

# From Okun's Law to the fiscal multiplier

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## Abstract

The paper revisits the notion of potential output, using different estimates of the Okun coefficient, to then extract new measures of the US fiscal stance which draw on observable data and transparent targets. It highlights the dynamic fiscal multiplier effects and shows that the value of the fiscal multiplier depends quite substantially on the underlying variables of potential output's estimates. In contrast, the state-dependence of the fiscal multiplier effect is found to be more sensitive on unemployment rate thresholds used to separate bad years from good years than on the underlying variables of potential output's estimates.

## 1 Introduction

One can reasonably expect from governments that, among other things, they plan to stabilize the economy, following one of the three functions of public finance elaborated by Richard Musgrave in 1959 in his Theory of Public Finance. For decades, the stabilization property of public finance has relied on the distance to a so-called potential output, i.e. a measure of how much the economy could produce if its resources were fully and efficiently utilized. The difference between the actual output and the potential output (the output gap) may thus trigger a stabilizing reaction by the government. No reaction to the output gap will show an a-cyclical policy, a fiscal contraction (resp. expansion) under a positive (resp. negative) output gap will show a counter-cyclical and stabilising policy, and a fiscal contraction (resp. expansion) under a negative (resp. positive) output gap will show a pro-cyclical and destabilizing policy.

The mere fact that the stabilizing property of an economic policy rests on an unobservable variable like potential output remains an issue, though. Policymakers may decide on the adoption of a fiscal expansion to boost demand in order to catch up with potential output. However, if the estimated potential output is not accurate, fiscal decisions may be badly suited to the economic

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situation. For example, if the potential output estimate is itself pro-cyclical (i.e. it is correlated to actual output), the fiscal reaction will be mild and it will eventually stabilize the economy at a low-output equilibrium (see e.g. Coibion et al., 2018).

Using a measure of potential output that relies on transparent objectives, rather than on unobservable variables, would certainly facilitate a proper interpretation of the stance of economic policy. Knowing a government’s target unemployment rate, would permit a comparison with the actual unemployment rate and help to estimate the fiscal policy stance. It would induce policymakers to choose the right timing and approach for their policies to achieve their stabilization objectives and escape the low-output equilibrium mentioned above. Moreover, if policymakers used a measure of potential output that relies on observable data and an explicit unemployment rate target, it would enhance their appropriation of policy consequences. Currently, the concept of potential output is tied to an equilibrium rate of unemployment that is an abstraction and beyond the control of policymakers - they simply inherit it. If policymakers were to set and communicate clear, specific targets that are uncorrelated with the actual unemployment rate, it would be easier to hold them accountable for their actions in the eyes of the public.

In the following, we compute new estimates of the cyclically-adjusted fiscal balance, i.e. a measure of the fiscal balance that has been corrected for the endogeneity of the business cycle. To do so, we draw on Fontanari et al. (2022) and only use observable data. The method by Fontanari et al. (2022) updates the original method for potential output estimation derived from Okun’s Law and permits to compute new estimates of the output gap. Then, and following Carnazza et al. (2023), we extract the cyclically-adjusted fiscal balance from these new estimates of the output gap. In a second step, we identify a fiscal shock as the fiscal stance computed as the quarterly change in the cyclically-adjusted fiscal balance, and then we revisit the fiscal multiplier effect following the method developed by Ramey and Zubairy (2018). We therefore investigate whether the fiscal stance has shown stabilizing properties.

While following the methods of Fontanari et al. (2022) and Carnazza et al. (2023), we contribute to the literature in many respects. First, we revisit Okun’s Law on US quarterly data and update estimates by either Ball et al. (2017) or Fontanari et al. (2020). Second, among the indicators of labor underutilization that we use to estimate Okun’s Law, we add the vacancy to unemployment ratio from Barnichon (2010). This ratio proves quite powerful at identifying a significant and stable Okun coefficient over the entire sample. Third, we extract new measures of the US cyclically-adjusted balance; Carnazza et al. (2023) apply the method predominantly to Italian data while estimates for five other EU countries are left to their appendix. Finally, we investigate the fiscal multiplier effect and add two contributions to the use of Okun’s Law for the identification of potential output. Hence, as a fourth contribution, drawing on our new

dataset, we show whether fiscal policy proves stabilizing. And fifth, we check the state dependence of the fiscal multiplier: has the fiscal multiplier effect been higher in bad times than in good ones?

This paper is organized as follows. Section 2 introduces Okun’s Law and estimates the Okun coefficient in the United States by using different indicators for the underutilization of labor potential. From these estimates, we compute the fiscal stance in Section 3 before Section 4 discusses the fiscal multiplier and draws a comparison with those arising from alternative identifications of fiscal shocks.

## 2 Estimates of Okun’s Law

This section briefly reviews the academic literature on Okun’s Law. It then presents the empirical estimates of the Okun coefficient in the United States using the unemployment rate and two alternative indicators of labor slack. The results are in line with the existing literature and are fairly robust across time. As expected, more broadly defined indicators of labor underutilization are more sensitive to changes in output.

### 2.1 A brief review of the literature

The empirical regularity between unemployment and output has first been described by Arthur Okun in 1962 in his analysis of the output capacity of an economy under full employment. This relationship, later termed “Okun’s Law”, has long been interpreted as a relationship between the deviation of output from its potential and the deviation of unemployment from its natural rate. The degree to which an increase in output contributes to a reduction in the unemployment rate is called the Okun coefficient. There are two major approaches to specify Okun’s Law.

The first approach is the “levels” or “gap” specification. The Okun coefficient ( $\beta$ ) can be estimated as described in Equation 1.

$$U_t - U^* = \beta \times \frac{Y_t - Y^{Pot}}{Y_t} + \theta_t \quad (1)$$

Notes:  $U_t$  is the unemployment rate at time  $t$ ,  $U^*$  is the target unemployment rate,  $Y^{Pot}$  is potential output,  $Y_t$  is the actual output and  $\theta_t$  is the error term.

The second approach is the “changes” or “difference” specification, in which the change in the unemployment rate is regressed on the output change. Equation 2 illustrates the estimation of the Okun coefficient ( $\beta$ ) in this specification.

$$\Delta U_t = \alpha + \beta \Delta Y_t + \epsilon_t \quad (2)$$

Notes:  $\Delta U_t$  is the change in the unemployment rate at time  $t$ ,  $\Delta Y_t$  is the change in actual output,  $\alpha$  is a constant, and  $\epsilon_t$  is the error term.

Today, both specifications of Okun’s Law are widely used in academia. Examples include Lee (2000) and Moosa (2008) for the “levels” version, and Knotek (2007) for the “changes” version<sup>1</sup>. Okun (1962) originally found that a 1 percentage point increase in output growth typically reduces unemployment by 0.3 percentage points, a finding consistent across both specifications. However, this relationship applies only in the short-term, as other macroeconomic factors like capital stock and technological progress are held constant and exogenous.

The body of research on Okun’s Law is extensive and varied. Most studies affirm the correlation between unemployment and output, but notable variations are observed across different countries and regions. Moreover, there is an ongoing discussion regarding the stability of Okun’s Law throughout different time periods.

## 2.2 Okun’s Law in the United States

The empirical validity of Okun’s Law in the United States has recently been confirmed by Ball et al. (2017). They show that the “changes” specification of Okun’s Law fits the data quite well. Estimates are fairly stable across various specifications. While Okun’s Law in “levels” requires to compute two unobservable variables (potential output and the natural rate of unemployment), the “changes” version escapes this difficulty while assuming that potential output has increased at a constant pace and the natural rate of unemployment has been constant over the entire sample<sup>2</sup>.

We follow the methodology of Ball et al. (2017) to estimate the Okun coefficient. Therefore, we regress the first difference of the unemployment rate on the current GDP growth rate and its first two lags:

$$\Delta U_t = \text{constant} + \beta_0 \Delta Y_t + \beta_1 \Delta Y_{t-1} + \beta_2 \Delta Y_{t-2} + \epsilon_t \quad (3)$$

Notes:  $U$  stands for the respective measure of unemployment or labor slack,  $Y$  is GDP at constant prices,  $\Delta$  stands for the change operator and  $\epsilon$  is a residual.

We extract the Okun coefficient from the sum of the coefficients on GDP growth rates, hence  $okun = \beta_0 + \beta_1 + \beta_2$ .

<sup>1</sup>Algebraically, the “changes” specification can be derived by differencing the “levels” specification under the assumption of a constant natural unemployment rate and a constant growth rate of potential output.

<sup>2</sup>A major distinction between the two specifications lies in how potential output is defined. The “levels” version requires estimating potential output, which is often interpreted as historical trends using for example the Hodrick-Prescott filter. The “changes” version, on the contrary, views potential output as the maximum achievable under full employment. This approach aligns more closely with Okun’s original query about production capacity at full employment.

Table 1 reports quarterly estimates of the “changes” version of Okun’s Law by Ball et al. (2017). Replicating their specification on an identical subsample (1980Q1-2013Q4), we find a very similar estimate of the Okun coefficient (-0.44 vs -0.46). Extending the sample to 2019Q4 does not impact the estimated value of the Okun coefficient much (-0.39 to be compared to -0.43 on Ball et al.’s longest sample).

