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Labor Markets in the Global Financial Crisis: The Good, the Bad and the Ugly

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Abstract: This note examines labor market performance across countries through the lens of Okun's Law. We find that after the 1970s but prior to the global financial crisis of the 2000s, the Okun's Law relationship between output and unemployment became more homogenous across countries. These changes presumably reflected institutional and technological changes. But, at least in the short term, the global financial crisis undid much of this convergence, in part because the affected countries adopted different labor market policies in response to the global demand shock.

Keywords: Okun's Law, Labor Markets, Labor Hoarding.
JEL Codes: E24, E27

I. Introduction

The impact of the global financial crisis on labor markets varied widely from country to country. For example, in the United States, the unemployment rate at its highest level was about five percentage points above its pre-recession level. The rate rose much less in the United Kingdom and barely changed in Germany—despite larger declines in gross domestic product.

In this note, we summarize a few key cross-country differences using the perspective of Okun's Law. Okun's Law, the reduced form empirical relationship between changes in the unemployment rate and changes in output growth, provides a natural measure of how labor markets in different countries responded to the large, arguably common, global financial shock. It also provides an organizing framework for discussing these differences.

We find that, after the 1970s but prior to the Great Recession, the relationship between output and the unemployment rate became more homogenous across countries. These changes presumably reflected institutional and technological changes. But, at least in

[1] This note was prepared for a special issue of the National Institute Economic Review, and is a slightly expanded version of an FRBSF Economic Letter (Daly et al, 2013b). We thank Bart Hobijn, Dawn Holland, Simon Kirby, Ron Smith, Garry Young, and conference participants at the Bank of England for helpful comments.

the short term, the global financial crisis undid much of this convergence, in part because the affected countries adopted different labor market policies in response to the global demand shock.

We then decompose the Okun relationship using a simple output identity, that output growth is the sum of growth in workers, hours per worker, and productivity. This identity suggests some potential reasons for the changes during and since the financial crisis. For almost all countries, increases in the unemployment rate were associated with larger declines—in some cases, substantially larger—in hours per worker in the crisis period than the pre-crisis period. The experiences in the U.S., U.K. and Germany offer three contrasting lessons about this process of adjustment.

II. Interpreting Okun's Law

Arthur Okun (1962) observed half a century ago that changes in the unemployment rate have a consistent and predictable relationship with changes in real gross domestic product (GDP). Since then, what is now called "Okun's Law" has become a standard rule of thumb used by monetary policymakers and economic forecasters.[2]

Okun's Law is estimated in different ways in the literature. Okun estimated the relationship in growth rates, but it is often estimated in levels (relating output and unemployment "gaps"). And, since it's a reduced-form relationship, either the unemployment rate or output can be put on the left-hand side. In what follows, we focus on the following relationship between output growth and the change in the unemployment rate:

$$\Delta y_t = \alpha + \beta \Delta U_t + \varepsilon_t \qquad (1)$$

Lower case variables are logs of upper case (level) variables and Δ is the four-quarter change. So Δy_t is the 4-quarter log-change in real output, and ΔU_t is the 4-quarter change in the rate of unemployment.

[2] See, for example, Bernanke (2012) and Congressional Budget Office (2014). Knotek (2007) and Ball, Loungani, and Leigh (2013) provide references to the substantial literature.

Daly et al (2013a) discuss the merits of estimating the relationship in the form of (1), from the perspective of growth accounting. Loosely speaking, a 1 percentage point change in the unemployment rate leads to a direct 1 percent reduction in the number of workers. From the production function, a 1 percent reduction in labor input should lead to about a 2/3 percent reduction in output, where 2/3 is labor's (approximate) share. A coefficient of β that is substantially greater than 2/3 in absolute value reflects other margins that adjust at the same time, and hence, are correlated with changes in the unemployment rate. In terms of the number of workers, these margins include labor-force participation, immigration, and multiple job holders. As we discuss further below, other margins include variations in hours per worker or imply cyclical movements in productivity.[3]

We will refer to β as Okun's "coefficient." In the data, this coefficient is always negative, indicating that increases in the unemployment rate are associated with slower-than-usual growth in output. The discussion in the previous paragraph makes clear that this negative relationship is hardly surprising. We expect a higher unemployment rate to be associated with lower hours worked which, other things equal, means less output.

