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The Algerian Retrenchment System: A Financial and Economic Evaluation

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The government of Algeria has adopted a new retrenchment system to facilitate labor shedding in a public sector characterized by redundant workers and in an environment of already high unemployment. This article assesses the financial viability of the retrenchment system and the inherent welfare costs and benefits associated with layoffs. A financial flows model tracks the Unemployment Insurance Fund's revenue and expenditure flows during the projected five-year adjustment period. It finds that even in the presence of massive retrenchment (21 percent of formal sector employment), the fund accumulates reserves equivalent to nearly 2 percent of gross domestic product. Because many displaced workers will end up in the informal sector, the resulting productivity gains or losses depend crucially on the initial level of productivity in the public sector. At the same time, retrenchment entails unambiguous benefits by reducing subsidies to state-owned enterprises, thereby generating efficiency gains. Considering these two effects together, the welfare model estimates that retrenching 13 percent of the formal sector will generate annual net welfare gains ranging from costs of $358 million to gains of $774 million.

The Algerian economy is struggling to break away from the central planning model it adopted following independence from France in 1962. Algeria's vast oil reserves and external borrowing during the 1970s and early 1980s financed heavy investment to develop an industrial sector that relies on capital-intensive production technology. Over time, the large public sector gradually lost competitiveness. Economic reform was initially undertaken in the late 1980s and has been stop-and-go since then. This period was characterized by political turmoil, during which social and political pressures emerged to derail the economic reform process. In 1991, renewed stabilization efforts were interrupted by political crisis resulting from the cancellation of legislative elections and were followed by backtracking on macroeconomic reforms. It was in this context that the Algerian authorities, facing balance of payments pressure engendered by depressed oil prices, undertook a broad program of stabilization and structural reform in 1994.

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The transition to a market economy involves restructuring Algeria's public industrial sector by removing or modifying controls and regulations that distort price signals and by opening up to international competition. This is a difficult chore, given the state's dominance in industry; state-owned enterprises account for 75 percent of total formal sector industrial employment. Moreover, public enterprises were (and mostly still are) highly subsidized, faced soft budget constraints with help from a compliant public banking sector, and served as a vehicle for the job creation objectives of the government. These firms therefore became bloated and unproductive but remained intact despite poor performance. Industrial production fell by half during the decade from 1986 to 1996, while industrial employment experienced no net change, indicating an increase in the number of redundant workers, defined here as underutilized. The extent of redundancy is unknown, but industrial public enterprises currently operate at a mere 35 percent capacity. In spite of potentially vast redundancies, however, the unemployment rate stands at nearly 30 percent.

In the framework of the structural reform process started in 1994, the Algerian authorities adopted a national retrenchment system to facilitate layoffs while protecting displaced workers. Concurrently, they introduced hard budget constraints in public enterprises and tight fiscal restraint in the government sector. The retrenchment system consists of a severance pay component and a monthly unemployment insurance benefit, a feature that is uncommon in developing countries and was only recently introduced in the transition economies of Central and Eastern Europe (see World Bank 1995: ch. 13). All formal sector firms are subject to a mandatory payroll tax specifically for unemployment insurance and are eligible to undertake massive layoffs with access to the system's benefits. The system's stated objectives are to facilitate enterprise restructuring through labor shedding and to provide income support to laid-off workers, mitigating the impact of the transition. Although not specifically targeted for restructuring, private firms can also benefit from greater flexibility in hiring and firing decisions. This new retrenchment system replaced an earlier scheme consisting exclusively of generous severance packages paid in a lump sum to workers at the moment of separation. Only minimal labor reallocation occurred under the old system, which proved untenable for a variety of reasons, chief among them the required union approval of retrenchment and an incentive structure that supported the government's employment promotion policies. It appears that these impediments to labor shedding have been reduced, although not entirely removed, within the context of the new system and the broader structural reform program.

This article assesses the financial viability of the new retrenchment system and the welfare implications of layoffs. The existing literature thoroughly addresses the financial returns to retrenchment (see, for example, Haltiwanger and Singh in this issue), the effectiveness of downsizing efforts as reflected by rehiring rates, and the impact on the postseparation earnings of laid-off workers (Alderman, Canagarajah, and Younger 1995; Lindauer and Nunberg 1994; and

Rama and MacIsaac in this issue). The main contribution of this article is to provide an economic evaluation of the welfare impact of retrenchment through changes in production and taxation.

Algeria's new retrenchment system represents a specific example of a downsizing mechanism, serving as a case study for financial and welfare analysis. The financial analysis relies on a simulation model of the Unemployment Insurance Fund (Caisse Nationale d'Assurance Chômage—CNAC) that tracks the fund's quarterly revenues and expenditures during the transitional period in which the public industrial sector is restructured through, among other things, massive layoffs. The financing model reproduces the evolution of the CNAC balances from 1995 to 2003 to assess whether the fund is financially sound.

In order to analyze the system's impact on economic welfare, I propose a two-sector partial equilibrium model in which the formal sector contains surplus workers who are redundant. The alternative sector, also referred to as the informal sector, consists of workers who are compensated at a wage equivalent to their marginal productivity. The wage gap between the formal and informal sectors creates incentives for job search and unemployment and is specified herein using the Harris-Todaro approach (see Harris and Todaro 1970). Given a constant wage gap, eliminating formal sector redundancies through layoffs may result in unemployment at the individual level, but in the aggregate, there is a reallocation of labor toward the informal sector and no change in the equilibrium unemployment rate. Although certain key variables are unobservable, such that calibration requires simplifying assumptions, the welfare model provides a framework for measuring the changes in aggregate production and the efficiency gains from eliminating subsidies; taken together, the model generates a value of the net welfare cost of layoffs.

Section I describes the retrenchment system and its benefit and financing structure and discusses the associated incentives. Section II presents the financial flows model and assesses the system's viability across a range of potential layoff scenarios. Section III develops the welfare model of economic costs and benefits and measures the net change in welfare associated with projected layoffs following the switch to the new retrenchment system. It also tests the model's robustness through sensitivity analysis. Section IV discusses the policy implications of the models' estimates.

I. Description of the System

The Algerian retrenchment system is a hybrid that resembles periodic severance payments spread over time. It shares its basic contributory structure and benefit design with many Central and Eastern European countries and members of the Organisation for Economic Co-operation and Development. However, the additional financing provided by firms in the form of an initiation fee is unusual. The appendix contains a detailed description of the system.

Eligibility

The retrenchment system was designed for workers and firms in the formal sector, specifically public enterprises, government administration, and a relatively small number of private firms. In 1995, 2.8 million workers were employed in the formal sector, comprising 1.2 million public enterprise employees, 1.2 million civil servants, and 400,000 private sector workers. All formal sector firms are required to pay the unemployment insurance payroll tax. Firms also must be up-to-date in their payroll tax payments and must complete each retrenched worker's application for admittance to benefits and submit it to the unemployment insurance authority. Workers laid off for economic reasons who have been affiliated with social security for at least three years and who receive no alternative earnings are eligible to collect benefits.

Benefit Structure

The new retrenchment system consists of a severance pay component and an unemployment insurance benefit component. At the time of separation, firms are required to pay retrenched workers a severance package equivalent to one month's salary per year of tenure up to three years, for a maximum of three months of salary. In addition, workers receive a monthly indemnity paid by the CNAC at a level proportional to each worker's salary; a reference wage is calculated as the average of the monthly and the minimum wages and is subject to a replacement rate that declines over the period of eligibility from 100 to 50 percent. Benefit levels are subject to a minimum and a maximum, equal to three-fourths and three times the minimum wage, respectively, spanning a fairly narrow range. The system administers indemnity payments for a period proportional to work history, that is, two months per year of tenure in excess of three years. All beneficiaries are guaranteed benefits for at least one year, up to a maximum of three years.

Financing Structure

The unemployment insurance component is financed by two sources of revenue: a 4 percent payroll tax on all formal sector employees, shared by the employer and employee (2.5 and 1.5 percent, respectively), and an initiation fee paid by firms to the CNAC for each retrenched worker. By charging an initiation fee proportional to the displaced worker's salary and job tenure, the costs associated with retrenching are made explicit because firms incur a direct cost for each worker laid off that is factored into their decision to retrench. This effect is similar to the experience rating observed in various unemployment insurance systems in the United States. The Algerian system does not perfectly internalize the cost of layoff into the employer's decision. For example, in the event that a worker quickly finds another job, the old employer is still required to pay the initiation fee even though the CNAC pays no benefits to the worker concerned. The sizable initiation fee requirement serves to boost fund reserves by covering

more than half of the total stream of monthly indemnities to be paid to the beneficiary and is instrumental in covering the initially high benefit outlays of a system facing large layoffs associated with enterprise restructuring.