	1948Q1 2013Q4	1980Q1 2013Q4	1960Q1 2013Q4	1960Q1 2019Q4
<b>Ball et al.</b>	-0.432 (0.035)	-0.443 (0.049)		
<b>Replication</b>		-0.456 (0.047)	-0.405 (0.044)	-0.393 (0.048)

Newey-West standard errors in brackets

Table 1: Okun coefficient from Ball et al. and replication

Quarterly, seasonally adjusted unemployment rate data expressed in percentage of the active population from 1960 to 2019 was retrieved from the US Bureau of Labor Statistics. Quarterly, seasonally adjusted real GDP data in billions of chained 2012 dollars from 1960 to 2019 was retrieved from the US Congressional Budget Office. Stationarity has been confirmed for the change in the unemployment rate and GDP growth using the Augmented Dickey-Fuller and the Phillips-Perron tests. The Breusch-Godfrey test, which is well-suited to detect autocorrelation in the model, finds first- to fourth-order autocorrelation (Godfrey, 1978). Consequently, Newey-West standard errors with four lags are used to correct the estimation accordingly (Newey and West, 1987).

Ball et al. (2017) suggests the introduction of a structural break in 1984 to test the stability of Okun’s Law. This year is often considered as the beginning of a phase in US economic policy called the “Great Moderation”. During this phase, labor market frictions have been removed and it is theorized that more straightforward hiring and firing processes could lead to the unemployment rate being more sensitive to economic changes, thereby influencing the Okun coefficient. Table 2 shows that our estimated Okun coefficients are very stable and even more robust than those in Ball et al. (2017), who conclude that a “stable Okun’s Law appears to be a good approximation to reality”.

Another potential structural break is identified statistically using the Supremum Wald test. The test suggests a break point in the unemployment-output relationship at Q1 of 2010. The sample was not split at the break point as the post-break subsample would only contain a few data points. Instead, the Okun

	<b>Ball et al.</b>		<b>Replication</b>			
	1948Q1	1984Q1	1960Q1	1984Q1	1984Q1	
<b>Break Date</b>	1983Q4	2013Q4	1983Q4	2013Q4	2019Q4	
	1984Q1	-0.417	-0.512	-0.407	-0.431	-0.411
		(0.033)	(0.040)	(0.048)	(0.075)	(0.086)

Newey-West standard errors in brackets

Table 2: Okun coefficient before and after potential structural break identified by the literature in 1984

coefficient before the break is compared to the one over the entire sample. Table 3 illustrates the findings. There is almost no change in the Okun coefficient, which supports the hypothesis of its stability. No structural break will be included in the final baseline model.

	<b>Replication</b>		
	1960Q1	1960Q1	
<b>Break Date</b>	2009Q4	2019Q4	
	2010Q1	-0.423	-0.393
		(0.040)	(0.048)

Newey-West standard errors  
in brackets

Table 3: Okun coefficient testing potential structural break identified by Wald test

Overall, a relatively stable Okun coefficient over time cannot entirely eliminate the caveat but still gives confidence that the assumptions made on the unemployment target and the potential output growth rate do not lead to biased results. In the following, we concentrate on the “changes” version of Okun’s Law which firstly fits the US data quite well, secondly is data-saving and thirdly does not require the introduction of unobservable data like the natural rate of unemployment.

### 2.3 Alternative indicators of labor slack

A noteworthy simplification of Okun’s Law lies in its reliance on the unemployment rate as a proxy for economic resource underutilization. The official

unemployment rate may not be the best indicator of this underutilization, as it overlooks for example individuals working less than desired or those outside the labor market but willing to work under better conditions. Consequently, this section examines alternative labor slack indicators as potential dependent variables in the Okun’s Law model described in Equation 3.

Both alternative indicators yield statistically significant and stable estimates of the Okun coefficient. They present an interesting alternative for labor underutilization for the following sections.

### 2.3.1 Involuntary part-time employment

The US Bureau of Labor Statistics (BLS) reports different categories of underemployment ranging from a very narrow estimate called U-1 (persons unemployed 15 weeks or longer, as a percent of civilian labor force) to a very wide estimate called U-6 (total unemployed, plus all marginally attached workers, plus total employed part time for economic reasons, as a percent of the civilian labor force plus all marginally attached workers). The regular unemployment rate is U-3.

The first alternative indicator for labor slack is wider than the regular unemployment rate. For data availability reasons, the indicator is close to but does not correspond exactly to a BLS category. The indicator includes involuntary part-time workers and is defined as follows:

$$U_{inclpt} = \frac{\text{total unemployed} + \text{involuntary part-time workers}}{\text{civilian labor force}} \quad (4)$$

The computation relies on BLS data on unemployed workers, persons working part-time for economic reasons, and the civilian labor force. The unemployment rate and the indicator including involuntary part-time workers are plotted in Figure 1. Both indicators move similarly across time but the rate including involuntary part-time workers trails a few percentage points above the official unemployment rate.

Following Equation 3, the Okun coefficient is computed for the labor slack indicator including involuntary part-time workers just with the same methodology as for the official unemployment rate. Stationarity of the change in  $U_{inclpt}$  and the GDP growth is tested and confirmed with the Augmented Dickey-Fuller and Phillips-Perron tests. Next, the Breusch-Godfrey test is applied to test for autocorrelation in the model. There is first- to fourth-order autocorrelation detected, which is why Newey-West standard errors with four lags are used to correct for it (Newey and West, 1987).

The results of the regression presented in the second column of Table 5 show a statistically significant coefficient for GDP growth and both of its lags.



Figure 1: Unemployment rate and unemployment indicator including involuntary part-time workers

Hence, the Okun coefficient using  $U_{inclpt}$  is  $-0.534$  (the sum of the three individual GDP growth coefficients). The absolute value is larger than the one for the Okun coefficient found with the official unemployment rate ( $-0.393$ ), which confirms the hypothesis that a wider defined labor slack indicator is more responsive to changes in output. The intuition is that in economically bad times it is easier for employers to transition employees to part-time jobs rather than to lay them off entirely and conversely in economically good times, it is easier to convert part-time employees to full-time rather than hiring new workers.

The  $U_{inclpt}$  indicator is also tested for stability over time. The Supremum Wald test suggests a potential structural break at the end of 2010. Comparing the subsample until 2010 to the entire sample until 2019 shows that the Okun coefficient barely changed ( $-0.575$  vs.  $-0.534$ ) suggesting the stability of the relationship between  $U_{inclpt}$  and GDP growth (see Table 4).

	1960Q1	1960Q1
<b>Break Date</b>	2010Q4	2019Q4
	-0.575	-0.534
	(0.061)	(0.071)
Newey-West standard errors in brackets		

Table 4: Okun coefficient testing potential structural break identified by Wald test when including involuntary part-time workers

### 2.3.2 Labor market tightness

A second alternative indicator of labor slack considered in this paper is a measure of labor market tightness. Specifically, we use the ratio of vacancies at firms and the number of unemployed workers in the economy. Equation 5 describes this measure, which is a standard variable in the matching literature (e.g., Michaillat & Saez (2021)) and was also used in recent work on the Phillips curve by Benigno & Eggertsson (2023).

$$U_{vacay} = \frac{\text{job vacancies}}{\text{unemployed workers}} \quad (5)$$

Data on job vacancies comes from the Help-Wanted-Index in the database developed by Barnichon (2010) and regularly updated by the author<sup>3</sup>. The data on unemployed workers comes from the BLS and is identical with the number used to compute  $U_{inclpt}$ . Figure 2 plots the vacancy-unemployed ratio  $U_{vacay}$  from 1960 to 2021. A ratio larger than one means that there is a labor shortage in the economy. During our sample this has only been the case twice: when the Vietnam War escalated after Lyndon B. Johnson was elected US president in 1964 and during the COVID-19 pandemic.

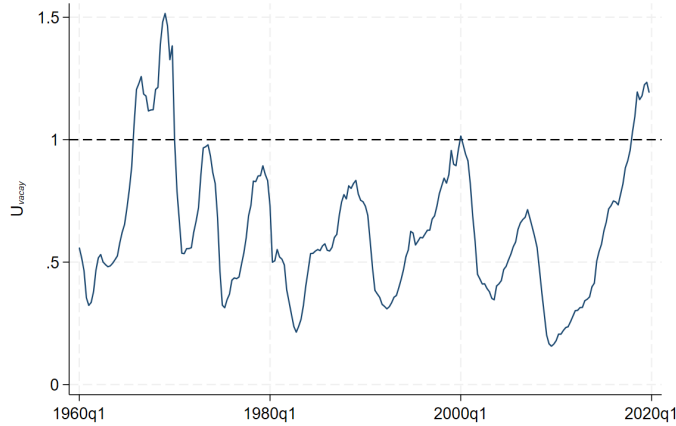


Figure 2: Ratio of job vacancies over unemployed workers from 1960 to 2021

The Okun coefficient for the labor market tightness indicator  $U_{vacay}$  can also be computed according to Equation 3 with the change in  $U_{vacay}$  as dependent variable. Stationarity of the variable is confirmed with the Augmented Dickey-Fuller and Phillips-Perron tests and due to the presence of first- to fourth-order autocorrelation found by the Breusch-Godfrey test, Newey-West standard errors with four lags are used. The intuition behind using  $U_{vacay}$  in the context

<sup>3</sup>Job vacancies are reported monthly and are averaged for each quarter to have a quarterly series.

of Okun's Law is that if there is a positive demand shock, firms open more job vacancies (the numerator increases) and fewer workers are unemployed (the denominator decreases). Consequently, the resulting Okun coefficient is expected to be positive. Indeed, the GDP growth coefficients in the third column of Table 5, which reports the regression results, are positive and highly statistically significant. The Okun coefficient for  $U_{vacay}$  is 0.065. Its absolute value is smaller than for  $U_{official}$  and  $U_{inclpt}$  but because  $U_{vacay}$  is a change in a ratio, it cannot directly be compared to the percentage point changes of the other variables. However, later in Section 3 a comparison can take place based on the potential output calculated with the respective coefficients.

