supporting the idea that above-normal jobs growth may not always correlate to economic growth, we construct probit regressions that estimate the probability of strong economic growth happening when different labor growth thresholds are met. We again incorporate country-specific fixed effects. Primarily, we ask the question, "What is the probability of GDP growth reaching levels above the country-specific median level for the 1989 to 2014 period when the

corresponding lagged annual jobs growth was at the 80th percentile or greater for yearly employment growth values for all six nations?" Explained within the conceptual framework of the model, we have,

$$\Pr(Y = 1 \mid X) = \Phi(X'\beta),$$

where Y is a binary variable for GDP growth being greater than the country-specific median annual GDP growth value for our studied time period. Our group of regressors X are made up of a binary variable for the lag of jobs growth being at the 80th percentile or above for annual labor growth values across the six nations, plus the same six binary variables that control for fixed country effects by representing each observation's occurrence in its country. Our parameters β are estimated by maximum likelihood procedures and represent the effect on the probability of Y being true when a particular regressor from the group X happens or is true. Lastly, the cumulative distribution function of the standard normal distribution is shown by Φ.

Models and Data: Interrupted Time Series (ITS)

As mentioned earlier in this work, the data available in Algeria and nations similar to it are not frequent enough nor longstanding enough for the construction of time series containing enough observations for use in standard least squares regressions. Similarly, data are not rich enough and research methods are not very feasible for the building of models of randomized design that might evaluate government policies. With these known limitations, a strong alternative—especially for evaluating community or

government interventions—is the implementation of interrupted time series (ITS) regressions (Biglan, et al, 2000). ITS analysis can be carried out when the moment of an intervention or shock is known and we wish to evaluate any change in the level or slope (trend) of the outcome following the interruption. This type of analysis has frequently been implemented for assessment of affected individuals' behavior post-intervention (Gelardi, 1996) and for comparing a performance metric before and after an intervention (Cullen, Levitt, et al, 2013; Dee, et al, 2010), the latter of which is our endeavor, as we examine Algeria's economic performance in terms of economic growth, labor productivity, and unemployment rate.

ITS uses segmented regression analysis and is carried out in the following design:

$$Y_t = \beta_o + \beta_1 \text{ x } \textit{pre-intervention}_t + \beta_2 \text{ x } \textit{intervention}_t + \beta_3 \text{ x } \textit{post-intervention}_t + e_t \ ,$$

where Y is our dependent variable of interest (i.e. unemployment, GDP growth, and productivity in our work), *pre-intervention* is an integral variable for the number of time periods from the beginning of the time series, *intervention* is a binary variable taking on a value of 1 for post-intervention years and 0 otherwise, *post-intervention* is a second integral variable for the number of time periods following the intervention, and e is our error term. The model estimates the parameters β_o for the base level of the outcome before the interruption, β_1 for the baseline trend before the interruption, β_2 for the change in level of the outcome post-intervention, and β_3 for the change in trend (slope) post-intervention.

We use the above specification to highlight the apparent relationship between unemployment, GDP growth, and worker productivity and the Algerian government's December 2004 decision to implement programs that stimulated the adding of many low-income, short-term jobs. Further, we compare identical ITS specifications for Algeria to world nations and our control group nations to confirm mathematically that the type of changes in GDP growth and productivity levels following its intervention were confined to the Algerian context. General conditions (Ramsay, et al, 2003) for this type of analysis suggest that we should have all observations spaced equally (ours are annual), that there should be at least 10 plotted points in time after the intervention (we have exactly 10, from 2005 to 2014), that at least 80 percent of the population should be considered in plotted observations (this does not apply to us; we employ national GDP and labor variables), and that evidence of any simultaneous change in relevant conditions should not be the source of level or trend changes in our treated individual or group (i.e. secular trends and environmental shocks must be considered).

Beyond the standard ITS model, we implement a second, 2-event/3-segment specification that accounts for the quick change in macroeconomic conditions that began in 2000 following the end of the fighting of the 1990s. That specification is as such,

$$Y_t = \beta_o + \beta_1 \text{ x } \textit{pre-interruption}_t + \beta_2 \text{ x } \textit{interruption1}_t$$

$$+ \beta_3 \text{ x } \textit{post-interruption1}_t + \beta_4 \text{ x } \textit{interruption2}_t$$

$$+ \beta_5 \text{ x } \textit{post-interruption2}_t + e_t \text{ ,}$$

where *pre-interruption* is the same as *pre-intervention* from the first equation, *interruption1* is a binary variable taking on a value of 1 for 2000 to 2004 (between interruptions) and 0 otherwise, *post-interruption1* is an integral variable for the number of time periods following the violence (2000 is 1, 2002 is 2, and so on), *interruption2* is the same binary variable as *intervention* in the first ITS specification, *post-interruption2* is likewise an integral variable akin to *post-intervention* from the first equation, and *e* is still our error term. Our parameters are these: β_o and β_1 are the same as the first ITS regression, β_2 and β_4 are the changes in output level following their corresponding interruptions, and β_3 and β_5 are the changes in trend following their corresponding interruptions.