Although the CNAC is a public institution, it is fiscally independent of the central government—an unusual feature even for the transition economies. Financed entirely by payroll tax contributions and initiation fees, it does not administer or finance any active labor market policies such as job training or placement schemes, nor does it have recourse to government funding in periods of reserve shortfalls. Instead, it must either amend its contribution and benefit parameters to restore financial viability or borrow from commercial lenders. Given the size of Algeria's highly subsidized public sector, however, the CNAC (through both payroll taxes and initiation fees) is ultimately financed by taxes on the formal private sector and by government oil revenues.

Comparison with the Old System

The new system of unemployment insurance replaced an earlier retrenchment scheme that consisted of a lump-sum severance payment proportional to salary and work tenure (equivalent to one month of salary for each year of experience), paid by the enterprise at the moment of separation. A comparison of layoff costs under the two systems demonstrates that the marginal statutory costs incurred by firms under the new system are close to those of the old regime (see table 1). Consider an average retrenched worker with 10 years of experience. Under the old scheme, firms were obliged to pay 10 months of salary immediately to the worker, whereas under the new scheme, firms must pay 8.6 months of salary (3 months severance plus 5.6 months initiation fee), of which only 5 months of

Table 1. *Comparison of the Financing of the Old and New Retrenchment Systems in Algeria*

Indicator	*Old system, before 1994*	*New system, after 1994*
Costs paid by firms		
Severance (to workers)	One month of gross salary per year of tenure	Three months of gross salary
Initiation fee (to CNAC)	None	80 percent of monthly gross salary per year of tenure in excess of three years: two months of salary paid on separation and the balance paid within one year
Maximum (severance plus initiation fee)	15 months of gross salary (equivalent to 15 years of tenure)	15 months of gross salary (equivalent to 18 years of tenure)
Payroll tax	None	2.5 percent of taxable wage bill
Costs paid by workers		
Payroll tax	None	1.5 percent of taxable salary

Source: Ministry of Labor and Social Protection.

salary are due within the first 3 months following separation. Although it is marginally cheaper to retrench under the new system, the principal gains come from spreading charges over time, thereby easing liquidity constraints.

Comparison of the old and new systems presupposes that firms actually laid off workers under the old regime; this was not the case. The labor shedding witnessed since implementation of the new system reflects a reorientation of the Algerian government's priorities, manifested by the government's withdrawal from employment and production decisions. Specifically, public enterprises are no longer mandated to create jobs, in contrast with earlier employment promotion policies that were facilitated by indirect subsidies. The fundamental change in the government's role is most readily apparent in the tightening of previously soft budget constraints. Under the old system, the maximum severance payment was equivalent to 15 months of salary; firms found it cheaper in the short run to keep redundant workers on the payroll. The government's reduced subsidy of the industrial sector appears to be the real force driving retrenchment activity. The shift to hard budget constraints (evidenced by emerging salary arrears and interenterprise debt), together with greater autonomy in employment and production decisions, induced firms to rationalize production and factor costs by reallocating labor.

Another indication of the government's new priorities is the diminished role of unions. The required approval of unions under the old system impeded layoffs. The government eliminated this legal provision and achieved union support of the retrenchment legislation through political maneuvering and collective bargaining. For example, the imposition of the payroll tax was accommodated by the government's agreement to take over a transfer program previously financed by a tax on firms. Although firms have greater autonomy in their employment decisions under the new system, the influence of unions remains significant, reflected by the similarity of firms' costs under the two schemes (for example, the same maximum equivalent to 15 months of salary).

Redistribution and Incentives

The CNAC, although nominally separate from treasury support, is in effect subsidized by civil servants through the employee portion of the payroll tax on the public administration wage bill (and at a more fundamental level by the private sector taxation and government oil revenues cited above). Public servants make up almost half of the eligible labor force, but they are not de facto subject to layoff at present, indicating an implicit subsidy of those workers who are retrenched. Redistribution results from the benefit structure as well; because indemnities are capped, the flat rate contribution constitutes an income redistribution from higher wage earners to those actually laid off. And despite the apparent link between benefits and contributions, benefits are compressed in favor of lower-wage earners (because they are calculated as a weighted average using the minimum wage). This eliminates any regressive income redistribution from low-salaried unskilled workers to highly paid skilled em-

ployees and at the same time provides a minimum level of protection to the affected population.

The new retrenchment system effectively changes firms' incentive structure through lower costs and greater autonomy, and because retrenchment is not voluntary, firms avoid efficiency losses associated with adverse selection by retaining their most productive workers. There is some risk of moral hazard, however; introducing hard budget constraints may give rise to labor hoarding, as witnessed in the transition economies of Central and Eastern Europe, especially for firms in serious financial straits.

The benefit structure does not on the whole distort beneficiaries' incentives. Although monthly income support discourages job search, the declining replacement rate means that benefits diminish over the course of eligibility, falling by half. The actual level of compensation is a function of the reference salary; although beneficiaries receive near-full replacement of the reference salary (an average of 90 percent) for at least 6 months and up to 18 months, the effective replacement rate averages 60 percent of gross salary for the same period.

The long duration of benefits, averaging about 20 months and up to a maximum of 3 years, could discourage job search by promoting attachment to unemployment, thereby swelling the ranks of the long-term unemployed. An increase in unemployment would be particularly undesirable in Algeria, where there is already a tendency toward entrenched long-term unemployment. For example, the average unemployment spell for workers over age 30 is longer than that for younger workers. The risk of exacerbating unemployment over the long run may have negative dynamic implications for the labor market by shifting it to a higher rate of equilibrium unemployment. Burda (1993) presents a dynamic theoretical model of equilibrium unemployment and vacancies, and Ruppert (1996) derives the model's application to Algeria.

Job search incentives are supported by the system's lack of enforcement. Because the benefit structure and eligibility are conditioned on need, beneficiaries are prohibited from earning alternative revenue. In reality, however, weak institutions and monitoring are likely to result in little actual enforcement, especially outside the formal sector; potential earnings from informal activity, therefore, provide the standard incentives.

Early Results

In its first two years of operation (1994–96), the new system functioned relatively smoothly. Already 42,000 formal sector workers in both state-owned enterprises and private firms were retrenched under its auspices, representing about 1.5 percent of formal sector workers. The unemployment insurance system was introduced rapidly by using the administrative capacity of the existing social security system. Administrative costs are relatively low as a result; by end-1996, only 124 personnel operated the system in 48 administrative regions. Among the total workers laid off and approved for benefit eligibility, about 65 percent actually receive benefits. After only two years, nearly $20 million had been col-

lected in initiation fees, and the monthly revenue inflows from payroll taxes were approximately $11 million.[1] Because monthly benefit outlays averaged about $3.3 million, the system is more than amply financed to meet its current obligations.

II. Assessment of Financial Viability

This section considers the system's financial viability over the medium run.

The Financial Flows Model

On the basis of work by Worden (1992), I constructed a financial flows model to evaluate the system's financial viability over the short and medium terms. The model monitors the revenues and expenditures of the CNAC by tracking flows into unemployment, flows out of unemployment, benefit outlays, payroll contributions, and the average level of initiation fees and their payment over time. The model reproduces the evolution of fund balances quarterly, from 1995 through 2003. The CNAC balance in period t is defined to be equal to the positive financial inflows resulting from the payroll tax, initiation fees, and CNAC balance carried over from the previous period, $t - 1$, minus the outflows to benefit payments, administrative costs, and social security taxes for beneficiaries.

The CNAC balance in period t (Z_t) is defined very generally as the sum of revenues minus expenditures plus government transfers in period t plus interest income on the previous period's fund balance, that is,

$$Z_t = R_t - E_t + G_t + (1 + r_t)\, Z_{t-1} \tag{1}$$

where R_t denotes fund revenues, E_t is fund expenditures, G_t is a net government transfer (positive or negative), and r_t is the real interest rate earned on the fund balance carried over from the previous period, Z_{t-1}.