VARIABLES	(1) $U_{official}$	(2) $U_{inclpt}$	(3) $U_{vacay}$
GDP growth	-0.184*** (0.025)	-0.337*** (0.054)	0.037*** (0.004)
L.GDP growth	-0.128*** (0.024)	-0.136*** (0.044)	0.018*** (0.006)
L2.GDP growth	-0.081*** (0.019)	-0.061** (0.029)	0.009*** (0.004)
Constant	0.287*** (0.047)	0.386*** (0.072)	-0.045*** (0.009)
Observations	237	237	237
Time period	1960q1-2019q4	1960q1-2019q4	1960q1-2019q4
Standard errors	Newey-West	Newey-West	Newey-West
Adjusted R-squared	0.540	0.449	0.402

Standard errors in parentheses  
\*\*\* p<0.01, \*\* p<0.05, \* p<0.1

Table 5: Regression results Okun coefficient different labor slack indicators

Testing for stability of the  $U_{vacay}$  Okun coefficient estimate, the Supremum Wald test indicates a potential structural break between 2010 and 2011. Just like for  $U_{official}$  and  $U_{inclpt}$ , there is no substantial difference between the pre-break sample and the entire sample reported in Table 6. No structural break is thus included in this model.

	1960Q1	1960Q1
<b>Break Date</b>	2010Q4	2019Q4
2011Q1	0.069 (0.008)	0.065 (0.008)

Newey-West standard errors  
in brackets

Table 6: Okun coefficient testing potential structural break identified by Wald test when using the vacancy-unemployed ratio

### 3 Deriving the fiscal stance from Okun’s Law

The estimate of the Okun’s coefficient can be used to compute an output gap and then a measure of the cyclically-adjusted public balance. In contrast with the usual approach (e.g. the CBO’s), we do neither need to rely on unobservable variables nor on complex transformation of data to estimate the output gap. Actually, the computation of the potential output will stem from observable variables and a transparent policy target (e.g. the targeted unemployment rate). Thus, one does not have to rely on theory to assess, e.g. a non-accelerating rate of unemployment (NAIRU), or on data-filtering, e.g. a Hodrick-Prescott filter.

Using the approach with the Okun coefficient to extract cyclically-adjusted deficits has many advantages. First, it requires a limited number of observable variables: GDP, unemployment rates (or another indicator of labor underutilization), and public deficit. These variables are available across a wide range of countries, therefore the method is easily replicable. And while data might be updated, the simplicity of the computation facilitates the updating of fiscal indicators. Finally, the method rests on a limited number of assumptions, the most notable one being the target for the unemployment rate. Checking for the robustness of fiscal indicators to the use of alternative assumptions is simple.

#### 3.1 The method

The method consists of three main steps. Firstly, we apply the “changes” specification of Okun’s Law and regress the first difference of the unemployment rate (or an alternative measure of labor slack) on the current GDP growth rate and its first two lags as described above in Equation 3 and extract the Okun coefficient from the sum of the coefficients on GDP growth rates (see Section 2 for details).

Secondly, we use the estimated Okun coefficients to calculate potential output following Fontanari et al. (2022). They report very different estimates of

the output gap compared to those reported by the Congressional Budget Office (CBO) in the US. Indeed, the method using Okun’s Law does not prevent long deviations of the actual output from the potential: the output gap does not rest exclusively on the adjustment of the supply-side of the economy to its so-called equilibrium value; it also depends on demand factors that may show some hysteresis. In contrast to Fontanari et al. (2020), the CBO uses a production function approach and estimates of the natural rate of unemployment towards which the economy should ”naturally” converge.

Specifically, potential output follows the specification first elaborated by Okun (1962). It rearranges the level and difference’s specifications of the Law. The resulting expression for potential output is:

$$Y^{Pot} = Y_t \times \left[1 - \frac{1}{okun}(U_t - U^*)\right] \quad (6)$$

Notes: U stands for the respective measure of unemployment or labor slack, \* indicates a long-run level, and  $Y^{Pot}$  stands for the potential output.

Potential output thus depends on the value of the Okun coefficient estimated in the first step, but also on the long-run value of the unemployment measure  $U^*$ . We prefer to interpret  $U^*$  as a target for the policymaker. Depending on the objective of unemployment that policymakers will give themselves, the targeted output (or potential output) ensues accordingly. In the following, we introduce different values for  $U^*$  to assess the sensitivity of potential output to the unemployment objective.

Thirdly, we compute the cyclically-adjusted budget balance (CAB) as the difference between the fiscal balance (FB) and a cyclical component. The latter is proportional to the output gap (OG) according to the semi-elasticity of the budget balance  $\mu$ . Equation 7 and Equation 8 illustrate this.

$$OG_t = \frac{Y_t}{Y^{Pot}} - 1 \quad (7)$$

$$CAB_t = FB_t + \mu OG_t \quad (8)$$

### 3.2 Data

The GDP and unemployment data come from the same source as outlined in Section 2. They are used to compute the respective potential output and output gaps according to Equations 6 and 7. For the sake of comparison, we will also use the CBO’s estimates of potential output and output gap to recompute the CBO’s fiscal indicators.

The fiscal balance indicators are expressed in percentage points of potential output. To construct these indicators, we divide the nominal government deficit

reported by the CBO by a price deflator to convert it to real terms. The price deflator is calculated by dividing nominal GDP by real GDP (both from CBO data) in each quarter. Finally, we divide real government deficit by the respective real potential output estimate.

Finally, the semi-elasticity of the budget balance is taken from the OECD, which estimates it to be 0.5 for the US (Price et al., 2015). All data sources are summarised in Table 8.

### 3.3 Results

For the three indicators of labor slack, the respective Okun coefficients calculated in Section 2 are reported in Table 7.

	$U_{official}$	$U_{inclpt}$	$U_{vacay}$
Okun coefficient	-0.393 (0.048)	-0.534 (0.071)	0.065 (0.008)
Newey-West standard errors in brackets			

Table 7: Okun coefficient of different labor slack indicators

These coefficients are used to compute potential output according to Equation 6. For the exogenous target level of labor slack  $U^*$ , we have chosen 4% as a benchmark policy target for the official unemployment rate. This is the level originally used by Okun and also by Fontanari et al. (2020) for the United States. Given the wider definition of  $U_{inclpt}$ , we use a higher target of 6% as a baseline. Robustness checks with policy target rates above and below these values are conducted. The target value for  $U_{vacay}$  is more straightforward. In this case, the labor market is in equilibrium when the number of vacancies equals the number of unemployed workers, so that  $U^*$  equals one.

Potential output estimates are then transformed to the output gap. Figure 3 plots the CBO output gap estimates in green and the estimates using  $U_{official}$  based on Okun’s Law in red. Two key observations emerge from this graph. Firstly, the CBO estimate oscillates around zero, while the  $U_{official}$  output gap is almost exclusively negative over the entire sample period. This highlights the different conceptualizations of the output gap in both estimates. In the Okun-based methodology, potential output is a measure of how much the economy could produce if its resources were fully and efficiently utilized. In contrast, the parametric calibration of the CBO’s production function approach forces potential output to oscillate around zero and should thus rather be interpreted as a trend output. Secondly, the Okun methodology yields a persistently larger output gap than the CBO, suggesting that the US economy has been running colder than according to official estimations. This has direct consequences for

economic policy choices. For example, a positive or only slightly negative output gap reported by the CBO suggests that a fiscal expansion to boost demand would be pro-cyclical and destabilizing. But had the CBO estimate been inaccurate and the output gap is actually more negative (as suggested by the Okun methodology), a fiscal expansion would be an appropriate counter-cyclical measure to stabilize the economy.

