

Coibion, Olivier; Gorodnichenko, Yuriy; Kostas, Dmitri

**Working Paper**

## Amerisclerosis? The Puzzle of Rising U.S. Unemployment Persistence

IZA Discussion Papers, No. 7715

**Provided in Cooperation with:**

IZA – Institute of Labor Economics

*Suggested Citation:* Coibion, Olivier; Gorodnichenko, Yuriy; Kostas, Dmitri (2013) : Amerisclerosis? The Puzzle of Rising U.S. Unemployment Persistence, IZA Discussion Papers, No. 7715, Institute for the Study of Labor (IZA), Bonn

This Version is available at:

<https://hdl.handle.net/10419/90035>

**Standard-Nutzungsbedingungen:**

Die Dokumente auf EconStor dürfen zu eigenen wissenschaftlichen Zwecken und zum Privatgebrauch gespeichert und kopiert werden.

Sie dürfen die Dokumente nicht für öffentliche oder kommerzielle Zwecke vervielfältigen, öffentlich ausstellen, öffentlich zugänglich machen, vertreiben oder anderweitig nutzen.

Sofern die Verfasser die Dokumente unter Open-Content-Lizenzen (insbesondere CC-Lizenzen) zur Verfügung gestellt haben sollten, gelten abweichend von diesen Nutzungsbedingungen die in der dort genannten Lizenz gewährten Nutzungsrechte.

**Terms of use:**

*Documents in EconStor may be saved and copied for your personal and scholarly purposes.*

*You are not to copy documents for public or commercial purposes, to exhibit the documents publicly, to make them publicly available on the internet, or to distribute or otherwise use the documents in public.*

*If the documents have been made available under an Open Content Licence (especially Creative Commons Licences), you may exercise further usage rights as specified in the indicated licence.*

IZA DP No. 7715

## **Amerisclerosis? The Puzzle of Rising U.S. Unemployment Persistence**

Olivier Coibion  
Yuriy Gorodnichenko  
Dmitri Koustas

November 2013

# Ameriscclerosis? The Puzzle of Rising U.S. Unemployment Persistence

**Olivier Coibion**

*University of Texas at Austin  
and NBER*

**Yuriy Gorodnichenko**

*University of California, Berkeley,  
NBER and IZA*

**Dmitri Koustas**

*University of California, Berkeley*

Discussion Paper No. 7715  
November 2013

IZA

P.O. Box 7240  
53072 Bonn  
Germany

Phone: +49-228-3894-0  
Fax: +49-228-3894-180  
E-mail: [iza@iza.org](mailto:iza@iza.org)

Any opinions expressed here are those of the author(s) and not those of IZA. Research published in this series may include views on policy, but the institute itself takes no institutional policy positions. The IZA research network is committed to the IZA Guiding Principles of Research Integrity.

The Institute for the Study of Labor (IZA) in Bonn is a local and virtual international research center and a place of communication between science, politics and business. IZA is an independent nonprofit organization supported by Deutsche Post Foundation. The center is associated with the University of Bonn and offers a stimulating research environment through its international network, workshops and conferences, data service, project support, research visits and doctoral program. IZA engages in (i) original and internationally competitive research in all fields of labor economics, (ii) development of policy concepts, and (iii) dissemination of research results and concepts to the interested public.

IZA Discussion Papers often represent preliminary work and are circulated to encourage discussion. Citation of such a paper should account for its provisional character. A revised version may be available directly from the author.

## ABSTRACT

### **Amerisclerosis? The Puzzle of Rising U.S. Unemployment Persistence<sup>\*</sup>**

The persistence of U.S. unemployment has risen with each of the last three recessions, raising the specter that future U.S. recessions might look more like the Eurosclerosis experience of the 1980s than traditional V-shaped recoveries of the past. In this paper, we revisit possible explanations for this rising persistence. First, we argue that financial shocks do not systematically lead to more persistent unemployment than monetary policy shocks, so these cannot explain the rising persistence of unemployment. Second, monetary and fiscal policies can account for only part of the evolving unemployment persistence. Therefore, we turn to a third class of explanations: propagation mechanisms. We focus on factors consistent with four other cyclical patterns which have evolved since the early 1980s: a rising cyclicality in long-term unemployment, lower regional convergence after downturns, rising cyclicality in disability claims, and missing disinflation. These factors include declining labor mobility, changing age structures, and the decline in trust among Americans. To determine how these factors affect unemployment persistence, this paper exploits regional variation in labor market outcomes across Western Europe and North America during 1970-1990, in contrast to most previous work focusing either on cross-country variation or regional variation within countries. The results suggest that only cultural factors can account for the rising persistence of unemployment in the U.S., but the evolution in mobility and demographics over time should have more than offset the effects of culture.

JEL Classification: E24, E32, E52, J64, R11, R23

Keywords: unemployment persistence, labor mobility, trust, demographics

Corresponding author:

Yuriy Gorodnichenko  
Department of Economics  
549 Evans Hall #3880  
University of California, Berkeley  
Berkeley, CA 94720-3880  
USA  
E-mail: [ygorodni@econ.berkeley.edu](mailto:ygorodni@econ.berkeley.edu)

---

<sup>\*</sup> We thank Olivier Blanchard, Romain Ranciere, David Romer, and Justin Wolfers for very helpful comments, and Florence Jaumotte for sharing updated Blanchard-Wolfers series on labor market institutions. This paper was written in part while Coibion was a visiting scholar at the IMF, whose support was greatly appreciated. The views expressed in the paper are those of the authors and should not be interpreted as representing those of any institutions with which they are or have been affiliated. We thank Alex Dombrowski, Noa Dreyman, Chuck Fang, and especially Donna Kim and Yury Yatsynovich for research assistance. Gorodnichenko thanks NSF and Sloan Foundation for financial support.

## I Introduction

When the U.S. unemployment rate surged by four percentage points between 1979 and 1983 in the midst of what was then the most severe slump since the Great Depression, West European countries experienced, on average, an almost identical rise in unemployment in those years. But whereas rapid job growth in the U.S. offset all of the rise in joblessness by 1987, the average unemployment rate among West European countries declined only half a percentage point over the same time period. This very different response to what was most likely a common set of shocks was crystallized for economists by Blanchard and Summers (1986) when they coined the term “hysteresis” to characterize the exceptional persistence in unemployment experienced by countries like France and Germany. Among a more general audience, Eurosclerosis became the common term used to describe the missing job recovery amongst European countries, in sharp contrast to the apparent dynamism and vitality of American labor markets.

Thirty years later, and nearly six years after the start of the 2007-9 “Great Recession”, the recovery in the U.S. labor market is a pale shadow of the U.S. experience in the early 1980s. From its peak of 10 percent in October of 2009, the U.S. has seen its unemployment rate fall only halfway back to its pre-recession levels in the four years since. This comparatively slow rate of recovery still likely overstates the state of the job market as much of the reduction in the unemployment rate reflects a decline in labor force participation rather than job growth (Erceg and Levin 2013).<sup>1</sup>

But while the pace of the U.S. job market recovery looks downright sclerotic relative to the rapid rebound experienced after the Volcker recessions of the early 1980s or prior recessions in the post-World War II era, the degree of persistence in unemployment since the Great Recession only modestly exceeds that following the 2001 recession, which in turn modestly exceeded that of the 1990 recession. From this perspective, we observe a *gradual* trend of increasingly “jobless recoveries” over the last three recessions that contrasts sharply with the previous U.S. experience. If this trend reflects more than a historical coincidence and were to continue, future U.S. recessions are likely to display a level of sclerosis which increasingly resembles the experience of many West European countries in the 1980s.

To support the notion that there may have been common factors at work in the 1990, 2001 and 2007 recessions, we document four related properties of the Great Recession which are puzzling in comparison to historical (pre-1990) recessions but are not unusual when compared with the 1990 and 2001 recessions: (1) missing disinflation— given the historical link between inflation and unemployment, one would have expected inflation to fall much more in the Great Recession than it actually did; (2) the unusually large share of long-term unemployed; (3) the slow rate of convergence in regional labor markets; and (4) the rise in disability claims during the Great Recession. We show that each of these is indeed puzzling relative to pre-1990 recessions, but that the experience in the Great Recession is either in line with or only modestly exceeding what would have been expected given the patterns of the 1990 and 2001 recessions and the severity of the Great Recession.

A second striking element about these properties of the data is that each was also found to be a puzzle for West European countries in the 1980s: Blanchard and Summers (1986) discuss the missing disinflation in European economies during the early 1980s, Decressin and Fatas (1995) document the slow regional convergence within individual European labor markets during the 1980s relative to the more rapid convergence of the U.S., Machin and Manning (1999) discuss the well-known rise of long-term unemployment in Western Europe over the course of the 1980s, and Emerson and Dramais (1988) document the unusual rise in disability claims amongst West Europeans in the 1980s. The fact that four

---

<sup>1</sup> The labor force participation rate has declined by over 3 percentage points since January 2007; in contrast, no major decline in labor force participation occurred during the 1980s recovery (BLS 2013).

features of the Great Recession (when unemployment persistence was high) are puzzling relative to pre-1990 recessions (when unemployment persistence was low) but not puzzling relative to the 1990 and 2001 recessions (when unemployment persistence was high) and that these same four features were also present in West European economies in the early 1980s (when unemployment persistence was high) is at least suggestive of common forces at work underlying the persistence of unemployment.

What lies behind this rising persistence of U.S. unemployment? We consider three classes of explanations. First, the composition of shocks driving U.S. business cycles may have changed. If the channels through which shocks affect the economy vary across different types of shocks, then one might expect some shocks to have more persistent effects on the economy than others. This view is frequently advocated in the context of financial shocks, based on the evidence of Reinhart and Rogoff (2009a) and Jorda, Schularick and Taylor (2011) that financial crises have historically been associated with longer-lived downturns than typical recessions. Second, policy responses to business cycles may have changed. In the context of the Great Recession, one can point to a monetary policy response which has been severely constrained by the zero bound on nominal interest rates and fiscal policy turning increasingly contractionary since 2010. Third, the economic mechanisms via which shocks propagate through the economy (propagation mechanisms) may have changed. This view would imply that the same shocks which generated little unemployment persistence in the U.S. economy of the 1980s may now have much longer-lived effects. We address each of these potential explanations in turn.

With respect to a changing composition of shocks, a common interpretation is that most post-WWII recessions were driven by the Federal Reserve's desire to clamp down on inflation, leading to rapid recoveries once interest rates were loosened, while recent recessions have been driven by financial factors which could inherently have longer-lived effects. While the historical evidence is certainly consistent with financial crises being associated with slow recoveries (e.g. Reinhart and Rogoff 2009a), this correlation does not tell us whether financial shocks *cause* slow recoveries or whether other factors are responsible for both a higher prevalence of financial shocks and gradual recoveries. To assess whether the relationship is causal, we compare the persistence of unemployment after financial shocks, identified as in Gilchrist and Zakrajsek (2012), to the unemployment persistence after monetary policy shocks, identified as in Romer and Romer (2004), and find no meaningful difference between the two. Historical decompositions further suggest that while these financial shocks contributed significantly to the rise in unemployment during the 2001 and 2007 recessions, they cannot account for the persistence in unemployment observed in each recession. Thus, our empirical evidence does not support the argument that financial shocks, as a source of recent business cycles, can explain the rising unemployment persistence in the U.S.

The second explanation is that changing policy responses to business cycles are responsible for the rising unemployment persistence, with the zero bound on interest rates and a turn toward fiscal austerity being the sources of contractionary monetary and fiscal policies respectively in the Great Recession. We construct for each recession the monetary policy deviations from an average response function conditioning on the Fed's real-time beliefs about economic conditions following Romer and Romer (2004), which allows us to quantify the extent to which monetary policy was unusually expansionary or contractionary in recent recessions (including during the zero bound period) relative to the pre-1990 average. We perform a similar exercise for fiscal policy, using changes in the cyclically adjusted federal budget balance as a share of potential GDP to quantify the extent to which fiscal policy was unusually expansionary or contractionary in each of the last three recessions relative to pre-1990 recessions. We can then quantify the contribution of the stance of monetary and fiscal policies on unemployment in each recession, using the estimated

response of unemployment to monetary policy shocks and assumptions about fiscal multipliers for monetary and fiscal policies respectively.

For the 1990 recession, we show that both monetary and fiscal policy were relatively contractionary and that, while these cannot account for the delayed peak in unemployment rates during this recession, unemployment rates would have declined much more rapidly if monetary and fiscal policies had followed their pre-1990 cyclical behaviors. Thus, policy responses can explain most of the inertia in unemployment rates during the 1990 recession. During the 2001 recession, while fiscal policy was initially expansionary relative to pre-1990 recessions and monetary policy was typical, both policies became relatively contractionary two and a half years after the start of the recession, contributing around one-third of the excess persistence in unemployment relative to historical recession patterns. Finally, in the Great Recession, both monetary and fiscal policies were initially quite expansionary by historical standards, yielding an unemployment rate that was approximately 1 percentage point lower in 2009 than would have been the case under pre-1990 policies. But with the onset of the zero bound on interest rates in December 2008 and the reduction in cyclically adjusted deficits starting in mid-2009, both policies turned increasingly contractionary relative to historical patterns, pushing the unemployment rate 1.5 percentage points higher than it would have at the end of 2011 under pre-1990 policies. Hence, fiscal and monetary policies clearly contributed to the unusually high persistence in unemployment during the Great Recession, as they did with the 1990 and 2001 recessions. Yet much of the excess persistence in unemployment relative to historical recessions remains unexplained.

We therefore turn to the third class of explanations: changes in the propagation mechanisms of the economy. Because the range of factors which can affect the propagation of shocks is vast, we use the four stylized facts from the Great Recession—the missing disinflation, the rise in long-term unemployment, the declining convergence rate in regional labor markets, and the changing cyclicalities of disability claims—as guideposts in selecting possible candidate explanations. For example, much of the recent discussion of the missing disinflation has centered on downward wage rigidity, which in a low inflation environment can hinder the downward adjustment of real wages needed to facilitate the adjustment of labor markets during economic downturns. Proponents of this view point to the fact that since the early 1980s a rising share of workers experienced no annual change in wages. But if downward wage rigidity is to hinder the downward adjustment of wages during a downturn, one would expect to find a larger increase in the incidence of zero wage changes during recent recessions than in the past, a feature which we document is absent in the data. More broadly, for wage rigidities to be the source of the missing price disinflation, one would expect to see a missing wage disinflation as well, whereas no such pattern can be found in the data. Hence, downward wage rigidities appear an unlikely source of the missing disinflation or the rising persistence in U.S. unemployment.

Since downward wage rigidities are unlikely to be the source of the missing disinflation or the rising persistence in U.S. unemployment, we consider instead three alternative potential explanations. Inspired by the declining rate of convergence in regional labor markets, the first possibility we consider is the declining rate of labor mobility in the U.S. Low mobility can delay the adjustment of regional labor markets (Blanchard and Katz 1992) and could lead to lower quality job matches, thereby potentially inducing firms to defer hiring after recessions in the presence of hiring/firing costs. The second possible explanation is the aging of the U.S. workforce. Older workers who lose their jobs tend to be unemployed for longer periods of time than younger workers, also in part because older workers may be more resistant to wage cuts, occupational changes, or geographic relocations (GAO 2012). Another mechanism is that older unemployed workers, particularly high-tenured displaced workers, are more likely to have obsolete

skills that require retraining, which is particularly costly given their shorter remaining working years. Hence, an aging workforce could potentially be a factor behind the rising persistence of unemployment. The third explanation we consider is a cultural one, inspired by the rising cyclicalness of disability claims and larger share of long-term unemployment. Surveys over the last thirty years reveal, for example, that Americans increasingly find it justifiable to claim government benefits for which one does not qualify. These surveys also reveal increasingly cynical interpretations of others' motives, and more broadly a decline in social trust. These changing social mores could naturally explain rising shares of long-term unemployment and increases in disability claims during downturns as well as more persistence in overall unemployment rates.

These explanations are potentially consistent not only with the time series variation in unemployment persistence in the U.S. but also the earlier cross-country differences in labor market outcomes from the 1980s. For example, the U.S. population in 1981 was unusually mobile and had a demographic composition much more heavily tilted toward the young than any of the countries in Western Europe. The U.S. also stood out among developed countries in terms of many of its cultural mores, including high levels of social trust. The falling U.S. labor mobility rate, the aging of the U.S. population and the decline in Americans' social trust over the last thirty years all represent, therefore, a movement toward West European characteristics of the early 1980s in the same way that the rising persistence of U.S. unemployment recalls the Euroclerosis experience.

Can the evolution of these characteristics account for the rise in U.S. unemployment persistence? Answering this question requires a quantitative estimate of how changes in each of explanatory variables are related to unemployment persistence. Because of the gradual evolution of each over time, there is little possibility of extracting such estimates from U.S. time series. Instead, we return to the cross-section experience of the 1980s to help quantify these effects. Specifically, we build a new dataset of *regional* labor market outcomes across twelve West European countries, the U.S. and Canada from 1970 to 1990, from which we construct regional measures of unemployment persistence—or degree of hysteresis in the terminology of Blanchard and Summers (1986). Regional data provide much wider cross-sectional variation than either time series or cross-country analysis, thereby allowing us to quantify the contribution of each explanation to unemployment persistence. For example, this regional variation captures the high hysteresis in the south of Belgium compared with the low level of hysteresis in the north of Belgium, along with the well-known variation in labor market outcomes between the north and south of Italy. We show that the average within-country labor market variation is as large as the variation across countries, so this strategy dramatically expands our ability to study the sources of European hysteresis. We also document a systematic positive link between the degree of aggregate hysteresis in unemployment and the extent to which regional disparities in unemployment within a country increased over the course of the 1970s and 1980s, further justifying our focus on regional variation in labor market outcomes.

To be able to isolate the causal effect of mobility, demographics and culture on regional unemployment outcomes, we integrate into our data a wide range of predetermined regional controls circa 1970 designed to capture in a reduced form the many factors which could affect regional hysteresis levels. These include, among others, income per capita levels, years of schooling, female employment shares, urbanization rates, and the sectoral composition of employment. We also construct regional measures of our key explanatory variables: labor mobility, age structure of the population, and levels of trust. The combination of detailed regional controls with country fixed effects that capture the effects of aggregate policies and institutions therefore allows us to isolate the quantitative effects of mobility, demographics and trust on regional hysteresis.



While regional mobility rates display a mild negative unconditional correlation with hysteresis levels, we find no evidence that higher mobility is associated with lower unemployment persistence once controls (regional and/or aggregate) for other factors are included. This result is robust to a variety of checks and strongly suggests that the rising persistence in U.S. unemployment cannot be explained through declining labor mobility. Second, we find that, *ceteris paribus*, a higher share of older workers relative to younger workers is generally associated with less hysteresis, the opposite of the effect needed to explain the rising persistence of U.S. unemployment through demographic effects. Third, we document a systematic negative correlation between regional levels of trust and unemployment persistence, even after regional controls and country fixed effects are included. Only this last result goes in the direction needed to account for the rise in U.S. unemployment persistence.

With these estimated effects of each channel on unemployment persistence, we can then quantify how much of the rise in unemployment persistence could potentially be accounted for through these propagation mechanisms. We find that the decline in trust in the U.S. can account for all of the rise in unemployment persistence observed since the 1980s. However, once we also incorporate the aging of the U.S. population, the latter yields even larger predicted declines in persistence, so that the net effect from all three explanations combined predicts a reduction in unemployment persistence since the 1980s rather than an increase.

We interpret our results as supporting the idea that “jobless recoveries” are likely to remain a prominent feature of future U.S. business cycles since the high persistence in U.S. unemployment after the Great Recession appears to be a continuation of previous trends rather than accounted for by special factors such as the financial crisis. While we cannot pin down a unique factor which explains the rising propagation of shocks in the U.S., this feature of the data may require some rethinking of optimal countercyclical policies. In particular, if we can expect future business cycles to be much more long-lived events than the V-shaped recessions that characterized much of the post-WWII period, then discretionary fiscal policy responses might need to be more focused on longer-lived investment projects than the transitory transfer payments that have become common in recent stimulus packages.

The structure of the paper is as follows. Section 2 documents the rising persistence of U.S. unemployment. Section 3 investigates whether this rising persistence can be explained—in whole or in part—by financial shocks or policy responses. Section 4 considers possible propagation mechanisms while section 5 quantifies the effects of our suggested mechanisms. Section 6 concludes.

## **II The Rising Persistence of U.S. Unemployment**

A useful starting point for characterizing the changing persistence of U.S. unemployment is to compare the Great Recession with the twin recessions of the early 1980s. The recession that began in 1980 was a watershed event for advanced economies. For the U.S., the twin recessions—induced by the Volcker disinflation policy—generated the largest increase in unemployment since the Great Depression, led to a persistent decline in inflation, and were ultimately followed by the Great Moderation, a twenty-five year period of relatively stable macroeconomic outcomes. In contrast, many European countries experienced a similarly large increase in unemployment over the course of 1980s, but whereas the rise in unemployment in the U.S. was completely undone by the mid-1980s, unemployment in many European countries persisted at exceptionally high levels beyond the 1980s. This high persistence in unemployment, referred to as

hysteresis among economists since Blanchard and Summers (1986) or Eurosclerosis among a broader audience, has been a scourge for many European policymakers since.<sup>2</sup>

Panel A of Figure 1 plots unemployment rates in the U.S. during the Volcker recession and thereafter relative to 1979. The unemployment rate rose nearly four percentage points by 1982 and 1983, but then declined sharply thereafter. The near-symmetry in unemployment rates during this period is striking, with unemployment declines in the years after the Volcker recession being nearly as rapid as the rise during the recession. The figure also plots the average rise in unemployment rates for West European countries. The rise in unemployment was of approximately the same size and speed as in the U.S. with a rise of nearly four percentage points by 1983. But whereas U.S. unemployment fell sharply after 1983, unemployment in Europe stayed persistently high, approximately three to four percentage points higher than in the late 1970s nearly a decade after the start of the recession.

Panel A also plots the unemployment rate in the U.S. during the Great Recession. The initial rise in unemployment exceeds that of the 1980s recession in both the U.S. and W. European countries by about one percentage point. But the more striking difference is the absence of a strong decline in unemployment in the U.S. since the peak in unemployment. This asymmetry in the response of unemployment during the Great Recession represents a sharp contrast with the U.S. experience of the 1980s, at least so far. From 2012 onwards (4 years into the recession), the figure also shows the projected path of unemployment from the Survey of Professional Forecasters, which implies only a very gradual decline in unemployment with much more persistence in unemployment than occurred in the U.S. in the early 1980s. Furthermore, some of the recent decline in unemployment has been driven not by rising employment but rather by declining labor force participation. Broader measures of employment in the U.S. like employment to population ratios suggest even less improvement in labor markets than the unemployment rate since the height of the recession (e.g. Erceg and Levin 2013). The figure suggests the U.S. recovery from the Great Recession is therefore approximately mid-way between the U.S. recovery in the 1980s and that of Western Europe over the same period.

The labor market recovery following the Great Recession appears anemic not only compared to the recessions of the early 1980s but also compared to most recessions of the post-World War II era. Panel B of Figure 1 illustrates this by plotting the average path of the unemployment gap (the unemployment rate minus the CBO's estimate of the long-run natural rate of unemployment) across U.S. recessions from the 1948 recession up to and including the 1981-82 recession, relative to the unemployment gap prior to the start of each recession and normalized by the maximum rise in the gap during each recession (to control for difference in size of recessions).<sup>3</sup> In the average recession until the 1980s, unemployment peaked approximately one year after the start of the recession and had returned to the natural rate within four years of the start of the recession. Within one year of the peak rise in unemployment, approximately half of the rise in the unemployment gap had been undone. In contrast, the peak in the unemployment rate during the Great Recession did not occur until two years after the start of the recession. Furthermore, in the two years following the peak rise in the unemployment gap during the Great Recession, only about one-fourth of the rise in unemployment was undone. Thus, the persistence in unemployment, both in terms of the length of

---

<sup>2</sup> While the term “hysteresis” is sometimes used narrowly to refer only to cases in which transitory shocks lead to permanent changes in unemployment rates, we adopt the broader interpretation of the word as characterizing long-lived changes in unemployment that need not necessarily be permanent.

<sup>3</sup> When the recovery from one recession is interrupted by a subsequent recession, we drop all values as of the start of the new recession in constructing the average path of pre-1990 recessions.

time before the peak and then in the pace of the decline in unemployment after the peak, following the Great Recession stands in sharp contrast to most post-World War II recessions in the U.S.

However, as also illustrated in Panel B of Figure 1, the labor market recovery following the Great Recession looks much less exceptional when compared to the 1990 and 2001 recessions. In each of these cases, unemployment gaps rose for around two years, and the subsequent declines were much more inertial than those of the average pre-1990 recession. There appears to be a trend toward increasingly inertial labor market recoveries over time, with the 2001 recovery being more inertial than the 1990 recovery and the Great Recession recovery in turn being more inertial than the 2001 recovery. Thus, while the labor market recovery following the Great Recession stands out relative to those recessions before 1990, it is not much more inertial than the “Jobless Recoveries” of 1990 and 2001. This suggests that there is likely a common cause to the high persistence in unemployment in all three recessions and that explanations for the high persistence in unemployment following the Great Recession which do not also apply to the 1990 and 2001 recessions are unlikely to be fully satisfactory. Indeed, in section 4.1, we document several other features of the Great Recession which stand out relative to most post-WWII recessions but which were also present in the 1990 and 2001 recessions, consistent with the presence of common factors underlying the high unemployment persistence in each recession.

As a third metric for assessing the changing persistence of unemployment in the U.S., we consider rolling autoregressive estimates of the unemployment rate. Specifically, starting in 1980Q1 and iterating forward until 2013Q2, we estimate an AR(2) model for the quarterly unemployment rate over the previous 30 years.<sup>4</sup> Panel C of Figure 1 reports the estimated sum of the two autoregressive coefficients along with one-standard-error band over time. The point estimates range from a low of approximately 0.92 in the sample ending in 1980Q1 to a high of 0.97 in the sample ending in 2011Q3.<sup>5</sup> This is a very large difference in terms of implied dynamic responses. For example, an AR(1) process with persistence of 0.92 has a half-life of approximately 2 years while an AR(1) process with persistence of 0.97 has a half-life of over 5 years. Furthermore, the increase in estimated persistence of unemployment occurs sharply at first as we move through the early 1980s but gradually afterwards. This pattern is consistent with the recession dynamics illustrated in Panel B of Figure 1: the 1990 recession is the first instance with increased persistence of unemployment and the subsequent recessions had even more persistence in unemployment. Thus, this time series approach confirms the progressive and ultimately large increase in unemployment persistence which has occurred since the early 1980s. In short, while the Great Recession stands out relative to the 1990 and 2001 recessions in terms of its magnitude, the slow pace of recovery in unemployment appears consistent with the continuation of a trend apparent in the previous two recessions.

### **III Can Financial Shocks and Policy Responses Account for Rising UE Persistence?**

In this section, we consider two prominent explanations for the rise in U.S. unemployment persistence since the 1980s. The first is that recent business cycles have been driven by financial factors and that financial crises are, in general, associated with more persistent declines in economic activity. The second explanation

---

<sup>4</sup> An AR(2) process is a parsimonious representation of unemployment dynamics, but higher-order lags are generally insignificant.

<sup>5</sup> We can reject the null that the sum of the autoregressive parameters is equal in the 30-year period preceding 1980Q1 and the period thereafter at the 5% level. The same result obtains if we use a later breakdate such as 1986Q1. We find similar results if we use the time series of the unemployment gap, and the estimated differences in unemployment persistence are even larger, with a low of 0.90 in 1980Q1 and a high exceeding 0.96 in 2011Q3.

focuses on the response of policy-makers to business cycles, such as the inability of monetary policymakers to reduce interest rates in the face of the zero-bound.

### **3.1. Financial Shocks and the Persistence of Unemployment**

A commonly suggested reason for the delayed recovery during the Great Recession is that financial crises such as that of 2007-09 have historically been associated with more persistent economic downturns than recessions not associated with financial crises (Reinhart and Rogoff 2009a, Reinhart and Rogoff 2009b), Jorda, Schularick and Taylor 2011). While the evidence on this point is persuasive, the chain of causality is much less so. The persistence of economic downturns following financial crises could be higher than normal because financial shocks themselves lead to more persistent downturns than other shocks. But it could also reflect other underlying factors responsible for both the appearance of financial shocks and more persistent economic downturns. Romer (2013), for example, notes that there have been many more financial crises in the U.S. since the 1980s than there were in the previous thirty years, which is precisely the period during which unemployment has become more persistent. To name just one such factor, low inflation rates could lead financial firms to invest in riskier assets in a “search for yield” (since nominal rates would also be low) and simultaneously lead to more persistence in unemployment if the low rate of inflation interacted with downward nominal wage rigidities to prevent the decline in real wages needed to clear labor markets.

To assess the causal nature of this claim, i.e. whether financial shocks lead to more persistent economic downturns than other shocks, we compare the persistence of unemployment after identified financial shocks to the unemployment persistence following monetary policy shocks. We focus on monetary policy shocks in particular because these are one of the leading candidates for explaining post-World War II recessions up to and including the Volcker recessions (Romer and Romer 2004, Coibion 2012). To identify monetary policy shocks, we replicate Romer and Romer (2004) with the same sample and data and regress changes in the target Federal Funds rate decided upon at FOMC meetings on real-time information available to FOMC members through the Greenbook forecasts generated by the staff of the Board of Governors. The estimated residuals are then defined as monetary policy shocks. Impulse responses of unemployment to monetary policy shocks are constructed by regressing the unemployment rate on lags of itself and lags of the monetary policy shock. Following Romer and Romer (2004), we use 24 monthly lags of the variable and 36 lags of the monetary policy shock to estimate impulse responses at the monthly frequency which we then convert to quarterly frequency.

For financial shocks, we focus on the credit spread shocks identified in Gilchrist and Zakrajsek (2012). They construct a measure of excess corporate bond premiums from corporate spreads which has significant predictive power for economic activity and then identify exogenous innovations to excess bond premiums from a vector autoregression (VAR). The specific VAR they use includes a vector of non-financial variables, their measure of the bond premium, and a vector of other financial variables. The identifying assumption is that non-financial variables do not respond on impact to a shock to the excess bond premium whereas other financial variables do. We replace real GDP in the VAR with the level of the unemployment rate, but otherwise follow Gilchrist and Zakrajsek (2012) in using 2 lags in the VAR and data from 1973Q1 until 2010Q3.

We focus on this specific measure of financial shocks for several reasons. First, this measure is one of very few well-defined identification schemes for financial shocks. Second, this shock captures rising bond spreads associated with credit crunches, a feature thoroughly documented in Gilchrist and Zakrajsek (2012) and apparent in the financial crisis of 2007-2009. Third, changes in the excess bond premium have

strong predictive power for macroeconomic aggregates, consistent with their quantitative importance. Fourth, the macroeconomic responses to these shocks from the VAR are consistent with financial shocks being a potential source of recessions, with a rise in the bond premium being followed by pronounced declines in consumption, investment, output, inflation and interest rates.

As a first step to measuring the persistence of unemployment implied by each shock, we estimate the half-life of unemployment from each shock, defined as the number of quarters needed for the unemployment rate to reach half its maximum level. Specifically, we estimate the impulse response of unemployment to each kind of shock along with standard errors of coefficients. We then repeatedly draw from the distribution of parameters and construct impulse responses for each draw. For each set of impulse responses, we find the number of quarters after the shock that it takes for the unemployment rate to fall halfway below its peak level. Monetary policy shocks, on average, require 13 quarters before unemployment falls below half of its peak level, while financial shocks take 12 quarters on average. The 90% confidence intervals are [11,20] and [8,20] quarters for monetary and financial shocks respectively. Thus, the two sets of shocks yield very similar results for the overall persistence of unemployment.

We also construct a narrower measure of persistence which focuses only on the rate of decline of unemployment after its peak. Specifically, we estimate the impulse response of unemployment to each kind of shock along with standard errors of coefficients. We then repeatedly draw from the distribution of parameters and construct impulse responses for each draw. For each set of impulse responses, we normalize the dynamic response of unemployment by the peak rise in unemployment in that response and store the resulting normalized path of unemployment starting with the period in which unemployment peaks. This yields a distribution of responses after the peak rise in unemployment for each of the two shocks. The left figure in Panel A of Figure 2 then plots the median response of unemployment after the peak for each of the two shocks as well as the associated 90% confidence intervals. The rate at which unemployment declines after the two shocks is broadly similar: a little quicker for monetary policy shocks in the first year but much slower in the second year, so that both median responses point to unemployment returning to normal approximately 10 quarters after the period in which unemployment peaks. The confidence intervals largely overlap, so there is little statistical evidence that an average financial shock leads to more persistence (by either metric) in unemployment rates than monetary policy shocks.

The right figure of Panel A reproduces the confidence interval for unemployment responses after financial shocks and superimposes on the graph the normalized path of unemployment (after the peak rise) for the average pre-1990 recession as well as for the 2007 recession. While the average pre-1990 recession is near the middle of the distribution, the unemployment persistence following the 2007 recession is well above the 90% confidence interval of unemployment paths from financial shocks. Thus, we find that financial shocks as identified in Gilchrist and Zakrajsek (2012) do not lead to more persistent responses of unemployment than monetary policy shocks and that the persistence of unemployment since the Great Recession exceeds what one would expect from a financial shock.

Even if a typical financial shock does not lead to more persistence in unemployment than monetary policy shocks, one could still explain high unemployment persistence over recent recessions through financial shocks if the latter were themselves unusually pervasive during each period. To assess this possibility, we construct the predicted path of unemployment during the 2001 and 2007 recessions from financial shocks starting in the year prior to each recession. We then plot in Panel B of Figure 2 the path of unemployment in each recession (relative to the level in the quarter prior to the start of the recession and

normalized by the size of the peak increase in unemployment), the predicted path from financial shocks, and the unexplained component of unemployment.<sup>6</sup>

Financial shocks account for most of the initial rise in unemployment, and because of the rise in the excess bond premium at the end of 2002 and 2003 can also account for some of the persistence in unemployment over the first year after the official end of the recession. This is an example of how an unusually long sequence of financial shocks can contribute to excess persistence in unemployment even if a single shock itself does not deliver more unemployment persistence than other shocks. However, this effect was short-lived: the effect of financial shocks on unemployment is predicted to have completely dissipated by early 2004 whereas unemployment was still at 80% of its peak rise. As a result, the very gradual decline of unemployment from 2003 to 2006 is unexplained by financial shocks. A similar result obtains in the Great Recession. The credit bust accounts for half of the initial rise in unemployment, but its effects should have dissipated rapidly, so the persistence of unemployment is again unexplained. In short, our results suggest that financial shocks have no more persistent effects on unemployment than monetary policy shocks and that the excess persistence in unemployment observed in the 1990, 2001 and 2007 recessions also cannot be explained by the sequences of financial shocks in each period.

Although credit supply shocks are likely one of the leading sources of financial shocks, one could extend this analysis to other financial factors. Hall (2013), for example, suggests that equity premia, rather than bonds, are at the root of the slow recovery from the Great Recession. While there are no well-identified measures of shocks to equity risk premia (to our knowledge), we find no evidence that shocks to excess stock returns in the VAR of Gilchrist and Zakrajsek (2012) contributed to the unusual persistence of unemployment following the 1990, 2001 or 2007 recessions.

Yet another financial factor which is often raised in the context of the Great Recession is the deleveraging hypothesis, the idea that the decline in household debt to income ratio since 2007 can account for the severity of job losses incurred during the Great Recession (e.g. Mian and Sufi 2011). There are, however, several reasons to be skeptical of household deleveraging as a fundamental explanation for the rising unemployment persistence observed in the U.S. First, household deleveraging has been unusually high only in the Great Recession. This is illustrated in Panel C of Figure 2, in which we plot the evolution of household debt to income ratios in the last three recessions as well as the average across pre-1990 recessions. If household deleveraging is central to the high unemployment persistence observed in the Great Recession, one needs additional explanations to account for the high persistence in unemployment during the two previous recessions. A second source of skepticism is that the 2001 recession was followed by a leveraging up of households which mirrors the deleveraging of households during the Great Recession. Unless there are strong asymmetries in the effects of leveraging versus deleveraging, strong repercussions of changes in household leverage on unemployment would imply that we would have expected unemployment to fall sharply during the 2001 recession, in direct contrast to what actually occurred.

