OKUN'S LAW, V/U AND THE FISCAL MULTIPLIER

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RESUME

Cet article étudie les propriétés de stabilisation de la politique budgétaire en revisitant la notion de production potentielle à travers l'utilisation de la loi d'Okun, en incluant le ratio postes vacants/chômeurs (V/U) comme indicateur de la sous-utilisation des capacités productives. Nous proposons de nouvelles mesures de l'orientation budgétaire des États-Unis basées sur des données observables et des objectifs transparents. Nos résultats suggèrent que les États-Unis ont en réalité adopté une orientation budgétaire plus conservatrice que ne l'indiquent les données officielles. Cet article analyse également les multiplicateurs budgétaires, qui sont plus élevés lorsque le ratio V/U est utilisé comme mesure de la sous-utilisation économique, plutôt que le taux de chômage. Nous constatons que la dépendance des multiplicateurs budgétaires à l'état de l'économie est aussi sensible aux seuils définissant les "mauvaises années" qu'à la mesure de la sous-utilisation employée dans la loi d'Okun.

MOTS CLES

PIB potentiel, Okun, ratio de postes vacants sur chômeurs, multiplicateur budgétaire, dépendance au régime

JEL

E23, E62, J63

ABSTRACT

This paper investigates the stabilization property of fiscal policy by revisiting the notion of potential output via the use of Okun's Law including the vacancy-to-unemployment ratio (V/U) to proxy economic slack. We propose new measures of the US fiscal stance based on observable data and transparent targets. Our results suggest that the US actually had a more conservative fiscal stance than official data indicate. This paper also examines fiscal multipliers, which are larger when V/U, rather than the unemployment rate, is used as measure of economic slack. We find that state-dependence of fiscal multipliers is as sensitive to thresholds for bad years than to the slack measure employed in Okun's Law.

KEYWORDS

Potential GDP, Okun, vacancy to unemployment ratio, fiscal multiplier, state-dependence

JEL

E23, E62, J63

Okun's Law, V/U and the fiscal multiplier

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Abstract

This paper investigates the stabilization property of fiscal policy by revisiting the notion of potential output via the use of Okun's Law including the vacancy-to-unemployment ratio (V/U) to proxy economic slack. We propose new measures of the US fiscal stance based on observable data and transparent targets. Our results suggest that the US actually had a more conservative fiscal stance than official data indicate. This paper also examines fiscal multipliers, which are larger when V/U, rather than the unemployment rate, is used as measure of economic slack. We find that state-dependence of fiscal multipliers is as sensitive to thresholds for bad years than to the slack measure employed in Okun's Law.

1 Introduction

One of the government's primary responsibilities is to stabilize the economy. This role has long been a central objective in economic thought, famously articulated by Richard Musgrave as one of the three key functions of public finance in his Theory of Public Finance in 1959 next to allocation and distribution. For decades, the stabilization property of public finance has relied on the distance of actual output produced 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. In the context of full utilization of productive capacity, recent research has increasingly turned to the vacancies-to-unemployment ratio (V/U) as a more comprehensive indicator of labor market slack than the unemployment rate. V/U integrates information from both labor market supply and demand, capturing job listings relative to the unemployment in the labor force. Studies such as Bernanke and Blanchard (2023), have highlighted the qualities of V/U as a more reliable indicator of labor market pressure, especially in

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times of economic instability.

However, the fact that the stabilizing property of economic policy today often relies on the unobservable potential output remains an issue. It is traditionally estimated with a Cobb-Douglas production function that builds on statistical filtering techniques and unobservable concepts such as the non-accelerating inflation rate of unemployment (NAIRU). Production function approaches are widely criticized for their complexity and their proneness to produce cyclically-sensitive estimates (see e.g. Coibion et al., 2018). Inaccurate potential output estimates may lead to fiscal reactions badly suited for the economic situation. For example, if the potential output estimate is pro-cyclical (i.e. correlated with actual output) after a shock, the fiscal reaction to boost demand will be mild and eventually stabilize the economy at a low-output equilibrium.

An emerging strand of literature has attempted to address this complication in stabilization policy by leveraging the empirical relationship between output and unemployment, as described by Okun's Law, to estimate potential economic production (see e.g. Fontanari et al., 2020). The method estimates potential output based on observable variables and an unemployment target, which can significantly enhance the transparency and intelligibility of the resulting economic policy stance. Carnazza et al. (2023) went a step further and translated potential output derived from Okun's Law into a new measure of the cyclically-adjusted public deficit, primarily using data for Italy.

In this paper, we revisit the potential output estimation based on Okun's Law using quarterly data in the United States, where Ball et al. (2017) have recently highlighted the Law's stability over time. We then extend the existing literature by introducing the vacancies-to-unemployment ratio as a measure of labor slack to better capture the utilization of economic potential. While the use of V/U has been on the rise, for example in research on the Phillips curve (Benigno and Eggertsson, 2023) or the Beveridge curve (Barnichon and Shapiro, 2024), it has not, to the best of our knowledge, been used to measure the structural part of the US public deficit. Lastly, we use the new measure of the cyclically-adjusted public deficit to identify fiscal shocks and compute fiscal multipliers in order to test whether fiscal stimuli have stabilized the US economy and if they did so more effectively during periods of economic slack.

