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RECOVERIES

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ABSTRACT

Recoveries*

The recovery from the last recession has been slower than any other recovery in the post-WWII period both in the US and in many other advanced economies. There is an ongoing debate around the causes of such a slow recovery. Are there any structural factors that are constraining the speed of recovery? Is it simply that recoveries from financial crises are slower than others? How should monetary and fiscal policy act in these circumstances? In this debate, there is a constant reference to a recovery phase in the business cycle, but such a phase is absent in the most-accepted methodology to characterize business cycles: that of the NBER business cycle dating committee. This paper explores data from the US to characterize and date a recovery phase in the business cycle. Rather than interpreting fluctuations as a two-phase cycle, we describe it as a succession of three distinct phases: expansions, recessions and recoveries. We discuss alternative methods to identify recoveries and provide a discussion of the potential benefits from using a proper definition of the recovery phase.

JEL Classification: E32, E50 and E60
Keywords: business cycles, NBER business cycles dating committee, recessions and recoveries

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1. Introduction

According to the NBER business cycle dating committee, the last recession in the US ended in June 2009.[1] Since then, we have witnessed the slowest recovery in the post-WWII period. This pattern of a slow recovery has also been present in other advanced economies.[2]

The slowness of the recovery has led to a growing literature that tries to understand the variables that might explain the speed and shape of the recovery phase. This literature, partly motivated by the specific factors driving the depth of the last recession, has focused on the role of the preceding financial and banking crisis. Are recoveries from recessions caused or accompanied by banking and financial crisis slower? Indeed, a positive answer to this question seems to be representative of the consensus view: Reinhart and Rogoff (2009a) and (2009b) present evidence that crises associated with systemic banking crises tend to be deep and protracted. Many others have confirmed this view although there is some disagreement on whether the recent recession in the US falls in this category.[3]

Although there seems to be a widespread agreement that the post-2009 recovery is slow by historical standards, there is still no uniform view on how slow it is. These disagreements are partly due to the difficulty in measuring how far the economy is from full employment or potential output. For example, when it comes to the labor market, there is a debate between those who see the current high level of unemployment as purely cyclical and those who also see a strong structural component in its evolution. A similar debate exists on the measurement of trend productivity, which is a necessary component in the estimation of potential output or the output gap.

The shape of the recovery has also affected the economic policy debate, and in particular the behavior of monetary policy in advanced economies. As an example, the US Federal Reserve has made explicit a commitment to keep interest rates at a

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[1] The announcement was made on September 20, 2010.
http://www.nber.org/cycles/sept2010.html

[2] In several European countries not only we have seen a slow recovery but also these economies have fallen into another recession. The CEPR business cycle dating committee announced on November 15, 2012, that the Euro area had entered a recession in the third quarter of 2011.

[3] See Papell and Prodan (2011), Jordà, Schularick, and Taylor (2011) or Claessens, Kose, and Terrones (2011) for additional evidence on the effects of financial crisis. See Bordo and Haubrich (2012) for a dissenting view on the US evidence.

very low level until the recovery is firmly established.[4] So monetary policy is now anchored around the notion of a phase of the business cycle that is meant to bring the economy close to what is considered normal, trend or full employment.

Despite the interest and policy relevance of measuring and understanding recoveries, the NBER methodology does not provide a guide to the length or speed of recoveries. Recessions are followed by expansions and there is no explicit difference between the earlier years of an expansion – what we refer to as the recovery—and the later years. [5]

The academic literature does not provide a specific analysis of recoveries either. Business cycles are seen as caused by shocks and represented by fluctuations around a trend, a framework that is quite different from that of the NBER methodology of characterizing the cycle as a succession of phases. In that framework, a recovery can be thought of as the adjustment towards a steady state. It is difficult to find papers that focus on the shape and causes of this transition.

This paper provides an explicit dating of the recoveries for the US business cycles since 1950. It uses as a starting point the framework of the NBER business cycle dating committee and it adds to that framework a phase following a recession that we refer to as the recovery phase. Recoveries are defined as the period where the economy goes from the trough back to trend. After a recovery is finished, we enter an expansion that can be seen as a phase where the economy grows at a rate consistent with trend growth.

Because of well-known difficulties in identifying empirically output trend, we discuss several approaches to the measurement of recoveries to understand how consistent different methodologies can be.

The next section of the paper presents a review of the literature and frames our analysis within the tradition of Burns and Mitchell (1946) and the NBER methodology. Section 3 presents several alternative methods to describe recoveries based on measures of potential output. Section 4 introduces an econometric analysis using the non-linear representations of the business cycle using regime-switching models pioneered by Hamilton (1989). Section 5 translates our framework into a measure of the cost of recessions. Section 6 uses the identification of recovery phases to discuss the role of fiscal and monetary policy. Section 7 concludes.

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[4] From the press release on December 12, 2012: "In particular, the Committee decided to keep the target range for the federal funds rate at 0 to 1/4 percent and currently anticipates that this exceptionally low range for the federal funds rate will be appropriate at least as long as the unemployment rate remains above 6.5%."

[5] The NBER dating committee does not make any official statement in between establishing the trough of the recession and the peak of the expansion that follows.

2. Literature Review[6]

The modern analysis of business cycle is associated with the NBER efforts and the work of Burns and Mitchell (1946) to define, measure and date business cycles in the US. Their approach starts by recognizing that economic fluctuations these are phenomena that are recurrent in time and therefore should be called cycles. They are cyclical in nature although they do not follow a given frequency (i.e. they are not periodic). There were two main central themes in their study: the notion of specific cycles and their comovements to produce an aggregate cycle.

Specific cycles describe the behavior of individual macroeconomic variables as they go through different phases of expansion and contraction. These phases repeat over time, and thus a contraction always follows an expansion. These specific cycles correlate with each other to produce the notion of a business cycle.

> *"Our definition presents business cycles as a consensus among expansions in 'many economic activities, followed by 'similarly general' recessions, contractions, and revivals." (…) "Another tacit implication of the definition is that business cycles run a continuous round; for the definition says that expansion is followed by recession, recession by contraction, contraction by revival, and revival by a fresh expansion."*
>
> - Burns and Mitchell (1946, p 6)

From the last sentence we can see that their original description of the business cycle consisted on four phases: recessions, contractions, revivals and expansions.

When it comes to identifying the transition between different phases their approach is one of identifying turning points. These turning points come either as peaks or troughs.

> *"Intermediate between the persistent drifts that often cover decades and the oscillations that occur every few months, they reappear in most series well-defined movements of rise and fall, the duration of which from trough to trough and from peak to peak is rarely less than two or more than seven years. These fluctuations varying in duration 'from more than one year to ten or twelve years' are our specific cycles; that is, they are fluctuations of the same order of duration as business cycles."*
>
> - Burns and Mitchell (1946, p 57)

While the concept of a peak or trough is clear, there is occasionally the difficulty of defining turning points when the series is volatile. Burns and Mitchell require that

[6] It is impossible to summarize all the literature on the definition, measurement and causes of business cycles in this paper. We simply provide a selective discussion for the purposes of framing our analysis.

for a cycle to be identified, the phases of expansion and contraction need to have certain duration.

The fact that the dating of two turning points, the peak and trough, identifies the cycle suggests that the original four phases of the business cycle have collapsed into two. As a result, in most of their analysis, Burns and Mitchell refer to expansions and contractions as the main two phases in the data even if they also highlight period of three months around peaks and troughs as transitions in between those two phases. A further decomposition into a nine-phase business cycle is done in later chapters as both the expansion and the contraction are split into three even periods in order to characterize the early and late years of each of the phase.

The methodology of Burns and Mitchell has been the base of the dating provided by the NBER business cycle dating committee. By defining peaks and troughs they characterize the cycle as the succession of expansions and recessions.

The description of fluctuations of economic activity as cycles was not the only one considered by Burns and Mitchell (1946), but they decided to use it based on the fact that it was driven by variables that can be measured. The alternatives would have required constructing variables that might be relevant from a theoretical point of view but not directly observed. In particular, in Chapter 1 they argue that an alternative way to look at economic fluctuations would be by:

> *"Defining business cycles as recurrent departures from and returns toward 'a normal state of trade', or 'a position of economic equilibrium'."*
>
> - Burns and Mitchell (1946, p 4)

But they later conclude that

> *"To say that business cycles are departures from and returns toward a normal state of trade of position of equilibrium, or that they are movements resulting from discrepancies between market and natural rates of interest, will not help because we cannot observe normal state of trade, equilibrium positions, or natural interest rates."*
>
> - Burns and Mitchell (1946, p 5)

Their choice of following a data-driven approach to characterize business cycles instead of one based on theory led to criticisms as in, for example, Koopmans (1947):

> *"But the decision not to use theories of man's economic behavior, even hypothetically, limits the value to economic science and to the maker of policies, of the results obtained or obtainable by the methods developed. This decision greatly restricts the benefit that might be secured from the use of modern methods of statistical inference."*
>
> - Koopmans (1947, p 172)

Koopmans' criticism is based on the view that without specific hypothesis to be tested, the empirical characterization of business cycles cannot provide enough insights to policy makers or those trying to understand the causes of economic fluctuations.

A lot of the academic work since Burns and Mitchell has led to models that rely heavily on a more structured view of what separates the trend and the cycle and this distinction was crucial to understand the shape and causes of business cycles. For example Kydland and Prescott (1998) contrast the logic of real business cycle models with that of Burns and Mitchell. They strongly support the view that "measurement without theory" will not provide a proper and complete characterization of business cycles.

