IZA Journal of Labor Policy
a SpringerOpen Journal

ORIGINAL ARTICLE Open Access

Why did unemployment respond so differently to the global financial crisis across countries? Insights from Okun's Law

Sandrine Cazes[1*], Sher Verick[1] and Fares Al Hussami[2]

* Correspondence: cazes@ilo.org
[1]International Labour Office (ILO) and IZA, Geneva Switzerland
Full list of author information is available at the end of the article

Abstract

The global financial crisis deeply impacted labour markets around the globe. In the case of the United States, some commentators have argued that the subsequent rise in unemployment exceeded previous estimates of the elasticity of the unemployment rate with respect to output growth, a statistical relationship known as Okun's law. In contrast, others find a stable, long-term estimate of Okun's coefficient implying that the deviation in unemployment during the crisis resulted from a larger output gap (not a structural shift in the trend). Ultimately, estimates of this relationship will depend on the methodology and data period utilized. Focusing more on short-term fluctuations, changes in unemployment are decomposed to identify the association with other channels of labour market adjustment (hours, productivity and labour force). Results presented in this paper confirm the cross-country variation in the responsiveness of unemployment in the wake of the Great Recession. In the United States, Canada, Spain and other severely affected economies, estimates of Okun's coefficient increased sharply, departing from pre-crisis levels. In other countries, where unemployment has remained subdued, such as Germany and the Netherlands, the coefficient has fallen dramatically over the short-term. While other factors can explain the heterogeneous impact of the global financial crisis on labour markets in OECD countries, this paper focuses on the contribution of labour market institutions (employment protection legislation) in explaining cross-country differences and shifts in the estimated Okun's coefficient. In this regard, empirical evidence confirms that the responsiveness in the unemployment rate during the global downturn was lower in countries where workers are afforded greater employment protection such as Germany.

JEL codes: E24, J64, G01

Keywords: Okun's law; Labour market institutions; Employment protection legislation; Great Recession

1. Introduction

In most OECD countries, labour markets remain deeply affected by the global financial crisis with weak aggregate demand, insufficient job creation and persistent high levels of unemployment. As of January 2012, the OECD unemployment rate stood at 8.1 per cent, less than half a percentage point down from its peak level of 8.5 per cent since the crisis (OECD 2013). Across the OECD, more than 48.8 million persons are unemployed, 16 million more than at the start of the crisis.

There are, however, important differences across countries, with unemployment rates ranging from below 5 per cent (Austria and Japan) to over 25 per cent (Greece and Spain).

In the United States, the economy deteriorated early during the crisis, leading to a contraction in GDP of 3.1 per cent in 2009[1]. In the wake of this downturn, a million workers were laid off, particularly in the construction and manufacturing sectors, and as a result, total employment in the United States fell by 4.7 per cent from 2007 to 2010[2]. At the same time, the unemployment rate soared from just 4.8 per cent in the fourth quarter of 2007 to 9.9 per cent two years later, the highest level since the recession of the early 1980s[3]. This outcome has led a number of US commentators to question the stability of Okun's law, one of the fundamental macro relationships. Using quarterly data for the post-second world war period (second quarter 1947-fourth quarter 1960), Arthur Okun (1962) found that a three per cent change in output is associated with a change in the unemployment rate of around one percentage point. A number of studies, such as Daly and Hobijn (2010) and Elsby et al. (2010), have proposed that there has been a departure from this 'rule of thumb' in the second half of 2009 that was mostly due to strong growth in productivity[4].

Prior to the impact of the crisis on the labour market, a number of studies (see, for example, Knotek (2007)) proposed that Okun's coefficient varies over time in the context of both longer-term trends and asymmetry over the business cycle. In this literature, asymmetry is used to denote the phenomenon where the correlation between the two series (change in the unemployment rate and output) differs over specific phases of the business cycle (Neftci 1984). The well-known lag in labour market recovery noted by IMF (2009), Reinhart and Rogoff (2009) and others is a reflection of this asymmetry.

By smoothing the series for the United States with an HP filter, Ball et al. (2013), however, find that Okun's Law is a 'strong and stable relationship in most countries', while its long-term average is not correlated with employment protection legislation (EPL). This study estimates a coefficient of -0.45 for the United States for the period 1948-2011. Moreover, Ball et al. (2013) do not find any evidence of non-linearity in terms of different coefficients for positive and negative output growth. However, this debate obscures the fact that Okun's 'law' is, ultimately, a statistical, not theoretical, relationship, and estimates of this coefficient will depend on the methodology employed. By smoothing the output and unemployment series with a Hodrick Prescott (HP) filter, a more stable relationship will emerge.

To contribute to this literature, this paper documents heterogeneity in the responsiveness of unemployment to changes in output, both during the Great Recession itself and over a broader time period. Focusing in particular on short-term fluctuations after 2008, these results show that Okun's coefficient rose sharply in the United States, but fell in other OECD countries. In order *to capture* and *understand* these different responses, the study explores the effects of labour market institutions, and EPL in particular, on aggregate unemployment during a period of recession. According to theory, EPL should dampen labour market adjustment during a contraction, while it is expected to reduce hiring during recovery (because of the anticipated cost of having to fire the worker in the future). The findings indicate that there is negative relationship between the shifts in Okun's coefficients over the crisis period for a set of OECD countries and the strictness of employment protection legislation.

The remainder of the paper is structured as follows. Section 2 provides estimates of Okun's coefficients both during the great recession and over a longer time period for most OECD countries, and decomposes changes in unemployment to identify the association with other channels of labour market adjustment (hours, productivity and labour force). Since diverging patterns emerge across countries and over time, Section 3 explores the role of labour market institutions, namely employment protection legislation, in driving these asymmetric behaviours. Finally, Section 4 concludes.

2. Okun's Law: an in-depth analysis of changes in unemployment and labour market adjustment

Changes in unemployment levels over the business cycle depend on the how labour markets adjust. In this context, one of the key issues is the difference between external (e.g. layoffs) and internal (e.g. reduction in working hours) margins of adjustment. At the firm level, adjustment to external shocks in labour demand can take place through quantitative changes (working time or employment) or through price adjustment (wages) (Cazes et al. 2009). Cutting nominal wages is not a popular policy option and even employers in countries with flexible labour markets such as the United States are often reluctant to do so because of its impact on the morale of staff and on productivity levels (see, for example, Bewley, 1999). Depending on the sector and the nature of the shock, firms may, thus, first try to use internal flexibility and adjust hours of work or reallocate workers within the enterprise before proceeding to external adjustment and dismiss workers; this arises because of cost considerations and the need to retain (especially skilled) workers.

In Germany, for example, (un)employment has adjusted by a much smaller margin, while hours worked have decreased much more than in most European countries. According to some economists, this was due to the extensive use of short-time work (STW) schemes such as Kurzarbeit in Germany (Boeri and Brückner 2011); but others have suggested that, since the use of such arrangements, was not much greater than in recessions in the 1970s and 1980s, the use of short time work cannot alone explain the remarkable resilience of the German labour market[5]. In contrast, evidence for the United States reveals that employers resorted more towards external adjustment rather than internal mechanisms (namely, hours worked and wages), despite firms using the hours worked "margin" more than in any previous recession (Fernald 2012). Section 2.3 describes in depth these different channels of labour market adjustment, as they are important to keep in mind when doing cross-country comparisons.