Our data series are again taken from World Bank and OECD national accounts data and World Bank, ILO, and ONS labor series. We use the following simple equation to normalize productivity units across the same six upper middle income MENA nations as before:

per-worker, per-hour productivity = real GDP in 2005 $ /

annual total employment / estimated average yearly working hours,

where we assume an average of 46 real weeks of work times 40 hours per week, according to Algerian labor norms and 2013 ONS per-week working hour estimates. This equation yields productivity values in the $2-per-hour to $12-per-hour range for Algeria and the five control group nations for all years, including years of unrest or economic sanctions.

CHAPTER III
RESULTS & DISCUSSION

Panel Data Results

Before making the final selection of our preferred dynamic panel models, we present a correlations table (Table 3) to demonstrate the interactions among our considered variables. In the end, we feel comfortable that none of the possible dependent variables, with these correlation statistics, will present an overpowering effect on the efficiency of

Table 3: Correlation statistics for considered lagged values of GDP growth and jobs growth

	gdpgr..th	Lgdp..h	L2gdp..h	L3gdp..h	L.JG	L.JG^2	L2.JG
L.GDPGrowth:	-0.011	1.00					
L2.gdpgr..th:	0.015	0.085	1.00				
L3.gdpgr..th:	-0.039	-0.160	-0.139	1.00			
L.JobsGrowth:	-0.175	0.308	0.389	-0.099	1.00		
L.JG^2:	0.254	-0.087	0.448	-0.258	0.586	1.00	
L2.JobsG..th:	0.035	-0.154	0.305	0.285	0.204	0.148	1.00
L2.JG^2:	-0.023	0.242	-0.084	0.343	0.193	0.108	0.584

our estimators, which are configured to reduce endogeneity much better than standard panel data models. Perhaps the most concerning pairs are the total employment growth (jobs growth) variables and their squares. We conclude from testing numerous models that there is a nonlinear relationship between jobs growth and GDP growth. Including quadratic independent parameters that may be somewhat correlated seems necessary and

unavoidable here. We should mention that we also add other variables to our growing multivariate model and find limited significance from them; namely, changes in oil prices through the period had little transcendent impact.

We systematically build our dynamic panel model lag by lag and variable by variable, always including no more lags of our studied independent labor variables than we retain of our dependent *y*; that is, GDP growth. Using a robust one-step system GMM estimator, and having included time variables in our model as exogenous regressors for the removal of universal time-related shocks from the errors according to the recommendations of Roodman (2009), we find that all seven of the variables from Table 3 can be included in our model (three lags of GDP growth and two lags each of jobs growth and jobs growth squared). They are all significant in a single model or in combinations with certain variables removed. In fact, the significance of the coefficients for these models is present in both simple or robust specifications. We choose to show robust results, as they yield stronger Wald tests for joint significance and they tend to minimize the impact of extreme results for both jobs and growth variables during times of unrest for all six studied nations. Beyond the seven mentioned variables, the inclusion of a fourth lag for GDP growth or a third lag for the total employment growth variables yield some insignificant coefficients; thus, we do not present results of models which include them or any greater lags. We begin with the parameters for a model containing all seven mentioned significant variables employed for GMM-style instrumentation (Table 4, "AB1"). Because instruments are equal to the number of observations, we are at maximum capacity for instruments here. We feel compelled to leave the model as it is

because of the need to instrument all of our seven independent variables of concern to control for potential correlation with other regressors and the error terms—despite the fact that the Hansen statistic has reduced meaning (Prob > 1.00 is not plausible) because

Table 4: Results for dynamic panel model AB1, estimated by robust one-step system GMM.

Variable	Coefficient	Standard Error	P>|z|
LagGDPGrowth:	.531	(.187)	(.005)
Lag2GDPGrowth:	-.225	(.115)	(.026)
Lag3GDPGrowth:	.129	(.049)	(.008)
LagJobGrowth:	-1.847	(.655)	(.005)
LagJobGrowth^2:	17.462	(4.42)	(.000)
Lag2JobGrowth:	1.093	(.607)	(.072)
Lag2JobGrowth^2:	-9.515	(3.86)	(.014)
year1-year26 (jointly insignificant)			
constant:	.011	(.025)	(.653)

N = 125; Wald stat = 194.25, Prob > chi^2 = 0.00
Arellano-Bond test for 1st & 2nd level autocorrelation in first differences: 0.082/0.156.
Sargan test of overid. stat: 123.46; Prob > chi^2 = 0.036
Hansen test of overid. stat: 0.00; Prob > chi^2 = 1.000
Wald test stat for joint significance of 4 JobGrowth variables:18.18; Prob > chi^2 = 0.00

of the possibility that we have employed too many instruments (although the test still suggests robust results here). The Arellano-Bond test for first and second order autocorrelation is also potentially suspect, as it is designed for larger numbers of observations in each panel. Our panels only hold roughly 20 observations each. The meaning of the Sargan test result here is that we reject the null that our instruments are definitely valid (i.e. they may be invalid, so we cannot strongly assert validity). Note the very strong Wald results for the entire model and the jobs growth variables jointly.

We move on to consider a model without the third lag of GDP growth (Table 5; "AB2"). Here, many of our test results are similar—but the Wald test stats are improved, from 194.25 in AB1 to 342.92 in AB2 here.

Table 5: Results for dynamic panel model AB2, estimated by robust one-step system GMM.