In their approach, Kydland and Prescott (1998) go back to the idea that was discarded by Burns and Mitchell: define cycles as deviations from equilibrium values. They do so using the neoclassical growth model to capture the trend or steady state and they describe business cycles as deviations from the trend as in Lucas (1977). Using this theoretical framework, one can produce a series of econometric methods to estimate the trend and, by default, the business cycle. This is the methodology made popular by Beveridge and Nelson (1981) of decomposition of GDP into a trend and a cycle.[7]

The methodology described in Lucas (1977) or Kydland and Prescott (1998) became the basis of most of the recent academic research in the area of business cycles. Whether we are referring to a real business cycle model or a New-Keynesian one, the analysis of business cycles is made explicitly around the notion of economic activity driven in the long run by a (possibly stochastic) trend. Fluctuations tend to be symmetric and caused by small and frequent shocks. Business cycles can be thought of as the movements of macroeconomic variables as they adjust to a new steady state. This is clearly the main framework of all models where shocks to technology or preferences are the only sources of shocks.

There are several important distinctions between the Burns and Mitchell (1946) methodology and the trend-cycle approach used in modern business cycles models:

1. There are no cycles in models driven by shocks. Recoveries are not linked to expansions in any way. It is the succession of shocks that produces economic fluctuations.
2. In Burns and Mitchell (1946) cycles are infrequent. There might be other sources of variation in the data but it is the identified cycles the ones that we refer to as business cycles. This is the same approach followed by the NBER.

[7] An alternative view that incorporates elements from some of the previous methodologies is the one proposed by Zarnowitz and summarized in Zarnowitz and Ozyildirim (2006).

The NBER business cycle dating committee does not comment on any macroeconomic event except those that cause recessions.

3. There is an implicit asymmetric nature to the notion of recessions in the Burns and Mitchell (1946) approach. Expansion can be seen as the normal phase of the cycle for two reasons: first, most economies display growth in the long run, so growth is the natural state and, second, expansions tend to be longer than recessions, which makes recessions look like the "shocked" state of an economy. A potential interpretation is that there are only negative shocks to output.

At this point it is also important to stress that in the work of Burns and Mitchell (1946) there is no *explicit* connection between the different phases of the business cycle. Recessions follow expansions but there is no reason why a given expansion must be followed by a recession of a given shape. There is an alternative way to think about cycles where recessions are caused and shaped by the dynamics of the previous expansion. Expansions are seen as building imbalances such as excessive credit or current account imbalances, and it will be the need for adjustment the one that will cause the recession. This is the view put forward by Minsky (1992) among others and recently used by Borio (2013) to describe the most recent cycle.[8]

Given that the main criticism of the Burns and Mitchell (1946) methodology is the absence of a theoretical framework, can we find economic models that can match the dynamics of their business cycles? For example, can their description of business cycles be consistent with a theoretical stochastic model based where fluctuations are driven by shocks? Possibly, but it would require that we assume that only large, infrequent and possibly negative shocks exist. Blanchard and Watson (1986) present evidence that this might be a good description of the business cycle.

Friedman (1964) and (1993) proposes a description of business cycles that shares many features with the Burns and Mitchell methodology. The description is based on the observation that recessions do not depend on the length of expansions but recoveries depend on the depth of recessions.

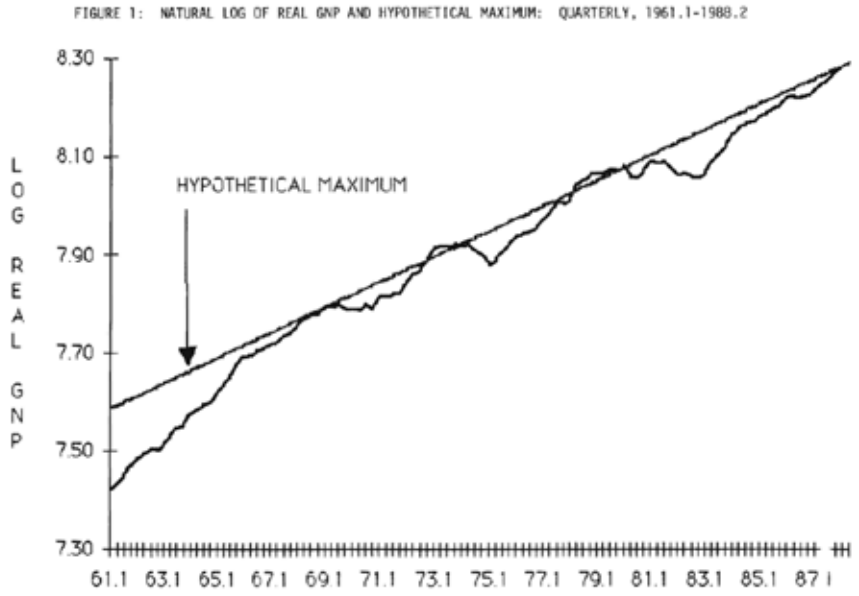
> *"Our analytical models generally involve a conception of a self-generating cycle, in which each phase gives rise to the next and which may be kept going by a sequence of random shocks, each given rise to a series of damped perturbations. (…) The asymmetric serial correlation pattern suggests that this analogy might be misleading, that a better one is what can be termed a plucking model. Consider an elastic string stretched taut between two points on the underside of a rigid horizontal board and glued lightly to the board. Let the string be plucked at a number of points chosen more or less at random with a force that varies at random and then held down at the lowest point reached.*

[8] From Minsky (1992): "The financial instability hypothesis is a model which does not rely upon exogenous shocks to generate business cycles of varying severity".

The result will be to produce a succession of apparent cycles in the strong whose amplitudes depend on the force used in plucking the string."

- Friedman (1964, p 17)

Friedman's "plucking" model of business cycles is an inherently asymmetric model of fluctuations and one that to some extent uses a concept similar to equilibrium or normal output to understand business cycles. There are periods where output is below the maximum level (using the terminology of Friedman (1993), see the Figure above borrowed from Friedman (1993)'s original article). There is no explicit discussion of how maximum output is measured, and it is simply represented as a log-linear historical trend. There is nothing in this approach that rules out the possibility that the trend itself is stochastic and driven by certain (low-frequency) shocks and where there are other disturbances responsible for events that we can call business cycles.



The implications of Friedman's model have been studied empirically within a literature that has characterized business cycles as asymmetric. In this literature we find often a reference to a phase in between recessions and expansion. For example, from Schultze (1964):

"A typical upturn measured from trough to peak, normally encompasses two sub phases: first a recovery of GNP to normal and then a period of slower growth after normal capacity utilization is approached or surpassed"

- Schultze (1964, p 162)

This hypothesis was empirically studied by De Long and Summers (1986), Sichel (1993) or Neftci (1984). In all these papers there is evidence that recessions happen

faster than expansions but also that the cycle exhibits a "peak-reverting behavior" and this is direct confirmation of Schultze's hypothesis of a third phase in the business cycle. In addition, Goodwin and Sweeney (1993) present evidence supporting the notion that there is a maximum level of output that serves as a ceiling for the largest OECD economies.

An alternative theoretical approach to model a behavior similar to the one captured by the figure above is to build a framework where the economy switches between two states of high and low growth. Models with multiple equilibria such as Azariadis and Smith (1998) fit this description.

Bringing any of these models to the data has always been a challenge. A bridge between these models and the econometric analysis of the business cycle has been established by regime-switching models as described in Diebold and Rudebusch (1996). In these models, the economy switches between "good" and "bad" states which are consistent with the Burns and Mitchell characterization of business cycles, as in Hamilton (1989) and (1990). Quoting from Diebold and Rudebusch (1996):

> *"The central idea of regime switching is simply that expansions and contractions may be usefully treated as different probabilistic objects. This idea has been an essential part of the Burns-Mitchell-NBER tradition of business-cycle analysis and is also manifest in the great interest in the popular press, for example, in identifying and predicting turning points in economic activity. Yet it is only within a regime-switching framework that the concept of a turning point has intrinsic meaning. Recent contributions that have emphasized the use of probabilistic models in the construction and evaluation of turning-point forecasts."*
>
> - Diebold and Rudebusch (1996, p 73)

As an example of how these econometric models can bring some of the above theories to the data, Kim and Nelson (1999) modify Hamilton (1989) econometric model to account for the predictions of Friedman's plucking model.

In summary, in this selective review of the literature on business cycles we wanted to stress the contrast between two classes of business cycles models. First we have models that see fluctuations driven by small and frequent shocks that take the economy away from a long-term trend. In this framework, shocks tend to be symmetric. The alternative view is that fluctuations in economic activity can be characterized by infrequent events that produce recessions. These events are large and possibly asymmetric in the spirit of Burns and Mitchell (1946) or Friedman (1964). Our framework to look at cycles and recoveries in particular will be anchored in this second approach to business cycles. In the next section we summarize our approach and apply it to the data.

3. Dating recoveries

We borrow from several of the papers and methodologies described above to present a framework that allows us to define the recovery phase. Our approach is to go back to the original description of Burns and Mitchell of a multi-phase business cycle and explicitly identify and date the revival (recovery) phase. In some sense we adopt a three-phase framework where expansions are followed by recessions, which are followed by recoveries. Relative to Burns and Mitchell we are ignoring the transition from recessions towards what they call contractions (i.e. their fourth phase).

A three-phase description of the business cycle is also very close to the spirit of the "plucking" model of Milton Friedman as well as the regime-switching models of Hamilton (1989), Kim and Nelson (1999) or Kim, Morley, and Piger (2005).