Furthermore, revenues can be decomposed as follows:

$$R_t = T_t + F_t \tag{2}$$

where T_t represents total payroll taxes collected each quarter and F_t is total initiation fees paid into the CNAC. Payroll contributions consist of the firm's portion of the tax, τ_f, and the worker's portion of the tax, τ_w, which are applied to the worker's net wage; η is the ratio of average net wage (net of social benefits and regional adjustment premia on the government-regulated base salary) to gross wage, and w_t is the average monthly wage, such that ηw_t represents the average taxable monthly wage. Formal sector employment is denoted by L_t, and γ_t is a tax collection efficiency parameter (between 0 and 1) to reflect imperfect revenue collection. Because the wage w_t is defined on a monthly basis, the total

1. Conversions from local currency are made at an exchange rate of 55 dinars per 1 U.S. dollar; all figures are in constant 1995 prices.

tax is multiplied by 3 to obtain quarterly taxes. Total payroll contributions in quarter t are therefore:

$$T_t = 3\,(\tau_f + \tau_w)\,\eta\; w_t L_t\,\gamma_t. \tag{3}$$

Total initiation fees, F_t, reflect the requirement that for each new entrant to benefit eligibility, the initiation fee must be paid in an initial lump sum equivalent to two months of salary up front in quarter t, with the balance paid over the next four quarters. The average initiation fee per worker, f_t, is calculated as 80 percent of the average gross monthly wage for each year of average work tenure in excess of three years. Let σ_t represent the separation rate in period t and θ_t denote the share of layoffs actually admitted to eligibility. Total initiation fees are defined in equation 4. The first term in equation 4 represents lump-sum payments, and the second term denotes the sum of the initiation fee balances left over from the previous four quarters. That is,

$$F_t = 2w_t\theta_t\sigma_t L_t + \textstyle\sum_{i=1}^{4} \frac{1}{4}(f_{t-i} - 2w_{t-i})\,\theta_{t-i}\sigma_{t-i}L_{t-i}. \tag{4}$$

Total expenditures, denoted E_t, consist of benefits paid out to system beneficiaries, B_t, the cost of administering the system, A_t, and charges for social security taxation, SS_t, that is,

$$E_t = B_t + A_t + SS_t. \tag{5}$$

Benefits are paid to those admitted to the system subject to the eligibility criteria and at a benefit level determined in relation to the reference wage. The quarterly outflow of benefits is defined in equation 6, where ϕ_{t-i} represents the share of beneficiaries entering in period $t - i$ who remain eligible for benefits in period t, and P_{t-i} denotes the average benefit paid to each worker. The product is summed over 12 quarters ($i = 1,\ldots,12$), implying that beneficiaries are not eligible for benefits beyond 36 months, and eligible workers separated in period t do not receive benefits until the following period $t + 1$. Specifically,

$$B_t = 3\textstyle\sum_{i=1}^{12} \phi_{t-i}\theta_{t-i}\sigma_{t-i}L_{t-i}P_{t-i}. \tag{6}$$

The average benefit level paid out, P_{t-i}, is calculated as a weighted average of (a) those beneficiaries receiving the minimum benefit, $\frac{3}{4}\,m_{t-i}$ (the share of total beneficiaries is equal to λ_{t-i}), (b) those beneficiaries receiving the maximum benefit, $3m_{t-i}$ (share equal to ν_{t-i}), and (c) the remaining beneficiaries whose salaries qualify them for benefits according to a declining replacement rate, ρ_{t-i}, of the reference wage, w^R_{t-i}. The shares λ_{t-i} and ν_{t-i} are based on an assumed distribution of wages. The average benefit level is therefore:

$$P_{t-i} = \lambda_{t-i}\,\tfrac{3}{4}\,m_{t-i} + \nu_{t-i}3m_{t-i} + (1 - \lambda_{t-i} - \nu_{t-i})\rho_{t-i}w^R_{t-i}. \tag{7}$$

Recall that the reference wage w^R is defined as the mean of the minimum wage and the average wage. Administrative costs are simply A_t, and SS_t is the total social security contribution made by the CNAC on account of beneficiaries, such that:

$$SS_t = \alpha 3 m_t \left(\sum_{i=1}^{12} \phi_{t-i} \theta_{t-i} \sigma_{t-i} L_{t-i} \right) \tag{8}$$

where α is the social security tax rate applied to the monthly minimum wage for those remaining eligible for benefits in period t (denoted by the expression inside parentheses). Again, by summing over the range $i = 1,\ldots,12$, I implicitly assume that social security tax payments for new entrants begin from the moment that laid-off workers receive benefits.

Finally, the level of employment evolves over time. Employment in the formal sector at the beginning of period t consists of those remaining after retrenchment of $\sigma_{t-1} L_{t-1}$ and separations to early retirement $\varphi_{t-1} L_{t-1}$ in period $t - 1$, as well as newly hired workers joining the formal sector, J_{t-1}. That is,

$$L_t = (1 - \sigma_{t-1} - \varphi_{t-1}) L_{t-1} + J_{t-1}. \tag{9}$$

Calibration of the Financial Flows Model

In order to calibrate the model, I need data on the variables defined above, where available, and assumptions on likely parameter values otherwise. The financial flows model relies on information regarding average wages and the pattern of layoffs observed during the first two years of the system's operation. The lack of time-series data on actual CNAC balances limits the model's accuracy; however, using observed data points on cumulative fund revenues and expenditures as benchmarks, I rely on the efficiency parameters θ and γ to capture, respectively, the unemployment insurance administration's inefficiencies in processing applications and imperfect tax compliance. Assumptions on the model's parameters are summarized in table 2. Because there is little or no enforcement of compliance with eligibility criteria once a worker receives benefits, I assume that outflows of benefit recipients from eligibility occur only after benefits expire. Based on the assurances of the Algerian authorities, there is no transfer of funds to the central government budget, nor any explicit government subsidy of the system's charges (that is, $G = 0$).

The early results described in section I indicate an accumulation of reserves; in practice, funds are starting to be invested in interest-bearing instruments. I set the real interest rate, r_t, equal to 0. Finally, in an effort to assess financial viability under conservative and perhaps pessimistic assumptions about the Algerian labor market, I assume that formal sector employment declines by the rate of retrenchment, σ_t, and separations to early retirement, φ_t, and that no new hiring occurs (that is, $J_t = 0$).

Table 2. *Calibration of the Financial Flows Model*

Variable	*Value*[a]
Average gross monthly wage, w_t (dollars)	239
Monthly minimum wage, m_t (dollars)	82
Formal sector employment, L_0 (millions of workers)	2.8
Firm's payroll tax, τ_f (percent)	2.5
Worker's payroll tax, τ_w (percent)	1.5
Ratio of net wage to gross wage, η	0.75
Share of layoffs admitted to benefit eligibility, θ_t	
θ_1	0.65
θ_t in 1998	0.95
Tax collection efficiency parameter, γ_t	θ_t
Average initiation fee per worker based on an average tenure of 10 years, f_t (months of salary)	5.6
Average reference wage, w_t^R (dollars)[b]	160
Average benefit in each quarter of duration (dollars)	
First quarter (100 percent replacement of w_t^R)	160
Second quarter (80 percent replacement of w_t^R)	128
Third quarter (60 percent replacement of w_t^R)	96
Fourth quarter (50 percent replacement of w_t^R)	80
Monthly administrative cost, A_t (dollars)	41,000
Share of beneficiaries still eligible for benefits at the end of the period, ϕ_t	[c]
Share of total beneficiaries receiving the minimum benefit, λ_t	[d]
Share of total beneficiaries receiving the maximum benefit, ν_t	[d]
Social security tax rate paid by CNAC on behalf of beneficiaries, α (percent)	15
Net government transfer to the CNAC, G_t	0
Real interest rate (on the unemployment insurance fund balance), r_t	0
New hires to formal sector employment, J_t (millions of workers)[e]	0
Separations to early retirement, φ_t (percentage of L_t)[f]	0.2

a. Dollar amounts are in constant 1995 prices.

b. $w_t^R = {}^1/_2 (w_t + m_t)$.

c. ϕ_t is determined by assuming that benefit duration is normally distributed around an average of 20 months. There is no evidence on the actual distribution of benefit duration; however, the results are not sensitive to this assumption.

d. λ_t and ν_t are calculated according to the wage profile in each period, assumed to follow a log-normal distribution around mean w_t.

e. The budget laws of 1996 and 1997 stipulate zero net recruitment for the civil service.

f. Based on retrenchment activity to date indicating that, on average, 5 percent of workers in restructured firms were admitted to early retirement.