Research has found that estimates of the Okun's Law relationship vary markedly across countries (e.g., IMF 2010 and Gordon 2011). We discuss cross-country estimates in Sections III and IV. The association between changes in the unemployment rate, hours worked, and productivity should depend on institutional, industrial, and other relations that affect how businesses and households adjust to shocks. IMF (2010) provides a detailed discussion of policies that affect these relations and, thereby, Okun's Law. Thus, the Okun coefficient provides a convenient, quantitative summary of how these institutional and other differences affect cyclical adjustment. Moreover, given the major shock of the global financial crisis, it provides a lens on the different sources of adjustment used in different countries.

We make use the following identity to look at Okun's Law in more detail:

$$\Delta y_t \equiv \Delta n_t + (\Delta l_t - \Delta n_t) + (\Delta y_t - \Delta l_t) \qquad (2)$$

[3] Basu and Fernald (2001) and Gali and van Rens (2014) discuss the literature on cyclical productivity.

Δn_t is the 4-quarter (log) change in total employment, (Δh_t -Δn_t) is the 4-quarter (log) change in hours per worker, and (Δy_t -Δh_t) is the 4-quarter (log) change in labor productivity.

This identity focuses on three levers businesses might use to adjust output in response to a decline in demand: The number of workers they employ, the number of hours each employee works, and (possibly as a residual) their rate of productivity. When demand changes, the use of these levers is likely to depend on a range of factors. These include labor laws and contracts that affect an employer's ability to lay off workers or change hours, as well as the bargaining environment. They are also likely to depend on the persistence of shocks to demand. For example, businesses are more likely to adjust the number of employees if the drop in demand is viewed as permanent. In contrast, for temporary shocks, they might "hoard labor" to have it ready for the eventual recovery. Productivity changes in response to a change in demand can be a residual, to the extent firms cannot or choose not to adjust total hours commensurate with changes in demand—perhaps reflecting labor hoarding. Productivity changes may also be intentional if, for example, competitive pressures create incentives to raise productivity and lower production costs.

Some responses to a downturn in demand might be captured only indirectly. For example, depending on the institutional environment, firms may be able to cut wages, reduce costs on other production factors, and/or squeeze their profit margins. These choices are likely to influence the adjustments made in the output identity (2). And general equilibrium effects might matter. For example, the monetary or fiscal policy reaction function may affect the persistence of a downturn in demand, thereby affecting the choice of margins by a firm. In the context of all of the factors, equation (2) nevertheless summarizes how businesses adapt to changes in demand.

These changes, in turn, have implications for Okun's Law. Specifically, we can project each of the terms in (2) on changes in unemployment:

$$\begin{aligned} \Delta n_t &= \alpha^{emp} + \beta^{emp}\Delta U_t + \varepsilon_t^{emp} \\ (\Delta l_t - \Delta n_t) &= \alpha^{hours} + \beta^{hours}\Delta U_t + \varepsilon_t^{hours} \\ (\Delta y_t - \Delta l_t) &= \alpha^{LP} + \beta^{LP}\Delta U_t + \varepsilon_t^{LP} \end{aligned} \qquad (3)$$

By construction, the Okun coefficient $\hat{\beta}$ is the sum of the three coefficients from (3):

$$\hat{\beta} = \hat{\beta}^{emp} + \hat{\beta}^{hours} + \hat{\beta}^{LP}$$

Thus, the estimates in (3) give us a lens to discuss why Okun's coefficient might be changing across countries.