The features that we consider important for the description of the cycle are:

1. There is a trend that can be seen as the balanced growth path of an economy. This trend could be stochastic or subject to breaks but we consider other phenomena, what we will refer to as cyclical (transitory) deviations, as the *main* drivers of the business cycle. So here we are deviating from the tradition of Lucas (1977), Kydland and Prescott (1998) and the real business cycle literature of considering shocks to the trend as the main source of cycles.
2. Although initially we consider several definitions of trend, we want to interpret this trend as the maximum level of output. This is different from the interpretation of potential output as a "sustainable" level of output in the tradition of measures such as the output gap or the NAIRU. Our notion of trend is similar to that of the Friedman's plucking model.
3. Business cycles are asymmetric and driven by negative shocks. While it is possible that there are positive shocks to the trend, we do not consider them the main driving force of the business cycle, as they only have significant effects at low frequencies. This asymmetry is implicit in the Burns and Mitchell or NBER methodology because of their focus on recessions.
4. After a trough, there is a distinct phase where the economy returns towards normal levels (trend). This phase is call recovery or revival. Identifying the shape and length of this phase is our innovation relative to the recession-expansion characterization of the cycle.

Defining and dating a recovery phase is a challenge because it requires a definition of what it means to return to "normal". This is probably the reason why, despite the fact that we commonly refer to recoveries when describing the early years of an expansion, it is rare to find actual dates and analysis on what that phase looks like.

The notion of trend as been analyzed from many perspectives; some are purely statistical while others have strong theoretical foundations.

From a theoretical point of view, most models have a precise definition of what constitutes "normal". It can be seen as the steady state or the level of output consistent with full employment. Because of the difficulties in measuring directly full employment or the steady-state level of output a statistical approach to the trend-cycle decomposition is more frequent. The work of Beveridge and Nelson (1981) and Nelson and Plosser (1982) serves as a basis for many of the empirical analysis of the trend-cycle decomposition used in the academic literature. The notion of the trend as the long-term forecast of a time series is a well-established method to capture cyclical components. In our case, their approach is not enough because we want to stay within the tradition of the Burns and Mitchell (1946) methodology, and we cannot simply follow a statistical approach that captures a smooth trend for the series

Returning to the previous peak

In the literature, there are several attempts to date the recovery phase. In particular, there are references to the recovery phase as the period of time where GDP the level reached at its previous peak. This definition has been regularly used by the IMF as in Kannan, Scott, and Terrones (2009) or Claessens, Kose, and Terrones (2009). [9]

Is peak GDP a good measure of trend? Not necessarily, because it ignores the growth of the trend, which occurs even when the economy is in a recession. Obviously, as long as trend growth continues during a recession, reaching the level of output of the previous peak is not enough to return the economy back to trend or full employment. And this criterion in no way it takes into account the length of the recession or recovery phase. Reaching the level of activity in the previous peak has a very different meaning for a short and a long recession. The longer the recession is the further we will still be from trend output. Despite this criticism, the measure has been used probably because of its simplicity and easiness to produce a measure of "returning to normal".

Figure 1 presents the evolution of GDP after each of the post-WWII recessions where we plot the difference between GDP and its level at the previous peak for the quarters where this difference is negative. Vertical lines represent the peak (red) and trough (grey) of all cycles as defined by the NBER.

What we are looking for in this picture is the quarter after the trough where this variable reaches zero again, i.e. GDP reaches its level in the previous peak. A quick glance of Figure 1 shows that recoveries are short as GDP returns to its pre-recession level in a matter of a few quarters.

[9] An alternative is to extrapolate trends from the year that preceded the recession as in Papell and Prodan (2011).

To visualize better the length of recoveries as well as the comparison across all cycles we plot in the next two figures the evolution of GDP around the quarter when the recession ends (trough). For each cycle we plot GDP starting in the quarter when the recession started. We label each of the recoveries by that quarter (the peak). We separate early recoveries from most recent ones.

Figure 1. Deviation of Real GDP from previous Peak level.

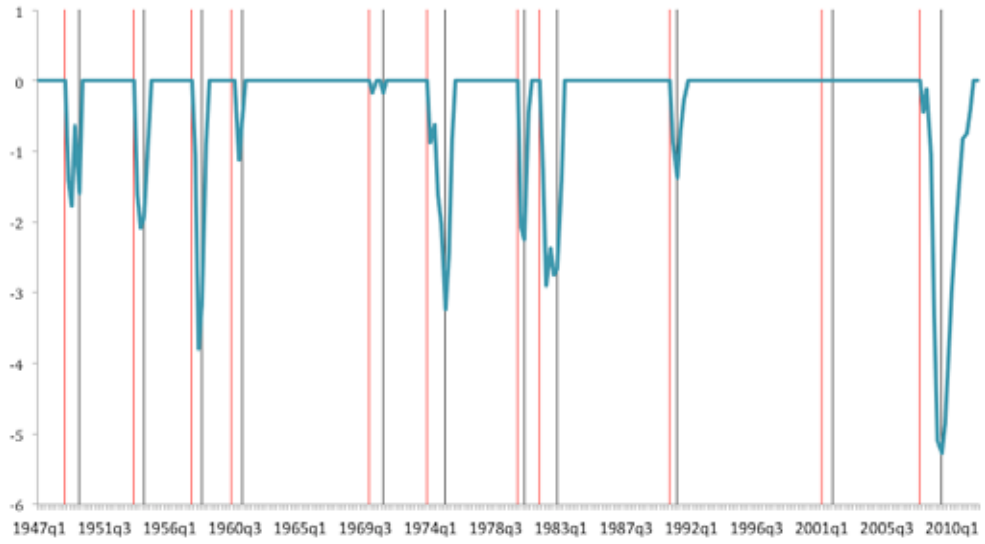
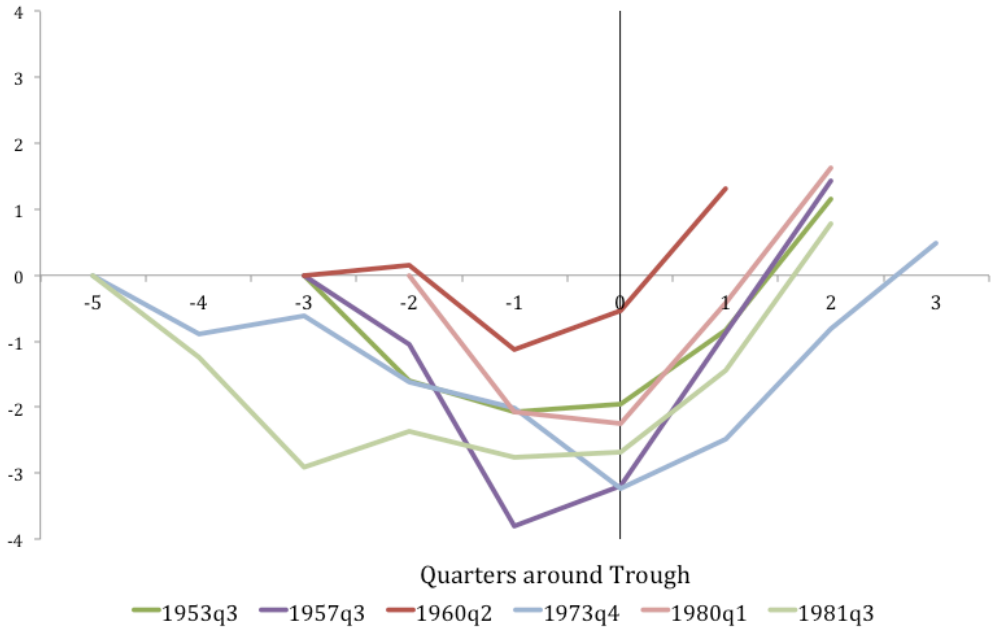


Figure 2. Deviation of GDP from previous peak. Selected cycles.

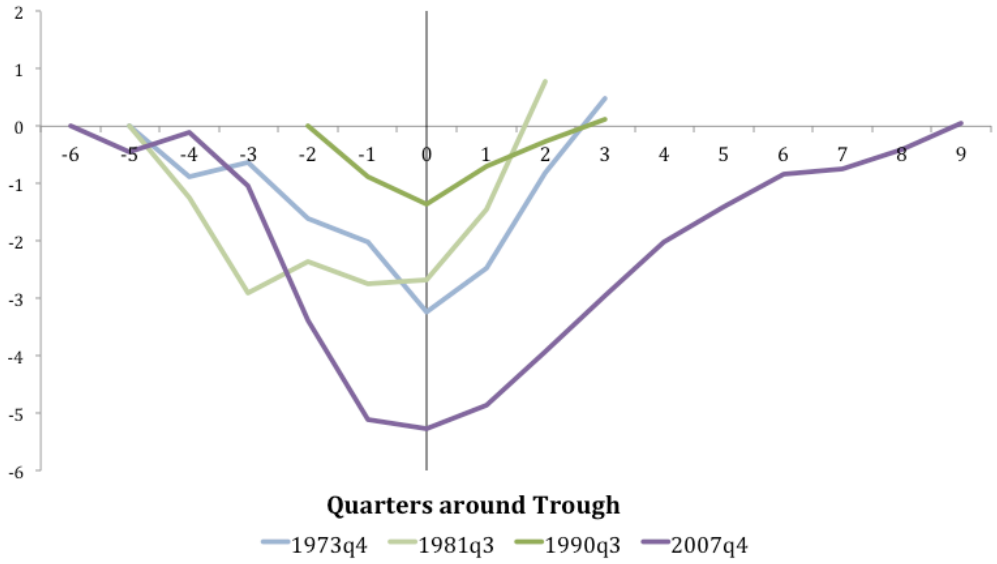


In Figure 2 we include the recoveries associated to the recessions in the 50s, 1960, 1973, 1980 and 1981.[10] There are many similarities in those 5 recoveries. Almost all of them take either 1 or 2 quarters to be completed. The only exception is 1973 with a recovery length of three quarters. It is interesting to notice that there are more differences in the recession phase than in the recovery phase. Some recessions last longer: five quarters the longest versus two quarters the shortest. But these differences in the length (or depth) of recession do not necessarily translate into different recoveries. Excluding 1973, the other four recoveries look almost identical in length. 1973 is possibly the only cycle in this sample where we see a correlation between a long recession and a long recovery.