Our findings can be summarized in four main contributions: Firstly, adding V/U as an indicator of labor slack proves to be quite powerful at identifying a significant and stable Okun coefficient over the entire sample. In our updates of the estimates provided by Ball et al. (2017) and Fontanari et al. (2020), the characteristics of Okun's Law remain consistent when we use V/U instead of the unemployment rate. We infer from this finding that estimating Okun's Law with V/U yields reliable results. Secondly, the resulting output gaps computed with the unemployment rate and V/U as labor slack indicators fall within a similar range, both in absolute values and relative to the esti-

mates of the Congressional Budget Office (CBO). The output gap estimates are significantly larger (in absolute value) than those provided by the CBO. However, the output gap computed with V/U correlates better than any other (including the CBO's) with inflation. Thirdly, we extract measures of the US cyclically-adjusted balance[1], which tells a different story of US public finances since 1960. These new estimates with Okun's Law and V/U are more on the consolidation side, suggesting that the US actually had a more conservative fiscal stance than CBO data indicates. Finally, the contribution of our investigation of the fiscal multiplier effect is twofold. Drawing on our new dataset, we show that US fiscal policy has been stabilizing. In the V/U case, fiscal multipliers are found to be growing over the first year as in Ramey and Zubairy (2018). Yet, the fiscal multiplier effect we find is stronger with a peak at around one, but less persistent, having vanished after two years. When we check for the state dependence of the fiscal multiplier, our results are mostly in line with those by Ramey and Zubairy (2018), who cannot detect a higher fiscal multiplier in bad years than in good years. However, results are quite sensitive to the benchmark chosen to identify periods of economic slack.

The rest of the paper is organized as follows. Section 2 reviews Okun's Law and estimates of the Okun coefficient in the United States. Section 3 introduces V/U as an alternative indicator for the underutilization (or slack) of labor potential when calculating the Okun coefficient. From these estimates, we derive the output gap and the fiscal stance in Section 4 before Section 5 discusses fiscal multipliers and compares the effects of fiscal shocks from the different specifications and under alternative thresholds for economic slack. Section 6 concludes.

2 Review of Okun's Law

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[2]. There are mainly two theoretical approaches to specify Okun's Law.

The first approach is the "levels" or "gap" specification. The Okun coefficient (β) can be estimated as described in Equation 1.

[1] Carnazza et al. (2023) apply the method predominantly to Italian data while estimates for five other EU countries are left to their appendix.

[2] Here, we always refer to Okun's Law as the relationship from output to unemployment. See Porras-Arena and Martin-Roman (2023) for a metaregression analysis including also the relationship from unemployment to output.

$$U_t - U^* = \beta \times \frac{Y_t - Y_t^{Pot}}{Y_t} + \theta_t \tag{1}$$

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

The second approach is the "changes" or "first-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 (β) in this specification.

$$\Delta U_t = \alpha + \beta \Delta Y_t + \epsilon_t \tag{2}$$

Notes: ΔU_t is the change in the unemployment rate at time t, ΔY_t is the change in actual output, α is a constant, and ϵ_t is the error term.

Today, both specifications of Okun's Law are applied in academic works, although the "changes" specification is used in two thirds of cases (Porras-Arena and Martin-Roman, 2023). Examples include Lee (2000) and Moosa (1997; 2008) for the "levels" version, and Knotek (2007) for the "changes" version. 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 are assumed to be 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[3]. Moreover, there is an ongoing discussion regarding the stability of Okun's Law throughout different time periods.

2.1 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 sample period[4].

[3]Porras-Arena and Martin-Roman (2023) show that the most influential factor of heterogeneity across Okun's Law's estimates is labor market characteristics (e.g. labor laws). In contrast, the underlying theoretical model (gap or first-difference) explains only a little of the heterogeneity.

[4]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

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

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

Notes: U stands for the unemployment rate, Y is GDP at constant prices, Δ stands for the change operator and ϵ is a residual.

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

Quarterly, seasonally adjusted unemployment rate data expressed in percentage of the active population from 1960 to 2019 were 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[5]. The Breusch-Godfrey test, which is well-suited to detect auto-correlation in the model, finds first- to fourth-order auto-correlation (Godfrey, 1978). Consequently, Newey-West standard errors with four lags are used to correct the estimation accordingly (Newey and West, 1987).

Table 1 reports the 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).

Ball et al. (2017) suggest 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 the "Great Moderation". During this phase, labor market frictions have declined and it is theorized that more straightforward hiring and firing processes could have led 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. We do not split

full employment. This approach aligns more closely with Okun's original query about production capacity at full employment.

[5]Results are reported in Table 8 in the Appendix.

the sample at the break point though because the post-break subsample would only contain a few data points. Instead, the Okun 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 (-0.42 vs. -0.40), which supports the hypothesis of its stability. No structural break will be included in the final baseline model.

