

Labor Market Institutions and Unemployment: Can Earlier Findings be Replicated?

Bree Dority
University of Nebraska

Scott M. Fuess, Jr.*
University of Nebraska & Institute for the Study of Labor (IZA)

In a well-known book, Layard, Nickell, and Jackman (LNJ) tried to measure how unemployment is related to labor market institutions. Using a cross-section of 20 OECD countries for 1983-1988, they found that changes in inflation and labor market institutions can explain most of the unemployment differences across countries. In recent years unemployment has been acute in several countries, particularly in Europe, and there is controversy whether labor market policies should be altered. This study examines whether Layard, Nickell, and Jackman's original findings can be replicated. Extending the sample period to 1989-2002, and using alternative specifications for the same group of OECD countries, we find that unemployment no longer is related to disinflation. Joblessness still is significantly related to labor market institutions, but many effects are different than those observed for 1983-1988. Specifically, active labor market programs have been more potent in combating unemployment.

Introduction and Review

Replication in empirical economics is vital. Indeed, it has been argued that a result is not worth knowing if it cannot be reproduced (Mittelstaedt and Zorn, 1984). Because confirming econometric results serves a public interest, this journal gives

* Bree Dority is a doctoral student at the University of Nebraska. Scott M. Fuess, Jr. is Professor of Economics at the University of Nebraska and a Research Fellow at the Institute for the Study of Labor (IZA) in Bonn, Germany. The authors thank Örn Bodvarsson and an anonymous referee for helpful suggestions. We are responsible for any remaining shortcomings.

priority to publishing replication studies.¹ Unfortunately, would-be replicators may be stymied by data problems (Feigenbaum and Levy, 1993). They may not have access to data used in original studies. Even if time series are available, the series often are revised, so that the numbers available to a replicator are not necessarily the same ones that were available to the original researcher. Moreover, it is not always clear what formulations were used to generate results, so findings cannot always be reproduced. For example, Wulwick (1996) described in detail the difficulties associated with trying to reproduce original Phillips Curve estimates.

There is a difference between attempts to duplicate results, so-called “econometric audits,” and efforts to reproduce and extend findings, known as “replication with extension.”² The latter efforts may try to keep all known conditions similar or they may involve variations in the original study. In either case, replication with extension tries to generalize the validity of empirical findings.

If empirical findings are robust—that is, they can be duplicated and extended—then we can have more confidence about policy recommendations based on those findings. Perhaps no policy issue receives more attention, and is more controversial, than labor market reforms. Despite chronically high unemployment in countries such as France or Germany, there is no consensus in those places about proposals to alter labor market institutions.

In a well-known book, Layard, Nickell, and Jackman (1994) tried to measure how unemployment is related to labor market institutions. Using a cross-section of 20 industrialized countries and data for 1983-1988, they found that changes in inflation and institutional variables can explain a large majority of unemployment differences across countries. To represent labor market institutions, they considered aspects of collective bargaining structure and labor market programs. Unemployment benefits are regarded as a passive type of program for the unemployed. Active help for the jobless includes training, placement services, direct job creation, and recruitment subsidies. In their analysis Layard, Nickell, and Jackman considered duration and amount of unemployment benefits. They also considered expenditures on active labor market programs.

Constructing measures to represent labor market institutions requires many judgments. For example, how does one classify a country’s collective bargaining structure? What does one include in measuring expenditures on active labor market programs? Layard, Nickell, and Jackman discussed how they constructed their variables. Moreover, they provided the *actual data* used in their computations. Based

¹For reviews of replication in business and economics research, see Dewald et al. (1986) and Fuess (1996).

²On different types of replication efforts, see Kane (1984), Hubbard and Vetter (1991), and Lindsay and Ehrenberg (1993).

on Layard, Nickell, and Jackman's data and discussion, we seek to duplicate their results.³

Since the Layard, Nickell, and Jackman book was published unemployment has been particularly acute in countries such as France, Germany, Italy, and Spain. Perhaps it is not surprising that research on the effectiveness of labor policies has concentrated on Europe. (See Kluve, 2006.) Analysts such as Belot and van Ours (2000) have pondered whether "cleverly designed" reforms can combat unemployment. Indeed, some countries have altered some of their labor market institutions. Therefore, it is particularly important to update the analysis of unemployment and labor market institutions.

To see if Layard, Nickell, and Jackman's findings for 1983-1988 can be extended, we use their econometric specification with a data set updated for 1989-2002. In further efforts to generalize Layard, Nickell, and Jackman's findings, we also adjust the econometric specification. Finally, we also analyze a combined sample for 1983-2002. Altogether, our results confirm that joblessness is affected significantly by labor market institutions, but for recent years many effects are different than those observed by Layard, Nickell, and Jackman for 1983-1988. In recent years especially, active labor market programs appear to be more effective in alleviating unemployment.

Can Earlier Findings be Duplicated?

Unemployment and Labor Market Institutions: Specification. Layard, Nickell, and Jackman began with a simple Phillips Curve specification:

$$\Delta p - \Delta p_{-1} = -\theta(u - u^*), \quad (1)$$

where:

- $\Delta p - \Delta p_{-1}$ = The change in inflation;
- u^* = The natural unemployment rate;
- u = The observed unemployment rate; and
- θ = A parameter.

If the natural unemployment rate in country i (u^*_i) depends on labor market institutions in that country (z_{ij}), then unemployment for that country (u_i) can be written as:

$$u_i = \alpha_0 + \alpha_1 \Delta^2 p_i + \sum_{j=2}^k \alpha_j z_{ij}, \quad (2)$$

³Following publication of the Layard, Nickel, and Jackman book, there have been efforts to extend the analysis. Nickell (1997) conducted a similar analysis with two different samples: 1983-1988 and 1989-1994. Nickell (1998, 2003) extended the sample period back to the 1960s. Nickell, Nunziata, and Ochel (2005) studied OECD countries for 1961-1995.

where:

α_s = Parameters to be estimated.

If disinflation pushes unemployment upward, then $\alpha_1 < 0$. If a labor market characteristic contributes to unemployment, $\alpha_j > 0$.