Figure 3 plots the more recent recessions and we include the 1973 once again for the sake of comparison with Figure 2 (notice that the 2001 recession is absent because there was no decline in GDP so there is no sense in talking about the recovery in this recession using this criterion).

The recovery from the 1990 recession happens over three quarters although the shape is flatter than in some of the previous cycles. This confirms that the shape of the recession does not seem to affect the shape of the recovery: A short and shallow recession does not make for a faster and stronger recovery. The recovery from the 2007 recession stands out as an outlier in terms of length: nine quarters. It also corresponds to the longest recession (although just by one quarter) and the deepest if measured as deviations from the previous peak.

Figure 3. Deviation of GDP from previous peak
Selected cycles.



[10] We exclude the 1969 recession because the evolution of GDP between the peak and trough is unique with GDP increasing in the first quarter then falling again. One quarter after the trough, GDP was once again above its pre-recession level.

The methodology of defining recoveries relative to the time it takes to reach pre-recession level has been applied to a large sample of countries in Morsink, Helbling, and Tokarick (2002). They find, as we do, that the duration of recoveries is not significantly related to either recession depth or duration. So there is no strong evidence that output recovers faster from recessions that have different depth or length. The only exceptions they can find are those of severe recessions. We confirm this in our sample with the shape of the 2007 recession (and possibly the 1973 one as well), which happens to be the most severe recession in our sample. In their sample recoveries are longer on average than recessions.

Closing the output gap

Using deviations of GDP from previous peak has the advantage of being a simple and readily available measure of the recovery. But as argued above, we are ignoring the growth of the trend and this matters when we have recessions and recoveries with large differences in length. In particular, in the 2007 cycle, from the end of expansion until the recovery we have 15 quarters. This represents almost twice as long as the second longest cycle (the 1973 recession). Given the presence of trend growth during these quarters, if we use this criterion we will be calling the end of the 2007 recovery too early (relative to other recoveries). If we adjust for trend growth we are likely to see an even longer recovery.

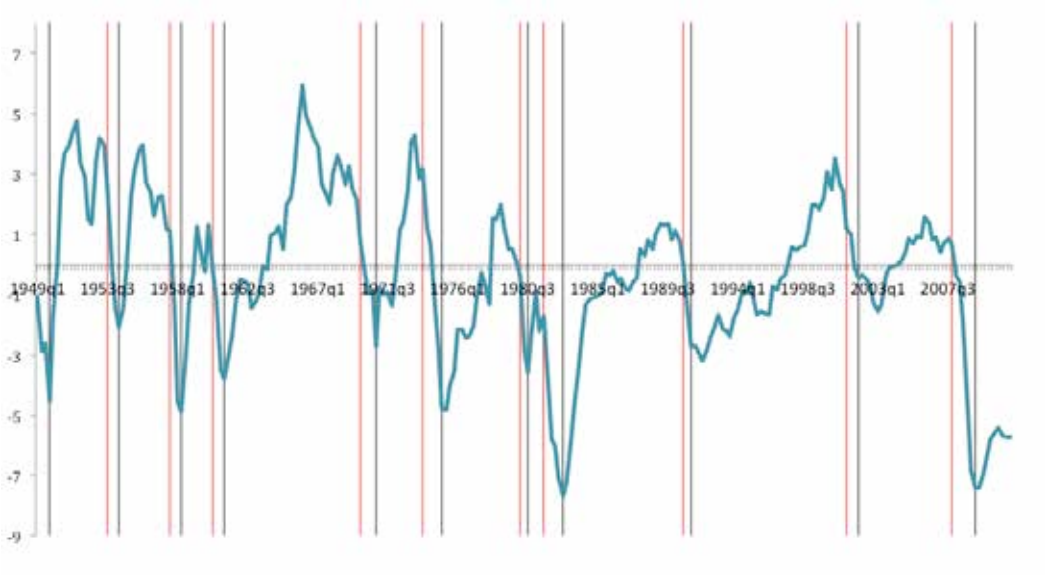
This criticism leads to measures of recoveries that take into account the growth in the trend itself and try to assess how close the economy is to potential. The natural candidates are measures such as the output gap or the unemployment gap (measured as the deviation of unemployment relative to its natural rate). There are other potential measures of the slack of the economy, such as capacity utilization, but both the output and unemployment gap seem to be better suited to give us a more complete picture of the true slack in the economy.

Both the output gap and the natural rate of unemployment are measured with great uncertainty and subject to constant revisions. Our analysis is historical in nature; it is not a forecasting exercise so revisions are not a big concern. Our goal is to understand business cycles ex-post, without the need to address how those business cycles look in real time. Uncertainty is, of course a big concern given that we need to have a good estimate of the actual level of these variables.

But the biggest drawback that we see in these two variables is that they do not exactly fit our framework of asymmetric cycles. Most estimates of these two variables allow for the economy to produce beyond potential or for the unemployment rate to be below its natural rate. In fact, a simple plot of the output gap as produced by the Congressional Budget Office shows that during some of the expansions, output was significantly higher than potential. When the recession starts we see a large fall in potential output but it takes several quarters to get to a point where the output gap is negative and even when we reach that point, the absolute deviation from potential output can be small. As a consequence, it does not

take many quarters of some recoveries to return to a positive output gap. See Figure 4.

Figure 4. Output Gap.



In particular, if we look at the 1960, 1969 or 1973 recessions, this is the pattern that we see, at the time of the peak the output gap tends to be positive. The last three or four cycles are closer to what we propose as our framework with smaller deviations from above, deeper recessions and longer-lasting recoveries.[11]

Having output deviate both from above and below potential output is useful in some instances, for example to understand the behavior of inflation, but it makes the dating of recoveries using our benchmark much less consistent over time.
In Figure 5 we plot the evolution of the CBO output gap for the eleven cycles in the post-WWII period just for quarters when this gap is negative. Using our criteria of waiting until the output gap becomes zero we can see a variety of recoveries from a few quarters to several years.

To make the analysis more clear we plot in Figures 6 and 7 the shape of recoveries for each of the post-WWII cycles. Now we see that recoveries are very different in terms of their length. While some are as short as two quarters (such as the one associated to the 1953 recession), others are as long as 13 quarters using this criterion.

[11] Although in the cycle of the 90s we see again the output gap becoming very positive before the peak.

Figure 5. Quarters with negative Output Gap.

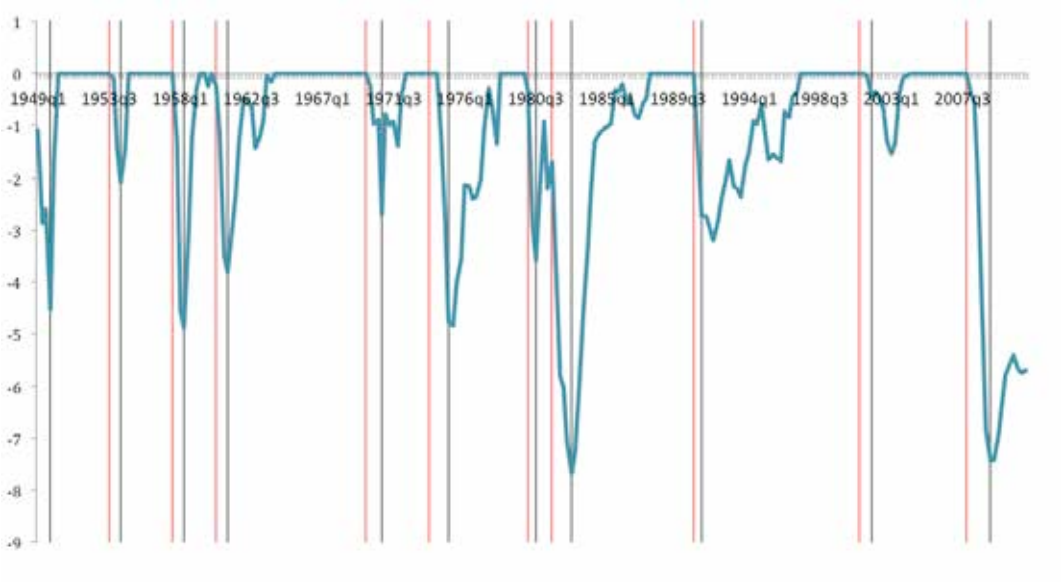
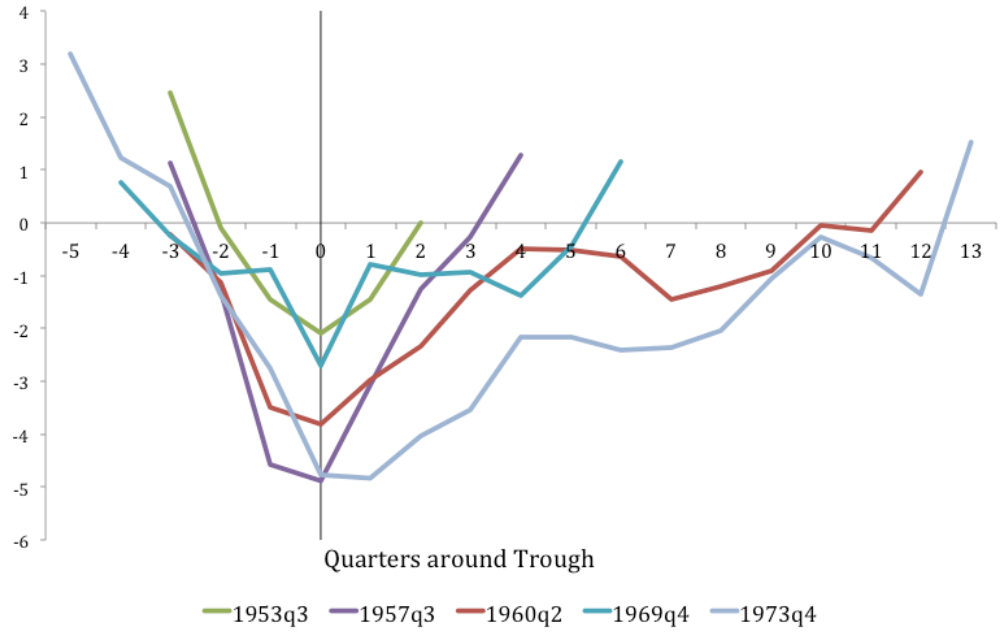


Figure 6. Output Gap around the Trough. Selected cycles.