III. Pre-crisis, advanced economies gradually looking more alike

Since the 1970s, several broad developments have affected labor markets and may have changed the cyclical relationship between the unemployment rate and changes in output. In many countries, labor markets have become more flexible and the power of unions has waned. Those might reduce the importance of labor hoarding (e.g., Gali and van Rens, 2014). From the mid-1980s to the mid-2000s, economies across the world experienced a simultaneous decline in the volatility of output and a reduction in inflation, a period known as the Great Moderation. Whether the decline in volatility reflected good policy or good luck (low variance of shocks), it would presumably affect incentives to hoard labor. The cyclical link between changes in the unemployment rate and changes in *em*ployment depend, in part, on the cyclical response of labor-force participation. Female labor force participation in advanced economies had surged since the 1960s, but began to stabilize in the mid-1990s and then declined; that might have influenced the responsiveness of the participation margin over the business cycle. Meanwhile, in the past ten years, aging populations in advanced economies have driven broader declines in overall participation rates.[4] For these and possibly other reasons, Okun's Law is likely to evolve over time.

Figure 1 shows how the distribution of Okun coefficients has evolved across 15 OECD economies over time, based on equation (1). Country by country, it estimates equation (1) as a simple OLS regression of the 4-quarter (log) change in real GDP on the 4-quarter change in unemployment, using rolling windows of 40 quarters. (See the appendix for details on the data.) The figure shows the end dates of the rolling windows, which range from 1979:Q4 through 2013:Q1.

[4] Movements in the labor-force participation may have a cyclical dimension that influences the relationship between changes in unemployment and changes in the number of people working. For example, in the Great Recession, some older people who lose jobs may decide to retire—and cease to be counted as unemployed.

Each estimated β shows how much output tends to change, relative to trend, for each one-percentage-point increase in the unemployment rate. The figure displays the average value of this relation across the 15 countries. The figure also depicts the dispersion of the Okun relation across countries by plotting the relation for the bottom and top quarter of countries in the sample, denoted 25th and 75th percentile respectively.

Early in the sample, before the Great Moderation, the Okun relation in the typical country was large. A one percentage point increase in the unemployment rate was typically associated with nearly a three percentage point decline in output growth. This suggests that countries were substantially relying on margins other than unemployment to adjust production to shocks. But around that average value, countries differed greatly as shown by the inter-quartile range.

Starting with samples ending in the mid-1980s, the average Okun coefficient fell sharply. During the 1990s and early 2000s, the coefficient gradually declined further to nearly one-to-one at its lowest point. And differences across countries narrowed considerably. A simple standard deviation across estimated Okun's coefficients confirms these patterns, with a substantial decline in its value between 1980 and 2005.