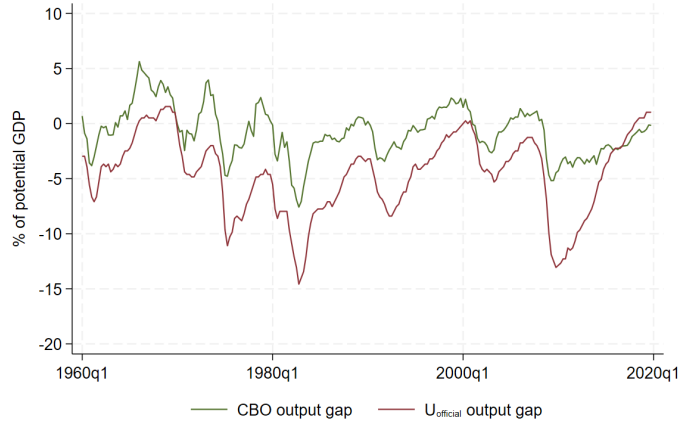


Figure 3: Output gap CBO and  $U_{official}$

Figure 4 shows the difference in the output gap estimates between CBO data and the Okun method for all three indicators of labor slack. It can be seen that including involuntary part-time employment (beige) leads to a larger output gap deviations than using the official unemployment rate (red) over the entire period. The output gap deviation computed with the labor market tightness indicator  $U_{vacay}$  (blue) lies somewhere in between. In the 1980s the difference to the CBO estimate is smaller than for the other two indicators, while it is larger than both in the 2000s. The estimates for 1968 and 1969 even yield a smaller output gap than the CBO reports during these years. The estimates for different unemployment targets can be found in Figures 24 and 25 in the Appendix.

To re-assess the fiscal stance of the United States, the cyclically-adjusted balance is computed by adjusting the fiscal balance by a cyclical component, which is based on the output gap estimates (see Equation 8). Figure 5 shows the cyclically-adjusted balance based on the CBO potential output and output gap in green and the one based on  $U_{official}$  in red. Following CBO data leads to the conclusion that the US had a constant structural deficit from 1965 until 2020 (except for a few quarters in 2000) of on average -2.88% of potential GDP. The  $U_{official}$  estimates yield a stronger fiscal stance from 1965 until 2016 compared to the CBO. While there is also a structural deficit for the majority of periods,

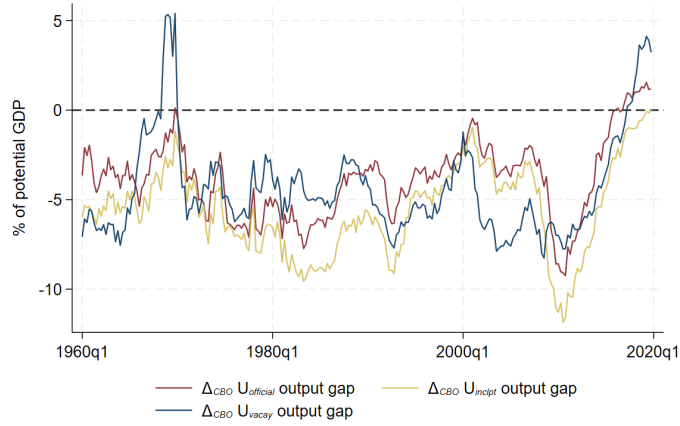


Figure 4:  $\Delta$  output gap CBO vs.  $U_{official}$ ,  $U_{inclpt}$ , and  $U_{vacay}$

it is substantially smaller with a mean of -0.78% of potential GDP. Moreover, for several quarters around 1980 and 2000, the US fiscal stance is found to have been in surplus.

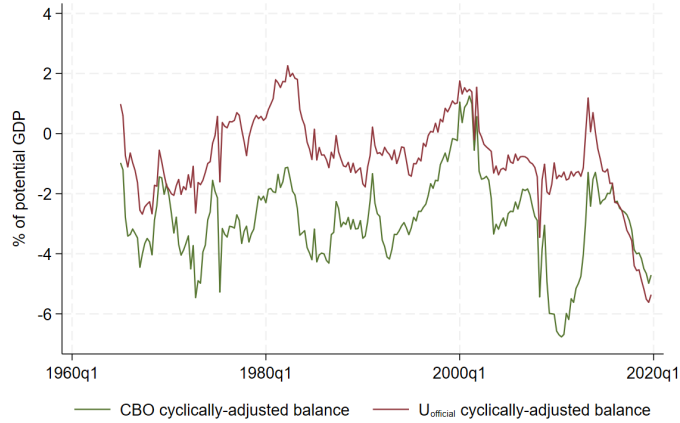


Figure 5: Cyclically-adjusted balance CBO and  $U_{official}$

The difference between the CBO cyclically-adjusted balance and the estimates based on the three labor slack indicators is depicted in Figure 6. Using  $U_{inclpt}$  to measure labor underutilization (beige) shows an improved fiscal stance compared to using  $U_{official}$  (red) and the CBO. The results using  $U_{vacay}$  (blue) show a more positive cyclically-adjusted balance than the other two labor slack

indicators in the 2000s but a more negative cyclically-adjusted balance in the 1980s. The estimates of all three indicators trail quite homogeneously above CBO estimates with a spike in the 2010s. In this period, the CBO reports a substantially smaller output gap and thus attributes fewer expenses to cyclical factors resulting in a larger cyclically-adjusted deficit. The cyclically-adjusted balance estimates for  $U_{inclpt}$  and  $U_{vacay}$  are reported in Figures 26 and 27 in the Appendix.

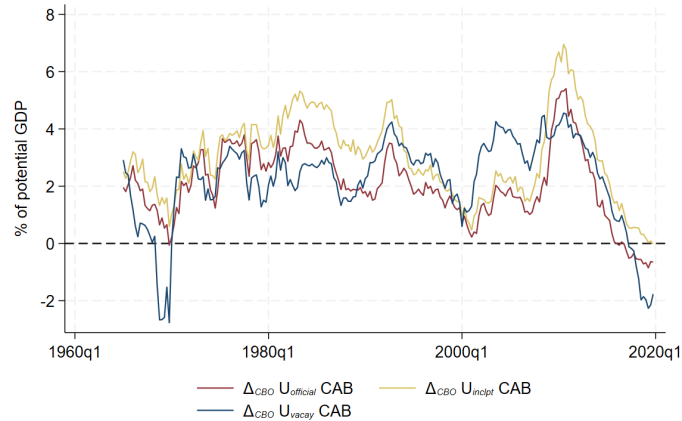


Figure 6:  $\Delta$  cyclically-adjusted balance CBO vs.  $U_{official}$ ,  $U_{inclpt}$ , and  $U_{vacay}$

Overall, the results for all three labor slack indicators are in a similar range in both absolute values and relative to the CBO. The output gap estimates are significantly larger (in absolute value) than those by the CBO and the resulting fiscal stance is more on the consolidation side. The Okun methodology thus delivers quite robust estimates across indicators and tells a different story of US public finances since 1960.

## 4 Fiscal multipliers

After the Great Recession, a debate arose among economists about the effects of fiscal stimulus and quite soon, a consensus emerged that the fiscal multiplier was state-dependent: it could be higher when monetary policy remained stuck at the zero lower bound (see Ramey, 2011) or when the economy was under a recession (see Auerbach and Gorodnichenko, 2012).

Drawing on a long historical sample, from 1889 to 2015, Ramey and Zubairy (2018) have cast doubt on some part of the state-dependence of the estimated fiscal multiplier in the US. While the fiscal multiplier is high under zero lower bound episodes (and close to 1.5), Ramey and Zubairy (2018) do not find it to be higher under a recession than under a low-unemployment state.

### 4.1 Fiscal shock identification

Ramey and Zubairy (2018) use two methods to identify fiscal shocks: one that uses military spending news from Ramey (2011) and one that uses the SVAR method of Blanchard and Perotti (2002), before using both combined. Their results are robust across the various specifications.

Identification of fiscal shocks in the literature has long proceeded from either narratives or econometric outcomes<sup>4</sup>. In the following, we hinge on an alternative identification of fiscal shocks. We use the updated fiscal stance (or cyclically-adjusted balance) presented in the former section to revisit the fiscal multiplier effect. We assume that the difference in the fiscal stance interprets as a fiscal shock. It is exogenous to GDP, therefore netted out from the past changes in the output, and it is unanticipated<sup>5</sup>. Our main measure of the fiscal shock is presented in Figure 7. This measure is based on the estimate of the Okun coefficient with the measure of unemployment, which does not include involuntary part-time employment. In contrast to “military news” in Ramey and Zubairy (2018) and by construction, fiscal shocks are very frequent. The variety and frequency of shocks resemble more that of Romer and Romer’s (2010) exogenous tax changes. While we draw on the overall fiscal stance, we add spending shocks to Romer and Romer’s (2010) tax shocks.

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<sup>4</sup>Romer and Romer (2010) have also extracted fiscal shocks from narrative records of presidential speeches and Congressional reports to identify tax changes in the US. They find quite high impacts of tax changes on the output but they do not check for contingency to economic activity and they also focus on tax policy and not on spending. Caldara and Kamps (2017) have reconciled evidence about the impact of public spending or tax changes on the output using SVARs to identify fiscal shocks. They concluded that public spending increases have a larger impact on the output than tax cuts

<sup>5</sup>We have checked that the difference in the fiscal stance was a pure exogenous shock by regressing it on the output gap and finding that the coefficient on the output gap was not statistically different from zero. Results are available upon request from the authors.