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. These properties make Okun's Law a promising concept to further explore the stabilization properties of fiscal policy.

3 V/U as an alternative indicator of labor slack

A noteworthy simplification of Okun's Law as specified in the previous section lies in its reliance on the unemployment rate as a proxy for economic slack or labor tightness. The official unemployment rate may not be the best indicator of economic slack though for it does not account for job seekers already in activity[6]. Actually, firms recruit workers away from other employers, with no immediate consequence on the unemployment rate.

To identify a more accurate labor market indicator for economic slack, we look at how "maximum employment" or "full employment" targets are defined. There are two principal approaches to defining these concepts. The first approach relies on the non-accelerating inflation rate of unemployment (NAIRU) and is based on the estimation of a Phillips curve (Phillips, 1958; Barnichon and Shapiro, 2024; Benigno and Eggertsson, 2023). The second approach focuses on the full-employment rate of unemployment (FERU) and aims to minimize unproductive labor activities, such as job seeking and recruiting (Meade, 1982; Michaillat and Saez, 2022).

Interestingly, both approaches share a common feature: while the latter uses the vacancies-to-unemployment ratio (V/U) as a standard variable to calculate the FERU (e.g., Michaillat and Saez, 2021), a key recent development has been the use of this job vacancy indicator as a superior indicator of labor market slack in Phillips curve estimations. This shift, replacing the unemployment rate with V/U, has led to findings of a steep, non-linear Phillips curve (see e.g. Benigno and Eggertsson, 2023). Barnichon and Shapiro (2024) argue that this is due to shifts in the Beveridge curve, which

[6]Arguments against the use of the unemployment rate as an indicator of economic slack are discussed, e.g. in Abraham (2024), Barnichon and Shapiro (2024), or Michaillat and Saez (2022).

captures labor market efficiency, thereby explaining the superiority of V/U over other slack indicators. This aligns with a broader discussion around the flattening of the Phillips curve, which has garnered significant attention from scholars like Ball and Mazumder (2011) and Blanchard (2016).

In the context of Okun's Law, Fontanari et al. (2022) tested a wider definition of labor underutilization including persons who are not in the labor force, but want to and are available for work. However, to our knowledge, no one has used V/U as an indicator of labor slack in Okun's Law. Motivated by the latest evidence of the effectiveness of V/U as a measure of labor underutilization, we examine its use in the Okun model described in Equation 3 where V/U replaces U.

3.1 The V/U Okun coefficient

The vacancy-to-unemployment ratio (V/U) combines data from both employers (labor demand) and workers (labor supply). Specifically, V/U is the ratio of vacancies at firms and the number of unemployed workers in the economy, which is described by Equation 4.

$$V/U = \frac{job\ vacancies}{unemployed\ workers} \tag{4}$$

Data on job vacancies comes from the Help-Wanted-Index developed by Barnichon (2010)[7]. The data on unemployed workers comes from the Bureau of Labor Statistics (BLS). Figure 1 plots V/U from 1960 to 2021. A ratio larger than one interprets as labor shortage or labor tightness in the economy. On 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.

The Okun coefficient for the labor market tightness indicator V/U is computed according to Equation 3 with the change in V/U as dependent variable. Stationarity of the variable is confirmed with the Augmented Dickey-Fuller and Phillips-Perron tests[8]. Due to the presence of first- to fourth-order auto-correlation found by the Breusch-Godfrey test, Newey-West standard errors with four lags are used. The intuition behind using V/U in the context 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. In line with this intuition, the GDP growth coefficients in the third column of Table 4, which reports the regression results, are positive and highly statistically significant. The Okun coefficient for V/U is 0.065. Its absolute value is smaller than with the unemployment rate ($U_{official}$) but because V/U is a change in a ratio, it cannot directly be compared to the percentage point changes of the unemployment rate. However, if one translates Okun coefficients into a percentage

[7]See Abraham (2024) for a discussion about the Help-Wanted-Index. From 2001, the data is identical with the BLS job openings and labor turnover survey (JOLTS). Job vacancies are reported monthly and are averaged for each quarter to have a quarterly series.

[8]Results are reported in Table 8 in the Appendix.