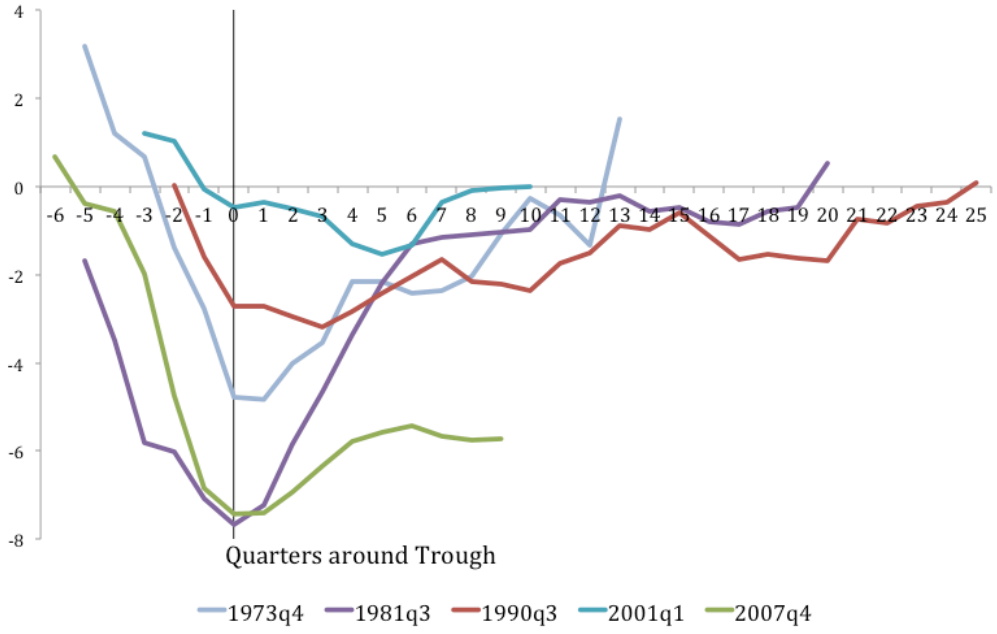
Why is the outcome of this analysis so different? There are several reasons why we have a very different pattern here. The first one is that not all recessions start from the same position. With our previous measure (deviations from GDP at Peak), all series started at zero by definition. Now we see that in some cases the output gap was as high as 3% while in other cases it was closer to zero. So while we are trying to give an absolute meaning to a zero output gap, the data seems to indicate that this

is not the case across all cycles. The second reason is that now the length of the recession matters. If the recession is longer, and given that output trend keeps growing, we will observe a slower recovery towards trend. In particular this is clear in the recovery associated to the 1973 recession where it takes 13 quarters to go back to positive output gap.

Also, the recovery for the 1960 recession now looks very different. When we used peak GDP as the benchmark, this recession looked shallow, with a recovery that lasted just one quarter. But because the quarters that follow showed weak growth relative to potential, the output gap remained negative until 10 quarters after the through, making this the second longest recovery in this sample.

There is a third potential reason why we see some very long recoveries once we use potential output as the measure of trend. It could be that the zero output gap is not precisely measured in the data and we cannot tell the difference between output gaps around zero. Visually, it seems to be the case that in some recoveries the steepness of the line changes before we get to zero. If we allow for some margin around zero to call the end of recoveries, it is possible that we would be calling the end of some of these recoveries earlier. For example, for the recovery associated to the 1960 recession, it seems that after 4 quarters the output gap remained close enough to zero and unchanged.

Figure 7. Output Gap around the Trough. Selected cycles.



When we plot more recent cycles we see differences that are much larger than in the previous chart. Here we need to make a special reference to the recessions of 1980 and 1981. While the NBER called the end of the 1980 recession in the third quarter of that year, there was not enough time for a proper recovery before the next recession started. There are two things we can do to deal with this special case. First, we could merge the two recessions into one and this will provide an extremely long recovery phase for the 1980 recession. But this is not correct, if we accept the NBER judgment that these were two separate recessions. Instead we will simply ignore the 1980 recession as one that never had a proper recovery and analyze the 1981 recession as any of the other cycles.

We find that the 1981 recession was characterized by a very fast recovery. However, if we strictly use the criterion of reaching zero output gap, the recovery was long (20 quarters). But visually we can see that after seven quarters the output gap had become very close to zero and from then on the growth of output is very close to potential for the next thirteen quarters. The 1990 cycle is also a special one. Despite a short and shallow recession, it took up to 25 quarters to return to a zero output gap. But as in the 1981 recession, after 7 quarters we see output growing at a similar pace as potential output and that's why the last part of the output gap takes so long to close.

The 2007 cycle is very far from being finished and we can only say that it remains an outlier, so far.

We have also produced a similar analysis using the unemployment gap as a measure of slack in the economy. There are lots of similarities to the analysis above and we once again encounter the same difficulties defining the length of recoveries. In some cases, the cycle starts with unemployment levels clearly below the natural rate so is more difficult to use a consistent notion of full employment. In addition, during some recoveries the unemployment rate recovers fast but then it slows down before reaching the natural rate, making the recovery phase stretch for a large number of quarters.[12]

There are some insights from the above analysis about the historical patterns of recoveries in the US (for example, it seems clear that the recovery associated to the 2007 recession is the longest by far). But it has also left many open questions about how to precisely estimate the trend to be able to properly date the end of the recovery. The use of the output gap or the unemployment gap has the advantage of being a simple and well-understood measure of the slack in the economy but it suffers from two drawbacks. First, there is uncertainty about how precisely potential output is measured. Second, and more important for our analysis, the notion of potential output that is being used is associated to the idea of sustainability, in some cases related to inflation dynamics. Inflation dynamics

[12] The results are available in the version of the paper presented in the Boston Fed Conference.

depend not only of the slack of the economy but also on the dynamics of wages and prices or the credibility of the central bank. The fact that the starting level for the output gap is so different across cycles makes the measure of trend more of a relative measure rather than the absolute measure of potential as a maximum level of output.

4. Using an econometric model to estimate recovery dates

Given the drawbacks of the previous section, we now explore the idea of dating recessions using an econometric model. What we are looking for in this model is the ability to separate the trend and the cycle. There are obviously many alternative ways to do that decomposition, but we need one that is consistent with our framework of focusing on large events (recessions) that are asymmetric in nature. In addition, we would like a decomposition where cycles are seen as deviations from a trend from below. In other words, the trend is a ceiling or a maximum level of output.

There is a literature that has emphasized the asymmetry of the business cycles and made an effort to provide an econometric structure to capture this asymmetry. This literature has a very natural connection to both the NBER methodology and the plucking model of Friedman (1964). Neftci (1984) or Sichel (1993) were some of the earlier contributors in terms of highlighting the asymmetries of cycles and providing an interpretation of cycles in terms of regime switching. The literature has mostly developed building on the methodology of Hamilton (1989) of regime-switching models to produce different estimates of the asymmetric business cycle.

The original work of Neftci (1984) or Hamilton (1989) was based on the idea that the economy follows a cycle where the growth rate switches between two states. This description fits well the two-phase NBER methodology of expansions followed by recessions. The basic Hamilton model has been later modified to take into account richer dynamics as for example in Kim, Morley, and Piger (2005) or Morley and Piger (2012). A similar approach but using an unobserved components model is used in Kim and Nelson (1999).

We follow here Morley and Piger (2012) and estimate a nonlinear model of the business cycle that allows for richer dynamics during the recovery phase. In particular, we use a model where the speed of the recovery depends on the depth of the recession.[13]

We can represent the nonlinear model as an AR model with regime-switching in the growth rate of GDP that depends on current and m lagged states.

[13] We use the Gauss code provided by the authors to estimate the model. Our estimation is done for a longer period of time than the original paper: 1947q1 to 2012q4.

$$\phi(L)(\Delta y_t - \mu_t) = \varepsilon_t$$

Where

$$\mu_t = \mu\,(S_t, \ldots S_{t-m})$$

And each $S_{t-i} = \{0,1\}$ is a Markov state variable with certain transition probabilities.