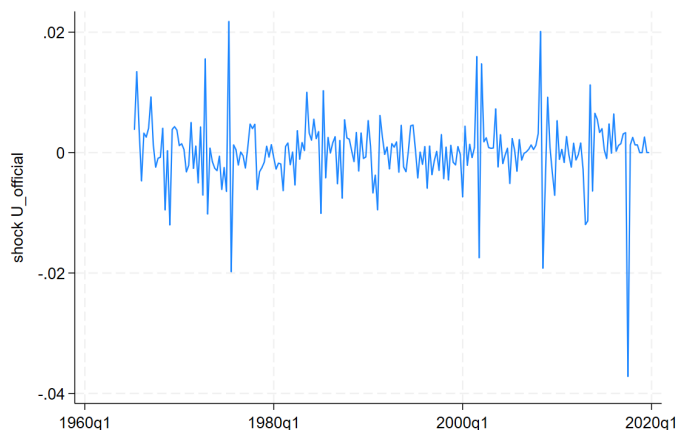


Figure 7: Fiscal shock using  $U_{official}$

## 4.2 Is fiscal policy stabilizing?

We alternatively compute fiscal shocks as the difference in the cyclically-adjusted budget balance between two quarters from different measures of potential GDP. First, we use the CBO’s own estimate. Second, we use three different measures of potential output stemming from Okun’s Law estimates with the unemployment rate, the unemployment rate including involuntary part-time employment and the vacancy-unemployment ratio.

Drawing on these four different fiscal shocks, we replicate the Ramey and Zubairy’s (2018) local projections to compute dynamic fiscal multiplier effects. Results are reported in top-right panels of Figures 8, 9, 10, and 11. For the sake of comparison, it is worth recalling that based on historical data and military news, Ramey and Zubairy (2018) find significantly inverted U-shaped fiscal multiplier effects with a peak at 0.3 after 12 quarters. In contrast, fiscal shocks computed from CBO’s data or via Okun’s Law based on the unemployment rate show an immediate significant impact at 0.3 and 0.2, respectively. Then, fiscal multiplier effects are not statistically significant. Switching to a measure of underutilization of labor including involuntary part-time workers reveals substantial differences. The fiscal multiplier starts at 0.5 and the effect gains importance over time and peaks at a much larger value of 1.6 after 11 quarters. After 16 quarters, the effect vanishes and is no longer statistically significant. Finally, the fiscal shock computed from the vacancy-unemployment ratio is closer to the inverted U-shape in Ramey and Zubairy (2018), but with a higher peak of the fiscal multiplier at 0.8 after a year. Beyond one year, the fiscal multiplier effect is no longer significant.

### 4.3 Are fiscal multipliers state-dependent?

The former part has shown that fiscal policy has been stabilizing in the US if one uses either the unemployment rate including involuntary part-time workers or the vacancy-unemployment ratio as indicators of labor underutilization to compute the Okun coefficient and the ensuing fiscal stance. Even with the CBO's data or the usual unemployment rate as an indicator of labor underutilization, the fiscal multiplier proved positive, though only transitorily.

While the former result was achieved over the entire sample, it remains to be seen whether it holds whatever the state of the economy. Auerbach and Gorodnichenko (2012) showed that US fiscal policy had higher real effects during recessions than during expansions. Ramey and Zubairy (2018) showed that instantaneous fiscal multipliers were higher during high-unemployment periods than under low-unemployment ones, but cumulative fiscal multipliers showed the opposite feature: under high-employment state, they were low or close to those under low-unemployment state. The difference between instantaneous and cumulative fiscal multipliers is that public spending after a "military news" shock increases only after a certain delay. Given this lagged effect of public spending and output responses, Mountford & Uhlig (2009) have introduced the use of a cumulative multiplier instead of using the output response at a given horizon or its peak. This cumulative multiplier refers to the integral of the output response divided by the integral of the government spending response (Ramey, 2019). In contrast to Ramey and Zubairy (2018), we do not use public spending but a change in the cyclically-adjusted balance as identification of fiscal shocks. We interpret this shock as discretionary and instantaneous, which is confirmed by no statistically significant increase in the cyclically-adjusted balance after the fiscal shock (see top-left panels of Figures 8, 9, 10, and 11). Therefore, we can concentrate on instantaneous fiscal multipliers.

We remain as close as possible to Ramey and Zubairy (2018) and choose the same unemployment rate threshold to separate two states of the economy: one with slack (bad years) and one without (good years). The threshold is set at an unemployment rate of 6.5%. In our sample, there were 79 occurrences of slack in the US economy.

We compute the fiscal multipliers under the two states of the economy. Results are reported in bottom-right panels of Figures 8, 9, 10, and 11.

In line with the results of fiscal multiplier effects commented above, estimates based on either the CBO's data or Okun's Law with the unemployment rate draw similar conclusions: fiscal multiplier effects are not state-dependent. Enlarging the scope of labor underutilization to involuntary part-time workers gives different results, though. Until one year after the shock, the fiscal multiplier is higher under high-unemployment state than under low-unemployment state. In the latter state, fiscal policy has on the most part no real significant

effect on the economy. Finally, the use of the vacancy-unemployment ratio as a measure of labor underutilization gives a different picture: fiscal policy has no strong or significant real effect in a slack economy, whereas the fiscal multiplier effect is rather strong and significant, yet only in the first two quarters after the shock when the economy is in a low-unemployment state.

In subsection Robustness checks of the Appendix, we report state-contingent fiscal multipliers with a higher threshold (unemployment rate above 8% of the labor force). We also separate bad and good years based upon a threshold quarterly increase in the unemployment rate (above 0.45 or 0.25%).

The state-contingent property of fiscal policy is quite sensitive to these new thresholds. In the three first cases (CBO's data, or Okun's Law based on the unemployment rate, excluding then including involuntary part-time workers), fiscal policy is shown to have stronger and more significant real effects on the economy under high-unemployment states than under low-employment ones. Using the vacancy-unemployment ratio shows a stronger and more significant real effects on the economy under high-unemployment state when slack is defined at an 8% unemployment threshold. However, the puzzling and inverted real effect with the vacancy-unemployment ratios remains for the thresholds based on unemployment rate increases even though the statistical significance is limited.