Asymmetric effects are, of course, possible. Indeed, theoretical models in which household deleveraging plays a large role emphasize precisely such an asymmetry occurring through the zero bound on interest rates (e.g. Eggertson and Krugman 2012). In these models, an increase in credit constraint on borrowers forces them to reduce their consumption, inducing an economic downturn and a decline in inflation via nominal rigidities. When nominal interest rates are fixed at the zero bound, the decline in

---

<sup>6</sup> We omit the 1990 recession from the figure because financial shocks did not contribute to raising unemployment. In the case of the 2007 recessions, financial shocks are not available after the third quarter of 2010. However, given the decline in bond spreads since then, it is unlikely that extending the excess bond premium series would significantly alter the results.

inflation raises real interest rates, which further reduces output and inflation. This deflationary spiral mechanism can lead to large and persistent declines in activity. There are thus two source of asymmetries present in these models. First is the absence of countercyclical monetary policy. Second are the feedback effects from the absence of countercyclical monetary policy into inflation expectations, leading to a deflationary mechanism which amplifies and propagates the initial impulse. This feedback effect through the expectations channel is, however, at odds with several features of recent years. First, neither inflation nor inflation expectations have fallen significantly since 2008 so the deflationary mechanism does not appear to have been operating in a meaningful way during the Great Recession. Second, Bachmann, Berg and Sims (2013) find no evidence that households with higher inflation expectations want to purchase more, holding other household characteristics and beliefs constant. Third, Wieland (2012) considers three additional and distinct tests of the expectations channel underlying the deflationary spiral and finds no empirical evidence for this channel, casting doubt on the primary mechanism through which very non-linear effects of the ZLB could arise. While these three pieces of evidence do not support the deflationary spiral mechanism, the absence of countercyclical monetary policy at the ZLB is still a source of asymmetry. In the next section, we therefore consider whether differences in monetary or fiscal policy responses to the 1990, 2001 and 2007 recessions can account for the rising persistence in U.S. unemployment.

### **3.2. The Contribution of Monetary and Fiscal Policies to Rising Unemployment Persistence**

Since financial shocks seem unable to account for the rising persistence of unemployment experienced by the U.S. since the 1980s, we turn to a second factor often suggested: differences in policy responses. We focus on both monetary and fiscal policies. For monetary policy, we again follow the approach of Romer and Romer (2004) after extending their dataset to December 2012.<sup>7</sup> We estimate the same reaction function as Romer and Romer (2004) until December 2008 when the zero bound on interest rates became binding. We interpret the reaction function as capturing the average or systematic response of the Federal Reserve to real-time economic conditions, and the residuals as the innovations to monetary policy. We then construct the cumulative sum of residuals for each recession since 1969 as a measure of unusual monetary policy actions taken in each recession. We plot the resulting series for the 1990, 2001, and 2007 recessions as well as the average across pre-1990 recessions in the left-hand graph of Panel A in Figure 3.

Monetary policy shocks averaged out in the first 12 months of the pre-1990 recessions, but thereafter interest rates progressively fell by two percentage points more than would have been expected given economic conditions. While we observe a similar pattern of shocks averaging out to zero over the first twelve months of the 1990 and 2001 recessions, differences arise thereafter. In the 1990 recession, monetary policy shocks continue to average around zero, such that monetary policy ultimately was two percentage points more contractionary than during the average pre-1990 recession. The 2001 recession is similar, except that monetary policy averaged an extra half-percentage points above and beyond what would have been expected from economic conditions. Hence, monetary policy in both the 1990 and 2001 recessions was more contractionary than in previous recessions.

For the Great Recession, we observe a more rapid decline in interest rates over the first twelve months than expected from economic conditions, leading to a cumulative decline in interest rates of one percentage below the experience in other recessions. Thus, through December 2008 when the zero-bound became binding, monetary policy was unusually expansionary. To construct monetary policy shocks after

---

<sup>7</sup> Forecasts from January 1997 to December 2007 are from the Greenbooks. However, because more recent Greenbooks have not yet been released by the Board of Governors, we use forecasts from the Blue Chip Survey of Forecasters starting in 2008.

2008, we construct a predicted path of interest rates for FOMC meetings starting in January 2009 under the assumption that the Federal Reserve would have followed the estimated reaction function in subsequent periods absent the ZLB. From this sequence of predicted rates, we define the shocks each month as the negative of the FFR changes that would have been decided upon had monetary policy-makers been free to lower interest rates further. This leads to the sequence of shocks plotted in the figure, which point toward a dramatic and continuing sequence of contractionary monetary policy shocks as the economy continued to deteriorate but monetary policymakers were unable to implement traditional monetary policy responses. Our estimates imply that the inability to lower interest rates starting in 2009 led to a sequence of monetary policy shocks summing to over 3 percentage points over a two-year period.

To assess differences in the stance of fiscal policy, we focus on changes in the cyclically adjusted Federal budget balance normalized by potential GDP. Cyclically adjusted balances are needed to control for automatic changes in spending and revenues as business cycle conditions change. We normalize these measures by potential GDP (rather than actual GDP) because this normalization is largely insensitive to business cycle conditions. We plot the changes in cyclically adjusted balances relative to their levels in the quarter prior to the start of each recession in the right-hand side graph of Panel A in Figure 3. As with monetary policy measures, we present these responses for the 1990, 2001 and 2007 recessions as well as an average across pre-1990 recessions.

The average pre-1990 recession is characterized by little change in the cyclically adjusted budget balance over the first year of the recession, after which a 1-1.5 percentage point decline in the budget balance occurs and is maintained over the subsequent two years. During the 1990 recession, there was a sharp increase in the budget balance over the first few quarters of the recession which was sustained relative to the pre-1990 recessions for the next two years. Ten quarters after the start of the recession, there was a second and sustained increase in the budget balance leading to a 3% point gap between the budget balances after the 1990 recession and pre-1990 recessions. Hence, fiscal policy was distinctly more contractionary in the 1990 recession than the average over previous recessions. In contrast, both the 2001 and 2007 recessions were followed by significant increases in cyclically adjusted deficits, approximately 4% points of potential GDP after two years. In both cases, these deficits were gradually reduced over the subsequent two years.

To quantify how policy responses may have contributed to rising unemployment persistence, we construct counterfactual paths of unemployment in which monetary and fiscal policies are set equal to the pre-1990 averages. We proceed as follows. For monetary policy, we estimate the impulse response of unemployment to monetary policy shocks (using the extended sample of shocks from 1969-2008) with 24 monthly lags of unemployment and 36 lags of monetary policy shocks, as in Romer and Romer (2004). For each of the 1990, 2001 and 2007 recessions, we use these estimated impulse responses to predict the path of unemployment coming from the difference in monetary policy shocks between each of these recessions and the pre-1990 recessions, which constitutes the contribution of “unusual” monetary policy to unemployment in each recession. These contributions are plotted in Panel B of Figure 3 for each of the three recent recessions. For example, the fact that monetary policy was more contractionary during the 1990 recession than during pre-1990 recessions points to a cumulative increase in unemployment over the course of the recession and beyond, ultimately pushing the unemployment rate approximately 0.70 percentage points higher four years after the start of the recession than it would have been had policy followed the same path as in pre-1990 recessions. Monetary policy similarly contributed to higher unemployment after the 2001 recession, albeit by less than in the 1991 recession. The zero-lower bound, on the other hand, is estimated to have contributed much more to unemployment in the Great Recession, adding approximately



1.5 percentage points to the unemployment rate after four years. Note that this increase in unemployment is estimated not to have begun until two years after the recession, which reflects the fact that the zero-bound was not reached until one year into the recession and that monetary policy shocks have delayed effects on economic activity, including unemployment rates. Thus, for each recession, monetary policy contributed to the persistence of unemployment relative to pre-1990 recessions by raising unemployment rates two years after the start of each recession.

To quantify the contribution of fiscal policy, we follow a simpler approach and assume instantaneous effects of changes in the cyclically adjusted fiscal balance on output growth, with a dollar multiplier of 1.5. This follows Auerbach and Gorodnichenko (2012) who document business cycle variation in the government spending multiplier, with multipliers being significantly higher in downturns than during expansions. A multiplier of 1.5 is also in line with a number of studies which estimated multipliers specifically during the Great Recession, including e.g. Romer and Bernstein (2009), Blanchard and Leigh (2012), and Nakamura and Steinsson (2011). The results are again presented in Panel B of Figure 3. For the 1990 recession, the fact that the cyclically adjusted balance was approximately 1% point higher (in terms of potential GDP) than in pre-1990 recessions leads to a prediction of a 0.5% point higher unemployment rate over the first two years, before rising to 1% point higher as the cyclically adjusted balance increased further relative to the pre-1990 recession. For the 2001 recession, the fact that the cyclically adjusted balance was significantly more expansionary than the pre-1990 average yields an unemployment rate lower by almost a full percentage point over much of the four-year period following the start of the recession. In the case of the Great Recession, the large decline in the cyclically adjusted balance over the first two years of the recession is predicted to have lowered unemployment by nearly a full percentage point, but this was almost completely reversed within the next two years as the cyclically adjusted balance converged back toward the pre-1990 average. Thus, as with monetary policy, fiscal policy likely contributed to higher persistence in unemployment by raising unemployment rates in later years of each recession episode relative to pre-1990 fiscal policies.

Can these effects quantitatively account for the increased unemployment persistence observed in Figure 1? We construct counterfactual paths of unemployment for each recession assuming that both monetary and fiscal policies had followed their pre-1990 averages. We then present in Panel C of Figure 3 the original dynamics of unemployment (normalized by predicted peak levels) as well as the counterfactual dynamics of unemployment (normalized by counterfactual peak levels) in which monetary and fiscal policies are held at their pre-1990 average responses. For the 1990 recession, monetary and fiscal policies can account for much of the excess persistence in unemployment. Four years after the recession, for example, unemployment with pre-1990 fiscal and monetary policies is predicted to have been even lower than in pre-1990 recessions. However, adjusting for fiscal and monetary policies cannot account for the delayed peak in the unemployment rate. The latter also obtains for both the 2001 and 2007 recessions. However, the rate of decline in unemployment after the peak is significantly faster once one accounts for the differences in monetary and fiscal policies: in each case, unemployment four years after the start of the recession is at 40% of the peak level after controlling for policy differences, whereas actual unemployment rates had only fallen to approximately 60% and 70% of peak levels in the 2001 and 2007 recessions respectively. Thus, unusually contractionary monetary and fiscal policies in the years following the official ends of each recession appear to have played an important role in generating lackluster recoveries in employment, explaining approximately one-third of the excess unemployment persistence.<sup>8</sup>

---

<sup>8</sup> This conclusion is qualitatively not altered if we use measures of total government employment rather than federal budget balances to compare historical responses of fiscal policy. In Panel A of Appendix Figure 1, we show that the

However, there are several reasons to think this is likely an upper bound on the contribution of policy differences to rising unemployment persistence. First, there is evidence that monetary policy shocks have smaller effects than normal in economic downturns (Tenreyro and Thwaites 2013), which would imply that we could overstate the effects of the unusually contractionary monetary policy responses in the 1990, 2001 and 2007 recessions. Second, monetary policymakers in the Great Recession have undertaken a number of non-traditional actions—such as quantitative easing and forward guidance—which we do not attempt to quantify but which likely contributed modestly to the economic recovery. Third, we assume fairly large fiscal multipliers. While there is significant evidence that government spending multipliers are larger than normal during downturns, it is not clear whether these multipliers should apply two to four years after the start of the recessions.<sup>9</sup> Lower multipliers in the later stages of economic recovery periods would tend to lower the contribution of fiscal policy to unemployment persistence. Thus, while monetary and fiscal policy differences over time have almost certainly played an important role in accounting for the rising persistence of U.S. unemployment, much of the rise in unemployment persistence remains unexplained.

#### **IV What Propagation Mechanisms May Have Changed Over Time?**

Given that neither financial factors nor policy responses can fully account for the rise in unemployment persistence, we turn to factors which determine how long-lived the effects of an economic shock of a given size are, i.e. propagation mechanisms. While one can entertain a very broad spectrum of possibilities, we present some additional facts about how the U.S. economy has changed in recent decades to discipline our choice of potential propagation mechanisms. We emphasize four potentially related facts: the declining sensitivity of inflation to real economic conditions, the rising importance of long-term unemployment, the decline in regional labor market convergence, and the changing cyclicity of disability claims. One potential explanation for these facts is downward wage rigidity, but we provide new evidence that this explanation is unlikely to lie at the root of these facts. So we suggest and document other propagation mechanisms which might account for these stylized facts and the rising persistence of unemployment.

##### **4.1. Other Changing Features of the U.S. Economy**

We consider four characteristics of the Great Recession which have received a lot of attention. In each case, we show that these features are not unique to the Great Recession but rather are a continuation of ongoing trends visible in the 1990 and 2001 recessions as well. These specific characteristics of the Great Recession are also particularly notable because they recall stylized features of the European unemployment

---

evolution of total government employment (relative to population) after each recession yields similar conclusions about the relative stance of fiscal policies across recessions. In Panel B of Appendix Figure 1, we plot the counterfactual normalized path of unemployment in the 2007 recession assuming pre-1990 monetary and fiscal policies, but using government employment for the fiscal policy stance. We assume that changes in government employment affect private employment by a factor of 0.5, such that total employment rises by 1.5 when government employment rises by 1, similar to our assumption of fiscal multipliers of 1.5. The results point to a slightly larger decline in unemployment after the 2007 recession than in our baseline. This reflects the fact that government employment shrank more sharply after 2009 than did cyclically adjusted deficits. But because total government employment measures are not adjusted to control for the size of the downturn, total changes in government employment in the 2007 recession likely overstate the discretionary changes in fiscal policy.

<sup>9</sup> Appendix Figure 2 plots the normalized counterfactual unemployment paths in each recession in which we assume a fiscal multiplier of 0.5 instead of 1.5 when setting policy responses equal to pre-1990 averages. The results are qualitatively similar to our baseline, albeit with somewhat smaller policy contributions, so that the results do not appear overly sensitive to assumptions about the fiscal multiplier.

experience of the early 1980s, at least qualitatively, and are significant departures from U.S. behavior over the same period.

First is the well-known case of the “missing disinflation,” the fact that large output gaps of the Great Recession should have led to much larger declines in inflation than what was actually observed (Ball and Mazunder 2011, Hall 2013). We illustrate this notion in the two figures of Panel A in Figure 4 using an expectations-augmented Phillips curve. We present a scatter plot of the quarterly unemployment rate gaps (deviations from CBO estimate of long-term unemployment) against inflation net of inflation expectations. In the left panel, we model inflation expectations as backward looking, using the average over quarterly inflation rates in the previous four quarters. In the right panel, we use a forward-looking measure of inflation expectations, the median forecast of inflation in the subsequent quarter from the Survey of Professional Forecasters. In each case, we can see that many of the observations since 2008 have displayed unusually high levels of inflation relative to expectations given the high levels of unemployment. Since this result obtains with professional forecasts and not just backward looking expectations, the missing disinflation remains puzzling even after accounting for the anchoring of expectations that has occurred since the 1990s.

For both measures of inflation expectations, we plot the average slope of the relationship between inflation net of expectations and unemployment for two sub-periods: the period up to the mid-1980s and the mid-1980s until immediately before the Great Recession. In each case, we observe a decline in the slope of the Phillips curve over time, such that there is little missing disinflation left during the Great Recession using the estimated slope of the Phillips curve from the mid-1980s on. This suggests that there has been a gradual decline in the slope of Phillips curve which has been ongoing since the early to mid-1980s. Appendix Figure C3 confirms this through rolling regressions of the slope of Phillips curve. The missing disinflation therefore, need not be interpreted as a puzzle which is unique to the Great Recession, but rather as part of a broader trend toward a declining sensitivity of U.S. inflation toward real economic activity which has been occurring since the early 1980s. Furthermore, missing disinflation was also noted as a puzzling feature of the West European experience of the early 1980s (Blanchard and Summers 1986), which suggests that there may be a systematic link between unemployment persistence and how strongly inflation responds to changes in economic activity.

A second feature of the Great Recession which has received much attention is the rise in long-term unemployment. The share of long-term unemployed (27 weeks and over) was less than twenty percent in the first quarter of 2007 but climbed as high as 45% of all unemployed in the second quarter of 2010, a feature which recalls the rise of long-term unemployment in many West European countries in the early 1980s (Machin and Manning 1999). In contrast, the share of the long-term unemployed in the U.S. during the early 1980s peaked at only 26% in the second quarter of 1983.

In the left graph of Panel B in Figure 4, we plot quarterly U.S. output gaps (log deviations of real GDP from the CBO measure of potential GDP) against quarterly unemployment rates. The striking feature of this figure is that the relationship between output gaps and total unemployment has remained remarkably stable over time, with no difference in slope across subsamples, and with the rise in unemployment during the Great Recession being entirely in line with previous episodes given the size of the decline in the output gap (see also Ball, Leigh, and Loungani 2012). In the right graph of Panel B in Figure 4, we plot the equivalent historical relationships between the output gap and the long-term rate of unemployment. Unlike with total unemployment rates, the Great Recession stands out in terms of how high long-term unemployment rates have been relative to the size of the output gap. But as with the missing disinflation, this pattern was already evident in the 1990 and 2001 recessions, with the slope of the relationship between

long-term unemployment and output gaps having become much steeper even prior to the Great Recession. Note that we illustrate this pattern using nonlinear (exponential) slopes because long-term unemployment rates do not fall much as output gaps become increasingly positive but a similar pattern obtains if we use linear relationships and restrict observations to those with negative output gaps. As with the missing disinflation, the puzzle of high long-term unemployment during the Great Recession is therefore much reduced if one compares it to the experience since the early 1980s, which again suggests that the unusual features of the Great Recession largely appear to be a continuation of longer-term trends in U.S. business cycle behavior but made more visible by the sheer size of the recent recession.

A third unusual property of the Great Recession relative to traditional U.S. recessions lies in the behavior of regional U.S. labor markets. As noted in Blanchard and Katz (1992) for the Volcker recession, changes in unemployment across states in the years after 1982 were systematically negatively correlated with the magnitude of the rise in unemployment over the prior years. Blanchard and Katz argued that the high degree of labor mobility in the U.S. led workers to move from high unemployment regions to low unemployment regions, thereby facilitating the adjustment of the labor market in the U.S. In contrast, Decressin and Fatas (1995) documented that the adjustment of European regional labor markets to regional shocks was not characterized by the same degree of regional mobility, leading to more persistence in unemployment rates. Panel C of Figure 4 illustrates the relationship between the initial rise in unemployment from 1979 to 1982 and the subsequent decline in unemployment rates between 1984 and 1982 for U.S. states emphasized by Blanchard and Katz (1992).<sup>10</sup> Like them, we find a strong negative correlation between the initial rise in unemployment and the subsequent change in unemployment. But when we replicate this analysis during the Great Recession, using the change in unemployment from 2007 to 2010 relative to the change between 2012 and 2010, we find a much weaker relationship between the two (the difference in slopes across samples is significant at the 10% level), with the slope of the relationship being cut in half since the mid-1980s: regional convergence in labor markets during the Great Recession has been significantly slower than what was experienced in traditional recessions. But as with the missing disinflation and the rising share of long-term unemployment, this characteristic is not unique to the Great Recession but was already visible in previous recessions. To see this, we also plot the equivalent state-level increases in the first two years of the 1990 and 2001 recessions against the subsequent declines in unemployment. For both recessions, the slope of the relationship is indistinguishable from that of the Great Recession. Hence, the slow convergence in regional labor markets during the Great Recession appears to be in line with that experienced in the previous two recessions.

Finally, we consider the behavior of disability claims over the cycle. A well-known fact is that Social Security disability claims have spiked during the Great Recession, with the ratio of claimants to insured workers rising by 30% from 2007 to 2010. This is particularly striking because, during the early 1980s, disability claims also went up dramatically in many West European countries, whereas no such rise occurred in the U.S. (Emerson and Dramais 1988). While the absence of a rise in disability claims in the U.S. in the early 1980s likely reflected in part policy changes designed to reduce the incidence of disability claims (Autor and Duggan 2003), there was no strong relationship between disability claims per 1,000 insured workers and unemployment prior to these policy reforms either. For example, between 1972 and 1973, disability claims per 1,000 insured workers rose 10 percent while the unemployment rate fell from 5.6 to 4.9%. Then, during the subsequent recession, as the unemployment rate spiked from 5.6% in 1974 to 8.5% in 1975, disability applications per 1,000 insured workers fell seven percent. Panel D of Figure 4

---

<sup>10</sup> Wisconsin is a larger outlier because its unemployment rate rose sharply between 1982 and 1983 rather than peaking in 1982, so it is not included in the Figure for the 1982 recession.

plots all annual changes in disability claims per 1,000 insured workers against annual changes in unemployment rates from 1965 to 1985 and confirms that there was little cyclical in disability claims during this early period, in sharp contrast to the European experience described in Emerson and Dramais (1988).

In contrast, disability claims per insured workers have been strongly countercyclical since then. Panel D of Figure 4 illustrates a strong positive correlation between annual changes in disability claims and annual changes in unemployment rates from 1986 to 2007, as noted in Duggan and Imberman (2009). Annual changes in disability since 2008 have been almost completely predictable given annual changes in unemployment over this period, when using the relationship between the two from 1986 to 2007.<sup>11</sup> Hence, once again, the experience of the Great Recession appears to have very closely followed that of the 1990 and 2001 recessions, but for the scale of the crisis.

Jointly, these four changing properties of the U.S. economy conform in timing to the rising U.S. unemployment persistence documented in section 2. Each also represents a growing qualitative similarity with the West European experience of the 1980s, in which very high levels of unemployment persistence were a defining characteristic. This gradual evolution in some of the properties of the U.S. labor market and business cycle more broadly, which increasingly resembles well-documented patterns from the Western European experience of the 1980s, suggests that the underlying explanation is likely to be rooted in slow-moving fundamental factors driving up the propagation of economic shocks rather than some of the unique forces at work during the Great Recession. To explore this possibility, we turn to some of the possible underlying forces which could potentially account for this evolution in U.S. business cycle properties.

#### **4.2. Can Downward Wage Rigidities and Low Inflation Rates Explain These Patterns?**

One potential source of additional propagation has been extensively discussed in conjunction with the missing disinflation, namely a combination of downward wage rigidities and low inflation rates. Since at least Tobin (1972), economists have recognized that wages tend to be downwardly rigid, as employees chafe at nominal wage declines, and that in a low inflation environment, downward wage rigidity can prevent declines in real wages from occurring during downturns, potentially leading to unusually high and persistent unemployment. The absence of wage declines would in turn lead to very little disinflationary pressures, thereby potentially accounting for the missing disinflation of the Great Recession. Given that the share of workers receiving no change in wages reached over 16% in 2011—more than twice the share in 1981—and that inflation rates have come down significantly since the early 1980s, this interpretation has not surprisingly become a leading explanation for the missing disinflation (Daly, Hobijn and Lucking 2012).

One can, however, make at least two counterarguments. First, if an economic downturn calls for a decline in real wages, the severity of downward wage rigidity should be captured by *the change* in the incidence of zero wage changes across the population, capturing the extensive margin of more workers not seeing their nominal wages cut. Using the data on the incidence of zero wage changes across all workers constructed by Daly, Hobijn and Lucking (2012), we quantify the change in this incidence for the 1990,

---

<sup>11</sup> In 1984, the Disability Benefits Reforms Act expanded the types of ailments which allowed one to qualify for disability and shifted the criteria for eligibility to broader measures of a person's ability to work, thereby making it easier to qualify for disability (CBO 2012). So one possibility is that workers who experience long-term unemployment have been increasingly filing claims for disability since 1984 upon the expiration of their unemployment benefits. Rothstein (2013), however, finds no link between the expiration of extended unemployment benefits and disability claims.

2001, and 2007 recessions relative to their initial levels and compare them to the change in the incidence of zero wage changes in the recession starting in July 1981 (the only pre-1990 recession covered in the dataset of Daly et al.). As illustrated in the left-hand graph in Panel A of Figure 5, the rise in the incidence of zero wage changes during the Great Recession exceeds that of the 2001 and 1990 recessions, but is in line with what was observed during the 1982 recession. If we normalize the change in the incidence of zero wage changes by the maximum rise in unemployment over the course of each recession (to control for the size of the recession and therefore the necessary decline in wages), the 1982 recession had a larger rise in the incidence of zero wage changes than any of the subsequent three recessions. So while recent recessions may have started at higher initial levels of zero wage changes across workers, it is during the 1982 recession that we observed the largest increase in the share of wages being restricted by downward wage rigidity.

A second issue is that if downward wage rigidity was preventing wages from falling as rapidly as in the past given economic conditions in the Great Recession, then one would expect to observe a missing wage disinflation puzzle along with the missing price disinflation puzzle. While the latter has already been well-documented, there has (to our knowledge) been much less emphasis placed on the former. To determine whether wages have been in any way unusual in recent years, we present in Panel B of Figure 5 a scatter plot of quarterly unemployment rates against annualized quarterly wage changes net of expectations. We model expectations as backward-looking and equal to the average over annualized quarterly wage changes over the previous four quarters. There are two key features of the data worth emphasizing. First, unlike with price Phillips curves, there is no evidence of a change in the slope of the wage Phillips curve since the early 1980s. Second, wage changes during the Great Recession line up very closely with what historical experience would have predicted from the run-up in unemployment rates since 2007. Coibion and Gorodnichenko (2013) document similar results for alternative wage measures and expectations of wage changes from professional forecasters. Hence, there is no missing wage disinflation puzzle to match the missing price disinflation puzzle. This strongly suggests that downward wage rigidity is unlikely to be the key factor underlying the missing disinflation of the Great Recession.

#### **4.3. Other Potential Explanations: Changes in Key Structural Characteristics**

Given that financial shocks, monetary and fiscal policies, and downward wage rigidity all seem insufficient to account for the rising persistence in U.S. unemployment, we turn to long-term trends in key structural characteristics which could potentially explain this phenomenon through propagation mechanisms. We specifically consider three possibilities: (1) declining labor mobility, (2) changing age composition of the population and (3) the declining culture of “trust” in the U.S.

The apparent decline in regional convergence across U.S. states points toward changing mobility patterns as a potential explanation. Kaplan and Schulhofer-Wohl (2013) document that mobility in the U.S. has declined since the early 1990s, with the fall in mobility rates being as high as one-half for some measures of mobility. This decline is visible for immigrants, individuals of all ages, single and dual earner households, low and high levels of education, and for different occupational groups. Using Decennial Census, American Community Survey (ACS) and Current Population Survey (CPS) data for the U.S., we plot in Panel A of Figure 6 the evolution of the interstate turnover mobility rate in the U.S. since 1970, where turnover mobility is defined as the (population-weighted) mean of each state’s immigration and outmigration rates. This rate was stable between 1970 and 1980 but has been falling since. Mobility as reported in the Census has declined by about 20% since 1980, while declining by a more dramatic 40-50% in the CPS since 1982 (the first year the turnover migration rate can be calculated in the CPS). While the sources of the decline in U.S. mobility are not fully understood and could be an endogenous response to

changing economic patterns, one can also consider causal effects of exogenous variation in mobility rates, due perhaps to the types of declining information costs suggested by Kaplan and Schulhofer-Wohl (2013). An exogenous decline in mobility over time could naturally account for declining regional convergence after recessions and could potentially account for other features of the data. For example, if falling mobility reduces the expected quality of job matches, then firms may choose to delay hiring more during recovery periods if there are costs to subsequent separations. One might also expect to see more long-term unemployment if workers are less willing to move away from the most seriously affected regions. This increase in expected duration of unemployment would also tend to increase the appeal of receiving disability payments, thereby potentially accounting for the changing cyclical nature of disability claims over time.

Another factor consistent with a mobility explanation is that, in the early 1970s, the U.S. stood out relative to most West European countries in terms of how high its mobility rate was. A decline in mobility therefore represents a growing similarity with one of the defining characteristics of West European economies during this early period. This is illustrated in Panel A of Figure 6: we plot the mobility rates of several West European countries in 1970 (see the data appendix for details on construction of these measures). These were all significantly lower than the U.S. at the time, but our mobility estimates for the U.S. imply that the declining mobility in the U.S. since 1980 has closed between 40-100% of the gap between the U.S. and what West European countries observed circa 1970, depending on whether we are using the Census or CPS migration data.

A second changing characteristic of the U.S. economy is the age composition of its workforce. In 1970, the U.S. stood out relative to West European countries in terms of its age distribution: it had a larger share of young people (0 to 24 years old) and a smaller share of seniors (over 65) than any West European country other than Spain. But as illustrated in Panel B of Figure 6, this age composition has changed significantly over time, with the share of 0-24 year olds falling from 45% in 1970 to 34% in 2010. Over the same period, the share of 55-65 year olds has gone from 19% in 1970 to 25% in 2010. The age structure of the labor force can be important because the experience of losing a job affects people differently depending on their age groups. For example, Johnson and Butrica (2012) document how, during the Great Recession, unemployment durations have been significantly longer for older workers than for younger workers and are associated with larger declines in earnings upon reemployment. Since older workers are also less mobile on average (Plane 1992), this could account for declining regional convergence. It could also be consistent with the rising cyclical nature of disability claims, since the higher expected duration of unemployment for older workers raises the benefit of receiving disability, and older workers may find it easier to justify claiming for disability by appealing to a wider range of health impairments than younger workers.

A third changing feature of the U.S. lies in its cultural characteristics. The U.S. has long been an outlier among developed economies along a number of cultural dimensions such as religiosity or views on private enterprise and the role of the state. Another metric along which the U.S. has traditionally differed from other developed economies is in people's perspectives toward claiming government benefits, and broader measures of trust toward others. For example, as illustrated in Panel D of Figure 6, Americans in the early 1980s were much less likely to report in the World Values Survey that it was ever acceptable to claim government benefits for which one did not qualify than citizens of major West European countries. A greater unwillingness to claim benefits can have direct effects on labor markets: workers are more likely to accept job offers when unemployed to minimize the time spent receiving unemployment benefits, and are less likely to claim disability benefits when they do not necessarily qualify for them. Thus, this cultural difference could have played a role in explaining why the U.S. experience was so different from that of

major West European economies in the early 1980s. Interestingly, this cultural feature of the U.S. has changed over time, as illustrated in Panel D of Figure 6, as Americans increasingly report that it is sometime acceptable to claim benefits which one does not qualify for. By 2006, the share of Americans reporting this had risen to the same level as reported, on average, by West Europeans in 1981. Thus, like mobility and age composition of the population, this cultural more is a dimension along which the U.S. was unusual in the 1970s and 1980s relative to West European economies and has gradually converged toward the levels reported by these economies.

These three factors—declining mobility, age composition and cultural values—are not meant to be an exhaustive list of potential factors underlying the changing propagation of shocks in the U.S. Clearly, many other factors could be behind the change.<sup>12</sup> But we view these three patterns as consistent with the other stylized facts about the U.S. economy which we have documented, and therefore they constitute a natural starting point. However, because of the gradually evolving nature of these factors, there is little hope of measuring their effects through time series methods. So instead, our strategy is to exploit the variation in labor market outcomes not just across countries but also across regions within countries over the course of the 1970s and 1980s, a time characterized by large common macroeconomic shocks, to shed light on the quantitative impact of each factor on unemployment outcomes.

## **V Quantifying Propagation Mechanisms through the Experience of the 1970s and 1980s**

In this section, we use the cross-sectional variation in labor market outcomes from the 1970s through the 1980s to quantify the extent to which labor mobility, age composition of the population and cultural values affect unemployment persistence. A key novelty of our analysis is that we focus on the variation across *regions* within West European countries, Canada and the United States. Whereas most previous work has focused on variation across countries, our approach significantly increases the size of the cross-section which allows us to more precisely isolate the contributions of each factor to unemployment persistence. To do so, we construct a novel dataset of regional labor market variables, across fourteen advanced economies, as well as a wide range of control variables designed to help isolate the marginal effects of labor mobility, age composition and cultural factors after controlling for the multitude of other factors affecting labor market outcomes.

### **5.1. Regional Labor Markets and Unemployment Persistence**

A central component of our analysis is the construction of a dataset of regional unemployment rates going back to 1970 for fourteen countries: Austria, Belgium, Canada, Denmark, Finland, France, (West) Germany, Italy, Netherlands, Spain, Sweden, Switzerland, U.K., and the U.S. For most European countries, the smallest regional unit the unemployment series and other variables of interest are typically available is at the Nomenclature of Territorial Units for Statistics (NUTS)-2 region level. NUTS regions refer to the modern statistical areas of Europe. When they were created in the 1970s, NUTS regions were based primarily on institutional divisions that already existed in a country. The three levels of regional units are NUTS-1, NUTS-2 and NUTS-3. Modern NUTS-2 regions, which are smaller than NUTS-1 and bigger than NUTS-3 regions, typically range in size between 800,000 and 3 million people. Examples of NUTS-2 regions include the 39 government regions (or equivalents) of Germany, the 19 autonomous communities and cities of Spain, the 26 administrative regions of France plus the Départements d'Outre Mer, etc. Our

---

<sup>12</sup> Some previous work, for example, has pointed to unionization as a potential explanation (e.g. Blanchard and Summers 1986, Alesina, Glaeser and Sacerdote 2006). However, U.S. unionization rates have fallen since the early 1980s, so this seems like an unlikely explanation for rising unemployment persistence over this period.



study also includes the 48 states of the continental United States, and the 10 provinces of Canada, yielding a total of 233 regions.<sup>13</sup> A detailed description of the sources of the data is in Appendix A. For most countries, regional unemployment rates are available at the annual frequency although for some countries (e.g. Switzerland, U.K.), comparable unemployment rates are only available in Census years or other select years before 1996.

Early work on the differences in unemployment patterns over the course of the 1980s emphasized the contrast between the United States and Western Europe as a whole (e.g. Blanchard and Summers 1986). While broad comparisons of Anglo-Saxon vs. West European averages are consistent with hysteresis explanations stemming from high labor and product market regulations in the latter, subsequent work emphasized that differences across West European countries are also large (Nickell 1997, Blanchard and Wolfers 2003). The Netherlands, for example, saw its unemployment rate catch up to Anglo-Saxon countries by the late 1990s despite the fact that by most metrics, its policies followed the West European model of high marginal tax rates, a large government, high unemployment benefits, and costly barriers to layoffs.

Differences in labor market outcomes *within* countries are even more challenging to explain in terms of aggregate policies and labor market institutions. In Belgium, for example, the North (Flemish) and South (Walloon) regions experienced diverging unemployment paths over the course of the 1980s despite a common set of aggregate institutions and policies. While both had similarly low rates of unemployment in the early 1970s, the South saw a larger increase in unemployment over the course of the late 1970s and the gap continued to widen from then on. By 1990, the North of Belgium had seen its unemployment rate decline to less than 6% from over 10% in 1980, whereas the unemployment rate in the South was still over 10% (see Figure C1 in Appendix C). Indeed, while the northern regions experienced a labor market recovery nearly as rapid as the U.S., the South displayed the same type of hysteresis as characterized France and Germany during this period. Within one country, one can therefore find approximately the same range of labor market outcomes as across countries.

This within-country heterogeneity in labor market outcomes is not limited to Belgium. Italy is another well-known example of a country exhibiting large regional disparities in unemployment since the 1970s, particularly during the late 1980s during which the Northern regions experienced progressive declines in unemployment while the South of Italy saw a sharp rise in unemployment. Other countries also experienced widening regional disparities over this time period, including among others France, Germany and Spain. In contrast, a few countries saw only limited and transitory regional disparities arise over the course of the 1970s and 1980s, such as Austria and Sweden.

To quantify the relative magnitudes of within and across country dispersion in unemployment, Figure 7 plots three measures of dispersion in unemployment rates from 1970 to 1995. First is the cross-sectional standard deviation in aggregate country unemployment rates.<sup>14</sup> Second, we plot the average (across countries) population-weighted standard deviations of regional unemployment rates *within* countries. In the early 1970s, cross-country dispersion in unemployment rates was approximately twice as large as within-country dispersion. But as cross-country dispersion fell over the course of the mid-1970s while within-country dispersion remained stable, the two were of almost identical magnitude by 1978. At

---

<sup>13</sup> In addition to Alaska and Hawaii, we exclude islands (e.g., Azores), West Berlin and Washington DC. Because some regions were split or merged over time, we combine regions in a handful of instances where available data did not allow us to create consistent series for a region that was merged or split over time.

