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# IMF Working Paper

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## Why Has Unemployment in Algeria Been Higher than in MENA and Transition Countries?

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**IMF Working Paper**

African Department

**Why Has Unemployment in Algeria Been Higher than in MENA and Transition Countries?**

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Authorized for distribution by Domenico Fanizza  
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**Abstract**

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This paper analyzes the determinants of labor market performance in Algeria. When the model is estimated with panel data on a sample of MENA and transition countries for 1995–2005, the results suggest that lower growth in labor productivity in Algeria is associated with higher unemployment than the sample average, though recent positive terms of trade shocks have helped Algeria reduce the differential. Labor market rigidities and labor taxation do not seem to explain why unemployment is higher in Algeria than in other countries. The results are robust to various panel econometric methods and instrumental variable estimates.

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Contents	Page
I. Introduction .....	3
II. Stylized Facts .....	3
III. Determinants of Labor Market Performance .....	9
A. Labor Market Institutions.....	9
B. Macroeconomic Shocks .....	13
IV. Econometric Estimates .....	16
A. The Model .....	16
B. Data and Methodology .....	17
C. Results .....	19
V. Conclusion and Policy Recommendations.....	24
Tables:	
1. Public Employment Programs in Algeria, 1999 .....	7
2. Algeria and Selected Economies: Tax Wedge as a Percent of Labor Cost, 2005 .....	13
3. Mean Comparison Test: Algeria and the Sample Average, 1995–2005.....	18
4. Determinants of the Unemployment Rate Differential between Algeria and Other Countries, 1995–2005 .....	20
5. Determinants of the Unemployment Rate Differential between Algeria and Other Countries: Alternative Estimates, 1995–2005 .....	22
6. Factors Affecting the Unemployment Rate Differential Between Algeria and the two Subgroups of Countries: MENA and Transition Countries, 1995–2005 .....	23
Figures:	
1. Trends in Labor Market Participation, Total Population, and Population Growth, 1980–2004 .....	4
2. Female Participation and Share in Total Population and Labor Force, 1980–2004 .....	5
3. Share of Employment by Sector in Total Employment, 1994–2005 .....	6
4. MENA and Transition Countries: Trends in Total and Youth Unemployment Rates, 1995– 2005 .....	8
5. Unemployment by Age, Gender, and Education, 2005 .....	9
6. MENA and Transition Countries: Rigidity of Employment Index, 2005.....	11
7. MENA and Transition Countries: Labor Productivity, 1989–2004.....	14
Annexes	
I. Data Sources .....	29
II. The Sample.....	30

## I. INTRODUCTION

In recent years Algeria has experienced encouraging economic growth, but though unemployment has declined substantially, it is still high. For the last five years, real nonhydrocarbon GDP grew on average by 5.5 percent but the unemployment rate, though cut in half, still reached 15.3 percent in 2005. Compared with unemployment rates in other Middle East and North Africa (MENA) countries and in Eastern European transition countries, Algeria's is above the average for both groups.

Why is unemployment so high in Algeria? Do labor market institutions matter? Is it affected by macroeconomic shocks?

The literature asserts that stricter labor market regulation and higher taxation of labor deter job creation and increase unemployment. The effect, however, is somewhat ambiguous for labor market regulation, because it also tends to reduce worker dismissals. Studies have also found that macroeconomic shocks are critical in determining the unemployment rate. Higher productivity growth, a moderate inflation rate, a lower real interest rate, and favorable terms of trade shocks are expected to reduce unemployment.

The intent of this paper is to investigate the extent to which these factors account for high unemployment in Algeria. The results suggest that lower growth of labor productivity in Algeria is associated with a higher unemployment rate differential between Algeria and the sample of MENA and transition countries, while positive terms of trade shocks helped Algeria to reduce the differential. Labor market rigidities and taxation do not appear to explain the differential.

The paper is organized as follows: Section 2 looks at recent labor market developments in Algeria. Section 3 briefly reviews the determinants of the unemployment rate, namely labor market institutions, and macroeconomic shocks. Section 4 presents the model, the data, and the results. Section 5 concludes with some policy recommendations.

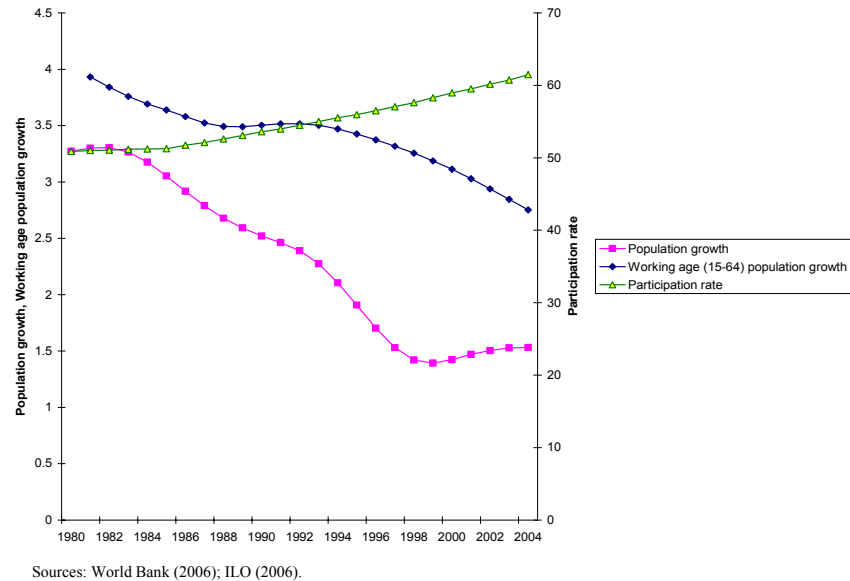
## II. STYLIZED FACTS

### Labor supply and labor demand

Population growth has been declining in Algeria since the 1980s, suggesting that the country has been undergoing a demographic transition (Figure 1). It decreased from an annual rate of 3.3 percent in 1980 to 1.5 percent in 2004—1 percentage point lower than the MENA average. The drop in population growth resulted mainly from a sharp decline in the fertility rate, falling from 7 children per woman in 1980 to 2.5 in 2004.

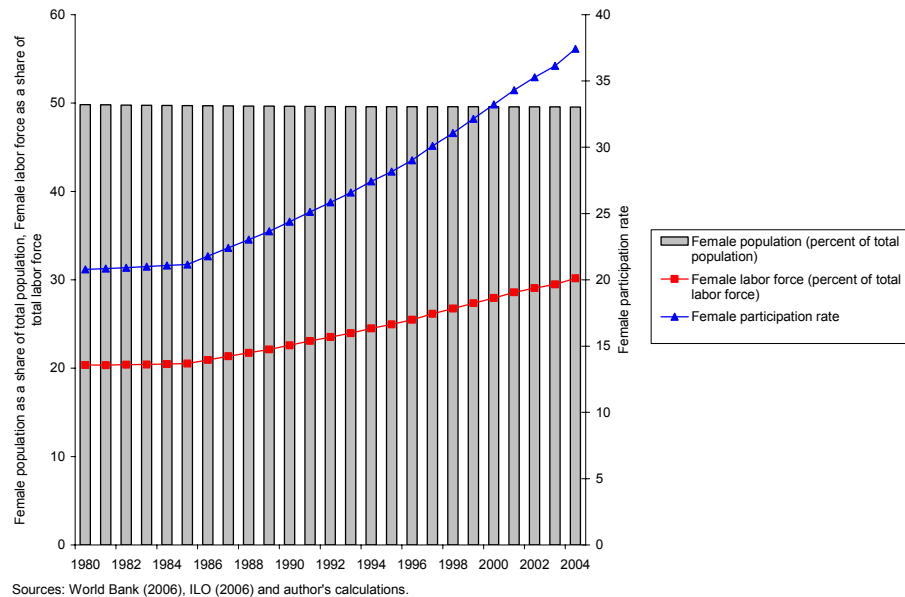
The growth of the working age population is thus declining but with a lag, temporarily increasing the share of potential workers in the population. While the population grew on average by 2.3 percent a year from 1980 through 2004, the working age population increased by 3.4 percent annually, raising the labor supply and creating the potential for employment and growth.

