CHAPTER 3

# UNEMPLOYMENT DYNAMICS DURING RECESSIONS AND RECOVERIES: OKUN'S LAW AND BEYOND

The global economy is recovering from its deepest downturn since World War II, but the speed of recovery differs greatly across regions. For many advanced economies—where the financial crisis was centered—recovery is expected to be slow. In this context, persistently high unemployment may be the key policy challenge facing these economies as recovery gains traction.

During the Great Recession, output and unemployment responses differed markedly across advanced economies (Figure 3.1). For example, in Ireland and Spain the unemployment rate increased by about 7½ percentage points, despite the fact that output dropped by more than 8 percent in Ireland but by only half as much in Spain. Moreover, although Germany suffered an output drop of about 7 percent, its unemployment rate actually *decreased*. Such different responses suggest that, apart from the impact of output fluctuations, unemployment dynamics are also driven by institutions, policies, and shocks.

Against this backdrop, this chapter addresses the following questions:

- What explains unemployment dynamics during the Great Recession? Why have responses differed across countries with similar output declines?
- What are the near-term prospects for employment creation given current output forecasts? What policies can enhance job creation during the recovery?

To shed light on these questions, this chapter provides a systematic analysis of unemployment dynamics in a sample of advanced economies during recessions and recoveries over the past 30 years.[1]

The main authors of this chapter are Ravi Balakrishnan, Mitali Das, and Prakash Kannan, with support from Stephanie Denis, Murad Omoev, and Andres Salazar; Tito Boeri was the external consultant.

[1]The sample includes Australia, Austria, Belgium, Canada, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Japan, Netherlands, New Zealand, Norway, Portugal, Spain, Sweden, Switzerland, United Kingdom, and United States.

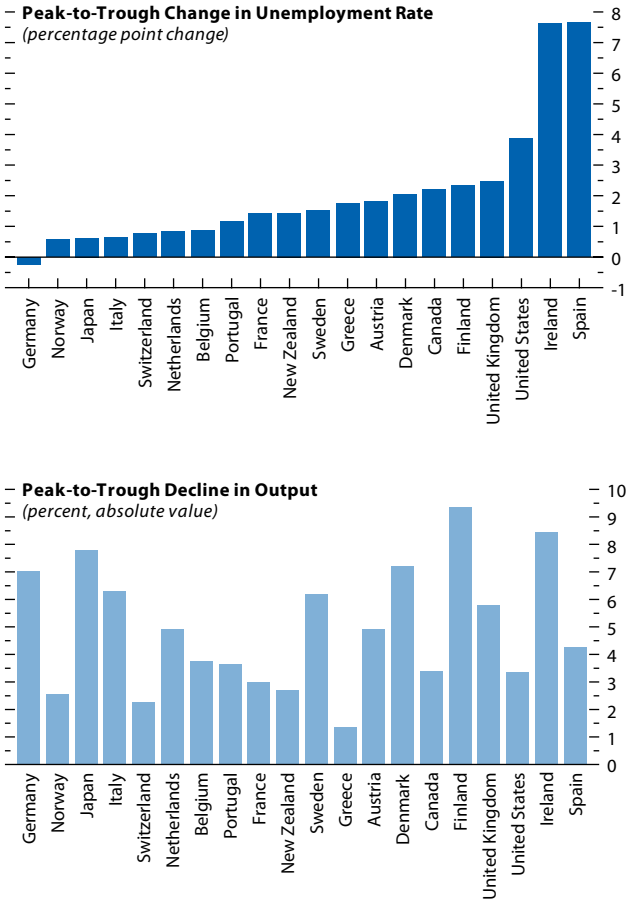
Because these dynamics can be driven simply by output fluctuations, the chapter uses Okun's law—the relationship between changes in the unemployment rate and changes in output—as an organizing framework.

The chapter contributes to the literature by examining the role of institutions and policies in explaining changes in Okun's law across countries and over time. The chapter then goes a step further by studying how financial crises, housing busts, sectoral shifts, and uncertainty can drive the response of unemployment beyond the impact of output fluctuations. Finally, the chapter analyzes some prominent policy issues—namely, short-time work programs, job subsidies, and two-tiered labor markets (the dualism between temporary and permanent contracts).

The main findings of the chapter are as follows:

- The responsiveness of unemployment to output has increased over the past 20 years in many countries. This reflects significant institutional reform, particularly making employment protection legislation (EPL) less strict, and greater use of temporary employment contracts.
- During recessions, financial crises, large house price busts, and other sectoral shocks raise unemployment beyond the levels predicted by Okun's law. During recoveries, the impact of financial crises and house price busts continues to constrain employment creation. In addition, there is some evidence that greater macroeconomic uncertainty slows employment growth.
- During the Great Recession, the sharp increases in unemployment in Spain and the United States can be explained largely by the impact of output declines as predicted using Okun's law, by financial stress, and by the impact of house price busts. In countries that implemented large short-time work programs (Germany, Italy, Japan, Netherlands), the rise in unemployment was less than predicted by these factors. Other countries that experienced less unemployment

**Figure 3.1. Change in Unemployment Rates and Output Declines during the Great Recession[1]**




Source: IMF staff calculations.
[1]Because GDP in Greece and Spain has not yet reached a trough according to official data, the change in the unemployment rate and decline in output are taken from the peak to the latest data point.

than expected present more of a puzzle (Canada, United Kingdom).

- For several advanced economies, the potential for a slow recovery in output and the nature of the recent recession (financial crisis combined with a house price bust) presage persistently high near-term unemployment rates. Given the additional prospect that unemployment becomes structural, the standard macroeconomic policy levers—monetary policy and fiscal policy—remain the primary tools for boosting employment through their impact on economic activity. In countries where unemployment rates remain high and the economy is operating below potential, policy stimulus remains warranted. Financial sector repair is also essential, given that labor-intensive sectors rely heavily on bank credit.
- Several specific labor market policies could help reduce unemployment in addition to pursuit of conventional macroeconomic and financial policies, encouragement of wage flexibility, and general improvements to labor market institutions. For economies with lingering macroeconomic uncertainty, but where labor productivity remains strong, targeted and temporary hiring subsidies may help advance employment creation. In countries with large short-time work programs, ending these, along with carefully designed wage-loss insurance programs, could help facilitate movement of labor across sectors. Finally, in countries with two-tiered labor markets, transitioning to a system of open-ended labor contracts under which employment security gradually increases with tenure could help enhance human capital formation and increase unemployment benefit coverage.

To motivate the analysis in this chapter, the following section looks at broad labor market dynamics during the Great Recession, and the next section discusses the theoretical considerations behind the Okun's law framework. Then the chapter examines how institutions change the relationship between unemployment and output across countries and over time. It subsequently proceeds to study unemployment dynamics during recessions and recoveries, controlling for output fluctuations and changes in Okun's law over time. Putting it all together, the chapter subsequently addresses

the key questions: What explains cross-country variation in unemployment responses during the Great Recession? What are the prospects for recovery? What policies may help promote job creation?

## Broad Labor Market Dynamics during the Great Recession

Recent labor market developments appear to have been driven largely by employment dynamics rather than by declining labor participation rates, as indicated by the fact that broad measures of unemployment (including workers marginally attached to the labor force) mirror trends in standard unemployment rates (Figure 3.2). Changes in actual participation rates during the Great Recession confirm this finding (Figure 3.3). Despite dramatic falls in employment, labor force participation rates have been fairly flat in most countries, except in Ireland.

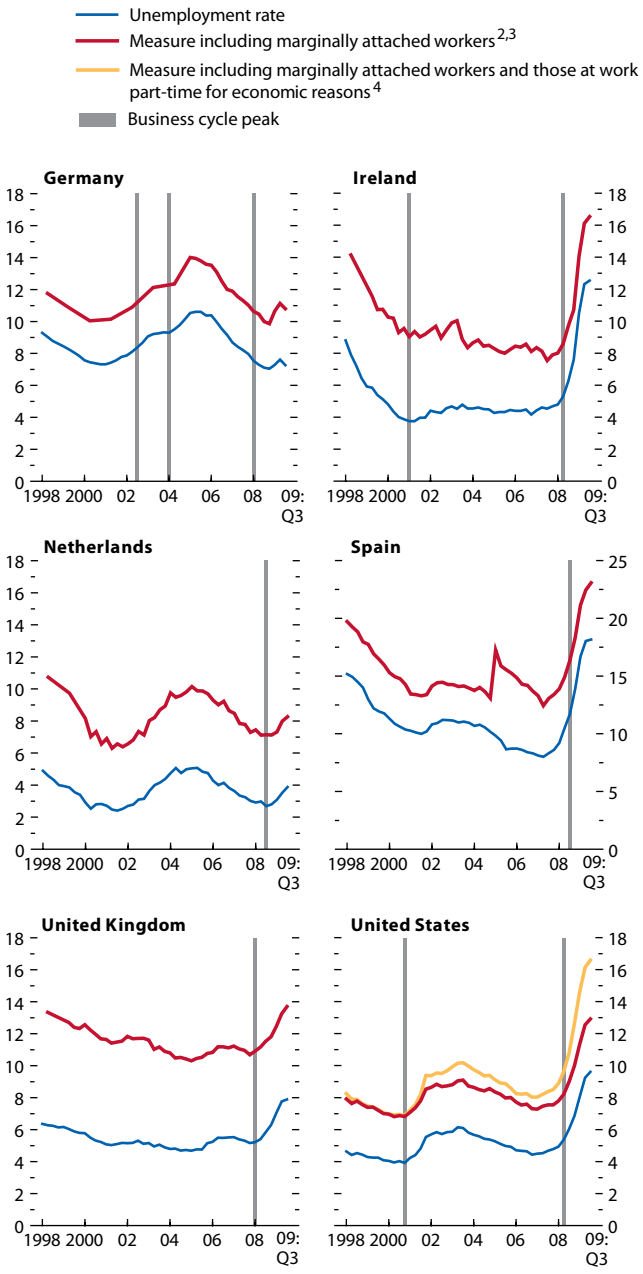
Figure 3.4 shows labor market dynamics during the Great Recession and previous cycles in the United States, Germany, and Japan. The panels track fluctuations in labor productivity (output per hour), hours worked per employee, employment rate (share of labor force), and labor force participation (share of population), using the following identity:

$$\log\left(\frac{Y}{P}\right) = \log\left(\frac{Y}{H}\right) + \log\left(\frac{H}{E}\right) + \log\left(\frac{E}{LF}\right) + \log\left(\frac{LF}{P}\right), \quad (1)$$

where $Y$ is real GDP, $P$ is population, $H$ is hours, $E$ is employment, and $LF$ is the labor force.

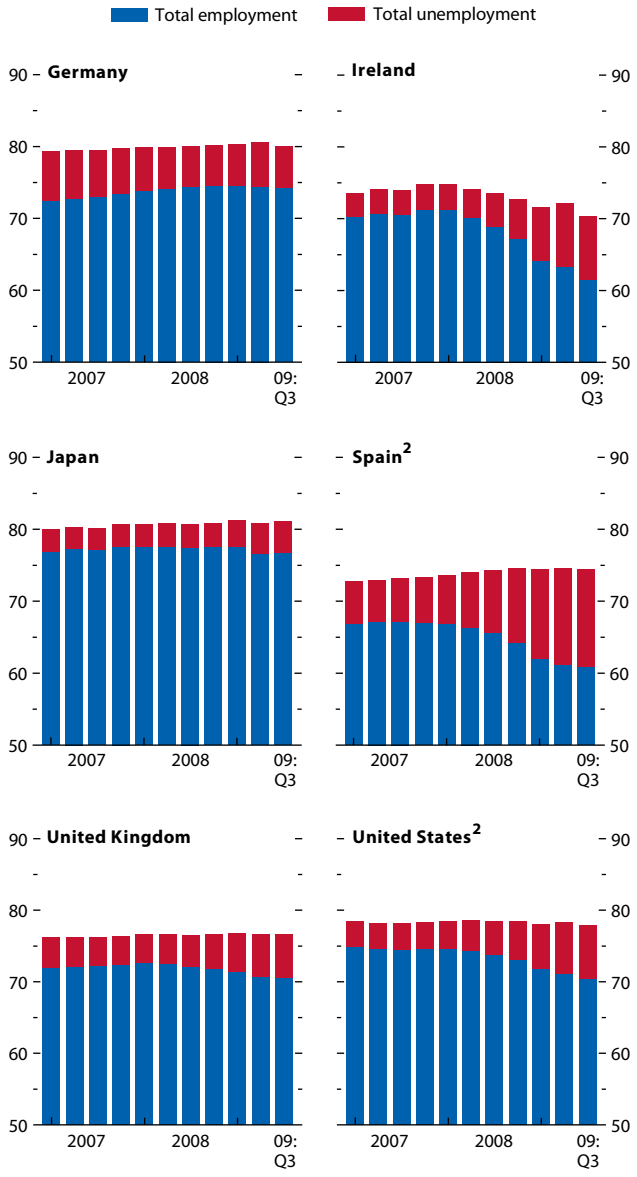
The differences between the United States and Germany are striking. In the United States, there was a larger drop than in previous recessions in both the employment rate and hours worked per employee, but output per hour grew strongly despite the large output decline. In Germany, the unemployment rate actually decreased, which is even more remarkable given the much larger output drop during the Great Recession than during previous recessions. It appears that the adjustment occurred through a substantial decrease in hours worked per employee and in output per hour.

**Figure 3.2. Broad Measures of Unemployment[1]**
*(Percent)*




Sources: Eurostat; Haver Analytics; and IMF staff calculations.
[1]This measure of unemployment is defined as $w$ = (total unemployment + marginally attached workers)/(civilian labor force + marginally attached labor force).
[2]For European countries, the measure is defined as "inactive population; would like to work but is not seeking employment."
[3]For the United States, the measure is defined as "not in labor force: want a job now."
[4]For the United States, the measure is defined as "part-time work for economic reasons": $w$ = (total unemployment + marginally attached workers + at work part-time for economic reasons)/(civilian labor force + marginally attached labor force).

**Figure 3.3. Evolution of Employment, Unemployment, and Labor Participation**
*(Percent of working-age population)*[1]




Sources: U.S. Bureau of Labor Statistics; Organization for Economic Cooperation and Development; and IMF staff calculations.
[1] Working-age population, 15–64 years.
[2] Working-age population, 16–64 years.

What underlies the different dynamics in Germany and the United States? Different labor market institutions and policies could play a role. Stricter employment protection legislation can mute the employment response during an economic downturn.[2] And according to the Organization for Economic Cooperation and Development (OECD) measure, Germany has much stricter EPL than the United States. Germany also massively expanded its short-time work program *(Kurzarbeit)* during the Great Recession, which may help explain why some of the adjustment occurred in hours worked per employee rather than in job losses.

However, the sharp difference in dynamics of output per hour in Germany and the United States—notwithstanding the larger output drop in the former—suggests other forces at work beyond institutions and labor market policies. Indeed, the nature of the shocks experienced by the two countries was markedly different: the United States experienced a housing bust combined with a systemic financial crisis, whereas Germany mainly experienced an external demand shock resulting from the open nature of its economy.

The analysis in this chapter assesses the impact of institutions, policies, and shocks (after controlling for output fluctuations) on unemployment dynamics during recessions and recoveries in advanced economies. Okun's law is the framework for the analysis, and that is outlined next.