<sup>14</sup> We do not include Spain in Figure 7 because its reported unemployment rates dwarf those of other countries during this time sample so that almost all variation in unemployment dispersion is driven by Spain.

that point, both measures began to rise in almost identical proportion and continued to do so through the entire decade of the 1980s. This illustrates that the heterogeneity in labor market outcomes at the aggregate level during the 1980s was matched by almost identical heterogeneity in labor market outcomes within countries. Finally, Figure 7 also plots the total population-weighted dispersion in regional unemployment rates across all countries. After remaining relatively constant over the course of the 1970s, total dispersion in unemployment across all regions rose progressively over the course of the 1980s as both within and across country unemployment dispersion rose. Total dispersion was approximately 50-80% larger than unemployment dispersion across country means or within countries during the 1980s. This large cross-sectional variation is what we will exploit to better understand the sources of hysteresis in unemployment, in contrast to most previous work which has focused either only on cross-country variation or regional variation within a country.

To measure the persistence of unemployment at the regional level, we focus on multi-year averages of unemployment rates for each region because of concerns about measurement error in regional unemployment rates at the annual frequency (this follows Blanchard and Wolfers 2003). Specifically, we calculate  $\bar{u}_{1990}^{i,c} \equiv \frac{1}{3}(u_{1989}^{i,c} + u_{1990}^{i,c} + u_{1991}^{i,c})$ ,  $\bar{u}_{1980}^{i,c} \equiv \frac{1}{3}(u_{1980}^{i,c} + u_{1981}^{i,c} + u_{1982}^{i,c})$ , and  $\bar{u}_{1970}^{i,c} \equiv \frac{1}{4}(u_{1970}^{i,c} + u_{1971}^{i,c} + u_{1972}^{i,c} + u_{1973}^{i,c})$  where  $u_t^{i,c}$  is the annual rate of unemployment in year  $t$  for region  $i$  in country  $c$ .<sup>15</sup> For some regions, data is not available for all years, so we use available data to construct  $\bar{u}_t^{i,c}$ . From these multi-year averages, we construct our primary measure of unemployment persistence or hysteresis  $h_{i,c}$  for region  $i$  in country  $c$  as

$$h_{i,c} = \ln(1 + \bar{u}_{1990}^{i,c} - \bar{u}_{1980}^{i,c}) + \ln(1 + \bar{u}_{1980}^{i,c} - \bar{u}_{1970}^{i,c})$$

The first term measures the change in unemployment over the 1980s whereas the second measures the change in unemployment over the course of the 1970s. High values of  $h_{i,c}$  denote regions with more hysteresis, i.e. regions in which unemployment fell only gradually (or even rose) relative to the initial rise in unemployment during the 1970s. We take logs to ensure a balanced distribution and minimize outliers. In Appendix B, we show how  $h_{i,c}$  can be related to the persistence of unemployment measured by the magnitude of the AR(1) coefficient. We prefer our measure of hysteresis over alternative measures based on time series regressions because our measures minimizes the influence of short term fluctuations, measurement errors, and missing observations in the series and thus provides a robust metric of persistence.

Figure 8 displays the resulting values of hysteresis for each region on a map. There are clear differences in hysteresis both across and within countries. For example, the U.S. and Canada both have relatively low levels of hysteresis on average, although there is some variation across regions. For example, in the U.S., southern states experienced more hysteresis than others, whereas northwestern states and New England states had the lowest. In Canada, Newfoundland and Nova Scotia, two sparsely populated provinces, stand out for having experienced significantly more hysteresis than the rest of the country. In Europe, Sweden experienced by far the least hysteresis, with very little interregional variation to be found, and Finland had a similar experience albeit with higher hysteresis on average. There are two other general regions of Europe in which hysteresis was relatively mild: central Europe (including Austria, Switzerland, northern Italy and southern Germany) and the south of the U.K. The Atlantic coast of Europe had

---

<sup>15</sup> The timing of the multi-year averages was determined by data availability as well as macroeconomic developments in Europe. Specifically, we include an additional year in calculating the average unemployment rate before the mid-1970s to improve the precision as earlier years have more missing observations. We shift the timing of the average for 1990 by one year because later years were marked with crises and recessions in Europe (ERM crises, collapse of trade with the Soviet Union, German reunification, etc.).

significantly higher hysteresis on average, with hysteresis growing gradually as one descends further south. Denmark is an exception, with much higher hysteresis levels than neighboring regions. Finally, the most extreme regions of hysteresis are in the far south of Spain and Italy, with some high hysteresis outliers along the Atlantic coast of Spain (e.g. Basque region).

Importantly, there appears to be a systematic relationship between the average level of hysteresis in a country and the cross-sectional dispersion in unemployment outcomes, i.e. labor market disparities within and across countries appear to be closely related phenomena. To see this, we construct five year averages of annual cross-regional population-weighted standard deviations of unemployment rates for each country. We then present scatter plots of changes in cross-sectional dispersion of unemployment rates within each country over different time periods against the average population-weighted hysteresis for that country in Figure 9. By 1980, there is a clear relationship between the rise in within-country dispersion in unemployment rates and subsequent hysteresis, and this relationship continues throughout the 1980s and into the early 1990s. This positive relationship between hysteresis in a country and a rise in regional disparities in labor market outcomes is not driven only by Spain and Italy, but can be seen across the other countries as well. This motivates our empirical approach of treating the regional variation in labor market outcomes as a laboratory to quantify the effects of different factors on unemployment outcomes.

## **5.2. Controlling for Regional and Aggregate Determinants of Unemployment Hysteresis**

To precisely estimate the effect of labor mobility, age composition, and cultural factors on employment persistence, we need to disentangle these effects from other potential sources of variation. While aggregate differences can be captured through country fixed effects, one would expect many factors to be potentially related to regional variation in unemployment rates. Thus, a second key element of our analysis is the construction of a set of “reduced form” pre-determined regional controls. We refer to these as reduced form controls because they are not meant to identify precise causal mechanisms. Rather, we expect these controls to be correlated with many of the channels which have been suggested in the hysteresis literature, so that controlling for them should allow us to evaluate the marginal contribution of labor mobility, age composition and cultural values.

We use ten regional control variables, each of which is plotted (against each region’s level of unemployment hysteresis) in Figure 10. Each of these variables is for 1970 or the nearest available year, as described in the data appendix. The first three include average education (years of schooling) in 1970, the log of GDP per capita (in PPP U.S. dollars from Penn World Tables) in 1970, and the share of female employment in total employment in 1970. As illustrated in Figure 10, all three measures are extremely highly correlated with subsequent regional labor market outcomes, with higher hysteresis regions being initially poorer, less educated, and with fewer women participating in the labor force. A fourth control is the “net migration rate”, defined as the annual net inflow (i.e. immigration – outmigration) of people normalized by total population. We interpret this measure as capturing average flows into (or out of) a region due to trend growth differentials or inherent appeal (or lack thereof) of a region. Figure 10 reveals little correlation between these regional net migration rates and subsequent labor market outcomes. The next set of controls consist of the industry composition of employment in the region in 1970. We plot in Figure 10 correlations of regional hysteresis with the share of the primary sector in employment (agriculture, fishing, mining, and energy), with the share of the secondary sector in employment (manufacturing and construction), and with the share of the tertiary sector in employment (all other sectors, e.g. services, government). Regions which experienced more unemployment hysteresis had, on average, larger shares of primary sector and smaller shares of tertiary sector. There is little visible relationship

between the size of the secondary sector and unemployment hysteresis. We also include as controls motorways density, household size, home ownership rates, and the share of the population living in urban environments. None of these display strong unconditional correlations with unemployment hysteresis. Finally, we also include dummy variables for regions which consist of a larger metropolitan area (e.g. Hamburg) and another dummy variable for regions in which the capital city is located.

A striking feature of these regional controls is that they can account for much of the regional variation in unemployment persistence. For example, we regress regional unemployment hysteresis on these predetermined regional controls with no aggregate controls or fixed effects,

$$h_{i,c} = \delta + \beta' X_{i,c} + v_{i,c}$$

where  $X_{i,c}$  is the vector of regional controls just described (not including the redundant share of employment in the tertiary sector). Our baseline methodology is to place equal weight on each country while weighting regions within countries by their population. We apply equal weights on countries to avoid having the results being dominated by the U.S. Weighting regions by population serves to avoid placing undue weight on smaller regions where measurement error is more likely to be an issue. But as we document in Appendix Table C2, none of our results are particularly sensitive to assumptions about the weighting of different observations. This regression yields an  $R^2$  of 0.71, implying that much of the variation in labor market outcomes is very highly correlated with the set of regional controls included here. This is surprisingly high given that this specification makes no attempt to control for aggregate policy differences across countries, different institutions, different shocks hitting the economy, etc.

We can also include country-fixed effects in the specification above as a simple way to capture these cross-country differences in policies, shocks, and institutions:

$$h_{i,c} = \beta' X_{i,c} + \gamma_c + v_{i,c}$$

where  $\gamma_c$  are fixed effects for different countries. Including country fixed effects only raises the  $R^2$  of the regression to 0.85. Furthermore, the estimated coefficients on country dummies are almost all not statistically significantly different from zero, which confirms that our regional control variables are successful in accounting for both the within and between country variation in unemployment outcomes, leaving little room for improvement in terms of controlling for aggregate variables. The main exception to this finding is Denmark, which experienced significantly more hysteresis than would have been predicted by regional controls.

### 5.3. The Effects of Mobility, Demographics and Culture on Unemployment Hysteresis

To assess how labor mobility, demographics and culture affect unemployment persistence, we construct regional measures of each. For labor mobility, our primary measure is the 1970 turnover migration rate, the sum of inflows and outflows of a region normalized by the population of the region and divided by two. As illustrated in the top left panel of Figure 11, there appears to be a weak negative relationship between mobility and hysteresis, due to the fact that high mobility countries tended to have relatively low hysteresis (especially U.S. and U.K.) whereas both high and low hysteresis outcomes are visible for low mobility countries. The first column of Table 1 presents results from regressing regional hysteresis on regional labor mobility. The coefficient is negative but insignificantly different from zero.

To estimate the effect of mobility on unemployment hysteresis after conditioning on other factors, we estimate the following regressions:

$$h_{i,c} = \theta_{mob} mobility_{i,c} + \beta' X_{i,c} + \gamma_c + v_{i,c}$$

where  $mobility_{i,c}$  is the turnover migration rate of region  $i$  in country  $c$ . We estimate this specification with and without country-fixed effects ( $\gamma_c$ ) and report results in columns 2 and 3 of Table 1. In both cases,

we find a positive estimate of  $\theta_{mob}$  which is statistically different from zero only at the 10% level. This implies that higher regional labor mobility is associated with, if anything, *more* hysteresis, which is the opposite result of what one would need for falling labor mobility to account for rising U.S. unemployment persistence.

The absence of a negative relationship between labor mobility and hysteresis is a robust finding. The figures in the middle and bottom rows of column 1 in Table 11 show scatter plots of hysteresis and regional labor mobility after partialling out the effects of the regional controls and the effects of both the controls and country-fixed effects respectively. In both cases, it is clear that the absence of a negative relationship between labor mobility and unemployment hysteresis is not driven by outliers but simply reflects the very weak correlation between the two. The results are also robust to alternative measures of mobility (e.g. aggregate mobility, inflow rates vs. outflow rates) and to including interactions (e.g. interacting aggregate or regional mobility with the change in a region's unemployment rate over the 1970s relative to that of other regions in that country). In all cases, the average effect of mobility on unemployment persistence is positive and of limited statistical significance.

One might have expected higher mobility to lower hysteresis, as regions with higher mobility should achieve higher quality and quicker job matches than others, resulting in lower unemployment persistence. However, most moves are short-distance moves to close by or neighboring regions. Given the spatial correlation of hysteresis shown in Figure 8, such short-distance moves will have less of an equilibrium effect on harmonizing unemployment rates across regions than longer-distance moves to areas with more favorable labor markets. In addition, other factors can push in the opposite direction. For example, jobs are frequently found through personal networks, but those who move to new areas will generally have much smaller personal networks. A loss of a job may therefore mean much longer unemployment durations and ultimately more hysteresis.

To measure the effects of demographic makeup of the population, we decompose regional populations in 1970 into three groups: the share of 0-24 year olds, the share of 25-54 year olds (prime age), and the share of people 55 and older. Since these shares are measured in 1970, the first category can be interpreted as capturing the share of young workers in the labor force in the mid-1980s, the second category corresponds to the share of older workers (i.e. approaching or reaching retirement age) over the 1980s, while the third group captures the share of retirees in the 1980s. The two middle panels in the top row of Figure 11 present scatter plots of the share of 0-24 year olds and the share of 55+ year olds for each region against subsequent hysteresis outcomes. Neither suggests a clear relationship between hysteresis and demographic composition. Countries with relatively low shares of young people and high shares of older people in 1970 tended to experience mid-level ranges of hysteresis, but we can find countries with high shares of young people which experienced low hysteresis (U.S., Canada) and high hysteresis (Italy, Spain), and the reverse finding obtains when looking at countries with low shares of older people (55+ years old). The fourth column of Table 1 presents regression results for these two measures of age composition with no regional controls or fixed effects. Both age groups are associated with higher hysteresis on average, but the explanatory power of these two variables is limited.

To assess how age composition affects unemployment persistence after controlling for other factors, we estimate

$$h_{i,c} = \theta_{<25} share_{i,c}^{<25} + \theta_{54+} share_{i,c}^{54+} + \beta' X_{i,c} + \gamma_c + v_{i,c}$$

where  $s_{i,c}^{<25}$  and  $s_{i,c}^{54+}$  are the shares of under 25 year olds and over 54 year olds for region  $i$  in country  $c$  respectively. We estimate this specification with and without country fixed effects and report the results in columns 5 and 6 of Table 1. For both variables, we find positive effects of their shares on hysteresis,

although the effects are much stronger when (and only statistically significant) we include country fixed effects. Both coefficients imply that larger shares of 25-54 year olds in 1970 are therefore associated with *lower* rates of unemployment hysteresis. As with labor mobility, this is the opposite effect of what one would need to explain the rising persistence of U.S. unemployment from the demographic transition to an older workforce: the decline in the share of 0-24 year olds and the increase in the share of 55+ year olds was such in the U.S. that the share of prime-aged population actually increased by the 2000s. The panels in the two middle columns and two bottom rows of Figure 11 present scatter plots of regional age distributions against regional hysteresis, after partialling out regional controls and after partialling out both regional controls and country fixed effects. For the share of 0-24 year olds, we continue to see a strong positive relationship with regional hysteresis after regional controls and country fixed effects are taken into account, with no evidence of this being driven by outliers. For the share of 55+ year olds, the positive relationship only appears after controlling for country fixed effects.

These results can be interpreted in (at least) two different ways. One interpretation is that the coefficients reflect differential impacts of job losses on different age groups. For example, the positive coefficient on the share of 55+ year olds in 1970 means that when the share of 55+ year olds in 1970 is low (and therefore the number of 25-54 year olds in 1970 is high), then the share of older workers in the mid-1980s is high (since 25-54 year olds in 1970 are approaching/reaching retirement age in the mid-1980s). This can lower hysteresis in unemployment if workers near retirement age are more likely to drop out of the labor force when they lose their jobs, such as through early retirements or claiming disability, thereby not being counted as unemployed (van Horn et al. 2011). Similarly, the positive coefficient on the share of 0-24 year olds in 1970 means that when the share of 0-24 year olds in 1970 is low (and therefore the number of 25-54 year olds in 1970 is high), then the share of older workers in the mid-1980s is high. This can lower hysteresis by the same logic. But the fact that the coefficient on 0-24 year olds is larger than the coefficient on 55+ year olds suggests that there is an additional effect stemming from the share of younger workers in the labor force. This could represent the scarring effects of job losses on the young, who lose valuable job experience and acquired human capital, thereby making them less desirable hires in the future (e.g. Gregory and Jukes 2001, Gregg 2001).

An alternative interpretation is that these coefficients reflect the effects of rigid wages and net job flows. A relatively large share of 0-24 year olds in 1970 relative to 25-55 year olds implies that there would be a relatively larger net inflow of new workers into the labor force relative to retirement outflows. If wages are not flexible enough to accommodate these changes in the net supply of workers, then a long-term rise in unemployment could result. Note that unlike the participation explanation, the net flow explanation suggests a rise in the natural rate of unemployment rather than a rise in cyclical unemployment. But the data currently available do not allow us to distinguish between these two hypotheses.

Finally, we turn to measuring the effect of culture, and specifically trust, on unemployment hysteresis. To construct a measure of trust, we aggregate over three different questions from the World Values Survey (WVS) that are directly related to civic attitudes about trust. The questions relate to whether it is ever acceptable to claim benefits which one does not qualify for, whether others can be trusted, and whether others will try to take advantage of you (see Appendix Table D3 for more details). From these three questions, we create a regional index of “trust” as described in Appendix D. In addition, we create two additional indices of regional cultural values. “Value of work” is constructed from questions related to how important individuals think work is in their life and how important work ethic is as a moral value relative to other values. “Individualism” is based on questions related to the importance of self-dependence and support for private ownership/competition relative to government involvement/regulation. The

resulting cultural indices are only moderately correlated with one another. The work value variable, in particular, is almost uncorrelated with the other two at the regional level, whereas the correlation between trust and individualism is 0.49. All three measures—value of work, individualism, and trust—are positively correlated with income per capita at the regional level, with correlations ranging from 0.33 to 0.46.<sup>16</sup>

One limitation of these cultural measures is that regional information on culture is only available at the NUTS-level in the 2008 wave of the WVS, with previous surveys providing only coarser regional or country-level information.<sup>17</sup> As a result, endogeneity of cultural variables with respect to prior economic conditions is a concern. For example, periods of high unemployment could tend to lower societal trust or reduce (or raise) the importance that people place on work. To investigate this possibility, we use the time-variation in aggregate values to each type of question and assess whether these are correlated with recent economic conditions, which is similar to the test in Stevenson and Wolfers (2011). For this purpose, we focus primarily on questions which have been asked since at least the 1980 or 1990 waves of the WVS and for which we can therefore measure some time variation. For each question  $x_t^c$  at time  $t$  for country  $c$ , we regress it on the unemployment rate for that country in that year

$$x_t^c = \delta_c + \beta u_t^c + \varepsilon_t$$

and pool across all countries for each question, allowing for country fixed effects  $\delta_c$ . We run this regression for two questions in each class of cultural variables as well as the cultural index value for that country, constructed in the same way as the regional indices (but using questions as they become available). We fail to find consistent and robust evidence that survey responses or indexes of cultural dimensions are sensitive to unemployment fluctuations, which is consistent with cultural factors not responding strongly to short-term economic conditions (see Appendix Table D2).

Given this lack of strong correlation between culture and the level of unemployment, we explore whether regional levels of trust are related to unemployment persistence over the 1970s and 1980s. The top right panel in Figure 11 is a scatterplot of our regional trust index against regional hysteresis: there appears to be a strong negative correlation such that areas with less trust experienced more unemployment hysteresis. As reported in column (7), this relationship is significant at the 1% level and trust single-handedly accounts for 12% of the cross-sectional variation in hysteresis. We then report estimates from the following specification allowing for regional controls and country fixed effects

$$h_{i,c} = \theta_t \text{trust}_{i,c} + \beta' \mathbf{X}_{i,c} + \gamma_c + v_{i,c}$$

when  $\text{trust}_{i,c}$  is the index of trust for region  $i$  in country  $c$ . Columns 8 and 9 of Table 1 report estimated coefficients for this specification with and without country fixed effects. The results are sensitive to the inclusion of the latter. In their absence, the coefficient on regional trust is close to zero and insignificant, whereas when fixed effects are included, the estimated coefficient is negative and significant at the 1% level. The panels in the middle and bottom rows of the right column in Figure 11 shed some light on this sensitivity. After partialling out both regional controls and country fixed effects, there is clear negative

<sup>16</sup> Previous research (e.g. Guiso, Sapienza and Zingales (2011), Blanchard and Philippon (2006), Doepke and Zilibotti (2008), Gorodnichenko and Roland (2010)) argued that these dimensions can be important determinants of labor supply, provision of public goods, and economic exchanges and, hence, can influence the degree of hysteresis in unemployment. In the interest of space, we focus on the index of trust. Results for other cultural dimensions are available upon request.

<sup>17</sup> Data for the U.S. & Canada come from the 2006 wave of the WVS. Regional data begins in 1990 for these two countries. For the U.S. in all WVS waves, the data is only available at the aggregation of the nine census divisions (New England, Middle Atlantic, South Atlantic, East South Central, West South Central, East North Central, West North Central, Mountain, Pacific [Excluding California], plus California). We tie the same responses from each Census division to each of the states within the division.

relationship between regional trust and hysteresis in the data, but not removing country fixed effects leaves a much noisier relationship with a number of clear outliers, particularly Denmark. As noted earlier, Denmark is the one country for which our regional controls do not capture the average country fixed effect, with the Danish level of hysteresis being unaccountably high. But with Denmark also having the highest levels of trust of any country in our sample, this leads to the outliers visible in Figure 11 which account in large part for the difference between estimates with and without fixed effects. Thus, unlike labor mobility and demographics, the estimated effect of trust on hysteresis is consistent with its time variation in the U.S. potentially accounting for the time variation in U.S. unemployment persistence.

These baseline results—i.e., only trust seems to affect hysteresis in a manner consistent with it potentially accounting for rising U.S. unemployment persistence over time—are robust to a wide range of checks. For example, in columns 10 and 11 of Table 1, we estimate the effects of mobility, demographics and culture on hysteresis jointly with and without fixed effects and find little variation relative to the baseline results. In Table 12, we reproduce baseline results with and without fixed effects dropping, in turn, different subsets of countries. Dropping the U.S. and Canada, for example, has no qualitative effect on the results. This is an important point as it suggests that regional variation in the U.S. is accounted for by regional variables in a similar manner as other countries, i.e. there is little reason to believe that different coefficients on controls are needed to explain European and North American regional variation in hysteresis. Dropping Italy and Spain generally reduces the estimated coefficients but does not otherwise affect our qualitative results. Since Spain and Italy are large outliers in terms of hysteresis outcomes, one might have expected them to drive the empirical results but this is not the case. Dropping France and Germany also does not qualitatively alter the results, other than rendering the estimated coefficient on mobility statistically insignificant, as does dropping the Nordic countries. The Nordic countries have a more substantial effect on the estimated effects of trust: dropping these leads to a large negative and statistically significant effect of trust on hysteresis even when fixed controls are not included. This reflects the sensitivity to Denmark which has already been noted. We also considered using equal weights across all observations, applying population weighting to all regions without imposing equal country weights, or using Huber robust regressions: none qualitatively affected the results (Appendix Table C2).

Another possibility is that interaction effects are important in accounting for cross-sectional hysteresis patterns. For example, low trust might only have negative implications for unemployment persistence in countries where unemployment benefits are high, or the effects of age composition on hysteresis could depend on the degree of employment protection. Using the country-level employment protection index and replacement rates (from 1970) from Blanchard and Wolfers (2003), we incorporate interactions for each of our explanatory variables in turn (but not regional controls) with either the employment protection index (Panel A of Table 3) or replacement rates (Panel B of Table 3). The statistical gains from incorporating interaction effects are very small, and most values of the Bayesian Information Criterion (BIC) are only a notch lower than in our baseline specification, suggesting that the marginal contribution of these interactions is not large. The results do suggest that our baseline effects are more pronounced in countries with high employment protections, but the results with replacement rates are extremely mixed and do not suggest any robust interaction effects. In summary, interactions with labor market institutions do not yield striking quantitative improvements nor do they change the qualitative interpretation of the baseline results.

Of course, interactions of mobility, demographics and trust with labor market institutions are but a small subset of the possible nonlinear or interaction effects which one could consider. There could conceivably be interaction effects between these variables and some of the controls, with each other, or



with the nature and size of the shocks hitting each economy. To assess whether any quantitative gains in prediction can be achieved by incorporating additional interactions, we present in Table 4 the quantitative gains (measured in  $R^2$  increment or by BIC criterion) that can be achieved through a wide range of interactions with shocks, institutions, controls, and additional cultural forces. For shocks, we use Blanchard and Wolfers (2003) estimates of country-level TFP, labor demand and real interest rate shocks and focus on the change in these variables in the late 1970s relative to the early 1970s, which we interpret as capturing the impulse to each economy. The labor market institutions are employment protection index and unemployment replacement rates, as in Table 3. The additional cultural variables include our “individualism” and “value of work” indices described previously. In specifications without country fixed effects, large gains in predictive power are achieved when regional controls are interacted with shocks (especially interest rate shocks and TFP shocks) or cultural variables (especially trust and individualism). These gains approximate, and sometimes exceed, those from including fixed effects, but they are very small quantitatively once fixed effects are included. This absence of large predictive gains, above and beyond country fixed effects, suggests that interaction effects are not a central feature of the cross-sectional variation in unemployment hysteresis.

### **5.3. Implications for Rising U.S. Unemployment Persistence**

With estimates of the quantitative effect of labor mobility, demographics and culture on hysteresis, we can quantify how the time variation in each of these factors would be expected to have affected unemployment persistence in the U.S. in recent years, assuming that the estimated effects of each on unemployment persistence have not evolved over time.

For labor mobility and demographics, we replace their 1970 values for each U.S. state with their 2000 values. Holding constant other controls, we can then construct a counterfactual level of hysteresis for each state and aggregate these with population weights into a counterfactual U.S. level of hysteresis. For culture, regional data for the U.S. in the WVS does not begin until 1990, so we cannot track the regional evolution of culture since the early 1980s. Instead, we lower the level of trust in each state by one standard deviation (i.e. moving from the U.S. level of trust to the lowest level of trust in our sample of countries). This corresponds to the historical variation in U.S. responses to the question of whether it is ever justifiable to claim benefits which one does not qualify for, but is larger than the historical variation in responses to the question of whether others can be trusted. Since the third question used in the trust index is not available going back to 1982, we cannot measure the historical change in the overall trust index for the U.S. But the time variation in the first two questions suggests that assuming a one-standard deviation decline in trust likely presents an upper bound on the possible historical variation in trust in the U.S. We present the results from this exercise in Table 5, both for changes in each factor individually as well as jointly, using the estimates with and without fixed effects.

Changes in U.S. labor mobility have trivial effects on the predicted level of U.S. hysteresis, reflecting both the small estimated coefficients in Table 1 and the modest decline in labor mobility documented in Figure 6. The changing demographic makeup of the U.S. population predicts lower hysteresis in the U.S., modestly if we use the estimates without country-fixed effects and dramatically if we use the estimates with fixed effects. The former is equivalent to reducing the level of hysteresis from French levels to Belgian levels, whereas the latter is equivalent to reducing the level of hysteresis from French levels to levels of Austria or Switzerland. The effects of demographics are primarily driven by the changing share of 0-24 year olds, reflecting both its large decline over time as well as the fact that its estimated coefficient is higher than that on the share of 55 year olds and over. Both labor mobility and

demographic changes predict *declines* in U.S. unemployment persistence, given the estimated effects of each on hysteresis from Table 1.

The decline in trust in the U.S. is the only variable among the three which is predicted to raise U.S. hysteresis when fixed effects estimates are used. But its quantitative effect is also modest. A large change in trust (moving from U.S. in 1980 to Spain in 1980) raises hysteresis by 1 point, or the equivalent of going from U.S. levels of hysteresis to those of Austria or Switzerland. Converted to AR(1) equivalents using the formula in Appendix B, this corresponds to moving from a quarterly unemployment persistence of 0.92 (the estimate from 1950-1980 in Figure 1) to a quarterly persistence of 0.98. This actually exceeds the increase in persistence found for the U.S. between the 1980s and 2010s, so by itself, the historical change in trust can account for the observed rise in U.S. unemployment persistence. But as documented in the last row of Table 5, this predicted increase in persistence from culture is dwarfed by the effect of demographics and mobility when we construct joint counterfactuals for all three. So appealing to a cultural explanation for the change in unemployment persistence would require ignoring these other factors (or finding new structural factors which could offset the effects of demographics on the predicted level of persistence).

## **V Conclusion**

There is a clear pattern: the response of the U.S. economy to recessions has become increasingly sclerotic starting with the 1990 recession, and the Great Recession appears to be continuing a trend toward rising unemployment persistence. Understanding the sources of this rising persistence is a key question for economists, as its continuation suggests a future in which post-recession unemployment outcomes increasingly resemble the Eurosclerosis experience of the 1980s rather than the rapid recoveries which characterized the U.S. economy through most of the post-World War II era.

This paper has ruled out many of the usual suspects. We document that commonly suggested explanations for the persistence of unemployment in the Great Recession cannot fully explain this unfortunate new characteristic of U.S. business cycles. Financial shocks do not mechanically lead to more unemployment persistence than monetary policy shocks, so it is doubtful that the underlying explanation stems from a changing nature of shocks driving the cycle. And while monetary and fiscal policies can account for a significant component of the rising unemployment persistence, much remains unexplained. This suggests that much of the answer must lie in the economic mechanisms that underlie the propagation of shocks through the economy. We test three potential propagation factors that are commonly discussed in the literature—declining labor mobility, changing demographic composition of the U.S. population, and changing cultural mores—which could account for rising unemployment persistence as well as explain other changes in U.S. business cycle properties. While a changing U.S. perspective on claiming government benefits and trusting others can quantitatively account for the observed rise in persistence, its predicted effect should have been more than offset by the other factors.

Our interpretation of these results is that there must be additional, and more powerful, factors at work. Identifying these other forces should be a key priority for the research agenda of macroeconomists. There is no shortage of places to look. A striking number of features of the U.S. economy changed circa 1980. We highlighted four such changes in cyclical patterns in Section 4.1; Garin, Pries and Sims (2013) emphasize another: the changing cyclicity of labor productivity. But there are also pronounced changes in trends for a range of variables all of which appeared around 1980. An incomplete list includes rising economic inequality (Piketty and Saez 2003), a declining share of labor income (Karabarbounis and Neiman 2013), changes in the demand for skills (Jaimovich and Sui 2013), and a higher frequency of financial crises (Romer 2013).

These results also have implications for policy responses to business cycles. First, we find a non-trivial contribution of monetary and fiscal policies toward the higher unemployment persistence of recent recessions. This suggests that improvements in the implementation of fiscal and monetary responses could go some way in reversing the trends toward more sclerotic labor market outcomes after recessions. Reducing the speed at which initially expansionary fiscal policies are reversed (as was the case in the 2001 and 2007 recessions) would be a step in the right direction.

More fundamentally, if future U.S. downturns can be more long-lived than pre-1990 recessions, then the nature of fiscal policy responses should likely be revisited. In the pre-1990 environment in which recessions were short-lived events, there was little need to implement discretionary countercyclical fiscal policies, other than perhaps highly transitory ones such as the rebate checks of 2001, because the long decision lags involved in the legislative process meant that any positive effects of stimulus would likely occur too late. But if business cycles have become systematically more protracted affairs, as seems to be the case, then discretionary fiscal policy responses should target longer-lived projects rather than transitory transfer payments. Investment projects can be especially desirable because these a) tend to have larger stimulative effects per dollar (e.g. Auerbach and Gorodnichenko 2012, Leduc and Wilson 2012), b) tend to have long-run social returns that significantly exceed those of transfer payments, and c) do not require legislators to vote on multiple “stimulus” packages. If “timely, targeted and temporary” remains the mantra of future stimulus measures, then Amerisclerosis may not be so far away.

## References

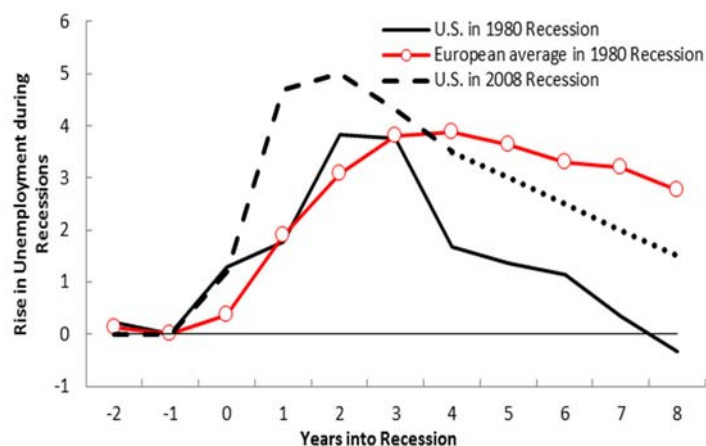
- Alesina, Alberto F., Edward L. Glaeser, and Bruce Sacerdote, 2006. "Work and Leisure in the U.S. and Europe: Why So Different?" *NBER Macroeconomics Annual* 20(20), 1-100.
- Auerbach, Alan J., and Yuriy Gorodnichenko, 2012. "Measuring the Output Responses to Fiscal Policy," *American Economic Journal: Economic Policy* 4(2), 1-27.
- Autor, David H. and Mark G. Duggan, 2003. "The Rise in the Disability Rolls and the Decline in Unemployment." *The Quarterly Journal of Economics*. 118(1), 157- 206.
- Bachmann, Rüdiger, Tim O. Berg, and Eric R. Sims, 2012. "Inflation Expectations and Readiness to Spend: Cross-Sectional Evidence," NBER Working Papers 17958.
- Ball, Laurence, and Sandeep Mazumder, 2011. "Inflation Dynamics and the Great Recession," *Brookings Papers on Economic Activity* 42(1) 337-405.
- Ball, Laurence, Daniel Leigh and Prakash Loungani, 2012. "Okun's Law: Fit at 50?" manuscript.
- Blanchard, Olivier, and Thomas Philippon, 2006. "The Quality of Labor Relations and Unemployment," manuscript.
- Blanchard, Olivier J., and Justin Wolfers, 2003. "The Role of Shocks and Institutions in the Rise of European Unemployment: The Aggregate Evidence," *Economic Journal* 110(462) 1-33.
- Blanchard, Olivier J., and Lawrence F. Katz, 1992. "Regional Evolutions," *Brookings Papers on Economic Activity* 23(1) 1-76.
- Blanchard, Olivier J., and Lawrence H. Summers, 1986. "Hysteresis and the European Unemployment Problem," *NBER Macroeconomics Annual*, Stanley Fischer, ed. Vol 1, Fall 1986, Cambridge: MIT Press. Pp. 15-78.
- Blanchard, Olivier, and Daniel Leigh, 2013. "Growth Forecast Errors and Fiscal Multipliers," IMF Working Paper No. 13/1.
- Coibion, Olivier, 2012. "Are the Effects of Monetary Policy Shocks Big or Small?" *American Economic Journal: Macroeconomics* 4(2), 1-32.
- Coibion, Olivier and Yuriy Gorodnichenko, 2013. "Is the Phillips curve alive and well after all? Inflation expectations and the missing disinflation." Manuscript.
- Congressional Budget Office (CBO), 2012. "Policy Options for the Social Security Disability Insurance Program," manuscript.
- Daly, Mary, Bart Hobijn, and Brian Lucking, 2012. "Why Has Wage Growth Stayed Strong?" *FRBSF Economic Letter* 2012-10, April 2, 2012.
- Dao, Mai, Davide Furceri, and Prakash Loungani, 2013. "Regional Adjustments and Labor Mobility," manuscript.
- Decressin, Jorg, and Antonio Fatas, 1995. "Regional Labor Market Dynamics in Europe," *European Economic Review* 39(9) 1627-1655.
- Doepke, Mathias, and Fabrizio Zilibotti, 2008. "Occupational Choice and the Spirit of Capitalism," *Quarterly Journal of Economics* 123(2), 747-793.
- Duggan, Mark and Scott A. Imberman, 2009. "Why are the disability rolls skyrocketing? The contribution of population characteristics, economic conditions, and program generosity," in David M. Cutler and David A. Wise, eds. Health at Older Ages: The Causes and Consequences of Declining Disability Among the Elderly. University of Chicago Press, pp. 337-379.
- Eggertsson, Gauti B., and Paul Krugman, 2012. "Debt, Deleveraging, and the Liquidity Trap: A Fisher-Minsky-Koo Approach," *Quarterly Journal of Economics* 127(3), 1469-1513.
- Emerson, Michael and Andre Dramaïs, 1988. What Model for Europe? MIT Press, Cambridge, MA.
- Erceg, Christopher J., and Andrew T. Levin, 2013. "Labor Force Participation and Monetary Policy in the Wake of the Great Recession," manuscript.
- Garin, Julio, Michael Pries, and Eric Sims, 2013. "Reallocation and the Changing Nature of Economic Fluctuations," manuscript.
- Gilchrist, Simon, and Egon Zakrajsek, 2012. "Credit Spreads and Business Cycle Fluctuations," *American Economic Review* 102(4), 1692-1720.