Figure 1. Trends in Labor Market Participation, Total Population, and Population Growth, 1980–2004  
(Percent)



At the same time, labor force participation has increased as young and female workers entered, putting pressure on the labor market. The participation rate increased by 10 percentage points between 1980 and 2004, mainly from young workers. Their contribution to labor force growth is currently high because they account for nearly 50 percent of the active population. In addition, increasing female participation is affecting the size and gender composition of the labor force. While the share of women in the total population was roughly constant between 1980 and 2004, their share in the labor force rose by almost 50 percent and the female participation rate increased by 70 percent (Figure 2), though it remained below that of men. Possible reasons for the rise in female participation could be not only declining fertility rates but also increasing education. Also, job prospects for women have improved, owing to explicit government policies to facilitate their participation in the labor force (Assaad and El-Hamidi, 2001).

Figure 2. Female Participation and Share in Total Population and Labor Force, 1980–2004  
(Percent)



Labor market outcomes are determined not only by supply but also by demand. When Algeria was a centrally planned economy, the public sector provided most jobs. Since the 1980s, the country has progressively abandoned its model of a planned and centralized economy and has set up an ambitious program of economic and social reforms to promote private sector development and economic growth.

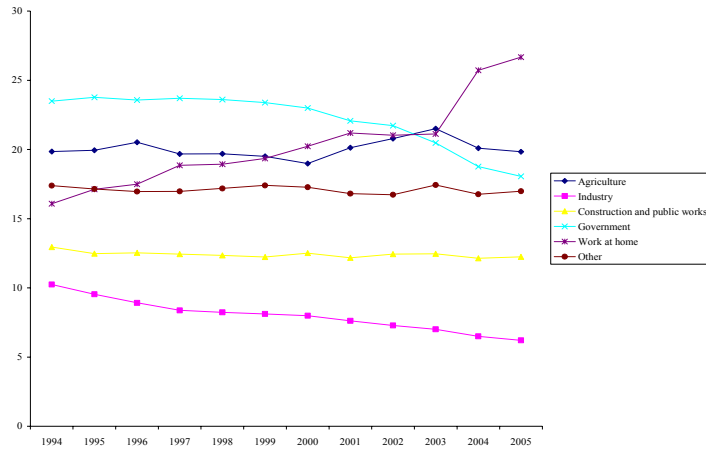
Although public sector employment is falling, government spending is still the main engine of employment creation. Figure 3 shows that government employment as a share of total employment is shrinking as the country moves to a market-based economy. In 2005, 18 percent of total employment was in the public sector, compared with 23 percent five years earlier.<sup>2</sup> But in agriculture and public works, where employment has been growing, labor productivity has been low and activities have been sustained by public spending, thanks to growing hydrocarbon revenues.

In 2001 the government launched a three-year Economic Recovery Program (ERP) to boost demand and generate jobs through public investment in infrastructure and support to agricultural production and to small and medium-sized enterprises. The ERP goal was to create nearly 850,000 jobs between 2001 and 2004. The authorities estimated that the ERP actually generated 728,000 jobs and launched a supplementary program for 2005–09.<sup>3</sup> The Organization for Economic Cooperation and Development (OECD, 2004), however, suggests that results have been mixed because the long-term impact of ERP on growth and employment is not clear.

<sup>2</sup> Here the public sector includes only the civil service.

<sup>3</sup> See the report on the ERP available at <http://www.cg.gov.dz/psre/bilanpsre.htm>.

Figure 3. Share of Employment by Sector in Total Employment, 1994–2005  
(Percent)



Source: IMF staff estimates (2006).

The evidence that public employment programs helped to push down unemployment is still unclear and more information is needed. According to the latest estimates, public employment programs created 1.4 million jobs between 1997 and 2001 (Ait Youness and Annane, 2004), but most of them were temporary jobs. For instance, under the program for local employment (*Emplois salariés d'initiative locale* [ESIL]) designed to provide low-skilled youth with minimum qualifications and experience, firms were granted subsidies as incentives to hire the unemployed. However, the retention rate at the end of the subsidy period was weak (Table 1). In addition, most of the employment programs actually cost 25 percent to over 100 percent more than was projected.

### Trends in unemployment

The Algerian total and youth unemployment rates have decreased markedly since 2000, but both remain high (Figure 4). Total unemployment was cut in half, from 30 percent in 2000 (the highest rate since the late 1980s) to 15.3 percent in 2005, and youth unemployment dropped from 48 percent in 2001 to 31 percent in 2005. Nevertheless unemployment in Algeria is still higher than the averages for other MENA countries and for transition countries. In 2004, for instance, unemployment in Algeria was 7 percentage points higher than the MENA average.



Table 1. Public Employment Programs in Algeria, 1999

Program	Description	Target	Number of Jobs Created (full-time job equivalent)	Share of Permanent Jobs (percent)	Projected Annual Cost per Job (DA)	Actual Cost per Job (DA)
ESIL	Subsidies are granted to firms as incentives to hire the unemployed.	Low-skilled young workers	68,300	7	28,571	35,580
AIG	The program provides compensation to people working in community-based activities.	Poor people	n.a.	n.a.	68,421	37,333
TUPHIMO	Labor-intensive activities such as road maintenance.	Unskilled unemployed persons	7,174	n.a.	50,000	82,038
CPE	Firms may hire the unemployed at no cost for one year; the salary is paid by the government.	Skilled young workers	12,191	15	64,800	147,000
ANSEJ	Interest subsidies, subsidies, and financing are provided to microenterprise projects.	Young people who wish to set up independent activities that fit in with their professional qualifications.	39,260	n.a.	n.a.	1,123,540

Sources: *Conseil National Economique et Social* ([www.cnez.dz](http://www.cnez.dz)); Musette, Isli, and Hammouda (2003); and author's calculations.