Source: Ministry of Labor and Social Protection, Unemployment Insurance Authority, National Statistical Office; author's estimates.

Alternative Scenarios

In order to assess the financial viability of the unemployment insurance system, I consider various scenarios based on observed characteristics regarding layoffs and system parameters. Two different layoff rates are presented here: a base case in scenario A and a high case in scenario B. The base case imitates the layoff rate already observed, such that when industrial restructuring is complete, 13 percent of total formal sector employment will have been retrenched, amounting to 365,000 of the 2.8 million workers initially employed in the for-

mal sector. In the interest of evaluating the limits of the fund's solvency, I assume that layoffs occur in a relatively short time frame in which separation rates, σ_t, peak during 1997–98 and layoffs are completed by the end of year 2000. This time frame is consistent with the Algerian authorities' current plan for comprehensive industrial restructuring and privatization. Under these assumptions, the resulting fund balances are positive and growing over time (see table 3); revenue outpaces expenditure, resulting in fund balances that exceed 1 percent of gross domestic product (GDP) by 1997 and rise to nearly 2.5 percent of GDP in the next decade.

Would the system continue to be viable in the event of very high layoffs? Scenario B, summarized in table 3, illustrates the effect on fund balances in the case where total layoffs amount to 21 percent of formal sector employment, or 588,000 workers (parameter value selection is discussed in section III). The period of high layoffs is assumed to begin in 1997, with 330,000 workers laid off over a two-year period, that is, by end-1998. Although net annual cash inflows are near zero in 1998–2000, funds previously accumulated are sufficient to cover this shortfall, as reflected by the overall balance, which consistently exceeds 1 percent of GDP.

The results of scenarios A and B in table 3 suggest that the system is amply financed and solvent over the crucial period of industrial restructuring, and, in fact, the system is projected to accumulate significant reserves over time. The

Table 3. *Algerian Unemployment Insurance Fund Accounts, Alternative Scenarios, 1996–2003*
(percentage of gross domestic product)

Scenario	*1996*	*1997*	*1998*	*1999*	*2000*	*2001*	*2002*	*2003*
Scenario A: 13 percent layoffs								
Revenues	0.53	0.79	0.84	0.63	0.54	0.44	0.38	0.36
Expenditures	0.12	0.38	0.69	0.44	0.26	0.14	0.02	0.00
Net inflows	0.41	0.41	0.15	0.19	0.28	0.31	0.36	0.36
Balance	0.90	1.27	1.36	1.49	1.70	1.93	2.19	2.45
Scenario B: 21 percent layoffs								
Revenues	0.53	0.81	0.99	0.84	0.67	0.46	0.35	0.33
Expenditures	0.12	0.42	0.90	0.89	0.65	0.32	0.05	0.00
Net inflows	0.41	0.39	0.09	–0.05	0.03	0.14	0.30	0.33
Balance	0.90	1.25	1.28	1.17	1.15	1.24	1.47	1.73
Scenario C: 13 percent layoffs and no initiation fee								
Net inflows	0.34	0.13	–0.19	0.02	0.17	0.26	0.36	0.36
Balance	0.80	0.89	0.66	0.65	0.79	1.02	1.33	1.62
Scenario D: 13 percent layoffs and no payroll tax after 1996								
Net inflows	0.41	–0.10	–0.35	–0.27	–0.14	–0.09	–0.02	0.00
Balance	0.90	0.76	0.37	0.08	–0.06	–0.15	–0.17	–0.16

Note: Results for 1997 onward are simulations.
Source: Author's calculations.

positive balance of the CNAC is partially driven by the high initiation fee, which covers more than half of the total stream of monthly indemnities to be paid to the beneficiary. Insolvent firms unable to meet their retrenchment cost obligations are assumed to be covered by the government. Suppose that the system were financed uniquely by employer and employee payroll tax contributions, as depicted in scenario C in table 3; the resulting balances would still be positive, although considerably lower (on the order of 57 percent lower than the base case scenario A by 1999).

The fund balance is quite sensitive to the payroll taxation rate. For instance, lowering the tax on firms from 2.5 to 1.5 percent starting in 1997 would slow the accumulation of fund reserves such that by year 2000 the balance would suffer a 25 percent decline (equivalent to 0.4 percent of GDP). The system would not have adequate resources to finance benefits if there were no payroll contribution at all. In light of the reserves accumulated by end-1996, however, eliminating the payroll tax starting in 1997 would not dissipate fund reserves until 2000 (see scenario D in table 3), and the system would thus be viable during the period of major layoffs.

The financial flows model presented here permits an assessment of the system's financial solvency across a range of layoff scenarios. It concludes that Algeria's CNAC is adequately financed even under high layoffs and is likely to accumulate significant reserves. The fund's financial viability was, in fact, a principal objective of the system design. Given the macroeconomic constraints attendant on Algeria's ongoing adjustment program (requiring the elimination of large fiscal deficits), it was crucial to avoid a budget implication.

III. Evaluation of Welfare Costs

The system should be evaluated not only from a financial point of view but also from an economic point of view; this is difficult given that the initial condition of the labor market reflects a distorted equilibrium. The Algerian labor market is characterized by high and increasing unemployment; the unemployment rate rose steadily from 17 percent in 1986 to 28 percent in 1995, illustrating the economy's inability to absorb new entrants. The predominantly public formal sector is subject to extensive labor market regulation. The total burden of social taxes levied on the wage bill (shared by workers and firms) amounts to 34 percent, up from 32 percent under the old regime. Social taxes cover pensions, social security, accident insurance, unemployment insurance, early retirement, and social works. In addition, wages are distorted and downwardly rigid due to a salary grid system not subject to market rules. Public sector wages depend on a government-defined base salary that is augmented by a series of premia for merit, hardship compensation, regional considerations, and various entitlements, most of which are determined through collective bargaining.

The labor market is characterized not only by excess supply, as evidenced by unemployment, but also by redundancies, primarily in the overstaffed public

sector. Before implementation of the new retrenchment program, public firms adhered to the government's employment promotion policies, and firms were rewarded by explicit and implicit subsidies that kept them afloat even though they were not competitive. State-owned firms are generally inefficient and unlikely to produce on the production possibilities frontier. Unfortunately, little information is available on the marginal productivity of public industrial firms, except that average industrial productivity fell by half during 1986–96. I can conclude only that their marginal productivity lies somewhere between zero and the level that a similar private firm facing the same prices and wages would achieve.

The extent of redundancy is integral to this analysis; it is therefore crucial to be clear about its measurement. Redundancy can be defined from the firm's perspective (also referred to as the private perspective), in which wages exceed the marginal productivity of labor in the firm, or from the social perspective, in which productivity in the firm is lower than productivity elsewhere. Under certain conditions, workers may be redundant from both perspectives—for example, if wages in the public and alternative sectors are equal but public wages exceed marginal labor productivity in the public sector and private labor earnings are equal to marginal labor productivity in the alternative sector. In this example, the public sector worker who is redundant from the firm's perspective is also redundant from the social perspective. These conditions do not hold in the Algerian case, however, because distorted high public wages exceed average labor earnings in the alternative sector. Consider instead a public sector worker with zero productivity; within the realm of possibility in Algeria, this low-case scenario depicts a worker who is redundant from both perspectives. Under either definition, redundancies indicate a distorted labor allocation, suggesting that policy adjustments should be considered within the context of a second-best approach.

In the presence of multiple distortions, removing only one, namely the subsidy, will not return the market to the efficient labor allocation resulting from fully flexible wages, nor will it move public sector firms onto their production frontiers in response to a single new market incentive. This economic evaluation therefore takes a second-best approach; that is, as long as distortions remain, retrenchment represents only a second-best policy. The analysis aims to isolate and quantify the effects of reducing private redundancies. In this section, I develop a model to estimate the relative welfare costs and gains associated with retrenchment in that environment.