- Gorodnichenko, Yuriy, and Gerard Roland, 2010. "Culture, Institutions and the Wealth of Nations," NBER Working Papers 16368.
- Government Accountability Office, 2012. "Unemployed Older Workers: Many Experience Challenges Regaining Employment and Face Reduced Retirement Security," Report to the Chairman, Special Committee on Aging, U.S. Senate. GAO-12-445. 2012 (April).
- Gregory, Mary, and Jukes, Robert, 2001. "Unemployment and Subsequent Earnings: Estimating Scarring among British Men 1984-94," *Economic Journal* 111(475), F607-625.
- Gregg, Paul, 2001. "The Impact of Youth Unemployment on Adult Unemployment in the NCDS," *Economic Journal* 111(475), F626-653.
- Guiso, Luigi, Paola Sapienza and Luigi Zingales. 2011. "Civic Capital as the Missing Link." In *Social Economics Handbook*, edited by Jess Benhabib, Alberto Bisin and Matthew O. Jackson, vol. 1, 417-480. Elsevier.
- Hall, Robert E., 2013. The Routes into and out of the Zero Lower Bound, manuscript.
- Jaimovich, Nir, and Henry Sui, 2013. "The Trend is the Cycle: Job Polarization and Jobless Recoveries," manuscript.
- Johnson, Richard W., and Barbara Butrica, 2012. "Age Disparities in Unemployment and Reemployment During the Great Recession and Recovery," Issue Briefs 2012-03, Urban Institute, Program on Retirement Policy.
- Jorda, Oscar, Moritz Schularick, and Alan Taylor. 2011. "Financial Crises, Credit Booms, and External Imbalances: 140 Years of Lessons." *IMF Economic Review*, 59: 340–378.
- Kaplan, Greg, and Sam Schulhofer-Wohl, 2012. "Understanding the Long-Run Decline in Interstate Migration," NBER Working Papers 18507.
- Karabarbounis, Loukas and Brent Neiman, 2013. "The Global Decline of the Labor Share," manuscript.
- Leduc, Sylvain, and Daniel Wilson, 2012. "Roads to Prosperity or Bridges to Nowhere? Theory and Evidence on the Impact of Public Infrastructure Investment," Federal Reserve Bank of San Francisco, Working Paper 12-04.
- Matheson, Troy and Emil Stavrev, 2013. "The Great Recession and the Inflation Puzzle," *Economics Letters* 120(3): 468-472.
- Mian, Atif, and Amir Sufi, 2011. "House Prices, Home Equity-Based Borrowing, and the US Household Leverage Crisis," *American Economic Review* 101(5): 2132-2156.
- Nakamura, Emi, and Jón Steinsson, 2011. "Fiscal Stimulus in a Monetary Union: Evidence from U.S. Regions," NBER Working Papers 17391.
- Nickell, Stephen. 1997. "Unemployment and Labor Market Rigidities: Europe versus North America," *Journal of Economic Perspectives* 11(3), 55-74.
- Piketty, Thomas and Emmanuel Saez, 2003. "Income Inequality in the United States: 1913-1998," *Quarterly Journal of Economics* 118(1), 1-39.
- Plane, David A., 1992. "Age-Composition Change and the Geographical Dynamics of Interregional Migration in the U.S." *Annals of the Association of American Geographers* 82(1), 64-85.
- Reinhart, Carmen M., and Kenneth S. Rogoff. 2009a. "The Aftermath of Financial Crises." *American Economic Review*, 99(2): 466–72.
- Reinhart, Carmen M., and Kenneth S. Rogoff. 2009b. *This Time Is Different: Eight Centuries of financial folly*. Princeton, NJ: Princeton University Press.
- Romer, Christina D. and David H. Romer. 2004. "A New Measure of Monetary Shocks: Derivation and Implications." *American Economic Review* 94: 1055-1084.
- Romer, Christina, and Jared Bernstein, 2009. "The Job Impact of the American Recovery and Reinvestment Plan", January 8, 2009.
- Romer, David, 2013. "Preventing the Next Catastrophe: Where Do We Stand?" International Monetary Fund Conference, Rethinking Macro Policy II: First Steps and Early Lessons, Panel Discussion, April 2013.
- Rothstein, Jesse, 2013. "Unemployment Insurance and Disability Insurance in the Great Recession," manuscript.

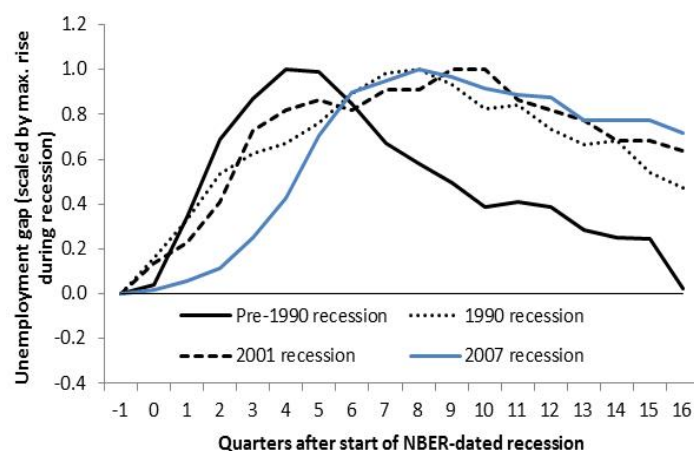
- Stephen, Machin, and Alan Manning, 1999. "The causes and consequences of long-term unemployment in Europe," in: O. Ashenfelter & D. Card (ed.), *Handbook of Labor Economics*, edition 1, volume 3, chapter 47, pages 3085-3139, Elsevier.
- Stevenson, Betsey, and Justin Wolfers, 2011. "Trust in Public Institutions over the Business Cycle," *American Economic Review* 101(3), 281-287.
- Stevenson, Betsey, and Justin Wolfers, 2011. "Trust in Public Institutions over the Business Cycle," *American Economic Review* 101(3), 281-287.
- Tenreiro, Silvana, and Gregory Thwaites, 2013. "Pushing On a String: US Monetary Policy is Less Powerful in Recessions," CEP Discussion Papers dp1218, Centre for Economic Performance, LSE.
- Van Horn, Carl E., Nicole Corre, and Maria Heidkamp, 2011. "Older Workers, The Great Recession, and the Impact of Long-term Unemployment," *Research Brief*, John J. Heldrich Center for Workforce Development, February 2011.
- Wieland, Johannes. 2012. "Are Negative Supply Shocks Expansionary at the Zero Lower Bound?" manuscript.

FIGURE 1: THE CHANGING PERSISTENCE OF U.S. UNEMPLOYMENT

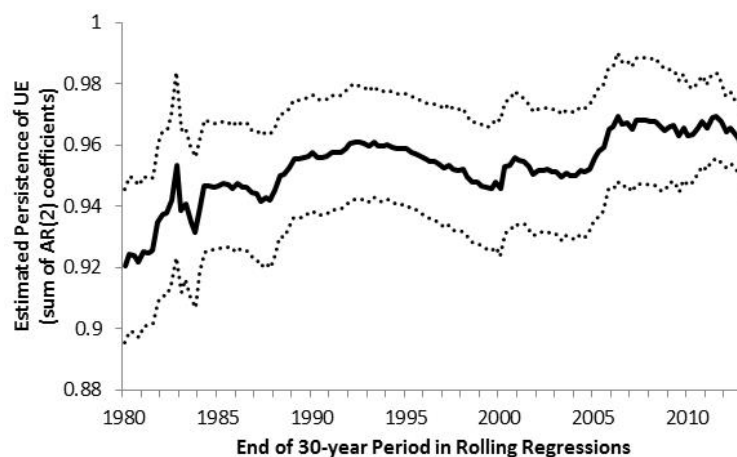
Panel A: The Great Recession and the 1980s Recessions



Panel B: Scaled Unemployment Patterns across U.S. Recessions



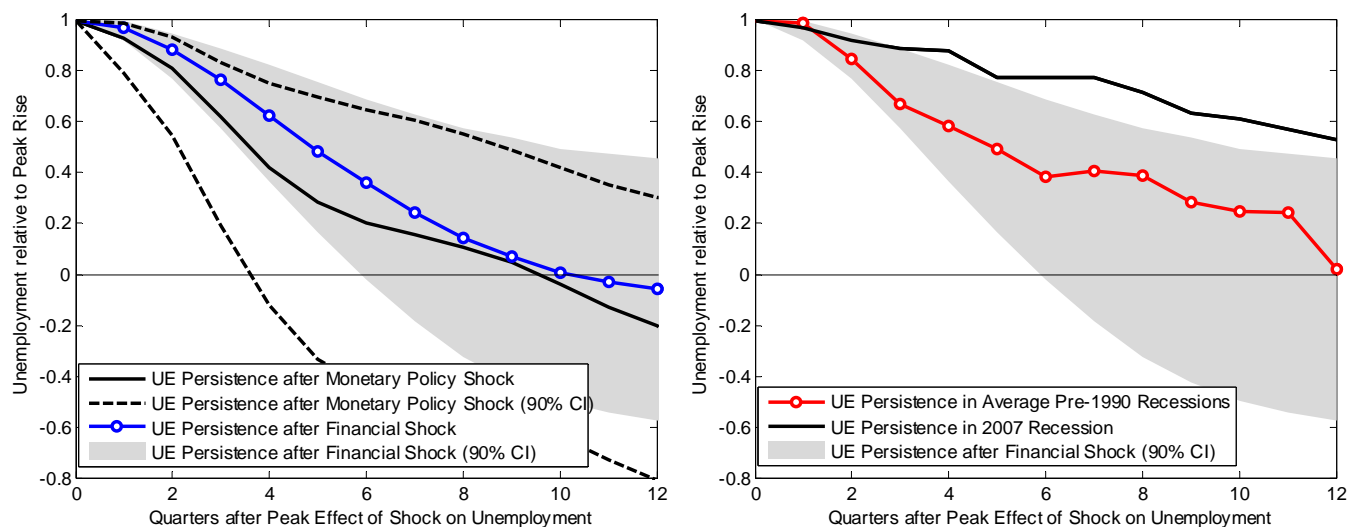
Panel C: Rolling Estimates of Unemployment Persistence



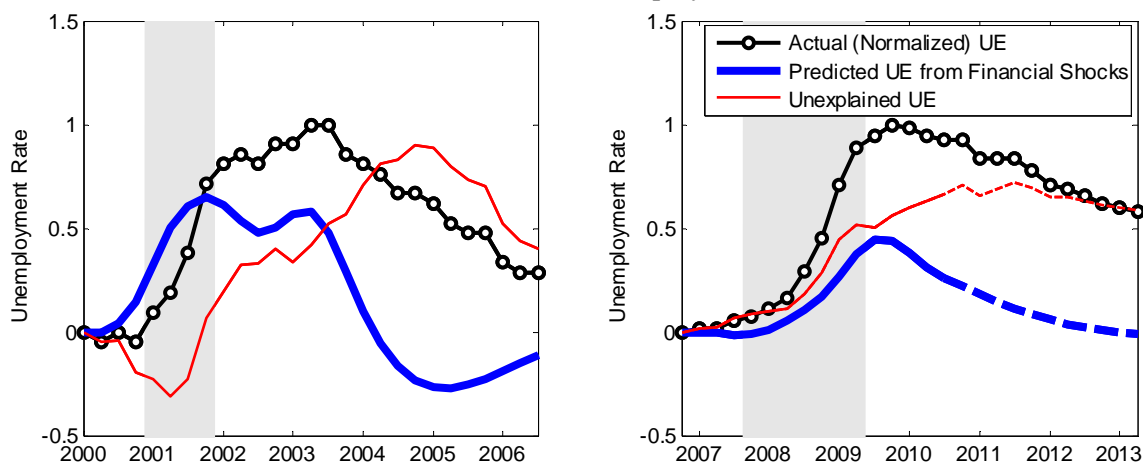
*Notes:* The top panel plots annual unemployment rates for Europe (average for twelve West European countries in our sample) and the U.S. relative to their levels in 1979 and annual unemployment rates for U.S. in the Great Recession relative to 2007 level. Values from 2013-2015 are forecasts from Survey of Professional Forecasters. Panel B plots unemployment rates across U.S. recessions relative to their level in the quarter prior to the start of the recession and normalized by the peak increase in unemployment in each recession. The pre-1990 average is average value across all recessions since 1948 and prior to 1990, dropping all periods following one recession which become part of the subsequent recession. The third panel plots rolling estimates of the sum of AR(2) coefficients for unemployment estimated over 30-year periods, along with one standard deviation confidence intervals.

FIGURE 2: FINANCIAL SHOCKS AND UNEMPLOYMENT PERSISTENCE

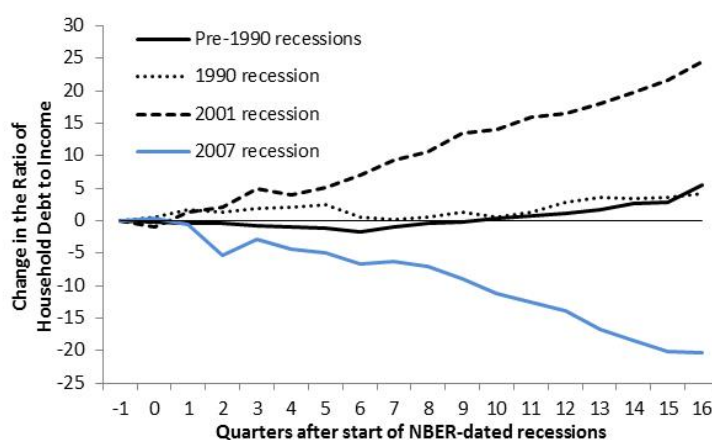
Panel A: Do Financial Shocks Imply High Persistence in Unemployment?



Panel B: Contribution of Financial Shocks to Unemployment in 2001 and 2007 Recessions



Panel C: Household Leverage after U.S. Recessions

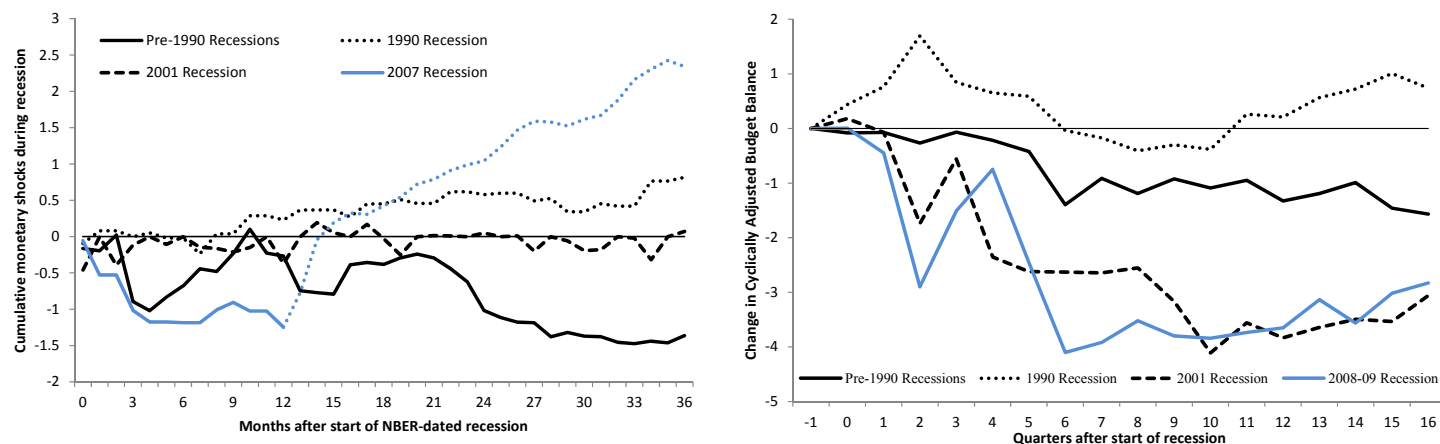


Notes: The left figure of Panel A plots the estimated median and 90% confidence interval (C.I.) of unemployment responses to financial and monetary policy shocks in periods after the peak rise in unemployment. The right figure of panel A plots the same 90% C.I. of unemployment rates for financial shocks after the peak rise in unemployment, as well as the actual paths of unemployment in the 2007 and pre-1990 recessions after the peak rise in unemployment. The figures in Panel B plot the contributions of financial shocks to unemployment in the 2001 and 2007 recessions. Panel C plots the cumulative change in the ratio of household debt to income in U.S. recessions relative to their level in the quarter prior to the start of each recession.

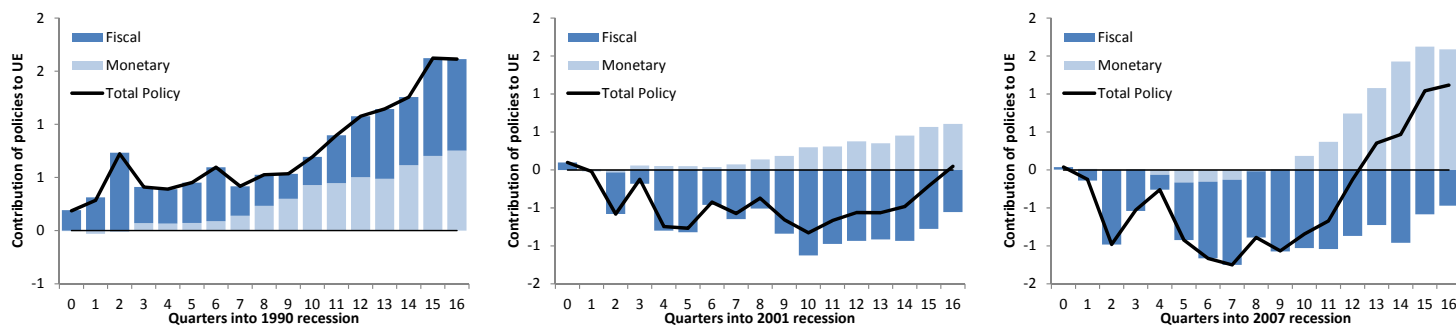


FIGURE 3: THE CONTRIBUTION OF POLICY DIFFERENCES TO UNEMPLOYMENT OUTCOMES

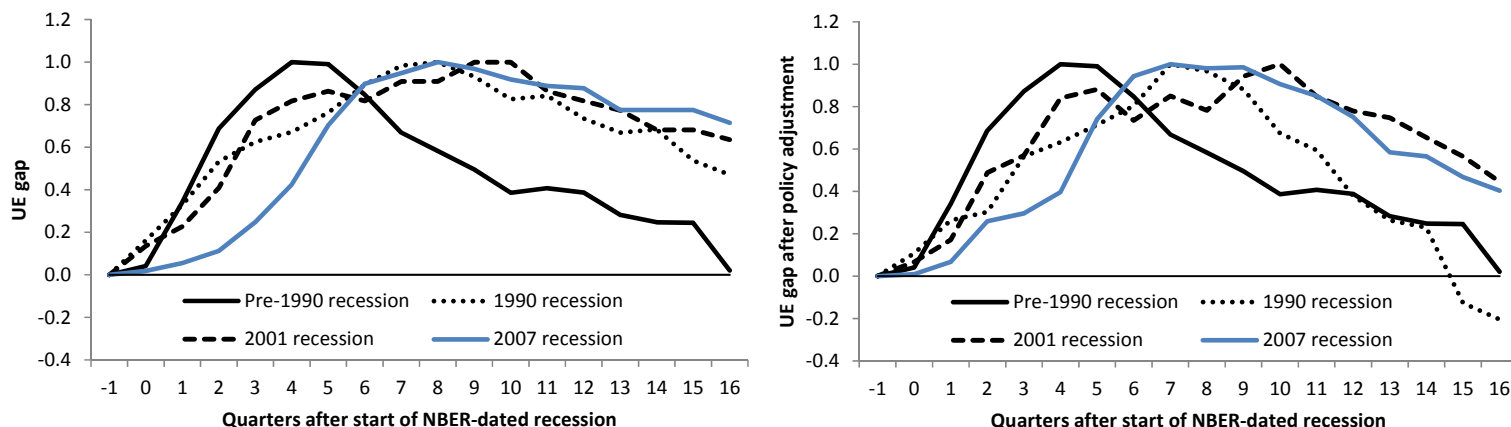
Panel A: Historical Differences in Monetary and Fiscal Policy Responses to Recessions



Panel B: Contribution of Monetary and Fiscal Policy Response Differences to Unemployment Gaps



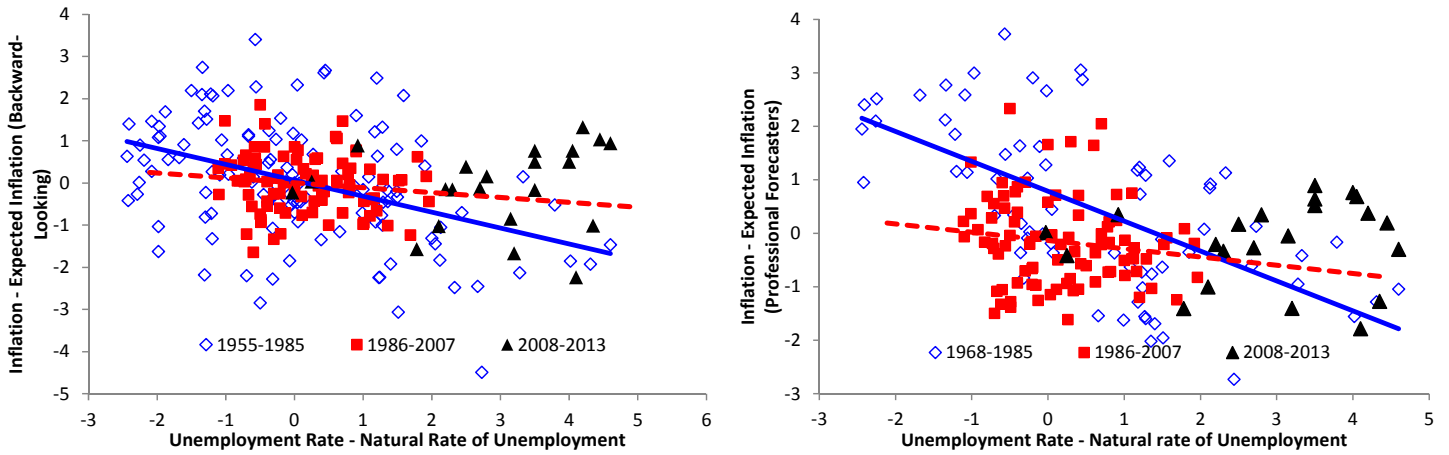
Panel C: Unemployment Gap after Recessions Setting Policies at Pre-1990 Recession Levels



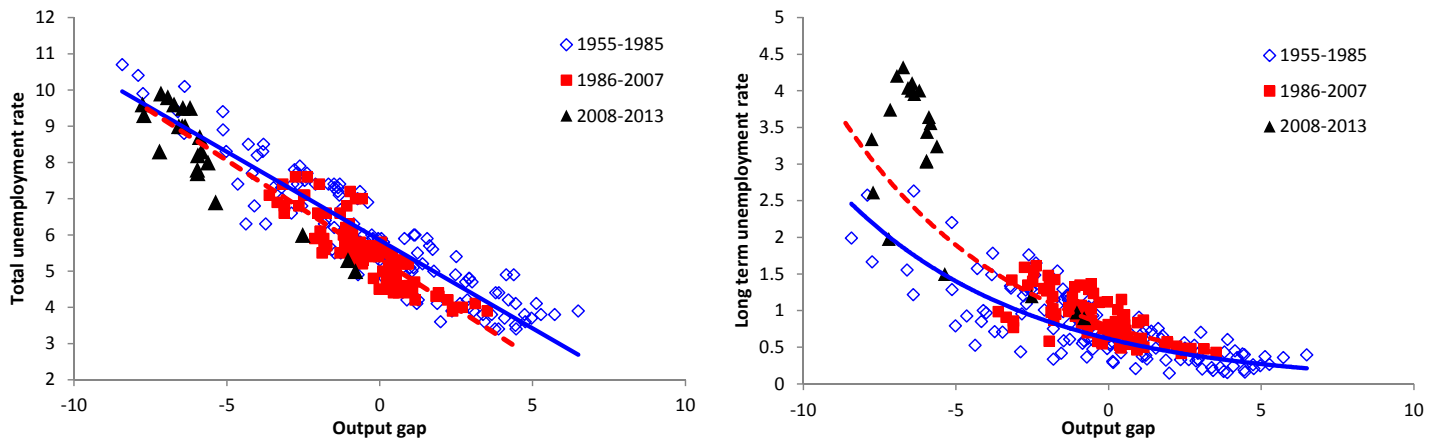
Notes: Panel A shows cumulative shocks to monetary policy (identified as in Romer and Romer (2004)) and to fiscal policy (identified as changes in cyclically adjusted fiscal balance in percent of potential output; source: CBO). Panel B shows the contribution of monetary and fiscal policy to unemployment rate. The contribution of the monetary policy is calculated from the sequences of shocks to monetary policy and estimated impulse response function of unemployment to monetary policy shocks. The contribution of fiscal policy is calculated with the estimated Okun's law (sample period 1949:2013) and output multiplier of government spending assumed to be equal to 1.5. Panel C shows actual (left) and counterfactual (right) dynamics of unemployment gaps. The counterfactual shows the dynamics when the contribution of monetary and fiscal policies is eliminated.

FIGURE 4: OTHER CHANGING FEATURES OF THE U.S. ECONOMY

Panel A: Missing Disinflation



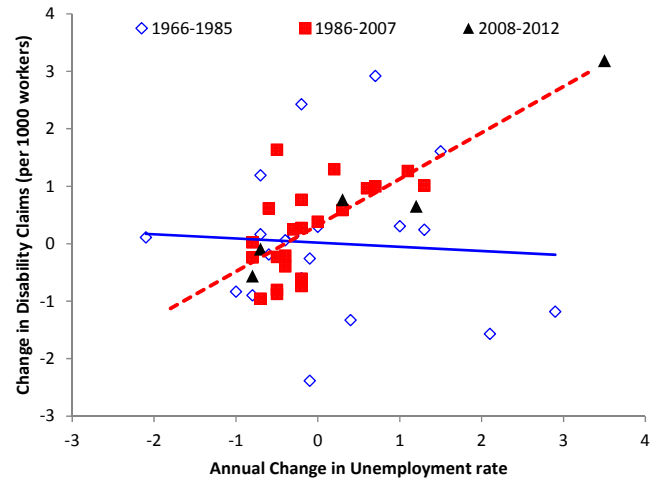
Panel B: Rising Share of Long-Term Unemployment



Panel C: Diminishing Regional Convergence



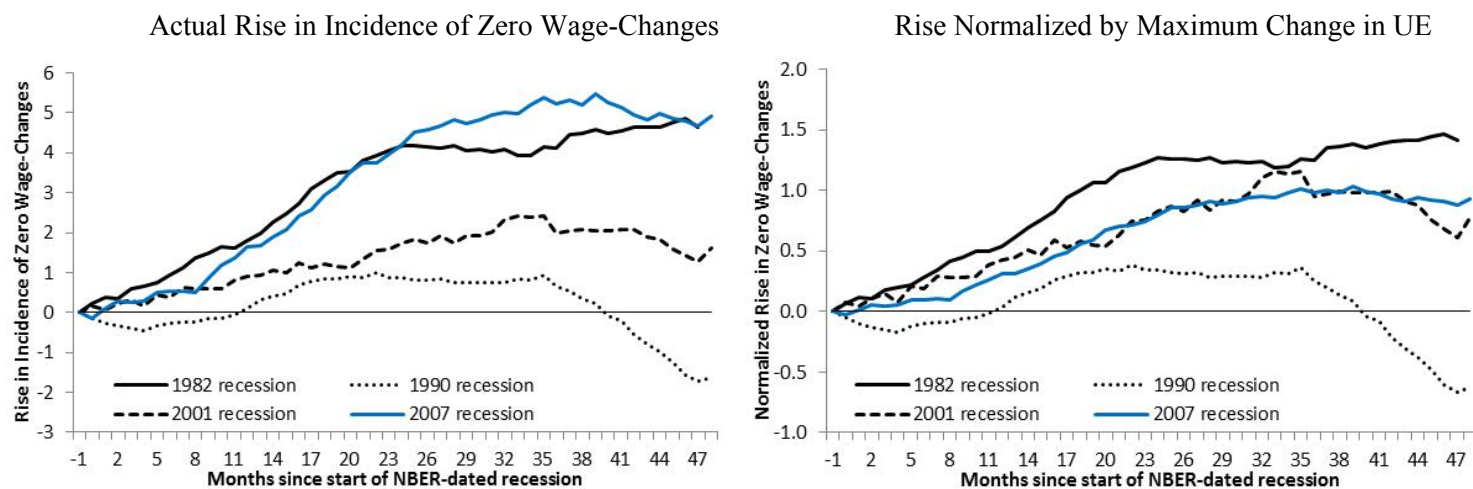
Panel D: Changing Cyclicalities of Disability Claims



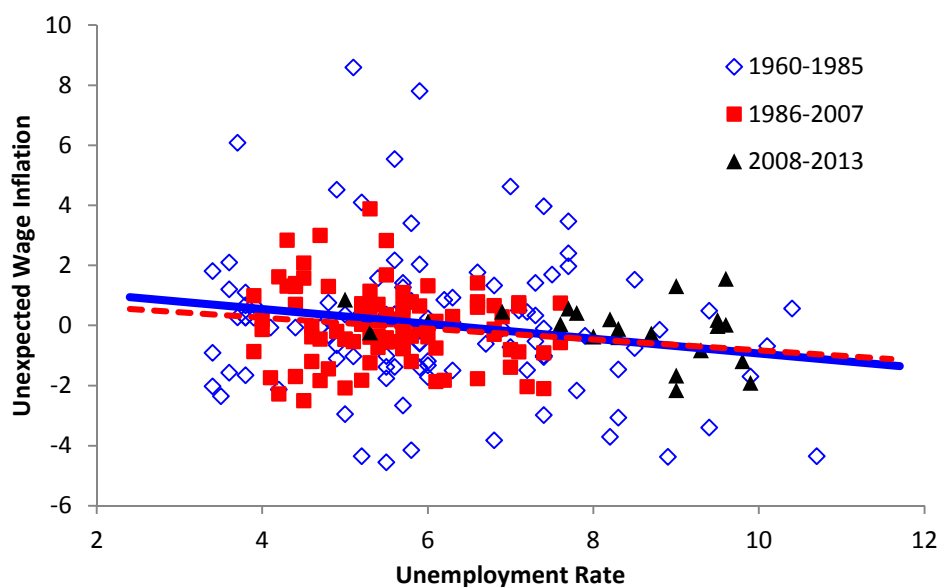
Notes: Panel A plots quarterly unemployment rates against the difference between quarterly changes in wage inflation and expected inflation. In the left figure, expected inflation is the average of the previous four quarterly changes in wage inflation while in the right panel we use expected inflation for the subsequent quarter from the Survey of Professional Forecasters. Panel B plots quarterly deviations of output from the CBO measure of potential against total unemployment rates (left figure) and long-term unemployment rates (right figure). Panel C plots, for each state and each recession, the rise in unemployment rate from the year prior to the start of the recession to two years into the recession (x-axis) versus the change in unemployment rate over subsequent two years (y-axis). Lines show average relationships between the two for each recession. Panel D plots annual changes in unemployment rates against annual changes in the number of disability claims per 1,000 insured workers from 1968-2012. See section 4.1 for details.

FIGURE 5: EVIDENCE ON WAGE RIGIDITIES

Panel A: Rise in incidence of zero wage-changes during last 4 U.S. recessions

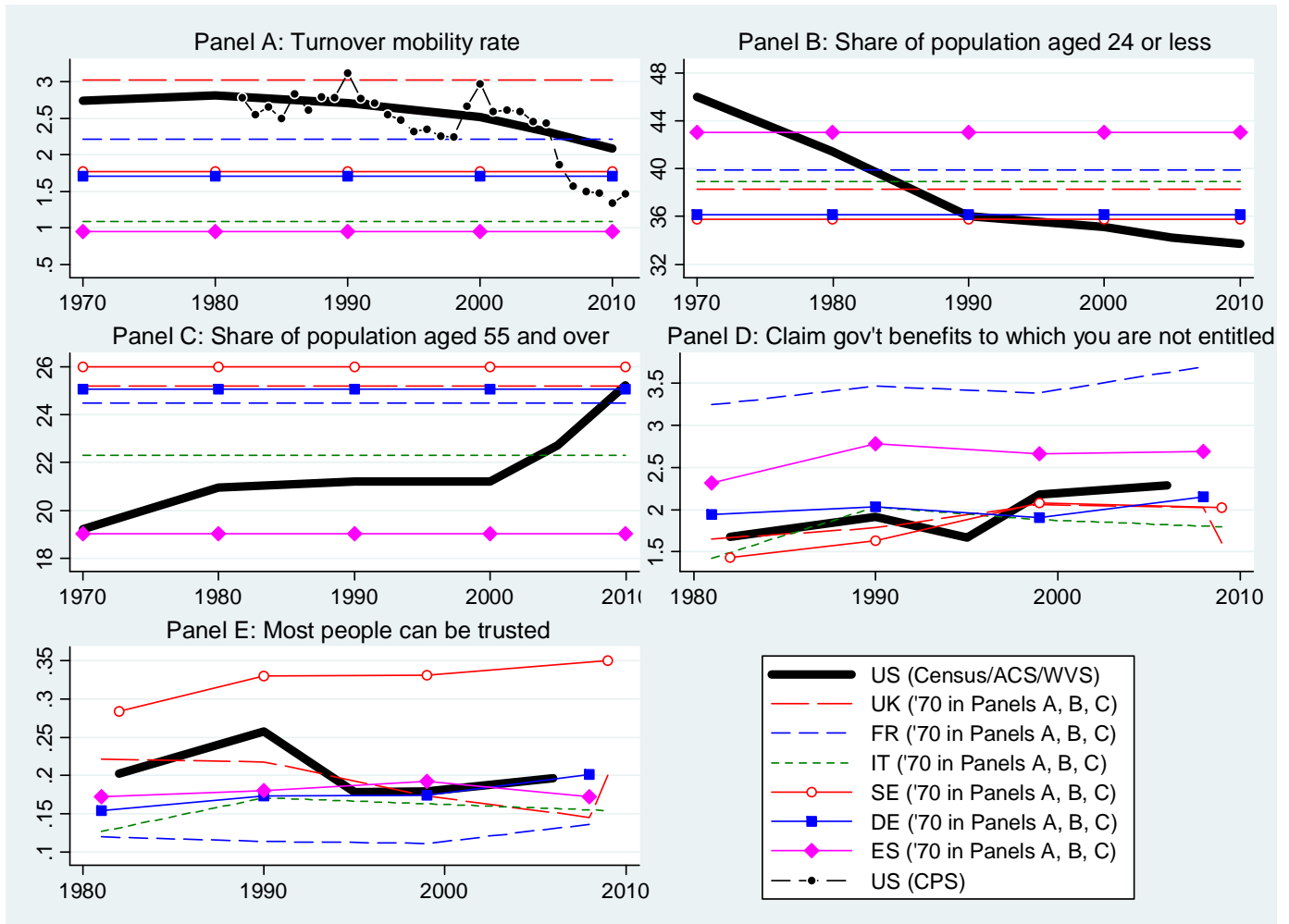


Panel B: Wage Phillips Curves 1960Q1-2013Q1



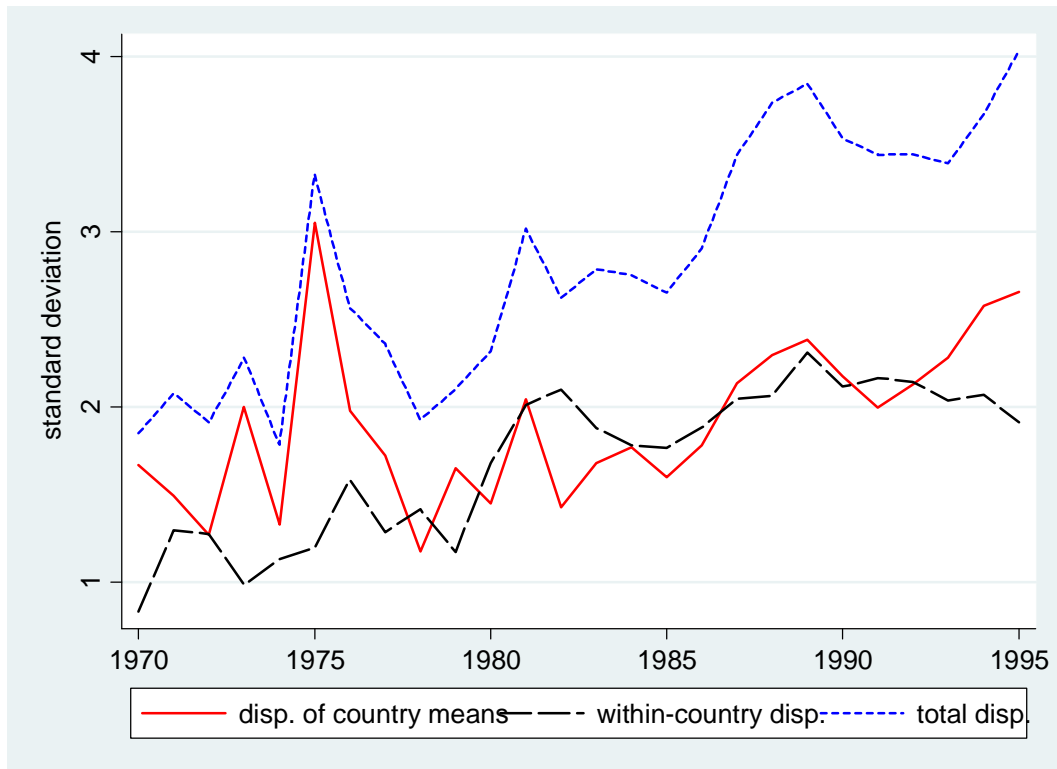
Notes: The left-hand figure in Panel A plots the change in incidence of zero-wage changes during the last four U.S. recessions relative to their level in the month prior to the start of the recession. The right-hand figure of Panel A normalizes the change in incidence in zero-wage changes during each recession by the maximum rise in the unemployment rate that occurred in each recession. Panel B plots a scatter of quarterly unemployment rates against quarterly unexpected wage inflation. The wage series is the average hourly earnings of production and nonsupervisory employees in manufacturing (variable code in the FRED database: CES3000000008). Trend lines for 1960Q1-1985Q4 and 1986Q1-2007Q4 are shown as the blue and red lines respectively. See section text for details.