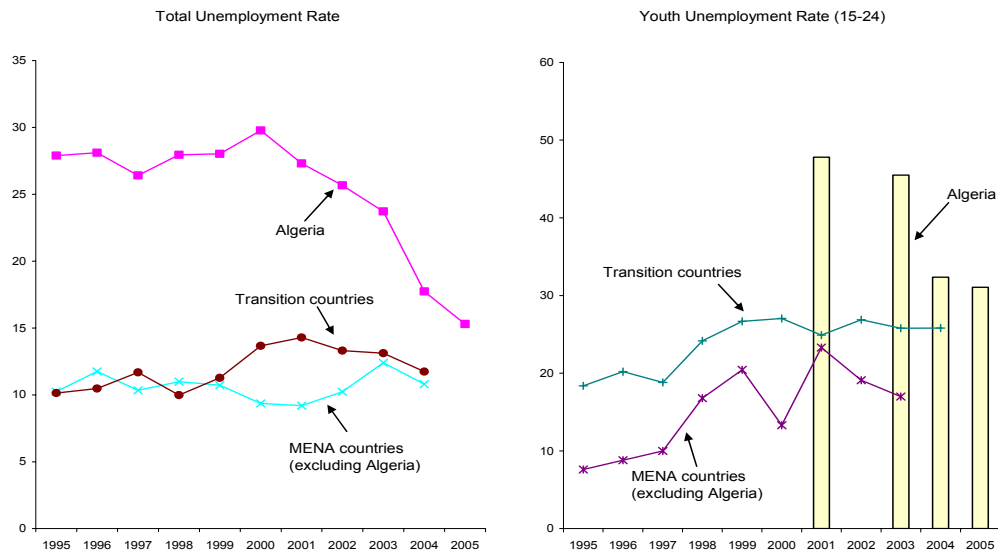
Notes: Program abbreviations: ESIL: the program for local employment (*Emplois salariés d'initiative locale*); AIG: the plan regarding general interest activities (*Activité d'intérêt général*); (iii) TUPHIMO: the program for public works requiring intensive labor (*Travaux d'utilité publique à haute intensité de main-d'oeuvre*); CPE: the pre-employment contract (*Contrat pré-emploi*); and (v) ANSEJ: the *Agence Nationale de Soutien à l'Emploi des Jeunes* (ANSEJ).

Recent economic growth has probably contributed to the fall in unemployment. Algeria's economy started to recover in 1995: real nonhydrocarbon GDP growth averaged –1.3 percent from 1992 to 1994 but 3 percent from 1995 to 2001 and then 5.7 percent from 2002 to 2005, partly because the surge in international oil prices affected domestic demand. Implementation of the 1994 reform program supported by the IMF and the World Bank helped the country achieve higher economic growth and push inflation down.

However, whether the 2004–05 reduction in unemployment is permanent has yet to be seen. Significant numbers of the new jobs are in the work at home category. Work at home, which includes the military and irregular employment, has risen dramatically, especially in 2004, when it increased by 34 percent, in part due to the occurrence of Ramadan shortly after the annual household survey was conducted,<sup>4</sup> and possible measurement issues. Without the rise in work at home in 2004 and 2005, the unemployment rate would have been about 22 percent in 2004 and 21 percent in 2005 (Kpodar, 2007).

<sup>4</sup> The fact that between 2003 and 2004 female employment increased by 45 percent while male employment increased by 12 percent could support this hypothesis.

Figure 4. MENA and Transition Countries: Trends in Total and Youth Unemployment Rates, 1995–2005  
(Percent)



Source: Algerian authorities (2005); World Bank (2006); and IMF estimates.

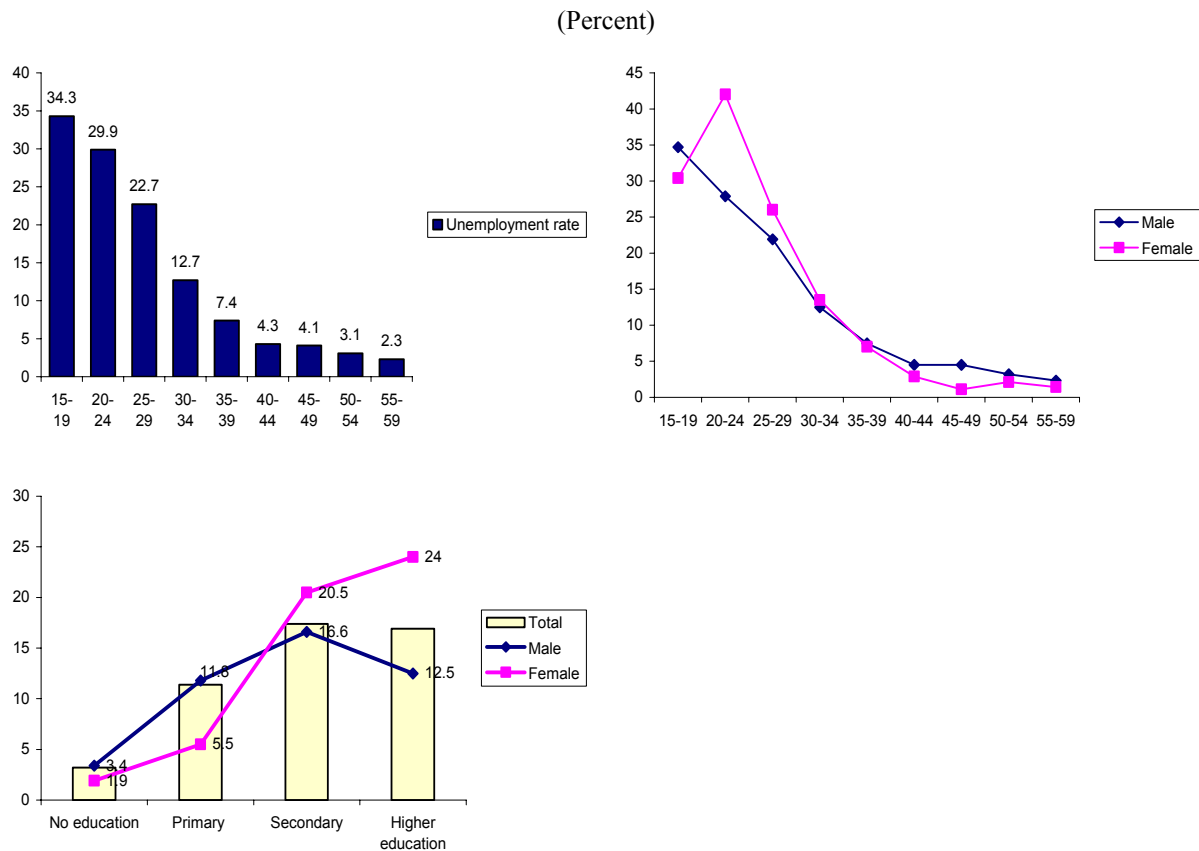
### Profile of the unemployed

In 2005, when the unemployment rate was 31 percent, young people were most likely to be unemployed, suggesting that unemployment in Algeria is essentially a phenomenon of the insertion into the labor market of new entrants. The unemployment rate tends to decrease with age (see Figure 5), ranging from 34 percent for people between 15 and 19 to less than 5 percent for people over 50 years old. People under 30 account for 70 percent of the unemployed. This is not surprising; unemployment in developing countries generally falls disproportionately on the young.

In 2005 in Algeria, the unemployment rate for women (17.5 percent) was close to that of men (15 percent), though in most MENA countries, female unemployment is higher than male, perhaps reflecting social factors. One explanation may be that the public sector in Algeria is a major employer of women: in 2003 it accounted for 56 percent of female employment and only 37 percent of male employment.

The likelihood of being unemployed increases with education. In 2005, secondary school and university graduates had the highest unemployment rates, possibly because of a skills mismatch but also possibly because young people, who tend to be more educated than their elders, are more likely to be unemployed. Higher-educated women are more likely to be unemployed than higher-educated men.

Figure 5. Unemployment by Age, Gender, and Education, 2005



Source: Algerian authorities.

### III. DETERMINANTS OF LABOR MARKET PERFORMANCE

The economic literature discusses two broad categories of factors underlying labor market performance: labor market institutions and macroeconomic shocks. The first category is related to labor market regulation and labor taxation. The second covers productivity growth, the real interest rate, the inflation rate, and terms of trade shocks. In this section we briefly examine how relevant each of these factors is in explaining the unemployment rate differential between Algeria and other countries.