To represent labor market institutions in a country, Layard, Nickell, and Jackman considered six different variables: (1) duration of unemployment benefits (*Duration*), (2) replacement ratio (*Replacement*), that is, unemployment benefits as a percentage of the relevant gross wage, (3) outlays on active labor market programs per unemployed person (*Active program spending*), (4) extent that union contracts apply to the workforce (*Union coverage*), (5) degree of union coordination in wage setting (*Union coordination*), and (6) degree of employer coordination in wage setting (*Employer coordination*). Thus, they specified the following *Unemployment* equation:

$$\begin{aligned} \text{Unemployment}_i = & \alpha_0 + \alpha_1 \text{Change in inflation}_i + \alpha_2 \text{Duration}_i \\ & + \alpha_3 \text{Replacement}_i + \alpha_4 \text{Active program spending}_i \\ & + \alpha_5 \text{Union coverage}_i + \alpha_6 \text{Union coordination}_i \\ & + \alpha_7 \text{Employer coordination}_i + \varepsilon_i, \end{aligned} \quad (3)$$

where:

ε_i = A random disturbance term.

If unemployment benefits reduce the cost of being jobless, they may discourage job finding, meaning $\alpha_2 > 0$ and $\alpha_3 > 0$. If active labor market programs help improve the quality of manpower or bolster the demand for labor, they may encourage job finding, meaning $\alpha_4 < 0$. It often is alleged that when union contracts are pervasive, wages are less responsive to market conditions, implying $\alpha_5 > 0$. If labor and management do not coordinate their wage bargaining, but bargain as individual units within the economy, they are likely to ignore the effects of their actions on the general labor market situation. In contrast, if labor and management coordinate their bargaining efforts, presumably they take into account the economy-wide effects of their agreements. Consequently, $\alpha_6 < 0$ and $\alpha_7 < 0$ should be observed.

To estimate equation (3) for a cross-section of countries, it is necessary to compile observations that reflect labor market characteristics. Focusing on 20 industrialized countries, Layard, Nickell, and Jackman assembled observations for the years 1983-1988.⁴

⁴For data sources and details, see Layard, Nickell, and Jackman, pp. 74-82, 119-32. The 20 countries in their sample included European Union (EU) members Belgium, Denmark, France, Federal Republic of Germany, Ireland, Italy, the Netherlands, Portugal, Spain, and the UK. Other European countries in the sample were Austria, Finland, and Sweden (now EU members); also included were Norway and Switzerland. From North America, they considered Canada and the US. From Oceania and Asia, they included Australia, New Zealand, and Japan.

For *Duration*, Layard, Nickell, and Jackman used government reports to compile for 1985 the duration of some form of unemployment benefit paying over \$120 per month.⁵ Similarly for *Replacement*, they relied on government reports to compile for 1985 gross benefits for a single person under age 50 as a percentage of the most relevant gross wage.

Active help for the jobless includes programs for training, placement services, and subsidies for job creation or recruitment. Layard, Nickell, and Jackman argued that the best way to quantify these activities is to measure outlays per unemployed person relative to output per worker. Relying on OECD *Employment Outlook* data, they computed *Active program spending* for 1987 for each country.

Union coverage is based on the percentage of workers who are covered by union contracts. If fewer than 25 percent of workers are covered by the terms of union contracts, then the *Union coverage* index equals 1. If the share of covered workers is in the 25-75 percent range, *Union coverage* equals 2; if coverage exceeds 75 percent, *Union coverage* equals 3.

Constructing indices for *Union coordination* and *Employer coordination* requires subjective judgments. For each country, Layard, Nickell, and Jackman used a *Union coordination* measure equal to 1, 2, or 3. If Layard, Nickell, and Jackman determined that unions bargain firm by firm, they set *Union coordination* equal to 1; if organized labor conducts national level wage bargaining, then *Union coordination* equals 3. If organized labor conducts wage bargaining at some intermediate level (for example, industry by industry), then *Union coordination* equals 2. Similarly, they used an *Employer coordination* measure set to 1, 2, or 3.

Besides describing their labor market variables and data sources, in Chapter 11 of their book Layard, Nickell, and Jackman presented the actual data used in estimating the *Unemployment* equation. (See Table 5, p. 74; Table 6, pp. 78-79.) In principle it should be fairly straightforward to duplicate their findings. Before describing our efforts to reproduce their findings, we recap Layard, Nickell, and Jackman's results.

Layard, Nickell, and Jackman's Results. Descriptive statistics for Layard, Nickell, and Jackman's variables are reported in Table 1, Panel A. For the 20 countries in the sample, *Unemployment* for 1983-1988 averages 7.89 percent. The mid-to-late 1980s were generally disinflationary, with *Change in inflation* averaging -2.99 percent. *Duration* of unemployment benefits is roughly 2.60 years, with a mean *Replacement* ratio of 58.25 percent. *Active program spending* per unemployed person is roughly 7.64 percent of output per worker. The norm is for *Union coverage* to exceed 75 percent. The norm for *Union coordination* and for *Employer*

⁵Whenever Layard, Nickell, and Jackman (1994) found "indefinite" duration of benefits, they assigned a value of 4 to *Duration*. This value is a mark-up: $1.06667 \times$ the longest duration recorded for any other country (France, 3.75).

coordination is for intermediate bargaining (neither national level nor firm by firm wage setting).

Table 1—Unemployment and Labor Market Institutions, 1983-1988: Descriptive Statistics

Variable	Mean	Std. Dev.	Minimum	Maximum
Panel A: Exact Data from Layard, Nickell, and Jackman, 1983-1988				
Average Unemployment Rate (%)	7.89	4.63	2.20	19.80
Change in Inflation (% Points)	-2.99	3.72	-12.70	1.40
Duration (Years, as of 1985)	2.60	1.58	0.50	4.00
Replacement (% as of 1985)	58.25	19.43	2.00	90.00
Active Program Spending (% as of 1987)	7.64	7.34	0.80	34.60
Union Coverage (Index = 1-3)	2.70	0.57	1.00	3.00
Union Coordination (Index = 1-3)	2.00	0.73	1.00	3.00
Employer Coordination (Index = 1-3)	1.95	0.89	1.00	3.00
Panel B: Recalculating Layard, Nickell, and Jackman's Data, 1983-1988				
Average Unemployment Rate (%)	7.92	4.62	2.30	19.80
Change in Inflation (% Points)	-3.05	3.70	-12.70	1.60
Active Program Spending (%)	13.40	19.94	3.00	96.00

Using the average unemployment rate for 1983-1988 as the dependent variable, Layard, Nickell, and Jackman estimated equation (3) with OLS regression. Their results appear in Table 2, left column. Labor market characteristics notwithstanding, they found that unemployment is inversely related to inflation. Specifically, accelerating inflation by one percentage point is associated with a drop in the unemployment rate by 0.35 percentage points.