## Using Okun's Law as a Framework

Okun's law captures the relationship between unemployment and output. It is a statistical relationship that has received strong empirical support for a broad cross section of countries (see Knotek, 2007; Moosa, 1997; and Okun, 1962). As originally estimated by Okun, it has the following simple form:

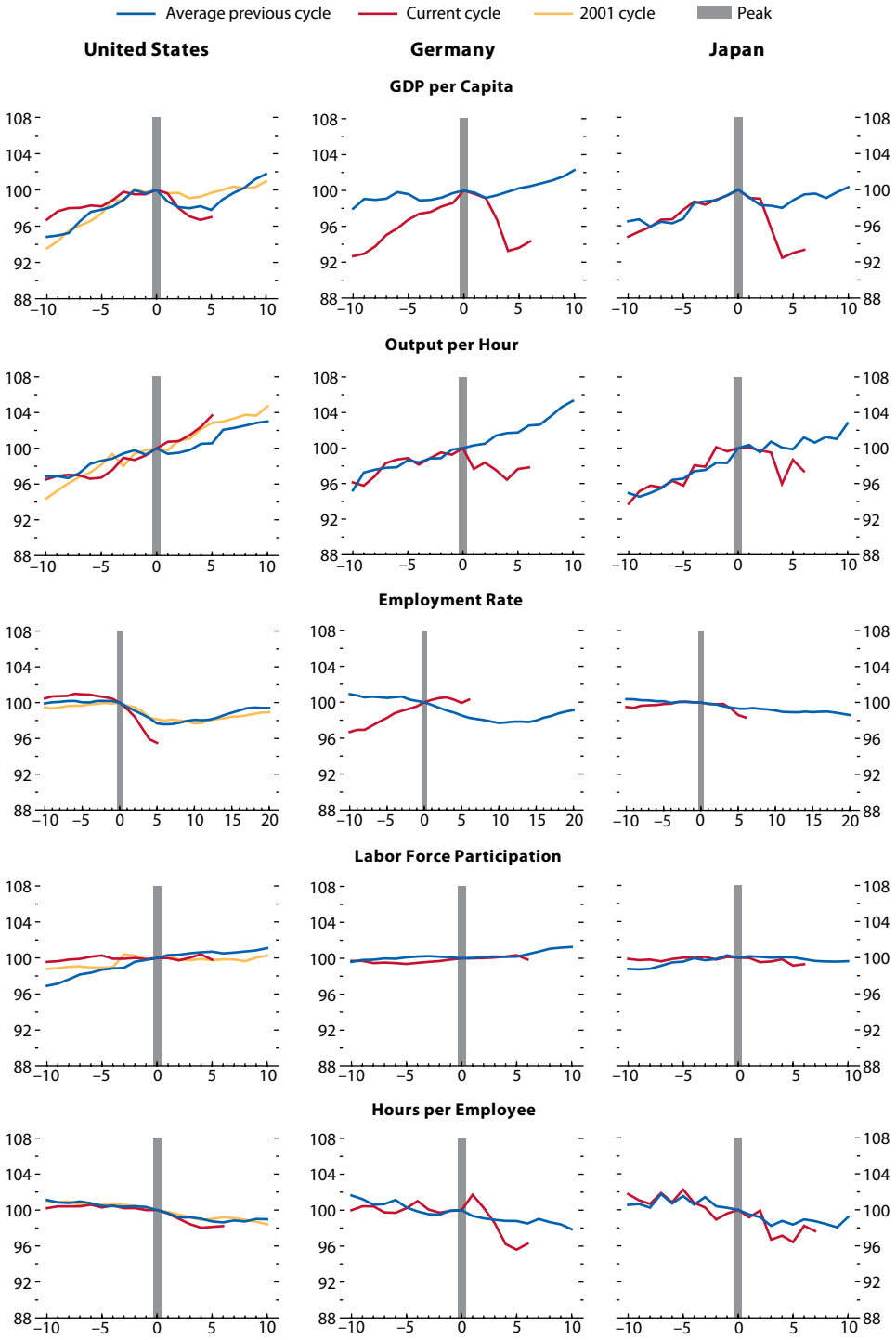
$$\text{Change in unemployment rate} = \alpha - \beta \times \text{change in real output}. \quad (2)$$

Here, $\alpha$ is an intercept coefficient, and $\beta$ (beta) is the elasticity of the unemployment rate with respect to output, which was estimated by Okun to

[2] See Box 1.3 in the October 2009 *World Economic Outlook.*

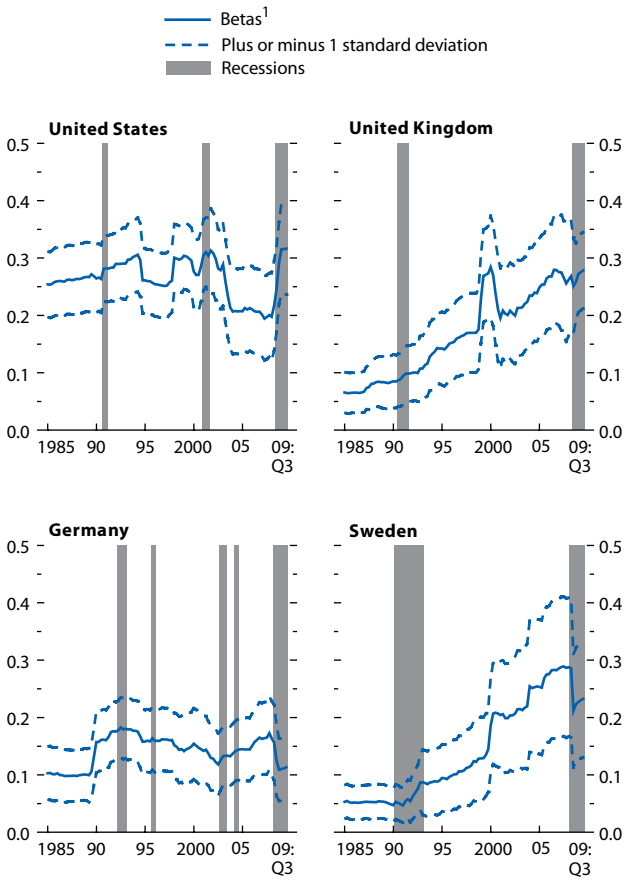
## Figure 3.4. Labor Dynamics in the United States, Germany, and Japan

*(All series are in levels indexed to 100 at the business cycle peak; quarters on x-axis; peak in output at t = 0)*




Sources: Haver Analytics; Institute for Employment Research; Organization for Economic Cooperation and Development ; and IMF staff calculations.

## Figure 3.5. Relationship between Unemployment and Output over Time




Source: IMF staff calculations.
[1]Absolute value of estimated elasticity of unemployment with respect to output from a static Okun's law relationship, which is regressed over rolling 40-quarter windows.

be about 0.3 for the United States during the early post–World War II period. The value of $\alpha/\beta$ is the minimum level of output growth needed to reduce the unemployment rate given labor force and labor productivity growth.

Figure 3.5 suggests that this relationship varies across countries and over time. For Sweden and the United Kingdom, the elasticity of the unemployment rate (beta) has trended upward for the past 20 years. For the United States, there is no discernible trend, but the beta has oscillated over time.

The variations in this relationship have important implications for unemployment dynamics during recessions and recoveries. For instance, larger betas would lead to larger predicted increases in unemployment during a recession for a given output decline. Figure 3.5 also points to gradual shifts in this relationship over time (trends) and to *episodic shifts* in the relationship (for example, the increase in the beta for the United States during the Great Recession). The analysis in this chapter differentiates between these two types of shifts by using a methodology consisting of two main steps.

### Step 1: Estimate Okun's Law for Each Recession Episode

In Step 1, for each country in the sample, a dynamic version of the Okun's law equation is estimated using data on unemployment and output for the 20 years prior to the start of each recession. A country that has had more recessions will have more "episodes" over which to estimate Okun's law. Since all countries in the sample have experienced at least two recessions, the resulting set of betas varies across countries and over time.

These variations in the betas reflect the effects of several key reforms of labor market institutions (Boeri and van Ours, 2008):

- Employment protection legislation: Stricter EPL (higher hiring and firing costs) should make it more difficult to fire workers in a downturn and to hire workers during a recovery. Thus, stricter EPL should lead to a lower elasticity of unemployment with respect to changes in output.
- Unemployment benefits: In theory, the effect of unemployment benefits (as measured by the ratio of income replaced) is ambiguous. During recessions,

higher benefits limit the potential range for wage adjustments, leading to more job losses. During recoveries, higher benefits lead to higher wage expectations on the part of potential workers, thus constraining job creation.[3]

- Temporary employment contracts: Workers with temporary contracts have less employment protection relative to those with regular (open-ended) contracts. Thus, in economies with a relatively higher share of workers on temporary contracts, unemployment should be more responsive to changes in output. This issue has become more prominent since the 1980s in many countries, especially Spain (Box 3.1).

Another important factor is wage flexibility. Decentralized wage systems can facilitate downward wage flexibility, mitigating job losses. In Japan, for instance, nominal wages fell by 4.4 percent in 2009 through reductions in wage rates, paid overtime, and bonus payments. Centralized collective bargaining systems, on the other hand, can sometimes impede the adjustment of wages to deflation, which increases job losses. For example, in Spain, contractual wages increased by almost 3 percent in 2009 despite a 7 percent decline in employment. Unfortunately, the analysis in this chapter does not directly include measures of collective bargaining, which are highly imperfect and not available at the frequencies required here. Moreover, to fully capture wage flexibility requires analyzing microeconomic data, which is not the focus of this chapter. However, other institutional variables that are incorporated here capture some aspects of the variation in wage flexibility across countries.

### Step 2: Compute Forecast Errors

Based on the estimated Okun's law relationships for each country, predictions about unemployment are made (1) during recessions and (2) during recoveries, using the observed changes in output for both. Actual unemployment rates are compared to the predicted rates in order to compute forecast errors for the behavior of unemployment in recessions and recoveries.[4] This two-step approach provides a clear and intuitive presentation of the separate effects of other episodic factors, beyond changes in output, that can affect unemployment, including

- Financial crises and stress: Historically, recessions accompanied by financial crises have been characterized by significantly larger drops and more protracted recoveries in the employment rate than normal recessions (Figure 3.6).[5] However, the output drop has also been larger during such episodes, so the conditional impact is not clear. Numerous studies, beginning with Bernanke and Gertler (1989), show how a firm's balance sheet can amplify business cycle fluctuations. For example, firms that are more highly leveraged prior to a recession may face a greater need to deleverage if the recession is associated with a credit crunch (Sharpe, 1994).[6] The conditional impact on unemployment is explored here by relating the forecast errors to the occurrence of financial crisis and the level of financial stress.
- Sectoral shocks: Examples of sectoral shocks include the negative impact of house price busts on workers in construction and real estate services, of financial crises on jobs in the financial sector, and of trade declines on employment in the tradables sector in open economies. Again, such shocks are also likely to reduce output, clouding the conditional impact on unemploy-

[3] It should be noted, however, that adequate unemployment benefits are an important automatic stabilizer and are essential for avoiding large increases in poverty following recessions.

[4] There is a question of whether the estimation should be done in a single step using output and unemployment lags, as well as the institutional variables and shocks dummies. The empirical procedure used here treats Okun's law as the benchmark specification in the first step primarily to allow comparability with the rest of the literature. The presence of large deviations from the baseline Okun's law specification then suggests that other institutional or episodic factors could also play a role beyond the effects of output. Appendix 3.2 discusses in detail the pros and cons of a two-step approach.

[5] The definition of financial crises is based on Chapter 3 of the April 2009 *World Economic Outlook*, which in turn is based on Reinhart and Rogoff (2008).

[6] Another channel is through the larger drops in net worth typically featured in recessions associated with financial crises. This can prompt larger layoffs by firms that rely more on working capital to finance their operations during recessions accompanied by financial crises than during more normal recessions, even with similar aggregate output losses.

## Box 3.1. The Dualism between Temporary and Permanent Contracts: Measures, Effects, and Policy Issues

Employment protection legislation (EPL)—the rules governing the costs to employers of dismissing workers—has been subject to frequent policy changes over the past 20 years. Only four Organization for Economic Cooperation and Development (OECD) countries out of 26 have not adjusted EPL over time. The OECD developed a widely used index to measure EPL strictness, based on an assessment of national regulations, and the changes in this index since 1990 (see first table) suggest that reforms during this period were broadly geared toward reducing dismissal costs, notably in countries that already had the strictest standards. The table lists all countries whose EPL reforms involved a change in the index exceeding 50 percent of the cross-country standard deviation in the index. Notice also the decline in the average of the overall index for OECD countries and of the cross-country standard deviation of this indicator (bottom two rows).

These reforms in most cases did not change—and may have even tightened—rules for regular, or open-ended, contracts. Instead, reforms were carried out primarily by changing rules only for new hires, introducing a wide array of flexible, fixed-term types of contracts or expanding the scope of existing temporary contracts. An inventory of reforms assembled by the Fondazione Rodolfo Debenedetti in cooperation with the Institute for the Study of Labor indicates that 92 percent of EPL regulatory changes involving a discrete change in the level of the overall index did not apply to workers with permanent contracts—in other words, there has been a dual-track (or two-tier) reform strategy. For instance, in Italy the so-called Treu Package in 1997 removed restrictions on the use of fixed-term contracts and introduced temporary agency work without modifying the rules for open-ended contracts. In Germany in 1997, the maximum duration of fixed-term contracts was extended from 9 to 12 months and the restrictions on the maximum number of contract renewals were loosened. The subsequent series of small reforms in these countries continued to increase flexibility at the margin, applying only to new hires.

As a result of these asymmetric reforms, the use of temporary workers, which had been close to zero in most countries, has steadily increased. Countries with the strictest provisions for regular, open-ended contracts experienced a large increase in the share of fixed-term (temporary) contracts in total dependent employment. Indeed, the increasing use of temporary workers has not only resulted in dual-track, two-tier labor arrangements but has also blurred the boundary between dependent employment and self-employment. The first figure displays, on the vertical axis, the share of temporary workers in 2008 and, on the horizontal axis, the EPL index for regular contracts in 1985. There is a strong positive association between the two variables (the correlation coefficient is 0.81).

The author of this box is Tito Boeri.

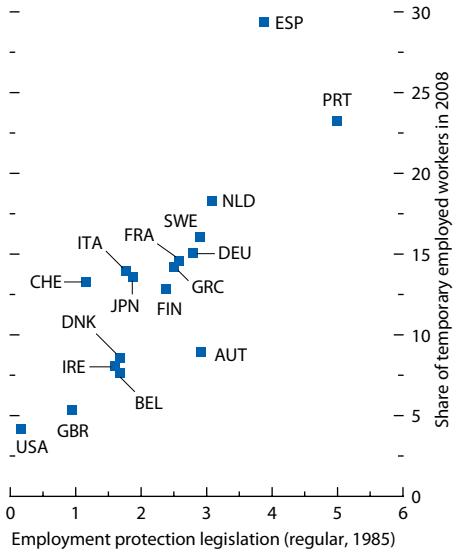
### OECD Employment Protection Legislation Strictness Index

| | EPL, All Contracts | | EPL, Regular Contracts | |
|---|---|---|---|---|
| | 1990 | 2008 | 1990 | 2008 |
| Belgium | 3.15 | 2.18 | 1.68 | 1.73 |
| Denmark | 2.40 | 1.50 | 1.68 | 1.63 |
| Germany | 3.17 | 2.12 | 2.58 | 3.00 |
| Greece | 3.50 | 2.73 | 2.25 | 2.33 |
| Italy | 3.57 | 1.89 | 1.77 | 1.77 |
| Netherlands | 2.73 | 1.95 | 3.08 | 2.72 |
| Portugal | 4.10 | 3.15 | 4.83 | 4.17 |
| Spain | 3.82 | 2.98 | 3.88 | 2.46 |
| Sweden | 3.49 | 1.87 | 2.90 | 2.86 |
| **Mean (all OECD countries)** | **2.30** | **1.93** | **2.17** | **2.05** |
| **Standard Deviation (all OECD countries)** | **1.17** | **0.85** | **0.99** | **0.85** |

Source: Organization for Economic Cooperation and Development.

Note: The index ranges from 0 to 6, with higher values indicating stricter employment protection. "Regular contracts" refer to open-ended employment contracts with no fixed term, which are sometimes referred to as permanent contracts.