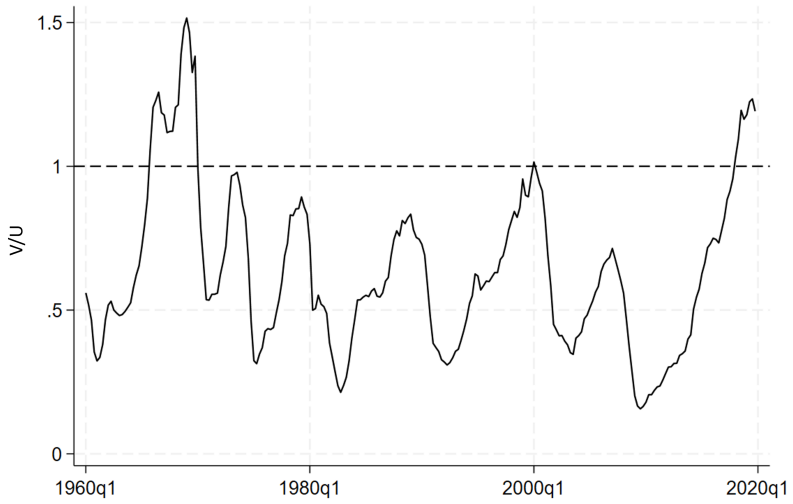


Figure 1: Ratio of job vacancies over unemployed workers from 1960 to 2021

of the standard deviation of the respective dependent variable, the two specifications give very close outcomes. The Okun coefficient in the specification with $U_{official}$ corresponds to a decrease of 0.4 percentage points of the unemployment rate, or to 24% of its standard deviation. The Okun coefficient with V/U corresponds to a rise of 6.5% of V/U, or to 23% of its standard deviation. A given change in GDP has thus a comparable impact on the standard deviation of different indicators of economic slack: the unemployment rate or V/U.

Testing for stability of the V/U Okun coefficient estimate, the Supremum Wald test indicates a potential structural break between 2010 and 2011. Just like for $U_{official}$, there is no substantial difference between the pre-break sample and the entire sample reported in Table 5. No structural break is thus included in this model. Overall, V/U yields statistically significant and stable estimates of the Okun coefficient.

4 Deriving the fiscal stance from Okun's Law

In this section, we use the Okun coefficient to compute the output gap and then a measure of the cyclically-adjusted public balance. The use of Okun's Law for this estimation has a variety of advantages, which are augmented by the use of V/U to measure labor slack.

Firstly, it yields a potential output estimate grounded in transparent objectives. In contrast to the approach used by institutions like the US Congressional Budget Office (CBO), we do neither need to rely on theory to assess a non-accelerating inflation rate of unemployment (NAIRU) nor on

data-filtering tools such as a Hodrick-Prescott filter. Only a limited number of observable variables are required to extract the cyclically-adjusted balance: GDP, unemployment rates (or another indicator of labor underutilization like V/U), and public deficit. This can significantly enhance the clarity and effectiveness of interpreting the stance of economic policy. Additionally, the input variables are available across a wide range of countries, making the method easy to replicate. 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, like a target for the unemployment rate, so that checking for the robustness of fiscal indicators to the use of alternative assumptions is made simple.

In addition, the method requires a labor underutilization policy target (e.g. targeted unemployment rate) to compare it with the actual labor market conditions and consequently estimate the fiscal policy stance. This approach supports policymakers in timing and tailoring their measures effectively to meet their stabilization objectives and avoid a low-output equilibrium. The adoption of a potential output measure based on observable data and an explicit unemployment target would also likely enhance policymakers' commitment to policy outcomes. Currently, the concept of potential output is tied to an abstract equilibrium rate of unemployment, which is beyond the direct control of policymakers, who essentially inherit it as a given. By setting clear, specific targets that are uncorrelated with actual unemployment, policymakers could be more easily held accountable, ensuring greater responsibility for economic outcomes.

Yet, the setting of an unemployment target remains the most disputable assumption of the method, as it may be plagued by political biases. Policymakers might set a high objective to easily reach the target without having to undertake ambitious structural reforms. Alternatively, they might expect the actual unemployment rate to fall below the target to gain political benefits from over-achievement.

Using V/U can overcome this shortcoming and thus strengthen the advantages of the Okun method. In contrast to the unemployment rate, setting a target for V/U is more straightforward. If V/U is below one, there are more unemployed workers than job vacancies posted, which means there is slack in the labor market. If V/U is larger than one, conversely, there is a labor shortage. An equilibrium is reached unequivocally when the ratio equals one, which is why the target for V/U should be set at unity. In this respect, the use of V/U reduces the political bias that the communication of a target for the unemployment rate may create.

4.1 The method

Our 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 V/U) on the current GDP growth

rate and its first two lags (see Equation 3) and we extract the Okun coefficient from the sum of the coefficients of the GDP growth and its lags (see Section 2 for details).

Secondly, we use the estimated Okun coefficients to calculate potential output following Fontanari et al. (2020; 2022). They report very different estimates of the output gap compared to those reported by the CBO. Indeed, the method using Okun's Law does not mechanically prevent lasting deviations of the actual output from the potential: the output gap is not mean-reverting. Actually, it 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; 2022), the CBO uses a production function approach and estimates of the natural rate of unemployment towards which the economy should "naturally" converge (the NAIRU).

Specifically, potential output follows the specification first elaborated by Okun (1962). It rearranges the level and difference specifications of the Law. The resulting expression for potential output is described by Equation 5.

$$Y_t^{Pot} = Y_t \times [1 - \frac{1}{\beta_{okun}}(U_t - U^*)] \tag{5}$$

Notes: U stands for the respective measure of economic slack (the unemployment rate or V/U), * 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 measure of economic slack U*. Like Carnazza et al. (2023), 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[9].