#### A. Labor Market Institutions

##### Regulation

Labor market regulation provides important social protections for workers (World Bank, 2004). Whether covering hiring contracts, severance pay, unemployment benefits, grounds for dismissal, the right to unionize, or the scope for collective bargaining, regulation aims to protect workers from arbitrary, unfair, or discriminatory actions by their employers while addressing

potential market failures stemming from insufficient information and inadequate insurance against risk. Blanchard (1998a) argues that some employment protection may also be desirable because job contracts are incomplete: “If workers sink some cost in the relation, say to spend some time and money training for job-specific skills, firms, once the cost is sunk, may have excessive bargaining power. Firing costs may then reestablish the balance and lead workers to invest the right amount in the relation.”

However, more employment protection raises the cost of labor and favors more privileged insiders. Excessive regulation increases nonsalary costs for business because it implies administrative costs: firms must pay the costs associated with layoffs or keep workers in jobs that are no longer productive. It also undermines the ability of firms to adjust to changes in technology and product demand, therefore reducing their efficiency. Moreover, regulation generally increases the bargaining power of incumbent workers while reducing job creation and labor market flexibility.

Stricter employment protection may thus have an ambiguous impact on overall employment because it reduces both creation and destruction of jobs. The impact on unemployment may not be small for vulnerable groups, such as women and youths, that are likely to experience high unemployment rates when regulation is too restrictive. Stricter regulation may also lead to an increase in the length of unemployment because job turnover is relatively low in such an environment.

While excessive labor market regulation is likely to depress labor demand, it also affects labor supply. It is well known that unemployment benefits may reduce labor supply, through a decline in the participation rate, and raise the duration of unemployment. The availability of generous unemployment benefits reduces the cost of unemployment relative to employment and might be a disincentive to work: an unemployed person would have less incentive to take a job for which the salary is lower than, or even just above, the unemployment benefits he or she could get, thus extending unemployment either to search for a better job or to substitute leisure for work.

There is no clear evidence that regulation hampers labor market outcomes. Scholars have typically found either an adverse effect or no effect of employment protection on the unemployment rate or employment ratio. While Blanchard (1998b) and Nickell (1997), among others, find no effect of job security on unemployment, Lazear (1990) and Scarpetta (1996) find positive effects. Similarly, Heckman and Pages (2000) provide evidence that job security regulations in Latin American countries reduce employment and promote inequality between workers. Nunziata (2002) finds that stricter employment protection does not seem to have a significant impact on the level of unemployment, although it increases its persistence.

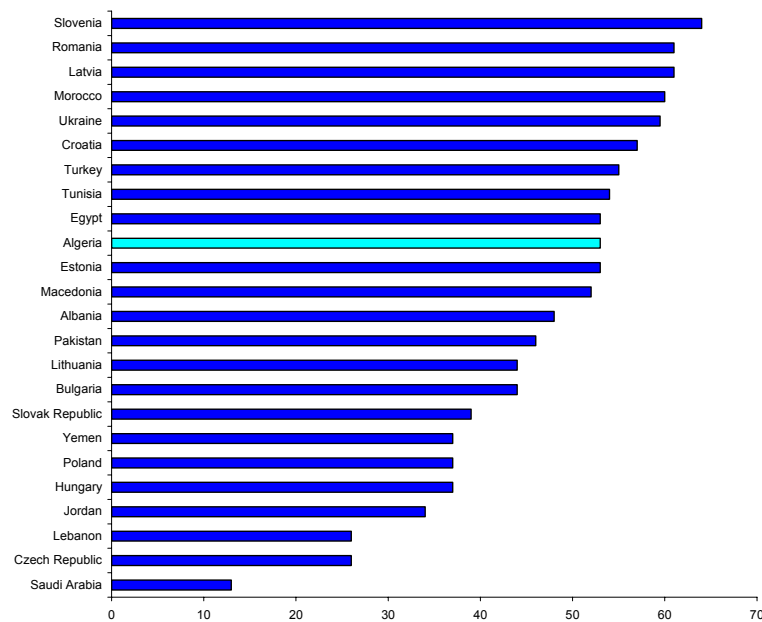
Algeria ranks relatively high on the standard indicators of labor market rigidities used by the World Bank in international comparisons (Figure 6). Algeria’s Rigidity of Employment Index,<sup>5</sup> an indicator that takes into account the difficulty of hiring and firing, is one of the highest in the MENA region, and labor market regulation is stricter in Algeria than in most transition

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<sup>5</sup> The index takes values between 0 and 100, with higher values implying more rigid regulation.

countries. Given the ambiguous effect of job security on unemployment, whether or not greater employment protection explains higher unemployment in Algeria remains an empirical issue.

Figure 6. MENA and Transition Countries: Rigidity of Employment Index, 2005



Source: World Bank (2006).

Algeria's severance pay requirements are, however, relatively modest. Since 1994 severance payments have been set at a minimum of one month's wages for each year of tenure, up to a maximum of six months of salary. Recent data suggest that employers pay laid-off workers on average three months of salary—not too high relative to MENA standards. Dyer (2005) points out that Algeria has a more modest system than Morocco and Tunisia, but within the MENA region, only Algeria has a functioning unemployment insurance system in which formal sector workers and employers participate through a mandatory payroll tax.

Though severance pay legislation in Algeria may not be stricter than in other countries, some nonprice restrictions may be costly for firms wanting to adjust their labor force. Among them are the need for prior authorization, the notification period, and an appeal procedure that has time and money costs that may be larger than the transfer itself. For example, it takes on average six months to lay off a worker; when there are collective dismissals, the employer has to negotiate with the unions which workers will be laid off. When a firm is privatized, the employer is not allowed to lay any worker off right after the takeover. Moreover, to allow a laid-off worker to receive unemployment benefits, the employer must pay the unemployment insurance system 80 percent of the worker's monthly wage for each year of tenure up to 12.

## Taxation

The more elastic the labor supply or demand curve, the more the labor tax will adversely affect employment. An increase in labor taxation generally reduces growth in employment, but the effects depend on the elasticity of the curve. If labor supply is perfectly elastic to wages, the burden of a tax increase will be borne by the employers because the workers will not accept any decrease in wages, and labor demand would then be reduced. If labor supply is perfectly inelastic, the increase in labor tax would be offset by a corresponding decrease in wages, leaving the employment level unaffected.

Labor taxes are more harmful for low wage earners. An increase in taxes cannot be fully accommodated by a decrease in wages for some workers because the minimum wage sets the floor when it is enforced. This suggests that employers would incur part or all of the financial burden of a higher tax, and that they would reduce employment for this category of workers.

Empirical evidence suggests that labor taxation has a detrimental effect on employment, although the magnitude may differ (Daveri and Tabellini, 2000; IMF, 2003; Nickel, 2003; Nunziata, 2002).

A common measure of the tax burden on labor is the tax wedge, which is defined as the difference between workers' take-home pay and the costs of employing them, including income taxes and social security contributions (OECD, 2006). It is calculated as follows:

$$\text{Tax wedge} = 100 * \frac{\begin{aligned} &(\text{Central government income tax} \\ &+ \text{Employee's social security contributions} \\ &+ \text{Employer's social security contributions} \\ &+ \text{Payroll tax}) \end{aligned}}{(\text{Gross earnings} + \text{Employer's social security contributions} + \text{Payroll tax})}$$

In Algeria, social security contributions account for 34 percent of the gross wage, 9 percent of which is paid by the employee. The 1 percent payroll tax was abolished in 2006.