2.1. Evidence on Okun's Law from the Great Recession

To highlight different adjustment paths across countries, this section begins with differences in the responsiveness of unemployment to changes in output during the Great recession. This analysis shows that Okun's coefficient rose sharply in the United States but fell in other OECD countries.

As a starting point, Figure 1 illustrates the raw relationship between the changes in the unemployment rate from 2008 to 2009 and GDP growth in 2009, which reveals that there has been great variation in the sensitivity of unemployment to the crisis. Firstly, unemployment in the United States had risen far more than other countries with a comparable economic contraction, though the increase in the Spanish unemployment rate departs even

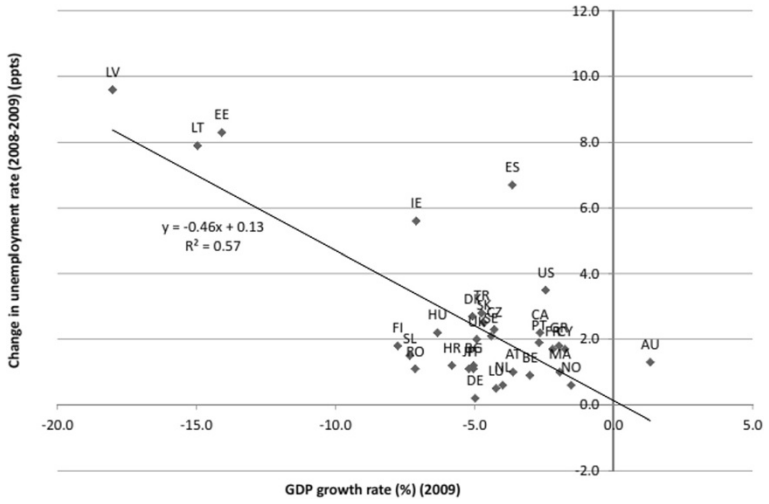

Figure 1 Relationship between output and unemployment rate during the Great Recession in the United States and other OECD countries.

more from the average than the case of the United States. The worst hit countries are Estonia, Ireland, Lithuania, and Latvia, which went through a severe macroeconomic shock with a severe fall in output and deterioration in the labour market. In the case of Germany, the Netherlands and some other European countries, the change in the unemployment rate was lower than the average.

Figure 2 highlights further these diverging trends across countries based on estimations of Okun's coefficients over the period, 2000-2010, for the United States, Germany and the Netherlands. The coefficients are estimated using quarterly data and the first-difference version as presented in Okun (1962); the relationship between the change in the unemployment rate and the growth in GDP can be stated

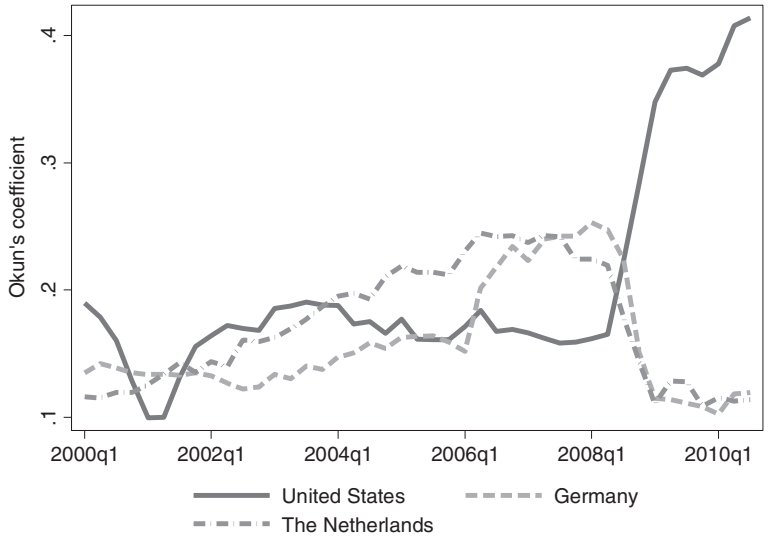

Figure 2 Divergence in Okun's law in the United States, Germany, and the Netherlands during the global financial crisis, 2000q1 – 2010q3.

as the following linear specification:

$$\Delta u_t = \alpha - \beta y_t + \varepsilon_t, \quad (1)$$

where Δu_t is the change in the unemployment rate from period t-1 to t, y_t the real GDP growth rate and ε_t a random error term. Similar to IMF (2010) and Knotek (2007), β is estimated using a technique known as rolling regressions, which means that Equation (1) is estimated using different sample periods each covering *forty* quarters of data, starting with the first observation for the unemployment and GDP series. For example, in the case of the United States, the model is estimated first for the period 1990q3 to 2000q2. The sample period is then moved forward one quarter and re-estimated for the next sample period, i.e. 1990q4 to 2000q3. The final estimation in the sample corresponds to the period 2000q4 to 2010q3 since 2010q3 is the last observation in our dataset.

The Okun's coefficient estimates obtained from Equation (1) using the rolling regression technique highlight considerable divergence during the Great Recession. As illustrated by Figure 2, the coefficient remained relatively stable over the 2000s in the United States, while it was increasing in Germany and the Netherlands where unemployment had been falling at a greater rate (and hence an increase in the elasticity) in the years leading up to the onset of the crisis. The first quarter of 2008 shows a dramatic deviation in the coefficient. In the case of the United States, it increased rapidly since the start of 2008 as the economy contracted and unemployment surged. At the same time, the coefficient fell markedly in Germany and the Netherlands, reflecting the point made in the introduction to this paper: output fell in these countries by more than 4 per cent in 2009 but unemployment barely moved.

2.2. Asymmetric adjustments: Okun's law over the business cycle

In order to better understand the previous divergence in unemployment elasticities, the Okun's coefficients are estimated over a much longer period using the same methodology as described above. This produces a series of estimates for β that varies over time, which, in turn, provides a useful description of the longer trends of the coefficient. Figure 3 presents the estimates for a number of OECD countries for the (1970- 2010) period; this yields an illustration of both different levels and varying trends over a span of three or four decades.

In order to detect movements in the coefficient over the business cycle, it is necessary first to date the business cycles in terms of delineating phases of recession and expansion. As in IMF (2010), this paper follows a 'standard' approach in dating business cycles using the level of output instead of the output gap (deviation of output from its long-run trend)[6]. It uses quarterly changes in real GDP level series to identify local peaks and troughs (turning points)[7]. The recession phase is defined as the peak to the trough, and symmetrically, the recovery phase is defined as the trough to the point where GDP returns to the peak level before the recession.