Joblessness is affected significantly by labor market institutions. As hypothesized, unemployment is directly related to *Duration* and *Replacement*. An extra year of eligibility for unemployment benefits adds an extra 0.92 points to the unemployment rate. Increasing the replacement ratio 10 points adds an extra 1.70 points to the unemployment rate.

Layard, Nickell, and Jackman also found that unemployment is inversely related to *Active program spending*. If program expenditures per unemployed person increase one percentage point, unemployment falls 0.13 points. At the mean value of *Active program spending* (7.64), unemployment would be approximately 1 percentage point lower.

Joblessness is affected by the wage-setting process too. Expanding *Union coverage* means higher unemployment. Other things equal, the unemployment rate in a highly unionized country (coverage exceeds 75 percent) is 4.90 points higher than in a weakly unionized country (coverage less than 25 percent). The more centralized is the bargaining process, the lower is a country's unemployment. Specifically, the unemployment rate is inversely related to both *Union coordination* and *Employer coordination*. The impact of *Employer coordination* is especially strong. For a

country where employers bargain as a group, unemployment is 8.56 points lower than for a country in which firms bargain individually.

Duplicating Layard, Nickell, and Jackman. When the data reported by Layard, Nickell, and Jackman in Chapter 11 are used with their specified equation, are their results reproduced? Our duplication effort is reported in Table 2, center column.

Table 2—Unemployment and Labor Market Institutions: Duplicating Layard, Nickell, and Jackman†

Dependent Variable: Average Unemployment Rate, 1983-1988			
Explanatory Variable	LNJ (1994)	Duplication 1:	Duplication 2:
	Original Results	LNJ's Exact Data	Re-Computing LNJ's Variables
Estimated coefficient (t-statistic)			
Constant	0.24 (0.1)	0.647 (0.31)	0.421 (0.17)
Change in Inflation (% Points)	-0.35** (-2.8)	-0.361** (-2.69)	-0.311* (-2.06)
Duration (Years, as of 1985)	0.92** (2.9)	0.873** (2.57)	0.622 (1.62)
Replacement (% as of 1985)	0.17** (7.1)	0.155** (6.57)	0.151** (5.57)
Active Program Spending (% as of 1987)	-0.13** (-2.3)	-0.135** (-2.29)	-0.035 (-1.46)
Union Coverage (Index = 1-3)	2.45** (2.4)	2.518** (2.27)	3.165** (2.49)
Union Coordination (Index = 1-3)	-1.42* (-2.0)	-1.334 (-1.76)	-1.667* (-2.02)
Employer Coordination (Index = 1-3)	-4.28** (-2.9)	-4.209** (-6.52)	-4.411** (-6.09)
R ²	0.91	0.93	0.91
F-statistic (Overall Regression)	-	24.00**	18.13**
Sample Size	20	20	20

†Original estimates are copied from Layard, Nickell, and Jackman (1994, p. 82)

**Significant at the 5 percent level; *Significant at the 10 percent level

Like Layard, Nickell, and Jackman, we find that unemployment is inversely related to inflation. Our estimates also confirm that unemployment is directly related to *Duration*, *Replacement*, and *Union coverage*; joblessness is negatively related to *Active program spending* and *Employer coordination*. Unlike Layard, Nickell, and Jackman, we find that unemployment is not significantly related to *Union coordination*.

Our audit essentially reproduces their findings, but does not duplicate them exactly. The estimated coefficients for *Duration* and *Replacement* are smaller than those reported by Layard, Nickell, and Jackman, more than 5 percent smaller. Whereas the negative *Union coordination* coefficient in the Layard, Nickell, and Jackman study is significant at the 10 percent level, our estimated coefficient is not significant. Our other coefficients are close to Layard, Nickell, and Jackman's, but

not identical. Do the differences matter? To address this question, consider another duplication effort.

For each of the 20 countries in the sample, Layard, Nickell, and Jackman reported in Chapter 11 averages (1983-1988) for both *Unemployment* and *Change in inflation* (Table 5, p. 74; Table 6, pp. 78-79). In Annex 6 of the same book, Layard, Nickell, and Jackman reported each country's unemployment rate and inflation rate for each year for 1955-1992 (Table A3, pp. 134-37; Table A4, pp. 138-40). Using the data from Annex 6 instead, we computed for 1983-1988 the average unemployment rate for each country. We found small discrepancies for seven of the 20 countries in the sample. Likewise, for each country we computed the average change in inflation for 1983-1988. We found discrepancies for 18 of the 20 countries (Table 1, Panels A and B).

Layard, Nickell, and Jackman's Chapter 11 also presents figures for each country's *Active program spending* for 1987 (Table 5, p. 74). Specifically, Layard, Nickell, and Jackman listed figures for outlays on active labor market programs per unemployed person (as a percentage of output per person). As a data source, they cited the OECD's *Employment Outlook* (September 1988, Table 3.1). But that OECD source reported expenditures on active programs as a percentage of GDP, not outlays per unemployed person. Layard, Nickell, and Jackman did not explain how they converted the OECD data into the figures appearing in Chapter 11. But elsewhere in the book there is a hint about what they may have done.

In Annex 3 of their book Layard, Nickell, and Jackman described how to convert unemployment benefits as a share of GDP into a measure of unemployment benefits per unemployed person (pp. 119-23). Following the method described in Annex 3 (see data appendix for details), we took the OECD *Employment Outlook* figures and calculated on our own *Active program spending* per unemployed person (as a percentage of output per person). For 18 of the 20 countries, our calculations yield values higher than those reported by Layard, Nickell, and Jackman, some substantially higher (Table 1, Panels A and B).

Using our re-calculations for *Unemployment*, *Change in inflation*, and *Active program spending*, we re-estimated the *Unemployment* equation. The results of our second duplication effort are reported in Table 2, right column. In many respects our second effort confirms Layard, Nickell, and Jackman's original findings. Unemployment is inversely related to *Change in inflation*, *Employer coordination*, and *Union coordination*; joblessness is directly related to *Replacement* and *Union coverage*. But the *Duration* effect is now insignificant. Furthermore, the *Active program spending* coefficient is smaller in magnitude and insignificant. Our first duplication effort essentially confirms Layard, Nickell, and Jackman's findings. In the second duplication effort, many of Layard, Nickell, and Jackman's findings are corroborated, but not reproduced exactly, which illustrates how challenging it can be to replicate econometric findings.