Currently the tax wedge for a single person with average earnings accounts for 41 percent of total labor costs in Algeria, relatively close to the levels in transition economies (Table 2). Estimates of the family tax wedge in fact suggest that labor taxation tends to be lower in Algeria than in transition countries, so unemployment may not be a taxation issue.

Table 2. Algeria and Selected Economies: Tax Wedge as a Percent of Labor Cost, 2005

Country	Single Person Tax Wedge <sup>1</sup>	Family Total Tax Wedge <sup>2</sup>
Algeria	41	28
Czech Republic	44	27
Estonia	40*	...
Hungary	51	40
Latvia	42**	...
Lithuania	43**	...
Poland	44	42
Slovak Republic	38	23
Slovenia	43**	...
Turkey	43	43

<sup>1</sup> Single persons without children at the income level of the average worker.

<sup>2</sup> Average single worker without children and one-earner married couple with two children.

Sources: OECD (2006); World Bank (2005); and author's calculations.

\*Data from 2001.

\*\*Data from 2003.

## B. Macroeconomic Shocks

### Productivity growth

In the short run there may be a trade-off between productivity growth and employment. Labor productivity is the value of a unit of output produced by a worker. A decline in productivity would imply that more workers would be needed to produce the same volume of output. While this could help reduce unemployment, for several reasons the effect is unlikely to be sustainable:

- Wages may tend to adjust slowly to changes in productivity. If wages are rigid, declining productivity would increase the cost of labor and force firms to reduce their demand for labor.
- Low productivity makes the country less competitive. As a result, a decrease in labor productivity could reduce export growth and ultimately trim employment by suppressing economic growth.
- Finally, lower productivity growth eventually means lower output growth and a slowdown in domestic demand that in turn would push employment down.

Faster growth of labor productivity is often associated with lower unemployment. A rise in labor productivity increases potential GDP by allowing more output to be produced with the same number of workers and by decreasing the cost of labor to firms, which would promote job creation. Higher productivity would also translate into higher wages, thus raising domestic demand. If firms see the demand for their products go up, they respond by increasing production

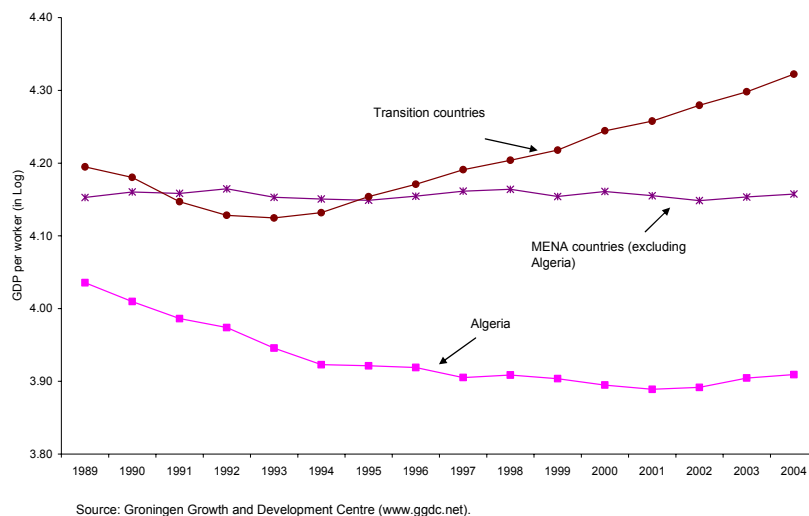
and hiring more workers. As mentioned, growing labor productivity also makes the export sector more competitive and stimulates economic growth and employment creation.

Aside from its positive effect on labor demand, growth in labor productivity may also impact labor supply. Because labor productivity growth is reflected in higher real wages, as predicted by the standard neoclassical theory, workers will increase their labor supply. Nevertheless, the effect is not as clear as one might expect, because all workers do not necessarily choose to work more. Because the marginal utility of leisure outweighs that of income for some workers, they may work less and gain more leisure without losing any income. As a result, the effect of labor productivity on the aggregate labor supply may be ambiguous.

Most studies on the link between productivity growth and unemployment to date have found a negative relationship. These studies used growth of either labor productivity or total factor productivity (TFP) as a measure of productivity growth. Using data on OECD countries from 1960 to 1995 Nunziata (2002) found that negative TFP shocks are correlated with higher unemployment. Blanchard and Wolfers (2000) argued that a decline in TFP accompanied by slow adjustment of wages to the new equilibrium could have pushed up unemployment in Europe in the 1970s. Similarly, Fitoussi and others (2000) found evidence that among OECD countries those with slower labor productivity growth tended to experience higher unemployment. This result is corroborated by the IMF (2003).

Algeria's labor productivity is low. Though its growth has resumed since 2001 after declining in the 1990s (see Figure 7), labor productivity is still below the average of MENA and transition countries. Interestingly, the recent slight increase in productivity coincided with the decline in unemployment. Lower labor productivity growth may thus explain why Algeria has experienced higher unemployment than other countries.

Figure 7. MENA and Transition Countries: Labor Productivity, 1989–2004





## Real interest rate

Increases in the real interest rate could have harmful effects on employment. A rise in the interest rate owing to a contractionary monetary policy both slows down domestic demand and increases the cost of capital. The resultant decreased domestic demand and capital accumulation cause labor demand to fall. Blanchard and Wolfers (2000) pointed out that real interest rate increases in the 1980s in Europe could have negatively affected capital accumulation, maintaining high levels of unemployment in that period (see also Fitoussi and others, 2000). However, Nickell (1998) suggested that the negative effect of a real interest rate increase on employment is likely to be small.<sup>6</sup>

A higher real interest rate may not only lower labor demand but also increase labor supply, probably leading to an increase in unemployment. Lucas and Rapping (1969) incorporated the intertemporal substitution hypothesis into a model explaining labor supply. The main idea of intertemporal substitution is that the labor supply depends on all past and expected future wages over the lifetime of current workers. If, due to an increase in the real interest rate, workers expect future real wages to decrease relative to present wages, they will increase their labor supply. However, tests of the intertemporal substitution hypothesis have yielded mixed results. While Hall (1980) and Dutkowsky and Foote (1982) support the hypothesis, Card (1991) suggests that careful consideration of the wealth effects associated with wage changes will undermine the predictions of the lifecycle model.<sup>7</sup> Moreover, using U.S. data Mankiw, Rotemberg, and Summers (1985) find no evidence of intertemporal substitution in labor supply.

## Inflation

The Phillips curve suggests a short-run tradeoff between the unemployment rate and the rate of inflation. An unexpected increase in prices reduces real wages, leading to an increase in the demand for labor and a decline in unemployment. In the 1970s, however, the experience of stagflation with high rates of both inflation and unemployment weakened the hypothesis of a stable trade-off between the two. Critics argued that rational and well-informed workers would realize that their real wages were falling and would ask for a nominal wage increase to compensate for higher prices. The increase in real wage demands tends to reverse the drop in unemployment. In the long run, the unemployment rate tends toward a level that is consistent with a stable rate of inflation, i.e., the natural unemployment rate or the nonaccelerating

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<sup>6</sup> It is likely that a rise in the interest rate will cause the relative cost of capital to increase, encouraging firms to increase their use of labor. This may partially offset the negative effect of the interest rate increase on employment through lower domestic demand.