FIGURE 6: CHANGING AMERICAN MOBILITY RATES, AGE STRUCTURE AND CULTURE



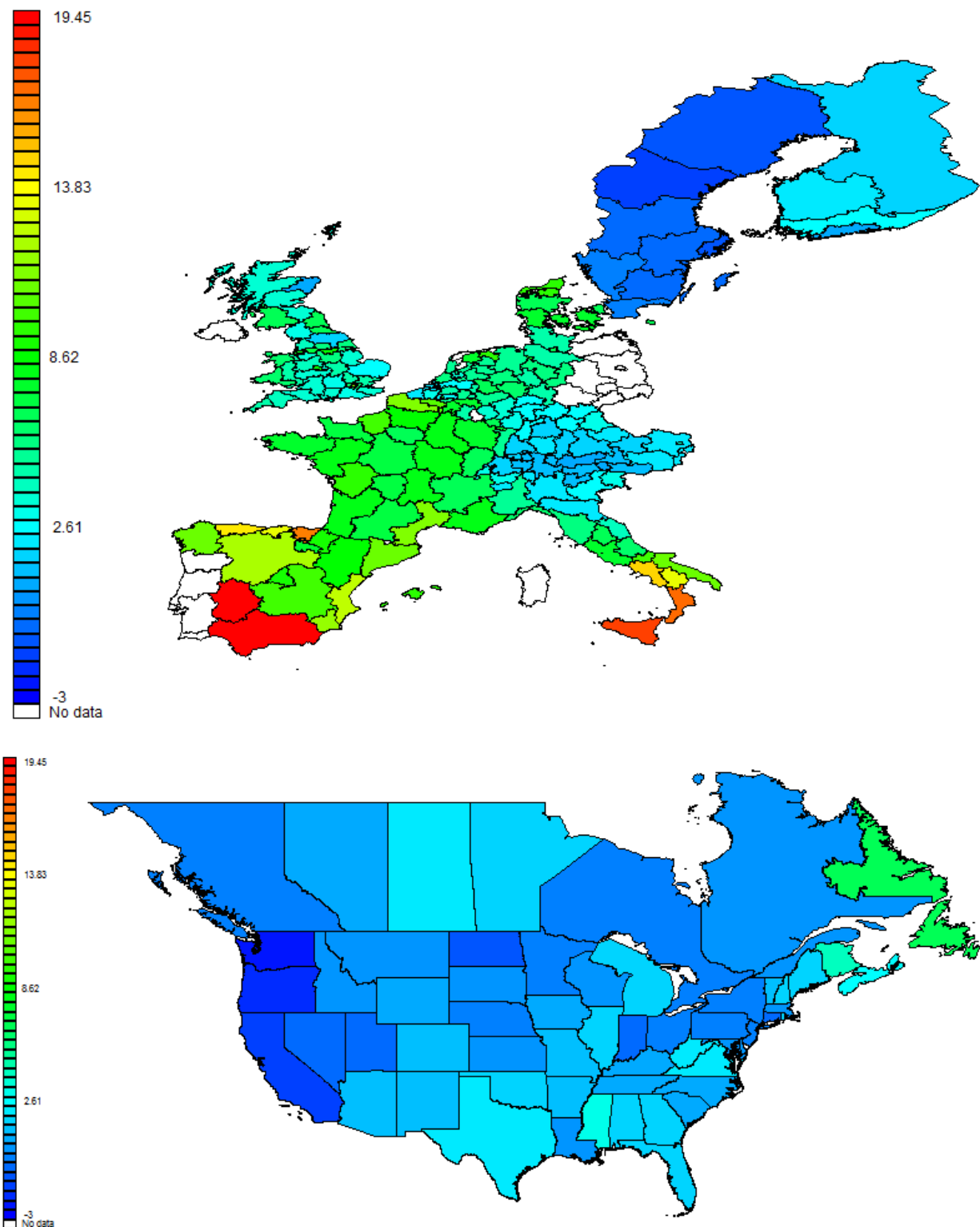
Notes: Panels A, B, and C show time series of the migration rate and population share for the U.S. and the levels of migration rate and population shares for European countries in 1970. Panel A shows migration rates for the U.S. from two sources: i) U.S. Censuses and American Community Surveys (solid, thick, black line) and ii) Current Population Survey (thin, dashed, black line). Panel D shows time variation in the average response to the question “Please tell me for each of the following actions whether you think it can be justified: Claiming government benefits to which you are not entitled” in the World Values Surveys. The possible responses range from 1 (never justifiable) to 10 (always justifiable). Panel C shows time variation in the average response to the question “Generally speaking, would you say that most people can be trusted or that you need to be very careful in dealing with people?” in the World Values Surveys. The possible responses range from 1 (most people can be trusted) to 0 (can’t be too careful).

FIGURE 7: CROSS-SECTIONAL DISPERSION IN UNEMPLOYMENT RATES



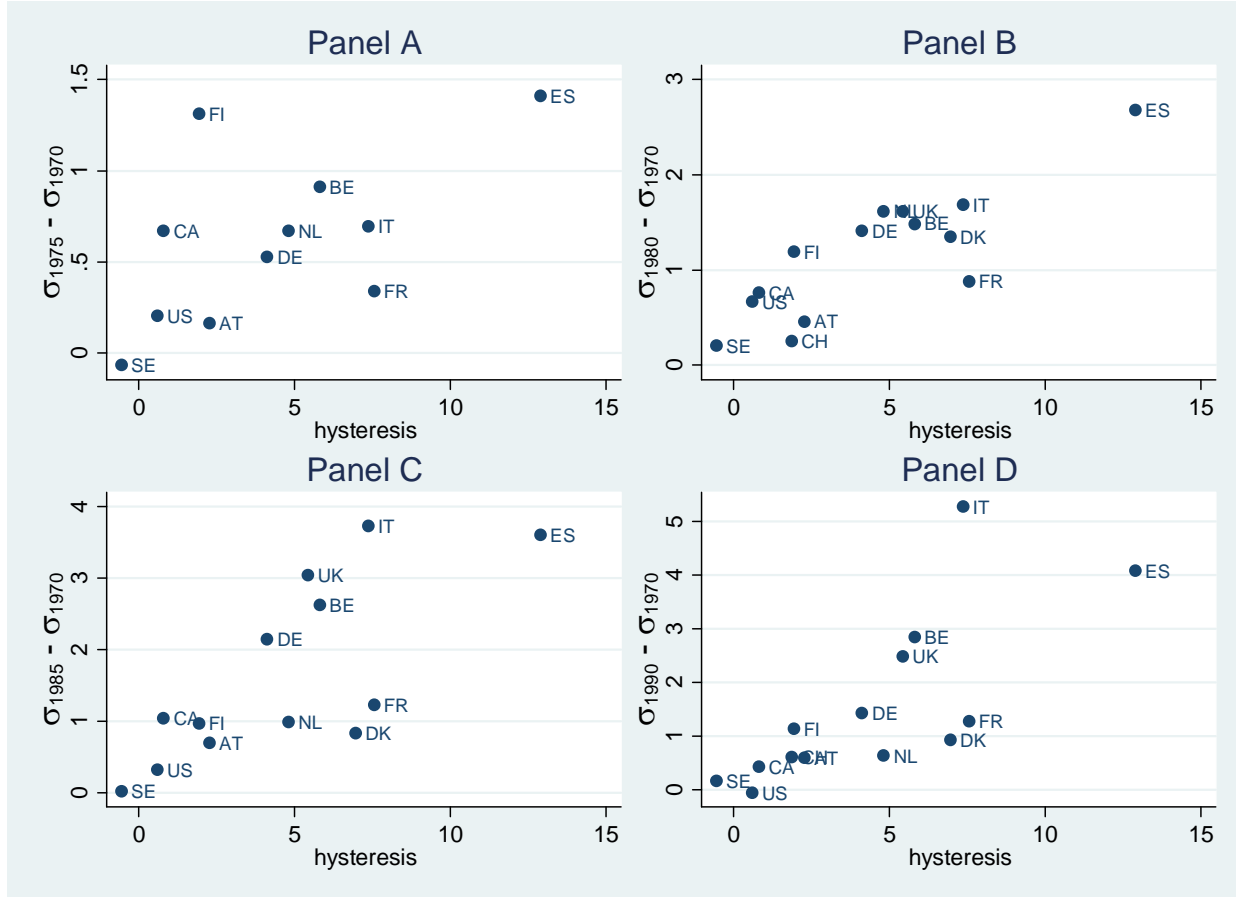
Notes: The dashed black line shows the annual average standard deviation of unemployment rates within countries (population-weighted across regions) over time for the U.S., U.K., Canada, Austria, Belgium, Denmark, Finland, France, Germany, Italy, Netherlands, Sweden and Switzerland. The red line shows the annual standard deviation of unemployment rates across these countries. The dotted line shows the annual standard deviation of unemployment rates across all regions in these countries.

FIGURE 8: GEOGRAPHIC DISTRIBUTION OF UNEMPLOYMENT HYSTERESIS



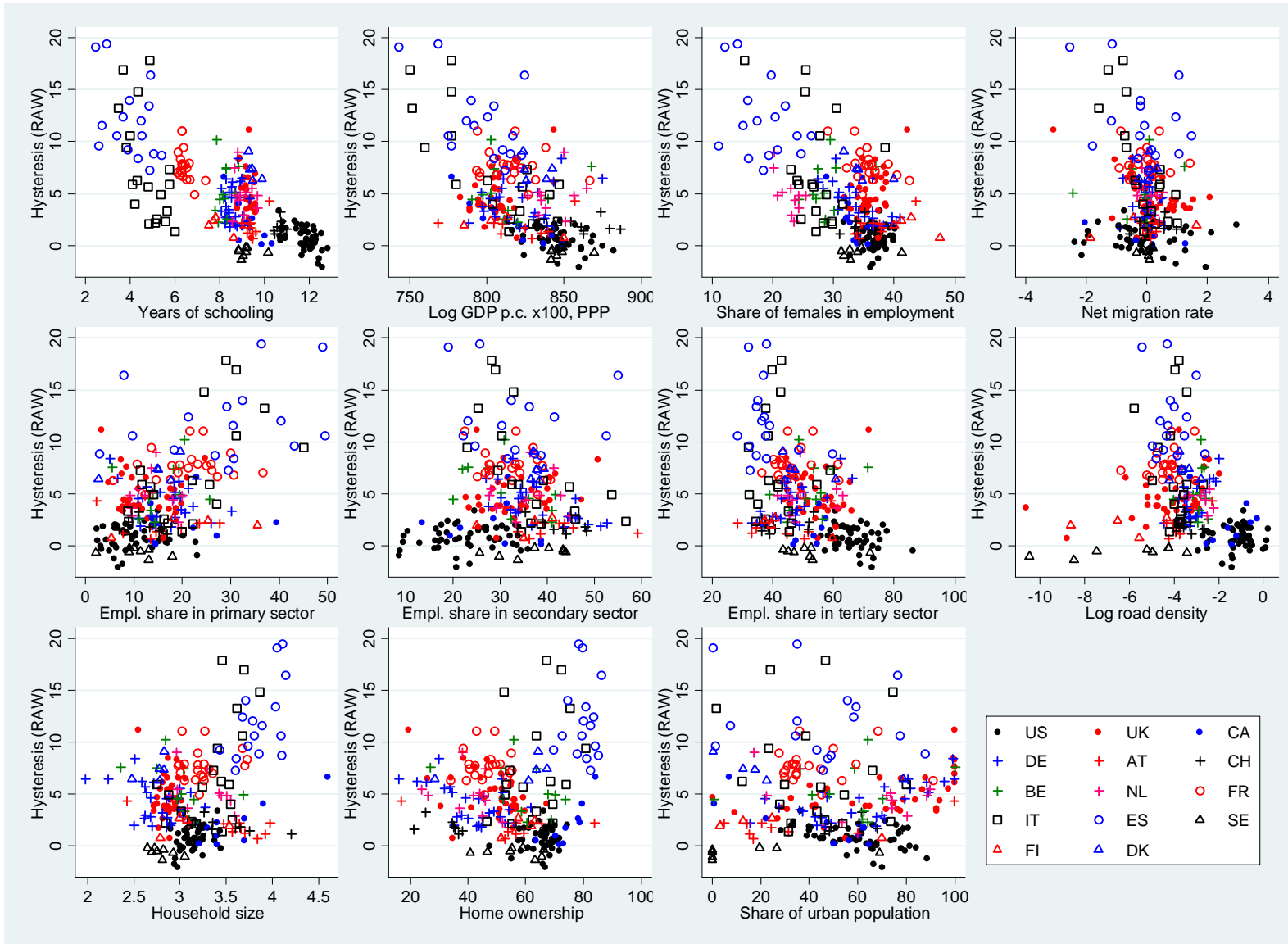
Notes: The figure shows the degree of hysteresis (as defined in the text) for each region. Higher values denote more hysteresis.

FIGURE 9: HYSTERESIS AND CHANGES IN THE WITHIN-COUNTRY DISPERSION OF UNEMPLOYMENT



Notes: Regional measures of hysteresis are aggregated to the country with population weights. The within-country dispersion of unemployment rate is calculated as follows. First, for each country & year, calculate standard deviation (population weighted) of regional unemployment rates:  $\sigma_{ct}$ . Second, calculate five year averages of  $\sigma_{ct}$  for each country:  $\bar{\sigma}_{ct}$ . For example,  $\bar{\sigma}_{c,1970} = \frac{1}{5}(\sigma_{c,1970} + \sigma_{c,1971} + \sigma_{c,1972} + \sigma_{c,1973} + \sigma_{c,1974})$ . Third, calculate the difference:  $\bar{\sigma}_{c,t} - \bar{\sigma}_{c,1970}$  and plot it against hysteresis.

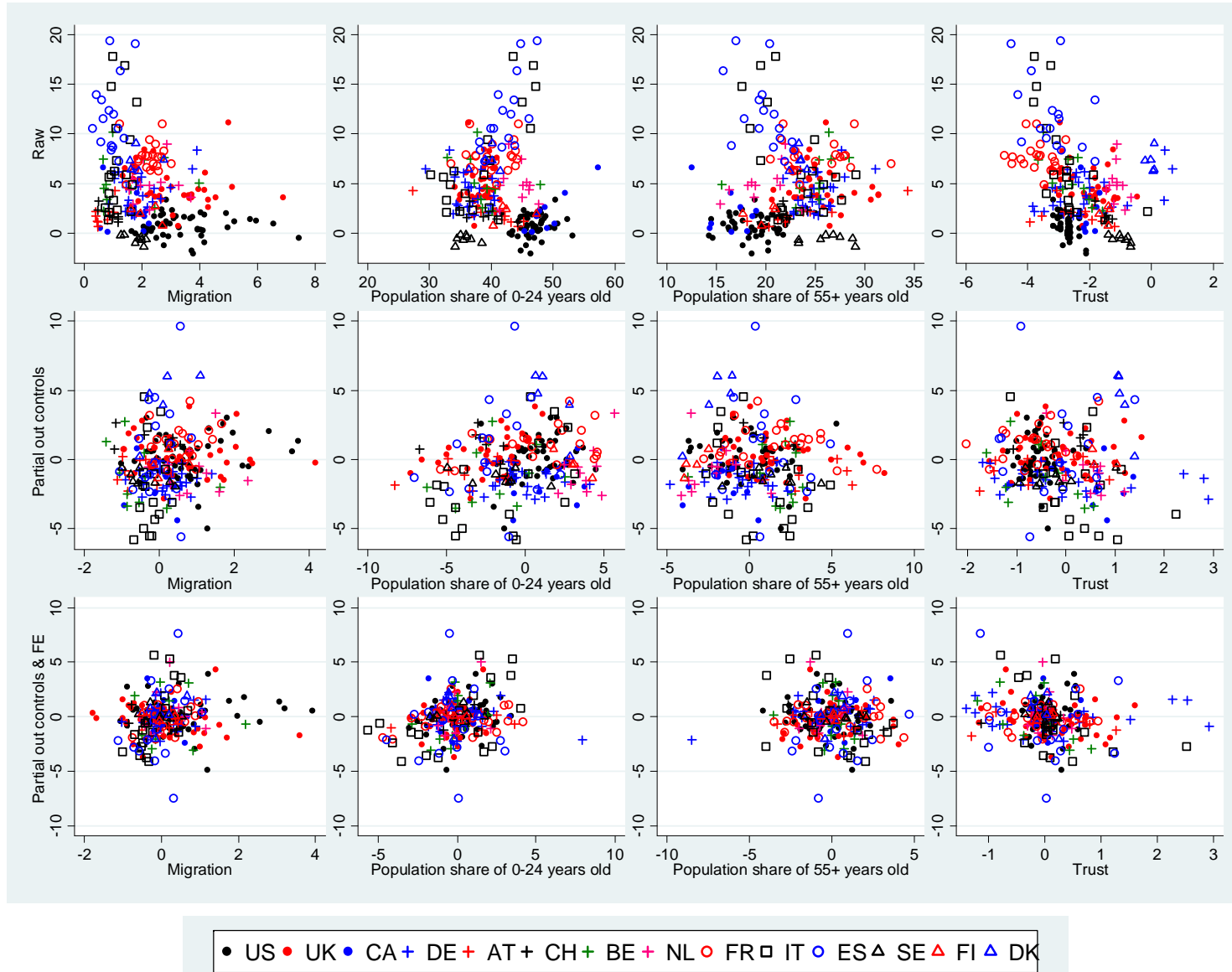
FIGURE 10: CORRELATIONS OF REGIONAL CONTROLS WITH REGIONAL UNEMPLOYMENT HYSTERESIS



Notes: Each panel shows a scatter plot of  $h$  (our measure of hysteresis in the unemployment rate) vs. a given control variable. Each point corresponds to a region. Each country has a country-specific marker. See Appendix A for definitions of variables as well as details on how these variables are constructed.



FIGURE 11: CORRELATIONS OF REGIONAL CONTROLS WITH REGIONAL UNEMPLOYMENT HYSTERESIS



Notes: Each panel shows a scatter plot of  $h$  (our measure of hysteresis in the unemployment rate) vs. a given control variable. Each point corresponds to a region. Each country has a country-specific marker. The first row shows the relationship between variables when no adjustments to the variables are made. The second row shows the relationship when the effects of controls (see Table 1 for the list of controls) are partialled out (as in Table 1, population weights are used when controls are partialled out). The second row shows the relationship when the effects of controls and country fixed effects are partialled out (as in Table 1, population weights are used when controls and country fixed effects are partialled out). See Appendix A for definitions of variables as well as details on how these variables are constructed.

TABLE 1: THE EFFECTS OF MOBILITY, AGE STRUCTURE AND CULTURE ON UNEMPLOYMENT HYSTERESIS

VARIABLES	OLS (1)	OLS (2)	FE (3)	OLS (4)	OLS (5)	FE (6)	OLS (7)	OLS (8)	FE (9)	OLS (10)	FE (11)
Turnover migration rate	-0.34 (0.37)	0.43* (0.26)	0.41* (0.24)							0.37 (0.27)	0.29 (0.22)
Population share 0-24 years				0.16 (0.15)	0.18 (0.13)	0.60*** (0.13)				0.14 (0.13)	0.58*** (0.12)
Population share 55+ years				0.18 (0.18)	0.17 (0.14)	0.42*** (0.13)				0.17 (0.14)	0.42*** (0.12)
Trust							-1.34*** (0.45)	0.08 (0.30)	-0.97*** (0.34)	0.16 (0.33)	-1.00*** (0.32)
Controls											
Years of schooling		-0.87*** (0.15)	-1.67** (0.66)		-0.94*** (0.15)	-1.60** (0.64)		-0.88*** (0.17)	-1.55** (0.66)	-0.98*** (0.17)	-1.57** (0.63)
Share of employment in the primary sector		0.05 (0.04)	0.02 (0.03)		0.03 (0.04)	-0.01 (0.03)		0.02 (0.04)	-0.00 (0.03)	0.04 (0.04)	-0.01 (0.03)
Share of employment in the secondary sector		-0.02 (0.03)	-0.05** (0.03)		-0.03 (0.03)	-0.07*** (0.02)		-0.05* (0.03)	-0.07*** (0.02)	-0.02 (0.03)	-0.06** (0.02)
Women's share in employment		-0.20*** (0.04)	-0.26*** (0.09)		-0.19*** (0.04)	-0.21*** (0.08)		-0.18*** (0.04)	-0.28*** (0.09)	-0.18*** (0.04)	-0.23*** (0.08)
Household size		-0.23 (0.74)	-0.67 (0.72)		-0.60 (0.91)	-2.48** (1.17)		-0.32 (0.72)	-0.65 (0.69)	-0.08 (0.76)	-2.13* (1.18)
Home ownership rate		-0.05*** (0.02)	-0.04* (0.02)		-0.05*** (0.02)	-0.04* (0.02)		-0.05*** (0.02)	-0.02 (0.02)	-0.05*** (0.02)	-0.03 (0.02)
Net migration rate		-0.39 (0.27)	-0.26 (0.21)		-0.35 (0.28)	-0.11 (0.20)		-0.40 (0.28)	-0.26 (0.21)	-0.34 (0.27)	-0.10 (0.18)
Share of urban population		0.01 (0.01)	0.03** (0.01)		0.01 (0.02)	0.03** (0.01)		0.01 (0.01)	0.03** (0.01)	0.01 (0.01)	0.04*** (0.01)
Log(Income p.c.) × 100		-0.05*** (0.01)	-0.04** (0.02)		-0.04*** (0.01)	-0.02 (0.02)		-0.05*** (0.01)	-0.03* (0.02)	-0.04*** (0.01)	-0.01 (0.02)
Road density		0.46*** (0.16)	0.49*** (0.12)		0.35** (0.17)	0.48*** (0.13)		0.42** (0.20)	0.47*** (0.12)	0.44** (0.21)	0.44*** (0.14)
City region		3.50*** (0.56)	0.40 (0.82)		3.52*** (0.69)	0.57 (0.91)		3.52*** (0.59)	0.88 (0.81)	3.33*** (0.63)	0.47 (0.92)
Capital		-0.05 (0.51)	0.50 (0.50)		-0.12 (0.60)	0.42 (0.46)		-0.31 (0.54)	0.28 (0.49)	-0.01 (0.59)	0.35 (0.46)
Observations	232	232	232	232	232	232	232	232	232	232	232
R-squared	0.01	0.71	0.85	0.01	0.71	0.86	0.12	0.70	0.85	0.71	0.87
BIC	5.690	4.741	4.415	5.712	4.772	4.342	5.570	4.759	4.355	4.803	4.286

Notes: Regression is estimated with population weights where weights are constructed in such a way that regions within a country receive weights proportional to their population but at the same time all countries have the same weight. Country fixed effects are included (but not reported) in columns "FE". Robust standard errors are reported in parentheses. \*, \*\*, \*\*\* significant at 10%, 5%, and 1%.

TABLE 2: ROBUSTNESS TO COUNTRY SELECTION

VARIABLES	Baseline		Exclude U.S. and Canada		Exclude Italy & Spain		Exclude France and Germany		Exclude Nordic countries	
	OLS (1)	FE (2)	OLS (3)	FE (4)	OLS (5)	FE (6)	OLS (7)	FE (8)	OLS (9)	FE (10)
Turnover migration rate	0.37 (0.27)	0.29 (0.22)	0.17 (0.28)	0.43* (0.25)	0.39 (0.24)	0.07 (0.16)	0.35 (0.31)	0.29 (0.23)	0.36 (0.22)	0.24 (0.27)
Population share 0-24 years	0.14 (0.13)	0.58*** (0.12)	0.26* (0.15)	0.59*** (0.14)	0.25** (0.13)	0.29*** (0.11)	-0.14 (0.18)	0.68*** (0.13)	0.20* (0.11)	0.58*** (0.12)
Population share 55+ years	0.17 (0.14)	0.42*** (0.12)	0.12 (0.16)	0.39*** (0.14)	0.32** (0.13)	0.25** (0.10)	-0.14 (0.20)	0.47*** (0.13)	0.31** (0.13)	0.38*** (0.12)
Trust	0.16 (0.33)	-1.00*** (0.32)	-0.09 (0.32)	-1.05*** (0.32)	0.36 (0.31)	-0.61** (0.24)	0.15 (0.39)	-1.55*** (0.44)	-1.14*** (0.30)	-0.91*** (0.32)
Controls										
Years of schooling	-0.98*** (0.17)	-1.57** (0.63)	-0.85*** (0.20)	-1.62* (0.85)	-0.95*** (0.17)	-1.64*** (0.45)	-0.56** (0.27)	-1.55** (0.67)	-0.63*** (0.17)	-1.22* (0.63)
Share of employment in the primary sector	0.04 (0.04)	-0.01 (0.03)	0.07 (0.05)	0.01 (0.04)	0.08** (0.04)	0.03 (0.03)	0.08* (0.05)	-0.02 (0.03)	0.05 (0.03)	0.01 (0.04)
Share of employment in the secondary sector	-0.02 (0.03)	-0.06** (0.02)	-0.05 (0.04)	-0.08*** (0.03)	-0.00 (0.03)	-0.06*** (0.02)	-0.00 (0.04)	-0.06** (0.03)	-0.04 (0.03)	-0.04 (0.03)
Women's share in employment	-0.18*** (0.04)	-0.23*** (0.08)	-0.14*** (0.04)	-0.22*** (0.08)	-0.07** (0.04)	-0.15*** (0.04)	-0.24*** (0.05)	-0.24** (0.11)	-0.24*** (0.05)	-0.23*** (0.09)
Household size	-0.08 (0.76)	-2.13* (1.18)	-0.96 (0.90)	-2.43* (1.32)	-1.03 (0.71)	-1.74** (0.87)	-0.83 (0.99)	-3.27** (1.50)	2.21*** (0.85)	-2.21 (1.34)
Home ownership rate	-0.05*** (0.02)	-0.03 (0.02)	-0.01 (0.03)	-0.03 (0.02)	-0.08*** (0.02)	-0.03** (0.02)	-0.04* (0.02)	-0.04 (0.02)	-0.07*** (0.02)	-0.07*** (0.02)
Net migration rate	-0.34 (0.27)	-0.10 (0.18)	-0.42 (0.33)	-0.23 (0.23)	-0.13 (0.22)	-0.07 (0.16)	-0.46 (0.30)	0.03 (0.21)	-0.13 (0.26)	0.05 (0.22)
Share of urban population	0.01 (0.01)	0.04*** (0.01)	0.01 (0.01)	0.05*** (0.01)	0.00 (0.01)	0.01 (0.01)	0.01 (0.01)	0.04*** (0.01)	0.06*** (0.01)	0.04*** (0.01)
Log(Income p.c.) × 100	-0.04*** (0.01)	-0.01 (0.02)	-0.03* (0.01)	-0.01 (0.02)	-0.03*** (0.01)	0.01 (0.01)	-0.07*** (0.01)	-0.02 (0.02)	-0.04*** (0.01)	-0.04** (0.02)
Road density	0.44** (0.21)	0.44*** (0.14)	0.78*** (0.25)	0.39*** (0.14)	0.67*** (0.19)	0.46*** (0.11)	0.45** (0.21)	0.42** (0.17)	-0.09 (0.18)	0.48** (0.19)
City region	3.33*** (0.63)	0.47 (0.92)	3.54*** (0.76)	0.55 (0.91)	2.21*** (0.65)	0.83 (0.63)	3.77*** (0.78)	-0.79 (0.95)	1.80* (0.93)	1.54 (1.38)
Capital	-0.01 (0.59)	0.35 (0.46)	-0.16 (0.78)	-0.25 (0.52)	-0.08 (0.47)	0.30 (0.28)	-0.11 (0.64)	0.75 (0.47)	0.17 (0.48)	0.49 (0.48)
Observations	232	232	175	175	197	197	183	183	215	215
R-squared	0.71	0.87	0.71	0.87	0.64	0.87	0.72	0.88	0.82	0.87
BIC	4.803	4.286	4.887	4.436	4.386	3.642	4.954	4.376	4.432	4.366

Notes: Regression is estimated with population weights where weights are constructed in such a way that regions within a country receive weights proportional to their population but at the same time all countries have the same weight. Country fixed effects are included (but not reported) in columns “FE”. Robust standard errors are reported in parentheses. \*, \*\*, \*\*\* significant at 10%, 5%, and 1%.

TABLE 3: INTERACTIONS OF MOBILITY, AGE STRUCTURE AND CULTURE WITH LABOR INSTITUTIONS

	OLS (1)	FE (2)	OLS (3)	FE (4)	OLS (5)	FE (6)	OLS (7)	FE (8)
<b>Panel A: Employment protection (EP)</b>								
Turnover migration rate	0.46 (0.40)	-0.11 (0.28)	0.37 (0.25)	0.31 (0.21)	0.40 (0.28)	0.25 (0.22)	0.43 (0.33)	-0.12 (0.30)
Population share 0-24 years	0.14 (0.15)	0.58*** (0.12)	-0.31* (0.18)	0.17 (0.18)	0.25* (0.15)	0.58*** (0.12)	-0.20 (0.20)	0.20 (0.17)
Population share 55+ year	0.16 (0.17)	0.41*** (0.12)	-0.04 (0.21)	0.19 (0.19)	0.25 (0.17)	0.42*** (0.12)	0.04 (0.22)	0.24 (0.19)
Trust	0.19 (0.33)	-1.01*** (0.31)	0.03 (0.30)	-0.89*** (0.31)	1.41*** (0.46)	-0.01 (0.46)	0.79* (0.46)	-0.03 (0.43)
EP	-0.02 (0.57)		-10.74** (4.76)		-1.30** (0.54)		-10.42** (4.98)	
EP × Turnover migration rate	-0.07 (0.21)	0.27* (0.16)					-0.03 (0.21)	0.27 (0.18)
EP × Population share 0-24 years			0.22*** (0.07)	0.18*** (0.07)			0.20*** (0.08)	0.16** (0.07)
EP × Population share 55+ years			0.08 (0.10)	0.13 (0.09)			0.07 (0.11)	0.09 (0.08)
EP × Trust					-0.57** (0.23)	-0.42* (0.23)	-0.35 (0.24)	-0.37* (0.22)
Observations	232	232	232	232	232	232	232	232
R-squared	0.71	0.88	0.75	0.88	0.72	0.88	0.75	0.89
BIC	4.847	4.290	4.729	4.267	4.814	4.283	4.762	4.274
<b>Panel B: Replacement Rate (RR)</b>								
Turnover migration rate	0.24 (0.66)	-0.04 (0.37)	0.53* (0.28)	0.36 (0.22)	0.32 (0.26)	0.29 (0.22)	0.73 (0.62)	-0.09 (0.39)
Population share 0-24 years	0.12 (0.14)	0.60*** (0.13)	-0.03 (0.19)	0.56*** (0.11)	0.08 (0.15)	0.58*** (0.12)	-0.09 (0.19)	0.60*** (0.12)
Population share 55+ year	0.15 (0.14)	0.43*** (0.12)	-0.38 (0.26)	0.20 (0.14)	0.16 (0.14)	0.42*** (0.12)	-0.41 (0.25)	0.27* (0.15)
Trust	0.14 (0.30)	-1.00*** (0.32)	0.24 (0.29)	-0.94*** (0.30)	-0.99 (0.68)	-1.53 (1.02)	-1.07* (0.63)	-1.12 (0.95)
RR	-0.04 (4.36)		-93.53 (56.63)		9.35 (6.16)		-87.94 (59.15)	
RR × Turnover migration rate	0.50 (2.30)	1.36 (1.43)					-0.94 (2.20)	2.02 (1.58)
RR × Population share 0-24 years			0.87 (0.87)	-1.03** (0.43)			0.92 (0.91)	-1.23** (0.48)
RR × Population share 55+ years			2.69** (1.04)	0.08 (0.45)			2.87** (1.11)	-0.24 (0.55)
RR × Trust					4.20 (2.65)	2.16 (3.74)	4.94** (2.34)	0.70 (3.48)
Observations	232	232	232	232	232	232	232	232
R-squared	0.71	0.87	0.74	0.88	0.72	0.87	0.76	0.88
BIC	4.848	4.304	4.763	4.274	4.814	4.304	4.757	4.310

Notes: The table reports results for the baseline specification augmented with interactions with the index of employment protection in 1970 (EP, source: Blanchard and Wolfers 2003) and with wage replacement rate for unemployed workers in 1970 (RR, source: Florence Jaumotte). Controls shown in Table 1 are included but not reported. Regression is estimated with population weights where weights are constructed in such a way that regions within a country receive weights proportional to their population but at the same time all countries have the same weight. Country fixed effects are included (but not reported) in columns “FE”. Robust standard errors are reported in parentheses. \*, \*\*, \*\*\* significant at 10%, 5%, and 1%.