## 5 Conclusion

to be added

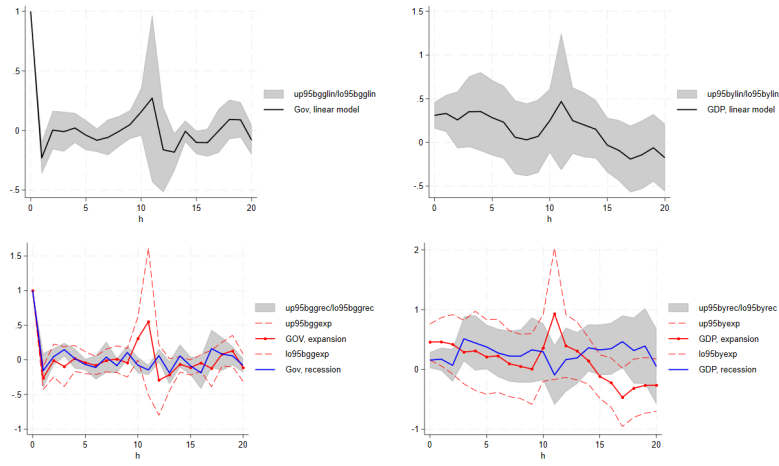


Figure 8: Impulse response functions CBO

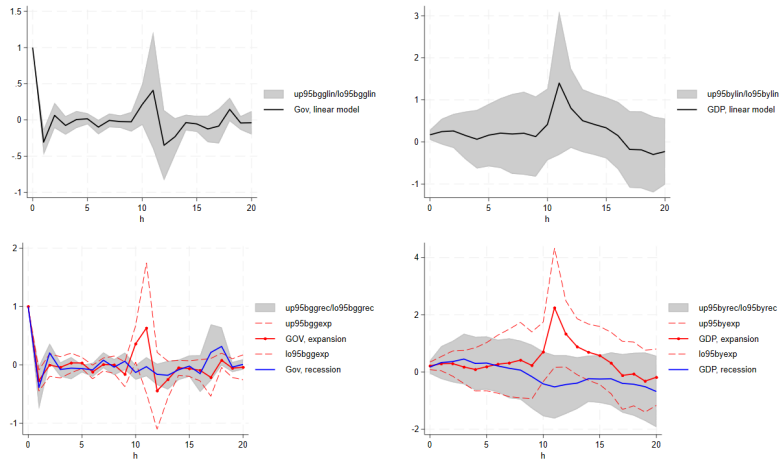


Figure 9: Impulse response functions  $U_{official}$

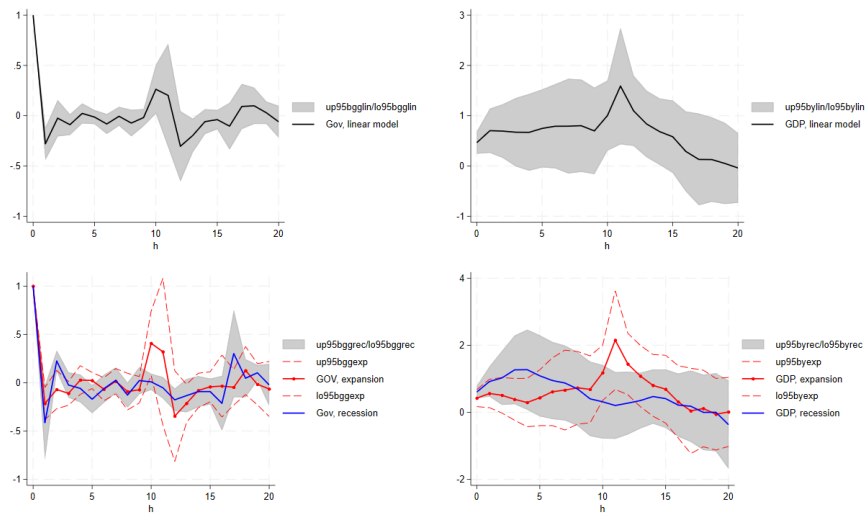


Figure 10: Impulse response functions  $U_{inclpt}$

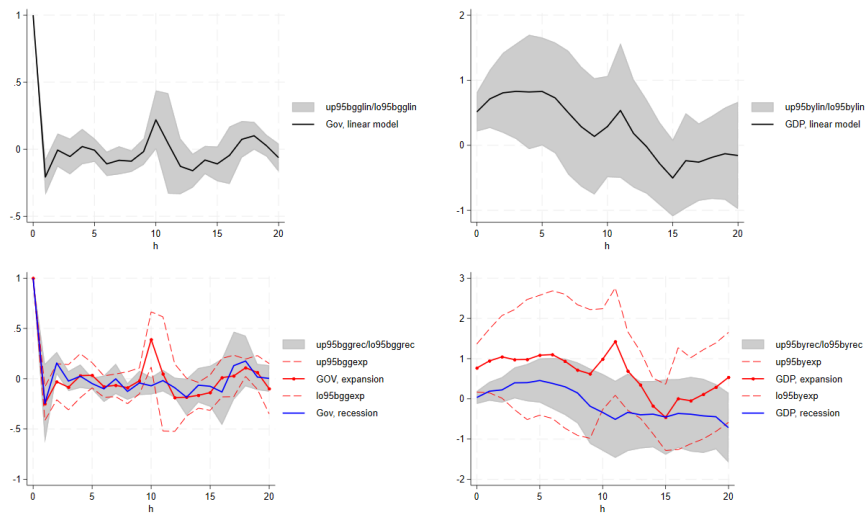


Figure 11: Impulse response functions  $U_{vacay}$

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## 7 Appendix

### 7.1 Robustness checks

#### 7.1.1 Slack = unemployment rate $\geq 8\%$ (n=28)

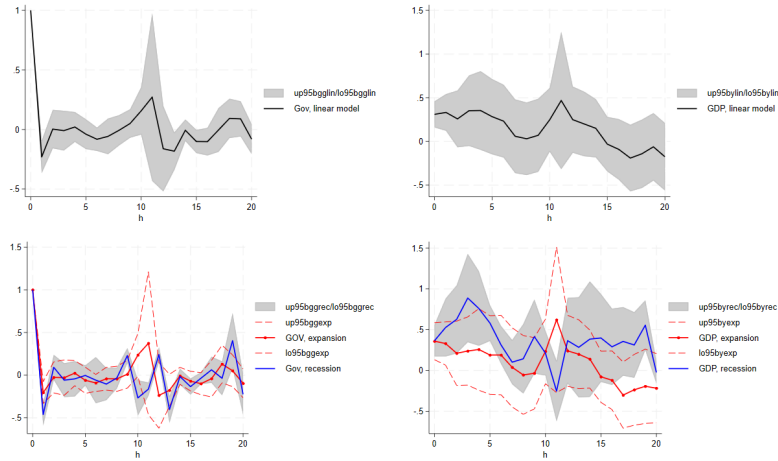


Figure 12: Impulse response functions CBO

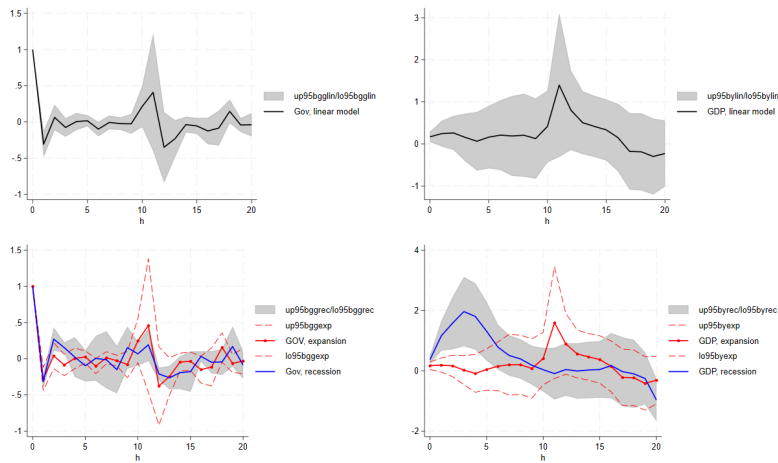


Figure 13: Impulse response functions  $U_{official}$

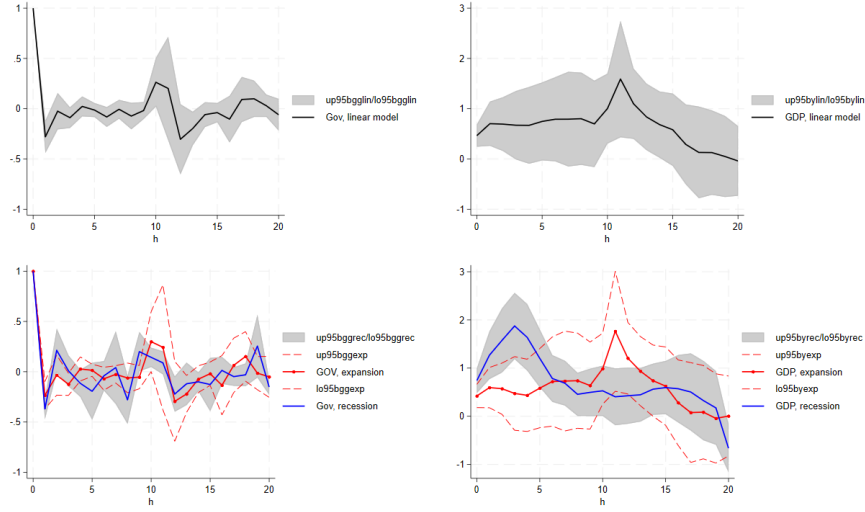


Figure 14: Impulse response functions  $U_{inclpt}$

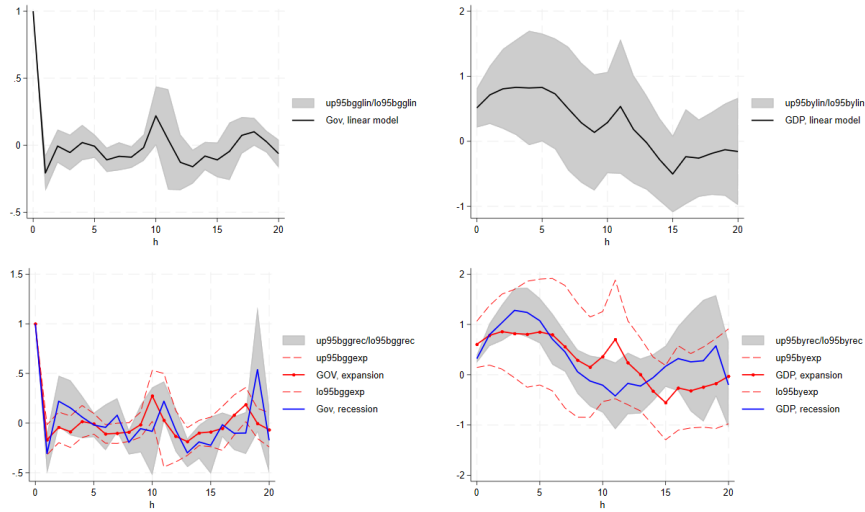


Figure 15: Impulse response functions  $U_{vacay}$

7.1.2 Recession =  $\Delta$  unemployment rate  $> 0.45$  (n=21)

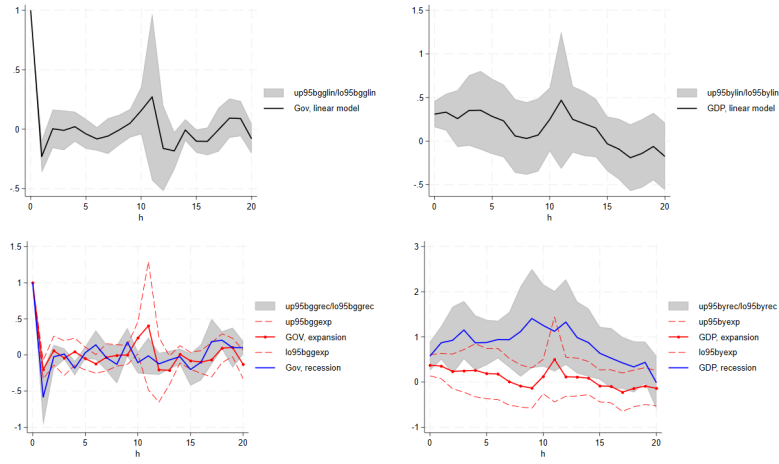