### Share of Temporary Workers and Employment Protection Legislation Index for Regular Contracts, 1985[1]

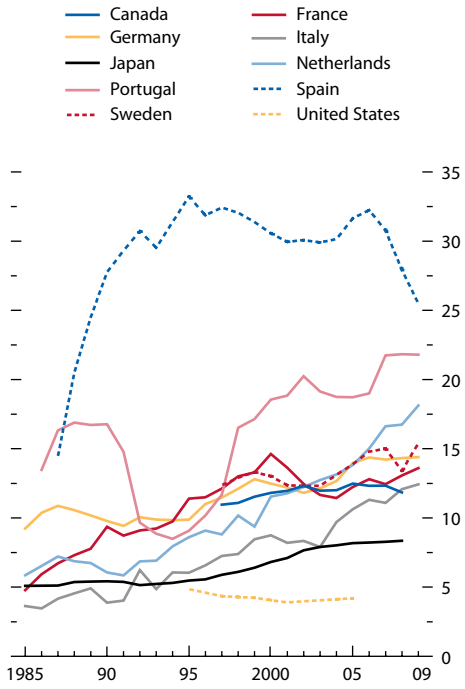



Sources: Organization for Economic Cooperation and Development, *Employment Outlook;* and IMF staff calculations.

[1] AUT: Austria; BEL: Belgium; DNK: Denmark; FIN: Finland; FRA: France; DEU: Germany; GRC: Greece; IRE: Ireland; ITA: Italy; JPN: Japan; NLD: Netherlands; PRT: Portugal; ESP: Spain; SWE: Sweden; CHE: Switzerland; GBR: United Kingdom; USA: United States.

### Temporary Workers

*(Percent of dependent employment)*




Sources: Eurostat; Organization for Economic Cooperation and Development, Labour Force Statistics; and IMF staff calculations.

As mentioned, the share of temporary contracts steadily increased before the Great Recession in countries with strict EPL (second figure). However, temporary workers experienced the majority of Great-Recession-related job losses, and so this share has fallen. For example, in Spain employment of temporary workers declined by almost 20 percent (compared with 7 percent for total employment); by almost 10 percent in Italy (compared with 1.5 percent); by 6 percent in France (compared with 0.3 percent); and by 2 percent in Germany (compared with an increase of 0.4 percent in total employment).

The two-tier nature of these labor markets is evident as well in the wage premium placed on permanent contracts. This premium reflects the stronger bargaining power of regular workers and the fact that workers with flexible contracts are not covered by EPL and have little or no access to unemployment benefits in case of job loss. The second table quantifies the premium for permanent employment. The first column shows the wage premium placed on permanent contracts with respect to fixed-term contracts. The results suggest that in countries like Italy, workers with permanent contracts are paid, other things being equal, almost one-fourth more than workers on fixed-term contracts. This price-based premium can be compared with the quantity-based measure in the second column: the share of temporary contracts in total dependent employment. The rankings differ (the Spearman's rank correlation coefficient between the two measures of dualism is 0.32), but the United Kingdom stands out as having

**Box 3.1 *(continued)***

**Disparity between Permanent and Temporary Employment**

| | Wage Premium for Permanent Contracts[1] (percent) | Share of Temporary Contracts in Total Dependent Employment | Yearly Probability of Transitioning from a Temporary to a Permanent Contract[2] |
|---|---|---|---|
| Austria | 20.1 | 8.9 | 47.4 |
| Belgium | 13.9 | 8.8 | 40.4 |
| Denmark | 17.7 | 7.8 | . . . |
| Finland | 19.0 | 12.4 | 22.7 |
| France | 28.9 | 13.7 | 13.6 |
| Germany | 26.6 | 14.2 | . . . |
| Greece | 10.3 | 12.9 | 31.3 |
| Ireland | 17.8 | 9.0 | 46.3 |
| Italy | 24.1 | 13.4 | 31.2 |
| Luxembourg | 27.6 | 6.9 | 41.0 |
| Netherlands | 35.4 | 16.6 | . . . |
| Portugal | 15.8 | 22.2 | 12.1 |
| Spain | 16.9 | 31.9 | 28.3 |
| Sweden | 44.7 | 17.5 | . . . |
| United Kingdom | 6.5 | 5.8 | 45.7 |

Sources: European Community Household Panel and *European Union Survey of Income and Living Conditions*.

[1]Estimated as the coefficient of a dummy variable capturing permanent contracts, in a (monthly) wage regression of male dependent employment, controlling for education, tenure, and the (broad) sector of affiliation:

$$\log(w_i) = \alpha + \beta_1 EDU_i + \beta_2 EDU_i^2 + \gamma_1 TEN_i + \gamma_2 TEN_i^2 + \delta PERM_i + U,$$

where $i$ indexes individuals, $w$ is monthly wages of individuals, $EDU$ is years of schooling, $TEN$ is years of tenure, and $PERM$ is the dummy for permanent contracts.

[2]Estimated from matched records of the *European Union Survey of Income and Living Conditions* for 2004–07.

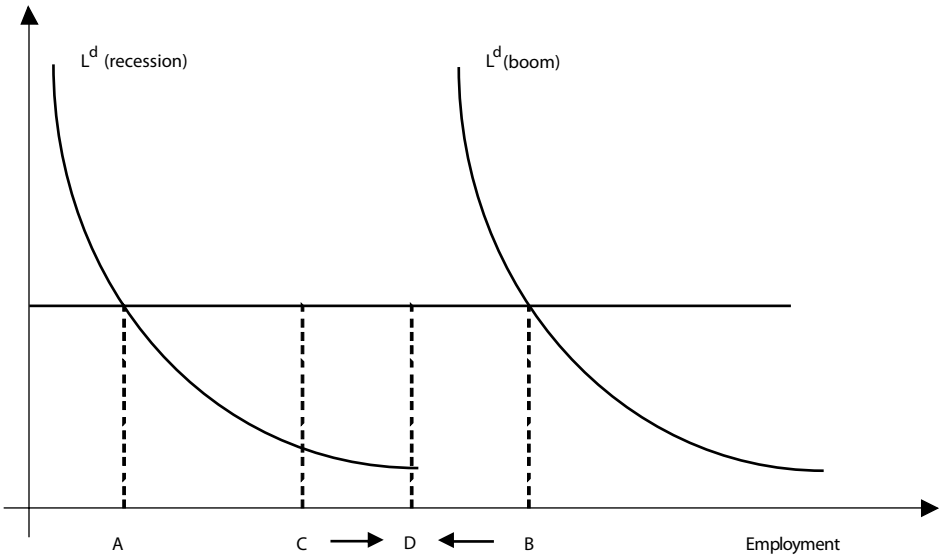
the least disparity according to both measures. The third column provides another measure of dualism: the yearly probability of transitioning from a fixed-term to a permanent contract. The larger this probability, the lower the disparity between permanent and temporary employment. Indeed, the correlation coefficient between this third measure and the other two is negative, although only the correlation between the transition and the wage premium is statistically significant.

### *Effects on Unemployment*

The asymmetric, or two-tier, EPL reforms have increased the responsiveness of employment and unemployment to output changes. Employers can hire temporary workers during upturns and can let them go during downturns, and they do not face any dismissal costs. Fixed-term (temporary) workers are typically protected against dismissal during the duration of the contracts, and there are generally (binding) restrictions on the number of temporary contracts that a firm can issue. There is therefore some time lag in both the growth of temporary workers during upturns and their reduction during downturns, and a long expansionary period can result in a large "buffer stock" of temporary workers, whereas a long recession could significantly reduce their share in total employment. This means that countries with more temporary workers could experience larger employment losses during a recession. Conversely, a lower share of temporary workers at the trough of the business cycle or fewer restrictions on the use of flexible contracts (which can be captured by the wage premium in the second table) imply a potential for greater employment gains during the upturn.

The effect of a two-tier labor market on employment is illustrated in the third figure, displaying labor demand as a function of wages in two extreme conditions: a recession (left-hand curve) and a boom (right-hand curve). When labor is perfectly flexible, the firm optimally hires at A when conditions are bad and at B when conditions are good. In the presence of strict EPL, the firm instead will set average employment at C to avoid paying dismissal costs.

**Labor Demand and the Honeymoon Effect**




Source: Boeri and Garibaldi (2007).

When temporary contracts are introduced, the firm exploits any hiring flexibility when business is good by gradually building up a stock of temporary workers but has limited flexibility when business is bad because it can reduce only the number of temporary workers and not permanent workers. Thus, employment will shift during the cycle between B and C, increasing average employment compared with a fully rigid labor market.

Firms facing strict EPL will adjust employment during the course of a business cycle only to the extent allowed by natural turnover: during upturns they will replace workers who voluntarily leave the firm, and during downturns they will leave vacancies unfilled and let employment decline by attrition. The increase in average employment associated with the introduction of temporary contracts will thus be transitory, creating a sort of "honeymoon effect" (see Boeri and Garibaldi, 2007). If regulations allow, fixed-term contracts could be substituted for permanent contracts for each worker hired during the cycle, but then the honeymoon would end, because employment would shift from A to B, just as in a flexible labor market.

This simple, stylized representation suggests the following:

- Employment should be more responsive to output changes in two-tiered labor markets than in markets with strict EPL (see also Costain, Jimeno, and Thomas, forthcoming).
- The share of temporary workers should increase the elasticity of employment to output during a recession; the increase will be greater the shorter the term of temporary contracts.
- Conversely, the increase in the responsiveness of employment to output changes during a recovery should be greater the lower the initial share of temporary workers (relative to any threshold set by regulation) and the less stringent the regulations concerning the duration and renewal of temporary contracts.

### *Policy Issues*

Temporary contracts can significantly increase employment during upturns. However, the heavy job losses associated with such contracts during the Great Recession have created strong pressure to phase out such arrangements. Firms that anticipate

**Box 3.1 *(continued)***

restrictions on the use of temporary contracts may be more reluctant to hire as the recovery gains traction. In fact, discontinuing temporary contracts in the wake of a recession compounds the worst aspects of a two-tiered labor market: temporary workers suffer greater unemployment during the downturn, but then find fewer jobs created during the recovery.

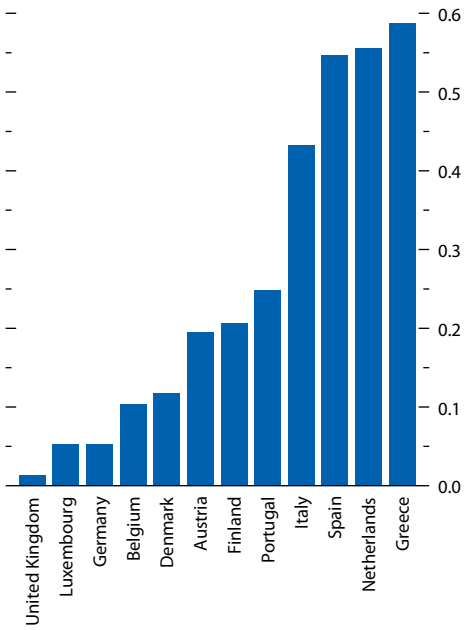
To benefit from the honeymoon effect and spur job creation during the recovery, policymakers should seek to credibly retain labor market flexibility, even in the face of pressure for stricter EPL.

Another policy issue relates to the negative impact of temporary employment on human capital formation. Temporary workers receive less training than workers with open-ended contracts (fourth figure). Recoveries from financial crises are typically associated with greater use of temporary contracts because uncertainty and liquidity constraints discourage firms from making long-term commitments. Both Japan and Sweden experienced a strong rise in the share of temporary contracts in the 1990s in the wake of financial crises. This means a new generation of workers could face a lack of adequate training in the wake of the Great Recession.

One way to encourage more hiring during the recovery and to foster on-the-job training is to bridge the two tiers of the labor market by allowing for graded employment security. In particular, policymakers could promote the staged entry of workers into the permanent labor market by gradually increasing the costs faced by employers for dismissing a worker under an open-ended contract as the worker's tenure lengthens.

A staged tenure arrangement could involve open-ended contracts but with a statutory severance payment that gradually increases with tenure (for example, five days' severance pay per quarter worked) up to the maximum under national regulations. This would reduce uncertainty for firms, lower the costs to employers of employment protection, and promote flexibility without creating a two-tiered labor market.

**On-the-Job Training: Difference between Permanent and Temporary Employment**
*(Percent)*




Source: European Community Household Panel.

ment. When such shocks affect a low-productivity sector (for example, the construction sector after a housing bust), the conditional impact may be stronger.

- Uncertainty: There may be more uncertainty about future demand after major asset busts or crises than after more normal recessions. This may leave firms more reluctant to hire new workers and more likely to simply adjust the hours of existing workers (Bloom, 2009).
- Policies: Finally, policies can affect the conditional impact of changes in output on unemployment dynamics. Germany's *Kurzarbeit* is perceived to have dampened the rise in unemployment during the Great Recession by giving employers financial incentives to adjust to lower

demand by reducing hours worked per employee rather than by eliminating jobs.

## Step 1: Okun's Law across Countries and over Time

The first step in the analysis is to estimate Okun's law equations for each of the advanced economies in the sample leading up to the start of a recession. To identify the cycles, we follow the procedure in Chapter 3 of the April 2009 *World Economic Outlook,* which uses quarterly changes in real GDP to determine cyclical peaks and troughs. The recession phase is defined as the cyclical peak to the trough; for simplicity, the recovery phase is defined as the first eight quarters after the trough.[7]

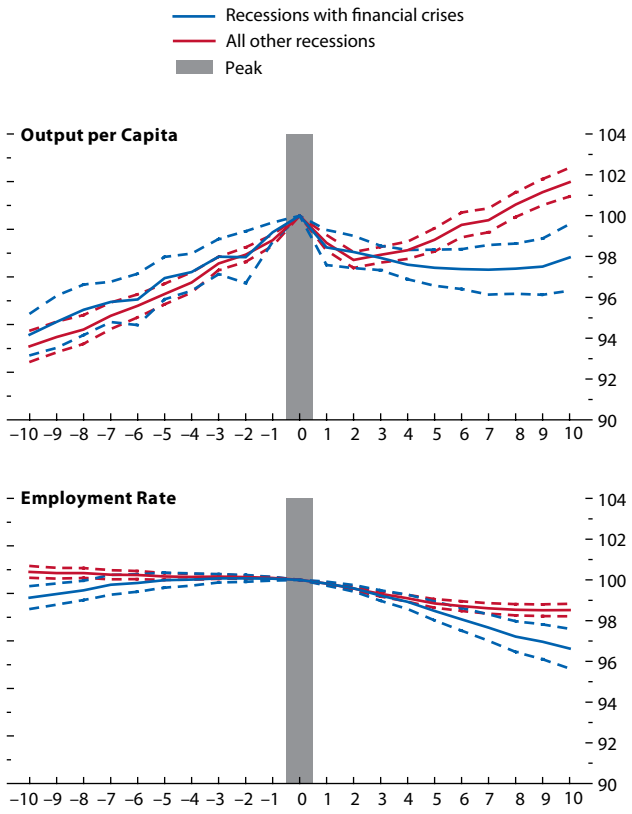
Given that there can be lags between changes in output and the unemployment response, the analysis uses a general dynamic specification of Okun's law, which also allows for betas to vary during recessions. To allow for different dynamics across countries, an optimal lag length is identified for each country and each recession.[8]

As mentioned, the window spans 20 years (80 quarterly observations), which is short enough to avoid instability in the relationship while being long enough to span at least two business cycles. Given that quarterly data is unavailable before the 1960s, the first recession episode is generally in the early 1980s. In our sample of 21 advanced economies, this results in more than 80 recession episodes.

Because the Okun's law equation allows for lagged effects, the short-term impact of a change in output on the unemployment rate can differ from the long-term impact. For example, after a demand shock, it may take time to dismiss employees, not least because employers may be initially uncertain as to whether the demand shock is temporary or more persistent. The analysis here focuses on the long-

**Figure 3.6. Output per Capita and Employment Rate Responses during Past Recessions[1]**

*(All series are in levels indexed to 100 at the peak; quarters on x-axis; peak in output at t = 0; solid line is the mean, and dashed lines are the 95 percent confidence band)*




Source: IMF staff calculations.

[1]Past episodes of recessions with financial crises: Australia (1990), Germany (1980), Italy (1992), Japan (1993 and 1997), Norway (1988), Spain (1978), Sweden (1990), and United Kingdom (1973 and 1990). Current episodes with financial crises: Belgium (2008), Ireland (2008), Netherlands (2008), United Kingdom (2008), and United States (2008).