TABLE 4: ADDITIONAL INTERACTIONS

Blocks of variables	Shocks			Labor Institutions		Cultural		
	Labor demand	Real interest rate	TFP	Replacement rate	Employment protection	Value of Work	Trust	Individualism
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
<b>Panel A: Change in R<sup>2</sup>, no country fixed effects</b>								
<i>Age distribution</i>	0.009**	0.000	0.002	0.000	0.000	0.003	0.000	0.005
<i>Mobility</i>	0.012**	0.038***	0.011*	0.030***	0.038***	0.027***	0.010*	0.009
<i>Cultural</i>	0.014***	0.101***	0.074***	0.010	0.010**	0.009*	0.063***	0.102***
<i>Controls</i>	0.072***	0.169***	0.096***	0.104***	0.069***	0.046***	0.140***	0.142***
<b>Panel B: BIC, no country fixed effects</b>								
<i>Age distribution</i>	4.806	4.813	4.785	4.848	4.847	4.834	4.826	4.831
<i>Mobility</i>	4.820	4.693	4.778	4.763	4.729	4.772	4.816	4.843
<i>Cultural</i>	4.794	4.261	4.508	4.834	4.843	4.857	4.543	4.404
<i>Controls</i>	4.806	4.134	4.617	4.657	4.830	4.931	4.419	4.424
Baseline (no interactions)	4.816	4.792	4.770	4.825	4.825	4.823	4.803	4.826
<b>Panel C: Change in R<sup>2</sup>, country fixed effects</b>								
<i>Age distribution</i>	0.000	0.001	0.000	0.002*	0.002*	0.001	0.001	0.000
<i>Mobility</i>	0.001	0.011***	0.001	0.007**	0.008**	0.007**	0.005*	0.002
<i>Cultural</i>	0.018***	0.012**	0.014***	0.001	0.010**	0.013***	0.008*	0.007
<i>Controls</i>	0.033***	0.043***	0.012	0.029***	0.019*	0.023**	0.037***	0.023***
<b>Panel D: BIC, country fixed effects</b>								
<i>Age distribution</i>	4.308	4.302	4.309	4.302	4.290	4.323	4.299	4.302
<i>Mobility</i>	4.322	4.239	4.328	4.290	4.267	4.299	4.292	4.312
<i>Cultural</i>	4.200	4.256	4.243	4.361	4.275	4.271	4.293	4.293
<i>Controls</i>	4.266	4.158	4.469	4.320	4.402	4.386	4.222	4.357
Baseline (no interactions)	4.286	4.286	4.286	4.298	4.286	4.308	4.286	4.278

Notes: Panels A and C show the change in R<sup>2</sup> when interaction of the variable in a given column with variables in the block indicated in the left column are introduced relative to the specification which includes all variables in the baseline specification as well as the variable indicated in the column. \*, \*\*, \*\*\* indicate statistical significance of interactions (joint F-test) at 10%, 5%, and 1%. Panels B and D present values of the Bayesian Information Criterion ( $BIC = (-2 \log \text{Likelihood} + (\# \text{ parameters}) \times \log(\# \text{ observations})) / (\# \text{ observations})$ ) when interaction of the variable in a given column with variables in the block indicated in the left column are introduced. The last row of Panel B and Panel D reports BIC for the specification which includes all variables in the baseline specification as well as the variable indicated in the column but no interactions. Shocks and Employment protection (for 1970) are taken from Blanchard and Wolfers (2003). Wage replacement rate for unemployed workers (for 1970) is from Florence Jaumotte. Construction of cultural indexes *Value of Work* and *Individualism* is described in Appendix Table A2.

TABLE 5: COUNTERFACTUAL LEVELS OF HYSTERESIS FOR THE U.S.

Scenario	Predicted hysteresis	Specification used for prediction	
		OLS	FE
		(1)	(2)
(1)	All variables have values from 1970	0.37 (0.18)	0.60 (0.20)
	Counterfactuals		
(2)	Migration rate is from 2000, all other variables have values from 1970	0.30 (0.19)	0.55 (0.20)
(3)	Demographic shares are from 2000, all other variables have values from 1970	-0.83 (0.25)	-4.91 (0.27)
(4)	Reduced index of trust, all other variables have values from 1970	0.21 (0.19)	1.61 (0.21)
(5)	Migration rate and demographic shares are from 2000, reduced index of trust, all other variables have values from 1970	-1.06 (0.26)	-3.97 (0.28)

Notes: the table reported predicted hysteresis for various scenarios. For column (1), we use estimated specification in column (10) of Table 1 to predict hysteresis. For column (2), we use estimated specification in column (11) of Table 1 to predict hysteresis. Scenario (1) uses actual values of the variables from 1970s to predict hysteresis. Scenario (2) uses U.S. migration rate from 2000 while all other variables continue to have their 1970 values. Scenario (3) uses U.S. demographic shares (0-24 and 55+) rate from 2000 while all other variables continue to have their 1970 values. Since the trust index is not available for 1970s, Scenario (3) assumes that the trust index fell by one standard deviation (the standard deviation is calculated from the cross-section of U.S., Canadian and European regions in 2000s; the standard deviation by construction is approximately one) while all other variables continue to have their 1970 values. Scenario (5) combines changes in Scenarios (2)-(4) where only control variables continue to have their 1970s values. Standard errors are reported in parentheses.

# APPENDIX

## APPENDIX A: DATA

Countries in the sample include Austria (AT), Belgium (BE), Canada (CA), Switzerland (CH), Germany (DE), Denmark (DK), Spain (ES), Finland (FI), France (FR), Italy (IT), Netherlands (NL), Sweden (SE), United Kingdom (UK), and the United States (US). An English translation of a source table or source title is provided only where a translation was provided in English in the original source; otherwise the table title or source title is reported in the original source language.

All links checked to be working as of 9/6/13.

### **I. Population and Labor Force Variables**

Different sources report labor force variables in a variety of ways. A source might report the number unemployed, the number employed, the number in the labor force, or the number economically active; in other cases, labor force participation, unemployment rates, or activity rates are reported. From rates or levels, we determine the number of unemployed and employed. When variables from multiple sources overlapped, we take the average across sources.

All sources of labor market data come from household surveys, i.e. censuses or labor force surveys.

#### **BE, DE, FR, IT, NL:**

- 1970: “5. Population by age groups, total,” pp. 148-155 and “9. Population by category of activity,” pp. 186-193 (Eurostat 1973).
- 1973: “5. Population by age groups, total,” pp. 148-155, and “19. Population par category of activity in 1973: hommes/femmes,” pp. 250-257 (Eurostat 1975)
- 1975: “6. Population by age groups, total – 1975,” pp. 192-199, and “10. Population by category of activity: total – 1975,” pp. 232-239.
- 1977: “10. Population by category of activity: total - 1977,” pp. 228-235 (Eurostat, 1979).
- 1979: “II.1. “Principal characteristics of population activity, total – 1979,” pp. 60-65 (Eurostat 1981);

#### **BE, DE, DK, ES, FR, IT, NL:**

- 1981: “II.1. “Principal characteristics of population activity, total – 1981,” pp. 51-53 (Eurostat 1984);
- 1983: “II.1 “Principal characteristics of population activity – 1983,” p. 51-53 (Eurostat 1985);
- 1985: “II.1 “Principal characteristics of population activity,” p. 51-53 (Eurostat 1986);
- 1985-6: “II.1. “Principal characteristics of population activity,” pp. 46-49, and “II.4. Unemployment,” pg. 66-73 (Eurostat 1987).
- 1986-7: “II.1. Principal characteristics of activity,” pp. 59-53, and “II.4. Unemployment,” pg. 70-77 (Eurostat 1988).
- 1987-8: “II.1. Principal characteristics of activity,” pp. 50-53, and “II.4. Unemployment,” pg. 70-77 (Eurostat 1989).

#### **BE, DK, DE, ES, FR, IT, NL:**

- 1988-1989: “Unemployment Rates in April (%)” (Eurostat 1989b)

#### **BE, DK, DE, ES, FR, IT, NL:**

- 1989-1990: “Unemployment Rates in April” (Eurostat 1990b)
- 1990-1: “Unemployment Rates in April” (Eurostat 1991)

#### **BE, DE, DK, ES, FR, IT, NL:**

- 1990-1: “II.1. Principal characteristics of activity,” pp. 38-41, and “II.4. Unemployment,” pg. 58-65 (Eurostat 1993).
- 1991-2: [No table title] (Eurostat 1993b)

#### **BE, DE, DK, ES, FR, IT, NL:**

- 1992-3: “II.1. Principal characteristics of activity,” pp. 54-57, and “II.4. Unemployment” pg. 74-81 (Eurostat 1994a).

#### **BE, DE, ES, FR, IT, NL, UK:**

- 1992-3: [No table title] (Eurostat 1994b)

#### **BE, DE, ES, FR, IT, NL:**

- 1993-4: “II.1. Principal characteristics of activity,” pp. 58-64, and “II.4. Unemployment,” pg. 84-93 (Eurostat 1995a).



**AT, BE, DE, ES, FI, FR, IT, NL, SE, UK:**

1993-4: [No table title] (Eurostat 1995b)

**BE, DE, DK, ES, FI, FR, IT, NL:**

1994-5: "II.1. Principal characteristics of activity," pp. 58-63, and "II.4. Unemployment," pg. 84-93 (Eurostat 1996).

1995-6: "II.1. Principal characteristics of activity," pp. 58-63, and "II.4. Unemployment," pg. 84-93 (Eurostat 1997).

**AT, BE, CH, DK, DE, ES, FI, FR, IT, NL, SE, UK:**

1990 – 2011: "Population on 1 January by five years age groups and sex - NUTS 2 regions" (European Commission, n.d.); "Population on 1 January by broad age groups and sex - NUTS 3 regions" (European Commission, n.d.); "Annual average population (1 000) by sex - NUTS 3 regions" (European Commission, n.d.); "Economically active population by sex and age, at NUTS levels 1 and 2 (1000), reg\_lfh2act" (European Commission, n.d.); "Economically active population by sex, age and NUTS 2 regions (1 000) (lfst\_r\_lfp2act)" (European Commission, n.d.); "Economically active population by sex and age, at NUTS levels 1, 2 and 3, Age from 15 to 24 (1000), lfst\_r\_lfp3pop" (European Commission, n.d.); "Employment by sex and age, at NUTS levels 1 and 2 (1000), reg\_lfh2emp" (European Commission, n.d.); "Employment by sex, age and NUTS 2 regions (1 000) (lfst\_r\_lfe2emp) (European Commission, n.d.)

**AT:**

1971, 1981: Censuses (Statistics Austria, n.d.)

1974 – 2011: "Microcensus Time Series Since 1974" (Statistics Austria, n.d.)

**CA:**

1971 – 2012: "Table 051-0001 - Estimates of population, by age group and sex for July 1, Canada, provinces and territories, annual (persons unless otherwise noted)," (Statistics Canada, n.d.).

1976 – 2012: "Table 282-0087 Labor force survey estimates (LFS), by sex and age group, seasonally adjusted and unadjusted, annual (persons unless otherwise noted)", (Statistics Canada, n.d.).

**CH:**

1970, 1980, 1990, 2000: Census, Federal Statistical Office (FSO), accessed via IPUMS-International.

**DK:**

1970: Unpublished data kindly made available by Anita Lange at Statistics Denmark.

1971 – 1985: "BEF1: Population 1. January by municipality, sex, age and marital status (DISCONTINUED) (1971-2002)" (Statistics Denmark, n.d.)

1981 – 2006: "RAS1: Population by living-region, socioeconomic status (3 groups), ancestry, age and sex (DISCONTINUED) (1981-2006)," (Statistics Denmark, n.d.)

**ES:**

1970: "14. Población económicamente activa según el sexo, la rama de actividad económica y la situación profesional" (Instituto Nacional de Estadística, 1974)

1970-1980: "1.4 Evolution of the population of Spain between the censuses 1970 and 1981 by reference date, autonomous community, sex, age group and year" (Spanish Statisticso Office, n.d.)

1976 – 2004: "Encuesta de Población Activa. Principales Resultados: 4.- Resultados provinciales: Población de 16 y más años por sexo, provincia y relación con la actividad económica (6)." (INE Instituto Nacional de Estadística (España) [Spanish Statistical Office], n.d.)

1981-1990: "1.4 Evolution of the population of Spain between the censuses 1981 and 1991 by reference date, autonomous community, sex, age group and year."

1991-2000: "1.4 Evolution of the population of Spain between the censuses 1991 and 2001 by reference date, sex, autonomous community, five year age group and year."

2002-2012: "2.3 Population, by reference date, Autonomous Community, sex and five-year age group"

**FI:**

1970: "22. Economically active population by industry, by province on 31 Dec. 1970," pg. 47 (Finland Bureau of Statistics, 1972)

- 1977-1984: "Population of working age, labour force and persons not in labour force by age and province" [various table numbers and pages], (Finland Bureau of Statistics, 1977-1984)
- 1985– 2009: "Labour force and persons not in labour force by age and province" [various table numbers and pages] (Finland Bureau of Statistics, annually 1985-2009)

**FR:**

- 1974 – 1985: "Taux de chômage regionaux et departementaux en moyennes annuelles de 1980 a 1985," pg. 3 and "Taux de chômage regionaux en moyennes annuelles de 1974 a 1979," pg. 4 (Marc and Marchand, 1986)
- 1982 – 2011, "Localised regional unemployment rates (Metropolitan France)," (Insee, n.d.)

**IT:**

- 1968 – 2010: "Table 2.3.2 - Resident population (a) at the 1st of January and average by region and geographical area - Years 1952-2010 [Average Population]" (Istat, n.d.)
- 1969-1995: (Obstfeld & Peri 1998)

**SE:**

- 1968-2011: "BE0101N1- Population by region, marital status, age, sex and period," (Statistics Sweden, n.d.)
- 1971 – 1975: "Tabell 6. Relativa arbetskraftsta for olika kons-och civilstandskategorier samt regioner. Procenttal, standard-avvikelser for skattningarna inom parents"; "Tabell 7. Relativa arbetsloshetstal for olika kons- och civilstandskategorier samt regioner. Procenttal, standard-avvikelses for skattningarna inom parentes" (Statistiska meddelanden, 1971a-1975a).
- 1976 – 2011: "Population aged 16-64 years (AKU), 100-tal efter region, arbetskraftstillhörighet och tid." Non-publicly-available data, kindly made available by the Swedish statistical office;

**UK:**

- 1971, Census of Population (Casweb, n.d.)
- 1981, 1991, Census of Population (nomis, n.d.)

**US:**

- 1968-1990: "State Population Estimates and Demographic Components of Change: 1900 to 1990 Total Population Estimates" (U.S. Census Bureau, n.d.)
- 1968-1975: March CPS, accessed via IPUMS-CPS
- 1976-2012: Series LASST01000003-LASST56000003 (BLS, n.d.)
- 1990-2000: "1990 to 1999 State Population Estimates: Annual Time Series" (U.S. Census Bureau, n.d.)
- 2000-2011: "Intercensal Estimates of the Resident Population by Sex and Age for States: April 1, 2000 to July 1, 2010" (U.S. Census Bureau, n.d.)

Table 1. Sources for time series of unemployment rates

Year	AT	BE	CA	CH	DE	DK	ES	FI	FR	IT	NL	SE	UK	US
1970		◆		■✕		✧	✦✕	✦	◆	◆○	◆	✦		✕
1971	■✕		✕							○		✦	■	✕
1972										○		✦		✕
1973		◆			◆				◆	◆○	◆	✦		✕
1974	■								✦	○		✦		✕
1975	■	◆			◆				✦◆✕	◆○	◆	✦		✕
1976	■		■				■		✦	○		✧		✕
1977	■	◆	■		◆		■	✦	✦◆	◆○	◆	✧		■
1978	■		■				■	✦	✦	○		✧		■
1979	■	◆	■		◆		■	✦	✦◆	◆○	◆	✧		■
1980	■		■	■✕			■	✦	✦	○		✧		■
1981	■✕	◆	■		◆	■	■✕		✦◆	◆○	◆	✧	■	■
1982	■		■			■	■	✦	✦■✕	○		✧		■
1983	■	◆	■		◆	■	■	✦	✦■◆	◆○	◆	✧		■
1984	■	◆	■		◆	■	■	✦	✦■◆	◆○	◆	✧		■
1985	■	◆	■		◆	■	■	✦	✦■◆	◆○	◆	✧		■
1986	■	◆	■		◆	■	■◆	✦	■◆	◆○	◆	✧		■
1987	■	◆	■		◆	■	■◆	✦	■◆	◆○	◆	✧		■
1988	■	◆	■		◆	◆■	■◆	✦	■◆	◆○	◆	✧		■
1989	■	◆	■		◆	◆■	■◆	✦	■◆	◆○	◆	✧	◆	■
1990	■	◆	■	■✕	◆	◆■	■◆	✦	■◆✕	◆○	◆	✧	◆	■
1991	■	◆	■		◆	◆■	■◆	✦	■◆	◆○	◆	✧	◆■	■
1992	■	◆	■		◆	◆■	■◆	✦	■◆	◆○	◆	✧	◆	■
1993	■	◆	■		◆	◆■	■◆	✦◆	■◆	◆○	◆	✧	◆	■
1994	■	◆	■		◆	◆■	■◆	✦◆	■◆	◆○	◆	◆✧	◆	■
1995	■◆	◆	■		◆	◆■	■◆	✦◆	■◆	◆○	◆	◆✧		■
1996	■◆★	◆★	■		◆★	■★	■◆★	✦◆	■◆◆★	◆★○	◆★	◆★✧	★	■
1997	■★	★	■		★	■★	■★	✦	■★	★○	★	★✧	★	■
1998	■★	★	■		◆★	■★	■★	✦	■★	★○	★	★✧	★	■
1999	■★	★	■		◆★	■★	■★	✦★	■✕★	★○	★	★✧	★	■
2000	■★	★	■	■✕	★	■★	■★	✦★	■★	★○	★	★✧	★	■
2001	■★	★	■	★	★	■★	■★	✦★	■★	★○	★	★✧	★	■

2002	■★	★	■	■★	★	■★	■★	★★	■★	★○	★	★❖	★	■
2003	■★	★	■	■★	★	■★	■★	★★	■★	★○	★	★❖	★	■
2004	■★	★	■	■★	★	■★	■★	★★	■★	★○	★	★❖	★	■
2005	■★	★	■	■★	★	■★	★	★★	■★	★○	★	★❖	★	■
2006	■★	★	■	■★	★	■★	★	★★	■★❖	★○	★	★❖	★	■
2007	■★	★	■	■★	★	★	★	★★	■★	★○	★	★❖	★	■
2008	■★	★	■	■★	★	★	★	★★	■★	★○	★	★❖	★	■
2009	■★	★	■	■★	★	★	★	★★	■★	★○	★	★❖	★	■
2010	■★	★	■	■★	★	★	★	★	■★	★○	★	★❖	★	■
2011	■★	★	■	■★	★	★	★	★	■★	★○	★	★❖	★	■

## Notes

- - National statistical agency, aggregate data, public web database.
- ★ - National census/statistical yearbook, accessed via library resources (book/microfilm).
- ❖ - National census/labor force survey microdata, accessed via IPUMS/ other online database
- ◆ - Eurostat Yearbooks/ Focus/Rapid Reports
- ★□ - Eurostat web database
- - (Obstfeld & Peri, 1998)
- ❖ - Unpublished data, received through private correspondence with country statistical agency.

## **II. Age Structure**

**AT:** 1971: “Population Census, time series 1971-2001 by regional criteria,” Census (Statistics Austria, n.d.)

**BE, DE, FR, IT, NL:**

1970: “Table 5, Population par groups d’age, total,” pp. 148-155 (Eurostat, 1973)

**CA:** 1971: Census, Statistics Canada, accessed via IPUMS-I.

**CH:** 1970: “4.10. Wohnbevölkerung der Kantone nach Fünfjahresklassen und Geschlecht,” pp. 60-61 (Eidgenössisches Statistisches Amt Switzerland 1971)

**DK:** 1970: “Population 1. January by region, age and time,” (Statistics Denmark, n.d.)

**ES:** 1971: Census (Spanish Statistical Office, n.d.)

**FI:** 1970: “1. (001) Population by main language (Finnish, Swedish), education and age by 5 years; whole country, provinces, regional planning areas, city regions, Coast Region of Vaasa, communes and localities,” pp. 52-59, (1970 Census)

**SE:** 1970: “Population by region, age and period” (Swedish Statistical Office, n.d.)

**UK:** 1971: Annual population data not publicly available, kindly made available by Bob Watson at the U.K. Office for National Statistics.

**US:** 1970: Census, U.S. Census Bureau, accessed via IPUMS-USA.

## **III. Educational Attainment**

We assign years of schooling equivalent to educational attainment of the population reported in each source, then use these values to approximate a region’s average years of schooling. There are a number of country specific sample universe issues, discussed briefly below for each country. An addendum is available upon request that provides detailed breakdowns of years of schooling classifications specific to each country’s system.

**AT:** 1971: Universe restricted to population aged 15+ not in school. 1971 Census, National Bureau of Statistics, accessed via IPUMS-I.

**BE:** 1970: Universe is population aged 14+ not in school. 1970 Census, “Table 21. Population de 14 Ans et Plus, Ne Suivant Plus Un Enseignement de Plein Exercice, Par Sexe et Genre D’enseignement Suivi en 1961 et 1970. Chiffres par Province, Arrondissement et Region Linguistique.”

**CA:** 1971: Universe restricted to population aged 15+ not in school. 1971 Census, Statistics Canada, accessed via IPUMS-I.

**CH:** 1970: Universe restricted to population aged 15+ not in school. 1970 Census, Federal Statistical Office, accessed via IPUMS-I

**DE:** 1970: Universe adjusted to approximate those not currently in school. “5. Wohnbevölkerung nach höchstem Schulabschluß,” pp. 98-101, (Statistisches Bundesamt Bundesrepublik Deutschland, 1970a)

**DK:** Universe is population aged 16–59. Adjusted to reflect 1971 levels based on national trend. “Table 52. Population aged 16-59 years by size-class of urban areas in municipalities, by county and by level of completed vocational education” (Europe—Denmark, 1970).

**ES:** Universe restricted to population aged 15+ in 1971 (25+ in 1981). 1981 Census, National Institute of Statistics, accessed via IPUMS-I.

**FI:** “Population aged 15 or over by level of education, municipality, gender and age 1970-2011,” (Finland Bureau of Statistics, 1970).

- FR:** 1968: Census, National Institute of Statistics and Economic Studies, Accessed via IPUMS-I.
- IT:** 1971: Universe adjusted to approximate those not currently in school. “Tavola 7.1.1- Popolazione residente in età da 6 anni in poi per grado di istruzione, regione e ripartizione geografica ai censimenti - Censimenti 1951-2001 (valori assoluti in migliaia e composizione percentuale)” (Istat, n.d.)
- NL:** 1971: Universe is population aged 14+ not in school. “Tabel 1 - Bevolking van 14 jaar en ouder geen dagonderwijs volgend naar onderwijsniveau en geslacht” (DANS n.d.)
- SE:** 1970: Universe is population aged 16-59. “Tabell 15, Befolkningen i åldern 16—59 år efter högsta utbildning och kön. länsvis år 1970,” pp. 160-163 (Statistiska centralbyrån Sweden, 1973b).
- UK:** 1978: The universe is persons born between 1919 and 1963 (people between the ages of 16-60 in 1979). Adjusted to reflect 1971 levels based on national trend. Labor Force Survey microdata (ONS, n.d.)
- US:** 1970: Universe restricted to population aged 15+ not in school. 1970 Census, U.S. Census Bureau, accessed via IPUMS-USA

#### **IV. GDP**

Each country’s GDP is converted to comparable purchasing power parity (PPP) in 1970 U.S. dollars, using Penn World Tables.

- AT:** 1971: “Brutto-Inlandsprodukt 1971,” pg. 61 (Geldner and Jeglitsch, 1976)
- BE, DE, FR, IT, NL:** 1970: “Gross domestic product per inhabitant (1970)” (Statistical Office of the European Communities, 1973).
- CA:** 1970: “TABLE I. Provincial Income and Provincial Gross Domestic Product,” pp. 2-23 (Statistics Canada, 1988).
- CH:** 1970: “Volkseinkommen der Kantone 1965-1985 (in Mio. Franken, zu laufenden Preisen) / Revenu des cantons 1965-1985 (en millions de francs, aux prix courants)” (Bundesamt für Statistik Schweiz 1986)
- DK:** 1983: “Gross income by region and time,” (Statistics Denmark, n.d.)
- ES:** 1980: “Spanish Regional Accounts. Base 1986. Series 1980-1996: Gross domestic product per region (GDPR): Gross domestic product (current prices) by autonomous communities and provinces and year” (Instituto Nacional de Estadística 2012)
- FI:** 1975: “234. Number, income and taxes of individuals by province in 1975,” pg. 237 (Finland Tilastokeskus, 1977)
- SE:** 1973: “Tab. 396: Income earners by total income in 1973 and other persons aged 15 and above at the beginning of 1974, by county,” (Statistiska centralbyrån, 1974b)
- US:** “Gross Domestic Product (GDP) by State,” (BEA n.d.)
- UK:** 1977: “2. GDP by county for selected years between 1977-1996: file gdpcty7796.” (ONS n.d.)

#### **V. Household Size and Ownership**

- AT:** 1971 (household size); 1981 (home ownership): 1971, 1981 Censuses, National Bureau of Statistics, accessed via IPUMS-I.

- BE:** 1970: “5. LOGEMENTS PRIVÉS HABITÉS À TITRE DE RÉSIDENCE PRINCIPALE PAR LE PROPRIÉTAIRE, LE COPROPRIÉTAIRE OU L'USUFRUITIER, COMPARAISON ENTRE 1961 ET 1970” (Institut national de statistique, 1973); 15. MÉNAGES PRIVES SELON LA TAILLE. COMPARAISON ENTRE 1961 ET 1970 (suite) (Institut national de statistique, 1973).
- CA:** 1971: “Table 4.24 Households by type, 1961, 1966, and 1971” (Statistics Canada, 1975); “Table 4.27 Families and persons per family, by province, 1961, 1966, 1971,” 171 (Statistics Canada, 1975).
- CH:** 1970: Census, Federal Statistical Office, accessed via IPUMS-I
- DE:** “2. PRIVATHAUSHALTE NACH KREISFREIEN STAEDTEN, LANDKREISEN UND HAUSFALTSGROESSE” (Statistisches Bundesamt Bundesrepublik Deutschland, 1970b); “Bewohnte Wohnungen ohne Zweit- und von Angehörigen ausländischer Streitkräfte privatrechtlich gemietete Wohnungen” (Statistisches Bundesamt Bundesrepublik Deutschland, 1970c)
- DK:** 1970: “Table 5, Number of dwellings with: (Table 5)”; “Table 7, Home Ownership - Type of Tenancy” (Europe—Denmark, 1970).
- ES:** 1970: Census 1970, (Instituto Nacional de Estadística, n.d.)
- FI:** 1975: “113. Dwelling units by housing density, number of,” pp. 128-9 (Finland Bureau of Statistics, 1977) (Finland Tilastokeskus, 1977)
- FR:** 1986: Census, National Institute of Statistics and Economic Studies, Accessed via IPUMS-I.
- IT:** 1971: (Istituto centrale di statistica [Italy])
- NL:** 1971: “Table 28, A6A, 14th General Census: annex housing census, February 28, 1971” (DANS, 2011); “Table 35, A6A, 14th General Census: annex housing census, February 28, 1971” (DANS, 2011); “Households and families by size and county, per 1000 households, respectively. per 1000 households in each province, February 28, 1971” (DANS, 2011); “Household composition and singles (def.1960) per county, per 1000 households in each province, 2-28-1971” (DANS 2011).
- SE:** 1970: “1. Dwellings by type of building, type of ownership, year of construction, size and quality group. Co-operating communes and localities” (National Central Bureau of Statistics Sweden, 1973); “2. Dwellings by type of building, type of ownership, year of construction, size and quality group. Individual communes in units of co-operating communes” (National Central Bureau of Statistics Sweden, 1973b).
- UK:** 1971, Great Britain Small Area Statistics (Casweb, n.d.)
- US:** 1970 Census, U.S. Census Bureau, accessed via IPUMS-USA.

## **VI. Industry Structure**

The Eurostat Yearbooks report industry breakdowns according to the Nomenclature des Activités Économiques dans la Communauté Européenne (NACE) 1970 codes. The data are broken down into the following categories:

### Agriculture

### Industry

- Energy
- Mining (includes chemicals)
- Construction
- Metals Manufacturing
- Other Manufacturing

## Service Sector

Commerce  
Transport  
Credit  
Administration  
Other service

For countries not in the Eurostat Yearbooks, we create categories that correspond to the NACE 1970 codes. We combined industries to fall into three sectors: the *primary*, *secondary* and *tertiary* sectors. *Primary* includes the agriculture, energy and mining sectors. *Secondary* includes metals and other manufacturing and construction. The *tertiary* sector includes all service sector employment.

**AT:** 1971: National Bureau of Statistics, Austria, Accessed via IPUMS-International.

**BE, DE, FR, NL, IT:**

“Table 11. Emploi par sexe et secteur d’activité économique en 1968 et 1973,” 198-205, (Eurostat, 1974)

**CA:** Industry data are for firms having 20 or more employees in any month of the year and are from 1971-2 (Statistics Canada, 1971; Statistics Canada, 1972). Agriculture and service sector data come from the 1971 census. 1971 Census, Statistics Canada, accessed via IPUMS-I.

**CH:** 1970: “5.06 Erwerbsgruppen nach Kantonen,” pg. 74-5 (Statistiska centralbyrån, 1971).

**DK:** 1971: “Employment Structure by Industry (Table 9)” (Europe—Denmark, 1970).

**ES:** 1970: Census 1970, “12. Economically active population by occupation,” (Instituto Nacional de Estadística, n.d.)

**FI:** 1972: “22. Economically active population by industry, by provinces on 31 Dec. 1970,” (Finland Tilastokeskus, 1972)

**SE:** 1970: “Tab 25. Economically active population by industry, by county,” pg. 49. (Statistiska centralbyrån 1970)

**UK:** 1981 data from the Special Workplace Statistics are more detailed than the 1971 Small Area Statistics, and include breakouts of employment in energy, metals manufacturing, and credit. 1981 employment from the Special Workforce Statistics is scaled downward to reflect 1971 shares in agriculture, construction, industry and services from the Small Area Statistics. The Special Workplace Statistics exclude Scotland. A more detailed industry breakdown for Scottish NUTS-2 regions is estimated using industry shares for the larger NUTS 1 region of Scotland given in Eurostat (1973).

1971, Great Britain Small Area Statistics (Casweb, n.d.)

1981, Census of Population, Special Workplace Statistics (nomis, n.d.)

**US:** Adjustments are made to make data comparable across NAICS to SIC codes.

1970-2011: “Total full-time and part-time employment by industry (SA25)” (BEA n.d.)

## VII. Migration

By migration, we refer to internal migration from one region to another within the same country. The “net migration rate” is defined as the annual net inflow (i.e. immigration – outmigration) of people normalized by population of the region. Turnover migration is the average of immigration and outmigration of a region normalized by the population of the region.

Migration data can be reported over varying intervals (i.e. 1 year, 5 year). Annualizing migration data that occurs over longer periods by simply taking the average is not going to be comparable with one-year flow data



because the average fails to account for return and continued migrations that occur within the five-year period. Migration over periods longer than one year is converted into an estimate of 12 month mobility as follows:

$$immigration\_rate_r = \frac{\frac{immigration_r}{years_r^{0.7}}}{pop_r}$$

Where *immigration\_rate* is the immigration rate, *immigration* is the number of immigrations to region *r*, *years* is the number of years over which the migration occurred, and *pop* is population of the region. Outmigration is defined similarly. The adjustment is based on relationships observed in the United States and Canada. For further discussion on reconciling and translating migration data collected over different time intervals, see Rogers, Raymer, and Newbold (2003).

- AT:** 1976 – 1981: “Austria, migrated at the age of 5 years and over by county of residence and place of origin (foreign), 1976-1981,” (Austria, Central Statistical Office, 1990).
- BE:** 1973: “Table 8. Inter-regional migrations,” pp. 174 (Eurostat 1975).
- CA:** 5 year immigration is adjusted by dividing by 3.31, the ratio of 5 yr to 1 yr flows for Canada in the early eighties from Rogers, Raymer and Newbold (2003)  
outmigration = immigration – net interprovincial migration.  
1966-1971 (Outmigration): Census, Statistics Canada, accessed via IPUMS-I.  
1971 (Net inter-provincial migration): “Table 051-0004 Components of population growth, Canada, provinces and territories annual (persons)” (Statistics Canada, n.d.).
- CH:** Table for lifetime migration is rescaled downward using the adjustment factor of the share of immigration that occurred in 1 year.  
1970: “7.03 Wohngebiet und Heimatkanton” (Statistiska centralbyrån, 1971); “7.12 Heutige Wohnbevölkerung nach Wohnortsklasse vor 1 und vor 5 Jahren” (Statistiska centralbyrån, 1971).
- DE:** 1970: “10. Wanderungen 1970 nach kreisfreien Städten und Landkreisen,” pp. 40-50 and “11. Wanderungen zwischen ausgewählten Kreisen des Bundesgebietes 1970,” pp. 51-118. (Statistisches Bundesamt Bundesrepublik Deutschland 1970d).
- DK:** 1974: “Table 8. Inter-regional migrations,” pp. 176 (Eurostat, 1975).
- ES:** 1971 – 1975: “Spain, inter-regional migration, 1971-75,” (Instituto Nacional de Estadística, 1978)
- FI:** 1970: “Table 55: Internal migration of population between different provinces in 1970,” p. 77 (Finland Tilastokeskus, 1972).
- FR:** 1968 – 1975: “Tableau 1: Migrations interregionales de population totale entre le 1er janvier 1968 et le 20 février 1975 et personnes en provenance de hors metropole,” pp. 55-56 (Statistique generale de la France).
- IT:** 1973: “Table 8. Inter-regional migrations,” pp. 174-5 (Eurostat, 1975).
- NL:** 1973: “Table 8. Inter-regional migrations,” pp. 175 (Eurostat, 1975).
- SE:** 1973: “Sweden internal migration, 1973,” pp. 14-51 (Official Statistics of Sweden 1974).
- UK:** 1971: “Table 1A Migrants within one year preceding census by area of former usual residence, area or usual residence at census and sex,” various pages across volumes (Office of Population Censuses and Surveys, 1975); “Table 2A Migrants within one year preceding census by area of former usual residence (region), area of usual residence (regions and conurbations in the rest of Great Britain) at census and sex,” various pages across volumes (Office of Population Censuses and Surveys, 1975); “Table 1A. Migrants within one year preceding census by area of former usual residence, area or usual residence at census and sex,” pp. 1-2, (General Register Office (Edinburgh), 1977); “Table 1A Migrants within one year preceding census by area of former usual residence, area or usual residence at census and sex,” pp. 1-2, (General Register Office [Edinburgh], 1977); “Table 2B Migrants within

one year preceding census by area of former usual residence (Scotland), area of usual residence (regions and conurbations in England and Wales) at census and sex, pp. 3-6 (General Register Office [Edinburgh], 1977)

- US:** 1965-1970: 1970 Census, Form 2, U.S. Census Bureau, accessed via IPUMS-USA.  
 1975-1980: 1980 Census, U.S. Census Bureau, accessed via IPUMS-USA.  
 1985-1990: 1990 Census, U.S. Census Bureau, accessed via IPUMS-USA.  
 1995-2000: 2000 Census, U.S. Census Bureau, accessed via IPUMS-USA.  
 2000-2011: American Community Survey, U.S. Census Bureau, accessed via IPUMS-USA.

### **VIII. Motorways**

The Eurostat definition of "motorway" is "a road that is especially designed and built for motor traffic, which does not serve properties bordering on it, and which: is provided, except at special points or temporarily, with separate carriageways for traffic in two directions, separated from each other, either by a dividing strip not intended for traffic, or exceptionally by other means; has no crossings at the same level with any road, railway or tramway track, or footpath; is especially sign-posted as a motorway and is reserved for specific categories of roadmotor vehicles."

Sources by country:

**AT, BE, CH, DE, DK, ES, FI, FR, IT, NL, SE, UK:**

1978-2012: "Road, rail and navigable inland waterways networks by NUTS 2 regions (tran\_r\_net)," (European Commission, n.d)

**CA:** Motorways for Canada is reported highway miles.

1978: (Census and Statistics Office Canada et al., 1979)

**US:** Motorways for the United States is the sum of municipal, rural and federal highway mileage.

1978: "Table 1104. Municipal and Rural Highway Mileage, 1970 to 1978, and Federal Aid Highway Mileage, 1978-States," (United States, 1980)

### **IX. Urban Density**

Each region,  $r$ , is split into "centroids" (roughly squares of 1x1 km). Population and density are known for each centroid. We classify a centroid as urban if its density is greater than a threshold of 500 people per square km. We aggregate all centroids in a region as follows to determine the region's urban density, *density*:

$$density_r^{500} = \frac{\sum_{i \in r} population_i \times 1(density_i > 500)}{\sum_{i \in r} population_i}$$

Source of data: (CIESIN, IFPRI, The World Bank, CIAT, n.d.)