The model we consider is one where μ_t takes the form

$$\mu_t = \gamma_0 + \gamma_1 S_t + \lambda \Sigma_{j=1}^{m} \left(\gamma_j + \Delta y_{t-j}\right) S_{t-j}$$

In the case where $\lambda = 0$ we have the standard Hamilton (1989) model.

This model is making explicit the existence of a third phase of the cycle. Relative to Hamilton (1989), it allows for a faster growth rate during the recovery phase. It does it by allowing the growth rate to depend on the extent of the depth of the recession (as opposed to the three-phase cycle description of Sichel (1993)). There are alternatives to this assumption discussed by Morley and Piger (2012), e.g. they consider also models with U-shaped and with V-shaped recessions.

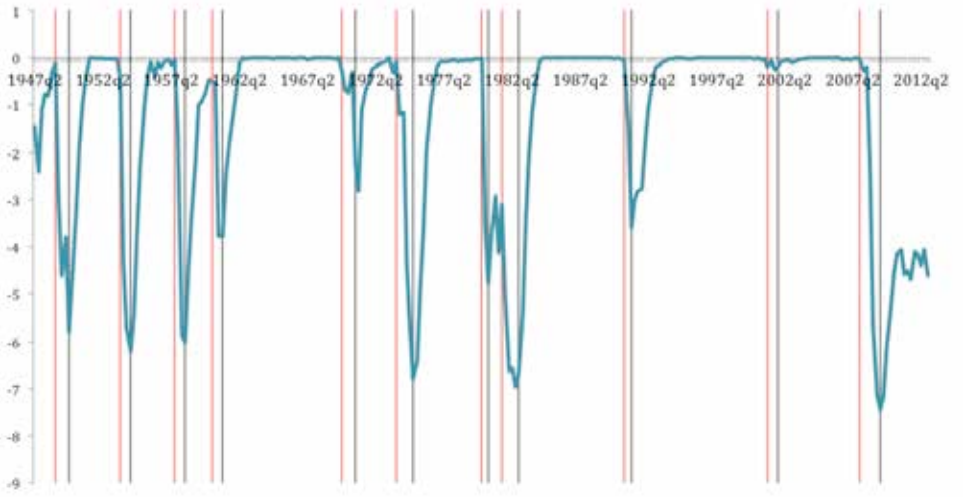
We choose this particular model and not the other ones presented in Morley and Piger (2012) because it is the one that gets picked up as the best fit to the US data. We refer the readers to their paper for a comprehensive analysis of how each of the alternative models compare to each other. [14]

Estimating the model with US data produces a cyclical component that we present in Figure 8.

Interestingly, there are lots of similarities between Figure 8 and some of our previous analysis of the cycle. The cycle matches well the NBER recession dates and its size is not far from that of the output gap. There are, however, also some differences. Overall, there are more similarities across all cycles in terms of length and shape. This is coming from the consistency that the model imposes across all cycles – something that it is absent in the output gap or unemployment gap analysis. The second difference, which is important for our logic, is that this cyclical measure is asymmetric by construction. The estimation assumes that the cyclical component in the high-growth state is zero. This allows for a very clean and consistent interpretation of the cyclical component as the gap between actual output and a measure of trend output that can be seen as a maximum, a ceiling.

[14] Following Morley and Piger (2012) we set the number of lags (m) equal to 6 and the parameter λ equal to 0.2. We have also replicated the analysis using some of the other models presented in their paper and the differences with what we present here are minimal.

Figure 8. Model-based Cyclical component.



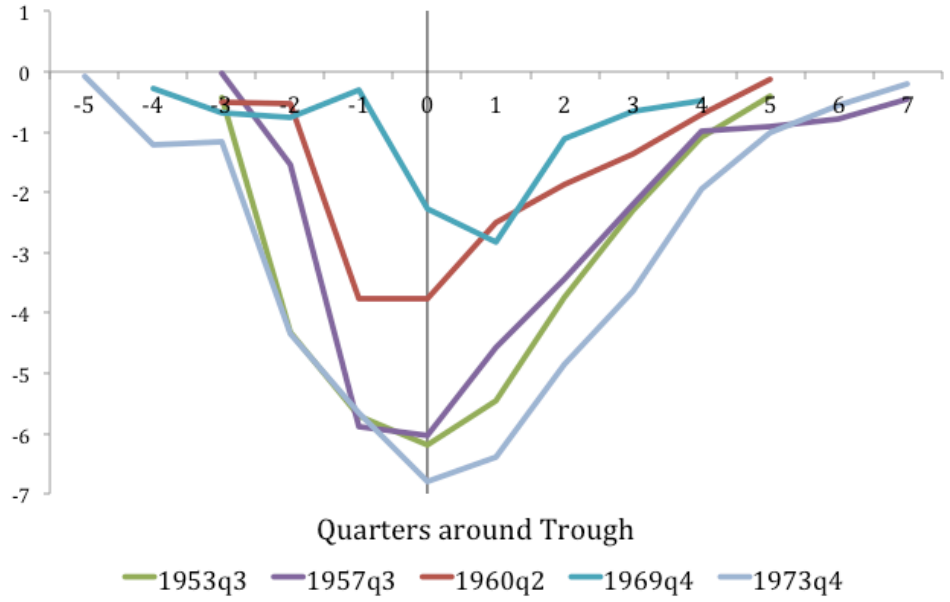
There is also one difference that is worth mentioning here: the 2001 recession is not visible in Figure 8. This should not be a complete surprise given how different that recession looks in terms of depth and length. However, it is a partly a surprise because in the original work of Morley and Piger (2012) on which our estimation is based, this recession is picked up -- in the sense that the estimation puts a significant probability that the state of the economy is a low growth state during the quarters around the second half of 2001. As such, the 2001 recession is visible in their representation of the cyclical component. There are two differences between our analysis and theirs. First, we are using a longer sample that now includes the 2007 cycle. Second, the data around the 2001 recession was revised after their paper was written in a way that made that episode smaller in depth. We wanted to understand which of these two factors was driving the difference in the results by running the same model with our new (revised) data but with the same sample as in Morley and Piger (2012) which finishes in 2006q4. In this modified estimation we also find that the 2001 recession is not there. So the difference between our estimates is entirely due to the revisions to GDP since their work was produced. The 2001 recession has "disappeared" when their model is estimated because of the revisions to the data around 2001.

To make the comparison across cycles more visible we produce as before two charts where data is centered around the beginning of the recovery phase. The 2001 cycle will be absent given that it is not picked up by the model (same for the 1980 cycle given that, as before, we cannot properly talk about the end of the recovery in that cycle).

In Figures 9 and 10 we plot the cyclical component for each cycle where the data starts with the quarter when the recession starts. To be able to put a date to the end of the recovery we need to set a criterion on the level that we consider represents a complete return to potential. By definition, the cyclical component that this model produces is always below zero, so establishing zero as the benchmark to call the end

of the recovery is not possible. We therefore need a threshold under which we consider the cyclical component to be "close enough to zero". We have experimented with different benchmarks and we have concluded that a benchmark in the range of 0.5%-1% produces stable and sensible dates. We can also justify this range visually because it matches the moment where the slope of the recovery becomes close to being flat. It is in some sense a turning point for the speed of the recovery. In our analysis below we discuss the end of recovery using the 1% benchmark.[15]

Figure 9. The Cyclical Component around the Trough. Selected cycles.



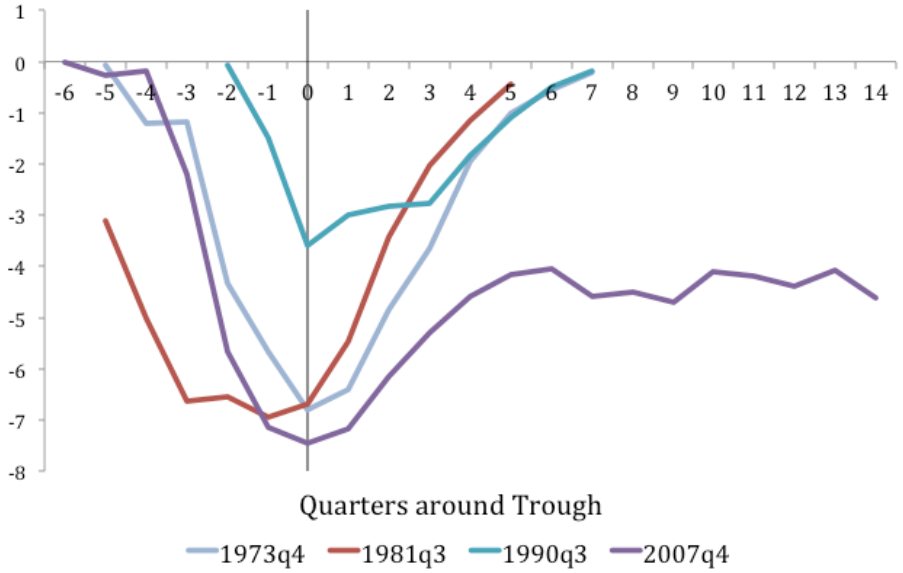
In Figure 9 we see that cycles are all very similar. The recovery lasts between three and six quarters, not far from the recession length. The longest recovery is the one from the 1973 recession, matching our previous results.

When we add more recent cycles (Figure 10) we can see that the 1981 and 1990 cycles are similar to the recovery associated to the 1973 recession. Unlike when we were using the unemployment or output gaps, we find a more sensible length for these two recessions. In particular, the recovery from the 1990 recession is still long given how shallow the recession was (so it can still be called a slow recovery), but it its length now is much more consistent with what we see in other cycles.

The recovery associated to the 2007 recession becomes, once again an outlier. It is not over but it is already fourteen quarters long, which makes it already more than twice as long as any other recovery.