Variable	Coefficient	Standard Error	P>|z|
LagGDPGrowth:	.454	(.141)	(.001)
Lag2GDPGrowth:	-.227	(.097)	(.019)
LagJobGrowth:	-1.748	(.595)	(.003)
LagJobGrowth^2:	15.522	(3.31)	(.000)
Lag2JobGrowth:	1.043	(.556)	(.061)
Lag2JobGrowth^2:	-7.528	(2.82)	(.008)
year1-year26 (jointly insignificant)			
constant:	.017	(.021)	(.422)

N = 125; Wald stat = 342.92, Prob > chi^2 = 0.00
Arellano-Bond test for 1st & 2nd level autocorrelation in first differences: 0.077/0.206.
Sargan test of overid. stat: 127.66; Prob > chi^2 = 0.024
Hansen test of overid. stat: 0.00; Prob > chi^2 = 1.000
Wald stat for joint significance of 4 JobGrowth variables: 308.68; Prob > chi^2 = 0.00

Finally, in Table 6, for Model AB3, we remove the second lag of all variables, retaining only the first lags. This final model yields the strongest Wald test statistic for the joint significance of jobs variables and of all included variables (1709.89 compared to 342.92 and 194.25 for AB2 and AB1). Thus, we use this third model to predict GDP growth values and to compare the predictions to real life in Table 7.

Although we have not discussed the specifics, it has been mentioned that there appears to be a diminishing positive impact of added jobs—an assumption that is

Table 6: Results for dynamic panel model AB3, estimated by robust one-step system GMM.

Variable	Coefficient	Standard Error	P>|z|
LagGDPGrowth:	.323	(.036)	(.000)
LagJobGrowth:	-1.581	(.506)	(.002)
LagJobGrowth^2:	12.617	(1.71)	(.000)
year1-year26 (jointly insignificant)			
constant:	.0301	(.012)	(.013)

N = 131; Wald stat = 1709.89 Prob > chi^2 = 0.00
Arellano-Bond test for 1st & 2nd level autocorrelation in first differences: 0.141/0.177.
Sargan test of overid. stat: 143.49; Prob > chi^2 = 0.009
Hansen test of overid. stat: 0.00; Prob > chi^2 = 1.000
Wald stat for joint significance of 2 JobGrowth variables: 448.06; Prob > chi^2 = 0.00

supported by the quadratic relationship illustrated in our three models. It is interesting to note, then, that even with these diminishing returns factored into the final dynamic panel models, we still see that the added jobs variables considerably over-project what

Table 7: Predicted GDP growth vs. actual GDP growth for Algeria for five-year period during peak total employment growth

	Predicted Cumulative GDP Growth for Algeria	Actual Cumulative GDP Growth for Algeria	Avg. Cumulative GDP Growth of our 5 similar nations(Predicted/Actual)
2004-2008:	24.4%	18.5%	44.2/45.5%

Algeria's growth rate should have been during the years with the highest increases in total employment, 2004-2008. The Table 7 totals illustrate the point well, but the results

of our second highly significant model (AB2) are even stronger—projecting Algerian GDP growth at a full 2.6 points per year higher than reality during the 2004-2008 period. In fact, a difference in means T-test for the most important period (2006-2008, immediately after the year of greatest total employment growth), suggests a statistically significant difference between estimated Model AB2 values and real-life values ($P > |t| = 0.054$). Even while oil prices—a huge component of the Algerian economy (Musette)—remained strong, and even while other oil-dependent and otherwise regionally and economically related nations maintained growth beyond their "jobs-growth-predicted" values, Algeria's values were low. Because we have considerable doubt that Algeria's total employment growth positively affected GDP growth outcomes during our concerned period, we would assert the counterfactual proposition that the added jobs during the period did not live up to the inferred causal expectation of economic growth and were mostly cosmetic with their short-term and low-paying characteristics.

Generally speaking, further evidence of diminishing returns (i.e. the possible lack of economic impact brought on by adding many low-quality jobs in our concerned context) can be found in the results of our probit specification. This specification[1] predicts that a nation with a lagged jobs growth value in the top 20 percent of values for all countries for all years in the study will see GDP growth exceeding its own 26-year median annual GDP growth rate only 58 percent of the time. Results of the "Top 20%" configuration are in Table 6. We can see from the chart that our overall numbers don't

[1]We report only this specification as representative of similar results from other models which attempted various thresholds and varying lag combinations.

suggest extreme significance; still, the Top20JobsGrowth variable is significant and we can make the estimate that a high level of jobs growth only amounts to about a 58 percent chance of being associated with stronger than median levels of GDP growth in the following year. This supports our earlier findings that a positive relationship

Table 8: Probit FE, regressing binary variable for more than median GDP growth on binary variable for Top 20% of annual jobs growth instances

Variable	Coefficient	Standard Error	P>|z|
Top20JobsGrowth:	.672	(.294)	(.023)
Algeria FE:	-.057	(.387)	(.883)
constant:	-.033	(.267)	(.900)

Prob > chi2: 0.36; Pseudo R-squared: 0.036; Observations: 132

between jobs growth and GDP growth does not necessarily always carry through to the highest levels of jobs growth. The freedom to reject the notion that high total employment growth automatically equates to strong GDP growth confirms our previously asserted freedom to propose the counterfactual that Algeria's high jobs growth did not correspond to strong economic growth outcomes.