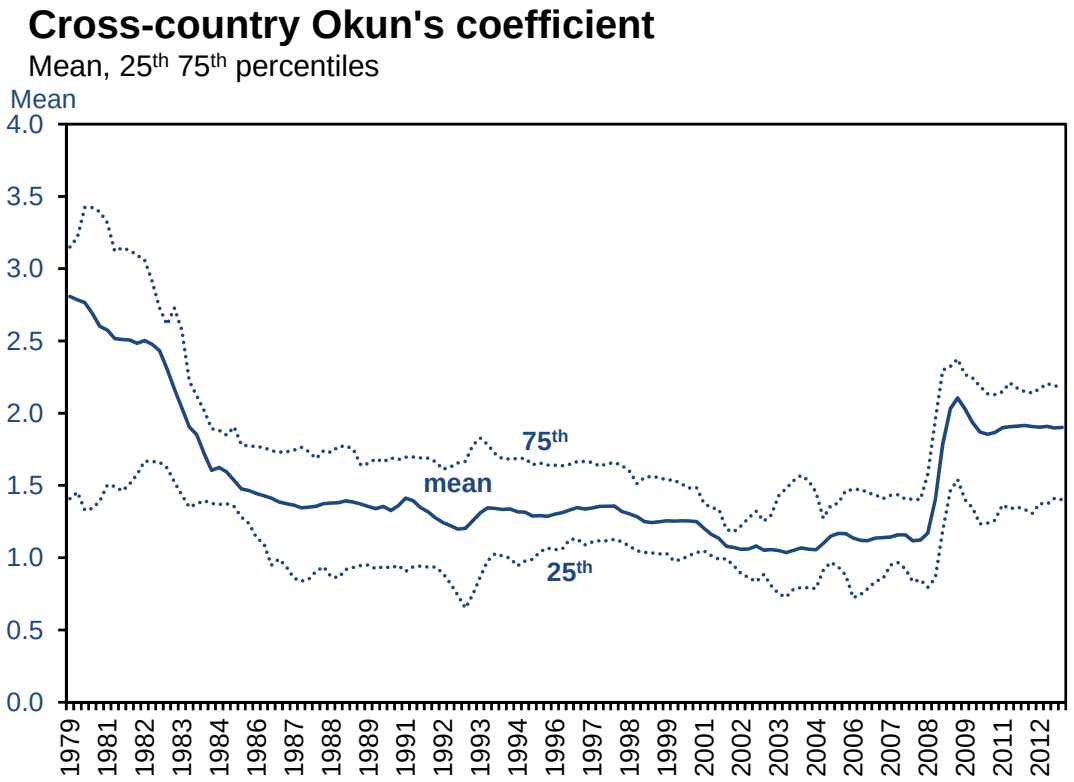
Several factors may contribute to explaining the decline in the Okun relation before 2007, including globalization, greater labor mobility, and overall liberalization of employee-employer relations. In addition, over the past decade, employment protection has declined, a feature visible in regulatory changes concerning individual and collective job dismissals (see, e.g. OECD 2013). These factors have generally increased labor- and product-market flexibility. As a result, when output changed, more of the adjustment took place through employment, which in turn showed up in the unemployment rate.

Then came the global financial crisis. Data since 2007 indicate that the Okun relation rose to levels last seen in the 1980s. Countries adopted different policies during and after the crisis, reflecting institutional or philosophical differences; in the next section, we discuss a few of these policies. Of course, the figure to some extent could also reflect institutional differences across countries that were relatively unimportant for Okun's Law in the decade or

so prior to the crisis, but then those differences became important in response the financial shock. As a reduced-form relationship, Okun's Law could depend on the source of the shocks hitting the economy.[5] In any event, as output fell, some of these policies prevented unemployment from rising as sharply as it typically did before the crisis. In addition to the rise in the Okun coefficient, the different approaches countries took increased the dispersion in the Okun relation as shown by the widening in the interquartile range. The next section discusses some of those differences.

[5] Daly et al (2013a) discuss conditional estimates of Okun's Law for the United States.

Figure 1 –
Narrowing and then widening of the output and unemployment relation



Source: OECD and author's calculations

Note: Figure summarizes the distribution of Okun coefficients estimated country-by-country with 40-quarter rolling regressions that end at the date shown. For each of 15 OECD countries, the coefficient is from regressing four-quarter changes in the log of output on four-quarter changes in the unemployment rate. The figure shows the unweighted mean coefficient, and 25th and 75th percentiles.

Some previous literature has also explored whether Okun's Law has changed over time. For example, IMF (2010) uses rolling regressions and reports changes in several countries. However, they do not explicitly compare the coefficients across countries as in Figure 1, and, below, we implement a different decomposition to understand these changes. In contrast, Ball, Loungani, and Leigh (2013) argue that Okun's Law is remarkably stable within countries over time. However, they begin their analysis a decade after we do (with data that start in 1980, and simply compare 1980-1995 with 1995-2011. In Figure 1, this

corresponds to windows from 1990-2011. Up until the last few years of the sample, it's not clear that one should find large changes across subsamples.