The Welfare Model

The assessment of welfare costs is separated into two main effects: changes in production and taxation. Following implementation of the new system concurrent with an end to the government's subsidy of public enterprises, the model predicts that firms retrench workers. At the level of the individual, a displaced worker either enters unemployment, finds another formal sector job, or relo-

cates to the alternative sector. The model assumes that those laid-off workers who relocate to the alternative sector are compensated below the formal sector wage. By construction, the wage gap between the formal and alternative sectors is constant and depends on the level of unemployment; in the aggregate, therefore, the decline in formal sector employment is equal to the increase in alternative sector employment, with no change in the long-term unemployment rate. Because this is an equilibrium analysis, any transitional fluctuations in unemployment are not considered. At the new steady-state equilibrium, the total change in production associated with layoffs is measured by the gap in actual marginal productivity between the formal and alternative sectors. This impact on production, whose sign depends on the ex ante level of retrenched workers' productivity, is offset or compounded by efficiency gains from eliminating the subsidy (the second main effect). Because the government's expenses are reduced, the diminished need for fiscal resources leads to lower taxation. The net welfare cost of retrenchment under the new system is therefore measured as the sum of changes in output and distortions from taxation.

In order to analyze the retrenchment system's impact on economic welfare, I posit a two-sector model with homogeneous workers. The formal sector employs L workers who are compensated at an average wage w. Government subsidies and regulation support the wage w above its market-clearing level. Some portion of these workers is assumed to be redundant from the firm's perspective, that is, their wage exceeds their marginal productivity. The alternative sector, also referred to as the informal sector, consists of workers who produce the same good using less capital-intensive technology. Workers in this sector are compensated by labor earnings w_a equivalent to their marginal productivity and below the formal sector wage. The formal sector wage is assumed to be constant, due to existing regulations and a government-defined salary grid.

The model uses a Harris-Todaro specification of relative wages in the two sectors, such that the higher formal sector wage induces workers to search for formal jobs until the expected returns to job search are just equal to informal sector labor earnings; this earnings gap determines the unemployment rate. The Harris-Todaro setup suffers from well-known limitations, chiefly that the probability of earning the formal sector wage is equal to 1 minus the unemployment rate. This restriction implies that all formal jobs turn over every period such that everyone in the labor force has a uniform probability of being hired. Harris and Todaro effectively ignore other factors that affect workers' true likelihood of finding a formal sector job, as well as the fact that individual expectations tend to deviate from actual probabilities. The model could be extended to correct for these shortcomings (as addressed below in the calibration).

The model assumes that there are three potential and mutually exclusive states of activity for labor force participants: employment in the formal sector at wage w, work in the informal sector at alternative earnings w_a, or unemployment. In reality, there is likely to be some overlap among these states of activity; for example, some public sector workers may undertake informal activity for addi-

tional earnings. By assuming no overlap, the analysis may overestimate the net production gains for displaced moonlighters if their reallocation to the informal sector does not entail an increase in informal activity. The total labor force, denoted *LF*, is assumed to be constant and is defined as follows:

$$LF = L + I + U \tag{10}$$

where *L* is formal sector employment, *I* represents the informal sector, and *U* is total unemployment. Furthermore, the unemployment rate, *u*, is defined as the share of unemployed workers in the total labor force:

$$u = \frac{LF - L - I}{LF}. \tag{11}$$

The Harris-Todaro hypothesis implies that workers equalize the returns to job search in the formal sector and potential labor earnings in the informal sector, w_a. Assuming that the probability of finding a formal sector job is equal to 1 minus the unemployment rate,

$$w\,(1 - u) = w_a. \tag{12}$$

Workers who remain unemployed have no earnings. The model relies on the central assumption that the marginal productivity of labor in the informal sector is independent of the employment level in that sector, such that w_a is constant. Because the formal sector wage *w* is constant, equation 12 implies that the unemployment rate *u* is constant as well. Whereas this result appears somewhat rigid, the evaluation ignores transitional unemployment because it is an equilibrium analysis. Using observable data on formal sector wages and unemployment, equation 12 provides a measure for w_a.

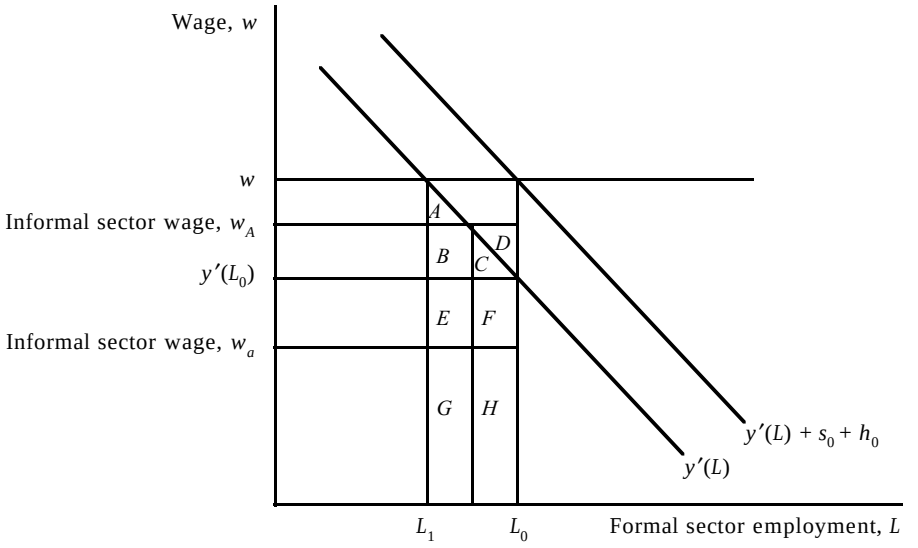
Solving for *u* and substituting into equation 11 yields the employment level:

$$L + I = LF\left(\frac{w_a}{w}\right) \tag{13}$$

where the right-hand side is constant, implying that the sum of *L* and *I* is also constant. This implication provides the basis for evaluating the effect on production of a change in formal sector employment resulting from enterprise restructuring. In the aggregate, any retrenchment in the formal sector constitutes an equivalent expansion of the informal sector. In order to measure the effect of such a change, I first need to determine the difference in productivity between the two sectors.

Productivity in the informal sector is given by the Harris-Todaro hypothesis, the observable formal sector wage, and existing unemployment. However, the actual labor productivity in state-owned enterprises is unknown. In order to cover a range of plausible outcomes, I consider two extreme assumptions: redundant workers in the public sector have zero productivity, and public firms

Figure 1. *Retrenchment and Changes in Production with No Subsidy Remaining ($s_1 = 0$)*



Note: See text for explanation. *y* is production, *s* is the subsidy per worker, and *h* is the severance cost per retrenched worker.

produce on their production frontier. The reality is likely to fall somewhere between these lower and upper bounds.

Under the assumption of zero productivity (in which case workers are redundant from both the private and social perspectives), the productivity of a worker retrenched from the public sector and reallocated to the informal sector will increase from zero to w_a. The total change in output resulting from retrenchment is therefore equal to the number of workers laid off between period 0 and period 1 times the new level of productivity, namely w_a. In figure 1, total layoffs are depicted by $L_0 - L_1$ on the horizontal axis (zero subscripts denote initial values under the old retrenchment system), and productivity increases are given by w_a on the vertical axis; the total increase in output is thus equivalent to $G + H$.

At the other extreme, suppose that redundant workers have positive productivity on the efficiency frontier. In the formal sector, firms produce output y with labor L and fixed costs C and face decreasing returns to labor. The cost of labor is the gross wage w (including payroll taxes).[2] Under the old severance pay system, Algerian firms faced distorting labor regulations in the form of severance charges for retrenching workers, a rigid salary structure, and high wages

2. The gross wage w is equal to $w_{net}(1 + \tau_0)$, where τ_0 denotes the payroll taxation rate, including social security contributions.

supported by government subsidies to maintain employment at some level L_0. The profit maximization problem was:

$$\text{(14)} \qquad \underset{L}{\text{Max}}\ y(L) - wL + s_0 L - h_0 (L_0 - L) - C$$

where s_0 represents the subsidy per worker and h_0 represents the severance cost per retrenched worker. The resulting first-order condition is:

$$\text{(15)} \qquad y'(L) = w - s_0 - h_0.$$

Formal sector workers L_0 have a marginal productivity $(w - s_0 - h_0)$ under the assumed upper bound of productivity but receive wage w. The initial equilibrium of Algeria's formal sector labor market (before the change to the new retrenchment scheme) is described by point L_0, w in figure 1. When $s_0 = h_0 = 0$, however, the labor demand curve shifts to the left, resulting in a lower employment level at the fixed formal wage w (L_1 in figure 1, where L_1 is less than L_0). Excess workers, $L_0 - L_1$, are therefore redundant from the firm's perspective because their wage exceeds their marginal productivity. Whether they are redundant from the social perspective depends on the relative magnitude of earnings in the informal sector, w_a.