[15] Using 0.5% as a benchmark produces identical dates for some recoveries; a recovery that is one quarter longer for 1950, 1962, 1969, 1973 and 1990 recession and for the 1957 recession it produces a recovery that is three quarters longer.

Figure 10. The Cyclical Component around the Trough. Selected cycles.



We now summarize the results in Table 1 where we include the peak and trough date from the NBER-identified cycles as well as potential dates for the end of the recovery phase as produced by our model. We also provide the analysis using the criterion of returning to previous peak level.

Table 1. Business Cycle Dates

Peak NBER	Trough NBER	Recovery Model	Recovery Peak GDP
1948q4	**1949q4**	1950q4	1950q1
1953q3	**1954q2**	1955q3	1954q4
1957q3	**1958q2**	1959q2	1958q4
1960q2	**1961q1**	1962q1	1961q2
1969q4	**1970q4**	1971q3	1971q1
1973q4	**1975q1**	1976q3	1975q4
1980q1	**1980q3**	--	1981q1
1981q3	**1982q4**	1983q5	1983q2
1990q3	**1991q1**	1992q3	1991q4
2001q1	**2001q4**	--	--
2007q4	**2009q2**	--	2011q3

Notice that the recovery date is blank for the 1980 and 2007 because the recovery phase is not complete. Also, for the 2001 recession, we do not include dates for the end of the recovery for either the model-based version or the one using peak GDP because neither of these two methods can identify a clear recession-recovery cycle.

Table 2. Length of Recession and Recovery			
Peak NBER	Recession	Recovery Model	Recovery Peak GDP
1948q4	4	4	1
1953q3	3	5	2
1957q3	3	4	2
1960q2	3	4	2
1969q4	4	3	1
1973q4	5	6	3
1980q1	2	--	2
1981q3	5	5	2
1990q3	2	6	3
2001q1	3	--	--
2007q4	6	--	9

Table 2 translates the dates of Table 1 into lengths of recessions and recoveries. The length of the recession is calculated using the NBER dates. The length of the recovery is calculated using our four different dating methods.

In the model-based dates we find many similarities across recoveries, which is a welcome feature as it suggest that the recovery is a meaningful and measurable phase of the cycle. [16]Early recoveries are all in the range 3-6 quarters. This is in contrast to our attempts to measure recoveries using the output gap. As an example, the recovery from the 1990 recession remains a long recovery (6 quarters) but is reasonably close to the others. When we were using the output gap, it looked as if this recovery stretched for more than 20 quarters.

We see some evidence of longer recoveries post-1973 but by one or two quarters. The 1973 cycle is possibly leading to a long recovery because of its depth, returning to trend takes longer when activity is further away from its normal state. The 1990 recovery remains special because despite being shallow, by historical standards, the speed to returning to normal seems this time slower than before. The recovery associated to the 2007 recession is a clear outlier. Partly because of its depth, as in 1973, we expected a longer recovery. But we are already 14 quarters into the recovery and looking at where we are, it is likely to take still several quarters for it to end. So there is no doubt that we are witnessing again a cycle where the speed of recovery is significantly slower than any of the previous cycle.

[16] This is also what we find when using GDP at previous peak as the definition of returning to "normal", most recoveries look identical, lasting between 1 and 3 quarters.

5. Measuring the costs of recessions and recoveries

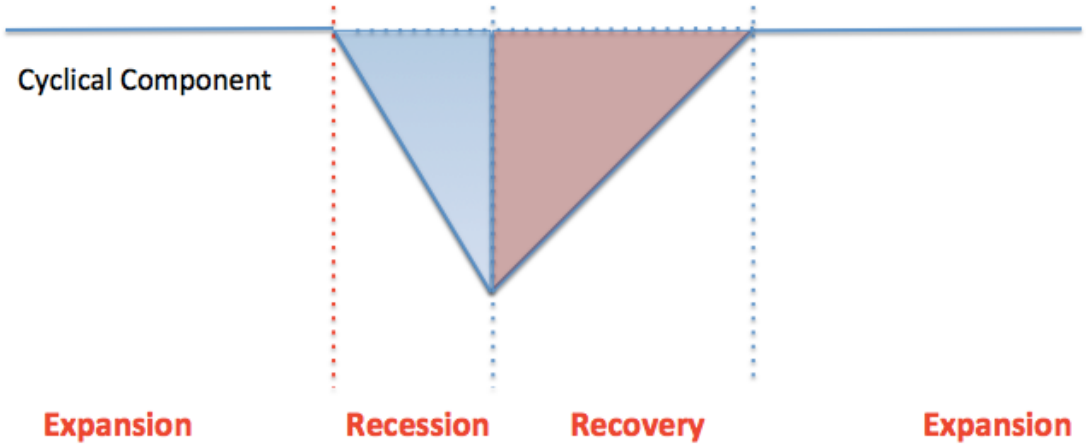
The question of how costly economic fluctuations are in terms of welfare appears often in the business cycle literature. The estimated costs are very different depending on the framework used to describe and characterize economic fluctuations. The seminal work of Lucas (1987) calculated that the deviations of output from trend represented a loss of as little as 0.1% of steady-state consumption. This surprisingly small number was later challenged by others who questioned some of the original assumptions used in Lucas (1987) model. Most of this literature still relies on symmetric models of the business cycle where the cyclical component is centered around the trend and the cost is a result of the uncertainty and volatility it introduces in consumption.

The framework we are using in our paper is one of an asymmetric cycle. In Friedman (1964)'s plucking model of the business cycle fluctuations are always from below the maximum level of output. In the model from Morley and Piger (2012) that we estimated in the previous section, the cyclical component is by construction always negative. In these models, the cost of recessions can be seen as the loss of output resulting from producing below potential for a number of quarters. This can be a first-order effect and therefore can lead to potentially larger estimates.

In order to produce an estimate of the cost of recessions in our framework, we need a date for the beginning of the recession (which is provided by the NBER) but we also need a date for the quarter when the economy has returned to trend, what we call in this paper the end of the recovery date. Once a recovery date is set we can simply calculate the cost as a function of the length and depth of the recession and recovery phases. In other words, we need to measure the area under the V-shaped recession and recovery phases that we have identified and we do so separately for the recession and recovery phase (see Figure 11).

Before we present the estimates we need to note that our calculation should be seen as a lower-bound estimate of the cost of recession because it ignores the potential long-term effects of recessions. It is possible that during recessions trend growth slows down and when output returns to trend it might not return to the same trend before the recession started. There is evidence that fluctuations are indeed very persistent and this persistence can be seen as the long-term effects of cyclical fluctuations (see Fatás (2000) or Balakrishnan et al. (2009)). In fact, in the econometric model we estimate, these long-term costs are explicit. As the economy enters a recession, the growth rate switches to a low-growth state. The recovery phase, through the bounce-back dynamics, allows for some partial return to the original trend but not enough to compensate for all the losses during the recession (see Kim, Morley, and Piger (2005) for a detailed analysis of this issue). We ignore these costs in our calculations and we simply calculate the output loss as the result of the deviation of the cycle relative to trend.

Figure 11. Measuring the Costs of Recessions and Recoveries.



In Table 3 we calculate this loss using the recovery dates from the estimated model (from Table 1). For each cycle we calculate the accumulated loss as a % of the annual GDP at the peak, before the recession started. We separate the cost of the recession and recovery phases.

Table 3 contains several important insights. Recessions are costly. Output loss can be as high as 22% of annual GDP (and this is for a recovery that is not over yet). Two recessions stand out as very costly: the 1981 and 2007 recessions. The 1981 cost is mostly due to its depth, not so much its length. In the 2007 case it is a combination of depth but also of length.

Table 3. Cost of Recessions (% previous peak annual GDP)

	Recession	Recovery	Total
1948q4	4.29	2.56	6.84
1953q3	4.07	3.16	7.23
1957q3	3.30	2.60	5.90
1960q2	2.12	1.46	3.58
1969q4	1.07	1.00	2.08
1973q4	4.75	4.48	9.23
1980q1	2.05	2.73*	4.78*
1981q3	8.65	3.07	11.72
1990q3	1.27	2.89	4.15
2001q1	--	--	--
2007q4	5.54	16.57	22.10

* The 1980 recovery is an unfinished recovery so costs are not comparable to the other recessions.

The second interesting fact that we learn from Table 3 is that a large portion of the costs of contractions can be attributed to the recovery phase. Furthermore, in the last few cycles the recovery phase bears the bigger portion of the costs. In the earlier recessions, the cost of recoveries is similar or lower than that of the recession. This is coming from the fact that, as we have shown earlier, the recovery phase was quick (as quick or quicker than the recession) in most of those episodes.

1973 stands out as a costly cycle but the losses are evenly distributed between the recession and recovery phase. The 1981 cycle is associated to a very costly recession but with a very quick recovery.

It is after the 1990 cycle that we see how much costlier contractions can be because of the speed of recovery. The 1990 recession is shallow and short so its total costs are small but it is interesting to notice that the costs are twice as large during the recovery than the recession phase. This pattern is even more extreme for the 2007 recession where costs are already three times larger in the recovery than in the recession phase.

Table 3 strengthens the motivation for the exercise we are doing in this paper. A characterization of business cycles as recessions and expansions only provides a partial view on the dynamics around crises. As it is clear from Table 3, by ignoring the recovery phase, we are missing on some of the interesting differences across cycles. Assuming that after the trough all expansions are similar misses important feature of business cycles, and this is more apparent in the last cycles.