ITS Results: GDP Growth

We begin our ITS analysis with a look at results for our specification for GDP growth (Table 9). Recall that we define our intervention as beginning in 2005, just after the

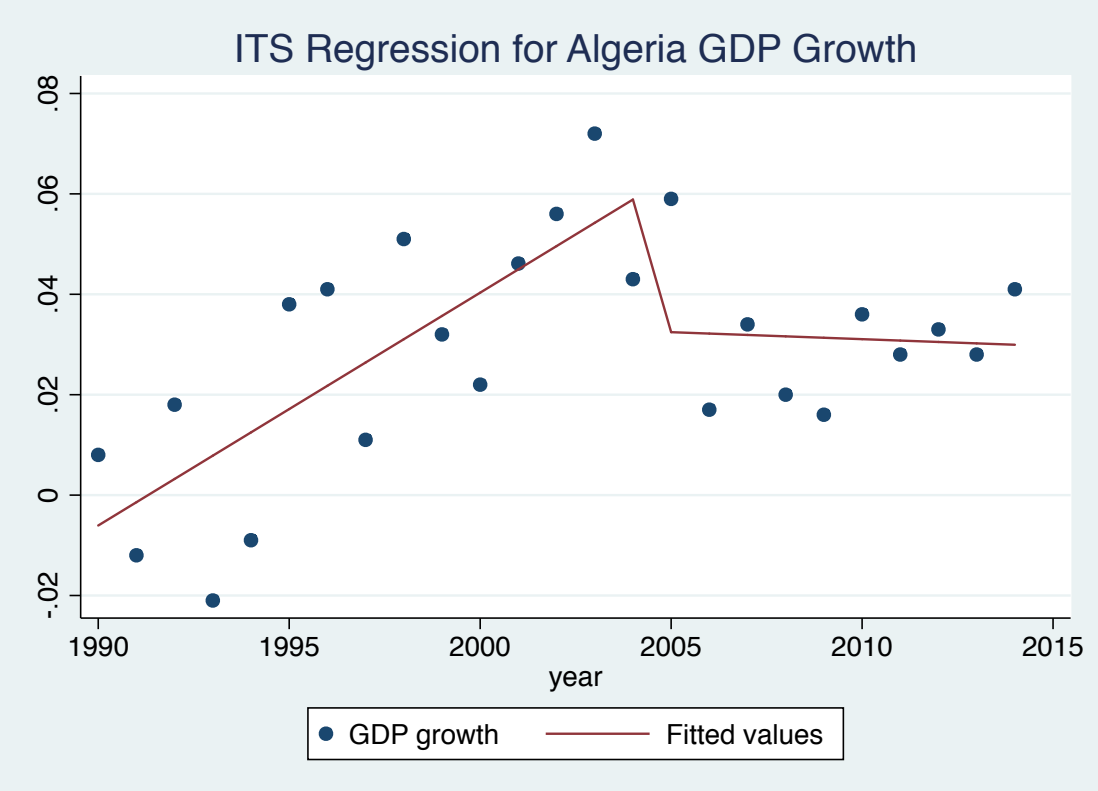
Table 9: ITS regression for Algeria GDP growth

Variable	Coefficient	Standard Error	P>|t|
Pre-intervention:	.0046	(.001)	(.000)
Intervention:	-.026	(.014)	(.073)
Post-intervention:	-.0049	(.002)	(.027)
constant:	-.006	(.008)	(.463)

Adj. R-squared: .451; Root MSE: .016; Observations: 25
Robustness: No observations with Cook's D values > 1 (i.e. nothing to drop)

passing of the new employment regulations of December 2004. We see from the chart that our results are significant on a number of levels. GDP growth not only dropped in