Can Earlier Findings be Extended?

Layard, Nickell, and Jackman's analysis focused on the 1980s, specifically, 1983-1988. But since then some countries have adjusted some of their labor market institutions. To see if Layard, Nickell, and Jackman's findings can be extended, we assembled data for the years 1989-2002. We also adjust the econometric specification. As a check on the robustness of our findings, we try two different procedures. Nearly a decade after the Layard, Nickell, and Jackman book was published, Nickell (2003) updated and modified some measures for some labor market institutions. Therefore, we also re-estimate the *Unemployment* equation using Nickell's alternative measures as explanatory variables. Finally, we combine sample periods, re-estimating the *Unemployment* equation for the 20-year span 1983-2002.

Extending the Sample Period. To see if Layard, Nickell, and Jackman's findings can be extended, we updated the data set, trying to follow Layard, Nickell, and Jackman as closely as possible. We were able to compile observations for the years 1989-2002.

In constructing their original data set Layard, Nickell, and Jackman relied primarily on OECD data, especially figures reported in issues of *Economic Outlook* and in various *Country Reports*. Observations for *Duration* and *Replacement* were obtained from the U.S. government report *Social Security Programs Throughout the World 1985* (Washington: U.S. Department of Health and Human Services). In updating the data set, a change in data availability led us to modify the *Unemployment* equation:

$$\begin{aligned} \text{Unemployment}_i = & \beta_0 + \beta_1 \text{Change in inflation}_i \\ & + \beta_2 \text{Duration}_i + \beta_3 \text{Replacement}_i \\ & + \beta_4 \text{Active program spending}_i \\ & + \beta_5 \text{Union coverage}_i + \beta_6 \text{Coordination}_i + \zeta_i, \end{aligned} \quad (4)$$

where:

ζ_i = The disturbance term.

Like Layard, Nickell, and Jackman, we obtained *Unemployment* and *Change in inflation* from the OECD's *Economic Outlook*. (See data appendix for sources and details.) *Duration* and *Replacement* (both as of 1999) are from an OECD report on benefits and wages.⁶ Observations for *Active program spending* (average for 1994-1997) are from an OECD report on countries' active labor market policies.

⁶Both *Duration* and *Replacement* apply to a 40-year-old single worker without children, with 18 years of employment records and previously earning an average income. An average income is defined as the earnings level of the average production worker. Whenever Layard, Nickell, and Jackman (1994) found "indefinite" duration of benefits, they computed *Duration* by taking $1.06667 \times$ the longest duration recorded for any other country (France, 3.75). In our updated data set for 1989-2002, we followed the same procedure. The Netherlands had the

Instead of reporting separate figures for *Union coordination* and for *Employer coordination*, a 1997 OECD report on bargaining structure classifies countries (as of 1994) by combining the extent of labor and management coordination in the wage-setting process. If labor and management tend to bargain on a firm by firm basis, the *Coordination* index equals 1. If labor and management tend to coordinate their bargaining efforts on an economy-wide basis, *Coordination* is set equal to 3. If there is an intermediate bargaining structure, the index takes values of 1½, 2, or 2½. The same OECD report classifies the extent of *Union coverage*.⁷

Descriptive statistics for the updated data set are reported in Table 3, Panel A. Over the years 1989-2002, mean *Unemployment* for the 20 countries is 7.30, which is 0.59 points lower than for 1983-1988. The 1990s continued to be disinflationary, with *Change in inflation* averaging -3.36 percent, but varying less than in the 1980s.⁸

Table 3—Unemployment and Labor Market Institutions, 1989-2002: Descriptive Statistics†

Variable	Mean	Std. Dev.	Minimum	Maximum
Panel A: Updating the Data Set				
Average Unemployment Rate (%)	7.30	2.84	2.80	14.00
Change in Inflation (% Points)	-3.36	1.92	-7.30	-0.70
Duration (Years, as of 1999)	5.86	3.97	0.50	9.60
Replacement (% of 1999)	66.67	12.85	49.00	90.00
Active Program Spending (% of 1994-1997)	12.03	8.13	2.80	29.30
Union Coverage (Index = 1-3, as of 1994)	2.45	0.69	1.00	3.00
Coordination (Index = 1-3, as of 1994)	1.93	0.67	1.00	3.00
Global Competitiveness (Index of Unit Labor Costs)	106.55	16.80	83.31	154.93
Openness to Immigration (Immigrants as % of Labor Force)	7.61	7.50	0.20	24.70
Panel B: Figures Assembled by Nickell (2003)				
Duration (Index, as of 1988-95, 1999)	0.52	0.32	0.00	1.02
Replacement (% of 1988-95, 1999)	48.58	16.83	19.50	73.00
Active Program Spending (% of 1989, 1993, 1998)	14.22	11.96	3.52	54.49
Union Coverage (Index = 1-3, as of 1990, 1994)	2.40	0.66	1.00	3.00
Coordination (Index = 1-3, as of 1990, 1994)	1.98	0.60	1.00	3.00

†For Panel A, see data appendix for sources and details; for Panel B, see Note 13 above and Nickell (2003, Tables 4, 5, 7, 8, and 10)

Some labor market characteristics remain unchanged. It is still the norm for *Union coverage* to exceed 75 percent. The norm is still intermediate bargaining, neither national level nor firm by firm wage-setting.

longest duration of benefits, nine years. Whenever we encountered “indefinite” duration for a country, we assigned *Duration* a value of $9 \times 1.06667 = 9.6$.

⁷Like Layard, Nickell, and Jackman, *Union coverage* equals 1 (if coverage is less than 25 percent), 2 (if coverage is in the 25 percent to 75 percent range), or 3 (if coverage exceeds 75 percent).

⁸For 1989-2002 the standard deviation for *Change in inflation* is roughly one half of that observed for 1983-1988.

Other labor market institutions are different for the 1990s than the 1980s. Compared to Layard, Nickell, and Jackman's figures for 1983-1988, *Active program spending* per unemployed person increases to 12.03 percent of output per worker.