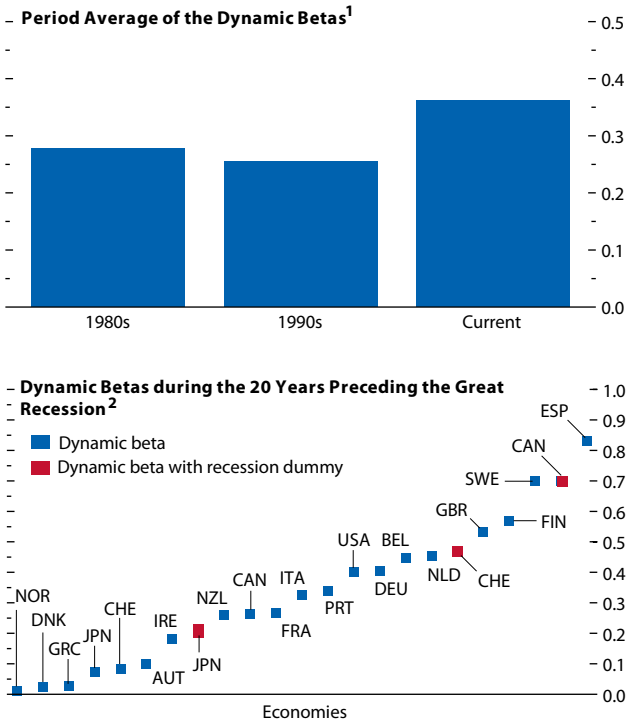
[7]The level of output typically surpasses its previous peak about three quarters after the end of the recession. After eight quarters, the economy is typically well into the expansion phase.

[8]For most economies, one to two lags are chosen for each variable, confirming that the dynamics of the relationship are unlikely to be captured by a simple, static Okun's law specification. Appendix 3.2 has details about the country-specific lag lengths.

term impact, which is called the dynamic beta (see Appendix 3.2 for the formula and derivation).

The variation in the dynamic betas for different recession episodes should capture the differences in institutions across countries and over time.[9]

## Figure 3.7. Dynamic Betas: The Long-Term Impact of Output Fluctuations on Unemployment Rate Dynamics




Source: IMF staff calculations.

[1]Averages taken of the dynamic betas for each recession in each economy during each decade.

[2]AUT: Austria; BEL: Belgium; CAN: Canada ; CHE: Switzerland; DEU: Germany; DNK: Denmark; ESP: Spain; FIN: Finland; FRA: France; GBR: United Kingdom; GRC: Greece; IRE: Ireland; ITA: Italy; JPN: Japan; NLD: Netherlands; NOR: Norway; NZL: New Zealand; PRT: Portugal; SWE: Sweden; USA: United States.

### Variation in Dynamic Betas over Time and across Countries

Figure 3.7 shows the average dynamic beta across advanced economies for recession episodes in the 1980s, 1990s, and 2000s.

- Unemployment has become more responsive to changes in output. The average dynamic beta increased from about 0.25 in the 1990s to 0.36 in the 2000s. It had previously declined between the 1980s and 1990s, but this change was not significant.
- There is significant variation across countries. Over the past 20 years, Spain has had the largest average response of the unemployment rate to changes in output (about 0.8). The response has also been high in Canada, but only during recessions. The high dynamic betas of Sweden and the United Kingdom likely reflect significant labor market reform over the past 20 years. Two other Scandinavian countries, Norway and Denmark, have the lowest dynamic betas. The big continental European countries (France, Germany, Italy) along with the United States have dynamic betas somewhere in the middle of the distribution.

### Impact of Institutions

Table 3.1 shows regressions of the dynamic betas using various indicators of labor market institutions.[10]

[9]The analysis focuses on unemployment rate specifications, the usual way that Okun's law is estimated. Similar results are obtained when using employment betas, as shown in Table 3.6.

[10]The dependent variable in the regression is the dynamic beta estimated for each recession episode. The OECD EPL strictness index is produced annually and generally goes back to the mid-1980s. It is a summary indicator based on 14 weighted components (such as dismissal procedures for regular contracts, group layoffs, use of temporary contracts). The unemployment benefits measure is a simple average of gross income replacement rates during the first and second year for a single worker without children. Temporary workers are defined as the share of workers

**Table 3.1. Factors Influencing the Responsiveness of Changes in Unemployment to Changes in Output[1]**

| | (1) | (2) | (3) | (4) | (5) |
|---|---|---|---|---|---|
| | Okun's Law with Optimal Lag Length | | | | |
| Employment Protection Legislation[2] | −0.05<br>[0.025]* | | | −0.062<br>[0.025]** | −0.058<br>[0.033]* |
| Unemployment Benefits | | 0.117<br>[0.103] | | 0.262<br>[0.100]** | 0.233<br>[0.097]** |
| Share of Temporary Workers | | | 0.014<br>[0.005]** | | 0.015<br>[0.006]** |
| Constant | 0.415<br>[0.062]*** | 0.368<br>[0.063]*** | 0.144<br>[0.066]** | 0.584<br>[0.088]*** | 0.383<br>[0.106]*** |
| Observations | 69 | 84 | 59 | 69 | 59 |
| $R^2$ | 0.05 | 0.02 | 0.11 | 0.14 | 0.22 |

Source: IMF staff estimates.

Note: Standard errors in brackets. *, **, *** denote significance at the 10 percent, 5 percent, and 1 percent level, respectively.

[1]The dependent variable is the dynamic beta assoicated with the unemployment rate version of Okun's Law.

[2]For specification 5, only the subindices associated with regular contracts are used.

- Less strict EPL and a higher share of temporary workers, as expected, lead to a higher beta and are generally significant.[11]
- The unemployment benefit replacement ratio also has a positive effect, meaning that the job destruction effect outweighs the job creation effect.
- It is possible to estimate the size of the effects. Using the regression in specification 5, a 10 percentage point increase in the share of workers on temporary contracts (the approximate difference between Portugal and Spain) increases the dynamic beta by 0.15 percentage point, whereas increasing the strictness of EPL on regular contracts from the level in the United States to that in Germany reduces the dynamic beta by about 0.16 percentage point. Increasing unemployment benefits from the level in the United Kingdom to that in Spain would increase the beta by close to 0.1 percentage point.

with temporary contracts (as defined by the OECD) in total dependent employment.

[11] In multivariate regressions where the share of temporary workers is included as an explanatory variable, we instead use the index of employment protection on regular contracts, because the broader index is affected by changes in legislation concerning temporary contracts.

## Step 2: Analyzing Unemployment Rate "Forecast Errors"

The analysis in the previous section shows how slow-moving variables such as institutional differences influence fluctuations in unemployment dynamics across countries and over time. This section studies how episodic factors—financial crises, sectoral shocks, uncertainty, and policies—alter the relationship between unemployment and output during recessions and recoveries.

The Okun's law estimates calculated using the 20-year prerecession quarterly samples are used to produce quarterly out-of-sample forecasts for changes in the unemployment rate. The difference between the actual change in unemployment ($\Delta u_t$) and its predicted value using the Okun's law estimates ($\Delta \hat{u}_t$) produces the unemployment forecast error:

$$\text{unemployment forecast error} \equiv \Delta u_t - \Delta \hat{u}_t. \quad (3)$$

Unemployment forecast errors are computed for both the recession and the recovery phases of each episode. The presence of forecast errors signifies that episodic factors could help explain unemployment

dynamics.[12] Regression results (Tables 3.2 and 3.3) reveal the influence of these factors.[13]

### Financial Crises and Stress

Financial crises have a significant impact during *recessions*, increasing unemployment by about 0.7 percentage point (Table 3.2, specification 1). A broader (and continuous) measure of financial stress is also associated with larger unemployment forecast errors (Table 3.2, specification 2).[14] The impact of financial stress during recessions is amplified by the extent of corporate leverage in the economy, as predicted by the literature (Table 3.2, specification 3).[15]

During the *recovery* phase, whether the preceding recession is associated with a financial crisis makes a significant difference, increasing the unemployment rate by about 0.3 percentage point (Table 3.3, specification 1). A 1 standard deviation increase in the measure of financial stress is also associated with higher unemployment of about 0.2 percentage point (Table 3.3, specification 2).

### House Price Busts

House price busts, as opposed to financial stress, most likely affect the unemployment forecast errors through a sectoral shock, namely to employment in the construction sector. To capture the effect, we utilize a dummy for house price busts with the share of employment in the construction sector.[16] Specification 4 in Table 3.2 shows that this variable is positively associated with unemployment forecast errors during *recessions*.[17] While many of the large house price busts are associated with financial crises, this variable continues to have an independent impact even after controlling for the level of financial stress (Table 3.2, specifications 7 and 8).

*Recoveries* from house price busts are not significantly associated with higher unemployment forecast errors (Table 3.3, specification 4). They are, however, significantly associated with lower employment forecast errors (Table 3.8). A possible interpretation is that house price busts are associated with declines in labor participation rates, for example migrants involved in construction returning to their home countries.

### Sectoral Shocks

Sectoral shocks can also be present in the absence of housing busts. To test this channel, we use the degree of dispersion in stock market returns as a measure of sectoral shocks.[18] A larger degree of dispersion indicates that the expected profitability of particular sectors, as measured by their stock returns, diverges from the average across all sectors—an indication of a sector-specific shock. Specification 5 in Table 3.2 shows that the impact of dispersion during *recessions* is positive and statistically significant, with a 1 standard deviation increase in the measure of stock market dispersion associated with about 0.2 percentage point higher unemployment. The measure of stock market dispersion continues to have an impact even after controlling for the level of financial stress and the

[12] The discussion that follows focuses on forecast errors based on the unemployment rate. A similar analysis—both in terms of estimating Okun's law equations and computing the forecast errors—can also be done for employment growth. Figure 3.3 shows that changes in labor participation rates have not played a significant role during the current cycle. This suggests that either the employment or unemployment rate specification should deliver similar results. Indeed, the results for the employment growth forecast errors are broadly similar and are discussed in Appendix 3.4.

[13] The regressions use forecast errors based on the dynamic specification of Okun's law with optimally chosen lag lengths. Appendix 3.4 discusses the results for the forecast errors based on a simple, static Okun's law specification.

[14] The Financial Stress Index developed in Chapter 4 of the October 2008 *World Economic Outlook* gauges stress in the markets for money, equities, and foreign exchange and elsewhere in the banking sector.

[15] The degree of leverage is captured by the aggregate debt-to-asset ratio of the corporate sector for each country in the sample. The sample average is about 24 percent. The negative impact of financial stress does not materialize until the debt-to-asset ratio is greater than 18 percent.

[16] The house price bust indicator is based on Kannan, Scott, and Rabanal (forthcoming).

[17] The incidence of a house price bust in a country whose construction sector is about 8 percent of employment (the sample average) reduces the unemployment forecast errors by about 0.7 percentage point.

[18] This measure was originally developed in Loungani, Rush, and Tave (1990). A four-quarter trailing moving average of this measure was used in the regression to capture lagged effects. See Appendix 3.1 for details.

## Table 3.2. Unemployment Forecast Errors during Recessions

| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) |
|---|---|---|---|---|---|---|---|---|
| Financial Crisis | 0.702<br>[0.185]*** | | | | | | | |
| Financial Stress Index (FSI—four-quarter moving average) | | 0.209<br>[0.106]** | −0.605<br>[0.250]** | | | | 0.266<br>[0.112]** | 0.181<br>[0.114] |
| FSI × Corporate Leverage (at peak) | | | 0.034<br>[0.011]*** | | | | | |
| House Price Bust[1] | | | | 0.085<br>[0.022]*** | | | 0.08<br>[0.024]*** | 0.066<br>[0.024]*** |
| Stock Market Dispersion (four-quarter moving average) | | | | | 0.627<br>[0.301]** | | | 1.32<br>[0.420]*** |
| Dispersion of GDP Forecasts (four-quarter moving average) | | | | | | −0.037<br>[0.106] | | |
| Constant | 0.228<br>[0.100]** | 0.129<br>[0.123] | 0.057<br>[0.115] | 0.079<br>[0.132] | 0.269<br>[0.108]** | −0.069<br>[0.112] | −0.148<br>[0.143] | −0.271<br>[0.147]* |
| Observations | 341 | 257 | 154 | 303 | 329 | 136 | 233 | 232 |
| $R^2$ | 0.04 | 0.02 | 0.06 | 0.05 | 0.01 | 0.00 | 0.09 | 0.12 |

Source: IMF staff estimates.
Note: Standard errors in brackets. *, **, *** denote significance at the 10 percent, 5 percent, and 1 percent level, respectively.
[1]Impact of house price bust takes into account the share of the construction sector in total employment.

## Table 3.3. Unemployment Forecast Errors during Recoveries

| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) |
|---|---|---|---|---|---|---|---|---|
| Recovery from a Financial Crisis | 0.256<br>[0.124]** | | | | | | | |
| Financial Stress Index (FSI—four-quarter moving average) | | 0.215<br>[0.071]*** | −0.110<br>[0.279] | | | | 0.211<br>[0.075]*** | 0.230<br>[0.085]*** |
| FSI × Corporate Leverage (at recession trough) | | | 0.011<br>[0.010] | | | | | |
| Recovery from House Price Bust[1] | | | | −0.007<br>[0.013] | | | −0.016<br>[0.013] | −0.015<br>[0.013] |
| Stock Market Dispersion (four-quarter moving average) | | | | | 0.013<br>[0.119] | | | −0.153<br>[0.232] |
| Dispersion of GDP forecasts (four-quarter moving average) | | | | | | 0.06<br>[0.050] | | |
| Constant | −0.181<br>[0.055]*** | −0.075<br>[0.052] | −0.061<br>[0.063] | −0.123<br>[0.070]* | −0.143<br>[0.057]** | −0.097<br>[0.056]* | −0.029<br>[0.073] | −0.004<br>[0.089] |
| Observations | 504 | 377 | 271 | 446 | 455 | 160 | 365 | 357 |
| $R^2$ | 0.01 | 0.02 | 0.02 | 0.00 | 0.00 | 0.01 | 0.02 | 0.02 |

Source: IMF staff estimates.
Note: Standard errors in brackets. *, **, *** denote significance at the 10 percent, 5 percent, and 1 percent level, respectively.
[1]Impact of house price bust takes into account the share of the construction sector in total employment.

incidence of a house price bust (Table 3.2, specification 8).

During *recoveries*, the broader stock market dispersion measure becomes insignificant (Table 3.3, specification 5).

### Uncertainty

Good measures of uncertainty at the country level are scarce. Some measures (such as the VIX) are useful as proxies for the degree of global risk aversion, but they do not capture any cross-country variation.[19] To some degree, country-specific uncertainty will be captured by some components of the Financial Stress Index. In addition, this chapter uses the dispersion of GDP found in *Consensus Forecasts* as a measure of uncertainty.[20] This measure, however, is available for only about half the countries included in our sample and generally only after the early to mid-1990s. In any event, this uncertainty channel does not have a significant impact on either *recession* or *recovery* forecast errors (Table 3.2, specification 6). However, it does have a significant and negative impact on recovery forecast errors for employment growth (Table 3.8, specification 6).

## The Key Issues: Drivers of Great Recession Dynamics and Recovery Prospects

This section uses the previous analysis to explain the unemployment response during the Great Recession and unemployment prospects during the recovery.

The Great Recession was a global financial crisis that also featured large house price corrections in several countries. As shown, unemployment rate changes and output declines varied tremendously across advanced economies (see Figure 3.1). How much of the recent unemployment rate dynamics can we explain? In particular, what importance can we ascribe to output declines, institutional differences (as captured by the dynamic betas), and the episodic factors we have studied?

### The Effects of Output Declines, Institutional Reform, and Episodic Factors during the Great Recession

As a first step in addressing these questions, Figure 3.8 examines the predicted change in the unemployment rate using the dynamic beta estimates and actual output declines. For many countries, a significant part of the total change in unemployment during the Great Recession can be accounted for by the predicted value based on Okun's law.