Figure 2: ITS for GDP Growth in Algeria

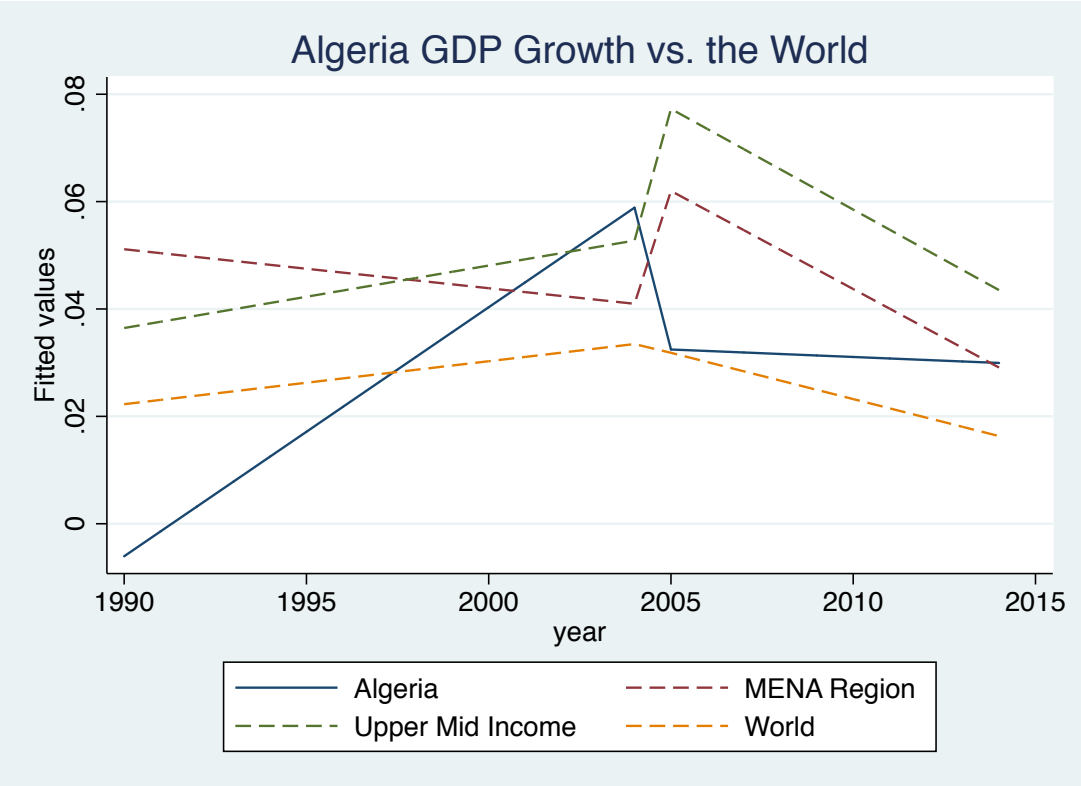


level after the intervention, with better than a 10 percent significance level, the trend also fell—beyond a 5 percent significance level. The graph in Figure 2 illustrates this nicely. For ITS results of this type to be meaningful, however, we must analyze whether there are any secular trends or contextual changes impacting Algeria's situation.

We next run the same ITS regression with nations of the world to put Algeria's situation into context[2]. Figure 3 shows the difference between the behavior of GDP growth for Algeria and that of the world, Algeria's region, and Algeria's economic grouping. We note similar kinks in the paths of all of the other groupings. However, level changes and trend changes are statistically insignificant in the world and MENA region regressions. On the other hand, changes for upper middle income nations are significant. First, there is a significant fall in trend (-0.0049, beyond the 0.05 significance level) that matches the fall in trend in Algeria. This provides some evidence, then, that Algeria's fall in trend may be attributed to changes in secular trends around it. In spite of this similarity, the significant change in GDP growth rate level in the upper middle income nations goes contrary to that of Algeria—resulting in a positive coefficient of 0.028 to the 0.054 significance level. This positive level change can be attributed at least in part to the rising post-Iraq war elevated oil prices, to which the upper middle income

[2]We show these results because the graphic representations of the situations of our control group nations for this ITS specification are a bit erratic due to period unrest in all five nations. In the end, only Jordan experienced a small, slightly significant drop in GDP growth rate trend post-intervention. All other trend and level changes were insignificant on the country level. A joint robust regression of the five nations' means yields a significant increase in GDP growth level post-intervention, consistent with the demographic-wide situation for upper middle income nations. There was no significant trend change.

Figure 3: Algeria GDP Growth vs. the World



nations' GDP growth correlates at a 0.43 level. The same correlation does not exist for Algeria, the world, or the MENA nations.

The fact that Algeria's significant negative change in GDP growth goes contrary to regressions of the world, the MENA region, and upper middle income nations implies that there is some evidence here to corroborate our earlier clues that not moving forward with strong measures for adding labor may have allowed Algeria's GDP growth to stay at higher levels through the last half of the decade of the 2000s. All nations demonstrate an observable, albeit statistically insignificant, kink in their paths in Figure 3 because of the high mid-2000s growth levels and subsequent downward trends brought on by the combination of the impact of post-Iraq war oil prices being elevated, followed by the

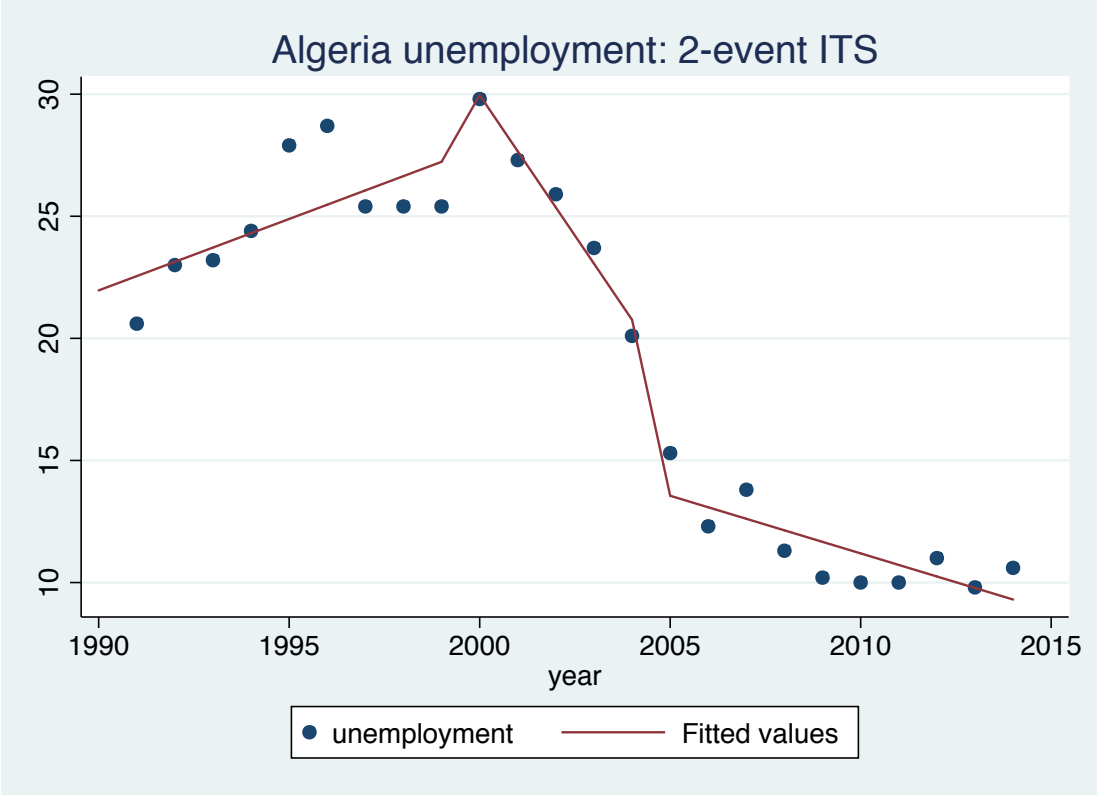
worldwide recession (and the currently falling oil prices in the case of the MENA and upper middle income groups). However, all groupings enjoyed several more years of above average growth that Algeria did not see following its mass job additions policies —despite its economy's dependence on oil and expected associated benefits. The fact that we can (a) reject the notion that Algeria's GDP growth level is unchanged (but is significantly altered toward the negative), (b) accept the opposite significant evidence that other upper mid-level wealth nations enjoyed an uptick in GDP growth level, and (c) reject the null that other groupings experienced significant changes to their growth levels all suggest that we could reject the notion that Algeria's growth outcomes were positively affected by its jobs intervention.