Taking a longer-term perspective confirms the diverging trends between countries but also reveal considerable variation over time. An upward trends in the estimated Okun's coefficient is evident in such countries as Spain, the Netherlands and France, while in Denmark, the coefficient has been falling since the mid-1980s (Figure 3). In other countries, there are large movements across time. This overall instability in the Okun's

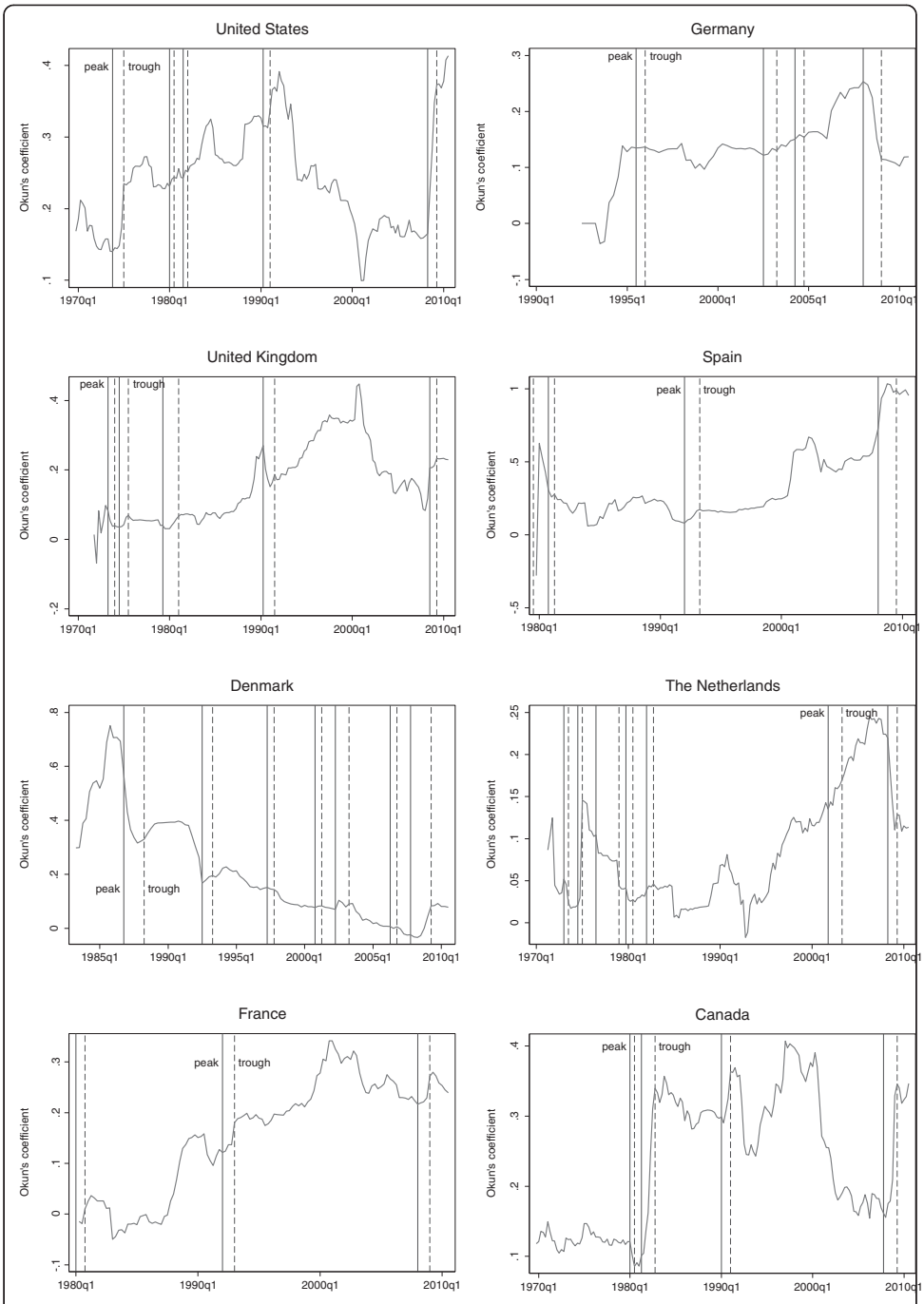

Figure 3 Okun's law in selected OECD countries, 1970-2010 (quarterly data).

parameter is found elsewhere in the literature (see, for example, IMF (2010), Knotek (2007), and Lee (2000)) and reflects both changes over the business cycle and structural movements in the relationship[8]. The graphs presented in Figure 3 show indeed that, in many countries, unemployment is more likely to rise during recessions than decrease during periods of expansion, though this asymmetric behaviour differs across countries.

A number of studies have investigated the extent of asymmetry in Okun's law. Lee (2000) finds mixed evidence of asymmetry in Okun's coefficient for sixteen OECD

countries depending on the methodology used. Using data for seven OECD countries, Harris and Silverstone (2001) find that failure to take into account of asymmetries would see a rejection of the hypothesis that there exists a long-run relationship between unemployment and output. They also find that in the short-run, unemployment adjustments to deviations of GDP from its long-run equilibrium differ depending on whether the economy is in a period of expansion or recession. While their results suggest that unemployment adjusts in the expected manner during downturns, it shows also that in most countries unemployment rates continue to increase but at a lower rate during an upturn.

Silvapulle et al. (2004) lists several theoretical arguments to explain the asymmetric behaviour of Okun's coefficient over the business cycle. One argument is that since labour market institutions restrict the ability of employers to lay off workers, unemployment responds less to output changes during phases of contraction than ones of expansion. Alternatively, another argument is that employers tend to be more pessimistic during recessions than they are optimistic during an upturn, in the sense that bad news is believed more quickly than good news. Thus, unemployment responds more strongly to output changes during a contraction than an expansion. Silvapulle et al. (2004) propose that the second argument is more relevant for the US, while the first version is likely to be more valid for Europe. Courtney (1991) attributes asymmetry to factor substitution during cycles (involving non-constant relationship among hours, labour force participation and capital), while Campbell and Fisher (2000) suggest that aggregate asymmetries in job creation and destruction are due to microeconomic asymmetries in adjustment costs. In a more recent paper, Beaton (2010) applies a time-varying parameter methodology for USA and Canada and finds evidence of asymmetric behaviour in Okun's law over the business cycle. In contrast, Ball et al. (2013) concludes that there is no evidence of a statistical difference in the coefficient during periods of growth and contraction.

Figure 4 displays the average estimated Okun's coefficient using the sample of OECD countries, from Equation (1) for the period 1990q1 to 2010q3 (distinguishing between the average for phases of recession and expansion). It shows that unemployment is more responsive during recessions in a range of countries (denoted by the square marker), but not in all. In particular, the Okun's coefficient is far larger during recessions in such countries as Spain (0.729 versus 0.251), Poland (0.433 versus 0.069), and the United States (0.315 versus 0.211). However, there are many countries clustered around the 45-degree line indicating that unemployment reacts in more or less a symmetric manner over the business cycle. In some countries, such as Ireland and Sweden, the estimated Okun's coefficient is, in fact, much larger during phases of expansion than in times of contraction.