Unemployment benefits changed too. Maximum *Duration* of benefits is higher than before for some countries (Denmark, France, Portugal, Canada, Japan, Norway, and Sweden) but lower for only one country (Switzerland). Overall, mean *Duration* rises to 5.86 years. Likewise, the unemployment benefit *Replacement* ratio increases for some countries (France, Italy, Portugal, United Kingdom, Australia, New Zealand, Japan, Finland) while dropping for other countries (Germany, Spain, Canada, Austria, Norway). Altogether, the average *Replacement* ratio increases to 66.67 percent.

Using the updated data set for 1989-2002, we used equation (4) to estimate an *Unemployment* regression, the results of which are reported in the left column of Table 4.⁹ Unemployment is *not* significantly related to changes in inflation, other things equal. Whereas disinflation in the 1980s meant more joblessness, continued disinflation in the 1990s did not affect unemployment. This finding suggests that labor market participants adjusted their expectations and no longer were surprised by lower inflation.

The effects of labor market institutions are somewhat different for 1989-2002 than for 1983-1988. *Unemployment* still is inversely related to *Active program spending*, but the estimated coefficient is now much larger. Increasing program expenditures per unemployed person one percentage point means lower unemployment by 0.21 points; this coefficient is 1.6 times bigger in magnitude than the one estimated by Layard, Nickell, and Jackman. At the mean value of *Active program spending* (12.03), unemployment would be approximately 2½ percentage points lower. Evidently, active efforts to improve employability have become more important in curbing unemployment.

The effects of unemployment benefits on joblessness are smaller than before. Raising the *Replacement* ratio 10 points adds 0.85 points to the unemployment rate, which is only one-half of the impact reported by Layard, Nickell, and Jackman for the 1980s. The *Duration* effect is now insignificant.

There are other factors, however, that tend to aggravate unemployment. As *Union coverage* becomes more extensive, the upward pressure on unemployment is greater than before. Other things equal, *Unemployment* in a highly unionized country

⁹For 1983-1988, Layard, Nickell, and Jackman's sample contains the Federal Republic of Germany (West Germany). For the 1989-2002 sample, observations are still for the Federal Republic of Germany, which for 1989-1990 means West Germany; for 1991-2002 it means unified Germany. As a check on our results we re-estimated the *Unemployment* equation; for Germany we used observations only for 1991-2002, thereby avoiding any potential discontinuities in the German data. None of our conclusions is affected. Results are available upon request.

(coverage exceeds 75 percent) is now 6.86 points higher than in a weakly unionized country (coverage less than 25 percent); this magnitude is 1.4 times greater than before. As before, the more coordinated is the wage-setting process the lower is a country's unemployment rate.

Table 4—Unemployment and Labor Market Institutions: Updating the Data Set/Altering the Specification†

Dependent Variable: Average Unemployment Rate, 1989-2002		
Explanatory Variable	Estimated Coefficient (t-statistic)	Estimated Coefficient (t-statistic)
Constant	-0.107 (-0.04)	4.090 (1.07)
Change in Inflation (% Points)	-0.056 (-0.25)	0.017 (0.08)
Duration (Years, as of 1999)	-0.109 (-0.86)	-0.145 (-1.09)
Replacement (% , as of 1999)	0.085** (2.29)	0.045 (1.08)
Active Program Spending (% , as of 1994-1997)	-0.210** (-3.75)	-0.216** (-4.11)
Union Coverage (Index = 1-3, as of 1994)	3.431** (4.58)	3.718** (4.32)
Coordination (Index = 1-3, as of 1994)	-1.917** (-2.86)	-1.977** (-2.84)
Openness to Immigration (Immigrants as % of Labor Force)		-0.133* (-2.07)
Global Competitiveness (Index of Unit Labor Costs)		-0.005 (-0.17)
R ²	0.75	0.83
F-Statistic (Overall Regression)	6.40**	6.16**
Sample Size	20	19

†See data appendix for sources and details

**Significant at the 5 percent level; *Significant at the 10 percent level

Altering the Specification. Besides extending the data set, altering the econometric specification is another way to see if results are robust. We modify Layard, Nickell, and Jackman's specification in two important ways.

In Layard, Nickell, and Jackman's analysis *Unemployment* is expressed in terms of labor market institutions and *Change in inflation*, which reflects changes in the state of the economy. Other things equal, we expect unemployment to be inversely related to an economy's *Global competitiveness*. As a measure of overall competitiveness, the OECD has constructed an index of relative unit labor costs (in manufacturing) in a country. A lower unit labor cost indicates greater

competitiveness, which may alleviate unemployment (see data appendix for source and details).¹⁰

For 1989-2002 the lowest unit labor costs are exhibited by the UK, Japan, Norway, USA, and Switzerland. For the UK, unit labor costs averaged only 83.3 percent of those observed for the base year, 2000. The mean value for *Global competitiveness* is 106.55 percent (Table 3, Panel A). Relative to the base year, unit labor costs averaged 116 percent or more for six countries: France, Sweden, Finland, Australia, Austria, and Ireland. In the case of Ireland, costs averaged 154.9 percent of those observed for the base year.

In many countries immigration is a controversial issue. It often is alleged that newcomers swell the supply of labor, thereby aggravating joblessness. In contrast, it often is argued that immigrants frequently work in jobs that natives will not perform. According to this view, immigration reflects a strong demand for labor and does not mean higher unemployment. If this rebuttal is correct, *Unemployment* will be inversely related to *Openness to immigration*, which is defined as the percentage of foreigners/foreign-born persons in the labor force. (See data appendix for details.)

Countries with relatively few immigrants include Japan (0.2 percent of the labor force), Spain (1.3 percent), Portugal (1.6 percent), and Finland (1.7 percent). Countries with relatively large numbers of immigrants include Australia (24.7 percent), Canada (19.2 percent), and the USA (11.3 percent); for Europe, Austria (20.3 percent) and Switzerland (18.1 percent) have relatively large numbers of immigrant workers. The mean value for *Openness to immigration* is 7.6 percent (Table 3, Panel A).¹¹

To see how competitiveness and immigration might affect the relationship between unemployment and labor market characteristics, we specified the following equation:

$$\begin{aligned} \text{Unemployment}_i = & \gamma_0 + \gamma_1 \text{Change in inflation}_i \\ & + \gamma_2 \text{Global competitiveness}_i \\ & + \gamma_3 \text{Openness to immigration}_i \\ & + \gamma_4 \text{Duration}_i + \gamma_5 \text{Replacement}_i \\ & + \gamma_6 \text{Active program spending}_i \\ & + \gamma_7 \text{Union coverage}_i + \gamma_8 \text{Coordination}_i + v_i, \end{aligned} \quad (5)$$

where:

¹⁰For two countries, Denmark and Portugal, the unit labor cost information is not available. The OECD has compiled another measure of overall cost competitiveness, an index based on relative consumer prices, which we used for Denmark and Portugal. As a check, we also estimated regressions dropping Denmark and Portugal from the sample. None of our findings is affected; the regression results are available upon request.