ITS Results: Unemployment and Labor Productivity

One of the benefits of ITS design is the ease with which we may estimate the absolute impact of an intervention because of the nature of the parameters that are constructed. For our work, we will move to another outcome of interest to consider an absolute impact question in general terms: Would unemployment have fallen naturally without the jobs addition intervention? We readily recognize that an outcome such as unemployment is potentially volatile and depends on factors that our work may not encompass. However, we conduct a graphical thought experiment related to unemployment because this is the macroeconomic statistic that would be most readily recognized by the casual observer and was most likely the statistic for which the Algerian government wished to

ease its citizens' minds in adopting its policies. We look at a 2-event ITS specification for unemployment (Figure 4). Here, the first event (kink) represents the coming of peace

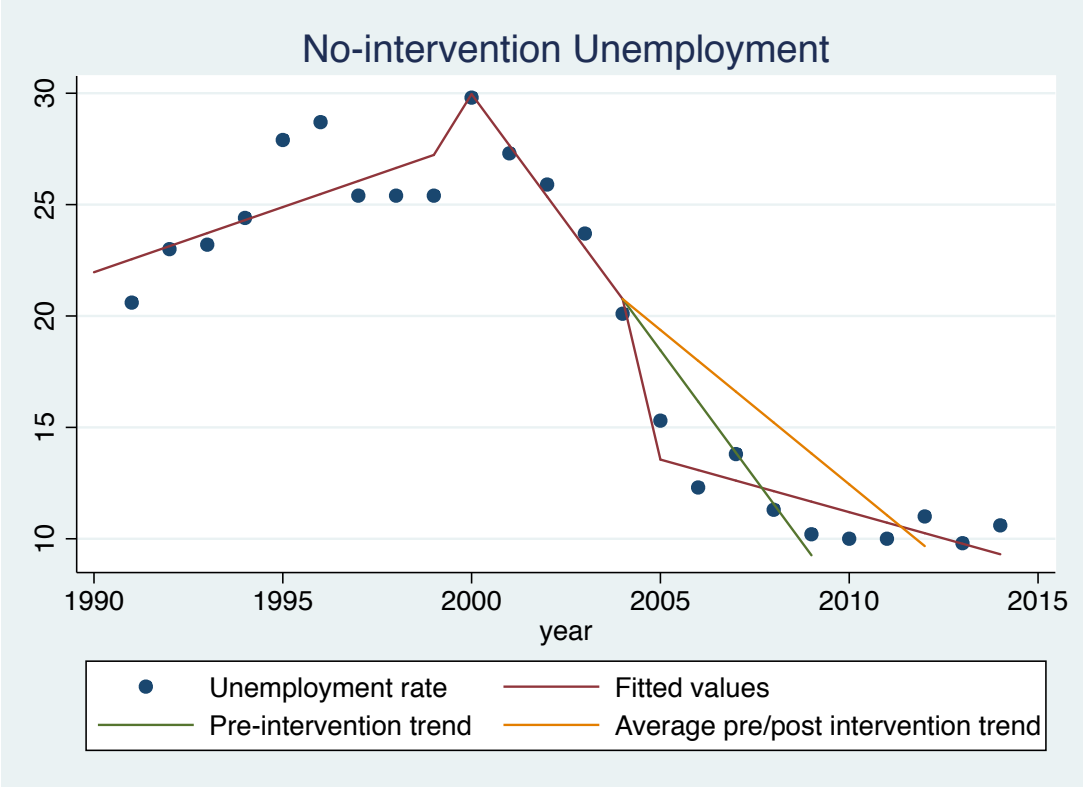
Figure 4: Algeria's unemployment under a 2-event ITS specification



at the end of the civil war of the 1990s. The second again represents our studied intervention. In this case, we see that there was already a rapid fall in unemployment taking place, which came naturally with the inherent freedoms to work and live as normal following the war. In fact, if we imagine the post-war trend had continued (unlikely, but we'll consider it for illustration's sake), the current trend line for unemployment would have been crossed only a couple of years after social labor

programs were accelerated (note the green line in Figure 5). Perhaps more realistically, consider an averaging of the post-war trend and the post-intervention trends. It seems