IV. The Great Recession: The Great Divergence?

The global financial crisis both raised the average 15-country Okun coefficient and increased its cross-country variability. Did these changes reflect a reversal of the factors behind the pre-2007 declines? To better understand what happened following the global financial crisis, we break down the estimate of the Okun coefficient into three parts using equation (3). Those regressions decompose the coefficient into the parts relating changes in output to movements in total employment, in hours per worker, and in labor productivity: Decomposing the Okun coefficient into these three factors helps clarify the differences across countries. Although we show more countries, for concreteness we focus the discussion on the United States, Great Britain, and Germany.

To begin, Figure 2 shows individual Okun coefficients for the 15 countries in our sample. The red bars show the pre-crisis period from 1996:Q1 through 2006:Q4. Consistent with Figure 1, those bars hover around -1 with a range from about -1½ to -½. The blue dots show the coefficients estimated over the period of the global financial crisis, from 2007:Q1 through 2013:Q1. In all but two cases (the United States and New Zealand), the coefficient is more negative in the crisis period. In several cases, including the U.K. and Germany, the coefficient is much more negative in the crisis period.

Figures 3-5 decomposes the bars in Figure 2 into the responses of each of the three factors from equation (3), namely $\hat{\beta}^{emp}, \hat{\beta}^{hours}, and\ \hat{\beta}^{LP}$. Not surprisingly, perhaps, Figure 3 shows that the magnitude of the Okun coefficient—indeed, its systematic negative sign—is mostly a result of the total employment component. In both the pre-crisis and later periods, a one-percentage-point increase in the unemployment rate is typically associated with a decline of about one percentage point or more in a country's employment rate. Such a relationship is intuitively obvious, but variations in such factors as labor force participation and immigration

mean that the association need not be one-to-one in practice. Daly et al (2013a) discuss the quantitative importance of some of these margins in the U.S. case.

Figures 4 and 5 shows that hours per worker and productivity contribute to the Okun relation, but prior to the Great Recession were less quantitatively important. Indeed, even the sign varied across countries. In the United States, hours per worker are procyclical—they tend to fall in a downturn, when unemployment rises. In others, including France, Germany, and Italy, hours per worker prior to the Great Recession tended to rise in a downturn, suggesting that the employed workforce was used more intensively. In terms of productivity, some recent literature has discussed the apparent change in the cyclicality of U.S. productivity, from procyclical (a negative $\hat{\beta}^{LP}$) to countercyclical (a positive coefficient).[6] Figure 4 shows that the U.S. was not alone in having countercyclical productivity since the mid-1990s. In contrast, in France, Germany, Italy, and several other countries, productivity tended to fall substantially when the unemployment rate rises.

During and since the Great Recession, countries have adjusted all three factors, but have placed different emphasis on them. The U.S. adjustment was largely in line with its pre-recession experience. Increases in unemployment were associated with reductions in employment, falling hours per worker, and slightly higher productivity. The coefficients change little relative to the pre-recession period.

Across countries, Figure 4 shows that a major difference in the post-2006 period is the use of the hours-per-worker margin. When unemployment rose, all countries reduced hours per worker, in some cases substantially. The productivity and employment responses varied less systematically across countries before and after the crisis.

Looking specifically at the United Kingdom, the declines in employment, hours, and productivity were all larger than in the pre-recession period. Compared with the US, the main difference was that the U.K. adjusted productivity far more, with a larger increase (in absolute value) of $\hat{\beta}^{LP}$. In Germany, the pre-and-post-crisis responses were particularly large. Both hours per worker and productivity fell much more following the crisis, explaining why

[6] See Gali and van Rens (2014) for references. Daly et al (2013a) discuss the changing $\hat{\beta}^{LP}$ coefficient in the U.S. context.

Germany saw big output changes during the crisis and recovery period with relatively little change in the unemployment rate. This partly reflects Germany's widespread adoption of procedures that permitted employers to adjust worker hours easily (Burda and Hunt 2011).