- *Spain* suffered the largest rise in unemployment among the advanced economies in the sample, but much of this can be explained. This is because Spain has the highest dynamic beta among the advanced economies (that is, a very elastic response of unemployment to output), which reflects the prevalence of temporary contracts. Spain also suffered a sizable output drop.[21]
- For *Canada* and the *United Kingdom,* the predicted values are even greater than the actual unemployment increases. For the United Kingdom, this is the product of a significant increase in its dynamic beta over the past two decades and a substantial output loss (about 6 percent). For Canada, it is explained by a relatively larger dynamic beta during recessions and a sizable though smaller drop in output than for the United Kingdom.
- *Ireland* suffered the second largest rise in unemployment among countries in the sample. Although it experienced the second biggest output decline (more than 8 percent)—surpassed only by Finland—its dynamic beta is one of the lowest (less than 0.2), and so the predicted unemployment increase is less than half the actual increase.

[19] The VIX is a measure of the implied volatility of options on the S&P 500 index. The index is computed by the Chicago Board Options Exchange.

[20] See Appendix 3.1 for further details. Several papers, including Kannan and Köhler-Geib (2009) and Prati and Sbracia (2002), show that this particular measure has explanatory power in predicting crises in emerging markets.

[21] The centralization of collective wage bargaining in the presence of a significant "buffer stock" of fixed-term contract workers also played a role through its impact in reducing wage flexibility. Contractual wages increased by almost 3 percent in 2009. Significantly, real wages increased most in industries that initially had a larger share of fixed-term contracts. For example, in construction employment declined by 23 percent, wages increased by 4 percent, and temporary contracts accounted for more than 50 percent of total employment in 2008.

- For the *United States*, the predicted change using Okun's law can explain a significant part of the nearly 4 percent increase in the unemployment rate during the Great Recession. This results from a dynamic beta and output drop that were both moderate compared with other advanced economies.

The next step in addressing these questions is to add the role of episodic factors to the predicted changes in the unemployment rates derived from Okun's law. Figure 3.9 shows the breakdown of the cumulative change in unemployment in terms of the predicted component from Okun's law, the impact of financial stress and house price busts, and the residual unexplained component for the largest economies and those with particularly interesting dynamics.

For several countries such as Canada, the Netherlands, the United Kingdom, and the United States, the high degree of financial stress can help explain an additional 0.4–0.6 percentage point of the increase in the unemployment rate.[22] House price busts are also significant contributors to the unemployment rate increase, especially in countries such as Ireland and Spain where the share of employment in the construction sector was particularly high.

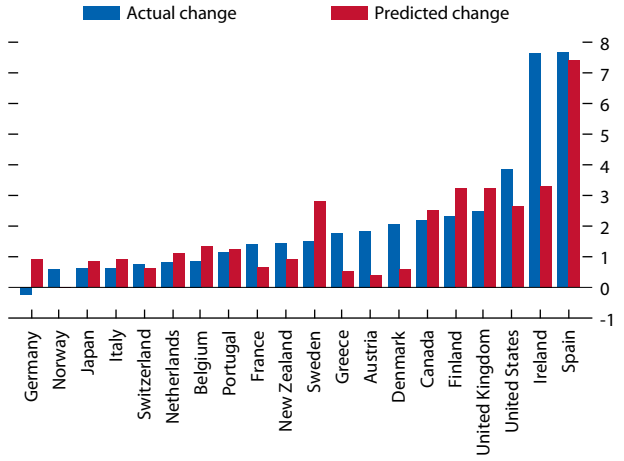
## The Importance of Short-Time Work Programs and Remaining Puzzles during the Great Recession

The predicted impact of output drops using Okun's law estimates, financial stress, and house price busts explains more than the cumulative increase in unemployment for several countries, as shown by negative unexplained components in Figure 3.9. Can the lower-than-predicted response of unemployment be explained by the unprecedented expansion of short-time work programs, which encourage adjustment to demand shocks by reducing hours worked rather than by job destruction?[23]

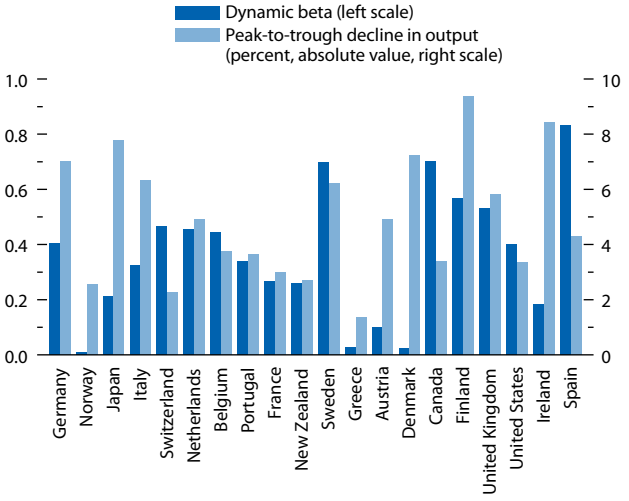
[22] The impact is measured using the coefficients from Table 3.2, specification 7.

[23] The reduction in hours is met by a reduction in wages, although this reduction is typically less than proportional. Employers are subsidized for the increase in hourly wages through contributions from employers and employees or general government revenues.

**Figure 3.8. Decomposition of the Actual Change in the Unemployment Rate during the Great Recession**
*(Peak-to-trough percentage point change)*



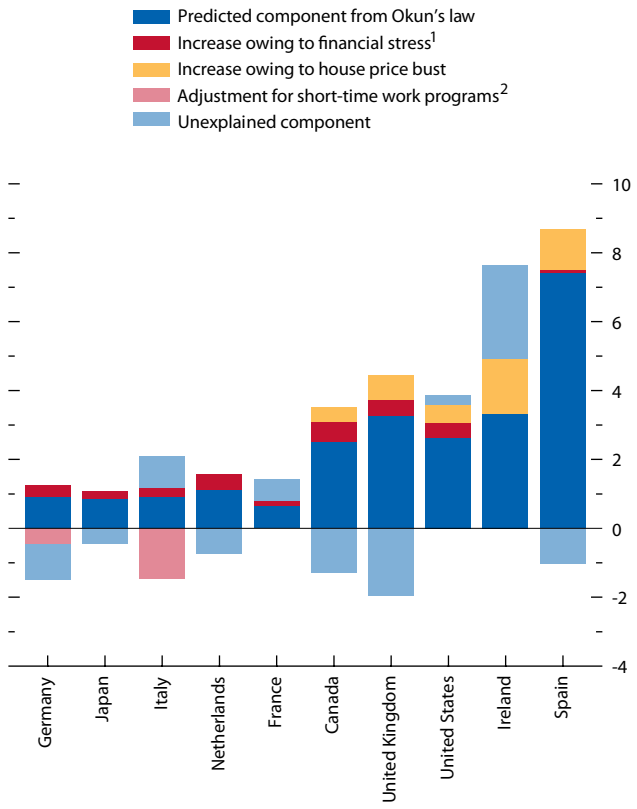

**Dynamic Betas and Peak-to-Trough Declines in Output**




Source: IMF staff calculations.

**Figure 3.9. Decomposition of the Cumulative Change in the Unemployment Rate during the Great Recession**

*(Peak-to-trough percentage point change, selected economies)*




Source: IMF staff calculations.
[1]The Financial Stress Index is not available for Ireland.
[2]Detailed data on short-time work programs that allowed for the computation of full-time-equivalent employees were obtainable only for Germany and Italy.

Detailed data are available for Germany and Italy, and for these two countries the increase in participation in these programs during the Great Recession was about 0.5 and 1.5 percent of the labor force, respectively.[24] Figure 3.9 includes the contribution of the short-time work programs for these two countries, assuming that the full-time-equivalent number of workers under these programs would have otherwise been laid off. For Germany, the resulting increase in unemployment would explain about one-third of the unexplained component. For Italy, on the other hand, accounting for the short-time work programs produces a positive unexplained component.

Ideally, this exercise should be extended to all countries that employ such programs. Unfortunately, detailed data on the participation rates in other countries are unavailable. It should be noted, however, that the other two countries with large short-time work programs, Japan and the Netherlands, also have negative unexplained components, although for Japan falling nominal wages also contributed. The key design features of the larger short-time work programs are discussed in Box 3.2. The benefits of these programs include stabilizing employment; eliminating unnecessary firing, hiring, and retraining costs; and countering wage deflation pressures that can occur in severe recessions.[25] There are also costs, however, including slowing movement of labor across sectors. For example, in Italy, the sectoral decomposition of short-time

[24]It should be noted that Germany experienced a large increase in participation in its short-time work program in the second quarter of 2009, amounting to an additional 0.5 percent of the labor force. This increase is not included in the analysis, as Germany's output level is assessed to have reached a trough in the first quarter of 2009.

[25]More generally, even in mild recessions or in response to temporary demand shocks, well-designed short-time work programs could facilitate adjusting hours worked per employee in countries where tax and benefit systems incentivize employment adjustment instead. For example, in the United States, some argue that the unemployment insurance system favors temporary layoffs as opposed to short-time work programs (Feldstein, 1978; Burdett and Wright, 1989). This tendency may have been exacerbated by increasing employer contributions to employee health care insurance programs, which are largely fixed regardless of hours worked. The case for using short-time work programs outside of recessions, however, requires further study of how they interact with other labor market institutions over the longer term.

## Box 3.2. Short-Time Work Programs

During the recent downturn, several advanced economies—including France, Germany, Italy, Japan, the Netherlands, Sweden, and the United States—increased their use of short-time work programs as a tool to stabilize employment in the face of large output declines. The table presents a snapshot of these programs for some major economies. Emerging economies such as Chile also introduced short-time work programs. Recognizing its importance, the International Labor Organization cites work sharing as a specific crisis management tool in its 2009 *Global Jobs Pact*.

### *Theoretical Pros and Cons*

The defining feature of short-time work programs is an adjustment for a decline in labor demand by a reduction in hours, leaving employment essentially unchanged. Thus, unlike layoffs, where the burden is borne only by terminated workers, short-time work involves greater burden sharing. The reduction in hours worked is met by a reduction in gross wages, although the per hour wage of the worker typically rises in many short-time work programs. Employers are subsidized for the increase in hourly wages, either through unemployment insurance (UI) or other government funds.

These programs involve both costs and benefits. An oft-cited benefit of short-time work programs is that they counter potential wage deflation pressures during a severe recession. By stabilizing employment and smoothing income through a downturn, such programs also mitigate large adjustments in domestic demand. In addition, there may be societal gains from reduced training and hiring costs and, potentially, productivity gains from retaining workers and thus maintaining employee morale (Vroman and Brusentsev, 2009).

The use of short-time work may also be associated with large costs. Since participation in such programs is contingent on maintaining ties with an existing employer, job lock could increase during a recession. Lower sectoral reallocation may perpetuate sectoral imbalances, leaving workers to languish in shrinking industries with skills ill suited for sectors that are growing. In the course of the recovery, as these workers search for jobs in expanding industries, unemployment could remain persistently high (Phelps, 2008).

### *Short-Time Work Programs during the Great Recession and Their Impact on Unemployment*

Historically, short-time work has followed a strong countercyclical pattern. Accordingly, the synchronized output declines in the recent downturn were met by a similar pattern of growth in short-time work. Following low use through mid-2008, there was an abrupt increase in the use of these programs as global demand contracted at the end of 2008 (first figure). In the last quarter of 2008, this increase was sharpest in Germany, where the number of employees shifting to short-time work

The author of this box is Mitali Das.

**Overview of Short-Time Work Programs (September 2008–September 2009)**

| | Maximum Usage, Peak[1] | Peak Usage | Change in Unemployment Rate | Eligibility | Duration | Experience Rating | Funding |
|---|---|---|---|---|---|---|---|
| Germany *(Kurzarbeit)* | 3.5 | April 2009 | 0.5 | Yes | Yes | No | Payroll |
| Italy *(Cassa Integrazione)*[2] | 4 | September 2009 | 1.2 | Yes | Yes | Yes | General fiscal, Payroll |
| Japan (Employment Adjustment Subsidy) | 3.8 | July 2009 | 1.42 | Yes | Yes | No | General fiscal |
| United States (Workshare) | 0.5 | May 2009 | 3.506 | No | No | Yes | State, Payroll |

Sources: U.S. Bureau of Labor Statistics; U.S. Department of Labor; Haver Analytics; International Monetary Fund; national authorities; and IMF staff calculations.

[1]Percent of labor force.

[2]Maximum enrollment is based on total hours, not on number of individuals participating.

**Box 3.2 *(continued)***

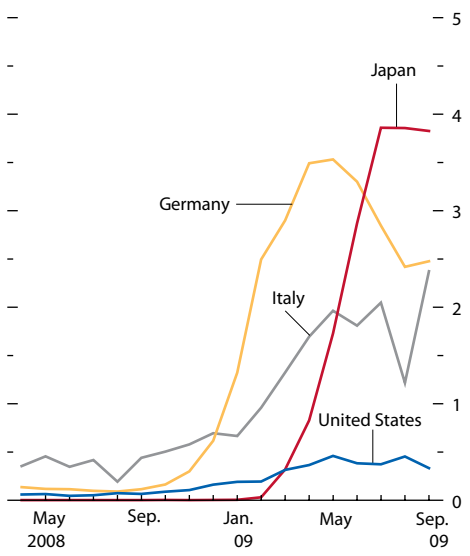
more than doubled in a single month, increasing by more than a quarter million enrollees. Growth was even more pronounced in Japan, where the number of employees targeted by job-subsidy programs grew by more than half a million enrollees in April, following an expansion of the program. Participation in Italy and the United States rose less, although given the differences in the size of their labor forces, the increase was more significant in Italy. Use of short-time work programs declined later in 2009, with the gradual bottoming out of the global recession.

Although short-time work programs share broad features across countries, there are nevertheless significant differences in design, coverage, participation, and funding. In part reflecting such differences, these programs have had mixed success in maintaining employment across countries during the downturn. To highlight these differences, the rest of the discussion will focus on the evolution of short-time work programs during the crisis in four cases: Germany, Italy, Japan, and the United States.

In Japan short-time work subsidies in May 2009 alone exceeded the annual subsidy in any year during 2003–07; the May 2009 outlay, in turn, was less than one-tenth of subsidies paid out in October. Another striking example is Germany, which experienced the largest increase in short-time work enrollment since reunification, with more than 1.5 million participants, or 3.4 percent of the labor force, at the peak. Italy's increase was also large: participation increased from less than 0.5 percent of the labor force on the eve of the crisis to more than 4 percent at the height of the downturn. The United States also experienced a very large increase in participation relative to previous downturns, although short-time work was a far smaller component of employers' response to the downturn than in the other three countries.

Despite this expansion, the effects of short-time work programs on unemployment were somewhat uneven. One way of quantifying the effects on unemployment is by calculating the full-time equivalent of participants in a program. The second figure shows that this adjustment would imply a large effect on unemployment rates in Germany and Italy. However, there are some caveats. First, the estimates assume that in the absence of a short-time program workers would have been unemployed; second, the size of the labor force is assumed not to have changed (for instance, no discouraged workers ceasing to look for work or dropping out of the labor force). A third caveat in the case of Japan is sizable nominal wage income reductions (4 percent in 2009) through cuts in wage rates, paid overtime, and bonus payments, which may have helped dampen the rise in unemployment. Nevertheless, it is still likely that the sheer scale of short-time work programs in the current recession contributed to the smaller changes in unemployment rates relative to other countries.

**Short-Time Work through the Crisis**
*(Percent of labor force)*




Sources: National authorities; and IMF staff calculations.

### *Sectoral Reallocation*

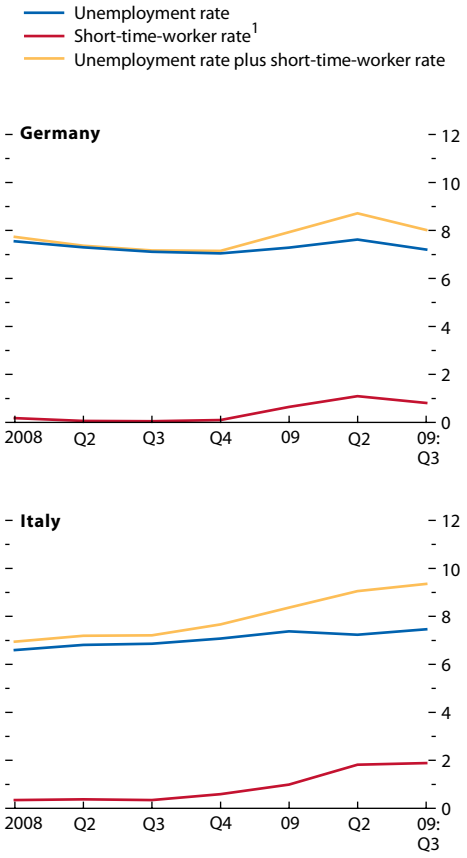
Given the beneficial effects of short-time work programs during a downturn, it is also useful to consider their costs in some detail. One such cost, as previously noted, is the risk that continuing such programs after recovery can have adverse consequences for job reallocation. One way to quantify

this risk is by analyzing the sectoral usage of short-time work programs before and during a recession. The premise is that if these programs are used as a temporary measure against a demand shock, usage must be different before the recession than during the recession.