Figure 16: Impulse response functions CBO

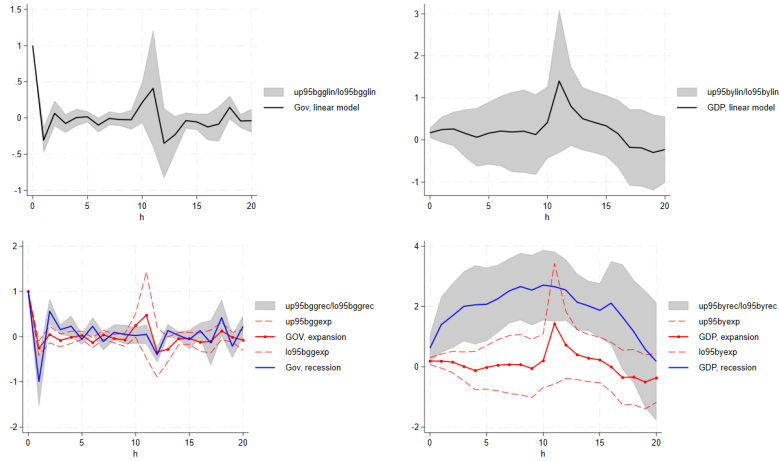


Figure 17: Impulse response functions  $U_{official}$

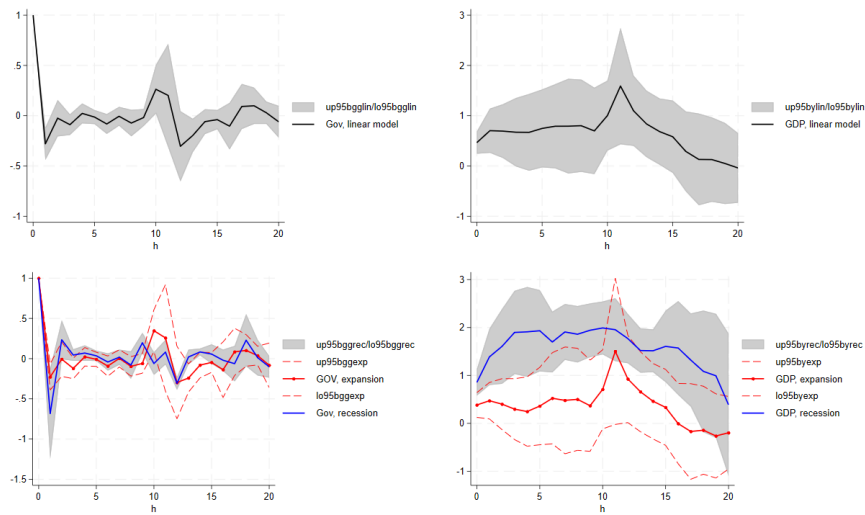


Figure 18: Impulse response functions  $U_{inclpt}$

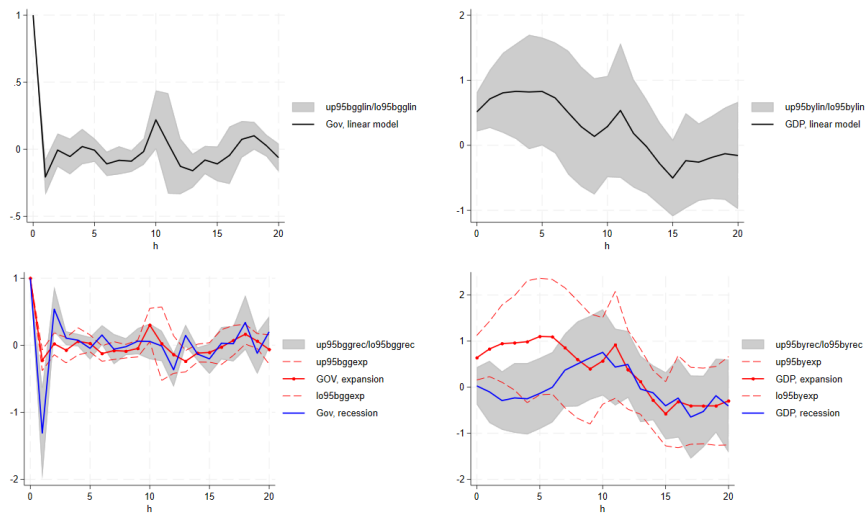


Figure 19: Impulse response functions  $U_{vacay}$

7.1.3 Recession =  $\Delta$  unemployment rate  $> 0.25$  (n=37)

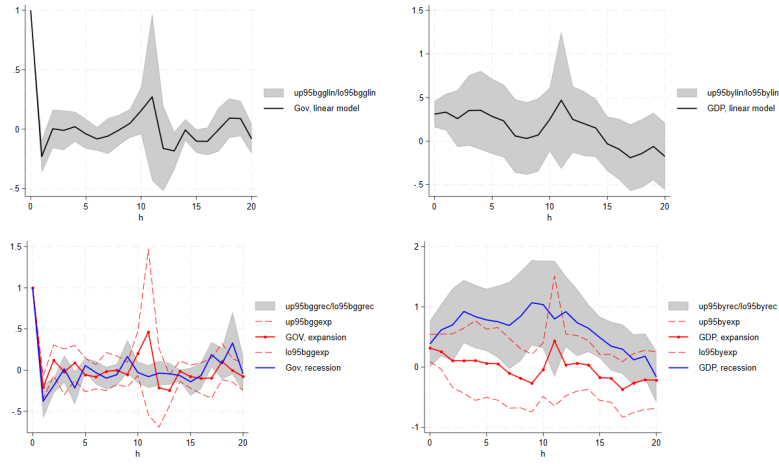


Figure 20: Impulse response functions CBO

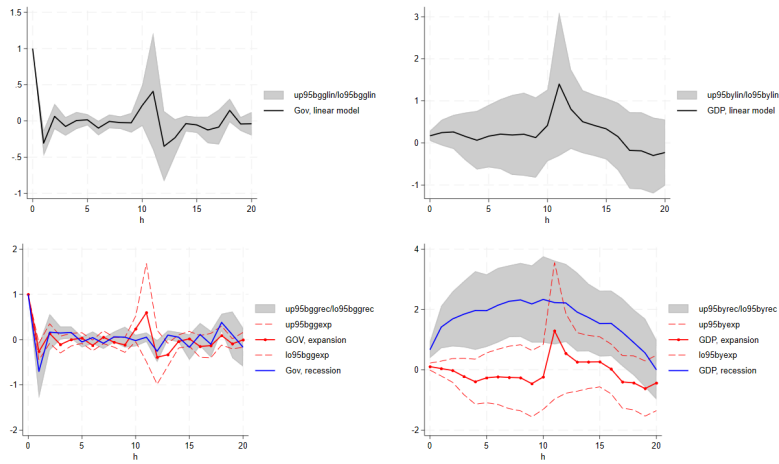


Figure 21: Impulse response functions  $U_{official}$

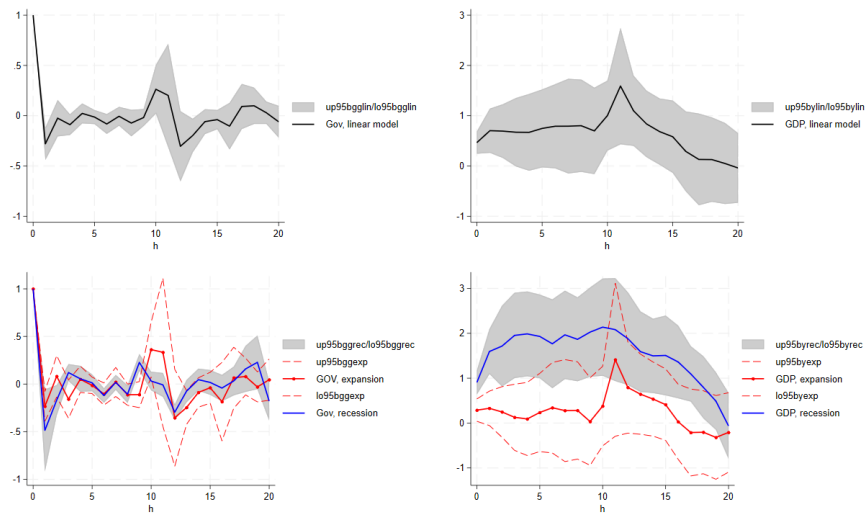


Figure 22: Impulse response functions  $U_{inclpt}$

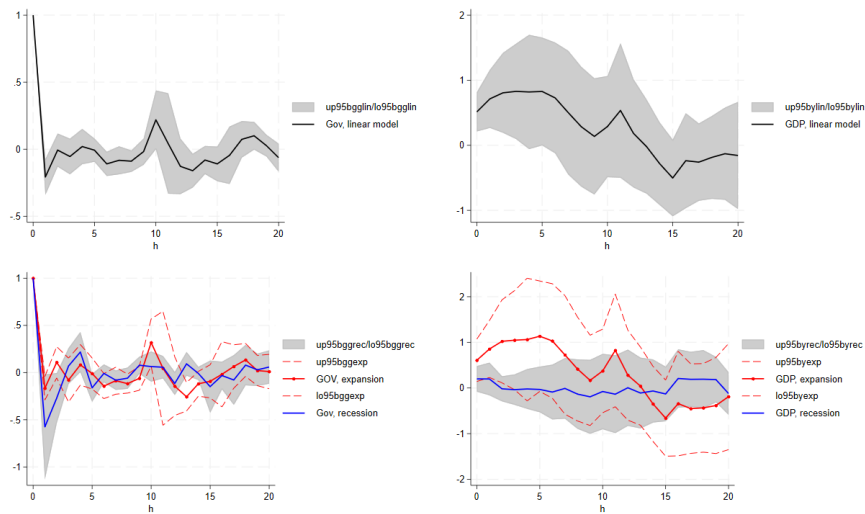


Figure 23: Impulse response functions  $U_{vacay}$

## 7.2 Data sources

VARIABLE	Frequency	Source	Unit
unemployment rate	quarterly	BLS	% of civilian labor force
unemployed workers	monthly	BLS	number of workers
involuntary part-time workers	monthly	BLS	number of workers
civilian labor force	monthly	BLS	number of workers