Introducing the unemployment insurance system changes the cost structure of firms in the formal sector. The severance cost per retrenched worker declines to h_1, which captures both the severance payment and the initiation fee. I assume that there is a simultaneous reduction in the subsidy to s_1, providing the impetus to retrench workers who are redundant from the firm's perspective (evidenced by newly hard budget constraints and actual retrenchment under the new system). Firms also face the additional cost of the payroll tax for unemployment insurance, τ_{UI}. The new profit maximization problem becomes:

$$\text{(16)} \qquad \underset{L}{\text{Max}}\ y(L) - w(1 + \tau_{UI})L + s_1 L - h_1 (L_0 - L) - C$$

with first-order condition:

$$\text{(17)} \qquad y'(L) = w(1 + \tau_{UI}) - s_1 - h_1.$$

If all subsidies are eliminated such that $s_1 = 0$, redundant workers $L_0 - L_1$ are no longer supported by subsidies to formal sector firms and are retrenched, and the new equilibrium in the formal sector is described by point L_1, w in figure 1.

The magnitude of the labor reallocation depends on the costs faced by firms under the new retrenchment system. The resulting net change in total production is equal to the change in the marginal products of all workers retrenched, which depends on the magnitude of the ex ante marginal productivity with respect to alternative earnings. Given that all workers $L_0 - L_1$ are redundant from the firm's perspective, production will increase if workers are also redundant from the social perspective, and production will decline otherwise.

Under the assumed upper bound of productivity—that is, marginal productivity is equal to $y'(L)$—the net change in production will depend on whether alternative informal sector earnings are less than or greater than $y'(L_0)$. In figure 1, for w_a less than $y'(L_0)$, retrenched workers move from productivity $y'(L_0)$ down to w_a, and the fall in production is equal to $A + B + C + E + F$. By contrast, for alternative earnings greater than $y'(L_0)$ (denoted w_A in figure 1), the employment shift to the alternative sector causes production to change by $D - A$; as the productivity of workers laid off at the margin rises from $y'(L_0)$ to w_A, the gains in production (denoted by area D) are offset by the losses in production for workers subsequently retrenched whose higher marginal productivity actually falls to w_A (denoted by area A).

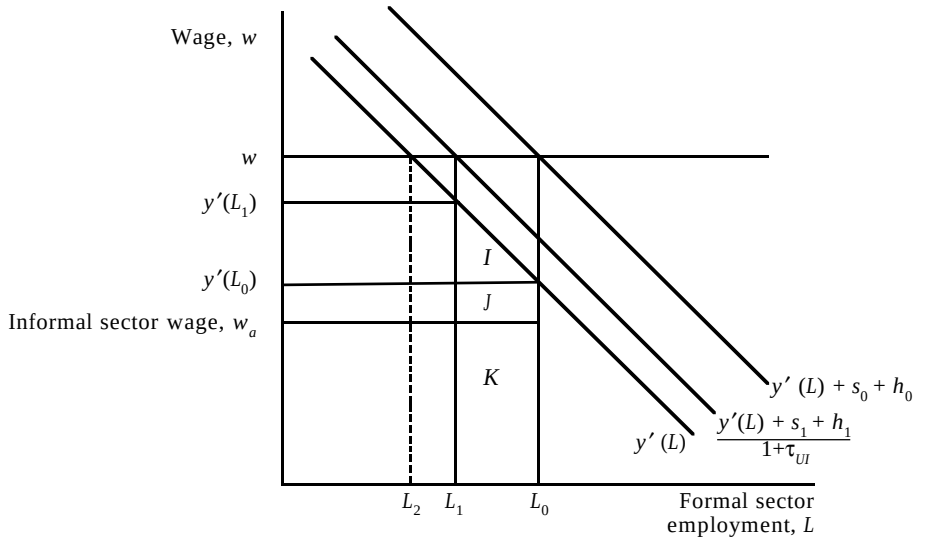
Thus far I have addressed only the changes in production associated with retrenchment. However, introducing the unemployment insurance system has another key effect, namely the associated decline in subsidy that offsets productivity losses. If, for example, firms retrench all privately redundant workers $L_0 - L_1$, then the subsidy is eliminated completely, easing pressure on the government's fiscal resources. Because taxation entails deadweight losses, reducing taxation gives rise to efficiency gains.

The net welfare cost of retrenchment in Algeria will depend on the labor market's initial conditions in terms of the relative marginal productivity of workers in the formal and informal sectors and the marginal cost of public funds. In order to measure the changes in output, I need information on the key parameters that determine the productivity of workers in the formal sector. With estimated values of the subsidy, s, the retrenchment cost per worker, h, and the unemployment rate, u, I use the first-order conditions (equations 15 and 17) to measure the wedge in productivity per worker between the two sectors. Together with information about the level of privately redundant workers and the gains from reduced government subsidy, I estimate the net welfare cost associated with layoffs.

To derive the initial level of productivity ($w - s_0 - h_0$), I need to know the extent of private redundancies. Suppose that all subsidies are eliminated ($s_1 = 0$) and public sector firms shed exactly all workers who are redundant from the firm's perspective; then equation 17 can be solved for h_1 because τ_{UI} and w are known. From the comparison of firms' retrenchment costs under the old and new systems (in table 1), I can solve for h_0 in terms of h_1.

Suppose, instead, that not all privately redundant workers are laid off and some degree of subsidy remains ($s_1 > 0$); this seems plausible in the case of Algeria. In figure 2, layoffs equivalent to $L_0 - L_1$ are less than total initial redundant workers $L_0 - L_2$. For redundant workers whose productivity is zero (the lower bound of the potential range), partially eliminating redundancies leads to production gains denoted by area K that are smaller than if all redundant workers $L_0 - L_2$ were retrenched. For worker productivity at the upper bound, marginal productivity rises from $y'(L_0)$ to $y'(L_1)$ under partial layoffs but still falls short of

Figure 2. *Retrenchment and Changes in Production with Some Remaining Subsidy ($s_1 > 0$)*



Note: See text for explanation. y is production, s is the subsidy per worker, h is the severance cost per retrenched worker, and τ_{UI} is the firm's payroll tax for unemployment insurance.

wage w.[3] The resulting production losses denoted by areas I and J are smaller than they would be if all redundancies were eliminated.

The only missing element needed to solve for the initial subsidy s_0 is the production function, whose first-order condition describes the demand for labor. I assume that δ is elasticity of labor demand. Solving for L under the old and new retrenchment systems (that is, for L_0 and L_1) and combining the two yield an expression for the rate of total layoffs σ as a function of the marginal labor productivities under the two systems,

$$1 - \sigma = \left[\frac{w - s_0 - h_0}{w(1 + \tau_{UI}) - s_1 - h_1} \right]^{\delta}. \tag{18}$$

Now that I can derive the marginal productivity of the formal sector from equation 18, a measure of productivity in the alternative sector is necessary to estimate potential production losses. This follows directly from equation 12, where w_a is a function of the unemployment rate.

Finally, the welfare costs associated with lost production derived above are offset by efficiency gains from lower subsidies; the marginal subsidy s_0 falls to s_1 ($s_1 \geq 0$) under the new retrenchment system. The government's lower burden

3. Note that only the case $w_a < y'(L_0)$ is depicted.

with respect to public enterprises implies a lower equilibrium level of tax revenue. Because the marginal cost of public funds is positive, this saving translates into real economic gains. (The welfare model ignores the distribution of costs.) To quantify these gains, I need information on the marginal cost of funds.

Calibration of the Welfare Model

The key data necessary to calibrate the model are summarized in table 4. Introducing the unemployment insurance system raises the effective magnitude of the payroll tax from 32 to 34 percent; because payroll taxes are levied on net salary, which averages 75 percent of gross wages (described by η in section II), the resulting increase in the tax rate on gross wages is 0.015. The relative magnitudes of h_0 and h_1 are derived from table 1. I rely on Hamermesh (1993) for the value of labor demand elasticity δ. Hamermesh surveys the literature on measures of aggregate constant-output labor demand elasticity for homogeneous labor and concludes that for industrial countries, it is likely to fall in the range [0.15, 0.75]. (By convention, labor demand elasticity is measured negatively, that is, in terms of $-\delta$, such that $\delta > 0$.) Recent estimates of labor demand elasticity in Morocco and Argentina also fall within the range (0.36 for state-owned enterprises in Morocco and between 0.30 and 0.75 in Argentina), suggesting that it is not unreasonable to apply the Hamermesh values to Algeria (see Guasch and others 1997 and World Bank 1997). In order to avoid underestimating the production losses and overestimating the efficiency gains of retrenchment in Algeria, I assume that δ takes a value equivalent to the upper bound 0.75. The model's results are not very sensitive to this assumption (as discussed below).