Overall, these empirical insights point to a non-linear, asymmetric relationship between changes in output and unemployment in only a few countries. While a range of studies has already explored this statistical finding, less has been said about the role of labour market institutions in contributing to this asymmetry. In particular, it would useful to articulate a micro-analysis of labour market dynamics with a macro one and study the cyclical sensitivity of labour flows given each national institutional setting[9]. However, such empirical work would require comparable micro data set to analyse the cyclical behaviour of workers flows and labour turnover, and how these flows relate to

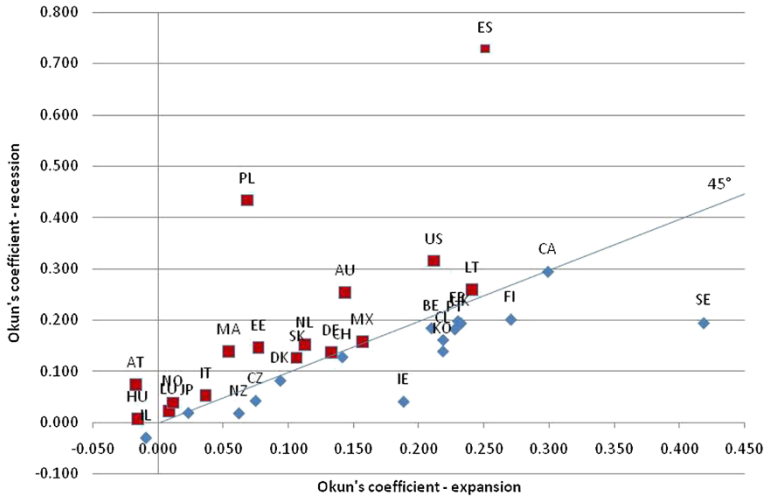

Figure 4 Okun's coefficient in phases of expansion and recession, average 1990q1 – 2010q3.

aggregate unemployment levels given the labour market institutions in place in each country. Such datasets are not systematically available or comparable. For this reason, Section 3 concentrates on how labour market institutions can explain cross-country differences in shifts in the estimated Okun's coefficients during periods of recession (from the downturn of the global financial crisis). Before that, it is useful to describe the adjustment mechanisms that took place across countries to understand how labour market institutions can explain the divergences underlined previously. This is the subject of the following section.

2.3. Beyond the black box of Okun's law: a decomposition exercise

In order to capture what is behind the recent divergence in Okun's coefficients across countries, this section presents a decomposition of the change in unemployment to explore the various margins of adjustment. In this regard, it is possible to decompose the relationship as follows:

$$\Delta u \approx -\Delta \ln(Y) + \Delta \ln \frac{Y}{H} + \Delta \ln \frac{H}{N} + \Delta \ln(LF), \qquad (2)$$

which implies that the change in unemployment rate can be separated into a change in output (Y), productivity per hour worked (Y/H) and hours per worker (H/N), as well as a change in the labour force (LF) (hereafter, the last three variables are referred as the "decomposition variables").

The decomposition exercise is based on OECD quarterly data, supplemented by a new dataset for hours worked constructed by Ohanian and Raffo (2012) for fourteen OECD countries[10]. In order to disentangle the contribution of each decomposition variables to the change in the unemployment rate, their respective average percentage change is computed during the Great Recession (as defined in the previous section, i.e. the period from the peak to the trough)[11]. The results of the decomposition are summarized in Figure 5 (see also Table A.1 in the Additional file 1), which also displays the average change in real GDP and the average change in the unemployment rate (as defined by the formula above in order to remain consistent).

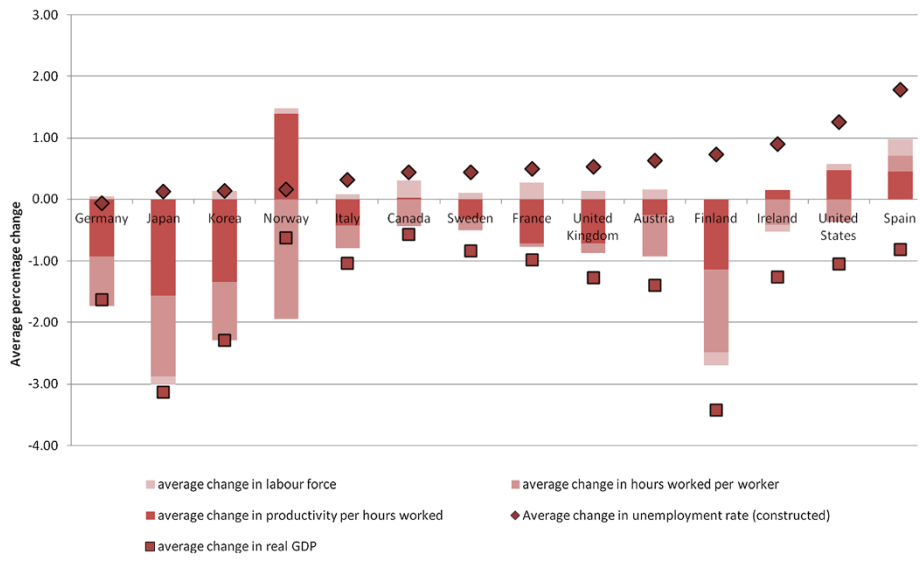

Figure 5 Average change in productivity, hours, and the labour force during the Great Recession.

The decomposition exercise confirms that beyond the change in real GDP, the divergence of Okun's coefficients across countries is driven by different patterns of adjustment and is increasing with the size of the gap between the sum of the three decomposition variables and real GDP. This is well illustrated by the cases of Japan and Spain, which provide contrasting patterns: in Japan, the decline in real GDP was followed by a very small increase in unemployment, while the opposite happened in Spain. The decomposition actually shows that in Japan, both productivity and hours worked sharply decreased in line with the decline in real GDP, allowing for less adjustment on the extensive margin (i.e. by firing workers). In Spain, however, all three decomposition variables increased[12], with a greater adjustment in productivity and labour force than hours worked. The gap between the average increase of the decomposition variables and the average drop in real GDP is behind the reason the Okun's coefficient in Spain departed sharply from its pre-crisis level.

Looking at the decomposition results by country shows that, as in the case of Spain, productivity increased as well in the United States and Ireland during the recession period. Actually, in these three countries, firms could maintain the same output with fewer workers by firing more people, so most of the labour market the adjustment took place at the external margin leading to a higher than average change in the unemployment rate. On the contrary, and similar to Japan, other countries contained the increase in their unemployment rate through a strong decrease in their productivity per hour worked. This is notably the case of France, Italy, Norway and Germany.

In almost all countries (except for Spain and Norway), hours worked per worker decreased on average; the scope of this adjustment differs, however, across countries: in Korea, almost all the adjustment on the labour market took place through a decrease in hours worked, leading to a slight increase in the unemployment rate during the recession period. In Austria, Finland, and Germany, a decline in hours worked has been an important channel of adjustment as noted above the context of short-time working arrangements.