The third figure shows the evolution of the relative incidence of short-time work programs in Standard International Trade Classification three-digit industries in Germany and Italy. The histograms denote the ratio of each sector's share of total short-time work program hours to the sector's share of total employment. A ratio larger than 1 indicates overrepresentation in the allocation of short-time work program funds. The figure reveals different dynamics in the use of short-time work programs in Germany and Italy. In Italy, two sectors—mechanical and textile industries—respectively received approximately 9 and 5 times more short-time work hours than their share in employment in 2005. Although the relative incidence of short-time work programs in specific sectors generally declined during the recession as other sectors increased their participation, we found that in 2008 these two sectors retained their advantage, receiving 8 and 6.5 times more short-time work hours than all sectors on average. The persistently high use of short-time work programs in specific sectors suggests that these programs may have been used to address structural layoffs rather than temporary demand shocks associated with the downturn. In Germany, on the other hand, consistent with expectations, short-time work usage in the most overrepresented sectors does decline over time.

### Germany and Italy: Unemployment Rate and Short-Time Workers

*(Percent)*




Sources: National authorities; Organization for Economic Cooperation and Development; and IMF staff calculations.
[1]The short-time-worker rate is calculated on a full-time-equivalent basis.

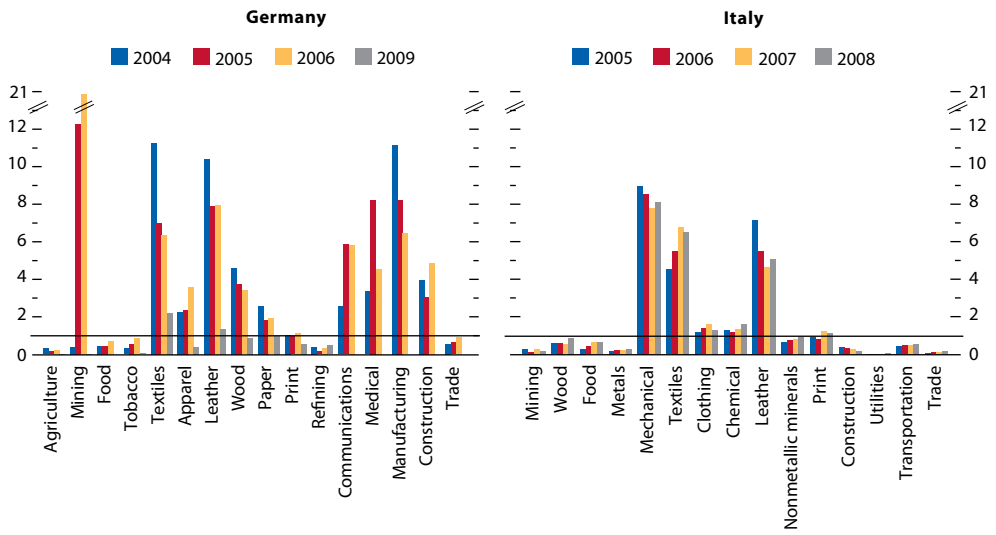
### *Country-Specific Differences in Design*

Given the sizable benefits both to firms and workers, it is useful to consider why participation in short-time work programs has been so uneven across countries during the recent downturn. Consider, for instance, the significant increase in the German program, *Kurzarbeit*, the Italian program, *Cassa Integrazione,* and Japan's Employment Adjustment Subsidy (EAS) program compared with participation in the U.S. Workshare program, whose participation peaked at only 0.5 percent of the labor force. What explains these discrepancies? The reasons are varied and include both design features and recession-specific modifications.

One of the key design features of *Kurzarbeit* is that weeks spent in the program do not affect an employee's eligibility for regular UI benefits if the worker is subsequently laid off. This differs significantly from the U.S. Workshare program, whose participants risk a decline in aggregate payments within a benefit cycle: UI entitlements drop on

## Box 3.2 *(continued)*

### Germany and Italy: Relative Incidence of Short-Time Work[1]




Sources: National authorities; Organization for Economic Cooperation and Development; and IMF staff calculations.
[1](Short-time workers in each sector as a share of total short-time workers) divided by (employment in each sector as a share of total employment).

a dollar-for-dollar basis for (full-time-equivalent) short-time work payments. Moreover, German and Japanese employers, unlike their U.S. and Italian counterparts, are not subject to experience rating, the practice of using an employer's past claims to calculate future contribution rates (employers who make more claims face higher contribution rates). The absence of experience rating increases employers' motivation to use short-time work programs to smooth fluctuations in labor demand.

These programs' financing also differs across countries. *Kurzarbeit,* for instance, is financed through payroll taxes paid by workers and employers. EAS in Japan is funded by employer contributions to a reserve, which is managed as part of the Employment Insurance System. In Italy, funding is largely through general government revenues. Large government cofinancing increases the incentive for employers to implement short-time work programs.

Expansion of short-time work programs is an additional reason for the difference in participation rates and effects on unemployment. During the recession, expansion occurred primarily in two areas in the countries we are considering. First, there was eligibility expansion, which included the duration of participation and the extension to nonregular workers. Second, the programs received increased funding. For example, *Kurzarbeit* was initially developed with a maximum duration of 12 months, but was extended to 18 and then 24 months during the recent downturn. In Italy the *Cassa Integrazione in deroga*, which is funded out of general government revenues rather than social security contributions, was expanded significantly during the downturn to prolong the duration of the program in some firms and make new firms eligible. In addition, its usage was not subject to experience rating. EAS authorized large increases in the subsidy component, from 67 percent to 75 percent for large corporations and from 80 percent to 90 percent for small and medium-size enterprises, which include additional payments for avoiding

dismissals. Furthermore, given the severity of the recession, eligibility for short-time programs in Germany, Italy, and Japan was expanded to include some nonregular, temporary contract workers. In contrast, there was no recession-induced expansion in the U.S. Workshare program.

### *Efficacy of Short-Time Work Programs*

During a downturn, short-time work may provide exactly the sort of employment and wage stabilization needed to prevent large adjustments in the labor market. One of the key aspects of short-time work programs that has emerged during this recession, however, is that design features are critical to their effectiveness. These design features include ease of implementation, such as administrative convenience, adequate advertisement, and complementarity with (rather than punitive effects on) eligibility for regular UI benefits. Indeed, weakness in this regard may have limited the program's usage in the United States (Vroman and Brusentsev, 2009).

Although many advanced economies' experience with short-time work programs has been largely successful, these programs may not be a universal substitute for traditional stabilizers, because they require strict oversight to prevent abuse. The experiences of advanced economies show that successful implementation of short-time work must limit the subsidy component and perhaps make it countercyclical, ensure that actual work sharing takes place, and eliminate subsidies when no hours are worked.

Careful design of short-time work programs can promote job retention during a downturn, but unwinding their use as recovery begins is equally important, for example, to prevent adverse effects on job reallocation. One possibility is making experience rating contingent on the state of the business cycle. Specifically, because experience rating may discourage employers from using short-time work programs, it could be tied to statewide or economy-wide triggers, such as a particular unemployment rate.

work hours indicates that about 55 percent of the subsidized hours are concentrated in two declining manufacturing sectors (textiles and mechanical industries), which account for less than 10 percent of employment. This issue is revisited in a later section on appropriate policies for the recovery.

Unemployment dynamics in Canada and the United Kingdom remain difficult to explain: these countries have sizable negative unexplained components but did not implement large short-time work programs. For the United Kingdom, pay moderation may help explain part of this puzzle.[26] Another factor may be that output declines were concentrated in high-productivity sectors, moderating the associated rise in unemployment. For Ireland, the large positive unexplained component may be partly explained by the lack of data required to construct the Financial Stress Index and hence its associated contribution to unemployment dynamics.

[26] See *Bank of England Inflation Report* (February 2010).

## Near-Term Prospects for Employment Creation

Along with the potential for a slow recovery in output, the nature of the recent recession in several advanced economies (financial crises combined with house price busts), the high level of financial stress, and the high degree of uncertainty all weigh against a speedy recovery in job creation. This section reviews the near-term employment prospects and what policies could help.

How long does it typically take for employment to recover once the recession ends? As shown in Figure 3.10, across all recessions, it typically takes three quarters after output has started to recover for employment to start registering positive growth and an additional two quarters for the unemployment rate to peak. These lags are longer if the preceding

recession is associated with a financial crisis or a house price bust.

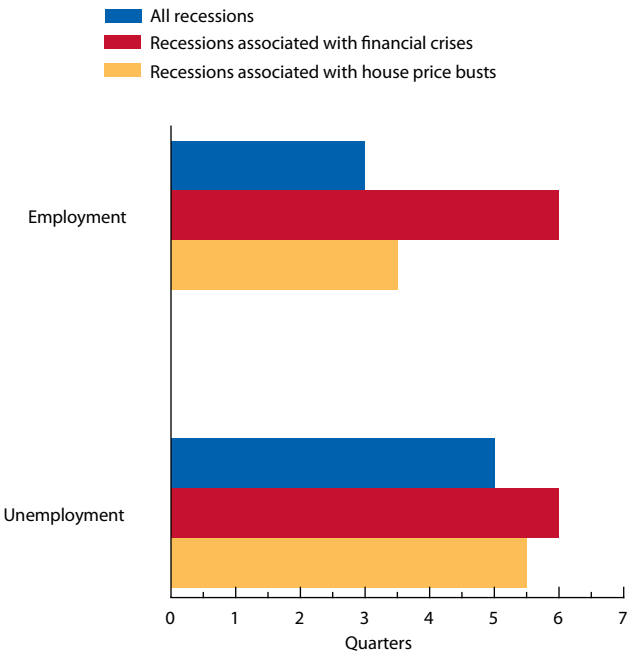
What is the unemployment rate forecast for this recovery, assuming that there are no further financial crises or house price busts through the end of 2011? To address this question, the Okun's law estimates and *World Economic Outlook* (WEO) output forecasts are combined. To this is added the impact of financial stress, which is significant during recoveries.[27] A similar approach is used to forecast the level of employment.

The employment, unemployment rate, and GDP growth forecasts for the advanced economies as a group are shown in Figure 3.11. The unemployment rate remains high—about 9 percent—through the end of 2011. Moreover, the unemployment rate is still rising even as employment starts to grow, given the continuous expansion of the labor force. The forecasts based on Okun's law are broadly similar to the WEO unemployment projections discussed in Chapter 1, although the latter start to decline earlier.[28]

A number of other considerations that cannot be incorporated into the forecasting exercise support the conclusion that there will be persistently high unemployment rates in OECD economies over the near term. In the United States, the share of permanent versus temporary layoffs was relatively higher during the Great Recession than in previous downturns. Furthermore, in a number of countries, an increasing share of part-time workers and short-time work programs may allow firms to initially raise output by means of increased productivity and longer work hours, rather than by hiring new workers.

**Figure 3.10. How Long before Employment Recovers?**

*(Median number of quarters before employment (unemployment) reaches its trough (peak) after the end of the recession)*




Source: IMF staff calculations.

## Policies to Jump-Start Job Creation

The prospect of persistently high unemployment increases the need for policies to jump-start job creation above and beyond generally encouraging wage flexibility and improving labor market institutions.

[27]Financial stress is assumed to revert to the mean by the end of 2010 for all economies.

[28]As an alternative approach, a vector autoregression is used to produce forecasts of the unemployment rate, employment, and GDP (see Appendix 3.5). This approach yields similar forecasts.

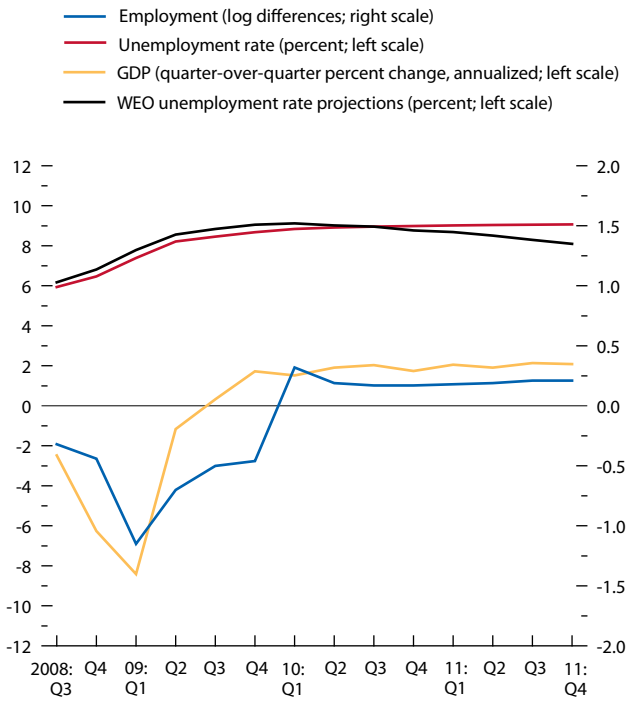
Although an analysis of the full spectrum of potential labor market policies is beyond the scope of this chapter (see OECD, 2009, for a recent review), this section considers a few policies that may be particularly relevant. First, in countries where labor productivity is strong but macroeconomic uncertainty remains high, temporary hiring subsidies may help advance job creation. Second, to facilitate the movement of labor across sectors, there should be a quick exit from short-time work programs, and wage loss insurance could be considered. Finally, some steps should be taken to address the negative effects of two-tiered labor markets (dualism).

### *Hiring Subsidies in an Uncertain Environment*

The level of macroeconomic uncertainty remains higher than average although it has decreased in recent months (Figure 3.12). Such uncertainty does not appear to have a significant impact on the unemployment rate, but it does significantly reduce employment growth, conditioning on the pickup in output during recoveries (see Table 3.8). In this environment, a temporary subsidy may stimulate job creation on the margin by encouraging firms to hire new workers, rather than to "wait and see" and simply increase the hours of existing workers. Such subsidies, which have been implemented by advanced economies in the past and during this recession, reduce per worker hiring costs to employers, usually through credits for new hiring or lower payroll tax liabilities.

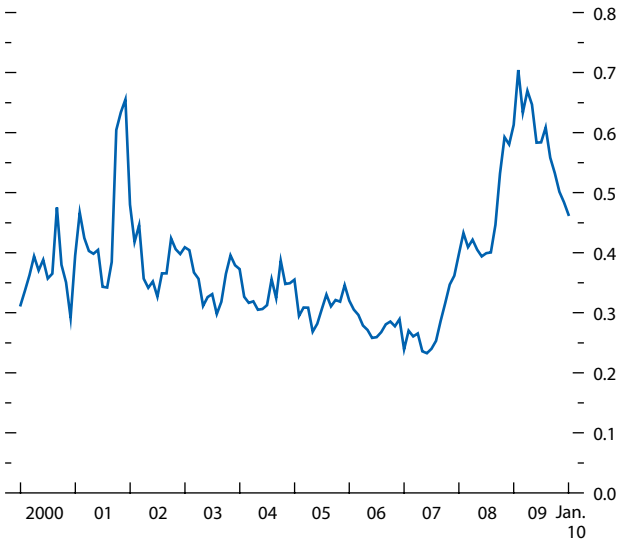
Such policies do raise concerns about cost and effectiveness, however. The evaluation of previous job subsidy programs has focused on two specific costs: the possibility that workers hired into subsidized jobs would have found jobs anyway *(deadweight losses)* and the replacement of an intended hire with one from a targeted group *(substitution effects)*. Deadweight losses should always be minimized, but substitution effects are not necessarily bad. An example of a positive substitution effect would be to subsidize the hiring of someone who has been unemployed for an extended time and is unlikely to be hired without assistance, even if that prevents the hiring of a worker unemployed for a short time. Overall, the evidence from a wide range of countries and time periods points to large

**Figure 3.11. Forecasts of Employment, Unemployment Rate, and GDP for Advanced Economies, Based on Okun's Law[1,2]**




Sources: Haver Analytics; Organization for Economic Cooperation and Development; and IMF staff calculations.
[1]Okun's-law-based forecasts use a mean-reverting Financial Stress Index.
[2]Purchasing-power-parity-weighted average of Austria, Canada, Finland, France, Germany, Greece, Ireland, Italy, Japan, Netherlands, Portugal, Spain, United Kingdom, and United States. Excluded are Australia because it did not experience a recession in 2008–09 and Switzerland for lack of data. Quarterly WEO unemployment projections are not available for Belgium, Denmark, New Zealand, Norway, and Sweden.