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 μ. Equation 6 and Equation 7 illustrate this.

$$OG_t = \frac{Y_t}{Y_t^{Pot}} - 1 \tag{6}$$

$$CAB_t = FB_t + \mu OG_t \tag{7}$$

[9]To assess the sensitivity of potential output to the unemployment objective, we introduce different values for U* in the unemployment rate case.

4.2 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 5 and 6. 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 percent 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 the 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 summarized in Table 9 in the Appendix.

4.3 Results

For the two indicators of economic slack, the respective Okun coefficients calculated in Section 2 are reported in Table 6. These coefficients are used to compute potential output according to Equation 5. For the exogenous target level of economic 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. Robustness checks with policy target rates above and below this value are conducted. The target value for V/U is set at one.

Potential output estimates are then transformed to the output gap. Figure 2 plots the CBO output gap estimate (solid line) and the estimates based on Okun's Law using $U_{official}$ (long-dashed line) and V/U (short-dashed line). Two key observations emerge. Firstly, the CBO estimate oscillates around zero, while the $U_{official}$ and V/U output gaps are negative over almost the entire sample period. The average values are -0.79%, -4.63%, and -5.17% of potential GDP for CBO, $U_{official}$ and V/U, respectively. 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 with the unemployment rate yields a persistently larger output gap than the CBO until 2016, 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 like in 1990 suggests that a fiscal expansion to boost demand would have been pro-cyclical and destabilizing. But had the CBO estimate been inaccurate and the output gap was actually more negative (as suggested by the Okun methodology), a fiscal expansion would have been an appropriate counter-cyclical measure to stabilize the economy. The output gap computed with V/U (short dash) is overall close to the one using $U_{official}$.[10] There are a few exceptions though. In the late 1960s and from the mid-1970s to the mid-1980s, the output gap computed with V/U comes closer to the CBO estimate. In the mid-2000s, on the contrary, the widest output gap is obtained with V/U. At the end of the sample, while the output gap of the CBO and the one computed with the official unemployment rate are close to zero, the output gap computed with V/U is significantly positive, thus highlighting a largely commented-upon period of strong labor tightness and economic expansion (see e.g. Abraham et al., 2020).

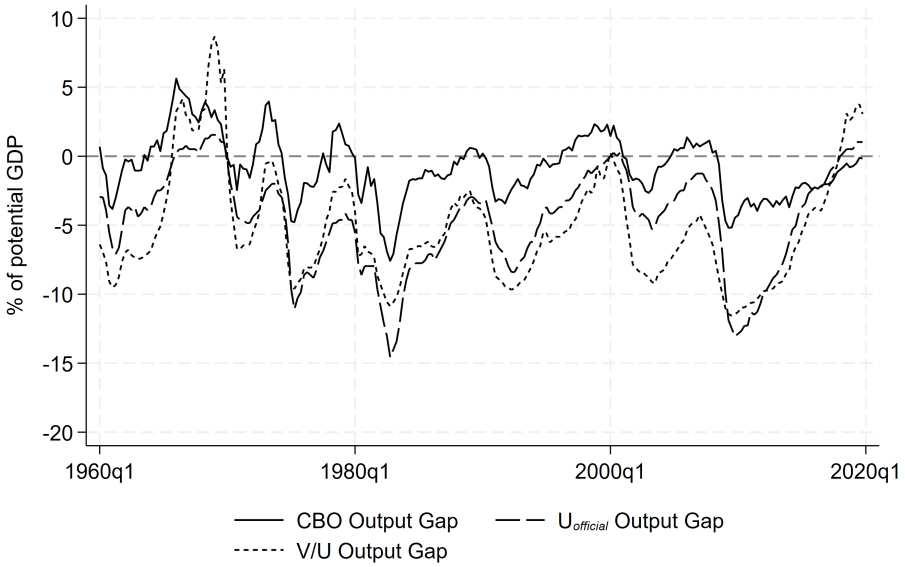


Figure 2: Output gap, different measures

The output gap computed with V/U correlates better than any other output gap measure (including the CBO's) with inflation (see Table 7). This is certainly only a rough assessment of its reliability but it is clear indication that this measure of the output gap squares pretty well with the intuition that higher inflation may stem from a level of output that gets closer to its potential. In a similar vein, Bernanke and Blanchard (2023) choose to use V/U instead of the unemployment rate as an empirical measure of labor market slack in their work on inflation, due to its superior

[10]The output gap estimates for different unemployment targets of $U_{official}$ can be found in Figure 8 in the Appendix.

reliability as a signal for the state of the economy and thus price developments.