¹¹Observations for *Openness to immigration* were available for 19 of the 20 countries in the sample. Observations were not available for New Zealand.

v_i = The disturbance term.

Using the updated data set for 1989-2002, we used equation (5) to estimate another *Unemployment* regression, the results of which are reported in the right column of Table 4.¹² Other things equal, joblessness still is unaffected by *Change in inflation*. Unemployment is not significantly related to a country's *Global competitiveness*.

Unemployment is inversely related to *Openness to immigration* (at the 10 percent level). Increasing the share of immigrants in the labor force ten points means a 1.33 point lower unemployment rate. Other factors held constant, immigration-friendly countries exhibit lower unemployment, suggesting that immigrants are attracted by strong labor demand.

Accounting for *Global competitiveness* and *Openness to immigration*, the effects on unemployment of labor market institutions are mostly the same (Table 4, compare columns). For *Active program spending*, *Union coverage*, and *Coordination*, the estimated coefficients have the same signs and are similar in magnitude. The *Duration* coefficient remains insignificant. The only notable change is in the *Replacement* effect, which is now insignificant.

It is natural to wonder whether these findings for 1989-2002 are themselves robust. One way to check is to reconsider some of the explanatory variables used in the regression analysis, specifically, the measures used to represent labor market institutions. Fortunately, data reported in an article by Nickell (2003) provide an opportunity to do just that.

Using Alternative Measures for Labor Market Characteristics. In their book Layard, Nickell, and Jackman relied on OECD data to construct measures for labor market institutions. Nearly a decade later, Nickell (2003) sought to revise or update many of these measures.

Relying on figures from the *OECD Jobs Study*, Nickell constructed an index for *Duration* for the years 1988-1995 and 1999 (see pp. 18-19). Following Layard, Nickell, and Jackman, Nickell used data from various issues of the OECD's *Employment Outlook* to update measures for the following variables: *Replacement*, *Active program spending*, *Union coverage*, and *Coordination*.¹³

¹²As a check on our results we re-estimated the equation; for Germany we used observations only for 1991-2002, avoiding any potential problems with discontinuities in the German data. None of our conclusions is affected. Results are available upon request.

¹³Nickell's *Replacement* ratio is an average across three different types of family (single individual, individual with dependent spouse, individual with spouse at work). For the *Duration* index and the *Replacement* ratio, Nickell (2003) reported for each country one observation for the 1988-1995 span and one observation for the year 1999 (Tables 4 and 5). Given the sample period for our analysis (1989-2002), we used the average of these two observations. For *Active program spending*, he reported one observation for each country for the years 1989, 1993, and 1998 (Table 7). Our analysis uses an average involving these observations. (See data appendix for details.) For *Union coverage*, Nickell presented figures

Descriptive statistics for Nickell's measures for 1989-2002 are reported in Table 3, Panel B. Comparing both panels of the table, it can be seen that Nickell's *Duration* index varies less than the Layard, Nickell, and Jackman-type *Duration* measure. For Nickell's *Replacement* variable, the mean, maximum, and minimum values are all lower than for the variables we constructed. In contrast, Nickell's *Active program spending* variable exhibits higher mean, maximum, and minimum values than the variables we constructed. The *Union coverage* and *Coordination* variables are virtually identical.

Using Nickell's versions of the labor market institution variables, we re-estimated for 1989-2002 both equation (4) and equation (5), that is, both the original Layard, Nickell, and Jackman specification and our alternative specification that includes *Openness to immigration* and *Global competitiveness* variables. The estimation results are presented in Table 5.

Table 5—Unemployment and Labor Market Institutions: Alternative Measures for Explanatory Variables†

Dependent Variable: Average Unemployment Rate, 1989-2002		
Explanatory Variable	Estimated Coefficient (t-statistic)	Estimated Coefficient (t-statistic)
Constant	2.567 (0.81)	0.300 (0.09)
Change in Inflation (% Points)	-0.094 (-0.30)	0.123 (0.49)
<i>Duration</i> * (Index, as of 1988-1995, 1999)	-1.143 (-0.57)	-0.464 (-0.28)
<i>Replacement</i> * (% , as of 1988-1995, 1999)	0.023 (0.48)	0.029 (0.81)
<i>Active Program Spending</i> * (% , as of 1989, 1993, 1998)	-0.142** (-2.21)	-0.138** (-2.83)
<i>Union Coverage</i> * (Index = 1-3, as of 1990, 1994)	2.643** (2.77)	2.326** (3.02)
<i>Coordination</i> * (Index = 1-3, as of 1990, 1994)	-0.211 (-0.20)	-2.372** (-2.31)
<i>Openness to Immigration</i> (Immigrants as % of Labor Force)		-0.250** (-3.15)
<i>Global Competitiveness</i> (Index of Unit Labor Costs)		0.086** (2.74)
R ²	0.48	0.78
F-statistic (overall regression)	2.02	4.41**
Sample Size	20	19

†See data appendix for sources and details; also see Note 13 and Nickell (2003, Tables 4, 5, 7, 8, 10)

*Alternative measure developed by Nickell (2003)

**Significant at the 5 percent level.

for 1990 and 1994 (Table 8); we took the average of the two observations. For *Coordination*, Nickell presented an average for 1988-1995 and one for 1995-1999 (Table 10); we took the average of the two observations.

When we used the Nickell variables with Layard, Nickell, and Jackman's original specification, some of the coefficient estimates are significant, but the F-statistic indicates that the overall equation is not statistically significant (Table 5, left column). Clearly, findings are sensitive to how labor market characteristics are quantified.

When we altered the specification by including the *Openness* and *Global competitiveness* variables, the overall regression is statistically significant (Table 5, right column). One effect is noticeably different from the Nickell data: higher unit labor costs result in greater joblessness.