<sup>7</sup> The lifecycle model implicitly assumes that the marginal utility of wealth is constant. Card (1991) underlines that the realization of wages provides new information that generates an update in the distribution of future wages and brings about a revision in the forecast of the marginal utility of wealth. Unfortunately, there are no closed form expressions for the marginal utility of wealth in an uncertain environment. Thus, the component of the change in labor supply attributable to wealth effects is usually treated as a “nuisance”, and is eliminated by an instrumental variables procedure.

inflation rate of unemployment (NAIRU). Under the natural rate of unemployment theory, inflation would begin to accelerate if unemployment were to fall below NAIRU. Difficulties arise in attempting to estimate the NAIRU because the rate changes over time. Moreover, Akerlof and others (1996) show that the NAIRU itself depends on the inflation rate. In the long run a steady rate of moderate inflation permits maximum employment and output; zero inflation measurably increases the natural unemployment rate and correspondingly reduces output.<sup>8</sup> Fitoussi and others (2000) found that changes in the rate of inflation tend to be negatively correlated with unemployment in a sample of OECD countries.

### Terms of trade

Favorable terms of trade shocks boost domestic demand and increase employment. A positive terms of trade shock implies that export prices are rising or import prices are falling, suggesting that more units of imports can be exchanged for a unit of exports. This has a direct effect on real incomes. It would increase domestic demand, economic growth, and thus employment.

A change in the terms of trade may also affect labor supply decisions, but the effect is ambiguous. Labor supply may decrease after a positive terms of trade shock due to the wealth effect. At the same time, the increase in labor demand would raise wages, which would stimulate labor supply. The overall effect of positive terms of trade shocks is likely to be a reduction in unemployment.

In Algeria favorable terms of trade shocks reduced unemployment mainly by increasing labor demand. Buoyant oil revenues have enabled the government to invest heavily in public infrastructure, which has increased employment in the construction and public works sectors.

## IV. ECONOMETRIC ESTIMATES

### A. The Model

The 2003 *World Economic Outlook* (WEO) model provides a good framework for investigating the determinants of unemployment. Building on related studies, the IMF (2003) looked at the relationship between unemployment and labor market institutions in a sample of 20 OECD countries for 1960–98 while controlling for various macroeconomic variables. The basic specification is as follows:

$$u_{i,t} = \alpha_i + \lambda u_{i,t-1} + \sum_{j=1}^J \beta_j X_{j,i,t} + \sum_{k=1}^K \gamma_k Z_{k,i,t} + \varepsilon_{i,t}$$

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<sup>8</sup> They authors argue that wage rigidity interferes with the ability of some firms to make adjustments in real wages, leading to inefficient reductions in employment when inflation approaches zero. Using U.S. data they find that targeting zero inflation will lead to a large inefficiency in the allocation of resources, because the difference in the sustainable rate of unemployment between operating with steady 3 percent inflation and steady zero percent inflation is estimated at 1 to 2.6 percentage points.

where  $u_{i,t}$  is the unemployment rate at time  $t$  in country  $i$ ;  $\alpha_i$  is a country-specific effect;  $X_j$  is a set of macroeconomic variables (productivity growth, the real interest rate, terms of trade shocks, and inflation);  $Z_k$  is a vector of labor market institutional indicators; and  $\varepsilon_{i,t}$  is an error term.<sup>9</sup>

A modified version of this model is used to test why Algeria has experienced higher unemployment than comparable countries, such as those in the MENA region and Eastern European transition countries. Obviously, limited availability makes it impossible to use time series data to assess the determinants of unemployment in Algeria at a macro level. Assuming that the 2003 WEO model is valid for the sample considered, we try to explain the unemployment rate differential between Algeria and other countries by differences in the determinants of labor market performance. The model is as follows:

$$u_{DZA,t} - u_{i,t} = \alpha_i' + \lambda' (u_{DZA,t-1} - u_{i,t-1}) + \sum_{j=1}^J \beta_j' (X_{j,DZA,t} - X_{j,i,t}) + \sum_{k=1}^K \gamma_k' (Z_{k,DZA,t} - Z_{k,i,t}) + \varepsilon_{i,t}'$$

where the subscript DZA refers to Algeria. According to this model, if the coefficient of a given variable is significant, this would imply that the variable accounts for the differential between Algeria and the sample average.

## B. Data and Methodology

Panel data are used as in IMF (2003). The sample consists of 24 countries (excluding Algeria), of which 10 are in the MENA region and 14 in Eastern Europe.<sup>10</sup> Annual data for 1995–2005 are used except for labor market institutions indicators, for which one observation per country is available.

Productivity growth is measured by the change in output per worker—the most commonly used indicator for international comparisons of productivity. Two main reasons explain why labor productivity growth is more often used than TFP growth: (i) labor productivity growth is a more general measure of productivity growth because it can be decomposed into capital deepening (an increase in the amount of capital per worker), human capital accumulation, and TFP growth; (ii) in contrast to TFP growth, data on labor productivity growth are easily available and do not require any assumptions about the stock of capital and the elasticity of output with respect to capital.

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<sup>9</sup> The full specification includes interactive terms and linear, and quadratic forms.

<sup>10</sup> See Annex 2 for the list of countries. Turkey and Pakistan are not officially MENA countries but are included in the sample.

The indicators of labor market institutions used are hiring and firing costs, the employment rigidity index, the percentage of managers ranking labor market regulation as a business constraint, and the tax wedge.<sup>11</sup> Terms of trade shocks are defined as the percentage change in the terms of trade weighted by the trade openness of the country. Table 3 reports the difference between Algeria and the sample average for some variables. For example, between 1995 and 2005, unemployment in Algeria was 15 percentage points higher than the sample average while labor productivity grew almost 5 percentage points less than the sample average.

Table 3. Mean Comparison Test: Algeria and the Sample Average, 1995–2005  
(Percent, unless otherwise noted)

Unemployment rate	15.2 (30.69)***
Employment rigidity index	4.5 (4.87)***
Tax wedge	2.0 (3.28)***
Labor productivity growth	-4.6 (6.28)***
Real interest rate	-5.1 (4.34)***
Inflation	-15.6 (2.30)**
Terms of trade shocks	3.9 (3.07)***

Notes: Absolute value of t statistics in parentheses;  
\*\*\* significant at 1 percent, \*\* significant at 5 percent.

Three panel data estimators are considered. First, a random effect model is used so that we can control for country heterogeneity using country-specific dummies and estimate the effects of the time-invariant variables included in the model. However, the random effect model assumes that country-specific effects are not correlated with the right-hand side variables. But it is likely to be a strong assumption when dealing with labor market issues, so we also use a fixed effect model to check the robustness of the result obtained by the random effect model. Finally, because attempting to assess the effect of labor productivity growth on the unemployment rate raises endogeneity issues that need to be addressed, we run an instrumental variable regression using the System GMM estimator that allows us to control for reverse causation, omitted variable bias, and measurement errors.

<sup>11</sup> The 2003 WEO model takes into account variables such as union density, bargaining coordination, benefit replacement rate, and central bank independence. But because the necessary data were not available, these variables were excluded from our specification.