job vacancies	monthly	Barnichon (2010)	number of jobs
real GDP	quarterly	CBO	chained 2012 US dollars
nominal GDP	quarterly	CBO	US dollars
nominal government deficit	quarterly	CBO	US dollars
CBO real potential GDP	quarterly	CBO	chained 2012 US dollars
CBO output gap	quarterly	CBO	% of potential GDP
NBER recession	quarterly	FRED	dummy variable

Table 8: Data sources

## 7.3 Alternative unemployment rate targets

VARIABLE	Baseline	Low target	High target
$U_{official}$	4%	2.5%	5.5%
$U_{inclpt}$	6%	4.5%	7.5%
$U_{vacay}$	1	na	na

Table 9: Different unemployment targets

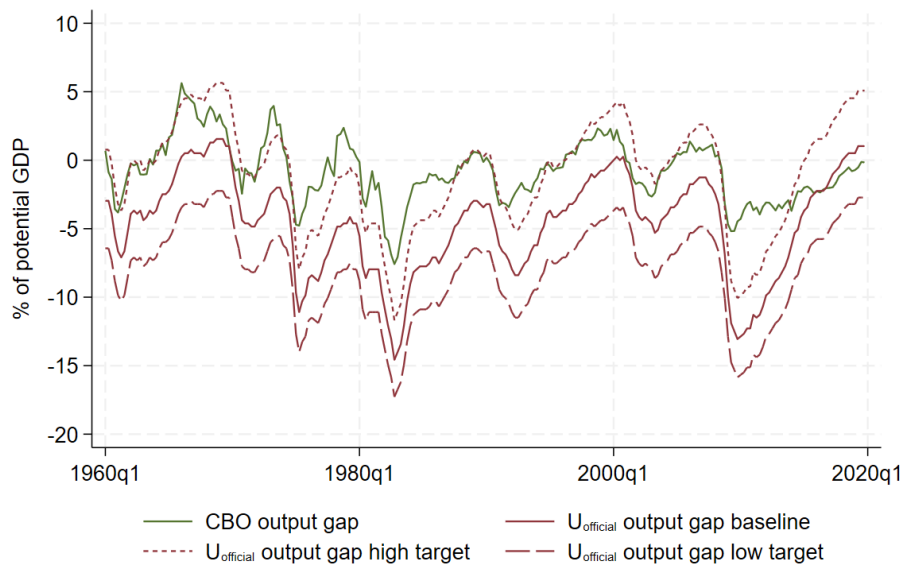


Figure 24: Output gap CBO and  $U_{official}$  with different unemployment targets

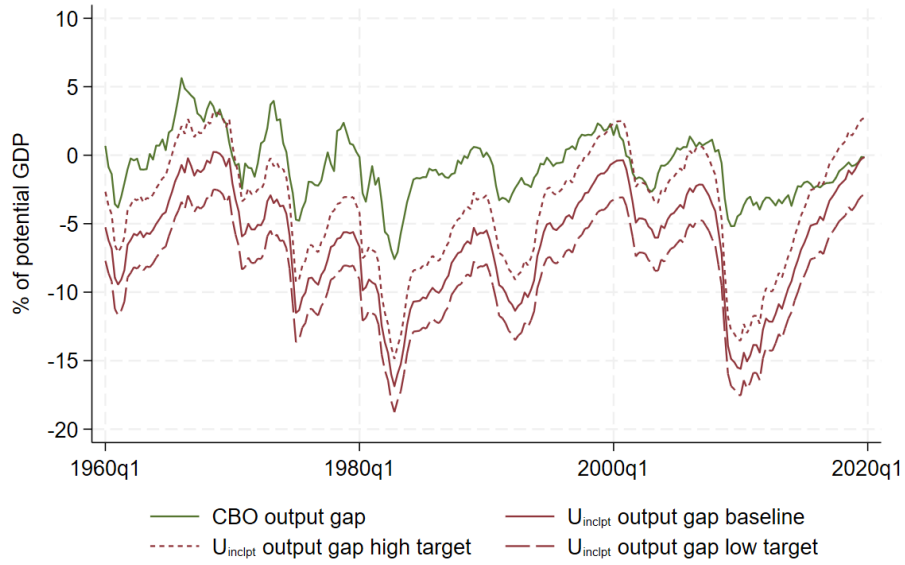


Figure 25: Output gap CBO and  $U_{inclpt}$  with different unemployment targets

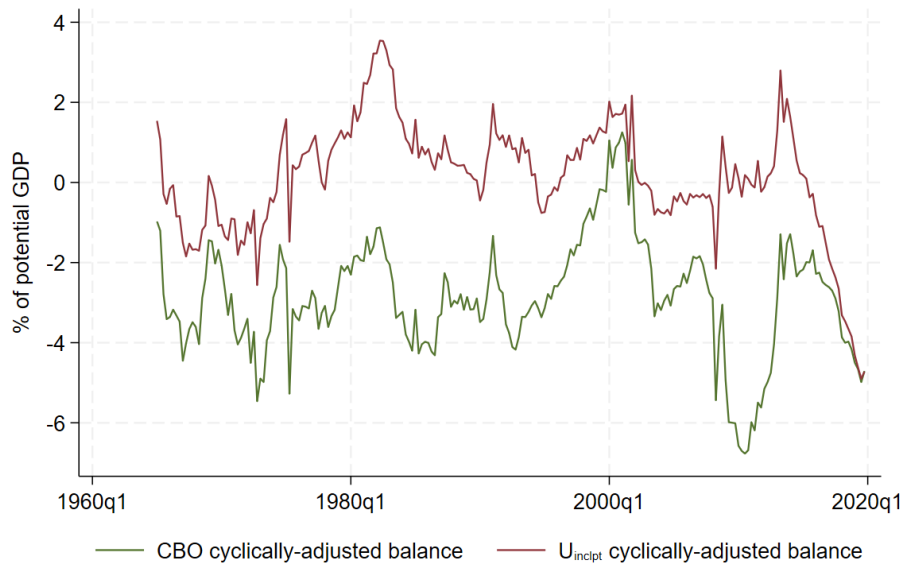


Figure 26: Cyclically-adjusted balance CBO and  $U_{inclpt}$

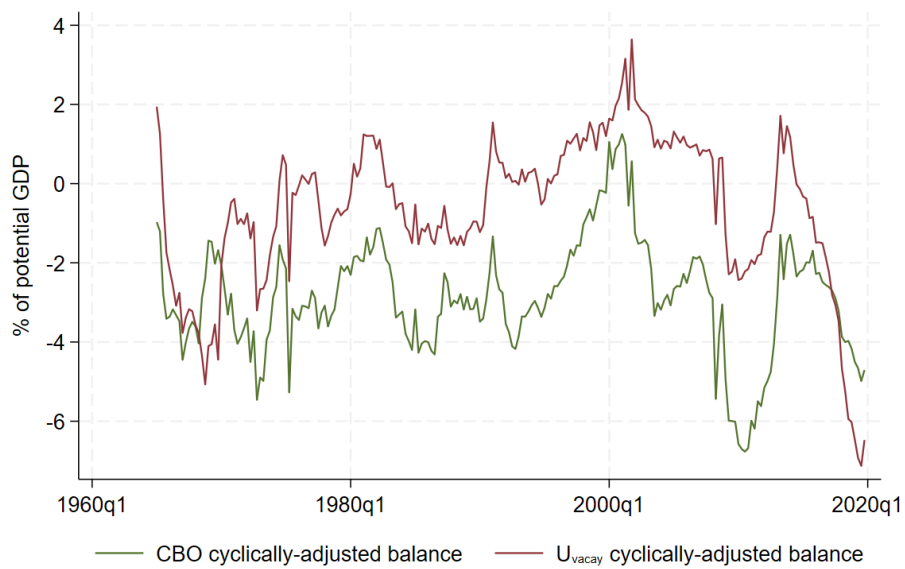


Figure 27: Cyclically-adjusted balance CBO and  $U_{vacay}$