6. The role of economic policy in the 2007 cycle.

Our results so far suggest that there have been substantial differences across different recovery episodes. These differences in post-recession dynamics can be attributed to the nature and the size of the initial shocks, changes in the propagation mechanism (possibly due to the presence of balance sheet effects), or to differences in monetary and fiscal policies. In this section we look at differences in macroeconomic policies during the recovery phase to see if they can explain the long recovery that we have seen in the 2007 cycle.

Monetary policy

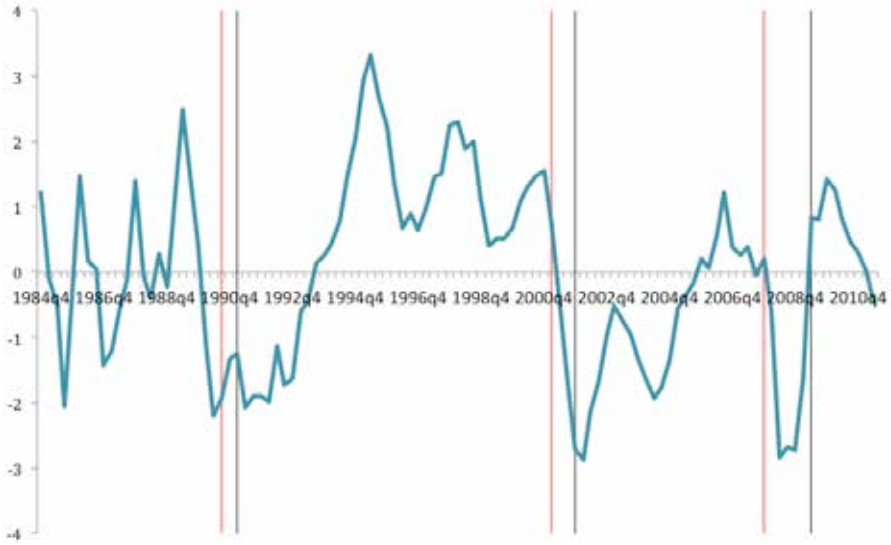
To investigate differences in monetary policy stance across various recovery episodes, we first estimate a standard reaction function following (Clarida, Gali, and Gertler 2000).

$$r_t = (1 - \rho)(\alpha + \varphi_\pi \pi_t + \varphi_x x_t) + \rho\, r_{t-1} + \varepsilon_t$$

The data are at quarterly frequency. We use the effective federal funds rate in the first month of the quarter as a policy instrument. As it is common, the interest rate reacts to inflation, π_t , and to the output gap, x_t. One lag of the interest rate is included to capture the dependence of current rates on the past ones. The model allows for partial adjustment to the desired level of interest rates, which is modeled by having $(1-\rho)$ multiplying the reaction of interest rates to the rate of inflation and the output gap.

Most of the variables are the same as the ones used by (Clarida, Gali, and Gertler 2000). The log change in the GDP deflator is our measure of inflation, while the output gap is the variable constructed by the Congressional Budget Office (CBO). Given that both inflation and the output gap are endogenous variables, we estimate the reaction function by using instrumental variables. As instruments we use one lag of each regressor plus one lag of the growth rate of M2, commodity price inflation, and the spread between the yield on a 10-year bond and the yield on a 3-month T-bill. We restrict our sample to 1984Q1 – 2011Q2. As it is well known, the Volcker disinflation of the early 1980s represents a break in the monetary policy reaction function.

Figure 12. Deviations from Taylor Rule.



The estimation produces standard results, which for brevity we do not report here. We use the estimates to construct the deviation of policy from the rule. We assume that these deviations are well captured by the residuals from the estimation of the reaction function. The graph below constructs the 4-quarter moving average of these residuals. According to this measure, one can see immediately that monetary policy has been quite different during the last three recessions/recoveries. In the 1991 and the 2001 recessions monetary policy turned unusually accommodating with a sequence of negative shocks (i.e. lower than predicted interest rates), and it stayed expansionary for more than a year after the end of the recession. In contrast,

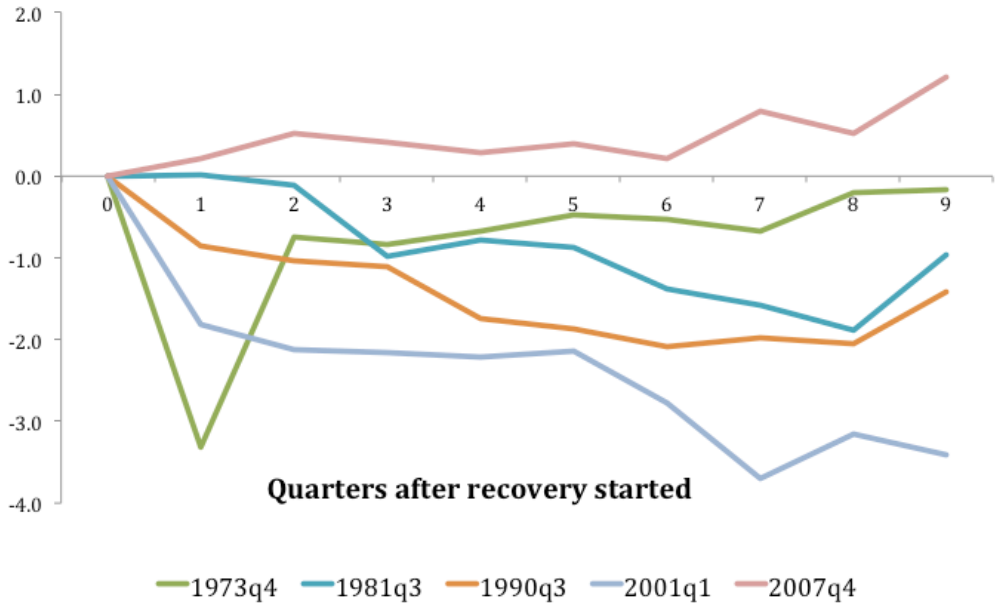
in the latest recovery policy stance was accommodating only in 2008 and in early 2009 it turned contractionary. This is not an entirely surprising finding – many economists have argued that the zero-lower bound has not allowed the Fed to be as accommodating as the reaction function estimates suggest.

This result also lends support to the quantitative easing implemented by the Fed. What is interesting in the context of our discussion of recoveries is that the length of the recovery seems to be connected to the absence of sufficient policy easing in the last recovery relative to the policy stance in previous recoveries.

Fiscal policy

Unlike monetary policy where recently consensus has emerged on the specification of the reaction function, in fiscal policy there is still significant controversy regarding proper measurement of policy stance. In Fatás and Mihov (2012) we review various measures of fiscal policy. We argue that as a first approximation, the change in the structural balance is a useful measure of policy stance.

Figure 13. Change in the Structural Balance relative to trough.



In Figure 13, we plot the accumulated change in the structural balance as a percentage of potential GDP following the end of each recession. Time 0 is the quarter when recessions end and recoveries begin. Once again, the most recent recession is followed by a recovery that was not supported by expansionary policy. The dynamics of the structural balance are in sharp contrast to the dynamics of the balance in previous recoveries. Interestingly, the shallowest two recessions

1990/91 and 2001 are followed by the most expansionary structural balances in our sample.

It is difficult from this small number of recoveries to draw conclusions about the role of fiscal and monetary policies in the dynamics of the economy. At the same time, it is worth pointing out that in the most recent recession both the interest rate and the structural balance have not gone to levels suggested by the historical behavior of the policy-makers. There is no doubt that there are good explanations why further easing might not have been possible, but from a positive point of view it is still important to emphasize the relationship between the speed of the recovery and policy stance.

7. Conclusions

The recovery from the last recession has been the slowest recovery in the post-WWII period. This slowness has led to debates about the extent to which structural factors are responsible for the low growth or about the importance of financial crisis explaining weak recoveries. In addition, it has been a key reason why monetary policy in the US has established an "unemployment target" as a way to provide guidance about future interest rates. This target can be seen as a signal on when the recovery is perceived to be over.

Despite the importance in understanding recoveries, the NBER methodology ignores this phase of the cycle. Recessions end when a trough is established, after which the economy enters an expansion phase. The original work of Burns and Mitchell (1946), on which the NBER methodology is based, recognized the existence of a revival phase but it was never made explicit in their dating procedures.

This paper provides estimates for what we call the recovery phase of the business cycle. We define the recovery as the phase in between the end of the recession (trough) and the quarter when output has gone back to trend. We use four criteria to characterize trend GDP and establish the timing of recoveries. Although there are many difficulties measuring potential GDP or full employment, we show that regardless of the criteria used there is some consistency in the way recoveries take place in the US economy.

Earlier cycles show recoveries that are as short or even shorter than the recession phase. There is no clear correlation between the length of the recession and the length of the recovery except for 1973 where we see both a long recession and a long recovery. The 1990 as well as the 2007 cycles show recoveries which are significantly slower than before and longer than their corresponding recessions. In particular, the 2007 recession stands out as the one with the longest recovery (and the recovery is not complete yet), which happens to be much longer than the recession that preceded it.

Using our recovery dates we produce an estimate of the cost of the recessions under the assumptions that they can be seen as downward deviations from a trend that represents maximum output. The cost of recessions and recoveries are as large as 20% of the peak GDP level. The recovery phase is as costly as the recession phase for earlier cycles. For the 1990 and 2007 cycles the recovery phase is much more costly than the recession phase given how weak growth is after the economy has passed the trough.

Given the low number of cycles it is hard to provide an exhaustive analysis of what explains the difference in recoveries, but we provide some anecdotal evidence that confirms that in the case of 2007 economic policy has not been as supportive as in previous recoveries.

8. References

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