### C. Results

Labor market institutions did not seem to explain the differential in unemployment rates. Table 4 sets out the results of using the random effect model. In columns 1 to 3, only institutional variables are introduced and none of them are significant, suggesting that the differential between Algeria and the sample average was not due to stricter labor market regulation and a larger tax wedge. One explanation might be the ambiguous effects of labor market flexibility on the unemployment rate and the fact that the tax wedge in Algeria is not much higher than the sample average.<sup>12</sup> Furthermore, the complexity of labor market regulation may not be fully captured by one composite indicator. This result however does not imply that a more flexible labor market would not help to reduce the unemployment rate. Keep in mind that the results are based on past data and should not be treated as stable.

Civil violence in Algeria did account for the differential. It disrupted economic activity, caused population movements, and increased unemployment. To take this factor into account, we add a dummy equal to 1 for the years 1995 to 2001 and 0 thereafter. Its coefficient is positive and significant (column 4), suggesting that political instability had increased the differential.<sup>13</sup>

Macroeconomic shocks do matter, especially labor productivity growth. Labor productivity growth in Algeria is almost 5 percent lower than the sample average, and the coefficient is negative and significant (column 5). This suggests that lower productivity growth in Algeria widened the gap between Algeria's unemployment rate and that of other countries. This holds even controlling for initial conditions (column 6). The coefficient of the lagged unemployment rate is correlated with the current unemployment rate, suggesting that the differential tends to persist over time. While the real interest rate and inflation proved not to be significant in explaining the differential, positive terms of trade shocks induced by rising oil prices helped Algeria reduce the differential.<sup>14</sup>

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<sup>12</sup> Taking into account the interaction between the employment rigidity index and the tax wedge does not change the results.

<sup>13</sup> A similar result is found using the International Country Risk Guide (ICRG) index of political stability, though the index is not available for all countries in the sample.

<sup>14</sup> To control the unemployment rate differential for demographic factors, the population growth rate differential is introduced, but the coefficient is nonsignificant. The main reason is probably the lag between population growth and labor force growth. Introducing lagged population growth would, however, lead to endogeneity issues. Because the lagged dependent variable is intended to control for initial conditions, omitting past population growth is not likely to affect the results.

Table 4. Determinants of the Unemployment Rate Differential between Algeria and Other Countries, 1995–2005

	Random Effects					
	(1)	(2)	(3)	(4)	(5)	(6)
Δ Hiring costs (as a percent of salary)	0.10 (0.23)					
Δ Firing costs (weeks of wages)	-0.04 (0.04)					
Δ Tax wedge	0.04 (0.20)	0.09 (0.18)	0.08 (0.23)	0.07 (0.16)	-0.35 (0.36)	
Δ Employment rigidity index		0.06 (0.12)		0.06 (0.11)	-0.03 (0.15)	
Δ Managers ranking labor regulations as a business constraint (percent)			-0.23 (0.27)			
Political instability dummy				4.90*** (0.50)	5.80*** (0.64)	2.68*** (0.35)
Δ Labor productivity growth (lagged)					-8.18** (3.65)	-4.69*** (1.78)
Δ Real interest rate					0.03 (0.03)	
Δ Inflation (log)					-0.06 (1.90)	
Δ Terms of trade shocks (lagged)					-0.07*** (0.02)	-0.06*** (0.01)
Δ Unemployment rate (lagged)						0.97*** (0.03)
Constant	12.96*** (2.11)	14.02*** (1.63)	15.13*** (1.92)	10.47*** (1.53)	9.41*** (1.78)	-2.30*** (0.50)
Observations	167	167	144	167	111	135
Number of countries	21	21	17	21	15	19
R-squared	0.11	0.05	0.06	0.12	0.23	0.98

Notes: Standard errors in parentheses; \*\*\* significant at 1 percent, \*\* significant at 5 percent, \* significant at 10 percent.

In sum, as long as Algeria experiences continuous terms of trade growth, that will offset the unfavorable effect of lower productivity growth on the unemployment differential with other countries and allow the country to reduce unemployment more rapidly than other countries. Nevertheless, persistent lower productivity growth compared to other countries raises doubts about the durability of the employment gains.

The results are robust to fixed effects estimations (Table 5).<sup>15</sup> Using fixed effects estimations that do not assume that country-specific effects are exogenous does not alter the results (columns 1 and 2). Given the relatively large time dimension of the data, we deal with likely error correlation by means of a fixed effect model with AR(1) correction; all variables keep their signs and are significant (column 3).<sup>16</sup>

The fixed-effect estimates, however, may be subject to endogeneity bias. The main argument is related to the likely endogeneity of labor productivity growth, because the causality may also run from unemployment to labor productivity. Higher unemployment could actually reduce the return on education and discourage investment in human capital, lowering future productivity. Also, higher unemployment is found to depress economic growth (Daveri and Tabellini, 2000) and thus labor productivity.

Other factors motivate the use of instrumental variable estimates: The lagged dependent variable may be correlated with the error term, leading to endogeneity issues. Also, omitted variables bias and measurement errors are likely to weaken the fixed-effects regressions.

Studies dealing with the determinants of productivity growth offer a range of variables that could be used as instruments. Levine (1997) argues that financial development contributes to productivity improvements by improving resource allocation and lowering transaction costs, both of which facilitate more specialization and promote exchange. Beck, Levine, and Loayza (2000) find that financial development is positively associated with TFP growth in a broad sample of countries. The findings of IMF (2006) also suggest that financial development stimulates productivity growth, proxied by either labor productivity or TFP growth. Financial development, trade openness, and investments in human and physical capital are found to be beneficial to productivity increases (IMF, 2006).

While financial development, trade openness, physical capital accumulation, and human capital accumulation are good candidates to instrument labor productivity growth, valid instruments should be correlated with the endogenous regressor but uncorrelated with the error term. Financial development and human capital accumulation are unlikely to directly affect the unemployment rate, but trade openness and physical capital accumulation are likely to do so.<sup>17</sup> Trade openness may increase unemployment in the short run due to a lack of labor market flexibility or a change in the skills employers need. Physical capital accumulation may have a direct effect on employment growth because capital and labor are substitutes.

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<sup>15</sup> As the indicators of labor market regulation are not significant, these are dropped from the model. This allows for the use of the fixed-effect estimator.

<sup>16</sup> The standard Durbin-Watson statistic is not appropriate for testing first-order autocorrelation when the panel is unbalanced. The Baltagi-Wu locally best invariant (LBI) is the relevant statistic; however, exact critical values are not available in the literature. A value of the Baltagi-Wu LBI-statistic significantly below 2 (1.71 in Table 5) indicates that correction for serial correlation may be necessary.

<sup>17</sup> Financial development and capital accumulation stimulate productivity and economic growth, which in turn help reduce unemployment. An increase in the financial sector size is unlikely to directly affect the unemployment rate because this sector is not labor-intensive.

Table 5. Determinants of the Unemployment Rate Differential between Algeria and Other Countries: Alternative Estimates, 1995–2005

	Fixed Effects		Fixed Effects with AR(1) Correction	System GMM	
	(1)	(2)	(3)	(4)	(5)
Political instability dummy	5.75*** (0.64)	2.99*** (0.41)	2.52*** (0.58)	2.61*** (0.35)	2.68*** (0.35)
$\Delta$ Labor productivity growth (lagged)	-7.76** (3.66)	-4.97** (1.94)	-5.73*** (1.81)	-4.58*** (1.74)	-4.84*** (1.82)
$\Delta$ Real interest rate	0.03 (0.03)				
$\Delta$ Inflation (log)	-0.10 (1.90)				
$\Delta$ Terms of trade shocks (lagged)	-0.07*** (0.02)	-0.06*** (0.01)	-0.06*** (0.01)	-0.06*** (0.01)	-0.06*** (0.01)
$\Delta$ Unemployment rate (lagged)		0.86*** (0.07)	0.89*** (0.10)	0.99*** (0.03)	0.98*** (0.03)
Constant	9.95*** (0.57)	-0.76 (1.02)	-1.09 (0.90)	-2.54*** (0.48)	-2.37*** (0.47)
Observations	111	135	116	135	135
Number of countries	15	19	19	19	19
R-squared	0.49	0.81	0.72		
Baltagi-Wu LBI			1.71		
AR(2)				0.41	0.38
Hansen test				0.18	0.13

Notes: Standard errors in parentheses; \*\*\* significant at 1 percent, \*\* significant at 5 percent, \* significant at 10 percent.