Finally, changes in the labour force during the recession were almost positive in all countries, reflecting that the decrease in employment was counteracted by the increase in unemployment plus entries into the labour force. In terms of intensity, it accounted relatively much less than productivity and hours worked per worker. As already said, Spain is a notable exception, since the positive average change in the labour force was as high as the one in productivity.

The Additional file 1 displays more details about the cyclical movements of each of these variables (productivity, hours worked per worker and the labour force) for eight countries, from the first quarter of 2005 until the third quarter of 2010 (the last available observation).[13] Overall, productivity is the most volatile variable of adjustment, with abrupt changes within the recession period, and sometimes with changes not consistent (i.e. having both positive and negative values). This is not surprising as productivity per hours worked, by construction, is directly affected by changes in real GDP; hours worked per worker are also very volatile during the recession period (see Ohanian and Raffo (2012) for a discussion on this outcome), but the changes are rather consistent over the period; As reported previously, changes in the labour force are smoother, also due to the lagged impact of real GDP on both employment and unemployment, with lower intensities of adjustment. Figure 6 shows these cyclical behaviours of these margins of adjustment for Germany, the United States, and Spain.

Germany, which had the same number of recession quarters than the United States (four quarters), witnessed pro-cyclical movements of productivity and hours worked per worker with significant declines until the beginning of 2009. The average decrease of both variables during the recession was higher than the decline in real GDP, pushing Okun's coefficient down. Germany's change in hours worked per worker is among the highest witnessed in the selected countries (after Japan and Norway).

The deviation of Okun's law in the United States was driven by rapid growth in average productivity per hour worked, associated with a strong adjustment through the extensive margin (e.g. layoffs). The mechanism behind that is described in the following way by Daly and Hobijn (2010): "Employment fell precipitously, hours per worker declined, and average labour productivity surged, allowing GDP to hold steady". The failure for hiring to take off in 2010 is not a new phenomenon for the US: Gordon (2010) and others stress that the last three recessions (1990-1991, 2001, and 2007-2009) have all been followed by a "jobless recovery" due to strong growth in productivity. Fernald (2012) shows that firms used the hours "margin" more than in any previous recession. Nevertheless, the drop in the average hours worked was by far not enough to prevent Okun's coefficient to depart sharply.

In Spain, movements of productivity are similar to the United States, though the recession lasted longer (six quarters), with productivity increasing steadily before starting to decline at the end of the recession. Also, the country witnessed a more erratic movement of the hours worked per worker, with both increases and decreases, but the change remained overall positive. Higher productivity and more hours worked per worker led firms to lay off workers, which, in turn, resulted in the divergence in the estimate of Okun's coefficient. Finally, the figure for Spain shows a steady and strong decline in the labour force, contributing to push upward Okun's coefficient. As explained by Ball et al. (2013), the structure of the Spanish labour market makes it

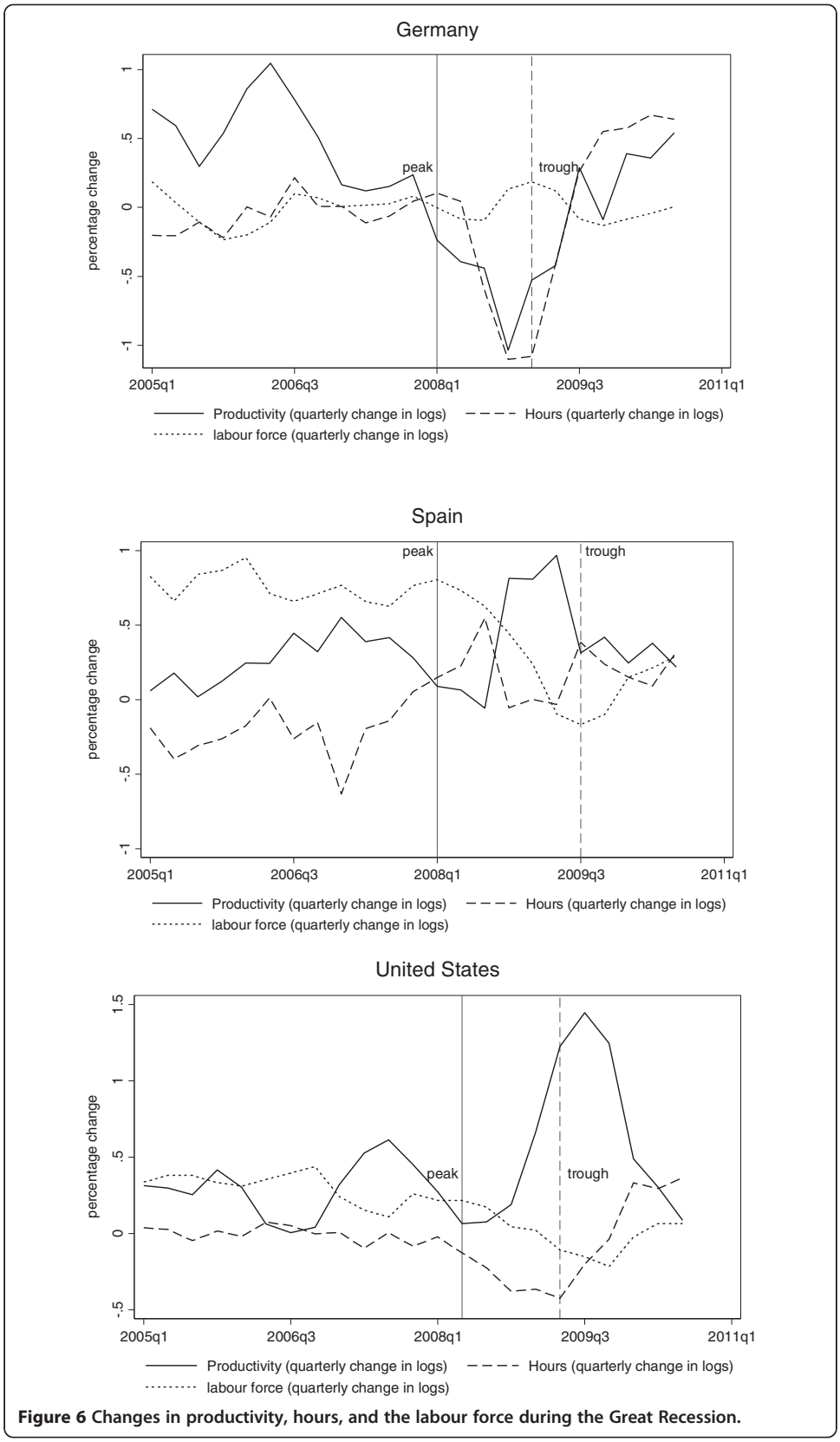

Figure 6 Changes in productivity, hours, and the labour force during the Great Recession.

faster and easier to adjust employment in response to changes in output through fixed-term contracts (Spain has the highest share of such workers in Europe).

3. Okun's law and labour market institutions

Section 2 presents different insights on the variation in Okun's coefficients across countries and time, most notably during the global financial crisis. Moving from this description, it is important to identify potential explanations for the patterns of adjustment observed in OECD countries. In order to identify the role of one key factor, the remainder of the paper explores the relationship between the changes in unemployment and labour market institutions, especially, employment protection legislation.