The model additionally requires a measure for the cost of public funds in order to calculate the efficiency gains from lower subsidies. Most available evidence refers to industrial countries: Browning (1987) finds that the marginal welfare cost of a tax on labor ranges from 32 to 47 percent in the United States; Hansson and Stuart (1985) estimate a range of 69 to 129 percent of revenue raised by a tax increase in Sweden. Developing countries are likely to encounter relatively higher costs due to less efficient tax administration and the use of less efficient tax instruments; Ahmad and Stern (1987) estimate welfare costs associated with a range of tax instruments in India at 77 to 85 percent. To calibrate

Table 4. *Calibration of the Welfare Model*

Variable	*Value*
Average gross monthly wage, w (dollars)[a]	239
Net payroll tax for unemployment insurance, τ_{UI} (percent)	1.5
Ratio of severance cost per retrenched worker under the new and old retrenchment systems, h_1/h_0	0.86
Constant-output elasticity of demand for labor, δ	0.75
Marginal cost of funds (percent)	75

a. In constant 1995 prices.
Source: Author's estimates.

Table 5. *Annual Net Welfare Gains from Retrenchment, 10 Scenarios*

Variable	*1*	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*	*10*
Layoffs (percent)	13	13	21	13	13	13	13	21	13	13
Redundancies (percent)	13	21	21	50	65	13	21	21	50	65
Ratio of informal to formal sector wages, w_o/w	72	72	72	72	72	50	50	50	50	50
Initial subsidy per worker, s_0/w (percent)	4.7	8.6	8.6	22.3	29.2	4.7	8.6	8.6	22.3	29.2
Final subsidy per worker, s_1/w (percent)	0	4.2	0	18.9	26.2	0	4.2	0	18.9	26.2
Ratio of initial marginal productivity to gross wage, $(w - s_0 - h_0)/w$ (percent)	93.6	89.7	89.7	75.9	69.0	93.6	89.7	89.7	75.9	69.0
Change in production (millions of dollars)										
Maximum productivity	–258.7	–216.7	–385.1	–68.1	2.1	–488.4	–446.3	–756.1	–297.7	–223.3
Zero productivity	751.5	751.5	1,213.9	751.5	751.1	521.9	521.9	843.0	521.9	521.9
Efficiency gains (millions of dollars)	36.6	88.3	108.4	252.0	322.4	36.6	88.3	108.4	252.0	322.4
Net welfare gains (millions of dollars)										
Maximum productivity	–222.2	–128.4	–276.8	183.9	324.5	–451.8	–358.0	–647.7	–45.7	99.0
	(–0.5)	(–0.3)	(–0.7)	(0.4)	(0.8)	(–1.1)	(–0.9)	(–1.6)	(–0.1)	(0.2)
Zero productivity	788.1	839.8	1,322.3	1,003.5	1,073.9	558.4	610.2	951.4	773.8	844.2
	(1.9)	(2.0)	(3.2)	(2.4)	(2.6)	(1.4)	(1.5)	(2.3)	(1.9)	(2.0)

Note: Annual welfare gains assume that retrenchment is complete. The share of GDP is in parentheses.
Source: Author's calculations.

the welfare model, I assume that the marginal cost of funds in Algeria is equal to 75 percent, such that each dollar reduction in total subsidy translates into a gain of 75 cents.

The welfare cost of retrenchment depends on actual layoffs and the magnitude of redundancies. Information on redundancies is generally unavailable, however, and imprecise at best, compounded by the fact that subsidies are largely implicit. I consider four values for redundancies as a share of formal sector employment: 13, 21, 50, and 65 percent. The value 13 percent reflects firms' observed labor-shedding behavior to date as an indication of the degree of redundant workers. The extent of redundant workers may be understated, however, based on the assertion that some degree of subsidy is likely to persist, enabling some redundant workers to remain employed in the formal sector. The value 21 percent is based on data from Egypt; El Khawaga (1993) finds public enterprise redundancies on the order of 21 percent using a 1986 Egyptian census. The value 50 percent reflects the fact that nonoil industrial value added declined 50 percent in real terms over the past decade, concurrent with no net change in employment. And finally, the value 65 percent is based on estimates of idle production capacity suggested by average capacity utilization rates of 35 percent in 1996. Whereas all of these values define redundancy from the firm's perspective, the very large magnitudes suggest that public industrial output is far from the production possibilities frontier, implying very low or zero marginal productivity for the workers in question.

In order to cover a range of plausible scenarios, the analysis considers the 10 combinations of redundancy, layoffs, and unemployment delineated in table 5 and generates an upper and lower bound of net welfare gains associated with each combination. Because the model relies on the Harris-Todaro hypothesis for measuring informal sector earnings, the unemployment rate is central to estimates of production losses. Official statistics from the Algerian Ministry of Labor and Social Protection estimate unemployment at 28 percent of the total labor force, translating into an alternative wage equal to 72 percent of w and a formal sector hiring rate equivalent to 72 percent (from equation 12). Scenarios 1 through 5 reflect this value. The actual hiring rate (the probability of finding a job) is likely to be much lower, however, given the lack of job turnover. I therefore consider a lower hiring rate of 50 percent in scenarios 6 through 10; informal sector earnings are thus assumed to equal half of the formal sector wage, averaging close to the minimum wage.

Results

I now have all the elements necessary to estimate the welfare effect of retrenchment under the new system. Table 5 summarizes the results, disaggregating the net welfare gains into the change in production and the gains in efficiency. Under the 10 scenarios, changes in annual production measured at the upper bound of marginal productivity range from losses of $756 million (scenario 8) to gains of $2 million (scenario 5). The wide disparity is driven by the

gap between the alternative wage and the initial marginal productivity $y'(L_0)$ across the various scenarios. In other words, production losses are dominated by the rectangle *J* depicted in figure 2 (not drawn to scale). At the lower bound of zero marginal productivity, production gains range from $522 million to $1.2 billion annually by the end of the enterprise restructuring period (estimated at five years in section II). Lower marginal productivity of public sector workers actually leads to higher welfare gains, as workers are reallocated to the informal sector. Note that the increase in production from zero productivity to average informal sector productivity is invariant with respect to redundancies but rather depends on the number of layoffs. The efficiency gains from reducing taxation are more modest but nevertheless significant, ranging from $37 million to $322 million per year.

Which scenario best describes the Algerian situation? I propose that scenarios 7 and 9, with a lower informal wage, layoffs of 13 percent, and private redundancies of 21 and 50 percent, respectively, most closely resemble the reality of the Algerian labor market. Retrenchment on the order of 13 percent leads to annual welfare effects ranging from costs of $358 million (0.9 percent of GDP) to gains of $610 million (1.5 percent of GDP) under scenario 7. At the upper bound of marginal productivity, the drop in annual production that results from shifting employment to the informal sector, depicted by areas *I* and *J* in figure 2, amounts to $446 million; under zero productivity, by contrast, annual production increases by an estimated $522 million, depicted by area *K* in figure 2. The associated efficiency gains resulting from a cut in the marginal subsidy are estimated at $88 million. Under the higher redundancies posited in scenario 9, retrenching 13 percent of the formal sector yields annual net welfare gains ranging from –$46 million to $774 million.

The net welfare gains resulting from these two cases can be easily compared with other scenarios; indeed, the model can be extended to predict welfare costs under any plausible retrenchment scenario. The estimates derived herein are striking because they illustrate that large-scale retrenchment may significantly increase welfare—by up to 2 percent of GDP. At the same time, however, the wide range of estimated welfare gains suggests that without more data on unobservable variables such as redundancies and informal sector wages, the model cannot generate a conclusive estimation of the economic cost of retrenchment.

Because the range of net welfare gains depends on the magnitude of private redundancies, I consider the sensitivity of results to this parameter and find it to be modest and fairly uniform across the 10 scenarios. A 1 percentage point increase in the degree of redundancies results in only small changes in welfare costs that average zero at the upper productivity bound and are negligible at the lower bound (except when all redundant workers are laid off). Efficiency gains are on average $7 million higher, due to the greater initial distortion reflected by higher redundancies.