To address the issues raised by the endogenous right-side variable and the use of the lagged dependent variable as an explanatory variable, we use the System GMM estimator developed by Blundell and Bond (1998).<sup>18</sup> We also take advantage of the availability of both internal (lagged values) and external instruments for labor productivity growth. Columns 4 and 5 of Table 5 present the results. In column 4, all the right-side variables are instrumented by their lagged values. In column 5, labor productivity growth is instrumented by the degree of financial development (measured by the ratio of private credit to GDP) and human capital accumulation (measured by the secondary school enrollment rate); internal instruments are used for all other variables except political instability, which is assumed to be exogenous in all regressions.

The results confirm the previous findings. The negative labor productivity growth differential increased the unemployment rate differential between Algeria and the sample average, and the

<sup>18</sup> See Bond, Hoeffler, and Temple (2001) for a description of the System GMM estimator and its application to growth models.



positive terms of trade shocks differential reduced the unemployment rate differential.<sup>19</sup> The Hansen overidentification test shown in Table 5 does not reject the exogeneity of the instruments, and the second autocorrelation test (also shown in Table 5) does not reject the null hypothesis of no autocorrelation.

Table 6. Factors Affecting the Unemployment Rate Differential Between Algeria and the two Subgroups of Countries: MENA and Transition Countries, 1995–2005

	System GMM			
	(1)	(2)	(3)	(4)
Political instability dummy	2.64*** (0.34)	2.68*** (0.35)	2.73*** (0.35)	2.70*** (0.34)
$\Delta$ Labor productivity growth (lagged)	-7.23*** (2.27)	-4.78*** (1.82)	-5.24*** (1.84)	-8.40*** (2.41)
$\Delta$ Terms of trade shocks (lagged)	-0.06*** (0.01)	-0.06*** (0.01)	-0.06*** (0.01)	-0.06*** (0.01)
$\Delta$ Unemployment rate (lagged)	0.98*** (0.03)	0.98*** (0.03)	0.97*** (0.03)	0.97*** (0.03)
$\Delta$ Labor productivity growth (lagged)*MENA	6.23* (3.60)			7.35** (3.66)
$\Delta$ Terms of trade shocks (lagged)*MENA		-0.01 (0.02)		-0.02 (0.02)
$\Delta$ Unemployment rate (lagged)*MENA			0.02 (0.02)	0.03 (0.02)
Constant	-2.49*** (0.47)	-2.38*** (0.47)	-2.34*** (0.46)	-2.55*** (0.46)
Observations	135	135	135	135
Number of countries	19	19	19	19
AR(2)	0.80	0.38	0.37	0.94
Hansen test	0.45	0.12	0.42	0.57

Notes: Standard errors in parentheses; \*\*\* significant at 1 percent, \*\* significant at 5 percent, \* significant at 10 percent. The baseline regression is that in column 5 of Table 5. MENA is a dummy variable equal to 1 for MENA countries and 0 otherwise.

To examine whether the factors explaining the unemployment differential between Algeria and MENA countries are different from those explaining the differential between Algeria and Eastern European transition countries, we add an interactive term between each macroeconomic variable and a dummy variable equal to 1 for MENA countries and 0 otherwise. The coefficient of the interactive term between productivity growth and the MENA dummy is positive and

<sup>19</sup> Following Blanchard and Wolfers (2000), we tested interactions between labor market institutions and macroeconomic shocks, but without significant results.

significant (Table 6). For instance, when Algeria is compared with other MENA countries, the marginal impact of the labor productivity growth differential is  $-1.05$  compared with  $-8.40$  for the group of transition countries (column 4). This suggests that labor productivity growth was most important in accounting for the differential between Algeria and Eastern European countries.<sup>20</sup>

## V. CONCLUSION AND POLICY RECOMMENDATIONS

This paper looks at the factors underlying the gap between Algeria's unemployment rate and that of other MENA and transition countries over 1995–2005. The econometric results suggest that slower labor productivity growth in Algeria increased the differential relative to the sample average. In contrast, positive terms of trade shocks resulting from rising oil prices led to a decrease in the gap. Neither labor market regulation nor the tax wedge seems to be more harmful to Algeria than to other countries.

The following actions could be considered to improve employment in Algeria:

- The government should pursue growth-enhancing policies that will create conditions for enough long-term employment to absorb the growing work force and reduce unemployment.
- Structural reforms to increase productivity are critical to ensure a durable reduction in unemployment. Promoting financial development, trade liberalization, private investment, and human capital accumulation would contribute to productivity growth. Private sector-led growth and investment should be the main engine of job creation, but this is unlikely to occur where labor productivity is low. Productivity improvements and moderate wage increases would stimulate employment growth.
- Though labor market regulations seem not to be a major issue, easing restrictions on hiring and firing would make the Algerian labor market more flexible and help reduce unemployment. Specifically, shortening the notification period and the length of the procedure for dismissal, lowering employer contributions intended to allow laid-off workers to receive unemployment benefits, removing the obligation to maintain the employment and activity of privatized firms, and allowing the employer to choose which workers to lay off without constraints could make the labor market more flexible and make it easier to create jobs. Broadening unemployment insurance coverage would help lessen the social impact of these measures.
- Similarly, though the tax burden on labor in Algeria does not seem to be a key factor in explaining unemployment, given Algeria's high unemployment rate, the fiscal space

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<sup>20</sup> We test also the interactive terms between labor market regulation indicators, inflation, interest rate and the MENA dummy, but the results are not significant.

provided by higher oil revenues could be used to lessen the tax burden on labor-intensive activities to stimulate job creation.

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## Annex I. Data Sources

Variable	Sources
Hiring costs (as a percent of salary)	World Bank Doing Business Indicators Database (2006)
Firing costs (weeks of wage)	
Employment rigidity index	
Tax wedge	OECD (2006), World Bank (2005), and author's calculations
Labor productivity growth	Groningen Growth and Development Centre, World Development Indicators (2006)
Percentage of managers ranking labor regulations as a key business constraint	World Development Indicators (2006)
Real interest rate	
Inflation	
Terms of trade shocks	
Unemployment rate	World Development Indicators (2006), Algerian authorities

## Annex II. The Sample

<b>Eastern European transition countries</b>	<b>MENA countries</b>
Albania	Algeria
Bulgaria	Egypt, Arab Rep.
Croatia	Jordan
Czech Republic	Lebanon
Estonia	Morocco
Hungary	Pakistan*
Latvia	Saudi Arabia
Lithuania	Syrian Arab Republic
Macedonia, FYR	Tunisia
Poland	Turkey*
Romania	Yemen, Rep.
Slovak Republic	
Slovenia	
Ukraine	

\* Countries not officially listed as MENA countries.