3.1. Some background debates

The effects of labour market institutions on labour market outcomes have been extensively studied, both theoretically and empirically. In this section reference is made to one key labour market institution, employment protection legislation (EPL) and its possible effect on the relationship between changes in output and changes in unemployment during a recession. [14] According to theory, and given a constant cyclical wage pattern, less stringent EPL makes job turnover more cyclical (for example, as witnessed in the United States), while a more protective EPL reduces job destruction in recessions as well as the variability of layoffs and limits the contribution of inflows to fluctuations in unemployment (as in many continental European economies) (Bertola et al. 1999).

A substantial empirical literature has explored these findings using a variety of EPL measures together with both cross-sectional and longitudinal data[15]. Though the evidence tends to be inconclusive, it does give some support to theoretical predictions. While aggregate unemployment levels are not strongly correlated with cross-sectional indicators of EPL, unemployment stocks are more stable when EPL is more stringent. Moreover, the cyclical volatility of employment is much more pronounced in the relatively less-regulated labour markets of the United States and the United Kingdom than in continental Europe (such as France or Germany) (Bertola and Ichino 1995; OECD 2009; Elsby et al. 2009).

Moreover, labour market institutions should contribute into reducing uncertainty, which is in itself a potential driver of asymmetric behaviour of employers and workers. During the recovery phase of the business cycle, employers are still uncertain about the future and hence reluctant to hire new staff (and subsequently, they tend to increase hours work first and make other organizational changes). As noted before, intensive margins of adjustment are in general more rapid than extensive ones due to differences in adjustment costs, which will depend on the nature of employment protection in place and the situation in the labour market when an economy is hit by a shock. Looking beyond the immediate impact of a downturn, a recession may also engineer structural changes such that laid-off workers are unable to find new jobs because they do not have the skills demanded in a post-recession economy, which can result in long-term unemployment driven by such a skills mismatch. This is currently a major issue in the United States where there is considerable discussion about whether the

Beveridge curve has shifted outwards, reflecting a poorer match between the unemployed and available vacancies (see, for example, Elsby et al. (2010)).

3.2. Cross-country evidence on the relationship between employment protection legislation and estimates of Okun's coefficients

There are different approaches to exploring the empirical relationship between Okun's law and labour market institution variables. IMF (2009) estimates a long-run relationship between the unemployment rate and output, resulting in what the report calls a 'dynamic beta'. This study finds that the responsiveness of unemployment to output has increased over time in many OECD countries reflecting changes in employment protection legislation, unemployment benefits and the growth of temporary work: weaker EPL and a higher share of temporary workers being associated with a larger estimate of the dynamic beta.

Rather than exploring this avenue, this section considers how labour market institution variables are associated with shifts in the estimated Okun's coefficient over the business cycle[16]. The rationale for taking this approach is provided by the evidence displayed in Figure 2 above, which reveals remarkable divergence in the coefficient across countries during the global financial crisis. Indeed, the upward shift in the US and the downward shifts in countries such as Germany and the Netherlands are likely to reflect, at least in part, differences in labour market institutions. In this regard, it is expected that the elasticity of the unemployment rate to output should increase more in countries, which protect less workers from dismissal[17].

To identify whether such a relationship does exist from a statistical point view, Figure 7 illustrates how the shift in the estimated Okun's coefficient (using Equation (1)) is related to the strictness of employment protection legislation (using the OECD EPL index). The shift is the percentage change in the Okun's coefficient from the peak in GDP to the

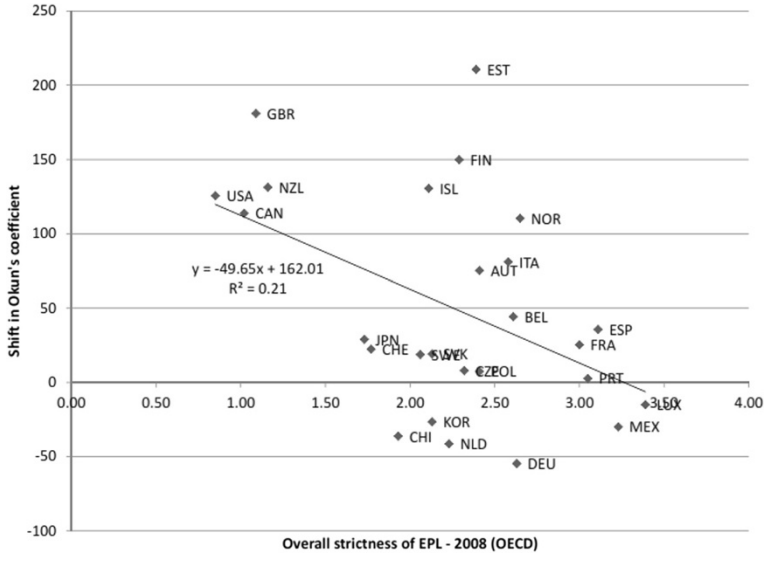

Figure 7 Relationship between employment protection legislation and shift in Okun's coefficient during the global financial crisis, 2007-2010.

subsequent trough during the period of the global financial crisis (2007-2010). As expected, there is a negative and significant relationship between EPL and the shift in Okun's coefficient during the global financial crisis. The relationship is significant at the one per cent level and it explains 21 per cent of the variation in the data (29 per cent if Estonia is excluded from the sample)[18].

A noted above, in such countries as Germany (DEU) and the Netherlands (NLD), the sensitivity of the unemployment rate to output actually fell during the global financial crisis. As indicated before, the main form of adjustment to the crisis in these countries was through a reduction in working hours rather than lay-offs. This was due to a range of factors such as the cost of dismissing workers along with policy measures that facilitated this adjustment process (short-time schemes such as the Kurzarbeit programme in Germany and the Dutch Deeltijd WW initiative).

The same relationship is more robust and the coefficient higher when the index for EPL governing regular contracts *only* is used, as shown in Figure 8 (the relationship explains 28 per cent of the variation – 36 per cent if Estonia is excluded). Figure 9 shows that the EPL index for temporary contracts is on the other hand less correlated with the shifts across countries and the relationship explains only twelve per cent of the variation (16 per cent if Estonia is excluded). This is not too surprising, since the EPL index governing temporary contracts captures hiring costs, while the EPL index governing permanent contracts rather captures dismissals costs.