Several of the findings are similar to those initially reported for 1989-2002 (compare Tables 4 and 5). In particular, *Active program spending* still alleviates unemployment. At the mean value of Nickell's *Active program spending* (14.22), unemployment would be approximately 2 percentage points lower.

Union coverage still contributes significantly to joblessness. Other things equal, *Unemployment* in a highly unionized country is nearly 4.7 points higher than in a weakly unionized country. Compared to the result reported in Table 4, the impact of *Openness to immigration* is roughly double in magnitude.

For 1989-2002 joblessness still is unrelated to disinflation. Labor markets may have adjusted their expectations and no longer were surprised by lower inflation.

Combining Sample Periods. Layard, Nickell, and Jackman focused on the years 1983-1988; so far our analysis has extended the sample to 1989-2002. As an additional check of our findings, we combined the data sets to form a 20-year sample, 1983-2002.¹⁴ (See data appendix for sources.) Then we estimated both equations (4) and (5).

When the sample period was only 1989-2002 our measure of *Openness to immigration* was the share of foreigners/foreign-born in the labor force. Unfortunately, this measure is not available for 1983-1988. For the combined 1983-2002 sample, the *Openness* measure is share of foreigners/foreign-born in the population.¹⁵

The estimation results for the combined 1983-2002 sample are presented in Table 6. Over the 20-year period, *Unemployment* is not affected by *Openness* or *Global competitiveness*. The other findings, however, are familiar.

Unemployment is inversely related to *Active program spending* and directly related to *Union coverage*. As before, *Coordination* in the bargaining process

¹⁴For each variable, we simply took a weighted average of the 1983-1988 value (30 percent weight) and the 1989-2002 value (70 percent weight). Because 1983-1988 represents six years of the 20-year time span, we assigned a 30 percent weight to the 1983-1988 value, with the remaining 70 percent weight applied to the 1989-2002 value.

¹⁵Even with this latter measure for *Openness*, it must be noted that observations were not available for New Zealand or Portugal, so the sample size is reduced to 18 countries. (See data appendix for sources and details.)

relieves joblessness. Also as before, the *Replacement* coefficient is significant in the Layard, Nickell, and Jackman specification but insignificant in our altered specification. When the focus is only 1983-1988, *Unemployment* is aggravated by disinflation. But when the focus is 1983-2002, joblessness is not related to disinflation.

Summary and Conclusions

Initial research by Layard, Nickell, and Jackman (1994) suggests that unemployment is affected by countries' labor market institutions. Their analysis focused on 20 OECD countries for the years 1983-1988. To see if Layard, Nickell, and Jackman's results are robust, we tried to replicate their findings. Using their data and econometric specification, we were able to corroborate their findings, but not duplicate them exactly.

Table 6—Unemployment and Labor Market Institutions: Combining the Data Sets/Altering the Specification†

Dependent Variable: Average Unemployment Rate, 1983-2002		
Explanatory Variable	Estimated Coefficient (t-statistic)	Estimated Coefficient (t-statistic)
Constant	-0.265 (-0.10)	3.936 (1.24)
Change in Inflation (% Points)	-0.069 (-0.74)	-0.238 (-1.19)
Duration (Years)	-0.120 (-0.74)	-0.005 (-0.02)
Replacement (%)	0.091** (2.26)	0.061 (1.61)
Active Program Spending (%)	-0.257** (-3.96)	-0.240** (-4.05)
Union Coverage (Index = 1-3)	4.089** (4.62)	3.445** (3.11)
Coordination (Index = 1-3)	-2.887** (-4.03)	-3.000** (-4.25)
Openness to Immigration (Immigrants as % of Population)		-0.105 (-1.33)
Global Competitiveness (Index of Unit Labor Costs)		-0.011 (-0.56)
R ²	0.81	0.89
F-Statistic (Overall Regression)	8.95**	9.17**
Sample Size	20	18

†See data appendix for sources and details

**Significant at the 5 percent level

Extending the sample period to 1989-2002 for the same 20 OECD countries, we used Layard, Nickell, and Jackman's specification to see if unemployment was related similarly to labor market institutions. In our analysis we also tried using

alternative measures developed by Nickell (2003) to represent labor market institutions. We also combined the samples, analyzing the 20-year span 1983-2002.

Our efforts to reproduce earlier results are sensitive to the econometric specification, measures used to represent labor market characteristics, and the sample period. Nevertheless, our findings confirm that unemployment continues to be affected significantly by labor market institutions. Moreover, several findings are robust, occurring over and over again.

For 1983-1988, disinflation means significantly higher unemployment. But for 1989-2002 and 1983-2002, unemployment is not related to disinflation. Apparently labor markets ceased to be surprised by efforts to curb inflation.

Coordination in the wage-setting process still helps suppress unemployment. Widespread union contract coverage provokes higher unemployment.

For the years 1983-1988, unemployment is directly related to the duration and size of unemployment benefits. But for 1989-2002, when there are controls for competitiveness and immigration, joblessness is unrelated to benefits. Other things equal, unemployment benefits are not necessarily an ongoing contributor to joblessness. Policies to curb benefits may not help solve unemployment problems.

One type of policy is more important than before. For 1989-2002 active labor market policies were 2 to 2½ times more potent in combating unemployment than for 1983-1988. Active labor market programs have become more effective in fighting unemployment. Future studies should continue to measure the effects of various active labor market programs, for such programs are likely to be key factors in policy recommendations.

Finally, it often is alleged that immigration aggravates unemployment. There is a counterargument that immigration is a result of strong labor demand. We find that immigration-friendly countries—at least when measured by immigrants as a share of the labor force—have substantially lower unemployment, which is consistent with the argument that strong labor demand attracts foreigners. Future research can be expected to examine in further detail whether immigration influences joblessness, either directly or indirectly by affecting labor market institutions.

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Data Appendix

Unemployment. Standardized rates for all 20 countries were downloaded from [d] (see "Data References" below).

Change in Inflation. For the years 1989-1990, the figures are from Annex Table 17 in [i]. For the years 1991-2002, the data are from Annex Table 16 in [f].