**Figure 3.12. Dispersion of GDP *Consensus Forecasts***
*(Purchasing-power-parity-weighted average of one-year-ahead growth forecasts for G7 economies)* [1]




Sources: *Consensus Forecasts;* and IMF staff calculations.
[1]G7 comprises Canada, France, Germany, Italy, Japan, United Kingdom, and United States.

deadweight losses, relatively small substitution costs, and a negative correlation between the size of the subsidy and deadweight losses.[29]

What characterizes an effective hiring subsidy? A larger per worker subsidy will likely increase overall job creation and reduce deadweight losses (by raising firms' incentives to create employment beyond their existing hiring targets), but will increase the cost of the program. To further reduce deadweight losses, the subsidy should be targeted and temporary. Target groups could include those with poor job prospects, such as the long-term unemployed or younger workers who represent a long-term investment in human capital formation. Furthermore, to minimize incentives for firms to simply rotate workers, the subsidy should be awarded on the basis of net job creation only. Deadweight losses and substitution costs that cannot easily be circumvented by policy design may simply need to be accepted as a price worth paying to increase job creation. No subsidy, however, should be allowed to become a tool for industrial policy (to target particular sectors or industries), and all subsidies should be designed in a manner that prevents fiscal costs from becoming permanent.

### *Exiting Short-Time Work Programs and Using Wage Insurance to Facilitate Mobility*

The challenge is to prevent short-time work programs from becoming permanent wage subsidies to declining industries and from obstructing the movement of jobs and workers across sectors. In addition to the strain on public finances, continued state financing of such programs reduces the incentive for employers to scale them down as the recovery gains momentum. In the absence of well-defined rules to the contrary, policymakers may also have substantial discretion in deciding which firms are eligible and which are not, transforming short-time work programs into a subsidy to particular sectors.

In order to encourage an orderly unwinding of short-time work programs during the recovery

[29]Examples of job subsidy evaluations are in Atkinson and Meager (1994), Calmfors and Lang (1995), Byrne and Buchanan (1994), Cippolone and Guelfi (2006), and Marx (2005).

(and their scaling up during recessions), employer and employee contributions could be made contingent on the state of the business cycle. In the same way, employers could be charged rising contribution rates as they increase their use of the programs, and these experience ratings could be adjusted over the cycle.

Exit from these programs could also be encouraged by providing workers with wage loss insurance that not only insures workers against a decline in income, but smooths their movement from declining sectors to growing ones (see Kling, 2006). In recent years, wage loss insurance policies have been considered in Canada and the United States to counter long-term unemployment by cushioning the impact of a job loss through subsidies for retraining, extended unemployment insurance, or payment of up to 50 percent of the wage differential between new and old jobs.

As with other types of insurance, there is potential for abuse. Employers subsidized by new employees' insurance would have incentives to pay low wages to these workers. Such abuse could be discouraged by requirements that wage insurance recipients not be paid less by their employer than other workers. Kling (2006) also suggests additional mechanisms to limit abuse, including making such programs temporary, linking workers' benefit eligibility to tenure in their previous job, and capping total benefits.

### *Addressing the Negative Effects of Two-Tiered Labor Markets (Dualism)*

Increasing use of temporary employment contracts over the past two decades has raised the response of unemployment to output fluctuations (increased the beta). Although having a higher beta is not by itself a problem—it increases job destruction during downturns but also raises job creation during upturns—there are negative effects from the increasingly two-tiered nature of the labor markets in many advanced economies. For example, as noted in Box 3.1, workers with temporary contracts generally receive less on-the-job training than those with open-ended contracts. Moreover, workers with temporary contracts can suffer greater social dislocation after losing a job because they are usually not eligible for unemployment benefits.[30]

Yet in periods of high macroeconomic uncertainty, employers may seek to offer temporary contracts to new hires, as happened in Japan and Sweden after the financial crises of the 1990s. These and other considerations have resulted in growing political pressure to phase out fixed-term or temporary employment contracts. From a policy standpoint, however, prohibiting temporary contracts during the recovery may produce the worst of all outcomes: a strong decline in employment during the recession without compensating employment growth during the upturn.

One politically feasible way to address the negative effects of dualism in the labor market, while maintaining incentives to hire, is to allow for graded employment security in new contracts—namely, to increase the use of open-ended (permanent) contracts but gradually and smoothly increase the dismissal costs to employers over the course of a worker's tenure. This would reduce the uncertainty for firms regarding potential dismissal costs, which is an issue in countries such as France, Germany, Italy, and Spain. This could also give employers flexibility to dismiss or lay off workers, while maintaining some measure of protection for employees and encouraging on-the-job training of new hires. The adoption of such measures in conjunction with higher contributions to the unemployment insurance program for employers who use temporary contracts could help bridge the two tiers in many labor markets without reducing job creation.

Encouraging greater use of open-ended contracts would also help reverse the decline in unemployment benefit coverage that has accompanied the spread of temporary contracts and in the process reduced the effectiveness of automatic stabilizers in cushioning the impact of downturns. Of course, the transition to the use of contracts

[30] Blanchard and Tirole (2008) argue that one way to reduce excessive layoffs and provide an adequate safety net is a combination of a layoff tax to force employers to internalize the cost of providing unemployment insurance to laid-off workers and individual unemployment accounts to encourage the unemployed to search harder for work (they would effectively be paying for their own insurance).

with graded employment security provisions would not be without challenges, and further study is needed.

## Conclusions and Implications for the Recovery

This chapter has looked at unemployment fluctuations during recessions and recoveries across a broad spectrum of advanced economies. The goal has been to provide a deeper understanding of the key factors that determine the unemployment rate in order to ultimately identify the sources of the increase in unemployment during the current recession, the prospects for recovery, and the role that policies have played—and can play—in tempering the employment cycle.

The key driver of the unemployment rate is the change in the level of economic activity. Indeed, this chapter has shown that the responsiveness of the unemployment rate to changes in output has increased over time for several advanced economies, due to less strict employment protection and greater use of temporary employment contracts. Although this increased responsiveness can exacerbate the response of unemployment during the recession phase of the business cycle, it can also amplify the bounce-back once a recovery gets under way.

Recessions associated with financial crises or housing busts lead to higher unemployment for a given decline in output. Disruptions in the supply of working capital to firms, which typically occur during periods of high financial stress, heighten job destruction, especially in economies where the corporate sector is highly leveraged. House price busts, on the other hand, generate significant shocks to particular sectors of the economy, namely construction and real estate. The evidence suggests that such shocks can also lead to higher unemployment for a given decline in output.

Overall, the analysis in this chapter presages sluggish employment growth during the recovery. Beyond the potentially slow recovery in output, the nature of the recent recession—financial crises combined with house price busts—in several advanced economies weighs against unemployment moderating anytime soon. Indeed, based on the current path of policies, the forecasts presented in this chapter suggest that although employment growth will turn positive in many advanced economies in 2010, the unemployment rate will remain high through 2011.

Therefore, one legacy of the Great Recession will likely be persistently high unemployment rates in several advanced economies. Because high unemployment can quickly become a structural problem, this could lead to serious political and social challenges. What can policymakers do? The standard macroeconomic policy levers—monetary policy and fiscal policy—remain the primary tools for boosting employment through their impact on economic activity. In countries where unemployment rates remain high and the economy is operating below potential, policy stimulus remains warranted. Measures to restore the health of balance sheets of financial institutions are also important to ensure that the flow of credit to firms resumes.

This chapter discusses some labor market policy measures that go beyond generally encouraging wage flexibility and improving labor market institutions. In recessions, short-time work programs, such as those implemented in Germany, can be beneficial in stabilizing employment and thus help employers avoid unnecessary firing, hiring, and retraining costs. These programs can also counter wage deflation pressures in a severe recession.

The challenge during the recovery period is to exit from such programs. Indeed, short-time work programs must have well-defined rules to prevent them from becoming permanent wage subsidies to declining industries and thereby impeding the movement of labor across sectors. Wage insurance programs can help encourage exit from such programs by providing workers with access to carefully designed benefits to smooth their transition from jobs in declining sectors to employment in those that are expanding.

For the immediate recovery, given the lingering high degree of macroeconomic uncertainty in some countries, there is a potential role for temporary hiring subsidies, which could help alter the "wait-and-see" behavior that is typical during such times. Such measures have been used before in advanced economies, and the evidence suggests that their success depends on how well they are targeted, designed, and enforced.

In countries with two-tier labor markets, political pressure is building to ban the use of temporary employment contracts. This could produce the worst of all outcomes: a strong decline in employment during the recession without compensating employment growth in the upturn. However, the use of temporary contracts has been associated with lower on-the-job training and limited unemployment benefit coverage. Open-ended contracts with graded employment security provisions may maintain incentives to hire while encouraging training and employment protection for workers, although transitioning to the use of such contracts would not be without challenges, and further study is needed.

In sum, the depth and duration of the Great Recession in several advanced economies has created a need for some structural adjustments to their labor markets. The task for policymakers is to ensure that this adjustment occurs as smoothly as possible and to minimize the long-term economic and social consequences of persistent high unemployment.

## Appendix 3.1. Data Sources and Construction

*The author of this appendix is Prakash Kannan.*

This appendix provides details on the sources of data used in this chapter and the construction of the stock market dispersion and uncertainty measures.

**Table 3.4. Data Sources**

| Descriptor | Source |
|---|---|
| Employment | OECD,[1] *Labour Force Statistics* |
| Labor Force | OECD, *Labour Force Statistics* |
| Unemployment Rate | OECD, *Labour Force Statistics;* Haver Analytics |
| Real GDP | GDS (raw data from Haver Analytics) |
| Employment Protection Legislation | OECD |
| Unemployment Benefits (average replacement ratio for first two years) | IMF Structural Reform Database |
| Share of Temporary Workers | Eurostat, OECD |
| Marginally Attached and Underemployed Workers[2] | BLS,[3] Haver Analytics, Eurostat, OECD |
| Long-Term Unemployment (six months or more) | Eurostat, Haver Analytics, OECD |
| Hours per Employee | Haver Analytics, National Sources |
| Average Forecast GDP One Year Ahead | *Consensus Forecasts* |
| Sectoral Stock Market Returns | Datastream |

[1]OECD = Organization for Economic Cooperation and Development.

[2]For European countries, "marginally attached" is defined as "would like to work but is not seeking employment." For the United States, marginally attached is defined as "not in labor force, want a job," and underemployment is defined as "part-time work for economic reasons."

[3]BLS = U.S. Bureau of Labor Statistics.

### Dating Business Cycle Peaks and Troughs

This chapter employs a "classical" approach to dating business cycles by focusing on turning points in the level of output rather than deviations from a trend. The procedure—based on Harding and Pagan (2002)—uses a set of statistical criteria to determine the window over which an observation is classified as a local peak or trough and to determine the minimum duration of a complete cycle and the minimum duration of a phase of a business cycle. In this chapter, the observation window is set at two quarters, the minimum duration at five quarters, and the minimum phase at two quarters. Although the criteria for the minimum duration of a cycle and a phase are occasionally binding, the procedure generally dates the start of a recession as the quarter during which output is higher than the two quarters preceding and following it. This implies that a period of two quarters of negative growth is a sufficient, but not necessary, condition for a recession. Likewise, the end of a recession is generally marked as the quarter during which output is lower than the two quarters before and after it. With these criteria in place, local peaks and troughs are identified, which define recessionary and expansionary phases of the business cycle.

### Measure of Stock Market Dispersion

The measure of dispersion in stock market returns follows Loungani, Rush, and Tave (1990). Stock market returns at the sectoral level for each country are obtained from Datastream. The data generally begin in the early to mid-1970s. For each country $i$, the time series of the stock market dispersion measure ($SD_t$) is computed as follows:

$$SD_{it} = \left[\sum_{N=1}^{N} \omega_{nt}(R_{nt} - \overline{R}_t)^2\right]^{1/2},$$

where $\omega_{nt}$ is the share of total market capitalization of sector $n$ in quarter $t$, $R_{nt}$ is the quarterly return on the sector $n$ index, and $\overline{R}_t$ is the total market quarterly return. To minimize large fluctuations in sectoral weights, the average share of market capitalization over the previous 10 years was used.

### Measure of Uncertainty

The measure of uncertainty is based on Kannan and Köhler-Geib (2009). For each country, the dispersion of GDP forecasts as reported in the monthly *Consensus Forecasts* is used. In each issue of *Consensus Forecasts,* GDP projections are made for the current year and the following year. In order to construct forecasts of one-year-ahead GDP, the forecasts are weighted such that the current-year forecast has a weight of 1 in January, 11/12 in February, and so on until December. Likewise the next-year forecast gets a weight of zero in January, 1/12 in February, and so on.

## Appendix 3.2. Methodological Details

*The author of this appendix is Prakash Kannan.*

This appendix goes through the details of the procedures used to estimate the Okun's law equation for each episode (Step 1) and the construction of the forecast errors (Step 2). The details related to the construction of the dynamic betas are also presented.

### Estimating Okun's Law (Step 1)

For each recession episode in a particular country, a dynamic version of Okun's law is estimated for the 20-year period leading up to the peak in output just before the start of the recession.

The general form of the equation that is estimated is as follows:

$$\Delta u_t = \alpha + \sum_{i=0}^{p1} \beta_i \Delta y_{t-i} + \sum_{i=1}^{q} \gamma_i \Delta u_{t-i} + \sum_{i=0}^{p2} \delta_i \times D^R \Delta y_{t-i} + \varepsilon_t,$$

where $\Delta u$ and $\Delta y$ refer, respectively, to the change in the unemployment rate and the level of output growth. $D^R$ is a dummy variable that takes on a value of 1 if the economy is in a state of recession. The use of the dummy variable allows the coefficients related to the responsiveness of changes in the unemployment rate to output growth to take on different magnitudes depending on the state of the business cycle.

To allow for different dynamics across countries, the lag lengths ($p1$, $p2$, and $q$ in the specification above) are chosen using a Bayesian information criterion for each country and each episode. For most countries and episodes, the criterion suggests the use of fewer than two lags. Table 3.5 lists the choice of lag lengths for the most recent set of episodes.

The procedure used to estimate the Okun's law equation for changes in employment is carried out in a similar manner, with the change in log employment as the dependent variable.

### Generating Forecast Errors (Step 2)

Based on the estimated Okun's law equation for each episode, forecast errors are constructed for both the recession and the recovery phases. The forecast errors are computed as the difference between the predicted changes in the unemployment rate (or the predicted changes in the logarithm of employment) based on the estimated Okun's law and the actual changes in the unemployment rate (or the changes in the logarithm of actual employment).

As an example for a particular episode, consider the recession in the United Kingdom in the early 1990s. The level of output peaked in the second quarter of 1990 and reached a trough in the third quarter of 1991. The window over which Okun's law is estimated for this episode ranged from the third quarter of 1970 to the second quarter of 1990. Based on the estimated coefficients, forecasts for the unemployment rate are generated for the recession period; that is, from the third quarter of 1990 to the third quarter of 1991. The forecast errors during the recession are then computed as the difference between the actual outturn of the unemployment rate and these forecast values. The forecast errors for the recovery period, which spanned the fourth quarter of 1991 to the third quarter of 1993, are computed based on the same Okun's law coefficients that were estimated up to the peak in output before the start of the recession.