Germany, the United Kingdom, and the United States are good examples of three ways businesses in advanced economies responded to the global financial crisis. In Germany, the pattern reflects explicit policy decisions. In other countries, the reasons for the differences are less clear. For example, it may reflect different social models in the U.K. and the U.S. about retaining jobs versus retaining wages.[7] And of course, productivity growth in the U.K. has been puzzlingly weak since the crisis began (see, e.g., the discussion in Bean, 2014). In all cases, the differences among countries in the methods businesses used to adjust output are directly reflected in the path of each country's unemployment rate.

V. Conclusion

The global financial crisis reversed the steady cross-country convergence of the Okun relation observed since the 1970s. This is not explained by a reversal of secular trends in labor markets. Rather, it reflects how countries responded to the crisis. Differences in the institutional framework in possible combination with government policy responses to the crisis led some countries to emphasize shrinking the workforce, others to reducing hours per worker, and still others to letting labor productivity adjust. These differences in emphasis probably contributed to divergent paths of recovery from the crisis; future work can help deepen our understanding of the key differences.

Given the financial roots of the crisis, one policy response has been to reevaluate financial market regulation. The results in this note point to a similar issue—that events of recent years should lead to a consideration of how labor-market institutions can be improved.

[7] For example, Elsby et al (2014) find much more procyclicality of real wages in the U.K. than the U.S. during the Great Recession.

Data Appendix

The data for Figure 1 consists of a balanced panel of 15 countries: Australia, Austria, Belgium, Canada, Denmark, Finland, France, Italy, Germany, Netherlands, New Zealand, Norway, Sweden, United Kingdom, and the United States. All data are quarterly. Figure 1 uses data running from the first quarter of 1970 to the first quarter of 2013.

Real GDP, the unemployment rate, hours per worker, and total number of workers are obtained from the OECD. To construct productivity as GDP per hour, we construct total hours as the product of hours per worker and the total number of employees.

For all series except unemployment, all growth rates are 100 times the 4-quarter change in logs. The unemployment rate enters all regression as a simple 4-quarter change.

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Figure 2:
Response of output to changes in unemployment