Figure 3 shows the cyclically-adjusted budget balance based on the CBO output gap (solid) and the one derived from the Okun method based on $U_{official}$ (long dash) as well as V/U (short dash). Following CBO data leads to the conclusion that the US constantly ran a structural deficit from 1965 until 2020 (except in 2000 and 2001) of, on average, 2.9% of potential GDP. The cyclically-adjusted balance estimates based on Okun's Law yield a more conservative fiscal stance from the mid-1970s until 2016 compared to the CBO. While there is also a structural deficit for the majority of periods, it is substantially smaller with a mean of 0.8% and 0.6% of potential GDP with $U_{official}$ and V/U, respectively. The estimates stemming from the use of Okun's Law trail quite homogeneously above CBO estimates. It is noteworthy that in post-crisis periods, and in contrast to the two Okun's Law estimates, the CBO reports a substantially smaller output gap and thus attributes fewer expenses to cyclical factors which result in a larger cyclically-adjusted deficit. This striking feature occurs after 1991, 2001 as well as 2009 and parallels the deficit errors in CBO's budget-year projections (CBO, 2019). The CBO reports significant underestimations of budget-year deficits after the unanticipated economic downturns of 1991, 2001 and 2009. But these were followed by long-lasting over-estimation of budget-year deficit that might have stemmed from the mismeasurement of public expenditures and revenues as structural components. This mismeasurement may have some impact on the fiscal stance: a larger structural deficit may trigger a fiscal consolidation, because the structural nature of the deficit is interpreted as a long-lasting feature. Aiyar and Voigts (2022) highlight that conventional output gap estimation methods like the CBO's show a systematic bias due to the assumption of a zero mean, which is particularly pronounced during deep recessions, where potential output is often significantly underestimated. The effects of economic crises on public finances and on GDP have long raised concerns about their persistence on the output gap. Fatás and Summers (2018) showed that after the Global Financial Crisis, fiscal consolidation, not structural factors, had permanent effects on GDP. They concluded that fiscal consolidation had been self-defeating.

The use of Okun's Law to compute the output gap and the cyclically-adjusted balance partially offsets the hysteresis effect present in the CBO's assessments. By construction, GDP is not forced to go back to potential GDP and the output gap may deviate from zero over long periods of time. Overall, the output gap and cyclically-adjusted balance measures stemming from the use of the two economic slack indicators in Okun's Law are in a similar range in both absolute values and relative to the CBO. The output gaps are significantly larger (in absolute value) than those by the CBO and the resulting fiscal stance is more on the consolidation side. One may interpret this more conservative stance as an indicator of the larger fiscal space at the disposal of the US federal government to dampen future economic shocks. Interestingly, the use of V/U in the output gap estimation introduces some nuance between the various computations of the cyclically-adjusted deficit. While the V/U cyclically-adjusted deficit is on average slightly lower than when $U_{official}$ is used (0.63%

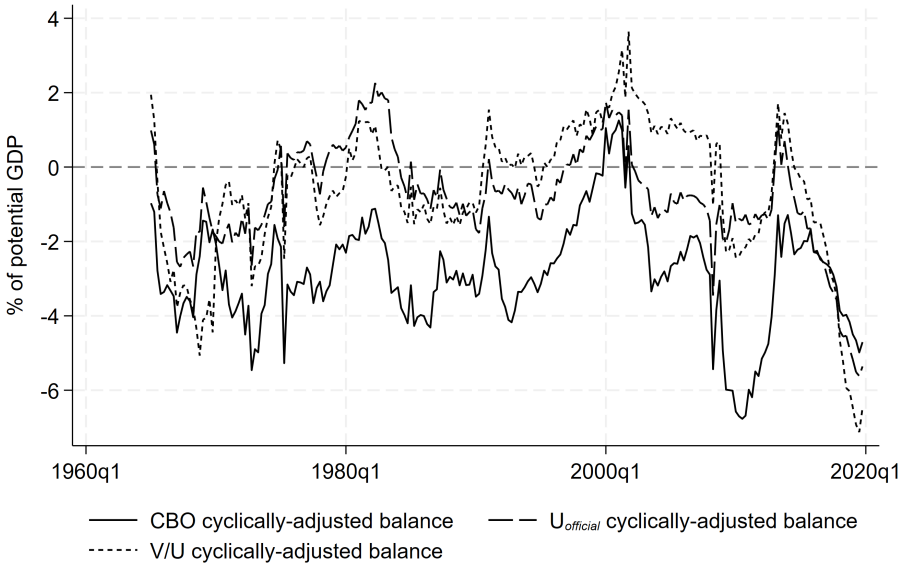


Figure 3: Cyclically-adjusted balance CBO and $U_{official}$

vs. 0.78% of potential output), the variation in the cyclically-adjusted deficit using V/U since 2016 has been way larger than the variation using the CBO estimate. It comes that the use of Okun's Law does not automatically yield a more conservative picture of the fiscal stance. As the standard deviation of the cyclically-adjusted balance with V/U shows[11], high cyclically-adjusted surplus and high cyclically-adjusted deficit alternate; there is thus less persistence in the fiscal stance according to this indicator.

5 Fiscal multipliers

After the Great Recession, a debate arose among economists about the real effects of fiscal stimulus and quite soon, the idea emerged that the fiscal multiplier was state-dependent: it could be higher when monetary policy remained stuck at the zero lower bound (Ramey, 2011) or when the economy was under a recession (Auerbach and Gorodnichenko, 2012; Bachmann and Sims, 2012; Fazzari et al., 2015; Mittnik and Semmler, 2012).