Figure 5: Algeria unemployment under 2-event ITS specification, with pre-intervention trend continued and with imagined average pre- and post-intervention smoothing trend



possible that less aggressive additions of employment may have allowed the trend to smooth more organically in this manner (yellow line in Figure 5). If so, could we envision that there is at least some possibility that lost government monies and lost low-quality work hours could have been re-allocated toward activities that could have smoothed the corresponding significant negative level change we see in the ITS chart for post-intervention GDP growth (Figure 2) as well.

Lastly, we also run a two-event ITS specification for labor productivity, which, according to previously mentioned growth models (Solow), is the foundational variable for beginning to evaluate the impact of workers on economic growth. We certainly hope that productivity, possibly as much as anything, will respond well to shocks brought on by labor policy change. The results of our productivity ITS specification are in Table 10 and Figure 6. From the table results, we see that there was a significant rise in the labor

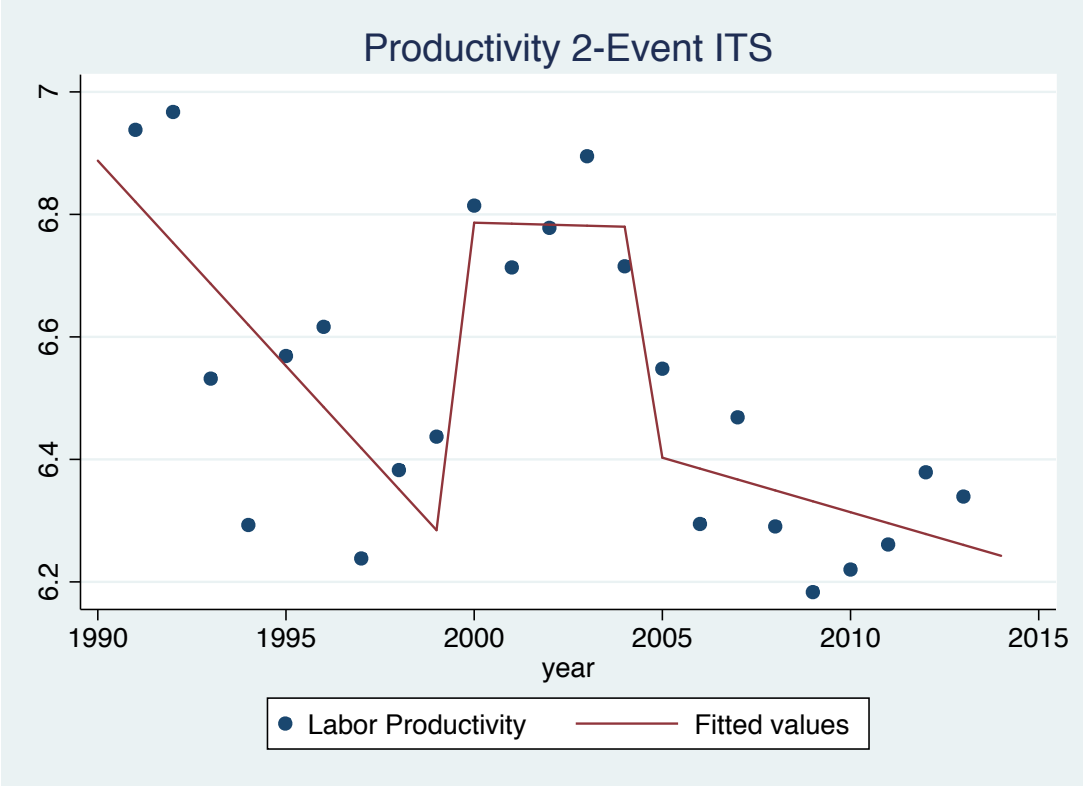
Table 10: ITS 2-event regression for Algeria labor productivity

Variable	Coefficient	Standard Error	P>|t|
CivilWarTrend:	-.067	(.019)	(.003)
EndCivilWar:	.503	(.181)	(.013)
PostWarTrend:	.065	(.051)	(.217)
Intervention*:	.144	(.275)	(.607)
PostIntervention:	-.016	(.051)	(.755)
constant:	-.006	(.008)	(.463)

Adj. R-squared: .635; Root MSE: .149; Observations: 23
Robustness: No observations with Cook's D values > 1 (i.e. nothing to drop)
*Post-2000 regression results for "Intervention": Coef. -.359, S.E. .114, P>|t| = 0.01