Duration of Unemployment Benefits. Total duration equals the sum of the duration of unemployment insurance (UI) plus supplementary insurance and unemployment assistance (UA). The duration of UI (converted to years) is from Table 2.2, column 8 in [h]. The duration of UA (converted to years) is from Table 2.3, column 4 in [h]. Both UI and UA pertain to a 40-year-old single worker without children, with 18 years of employment records, and previously earning an average income. (Average income is defined to equal the earnings level of Average Production Worker (APW); see p. 11 of [h]).

Given the two components of total *Duration*, nine countries have indefinite duration of UI, so duration of supplementary insurance does not matter. Of the remaining 11 countries, we obtained information on supplementary insurance from [b] for seven of them (specifically, Denmark, Italy, Netherlands, Portugal, Spain, Norway, and Sweden). For the remaining four countries (Canada, Japan, Switzerland, and the US), [a] does not report values for 1983-1988 (Table A1, p.

121), nor could values be found for 1989-2002, so we assumed there was no supplementary insurance.

Whenever Layard, Nickell, and Jackman (1994) found “indefinite” duration of benefits, they assigned a value of 4 to *Duration*. This value is a mark-up: $1.06667 \times$ the longest duration recorded for any other country (France, 3.75). In our updated data set for 1989-2002, we followed the same procedure. The Netherlands had the longest duration of benefits, nine years. Whenever we encountered “indefinite” duration for a country, we assigned a value of $9 \times 1.06667 = 9.6$ to *Duration*.

Replacement. The replacement rates were obtained from Table 2.2, column 3 in [h]. The rate is a percentage of previous gross earnings for a 40-year-old single worker without children, with 18 years of employment records, and previously earning an average income. The rate for Germany is expressed as a percentage of previous net income. Belgium’s rate decreases over time from 60 percent to 43 percent; we used the 60 percent value. Australia, Ireland, New Zealand, and the UK are expressed as net income replacement rates for unemployment, obtained from [e], Figure 2.2.

Active program spending. Layard, Nickell, and Jackman described how they took unemployment benefits as a percentage of GDP and divided by [*Unemployment*/(1-*Unemployment*)] to yield benefits per unemployed person as a share of output per person ([a], pp. 119-23). For our second duplication effort, we calculated *Active program spending* for 1987 on our own following a similar method: dividing expenditures on active labor market programs as a percentage of GDP by [*Unemployment*/(1-*Unemployment*)].

For our extension effort, spending on active labor market policies as a percentage of GDP for the years 1994 and 1997 can be found in Table 1, columns 3 and 4, p. 85 in [k]. Data for employment and unemployment were downloaded from [d]. Following the same procedure, we calculated figures for both 1994 and 1997 and then we averaged the two figures.

Union coverage. Observations can be found in Table 3.3, Column 11, p. 71 in [l]. Coverage ranges are specified as follows: (1) if union contract coverage is less than 25 percent, *Union coverage* = 1; (2) if contract coverage is in the 25-75 percent range, *Union coverage* = 2; (3) if contract coverage exceeds 75 percent, *Union coverage* = 3.

Coordination. Observations can be found in Table 3.3, Column 23, p. 71 in [l]. In some cases, the source listed a value of “2+”; in these cases we set *Coordination* = 2.

Global competitiveness. To measure an economy’s overall competitiveness, the OECD has constructed an index of relative unit labor costs (in manufacturing) in a country, which we obtained from [c]. For each year, the index reflects a country’s unit labor costs compared to a base year (2000). A lower relative unit labor cost indicates greater competitiveness. For each year for 1989-2002, we obtained the

index for each country; then we took the average to obtain a measure of the country's cost competitiveness. For two countries, Denmark and Portugal, the unit labor cost information is not available. The OECD has compiled another measure of overall cost competitiveness, an index based on relative consumer prices, also available from [c]. So for Denmark and Portugal we used this alternative index of competitiveness.

Openness to immigration. To represent the presence of immigrants in the labor market, we used the average stocks of foreign and foreign-born labor force as a percentage of the total labor force. Data for 1990-1991 are from Table A.2.3, p. 286 in [j]; data for 1992-2001 are from Table A.2.3 in [g]. New Zealand was dropped because data were unavailable. If a figure was missing for a particular year, we computed the measure of openness by averaging over the years available (which occurred for Australia, Belgium, Canada, Finland, Germany, Italy, Japan, Netherlands, Norway, and the US).

To represent the presence of immigrants in the population, we used the average stocks of foreigners and foreign-born persons as a percentage of the total population. Data availability differed by country.

For Austria, Belgium, Denmark, Finland, Germany, Ireland, Italy, Japan, Netherlands, Norway, Spain, Sweden, Switzerland, and the UK data were obtained as follows: (1) 1983-1989 observations are from [m], Table A.1., (2) 1990-1991 figures are from [j], Table A.1.5, (3) 1992-2001 data are from [g], Table A.1.5. For the 1983-1988 *Openness* value, we simply averaged the observations available for 1983-1988; for the 1989-2002 *Openness* value, we averaged the observations available for 1989-2001.

For Australia data were obtained as follows: (1) 1981 and 1986 figures are from [m], Table C1., (2) 1990-1991 figures are from [j], Table A.1.4, (3) 1992-2001 data are from [g], Table A.1.4. For the 1983-1988 *Openness* value, we averaged the observations available for 1981 and 1986; for the 1989-2002 *Openness* value, we averaged the observations available for 1990-2001.

Canadian observations are from the following: (1) 1981 and 1986 figures are from [m], Table C1., (2) the 1991 figure is from [j], Table A.1.4, (3) 1996 and 2001 figures are from [g], Table A.1.4. For the 1983-1988 *Openness* value, we averaged the observations available for 1981 and 1986; for the 1989-2002 *Openness* value, we averaged the observations available for 1991, 1996, and 2001.

French observations are from the following: (1) a figure for 1982 from [n], Table A.1, (2) an observation for 1990 from [j], Table A.1.5, (3) a figure for 1999 from [g], Table A.1.5. For the 1983-1988 *Openness* value, we simply used the 1982 figure; for the 1989-2002 *Openness* value, we averaged the observations available for 1990 and 1999.

US observations were available as follows: (1) a 1980 figure from [m], Table C1., (2) a 1990 figure from [j], Table A.1.4., (3) 1994-2001 figures from [g], Table A.1.4. For the 1983-1988 *Openness* value, we used the 1980 figure; for the 1989-

2002 *Openness* value, we averaged the observations available for 1990 and 1994-2001. Data were unavailable for New Zealand and Portugal.

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