The results of this analysis are moderately sensitive to parameter assumptions about the elasticity of labor demand, the level of unemployment, and the mar-

ginal cost of funds. The degree of sensitivity to these parameters, illustrated in table 6, is assessed relative to scenario 7. I consider, for example, a labor demand curve that is less elastic by 1 percentage point, that is, δ equal to 0.74. The resulting net welfare gains are 0.7 percent higher than in scenario 7 at the upper bound of productivity, with an even smaller increase in welfare gains at the lower bound of productivity (0.2 percent). Less responsive labor demand implies smaller production losses and greater efficiency gains by cutting a higher initial subsidy. For unemployment, the effect is more significant. An unemployment rate of 27 percent results in a higher alternative wage, raising net welfare gains by 2.9 percent (at the upper bound). Alternatively, a small decline in the marginal cost of funds from 75 to 74 percent lowers the net gains slightly (by 0.2–0.3 percent), because reducing the subsidy engenders smaller efficiency gains; the difference translates into additional costs of $1 million annually.

IV. Policy Implications and Conclusions

Does the Algerian retrenchment system effectively and efficiently achieve its objectives of facilitating layoffs and easing the transition costs by providing income support to affected workers? An affirmative answer to this question would suggest that the system could be imitated in other developing countries. Whereas the above analysis concludes that the CNAC is financially sound, the scope for its application elsewhere depends critically on institutional capacity. In light of its complicated benefit design and intensive administrative and monitoring requirements, the Algerian system as is appears ill-suited for less-developed countries, although simplifying modifications could expand its applicability.

This article addresses the more fundamental issues of financial and economic costs by evaluating the Algerian retrenchment system in terms of its financial viability and the welfare costs associated with layoffs in a labor market characterized by high unemployment and redundancies. Because retrenchment is somewhat cheaper under a system that allows greater flexibility in labor decisions, firms are able to shed redundant workers, thus raising the average level of labor

Table 6. *Sensitivity Analysis*

	Percentage change in welfare gains	
Change in parameter assumption	*Maximum productivity*	*Zero productivity*
Constant-output elasticity of demand for labor, δ, declines from 0.75 to 0.74	0.7	0.2
Unemployment rate declines from 28 to 27 percent	2.9	1.7
Marginal cost of funds declines from 75 to 74 percent	–0.3	–0.2

Note: Results of the sensitivity analysis are relative to scenario 7, in which layoffs are 13 percent, redundancies are 21 percent, and the informal sector wage is half the formal sector wage (see table 5).
Source: Author's calculations.

productivity and reducing the wage bill. The financial flows model presented in section II assesses the system's financial viability and projects a buildup of CNAC reserves on the order of 2 percent of GDP, implying that the system does not risk insolvency.

These results have certain policy implications. The fact that the system is not only financially viable but also likely to accumulate considerable reserves indicates potential overfunding and raises questions regarding the use of funds. This is especially important in an inflationary environment; annual inflation around 20 percent during 1995–96 dissipated the real value of accumulated reserves. There is certainly scope for improving the financial efficiency of the new system, specifically by lowering the initiation fee or the payroll tax rate or by raising benefit levels. Although a cut in the payroll tax would reduce the burden on firms and workers, tax rates could be raised to meet unexpected financing needs, according to a general solvency provision in the legislation. Because Algeria faces a critical period of adjustment, this option would reduce labor costs in the immediate run, postponing higher taxes to a period in which firms would be better able to respond.

Although the financial evaluation suggests that the unemployment insurance system is adequately financed, the economy may incur costs in the form of lost output under mass layoffs. The model presented in section III calculates the welfare cost of retrenching formal sector workers. Assuming that the aggregate reduction in formal sector employment due to retrenchment is equal to the aggregate increase in informal employment, the welfare model estimates total production losses (in the case of redundancy from the firm's perspective) or gains (for socially redundant workers) associated with layoffs that are offset or compounded by efficiency gains from cutting subsidies. These efficiency gains are generated by the fact that the government's marginal cost of funds is positive; reduced subsidy of public enterprises consequently diminishes the government's need for fiscal revenue. The net welfare cost of retrenchment depends on the initial number of redundancies and their ex ante marginal productivity, the extent of layoffs, and informal sector earnings. The model estimates welfare costs for the two most likely outcomes, described in scenarios 7 and 9 in section III. Retrenching 13 percent of the formal sector is estimated to generate annual net welfare gains ranging from costs of $358 million to gains of $774 million. Whereas this range of potential gains appears rather broad for deriving precise conclusions, the model provides a method of evaluation that will be more useful when the necessary data are available.

There are several directions in which the welfare model could be extended to address related issues. For example, it could be refined by introducing labor supply effects on informal sector earnings following the influx of laid-off workers. Alternatively, the dynamic potential of the private (including informal) sector could be incorporated into the analysis, resulting in larger estimates of welfare gains. Whereas the welfare model takes a partial equilibrium approach, a general equilibrium analysis could account for the additional costs associated

with transitory shocks to aggregate demand in the wake of massive retrenchment. Furthermore, large layoffs could have dynamic implications for the CNAC's financial viability, if firms are unable to make the necessary initiation fee payments, as well as for sectoral and economywide output as a whole. If, for example, restructuring results in widespread firm closures, additional constraints on growth could emerge with respect to aggregate demand, the availability of inputs to production, and fiscal pressures large enough to affect the macroeconomy. There is also scope for assessing the short-term effects of retrenchment on production losses because reallocation to informal activity is not instantaneous; this aspect cannot be addressed using equilibrium analysis. I raise these suggested extensions as areas for future research.

Although redundancies involve costs to efficiency, eliminating them completely may be undesirable: there is a risk that layoffs resulting from cutting the subsidy to public firms will worsen welfare, consistent with the theory of the second best with respect to removing a single distortion in the context of many. These conflicting potential outcomes highlight the complexity of public sector downsizing and the inherent risks to the economy as a whole. It is not clear from table 6 exactly what would be an optimal retrenchment strategy, although the welfare model is a tool for answering this question. The optimal level of layoffs therefore cannot be determined without detailed information on the number and actual level of marginal productivity of redundant workers. The analysis presented here is useful because it provides a framework for measuring financial and economic costs under various scenarios and assesses the cost impact of changing the system's parameters. In light of Algeria's various labor market distortions, the new retrenchment system appears to meet the objective of facilitating labor shedding, but the magnitude of the net economic gains remains somewhat uncertain.

Appendix. The Algerian Retrenchment System

Eligibility criteria for the worker

Laid off for economic reasons.
Receives no other earnings, except for unpaid leave.
Ineligible for early or regular retirement.
Affiliated with social security system for at least three years.
Paid unemployment insurance contributions (1.5 percent of taxable wage) for at least six months prior to layoff.
Employer paid the initiation fee to the unemployment insurance fund.
Registered "job seeker" with employment office for at least three months.
Does not refuse job offer or retraining.

Eligibility criteria for the employer

Firm must be up-to-date in payment of social security contributions and unemployment insurance contributions (employer portion of unemployment insurance tax = 2.5 percent of taxable wage bill).

Firms with more than nine employees must present an employment reduction or restructuring plan (*volet social*) to workers' participation committees and labor unions for agreement, negotiation, and mediation, with recourse to arbitration.

For each employee laid off, the firm pays a severance package equal to three months of salary, notifies the unemployment insurance fund, and pays the initiation fee.

Initiation fee is equal to 80 percent of the gross monthly salary for each year of work experience in excess of three years, up to a maximum of 12 months of salary (equivalent to 18 years of tenure):

- Initial payment equivalent to two months of salary must be paid up front.
- Balance paid over one year.

Benefit structure

Severance pay equal to one month of salary per year of service up to three years, paid in lump sum by the employer directly to the worker.

Continued eligibility for health insurance, maternity benefits, and family benefits.

Duration period equal to two months per year of unemployment insurance contributions paid to the last employer: 12-month minimum, 36-month maximum.

Duration period divided into four equal subperiods.

Monthly reference wage equal to half the sum of the gross monthly wage and the minimum wage.

Benefit level equal to graduated replacement rate of the monthly reference wage:

- 100 percent during the first subperiod
- 80 percent during the second subperiod
- 60 percent during the third subperiod
- 50 percent during the fourth subperiod.

Benefit level minimum is three-quarters of the minimum wage; the maximum is three times the minimum wage.

Benefits are subject to the employee portion of social security contributions.

After exhaustion of benefits, continued eligibility for health insurance and family benefits for one year.

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