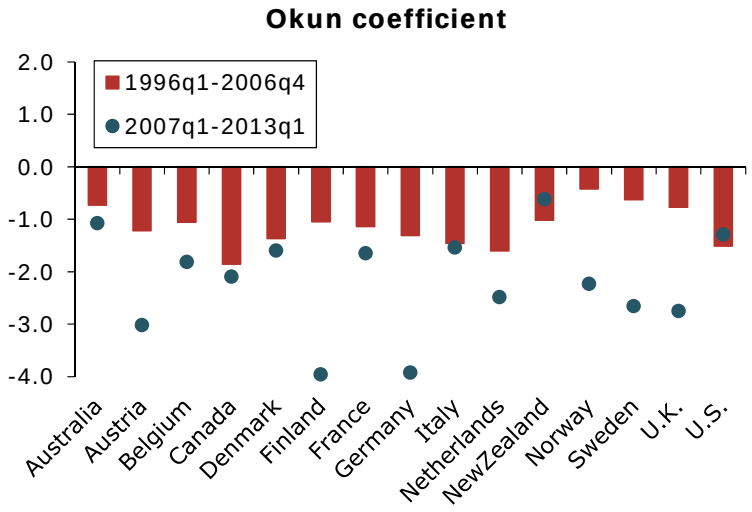


Figure 3:
Response of employment to changes in unemployment

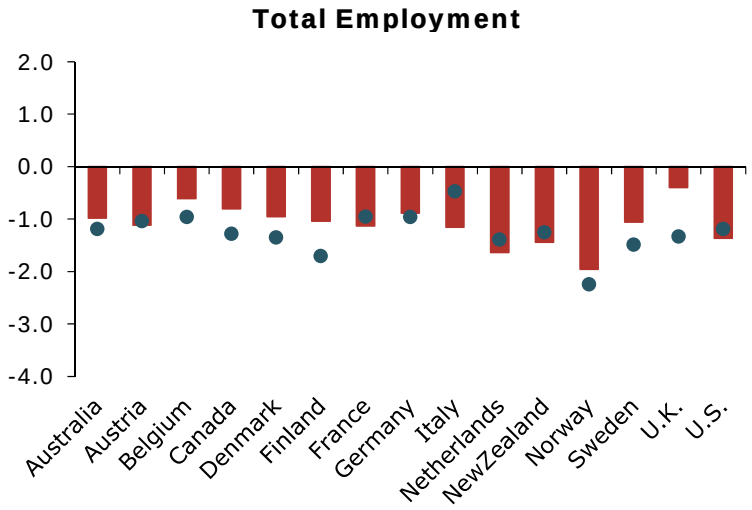


Figure 4:
Response of hours per worker to changes in unemployment

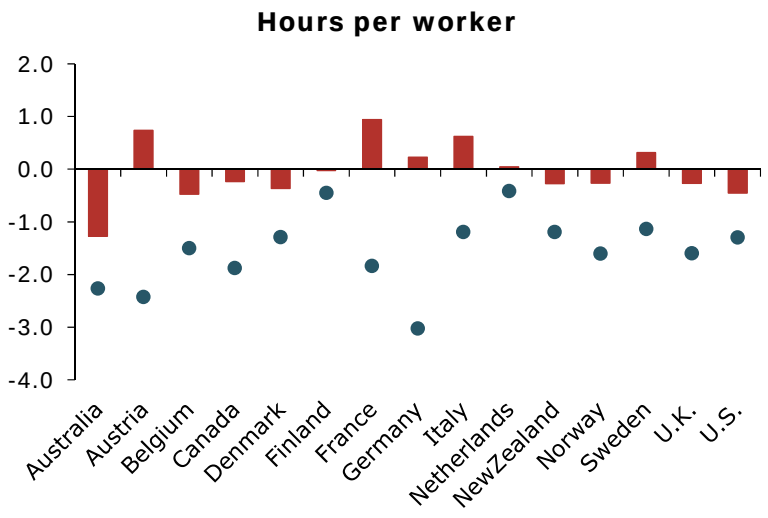
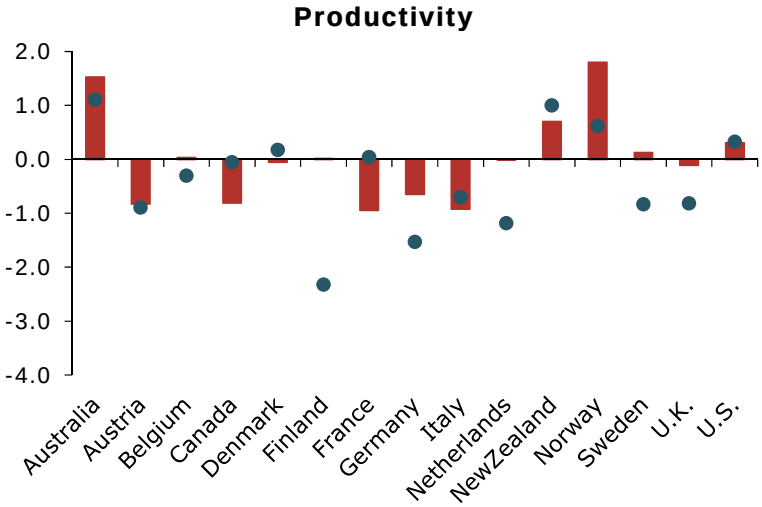


Figure 5:
Response of labor productivity to changes in unemployment



Notes to Figures 2 to 5: For each country, the bars and dots show the coefficient from regressing the four-quarter log-change in the variable shown on the four-quarter percentage-point change in the unemployment rate. The red bars show the coefficient for the 1996:Q1-2006:Q4 period. The blue dots show the coefficient for the 2007:Q1-2013:Q1 period. All regressions include a constant term.