## **References:**

- Bundesamt für Statistik Schweiz/ Office federal de la statistique Suisse / Ufficio federale di statistica. (1986). *Statistische berichte/ etudes statistiques: Die volkseinkommen der kantone / les revenus des cantons: Analyse der reihe 1965-1985 / analyse de la serie 1965-1985*. Bern:
- Bureau of Economic Analysis (BEA). Regional economic accounts. Retrieved from <http://www.bea.gov/regional/downloadzip.cfm>
- Bureau of Labor Statistics (BLS). Local area unemployment statistics. Retrieved from <http://www.bls.gov/lau/>
- Canada Census and Statistics Office, Canada Dominion Bureau of Statistics, General Statistics Branch, Canada Dominion Bureau of Statistics, Information Services Division, Canada Year Book Section, Canada Year Book, Handbook and Library Division, Canada, & Statistics Canada. (1979, 1980). *The Canada Year Book*. Ottawa.
- Center for International Earth Science Information Network (CIESIN)/Columbia University, International Food Policy Research Institute (IFPRI), The World Bank, and Centro Internacional de Agricultura Tropical (CIAT). (2011). *Global rural-urban mapping project, version 1 (GRUMPv1): Population density grid*. Palisades, NY: NASA Socioeconomic Data and Applications Center (SEDAC).
- Data Archiving and Networked Services (DANS). (2011). Volkstellingen 1795-1971 [dutch censuses 1795-1971]. Retrieved from <http://www.volkstellingen.nl/en/index.html>
- Eidgenössisches Statistisches Amt Switzerland. (1971). *Eidgenössische volkszählung 1970. recensement fédéral de la population 1970*. Bern: Eidgenössisches Statistisches Amt.
- European Commission. (2013). Main tables: Regional statistics. Retrieved July, 2013, from [http://epp.eurostat.ec.europa.eu/portal/page/portal/region\\_cities/regional\\_statistics/data/main\\_tables](http://epp.eurostat.ec.europa.eu/portal/page/portal/region_cities/regional_statistics/data/main_tables)
- Eurostat. (1973). *Regional statistics, 1972*. Luxembourg/ Bruxelles: Statistical Office of the European Communities.
- Eurostat. (1975). *Regional statistics, 1973*. Luxembourg/ Bruxelles: Statistical Office of the European Communities.
- Eurostat. (1976). *Regional statistics, 1972-1974*. Luxembourg/ Bruxelles: Statistical Office of the European Communities.
- Eurostat. (1981, 1983, 1984, 1985). *Yearbook of regional statistics*. Luxembourg/ Bruxelles: Statistical Office of the European Communities. Retrieved from [http://epp.eurostat.ec.europa.eu/portal/page/portal/publications/regional\\_yearbook/previous\\_editions\\_sub](http://epp.eurostat.ec.europa.eu/portal/page/portal/publications/regional_yearbook/previous_editions_sub)
- Eurostat. *REGIONS: Statistical yearbook*. (1986-1990a, 1994-1997, 1999). Luxembourg/ Bruxelles: Statistical Office of the European Communities. Retrieved from [http://epp.eurostat.ec.europa.eu/portal/page/portal/publications/regional\\_yearbook/previous\\_editions\\_sub](http://epp.eurostat.ec.europa.eu/portal/page/portal/publications/regional_yearbook/previous_editions_sub)
- Eurostat. (1989-1994b). *Rapid Reports*. Luxembourg/ Bruxelles: Statistical Office of the European Communities.
- Eurostat. (1995). *Statistics in Focus*. Luxembourg/ Bruxelles: Statistical Office of the European Communities.
- Europe--Denmark [microform], international population census publications*. (1970). New Haven, Conn.: Research Publications.
- Federal Statistical Office (FSO) [Switzerland]. (2010). Neuchâtel / Switzerland database: FSO - STAT-TAB. Retrieved from <http://www.bfs.admin.ch/bfs/portal/fr/index/infothek/onlinedb/stattab/01.html>
- Finland Tilastokeskus / Finland Tilastollinen päätoimisto [Finland Bureau of Statistics]. (1970-2009). *Statistical Yearbook of Finland*.
- Geldner, N., & Jeglitsch, H. (1976). Das inlandsprodukt nach politischen bezirken im jahre 1971. *WIFO Monatsberichte (Monthly Reports)*, 49(2), 54-63.
- General Register Office (Edinburgh). (1977). *Census 1971, Scotland, migration tables. part 4 : (10% sample)*. Edinburgh: H.M.S.O.
- Institut National de Statistique (Belgium). (1973). *Recensement de la population, 31 Décembre 1970*. Bruxelles.
- Instituto Nacional de Estadística (Spain). (1978). *Migraciones interiores en españa: Quinquenio 1971-1975*. Madrid: El Instituto.
- Instituto Nacional de Estadística [Spanish Statistical Office]. Censos de població, censo de 1970. *Volúmenes provinciales* (Tomo II.)

- Instituto Nacional de Estadística [Spanish Statistical Office]. (2012). Spanish regional accounts. Base 1986. series 1980-1996: Gross domestic product per region (GDPR). Gross domestic product (current prices) by autonomous communities and provinces and year. Retrieved from <http://www.ine.es/jaxi/tabla.do?path=/t35/p010/a1996/11/&file=re001.px&type=pcaxis&L=1>
- Italian National Institute of Statistics (Istat). TimeSeries: Italian historical statistical depository. Retrieved from <http://timeseries.istat.it/>
- King, M., Ruggles, S., J., Alexander, T., Flood, S., Genadek, K., Schroeder, M. B., Vick, R. [IPUMS-CPS] (2010). *Integrated public use microdata series, current population survey: Version 3.0. [machine-readable database]*. . Minneapolis: University of Minnesota.
- Labour Division, Monthly Employment, Payrolls and Labour Income Section. (1975). *Estimates of employees by province and industry, 1961-1974* (Catalogue 72-514 Occasional ed.). Ottawa: Statistics Canada.
- Marc, N., & Marchand, O. (1986 (Jan.)). Taux de chômage régionaux et départementaux. *Premiers Resultats. Institut National De La Statistique Et Des Etudes Economiques. Paris*, (49)
- Minnesota Population Center [IPUMS-International]. (2013). *Integrated public use microdata series, international: Version 6.2 [machine-readable database]*. Minneapolis: University of Minnesota.
- National Central Bureau of Statistics. (1973). *Official statistics of Sweden: Population and housing census 1970: Part 6. Dwellings and households in co-operating communes and localities*. Stockholm: National Central Bureau of Statistics.
- National Institute of Statistics and Economic Studies (Insee). Localised regional unemployment rates: Quarterly series. Retrieved from <http://www.bdm.insee.fr/bdm2/choixCriteres.action;jsessionid=216E4C213896A0EE4CC7932BA7BC0C7D?codeGroupe=712>
- Obstfeld, Maurice and Giovanni Peri. (1998). "Regional Non-Adjustment and Fiscal Policy." *Economic Policy*. 13(26).
- Official Statistics of Sweden. (1974). *Population Changes 1973: Part 2. Migration between communes*. Stockholm: National Central Bureau of Statistics.
- Office for National Statistics (ONS). Nomis Official Labour Market Statistics. Retrieved from <http://www.nomisweb.co.uk/query/select/getdatasetbytheme.asp?opt=3&theme=&subgrp=>
- Office for National Statistics (ONS). *Regional accounts data, 1971-1999*
- Office of Population Censuses and Surveys. (1975). *Census 1971, England and Wales, migration regional report (10 % sample)*. London: H.M.S.O.
- Österreich Statistisches Zentralamt [Austria, Central Statistical Office]. (1990). *Volkszählung 1981 textband, beiträge zur österreichischen statistik*.
- Rogers, Andrei, James Raymer, and K. Bruce Newbold. (2003) "Reconciling and Translating Migration Data Collected over Time Intervals of Differing Widths." *The Annals of Regional Science* 37(4): 581-601.
- Ruggles, S., J., Alexander, T., Genadek, K., Goeken, R., Schroeder, M., B., & Sobek, M. [IPUMS-USA] (2010). *Integrated public use microdata series: Version 5.0 [machine-readable database]*. Minneapolis: University of Minnesota.
- Statistique Generale de la France. (1978). *Annuaire statistique de la France*. Paris.
- Statistics Austria.STATcube - statistical database of statistics Austria. Retrieved from [http://www.statistik.at/web\\_en/statistics/labour\\_market/index.html](http://www.statistik.at/web_en/statistics/labour_market/index.html)
- Statistics Austria: Population census, time series 1971-2001. Retrieved from [http://www.statistik.at/web\\_en/statistics/population/population\\_censuses/index.html](http://www.statistik.at/web_en/statistics/population/population_censuses/index.html)
- Statistics Canada.CANSIM - canadian socioeconomic database from statistics Canada. Retrieved from <http://www5.statcan.gc.ca/cansim/home-accueil?lang=eng>
- Statistics Canada, Employment Section, Statistics Canada, Monthly Employment, Payrolls and Labour Income Section., Statistics Canada., Employment and Payrolls Section, Statistics Canada, Employment Survey Operations Section, Statistics Canada, Labour Division. (1971). *Employment, Earnings and Hours*, Ottawa.
- Statistics Canada, Income and Expenditure Accounts Division. (1988). *Provincial economic accounts: Historical issue, 1961-1986*. Ottawa: Statistics Canada.
- Statistics Denmark. StatBank Denmark. Retrieved from <http://www.statbank.dk/statbank5a/default.asp?w=1280>

Statistics Sweden. Statistical database. Retrieved from  
[http://www.scb.se/Pages/SSD/SSD\\_TreeView\\_340506.aspx](http://www.scb.se/Pages/SSD/SSD_TreeView_340506.aspx)

Statistisches Bundesamt Bundesrepublik Deutschland (1970a). *Bevölkerung und kultur. Volkszahlung vom 27. Mai 1970*. Heft 3. Zusammengefabte Daten uber Bevölkerung und Erwerbstätigkeit für Bund und Lander. Verlag W. Kohlhammer, Stuttgart und Mainz.

Statistisches Bundesamt Bundesrepublik Deutschland (1970b). *Bevölkerung und kultur*. Heft 4. Zusammengefabte Daten Über Bevölkerung und Erwerbstätigkeit für nichtadministrative Gebietseinheiten. Verlag W. Kohlhammer, Stuttgart und Mainz.

Statistisches Bundesamt Bundesrepublik Deutschland. (1970c). *Bauwirtschaft bautätigkeit wohnungen gebäude- und wohnungszahlung* (Heft 2 ed.). Verlag W. Kohlhammer, Stuttgart und Mainz.

Statistisches Bundesamt Bundesrepublik Deutschland (1970d). *Bevölkerung und kultur. Reihe 3*

Statistiska centralbyrån Sweden. (1970-1974a). The Labour force surveys. *Statistiska Meddelanden*,

Statistiska centralbyrån. (1974b). *Statistical abstract of Sweden*. Stockholm.

Statistiska centralbyrån. (1971b). *Population and housing census in 1970: Households and dwellings in communes and parishes: First estimates*. Stockholm.

Statistiska centralbyrån Sweden. (1972b). *Folk-och bostadsräkningen 1970*. Stockholm.

U.S. Census Bureau. Population estimates: State tables. Retrieved from  
<http://www.census.gov/popest/data/historical/index.html>

U.S. Census Bureau. Population estimates: State intercensal estimates (2000-2010). Retrieved from  
<http://www.census.gov/popest/data/intercensal/>

U.S. Department of the Treasury, U.S. Bureau of Statistics, U.S. Department of Commerce and Labor, U.S. Bureau of Statistics, U.S. Bureau of Foreign and Domestic Commerce, & U.S. Census Bureau. (1980). *Statistical abstract of the United States*.

UK Data Service Census Support. Casweb. Retrieved from <http://casweb1.ds.man.ac.uk/>

## APPENDIX B: DERIVATIONS

In this appendix, we establish how our measure of hysteresis is related to persistence of a series. To simplify the argument, suppose that unemployment is an AR(1) process:  $U_t = (1 - \rho)U_{SS} + \rho U_{t-1} + e_t$  where  $U_t$  is a measure of unemployment rate,  $U_{SS}$  is the steady state level of unemployment, and  $e_t$  is an error term.

Suppose there is an impulse  $\Delta = U_\tau - U_{SS}$  at time  $\tau$  and we would like to know how much convergence back to the steady state is achieved after  $N$  periods. Given the data generating process,  $U_\tau - U_{\tau+N} = U_\tau - \{U_{SS} + \rho^N(U_\tau - U_{SS})\} = (1 - \rho^N)(U_\tau - U_{SS}) = (1 - \rho^N)\Delta$  is by how much the gap from the impulse to the steady state is closed. After normalizing the gap by the size of the impulse, one obtains

$$\frac{U_\tau - U_{\tau+N}}{U_\tau - U_{SS}} = (1 - \rho^N)$$

While theoretically this is an appealing measure,  $\Delta = U_\tau - U_{SS}$  can be very small or even negative for some regions. Since  $U_{\tau+N} - U_\tau$  and  $U_\tau - U_{SS}$  are relatively small (no more than 0.1 for most cases), one can use

$$\begin{aligned} \frac{1 + U_\tau - U_{\tau+N}}{1 + U_\tau - U_{SS}} &= \frac{U_\tau - U_{\tau+N}}{U_\tau - U_{SS}} + \frac{(U_\tau - U_{\tau+N}) - (U_\tau - U_{SS})}{(U_\tau - U_{SS})(1 + U_\tau - U_{SS})} = (1 - \rho^N) + \frac{(1 - \rho^N)\Delta - \Delta}{\Delta(1 + \Delta)} \\ &= (1 - \rho^N) - \frac{\rho^N}{(1 + \Delta)}. \end{aligned}$$

Since  $\Delta$  is small,

$$\frac{1 + U_\tau - U_{\tau+N}}{1 + U_\tau - U_{SS}} \approx 1 - 2\rho^N.$$

In the data, the distribution of this ratio is somewhat skewed which can lead to estimates sensitive to a handful of observations. To make it more symmetric, we take the following transformation:

$$\begin{aligned} -\log\left(\frac{1 + U_\tau - U_{\tau+N}}{1 + U_\tau - U_{SS}}\right) &= -\log(1 + U_\tau - U_{\tau+N}) + \log(1 + U_\tau - U_{SS}) \\ &\approx \log(1 + U_{\tau+N} - U_\tau) + \log(1 + U_\tau - U_{SS}) \end{aligned}$$

where the last approximation follows from  $\log(1 + x) \approx -\log(1 - x)$ . By combining the last two equations, we obtain

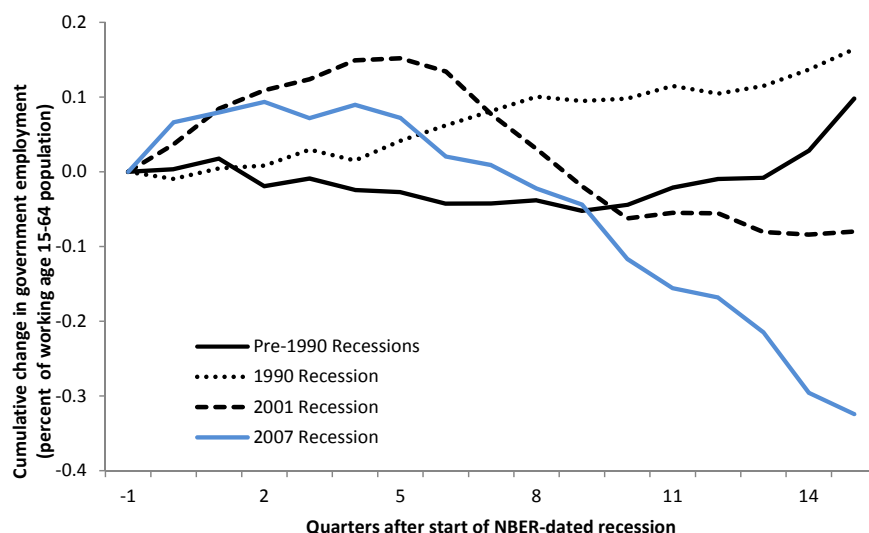
$$\log(1 + U_{\tau+N} - U_\tau) + \log(1 + U_\tau - U_{SS}) \approx -\log\left(\frac{1 + U_\tau - U_{\tau+N}}{1 + U_\tau - U_{SS}}\right) \approx -\log(1 - 2\rho^N) \approx 2\rho^N.$$

Hence, our measure of hysteresis  $h \equiv \log(1 + U_{1990} - U_{1980}) + \log(1 + U_{1980} - U_{1970})$  can be directly mapped to the persistence of unemployment.

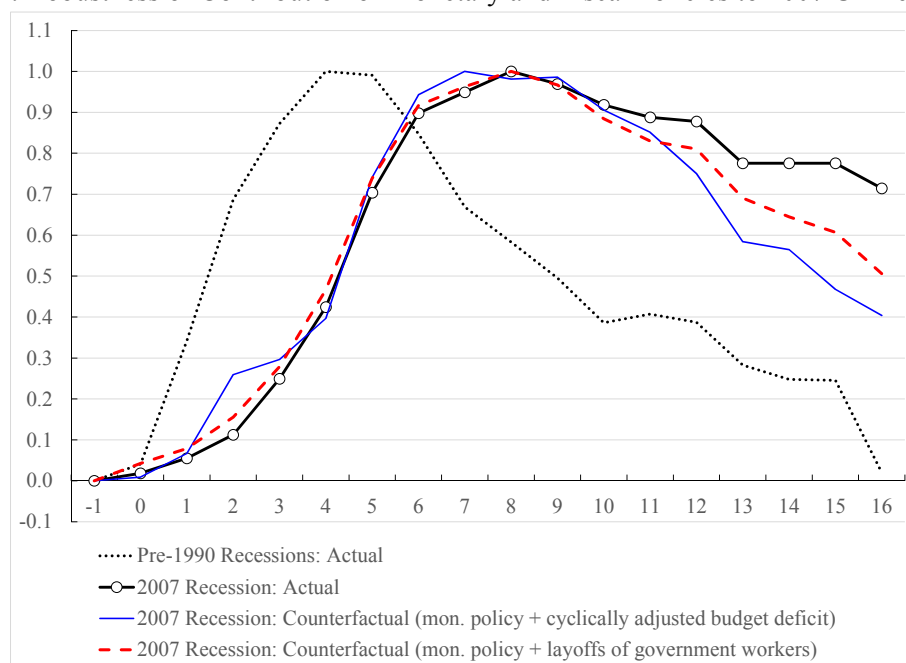
## **APPENDIX C: ADDITIONAL FIGURES AND TABLES**

# APPENDIX FIGURE C1: MEASURING FISCAL POLICY THROUGH GOVERNMENT EMPLOYMENT

Panel A: Historical Differences in Government Employment to Population Ratios



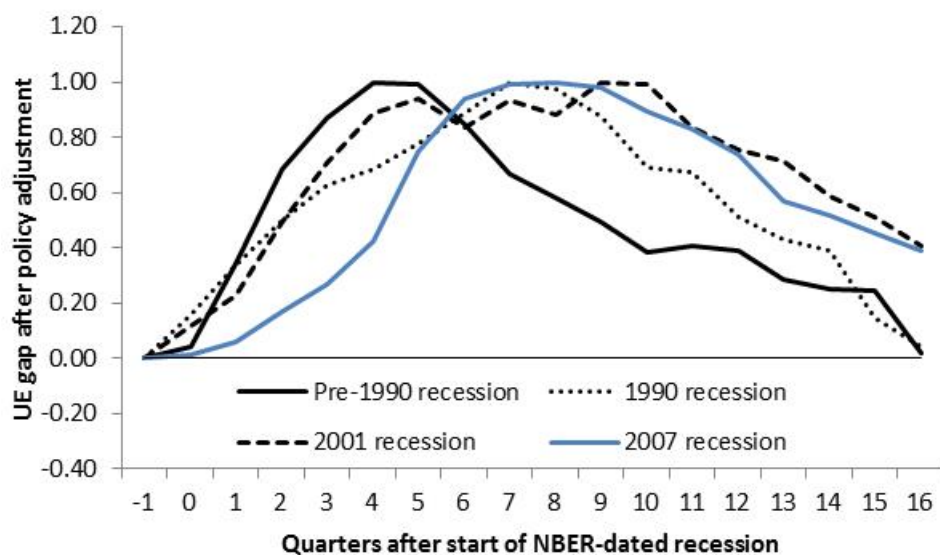
Panel B: Robustness of Contribution of Monetary and Fiscal Policies to 2007 UE Persistence



*Notes:* The top panel plots the path of combined federal, state and local government employment (relative to U.S. population 16 years old and over) for 1990, 2001 and 2007 recessions as well as the average path over pre-1990 recessions. The bottom panel plots the actual path of unemployment in the 2007 recession (normalized by its peak rise), the normalized path of unemployment in pre-1990 recessions, and two estimates of the counterfactual normalized path of unemployment assuming monetary and fiscal policies in the 2007 recession had followed their pre-1990 paths. In one case, fiscal policy is measured using the cyclically adjusted federal budget balance as a share of potential GDP (as in the text). In the other, fiscal policy is measured using total government employment relative to population. For the latter we assume that changes in government employment affect private employment by a factor of 0.5 (i.e. one new government job also creates half a private sector job).

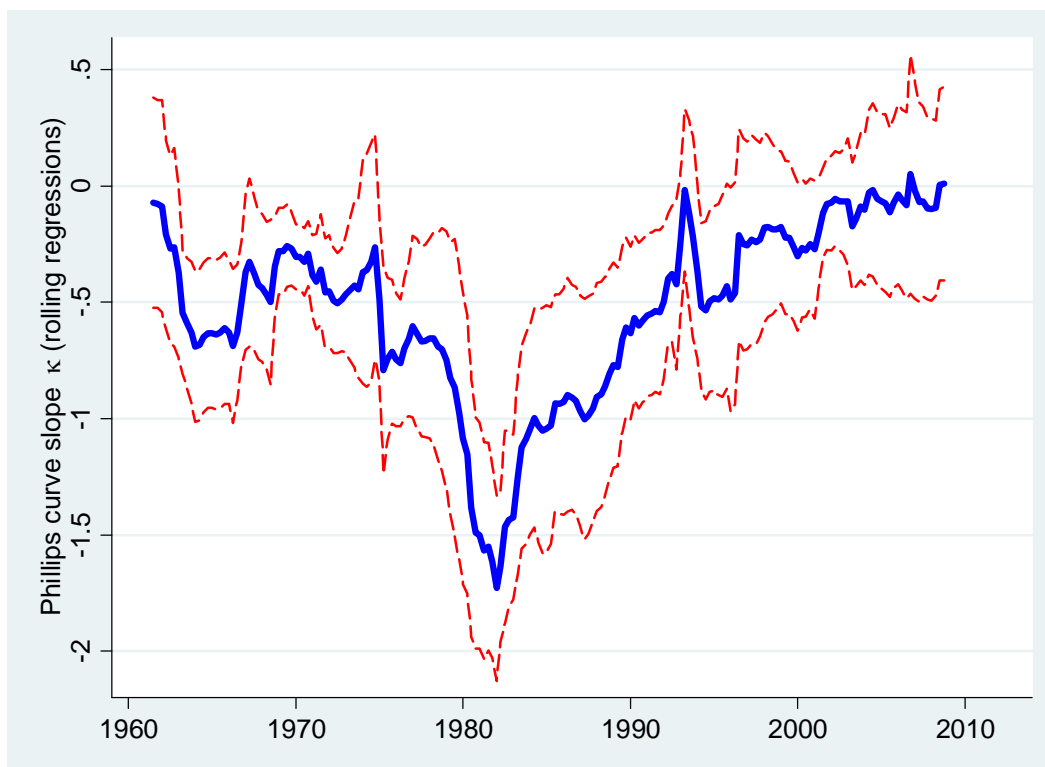


APPENDIX FIGURE C2: ROBUSTNESS TO SMALLER FISCAL MULTIPLIERS



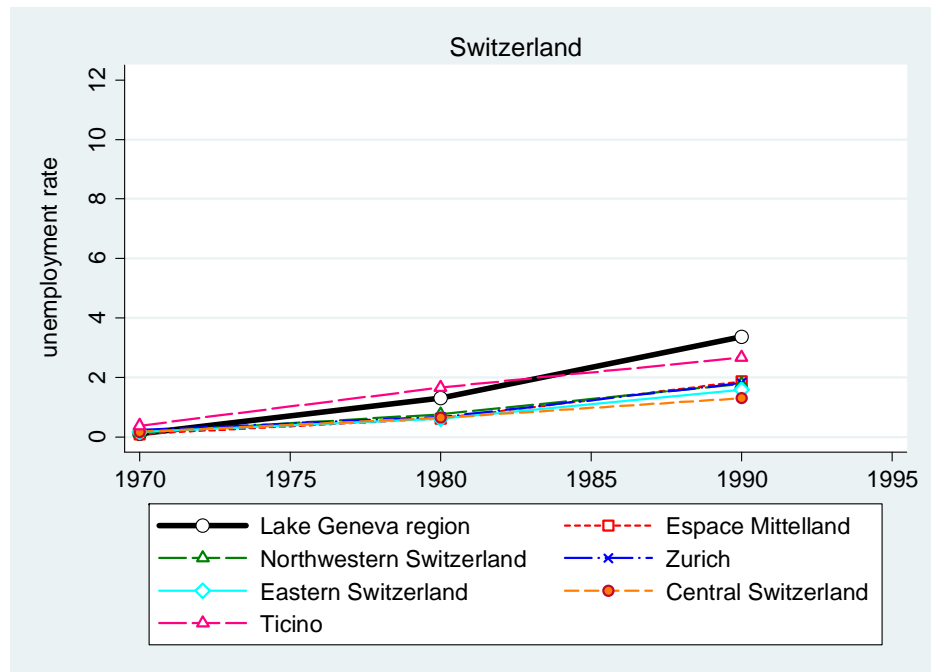
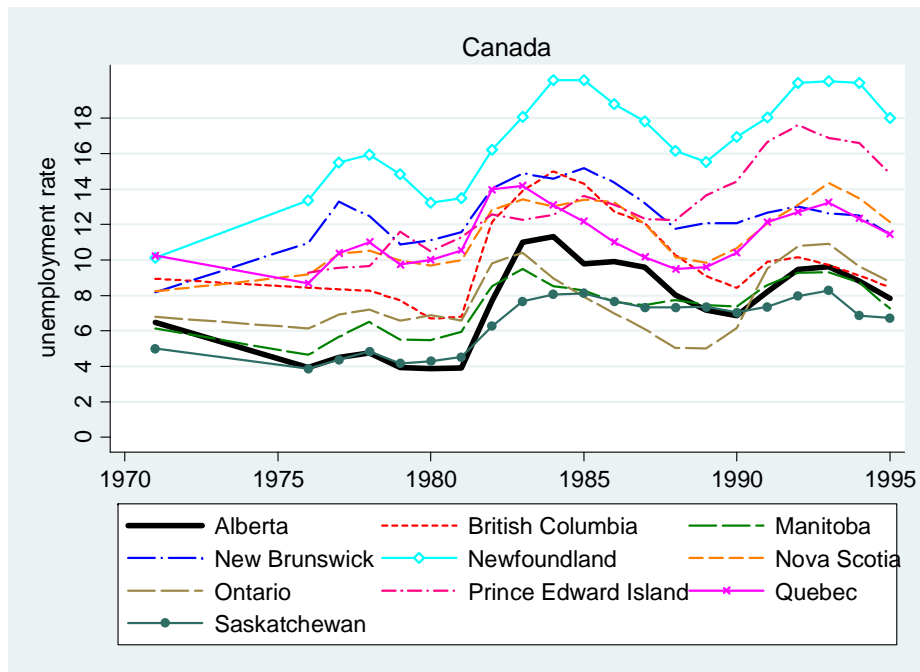
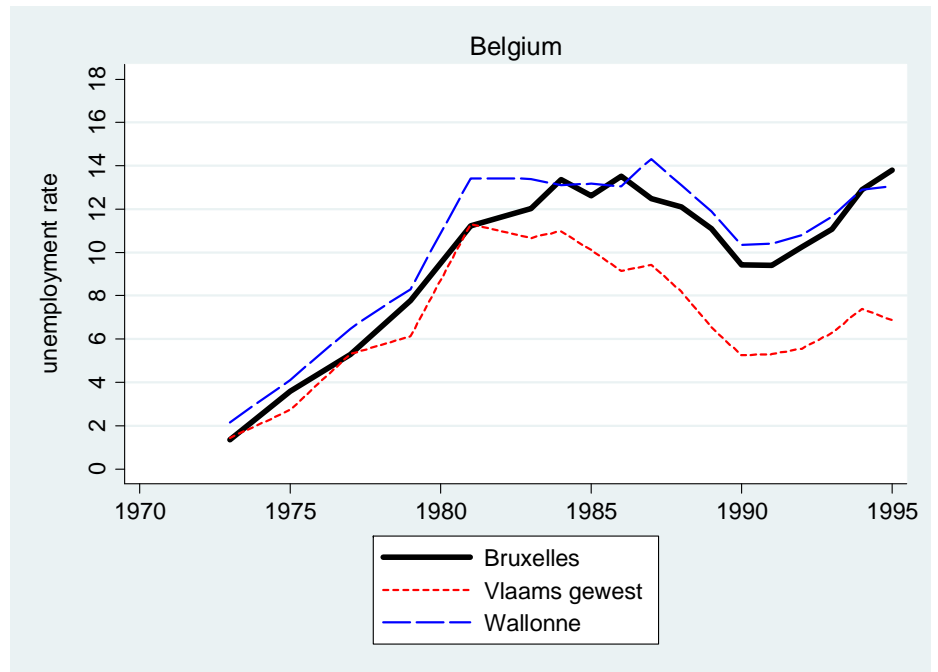
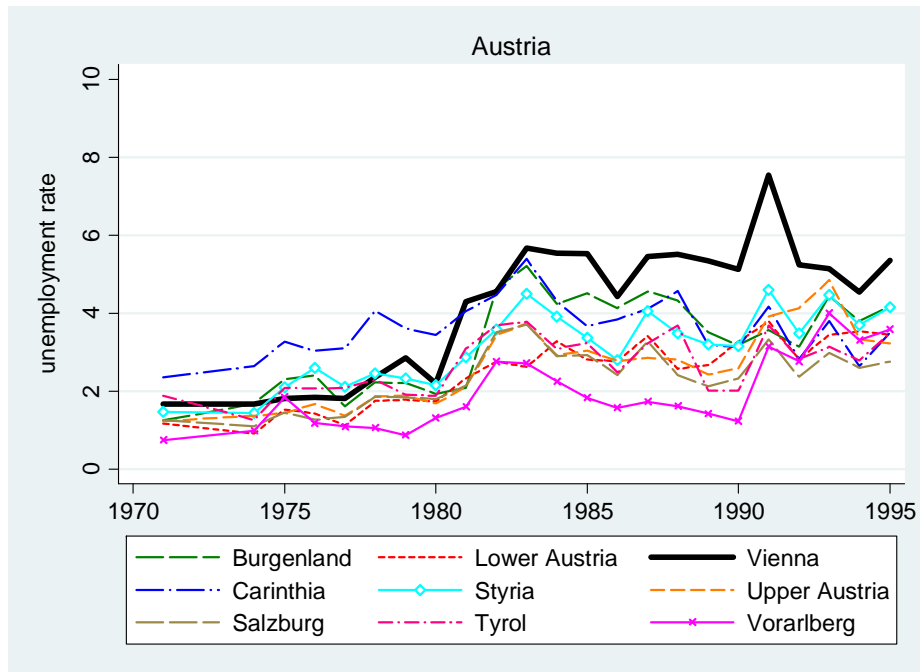
Notes: The figure plots counterfactual normalized paths of unemployment for 1990, 2001 and 2007 recessions assuming fiscal and monetary policies in each had followed pre-1990 patterns. Changes in fiscal balances are assumed to have a multiplier of 0.5.