There is some question regarding whether our estimation should be done in a single step using output and unemployment lags as well as the institutional variables and shock dummies. A two-step method is used because our underlying null hypothesis is that Okun's law is the correct specification. That is, in the null model changes in unemployment vary systematically only as a result of changes in output (or, in the dynamic case, lags of output and unemployment). We take the presence of significant forecast errors to indicate a discrepancy with the null model and as evidence that, conditional on output, institutional features and macroeconomic shocks could be significant in explaining unemployment dynamics.

In constructing forecast errors, we exclude estimated betas that are statistically indistinguishable from zero. We do this because in some cases the estimated betas are large in magnitude, are statistically indistinguishable from zero, and overstate the size of forecast errors. We nevertheless exclude such estimates conservatively by increasing the test's ability to minimize the likelihood of excluding estimates resulting from statistical noise (Type 2 errors), with the significance level held at 0.15. Note that under the assumption that the model is correctly specified, the second-step regression does not require a standard-error correction, since there are no generated covariates in the second step.

A complementary way of thinking about the multistep approach relaxes this assumption on the null model. Suppose first-step errors have two components: a systematic component that depends on institutional variables and/or shocks and a random component. This is a generalization of Okun's law that permits the unemployment gap to vary based on factors beyond the output gap. In this case, the key assumption underlying the two-step approach is that the systematic component of the errors is statistically independent of the change in output, lag on output, and unemployment. The natural interpretation of the second-step regression is the decomposition of forecast errors into a predictable element based on the systematic component and a residual based on the random component.

### Dynamic Betas

This section derives the equation for the dynamic beta multiplier, $DB$, which is used in the chapter. The dynamic multiplier captures the long-term impact of changes in output on changes in the unemployment rate.

We will derive the equation for the case in which there is one lag on output and one lag on unemployment. For this particular case, the Okun's law equation is as follows:

$$\Delta u_t = \alpha + \beta_0 \Delta y_t + \beta_1 \Delta y_{t-1} + \gamma_1 \Delta u_{t-1} + \varepsilon_t.$$

The dynamic beta (*DB*) measures the long-term impact of a one-unit change in $\Delta y$ on $\Delta u$, or $\sum_{s=0}^{\infty} \Delta u_{t+s}$.[31] Using the specification above, we can write the dynamic beta for this particular case as follows:

$$DB = \sum_{s=0}^{\infty} \Delta u_{t+s}$$

$$= \sum_{s=0}^{\infty} [\beta_0 \Delta y_{t+s} + \beta_1 \Delta y_{t+s-1} + \gamma_1 \Delta u_{t+s-1}].$$

[31] We assume that the absolute value of $\gamma$ is less than 1 to avoid an explosive process for $\Delta u$.

When there is a one-unit change to growth, $\Delta y = 1$, during period $t$ and zero everywhere else, we can rewrite the equation above as

$$DB = \beta_0 + \beta_1 + \gamma_1 \sum_{s=0}^{\infty} \Delta u_{t+s-1}.$$

We can write the summation in the last term as

$$\sum_{s=0}^{\infty} \Delta u_{t+s-1} = \Delta u_{t-1} + \sum_{s=0}^{\infty} \Delta u_{t+s}.$$

We assume that the "initial condition"; that is, $\Delta u_{t-1}$, is equal to zero. In this case, we have

$$DB = \beta_0 + \beta_1 + \gamma_1 DB,$$

which leads to the equation for the dynamic beta:

$$DB = \frac{\beta_0 + \beta_1}{1 - \gamma_1}.$$

**Table 3.5. Okun's Law Lag Lengths (Great Recession)**

| | Unemployment | | | Log Employment | | |
|---|---|---|---|---|---|---|
| | Output | Unemployment | Recession Dummy | Log Output | Log Employment | Recession Dummy |
| Austria | 1 | 1 | no | 0 | 0 | no |
| Belgium | 1 | 2 | no | 1 | 2 | no |
| Canada | 1 | 0 | yes | 0 | 1 | no |
| Denmark | 0 | 1 | no | 0 | 0 | no |
| Finland | 1 | 2 | no | 2 | 2 | no |
| France | 0 | 1 | no | 1 | 0 | no |
| Germany | 1 | 1 | no | 2 | 1 | no |
| Greece | 0 | 1 | no | 0 | 1 | yes |
| Ireland | 1 | 1 | no | 0 | 1 | no |
| Italy | 1 | 2 | no | 0 | 1 | no |
| Japan | 1 | 2 | yes | 1 | 1 | no |
| Netherlands | 2 | 2 | no | 2 | 2 | no |
| New Zealand | 1 | 2 | no | 0 | 1 | no |
| Norway | 0 | 0 | no | 1 | 2 | yes |
| Portugal | 4 | 5 | no | 0 | 0 | no |
| Spain | 2 | 1 | no | 1 | 1 | no |
| Sweden | 2 | 1 | no | 1 | 2 | no |
| Switzerland | 0 | 1 | yes | . . . | . . . | . . . |
| United Kingdom | 2 | 2 | no | 1 | 2 | no |
| United States | 1 | 1 | no | 1 | 0 | no |

Source: IMF staff estimates.

The derivation for the more general case follows the steps above in an analogous manner. The resulting specification is as follows:

$$DB = \frac{\sum_{i=0}^{p1} \beta_i + \sum_{j=0}^{p2} \delta_j}{1 - \sum_{k=1}^{q} \gamma_k}.$$

## Appendix 3.3. Analysis on Dynamic Betas Derived from the Employment Version of Okun's Law

*The author of this appendix is Prakash Kannan.*

This appendix presents the regression results from use of the dynamic betas derived from the employment version of the Okun's law equation (Table 3.6).

**Table 3.6. Factors Influencing the Responsiveness of Changes in Employment to Changes in Output[1]**

| | (1) | (2) | (3) | (4) | (5) |
|---|---|---|---|---|---|
| | Okun's Law with Optimal Lag Length | | | | |
| Employment Protection Legislation[2] | –0.031<br>[0.044] | | | –0.058<br>[0.043] | –0.109<br>[0.062]* |
| Unemployment Benefits | | 0.332<br>[0.186]* | | 0.475<br>[0.165]*** | 0.467<br>[0.162]*** |
| Share of Temporary Workers | | | 0.020<br>[0.009]** | | 0.021<br>[0.011]* |
| Constant | 0.491<br>[0.114]*** | 0.607<br>[0.116]*** | 0.215<br>[0.111]* | 0.817<br>[0.156]*** | 0.692<br>[0.182]*** |
| Observations | 62 | 77 | 53 | 62 | 53 |
| $R^2$ | 0.01 | 0.04 | 0.08 | 0.13 | 0.24 |

Source: IMF staff estimates.

Note: Standard errors in brackets. *, **, *** denote significance at the 10 percent, 5 percent, and 1 percent level, respectively.

[1]The dependent variable is the dynamic beta assoicated with the employment version of Okun's law.

[2]For specification 5, only the subindices associated with regular contracts are used.

The explanatory variables are the same as those used in Table 3.1 and thus have the same definitions.

## Appendix 3.4. Regression Results Using Employment Forecast Errors and a Static Okun's Law Specification

*The author of this appendix is Prakash Kannan.*

The first part of this appendix presents regression results using employment forecast errors during recessions and during recoveries as the dependent variables. The definitions and sources of the explanatory variables are the same as in the baseline unemployment forecast errors. The regression results using forecast errors derived from a static Okun's law specification are also briefly discussed below.

Recessions associated with financial crises or house price busts (which take into account the share of the construction sector in total employment) are associated with employment forecast errors that are lower by about 1½–2 percent (Table 3.7). Sectoral shocks continue to matter: a 1 standard deviation increase in the measure of stock market dispersion is associated with lower employment forecast errors during recessions of about 2/3 percentage point. The effect of financial stress interacted with corporate leverage is positive and significant.

During recoveries, financial crises and financial stress still have a significant impact on the employment forecast errors. Unlike the results for the unemployment forecast errors, however, house price busts are significant and have a negative impact (Table 3.8, specification 4). This relation-

**Table 3.7. Employment Forecast Errors during Recessions**

| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) |
|---|---|---|---|---|---|---|---|---|
| Financial Crisis | –1.941<br>[0.395]*** | | | | | | | |
| Financial Stress Index (FSI—four-quarter moving average) | | –0.59<br>[0.194]*** | 0.591<br>[0.516] | | | | –0.628<br>[0.215]*** | –0.478<br>[0.225]** |
| FSI × Corporate Leverage (at peak) | | | –0.041<br>[0.023]* | | | | | |
| House Price Bust[1] | | | | –0.174<br>[0.046]*** | | | –0.18<br>[0.045]*** | –0.161<br>[0.046]*** |
| Stock Market Dispersion (four-quarter moving average) | | | | | –1.979<br>[0.570]*** | | | –1.962<br>[0.791]** |
| Dispersion of GDP Forecasts from *Consensus Forecasts* | | | | | | –0.052<br>[0.205] | | |
| Constant | –0.335<br>[0.220] | –0.393<br>[0.228]* | –0.134<br>[0.238] | –0.18<br>[0.287] | –0.585<br>[0.212]*** | –0.178<br>[0.223] | 0.264<br>[0.279] | 0.454<br>[0.291] |
| Observations | 322 | 238 | 137 | 288 | 308 | 125 | 218 | 215 |
| $R^2$ | 0.07 | 0.04 | 0.03 | 0.05 | 0.04 | 0.00 | 0.12 | 0.15 |

Source: IMF staff estimates.

Note: Standard errors in brackets. *, **, *** denote significance at the 10 percent, 5 percent, and 1 percent level, respectively.

[1]Impact of house price bust takes into account the share of the construction sector in total employment.

## Table 3.8. Employment Forecast Errors during Recoveries

| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) |
|---|---|---|---|---|---|---|---|---|
| Recovery from a Financial Crisis | –0.843 [0.216]*** | | | | | | | |
| Financial Stress Index (FSI—four-quarter moving average) | | –0.344 [0.136]** | 0.68 [0.504] | | | | –0.288 [0.147]* | –0.398 [0.165]** |
| FSI × Corporate Leverage (at recession trough) | | | –0.036 [0.018]** | | | | | |
| Recovery from House Price Bust[1] | | | | –0.048 [0.023]** | | | –0.053 [0.025]** | –0.05 [0.025]** |
| Stock Market Dispersion (four-quarter moving average) | | | | | –0.008 [0.213] | | | 0.594 [0.427] |
| Dispersion of GDP Forecasts (four-quarter moving average) | | | | | | –0.495 [0.104]*** | | |
| Constant | 0.041 [0.098] | –0.139 [0.099] | –0.047 [0.119] | 0.045 [0.125] | –0.139 [0.106] | –0.167 [0.121] | 0.053 [0.141] | –0.104 [0.170] |
| Observations | 467 | 349 | 234 | 410 | 419 | 141 | 329 | 321 |
| $R^2$ | 0.03 | 0.02 | 0.03 | 0.01 | 0.00 | 0.14 | 0.03 | 0.04 |

Source: IMF staff estimates.

Note: Standard errors in brackets. *, **, *** denote significance at the 10 percent, 5 percent, and 1 percent level, respectively.

[1]Impact of house price bust takes into account the share of the construction sector in total employment.

ship remains significant even after controlling for the level of financial stress. Heightened uncertainty also has a significant impact: a 1 standard deviation increase in the dispersion of GDP forecasts from *Consensus Forecasts* reduces employment growth by about 0.5 percent (Table 3.8, specification 6).

Table 3.9 presents the results from regressions of employment and unemployment forecast errors both during recessions and during recoveries, based on the static Okun's law specification shown above. In general, the results show that allowing for lags in the Okun's law specification

## Table 3.9. Regressions Using Forecast Errors Based on the Static Version of Okun's Law

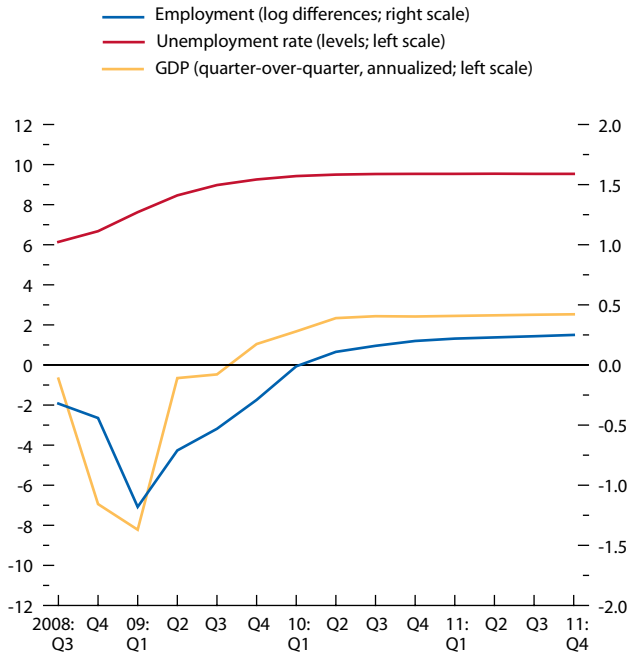
| | (1) | (2) | (3) | (4) |
|---|---|---|---|---|
| | Recessions | | Recoveries | |
| | Employment | Unemployment | Employment | Unemployment |
| Financial Stress Index (FSI—four-quarter moving average) | 0.18 [0.601] | 0.511 [0.132]*** | 0.003 [0.762] | 0.536 [0.096]*** |
| House Price Bust[1] | –0.077 [0.126] | 0.175 [0.028]*** | 0.215 [0.117]* | –0.008 [0.015] |
| Stock Market Dispersion (four-quarter moving average) | –4.159 [2.122]* | 0.807 [0.488]* | –2.859 [1.974] | –0.392 [0.258] |
| Constant | –1.185 [0.783] | –0.312 [0.170]* | –1.89 [0.784]** | 0.132 [0.099] |
| Observations | 209 | 232 | 321 | 356 |
| $R^2$ | 0.02 | 0.27 | 0.02 | 0.09 |

Source: IMF staff estimates.

Note: Standard errors in brackets. *, **, *** denote significance at the 10 percent, 5 percent, and 1 percent level, respectively.

[1]Impact of house price bust takes into account the share of the construction sector in total employment. For recovery forecast errors, house price bust refers to the preceding recession.

**Figure 3.13. Forecasts of Employment, Unemployment Rate, and GDP for Advanced Economies, Based on Vector Autoregression[1]**




Sources: Haver Analytics; Organization for Economic Cooperation and Development; and IMF staff calculations.

[1]Advanced economies comprise Austria, Belgium, Canada, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Japan, Netherlands, Norway, New Zealand, Portugal, Spain, Sweden, United Kingdom, and United States. Excluded are Australia because it did not experience a recession in 2008–09 and Switzerland for lack of data.

makes a difference. The unemployment forecast errors during recessions can be explained by fluctuations in financial stress and house price collapses, but most of the other variables in the other specifications do not explain the forecast errors as they do in the regressions based on the dynamic Okun's law. Furthermore, the coefficient on the house price bust variable in the regression of employment forecast errors during recoveries is of the opposite sign than expected and from what we obtained using the dynamic Okun's law specification.

## Appendix 3.5. Vector Autoregression Forecasting Methodology

*The author of this appendix is Ravi Balakrishnan.*

As an alternative to the baseline forecasting approach, a four-variable vector autoregression (VAR) is used, consisting of the changes in log output, changes in log employment, the unemployment rate, and the level of financial stress (Figure 3.13). The specification allows for two lags of each variable and includes two exogenous variables: dummies for financial crises and house price busts.

Each equation of the VAR allows for country-specific constants and slope coefficients and is estimated over the period 1981:Q2–2009:Q2, with Financial Stress Index data availability determining the start and end points. The coefficients on the financial crises and house price bust variables are constrained to be the same across all countries. In order to generate the forecasts, it is assumed that there are no further financial crises or house price busts until the fourth quarter of 2011, which is the end of the forecast horizon. A dynamic forecasting procedure is used, starting in the third quarter of 2009, to produce projections of output, employment, the unemployment rate, and the level of financial stress. As the figure shows, the results are similar to the baseline forecast.

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