Drawing on long historical samples, Owyang et al. (2013) and Ramey and Zubairy (2018) have cast doubt on some part of the state-dependence of the estimated fiscal multiplier in the US. While

[11]It is equal to 1.88, hence higher than the one obtained with the unemployment rate and CBO data (1.41 and 1.44, respectively).

the fiscal multiplier is high under zero lower bound episodes (close to 1.5), Ramey and Zubairy (2018) do not find it to be higher under a period of slack than during a period of expansion, a conclusion later confirmed by Alloza (2022). We use the newly computed cyclically-adjusted balance data to revisit this debate.

5.1 Fiscal shock identification

Identification of fiscal shocks in the literature has long proceeded from either narratives or econometric outcomes[12]. For instance, Ramey and Zubairy (2018) use two methods to identify fiscal shocks: a narrative approach based on military spending news gathered by Ramey (2011) and the recursive approach of Blanchard and Perotti (2002), before using both combined. Their results are robust across the various specifications.

In the following, we hinge on an alternative identification of fiscal shocks. We use the updated cyclically-adjusted balance presented in the former section and we characterize a fiscal shock as the difference in the cyclically-adjusted balance from one quarter to another. This is a very usual way for forecasters and policymakers to characterize the fiscal stance. A positive difference (i.e. an improvement in the cyclically-adjusted balance) is interpreted as a discretionary fiscal contraction whereas a negative difference is interpreted as a discretionary fiscal expansion. While it informs about the fiscal stance, it is also used to forecast the impact on GDP and to run counterfactual analyses (e.g. in the FRB/US or ECB-Base large-scale semi-structural macroeconomic models, see Bankowski, 2023 or Brayton and Reifschneider, 2022). This measure consisting in an implemented change in spending and taxes during a quarter can be considered as unanticipated[13]. This measure is also exogenous to GDP, therefore netted out from the past changes in the output[14].

We compute fiscal shocks based on three different measures of potential GDP. First, we use the CBO's own estimate. Then, we use the cyclically-adjusted balance resulting from potential output estimates via Okun's Law with the unemployment rate and V/U.

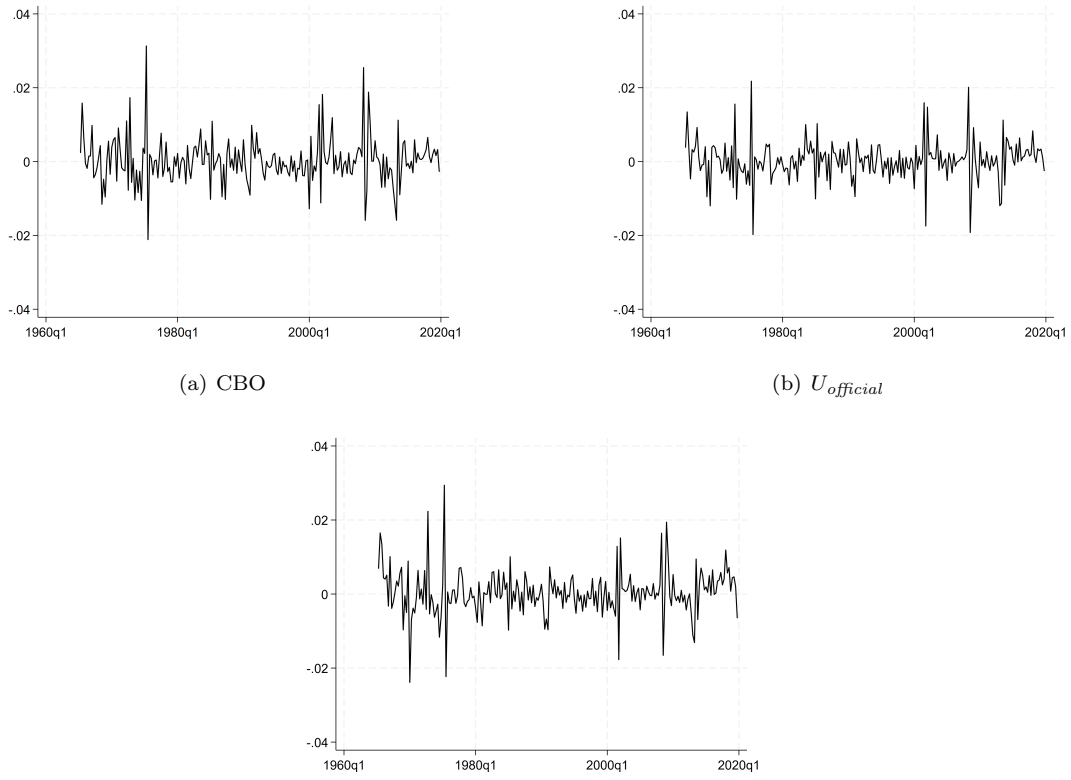
The fiscal shocks are presented in Figure 4. In contrast to "military news" in Ramey and Zubairy (2018) and by construction, fiscal shocks are very frequent. The variety and frequency of shocks

[12]Romer and Romer (2010) have also extracted tax 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 and tax changes on the output. They concluded that public spending increases have a larger impact on output than tax cuts.