Finally, the robustness of previous findings is checked using levels instead of percentage changes, since using percentage changes could be misleading given the great heterogeneity of the pre-crisis coefficients. The relationship is still significant although now at the 5 per cent level and explains only thirteen per cent of the variation in the data. Using the level version makes it clear that Spain is an outlier. This may be explained by the fact that, already from the early 2000s, unemployment was becoming more and more sensitive to output growth (largely driven by the boom in the

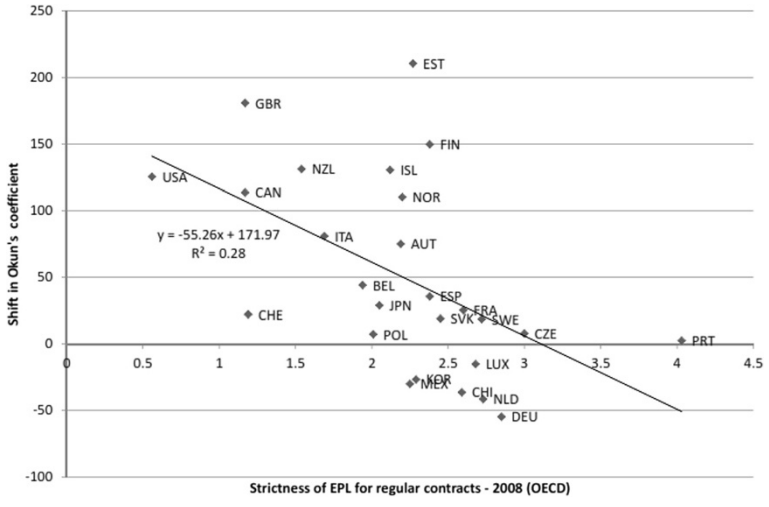

Figure 8 Relationship between employment protection legislation *for regular contracts* and shift in Okun's coefficient during the global financial crisis, 2007-2010.

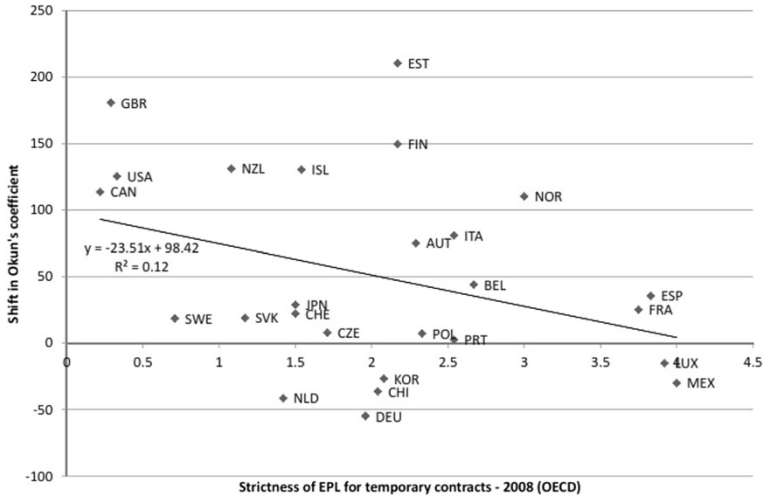

Figure 9 Relationship between employment protection legislation *for temporary contracts* and shift in Okun's coefficient during the global financial crisis, 2007-2010.

construction sector prior to the onset of the crisis). The coefficient reached almost 0.6 just before the crisis, a level by far above all others countries reviewed in this paper.

Overall, since the focus of the paper was to assess whether there was any relationship between the change in Okun's coefficient and various labour market institutions across countries, it seemed more accurate to use the shift in *percentage change* since it provides a way to normalize the change across countries.

4. Conclusion

The global financial crisis hit labour markets in OECD countries hard. In the United States, Spain and other countries affected by the collapse housing bubbles, the downturn resulted in a substantial rise in the unemployment rate. At the same time, unemployment has remained subdued in a number of Continental European countries, notably the ones that have often been labelled sclerotic in the past, such as Germany and Italy (though the current sovereign debt crisis in the Eurozone have had negative implications for labour markets in the Eurozone). In order to identify the patterns of adjustment over time and across countries, this paper adopts the approach of estimating Okun's coefficients, representing the elasticity of unemployment with respect to output.

The results presented in this paper confirm that Okun's coefficient varies across countries and time, where the latter is due to both longer-term trends and movements in output over the business cycle. Focusing on the period of the global financial crisis, the findings show that there was considerable divergence in the rolling regression estimates of Okun's coefficient during 2007-2010. In the United States, Canada, Spain and other badly affected economies, the coefficient increased rapidly, departing from pre-crisis levels and suggesting high volatility of those labour markets. In other countries where unemployment has remained subdued, namely Germany and the Netherlands, the coefficient has fallen dramatically. Changes in unemployment were decomposed to identify the association with other channels of labour market adjustment (hours,

productivity and labour force). The results presented provide in-depth insights on the reasons behind the divergence in Okun's coefficient during the recession and across countries. Countries that witnessed increases in productivity, hours per worker, and the labour force tended to have a sharp increase in their Okun's coefficients, while the opposite happened for countries that displayed mild or declines in the decomposition variables.

As recognized by the literature, it is expected that unemployment react differently to a downturn than to an upswing in the economy. This paper delves deeper into why unemployment adjustment should be asymmetric over the business cycle, focusing on how labour market institutions impact these movements. Using data from the global financial crisis, results are presented on the relationship between the shift in the sensitivity of the change in the unemployment rate to output during a recession and employment protection legislation. The simple correlations reveal that there is indeed a negative relationship between the strictness of employment protection and the shift, particularly for regular contracts. In other words, these findings confirm that the responsiveness in the unemployment rate during the global financial crisis was lower in countries where workers are afforded greater protection (such as Germany).

Endnotes

[1]IMF World Economic Outlook Database, April 2013.

[2]OECD Labour Force Statistics Database.

[3]See US Bureau of Labor Statistics (BLS); quarterly unemployment rate is seasonally adjusted; http://bls.gov.

[4]See, for example, http://economix.blogs.nytimes.com/2010/02/22/a-broken-economic-law/.

[5]According to Dietz et al. (2010), the German short-time work scheme, 'Kurzarbeit', only accounted for 13.4 per cent of the fall in average hours worked in 2009.

[6]Studies such as Harding and Pagan (2002) suggest that it is unnecessary to detrend the series and prefers the level approach. Furthermore, as underlined by Knotek (2007), the problem with the output gap version is that neither potential output nor the natural unemployment rate is directly observable. As such, the gap approach leads to the identification of different business cycles to depend on the selected filtering methodology. For example Lee (2000) compares the Okun's coefficients obtained for a series of OECD countries using three different filtering methodologies. He finds that there are sensible differences in the resulting Okun's coefficient depending on the methodology used.

[7]The authors are grateful to the OECD, particularly Paul Swain, for assisting us with the data on turning points for OECD countries.

[8]Lee (2000) finds strong evidence of structural break around the 1970s that is attributed to: (i) changes caused by rising female labour force participation; (ii) productivity and wage slowdown; and (iii) corporate restructuring.

[9]Clearly, inflows into unemployment, as well as outflows from unemployment, play crucial roles in accounting for the level of unemployment stocks over the business cycle.

[10]Their dataset draws on a variety of international sources, including data from national statistical sources, establishment surveys, and household surveys.

[11]The choice of taking the average change during the recession period between the peak and trough is due to the fact that the decomposition variables do not follow a linear trend during the recession, thus we cannot take the difference between the trough and peak as a measure of the change. Also, the number of recession quarters varies across countries and, thus, taking the average change allows for better cross-country comparisons.