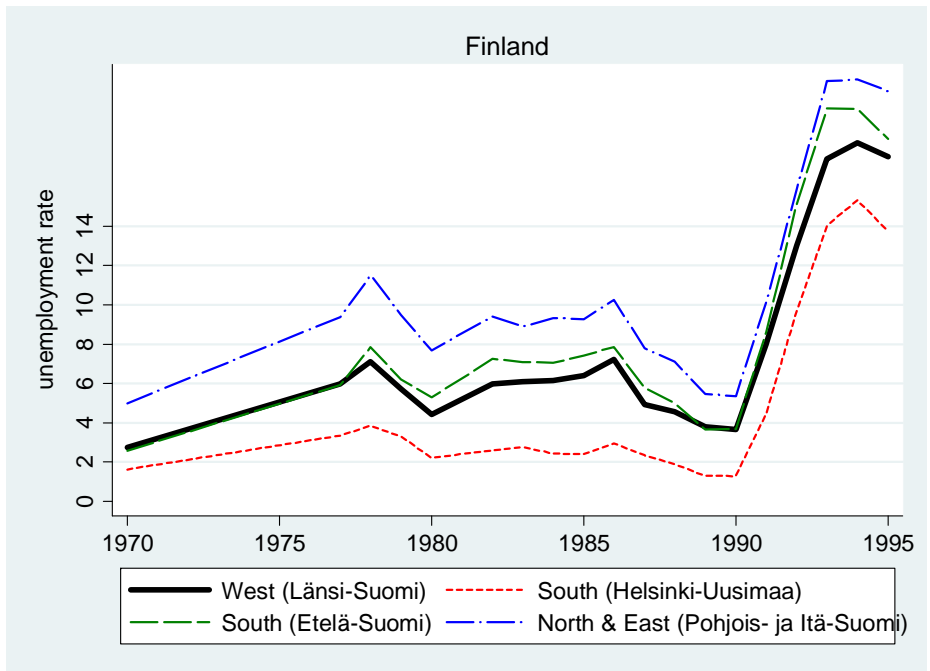
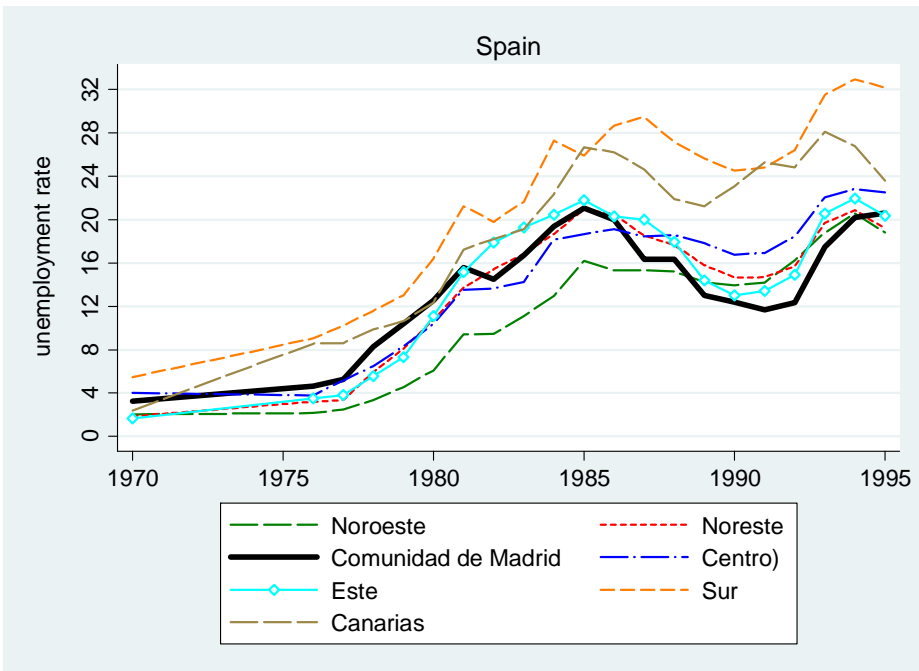
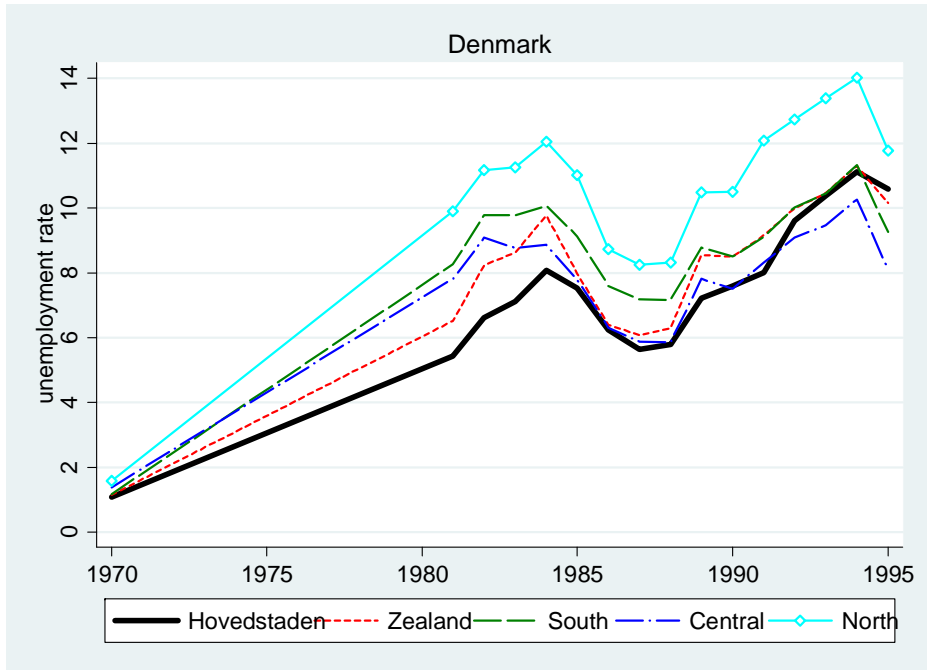
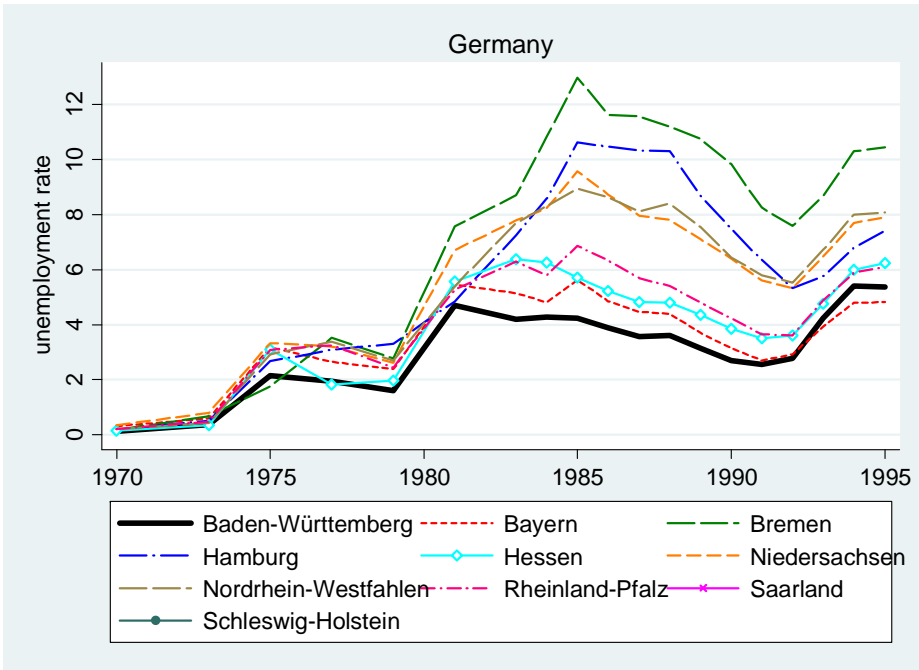
APPENDIX FIGURE C3: ROLLING ESTIMATES OF THE SLOPE OF THE PHILLIPS CURVE

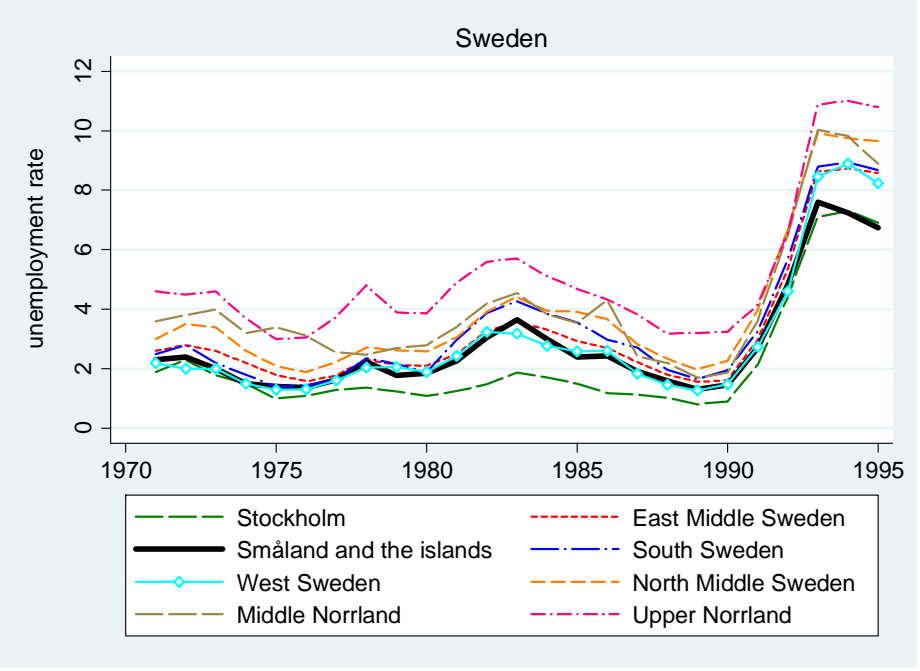
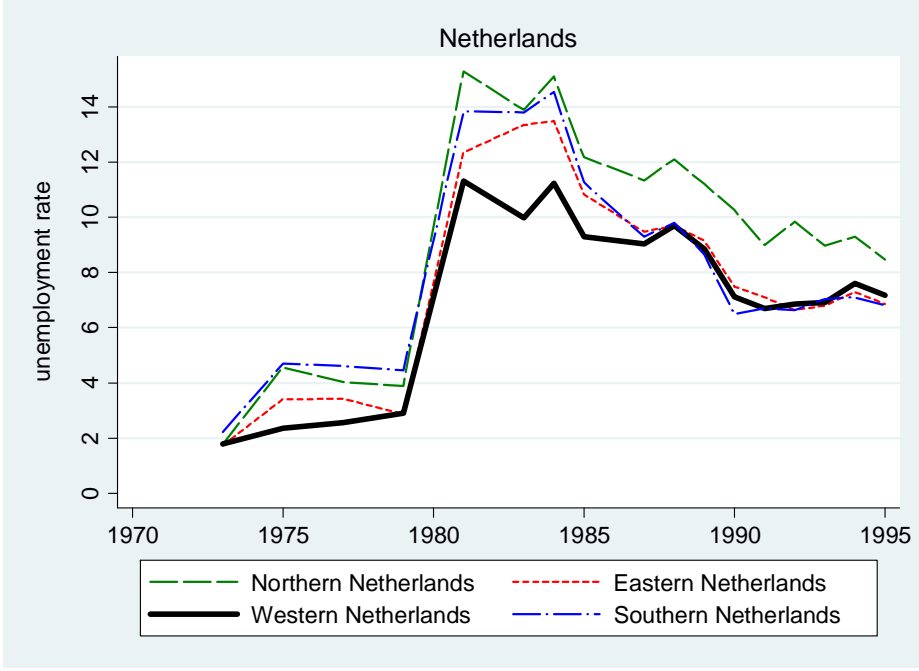
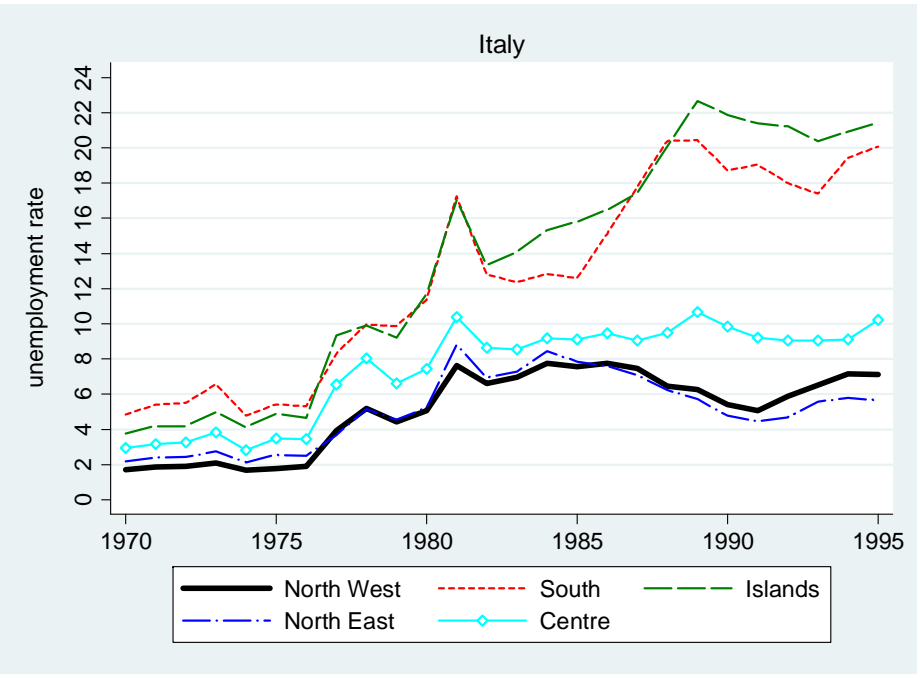
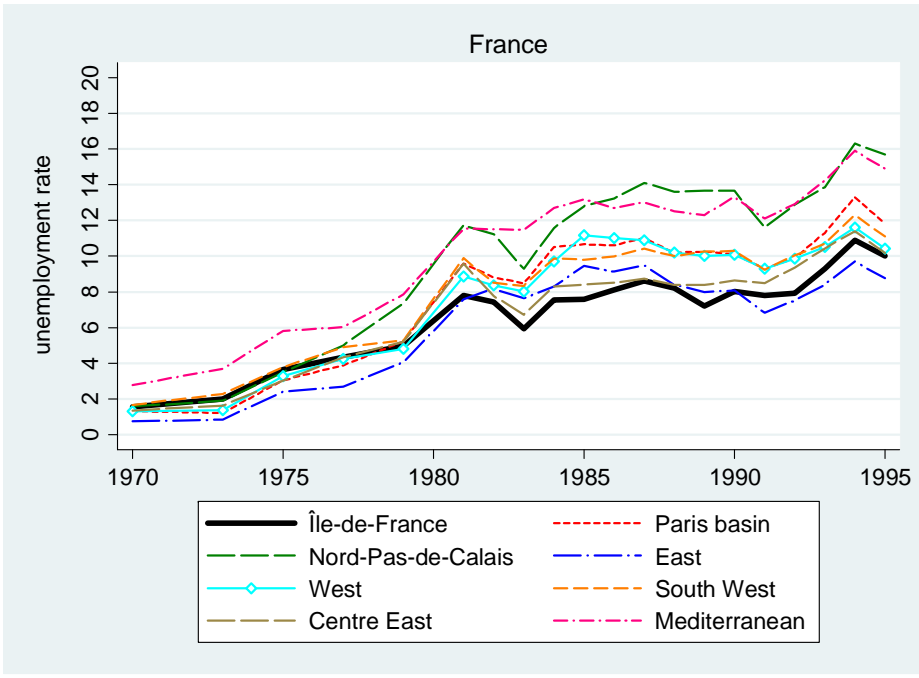


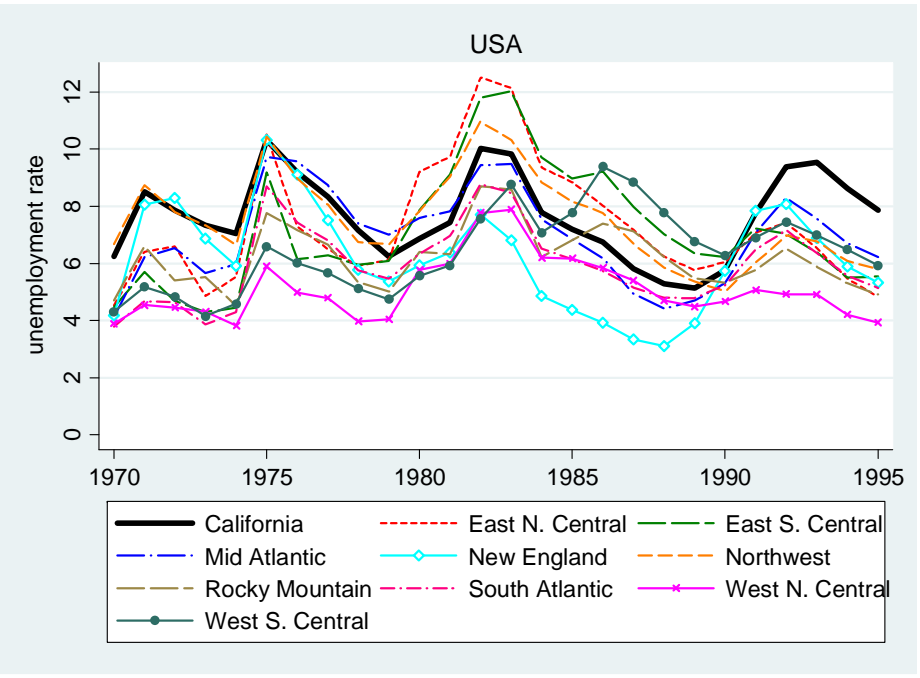
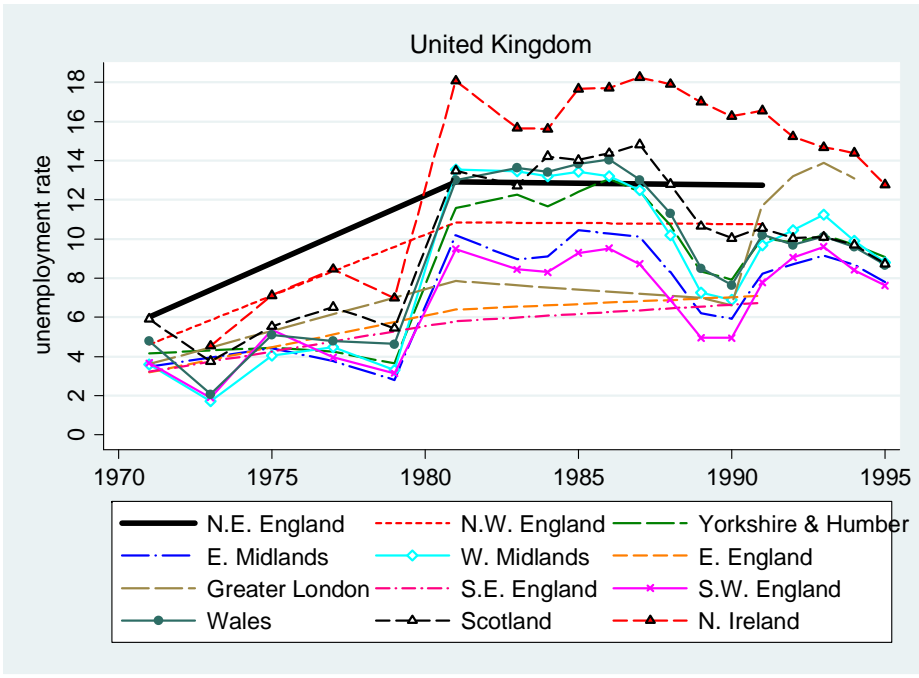
Notes: The figure plots 10-year rolling estimates of the slope of the expectations-augmented Phillips curve. The dependent variable is quarterly inflation minus expected inflation, where the latter is defined as the average over quarterly inflation rates in the previous four quarters. The right-hand side is the quarterly unemployment rate.

APPENDIX FIGURE C4. TIME SERIES OF REGIONAL UNEMPLOYMENT RATES BY COUNTRY.









APPENDIX TABLE C1. DESCRIPTIVE STATISTICS BY COUNTRY

Variable	Country														All
	AT	BE	CA	CH	DE	DK	ES	FI	FR	IT	NL	SE	UK	US	
Hysteresis $h$	2.27 (1.21)	5.51 (2.74)	0.81 (1.35)	1.87 (0.70)	4.13 (1.74)	6.97 (0.92)	12.89 (4.03)	1.94 (0.81)	7.57 (1.55)	7.36 (5.62)	4.82 (1.42)	-0.54 (0.33)	5.44 (2.18)	0.60 (1.18)	4.40 (4.13)
Turnover migration rate	0.71 (0.32)	1.28 (0.92)	1.16 (0.69)	0.93 (0.27)	1.71 (0.70)	1.83 (0.43)	0.95 (0.32)	2.13 (0.49)	2.22 (0.47)	1.09 (0.27)	2.12 (0.62)	1.77 (0.35)	3.02 (1.29)	2.78 (0.93)	1.69 (0.93)
Population share 0-24 years	38.27 (6.43)	38.58 (3.42)	48.02 (2.30)	38.74 (2.69)	36.15 (2.49)	39.02 (2.20)	43.00 (2.84)	43.19 (3.05)	39.86 (3.11)	38.90 (5.45)	44.13 (2.44)	35.78 (1.09)	38.27 (1.81)	45.98 (2.20)	40.56 (4.72)
Population share 55+ years	25.66 (5.33)	24.60 (3.10)	16.07 (1.72)	21.64 (1.08)	25.05 (1.90)	23.51 (0.72)	19.03 (2.11)	19.73 (1.56)	24.48 (2.75)	22.28 (3.35)	19.41 (2.45)	25.99 (1.97)	25.18 (2.50)	19.23 (2.15)	22.28 (3.89)
Trust	-2.72 (0.78)	-2.46 (0.65)	-2.11 (0.17)	-1.55 (0.32)	-2.20 (0.96)	-0.00 (0.13)	-3.26 (0.50)	-1.46 (0.17)	-3.57 (0.47)	-2.92 (0.56)	-1.13 (0.20)	-1.02 (0.25)	-2.26 (0.69)	-2.76 (0.23)	-2.10 (1.06)
Years of schooling	9.56 (0.39)	8.17 (0.33)	9.51 (0.59)	10.67 (0.20)	8.64 (0.29)	9.57 (0.27)	3.92 (0.89)	7.89 (0.47)	6.60 (0.41)	4.98 (0.67)	9.24 (0.36)	9.29 (0.47)	9.31 (0.25)	11.73 (0.51)	8.51 (2.09)
Share of employment in the primary sector	16.10 (8.84)	14.87 (4.99)	16.82 (6.56)	12.58 (3.51)	15.89 (4.61)	11.86 (7.40)	26.51 (16.05)	22.23 (12.51)	17.99 (8.20)	18.95 (8.55)	12.09 (3.21)	9.35 (4.33)	10.83 (5.33)	7.99 (4.00)	15.29 (8.89)
Share of employment in the secondary sector	41.06 (5.10)	33.20 (7.10)	33.83 (8.13)	43.49 (5.01)	38.68 (6.68)	37.61 (1.08)	34.65 (11.86)	34.24 (6.99)	32.31 (4.88)	40.16 (10.87)	34.41 (6.84)	37.51 (7.23)	34.25 (6.78)	25.24 (6.18)	35.76 (8.17)
Women's share in employment	38.05 (3.48)	29.52 (3.12)	34.21 (1.56)	33.98 (1.23)	33.38 (3.88)	35.92 (3.30)	19.31 (4.94)	42.63 (3.24)	36.62 (3.59)	26.11 (4.28)	23.19 (1.58)	35.20 (3.48)	36.68 (2.25)	37.26 (1.36)	33.00 (6.82)
Household size	3.40 (0.56)	2.96 (0.32)	3.51 (0.27)	3.57 (0.28)	2.72 (0.22)	2.69 (0.17)	3.89 (0.19)	3.12 (0.32)	3.23 (0.19)	3.35 (0.31)	3.22 (0.29)	2.78 (0.12)	2.86 (0.12)	3.11 (0.13)	3.17 (0.43)
Home ownership rate	49.88 (19.62)	55.58 (12.51)	70.54 (5.55)	31.70 (6.79)	37.92 (10.35)	51.95 (18.70)	79.03 (4.17)	58.99 (5.19)	43.79 (6.88)	58.04 (8.48)	36.14 (10.04)	53.67 (9.03)	48.30 (11.51)	63.19 (7.21)	52.77 (16.22)
Net migration rate	-0.00 (0.24)	0.02 (0.64)	-0.01 (0.70)	-0.01 (0.80)	0.01 (0.28)	-0.00 (0.23)	-0.03 (1.21)	0.00 (1.44)	-0.01 (0.61)	0.03 (0.67)	-0.00 (0.30)	-0.00 (0.20)	-0.10 (1.04)	0.02 (0.90)	-0.01 (0.72)
Share of urban population	37.99 (35.89)	63.71 (18.63)	54.78 (15.92)	59.11 (12.52)	68.38 (20.89)	36.79 (33.91)	50.36 (26.75)	25.24 (28.70)	51.63 (22.54)	53.85 (18.06)	75.03 (20.11)	20.56 (27.09)	76.45 (25.02)	67.80 (14.56)	52.98 (28.14)
Log(Income p.c.) $\times 100$	824.12 (23.28)	821.54 (21.88)	831.89 (19.14)	870.41 (10.99)	826.69 (17.49)	831.76 (8.57)	793.89 (22.43)	810.52 (26.73)	824.34 (23.84)	811.62 (30.61)	845.35 (14.76)	850.56 (10.03)	809.70 (15.78)	851.28 (13.79)	828.83 (27.01)
Road density	-3.61 (0.75)	-2.83 (0.32)	-1.71 (0.69)	-3.29 (0.47)	-3.09 (0.56)	-3.44 (0.60)	-3.94 (0.76)	-6.42 (1.80)	-4.06 (0.85)	-3.76 (0.41)	-2.76 (0.46)	-5.24 (2.04)	-3.78 (1.24)	-0.94 (0.54)	-3.49 (1.57)
City region	0.22 (0.44)	0.11 (0.33)	0.00 (0.00)	0.00 (0.00)	0.04 (0.21)	0.33 (0.53)	0.11 (0.33)	0.00 (0.00)	0.19 (0.40)	0.00 (0.00)	0.00 (0.00)	0.00 (0.00)	0.14 (0.35)	0.00 (0.00)	0.08 (0.27)
Capital	0.22 (0.44)	0.11 (0.33)	0.36 (0.51)	0.25 (0.47)	0.00 (0.00)	0.33 (0.53)	0.11 (0.33)	0.22 (0.48)	0.19 (0.40)	0.09 (0.29)	0.17 (0.40)	0.18 (0.41)	0.14 (0.35)	0.00 (0.00)	0.17 (0.38)
Number of regions	9	11	9	7	28	5	16	4	21	19	11	8	36	48	232

Notes: for each variable, the first row shows mean and the second row shows standard deviation. All moments are calculated using population weights (weights to regions within a country are proportional to population; equal weights to all countries). The last column reports statistics for the pooled sample. The last rows reports the number of regions for each country.

APPENDIX TABLE C2. SENSITIVITY OF ESTIMATES TO ALTERNATIVE WEIGHTING.

	Baseline		No population weights		Population weights, no normalization at the country level		Huber robust regression	
	OLS (1)	FE (2)	OLS (3)	FE (4)	OLS (5)	FE (6)	OLS (7)	FE (8)
Turnover migration rate	0.37 (0.27)	0.29 (0.22)	0.23 (0.14)	0.29* (0.16)	0.32* (0.19)	0.35 (0.23)	0.18 (0.12)	0.13 (0.13)
Population share 0-24 years	0.14 (0.13)	0.58*** (0.12)	0.30*** (0.09)	0.47*** (0.10)	0.41*** (0.11)	0.55*** (0.11)	0.20*** (0.07)	0.26*** (0.09)
Population share 55+ years	0.17 (0.14)	0.42*** (0.12)	0.23*** (0.09)	0.36*** (0.09)	0.39*** (0.10)	0.45*** (0.10)	0.23*** (0.08)	0.24*** (0.09)
Trust	0.16 (0.33)	-1.00*** (0.32)	-0.26 (0.21)	-0.53*** (0.20)	-0.40 (0.25)	-0.67** (0.29)	-0.42*** (0.13)	-0.30* (0.15)
Controls								
Years of schooling	-0.98*** (0.17)	-1.57** (0.63)	-0.93*** (0.15)	-0.99** (0.44)	-0.80*** (0.21)	-1.24** (0.53)	-0.82*** (0.12)	-0.86*** (0.29)
Share of employment in the primary sector	0.04 (0.04)	-0.01 (0.03)	0.02 (0.03)	0.00 (0.03)	0.02 (0.03)	0.01 (0.03)	0.01 (0.02)	0.01 (0.02)
Share of employment in the secondary sector	-0.02 (0.03)	-0.06** (0.02)	0.01 (0.03)	-0.00 (0.02)	0.01 (0.03)	-0.00 (0.03)	-0.02 (0.02)	-0.01 (0.02)
Women's share in employment	-0.18*** (0.04)	-0.23*** (0.08)	-0.18*** (0.03)	-0.17*** (0.06)	-0.21*** (0.05)	-0.26*** (0.08)	-0.11*** (0.02)	-0.15*** (0.04)
Household size	-0.08 (0.76)	-2.13* (1.18)	-0.26 (0.68)	-0.51 (0.89)	0.16 (0.80)	-0.52 (1.08)	0.90* (0.49)	0.04 (0.73)
Home ownership rate	-0.05*** (0.02)	-0.03 (0.02)	-0.06*** (0.01)	-0.08*** (0.02)	-0.05*** (0.02)	-0.05* (0.02)	-0.07*** (0.01)	-0.08*** (0.02)
Net migration rate	-0.34 (0.27)	-0.10 (0.18)	-0.07 (0.17)	-0.03 (0.16)	-0.35* (0.20)	-0.25 (0.20)	-0.01 (0.14)	0.06 (0.14)
Share of urban population	0.01 (0.01)	0.04*** (0.01)	0.03*** (0.01)	0.03*** (0.01)	0.04*** (0.01)	0.05*** (0.01)	0.03*** (0.01)	0.02*** (0.01)
Log(Income p.c.) × 100	-0.04*** (0.01)	-0.01 (0.02)	-0.04*** (0.01)	-0.04*** (0.01)	-0.05*** (0.01)	-0.03* (0.02)	-0.04*** (0.01)	-0.04*** (0.01)
Road density	0.44** (0.21)	0.44*** (0.14)	0.16 (0.11)	0.34** (0.13)	0.09 (0.15)	0.48*** (0.18)	0.16 (0.10)	0.31*** (0.11)
City region	3.33*** (0.63)	0.47 (0.92)	3.61*** (0.72)	2.12** (1.04)	3.18*** (0.91)	1.39 (1.20)	2.90*** (0.75)	2.50*** (0.78)
Capital	-0.01 (0.59)	0.35 (0.46)	0.13 (0.46)	-0.09 (0.50)	0.04 (0.50)	0.65 (0.56)	-0.13 (0.60)	0.32 (0.61)
Observations	232	232	232	232	232	232	232	232
R-squared	0.71	0.87	0.75	0.84	0.84	0.89	0.83	0.87

Notes: The table shows results for baseline specification estimated with different weighing schemes. Columns (1) and (2) correspond to the baseline weighing scheme: assign weights to regions within a country proportional to population and assign equal weights to all countries. Columns (3) and (4) present results when each region has the same weight. Columns (5) and (6) presents results when regions are assigned weights proportional to population irrespective to which country they belong. In this scheme, there is no normalization that countries have equal weights. As a result, smaller countries such as Denmark, Sweden, etc. can have weights smaller than regions like California, Texas, Il de France, or Greater London. Columns (7) and (8) present results when Huber robust estimation is used to minimize adverse effects of outliers and influential observations. There is no weighing by population in this scheme.

## APPENDIX D: CULTURAL VARIABLES

This appendix describes how cultural variables are constructed from the survey questions of the World Values Survey (WVS). WVS has a number of appealing features.

First, WVS has been carried out in over 100 countries since 1981. There have been five major waves of WVS approximately every 5-10 years in a typical country. Second, over time, WVS has not only increased country coverage but also extended the set of questions in the survey so that researchers can have finer measures of various cultural aspects. This is an important development as any single question may be an imperfect proxy of a given cultural dimension but using sets of questions related to this cultural dimension can greatly improve the measurement of this cultural dimension by constructing indexes (or averages) across these sets. Third, the questionnaires were standardized across countries which makes data comparable across countries. Finally, since 2000s, WVS provides geocoding of survey responses so that one can construct measures of cultural dimensions at the subnational level.

We focus on three cultural dimensions: i) trust; ii) value of work; iii) individualism. Previous research (e.g. Guiso, Sapienza and Zingales (2011), Blanchard and Philippon (2006), Doepke and Zilibotti (2008), Gorodnichenko and Roland (2010)) argued that these dimensions can be important determinants of labor supply, provision of public goods, and economic exchanges and, hence, can influence the degree of hysteresis in unemployment. For each of these dimensions, we construct an index based on a set of related question. As discussed above, using indexes is likely to reduce measurement errors. Appendix Table D1 provides the list of questions we used for each dimension.

While one may use a variety of approaches to construct indexes (e.g., simple averages, principle components, factor analysis), we use the following method as a baseline. Suppose that a cultural dimension  $k$  we have questions  $X_{k,1}, X_{k,2}, \dots, X_{k,s}$ . The scale of the responses may vary with questions (e.g., yes/no, 0-4 scale, 1-10 scale). To make units comparable across variables, we scale each variable by its standard deviation. Then we add up scaled variables into an index where a variable may enter with “+” or “-” signs depending on the connotation of a question. Appendix Table D1 shows the sign for each variable. Since variables are likely to be correlated, we further scale this sum by its standard deviation and obtain an index that has unit variables. More formally, the index of variable  $k$  is given by

$$I_k = \frac{\sum_{m=1}^s \frac{X_{k,m}}{\sigma(X_{k,m})}}{\sigma\left(\sum_{m=1}^s \frac{X_{k,m}}{\sigma(X_{k,m})}\right)}$$

where  $\sigma(Z)$  denotes the standard deviation of variable  $Z$ . The key advantage of this approach is transparency. We find similar results when we use specific variables or alternative aggregation approaches (e.g., principle components).

Because some countries and questions entered WVS in 2000s, in our regression analyses we use indexes constructed for 2000s rather than 1980s. One may be concerned that using values from 2000s may be inappropriate since culture can respond to economic developments. For example, trust can decline if unemployment stays persistently high. While this is certainly plausible, Roland (2004) emphasizes that culture is slow moving and it can take a long time (many decades if not centuries) for culture to respond. To assess more formally the sensitivity of cultural dimensions to fluctuations in unemployment, we follow Stevenson and Wolfers (2011) and regress a cultural dimension on unemployment rate:

$$I_{ct} = \gamma_c + \beta UR_{ct} + error$$

where  $c$  and  $t$  index countries and time,  $UR$  is the unemployment rate,  $I$  is a cultural dimension. Because geocoding is available only in the recent wave of WVS, we estimate this regression at the country level. Appendix Table D2 presents results for each index as well as specific variables entering the index and available



in multiple waves. We fail to find consistent and robust evidence that survey responses or indexes of cultural dimensions are sensitive to unemployment fluctuations.

## References

- Blanchard, Olivier, and Thomas Philippon, 2006. "The Quality of Labor Relations and Unemployment," manuscript.
- Doepke, Mathias, and Fabrizio Zilibotti, 2008. "Occupational Choice and the Spirit of Capitalism," *Quarterly Journal of Economics* 123(2), 747-793.
- Gorodnichenko, Yuriy, and Gerard Roland, 2010. "Culture, Institutions and the Wealth of Nations," NBER Working Papers 16368.
- Guiso, Luigi, Paola Sapienza and Luigi Zingales. 2011. "Civic Capital as the Missing Link." In *Social Economics Handbook*, edited by Jess Benhabib, Alberto Bisin and Matthew O. Jackson, vol. 1, 417-480. Elsevier.
- Roland, Gerard, 2004. "Understanding Institutional Change: Fast-moving and Slow-moving Institutions." *Studies in Comparative International Development* 38, 109-131.
- Stevenson, Betsey, and Justin Wolfers, 2011. "Trust in Public Institutions over the Business Cycle," *American Economic Review* 101(3), 281-287.

APPENDIX TABLE D1. CONSTRUCTION OF CULTURAL INDEXES

Sign	Question	Scale
<i>Value of Work</i>		
-	[a003] Would you say <b>leisure time</b> is important in your life?	1 = very important 2 = rather important 3 = not very important 4 = not at all important
+	[a004] Would you say <b>work</b> is important in your life?	1 = very important 2 = rather important 3 = not very important 4 = not at all important
+	[a030] Here is a list of qualities that children can be encouraged to learn at home. Which, if any, do you consider to be especially important? Please choose up to five! Quality: <b>hard work</b>	0 = not mentioned 1 = important
+	[c037] Please specify for each of the following statements how strongly you agree or disagree with it: <b>humiliating to receive money without having to work for it</b>	1 = strongly agree 2 = agree 3 = neither agree or disagree 4 = disagree 5 = strongly disagree
+	[c038] Please specify for each of the following statements how strongly you agree or disagree with it: <b>people who don't work turn lazy</b>	1 = strongly agree 2 = agree 3 = neither agree or disagree 4 = disagree 5 = strongly disagree
+	[c039] Please specify for each of the following statements how strongly you agree or disagree with it: <b>work is a duty towards society</b>	1 = strongly agree 2 = agree 3 = neither agree or disagree 4 = disagree 5 = strongly disagree
+	[c041] Please specify for each of the following statements how strongly you agree or disagree with it: <b>work should come first even if it means less spare time</b>	1 = strongly agree 2 = agree 3 = neither agree or disagree 4 = disagree 5 = strongly disagree
<i>Trust</i>		
-	[a165] Generally speaking, would you say that most people can be trusted or that you need to be very careful in dealing with people?	1 = most people can be trusted 2 = can't be too careful
+	[a168a] Do you think most people would try to take advantage of you if they got a chance, or would they try to be fair?	1 = would take ... 10 = try to be fair
-	[f114] Please tell me for each of the following actions whether you think it can be justified: <b>Claiming government benefits to which you are not entitled</b>	1 = never justifiable ... 10 = always justifiable

(continued on the next page)

## Individualism

+	[a029] Here is a list of qualities that children can be encouraged to learn at home. Which, if any, do you consider to be especially important? Please choose up to five! Quality: <b>Independence</b>	0 = not mentioned 1 = important
+	[e035] How would you place your views on this scale? 1 means you agree completely with the statement on the left; 10 means you agree completely with the statement on the right; and if your views fall somewhere in between, you can choose any number in between: <b>Inequality</b>	1 = incomes should be made more equal ... 10 = we need larger income differences as incentives
-	[e036] How would you place your views on this scale? 1 means you agree completely with the statement on the left; 10 means you agree completely with the statement on the right; and if your views fall somewhere in between, you can choose any number in between: <b>Ownership</b>	1 = private ownership of business should be increased ... 10 = government ownership of business should be increased
-	[e039] How would you place your views on this scale? 1 means you agree completely with the statement on the left; 10 means you agree completely with the statement on the right; and if your views fall somewhere in between, you can choose any number in between: <b>Competition</b>	1 = competition is good ... 10 = competition is harmful
-	[e037] How would you place your views on this scale? 1 means you agree completely with the statement on the left; 10 means you agree completely with the statement on the right; and if your views fall somewhere in between, you can choose any number in between: <b>Responsibility</b>	1 = people should take more responsibility to provide for themselves ... 10 = the government should take more responsibility to ensure that everyone is provided for

Notes: The table describes how cultural indexes are constructed from the World Values Survey. The column “Sign” shows how a variable enters an index. Columns “Question” and “Scale” present the wording and scale of a survey question. All variables are standardized (across countries and regions; these moments are computed with population weights) before aggregated into indexes.

APPENDIX TABLE D2: SENSITIVITY OF CULTURAL VARIABLES TO UNEMPLOYMENT

	Coef. (s.e.)	Nobs
<i>Value of Work</i>		
how important in your life: leisure time	0.009 (0.006)	47
how important in your life: work	0.006 (0.009)	47
learn children at home: hard work	-0.011* (0.006)	58
Index	-0.029 (0.054)	47
<i>Trust</i>		
people can be trusted/can't be too careful	0.002 (0.004)	58
do you justify: claiming state benefits	-0.040 (0.028)	58
Index	0.022 (0.029)	58
<i>Individualism</i>		
private vs. government ownership business	-0.006 (0.040)	42
individual vs. state responsibility for providing	0.007 (0.037)	47
equalize incomes vs. incentives for individual effort	-0.131** (0.064)	41
Index	-0.097 (0.170)	40

Notes: the table reports estimates of  $\beta$  in  $Culture_{ct} = \gamma_c + \beta UR_{ct} + error$  where c and t index countries and time,  $UR$  is the unemployment rate,  $Culture$  is a cultural variable. Cultural variables are aggregated to the country level for any given year.