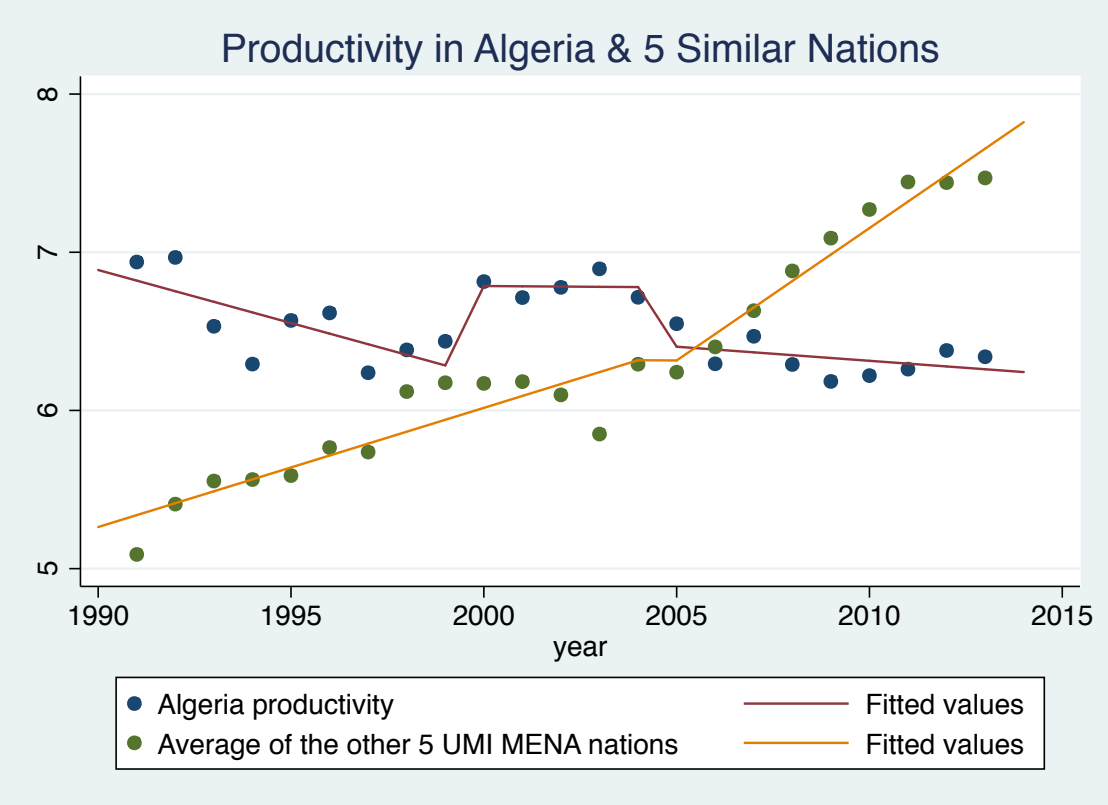
productivity level after the civil war, signified by "EndCivilWar." We then see from the partial, post-2000 regression in the notes that there was a very significant fall in productivity level after the intervention ("Intervention" and "Post-Intervention" full-period regression results do not mean much because they are being compared with the initial level and trend). Figure 6 shows the significant rise and fall.

Figure 6: Labor productivity 2-event ITS for Algeria



Finally, to contrast the situation of the previously studied five control group nations from Algeria's income and geographic groupings, we compile the average labor productivity rate for the group and run a single-event ITS specification at the time of Algeria's intervention. We see from the graph (Figure 7) that there is virtually no kink for the five-nation group, but instead a relatively steady, highly statistically significant, incline in productivity over the entire 25-year period. Strikingly, we notice how the group's productivity rate has ascended nicely every year since the time of Algeria's intervention, while Algeria's productivity predictably fell significantly and has

Figure 7: Algeria labor productivity compared to the average of the control group of 5 upper middle income MENA nations



floundered at lower levels as the large numbers of temporary, unskilled workers struggle to add value to the economy. If we look closely at 2001 to 2003, during immediate post-war recovery, we notice that Algeria seemed headed toward a trajectory similar to its relatives. We wonder, once again, what may have happened with Algeria's economic outcomes path if the government had interceded in a smoother manner.

CHAPTER IV
CONCLUSION

We have shown that Algeria has used aggressive social policies for providing jobs for its citizens while navigating through the global recession unscathed (Aly, 2010) and avoiding the intense unrest of the Arab Spring (Musette) during the recovery period following the "dark decade" of the 1990s. Unfortunately, evidence from dynamic panel data specifications using GMM via Arellano-Bond estimators suggests that the numbers of jobs added in the middle and late 2000s have not exhibited the apparent causal relationship with GDP growth that would be expected by nations similar to Algeria. Further, ITS results show significant level changes toward the negative for growth and productivity in Algeria—beginning at the time of the most drastic labor intervention at the end of 2004. These pieces of evidence cause us to conclude that Algeria's employment intervention programs have not had a positive impact on economic outcomes.

Questions for policy makers will remain as to whether the undertaken steps were too drastic and too hurried. In the future, efficiency gains from programs of the sort analyzed here might come from budgeting less money toward volumes of short-term jobs and more money toward oversight and accountability that (a) lead to firms' genuine

use of government-funded stimuli for the training necessary to keep employees for long-term contracts and that (b) lead to the development of entrepreneurial endeavors beyond their infancy.

Further work here could involve deepening investigation into the relationship between economic growth and employment growth by experimenting with additional global control groups and by tracking Algeria's growth within the specific parameters of modern growth models to isolate the performance of its labor variables.

What's more, as data are available, studies into other development indicators (female unemployment and female productivity, for example) and their responses to specific government policies will be worthwhile in the future.

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