[12]Spain is the only country from the dataset displaying these results.

[13]As quarterly changes for these variables are very volatile and thus more difficult to analyse whether there is a trend or not, we smooth the series by taking a simple moving average that includes the quarter itself, one quarter before, and one quarter after.

[14]Other dimensions, such as unemployment insurance schemes (UI) and unionization, have been analysed, but do not reveal any significant findings.

[15]Given the elusive and complex nature of EPL, many have argued that the difficulty of getting clear-cut results on the role of EPL on labour market performance may be due to the lack of satisfactory indicators.

[16]Other specifications, which consider the relationship between size of the Okun's coefficient and labour market institutions, have been estimated, but generally do not provide any clear results (available upon request from the authors). See also Cazes and Verick (2011).

[17]Of course, a range of non-labour market variables can also potentially explain the variation in this divergence across countries, such as openness (trade-GDP ratio) and the nature of credit markets (credit-GDP ratio and credit market regulation). These dimensions are not explored in this paper.

[18]This finding holds when using other indices for labour market regulation (not reported here) such as the Fraser Freedom Indices for labour market regulation and the hiring and firing regulation.

Additional file

Additional file 1 Table S1. Average change in percent during the global financial crisis (from peak to trough). Figure S1. Changes in productivity, hours, and the labour force during the Great Recession.

Competing interests
The IZA Journal of Labor Policy is committed to the IZA Guiding Principles of Research Integrity. The authors declare that they have observed these principles.

Acknowledgment
The authors are grateful to the OECD for assisting us with the data on turning points for OECD countries and to Lee E. Ohanian and Andrea Raffo for sharing their dataset on hours worked. The authors also appreciate comments received from Juan Jimeno, Paul Swaim, and two anonymous referees, which have helped improve this paper.
Responsible editor: Juan Francisco Jimeno.

Author details
[1]International Labour Office (ILO) and IZA4, route des Morillons, Genève 22 CH-1211, Switzerland. [2]Organisation for Economic Co-operation and Development (OECD).

Received: 12 November 2012 Accepted: 5 July 2013
Published: 06 Aug 2013

References

Ball L, Leigh D, Loungani P (2013) 'Okun's Law: Fit at 50?'. NBER Working Paper 18668, Cambridge, MA
Beaton K (2010) 'Time variation in Okun's law: a Canada and U.S. comparison'. Bank of Canada Working Paper, No. 2010-7
Bertola G, Ichino A (1995) 'Wage Inequality and Unemployment: US vs Europe'. In: Bernanke B, Rotemberg J (eds) NBER Macroeconomics Annual 1995. MIT Press, Cambridge, MA, pp 13–54

Bertola G, Boeri T, Cazes S (1999) 'Employment protection and labour market adjustment in OECD countries; evolving institutions and variable enforcement'. ILO Employment and Training Papers, No. 48, ILO
Bewley TF (1999) Why Wages don't Fall during a Recession. Harvard University Press, Cambridge, MA
Boeri T, Brückner H (2011) 'Short-time work benefits revisited: some lessons from the Great Recession'. IZA Discussion Paper No. 5635, Bonn
Campbell JR, Fisher JDM (2000) Aggregate employment fluctuations with microeconomic asymmetries. Am Econ Rev 90:1323–1345
Cazes S, Verick S (2011) 'What has happened to Okun's law in the United States and Europe? Insights from the global financial and economic crisis and long-term trends'. In: The Global Crisis: Causes, Responses and Challenges. Chapter 9. International Labour Office, Geneva
Cazes S, Verick S, Heuer C (2009) 'Labour market policies in times of crisis'. Employment Working Paper, No. 35, ILO, Geneva
Courtney HG (1991) 'The Beveridge curve and Okun's law: a re-examination of fundamental relationships in the United States'. PhD thesis, MIT, Cambridge, MA
Daly M, Hobijn B (2010) 'Okun's law and the unemployment surprise of 2009'. FRBSF Economic Letter, 2010-07, March 8, 2010. , San Francisco
Dietz M, Stops M, Walwei U (2010) 'Safeguarding jobs through labour hoarding in Germany'. Working paper, Institution for Employment Research, Neremberg
Elsby M, Hobijn B, Sahin A (2009) 'Unemployment dynamics in the OECD'. Federal Reserve Bank of San Francisco Working Paper Series, No. 2009-04, San Francisco
Elsby M, Hobijn B, Sahin A (2010) 'The labour market in the Great Recession'. Federal Reserve Bank of San Francisco Working Paper Series, No. 2010-07, San Francisco
Fernald J (2012) 'Productivity, potential output before, during, and after the Great Recession'. Federal Reserve Bank of San Francisco Working Paper Series, No. 2012-18, San Francisco
Gordon RJ (2010) 'Okun's Law and productivity innovation'. Am Econ Rev 100:11–15
Harding D, Pagan A (2002) 'Dissecting the cycle: a methodological investigation'. J Monet Econ 49(2002):365–381
Harris R, Silverstone B (2001) Testing for asymmetry in Okun's law: a cross-country comparison. Economics Bulletin 5 (2):1–13
International Monetary Fund (IMF) (2009) 'From recession to recovery: how soon and how strong?' Chapter 3 in IMF. World Economic Outlook (WEO) Crisis and Recovery, April 2009. IMF, Washington, D.C
International Monetary Fund (IMF) (2010) 'Unemployment dynamics during recessions and recoveries: Okun's Law and beyond,' Chapter 3 in IMF (2010). World Economic Outlook Rebalancing Growth, April 2010. IMF, Washington, D.C
Knotek E (2007) 'How useful is Okun's law?' Economic Review, Fourth Quarter 2007. Federal Reserve Bank of Kansas City, pp 73–103
Lee J (2000) The robustness of Okun's law: evidence from OECD countries. J Macroecon 22:331–356
Neftci SN (1984) Are economic time-series asymmetric over the business-cycle? J Polit Econ 92(2):307–328
Ohanian LE, Raffo A (2012) Aggregate hours worked in OECD countries: New measurement and implications for business cycles. J Monet Econ 59(1):40–56
Okun AM (1962) 'Potential GNP: its measurement and significance', American Statistical Association, Proceedings of the Business and Economics Section., pp pp. 98–104
Organisation for Economic Cooperation and Development (OECD) (2009) OECD Employment Outlook 2009. OECD, Paris
Organisation for Economic Cooperation and Development (OECD) (2013) OECD Employment Outlook 2013. OECD, Paris
Reinhart C, Rogoff K (2009) This Time is Different: Eight Centuries of Financial Folly. Princeton University Press, Princeton and Oxford
Silvapulle P, Imad AM, Silvapulle MJ (2004) Asymmetry in Okun's law. Can J Econ 37(2):353–374

10.1186/2193-9004-2-10
Cite this article as: Cazes *et al.*: Why did unemployment respond so differently to the global financial crisis across countries? Insights from Okun's Law. *IZA Journal of Labor Policy* 2013, 2:10