[13]Mertens and Ravn (2012) use this timing convention to distinguish between anticipated and unanticipated changes in taxes: if announcement date and implementation date of a tax change are in the same quarter, the tax change is classified as unanticipated; it is classified as anticipated otherwise.

[14]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.

resemble more that of Romer and Romer (2010). While we draw on the overall fiscal stance and not only on exogenous tax changes, it may be argued that we add spending shocks to the Romer and Romer (2010) tax shocks. Descriptive statistics for the three different shocks[15] show that they have a mean of zero and a low standard deviation. Ljung-Box test statistics fail to reject the hypothesis that the fiscal shocks behave like white noises.



(a) CBO

(b) $U_{official}$

(c) V/U

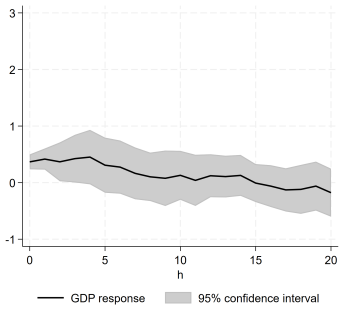
Figure 4: Fiscal shocks with output gap computed from CBO data or via Okun's Law and different labor slack indicators

5.2 Is fiscal policy stabilizing?

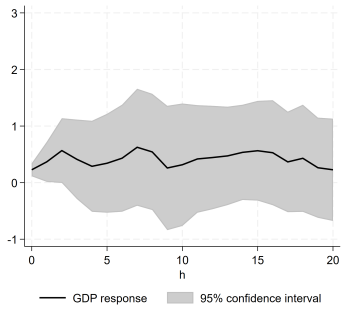
Drawing on these three different fiscal shocks, we replicate the Ramey and Zubairy (2018) local projections to compute dynamic fiscal multiplier effects. The resulting impulse response functions are reported in Figure 5. For the sake of comparison, it is worth recalling that based on historical data and military news, Ramey and Zubairy (2018) find significantly inverted U-shaped fiscal multiplier

[15]Results are available upon request.

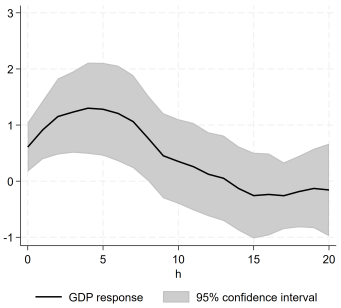
effects with a peak at 0.3 after 12 quarters. In contrast, fiscal shocks computed from CBO's data show an immediate significant impact on GDP at 0.4. It remains constant and significant for four quarters. Using Okun's Law based on the unemployment rate yields an immediate multiplier effect of 0.2 before increasing to 0.4 after one quarter and being statistically insignificant thereafter. When we use the fiscal shock computed from the use of V/U, we obtain an impulse response function, whose inverted U-shape is closer to the results reported in Ramey and Zubairy (2018). However, the fiscal multiplier is substantially larger with a peak at 1.3 after a year. Beyond two years, the fiscal multiplier effect is no longer significant, in contrast to Ramey and Zubairy's estimate, which is more persistent.



(a) CBO



(b) $U_{official}$



(c) V/U

Figure 5: Impulse response functions on GDP after a fiscal shock

5.3 Are fiscal multipliers state-dependent?

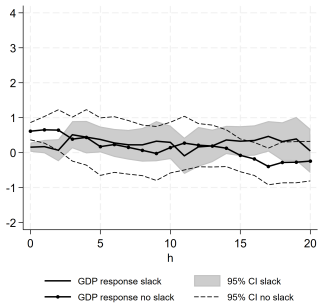
The former part has shown that fiscal policy has been stabilizing in the US if one uses V/U as an indicator of labor underutilization to compute the Okun coefficient and the ensuing fiscal stance. Even with the CBO's data or the official unemployment rate as an indicator of labor underutilization, the fiscal multiplier proved positive, though only very transitorily.

While the fiscal multipliers reported so far were estimated from the entire sample, it remains to be seen whether it holds whatever the state of the economy. Auerbach and Gorodnichenko (2012), Bachmann and Sims (2012), Fazzari et al. (2015), and Mittnik and Semmler (2012) showed that US fiscal policy had higher real effects during recessions than during expansions. Ramey and Zubairy (2018) found that instantaneous fiscal multipliers were higher during high-unemployment periods than during low-unemployment ones, but cumulative fiscal multipliers showed the opposite feature: in a high-employment state, they were low or close to those in a 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 and 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 to identify the fiscal shock. We interpret this shock as discretionary and instantaneous, which is confirmed by the absence of autocorrelation in the fiscal shocks and also by no statistically significant increase in the cyclically-adjusted balance after the fiscal shock (see Figure 9 in the Appendix). Therefore, we can concentrate on instantaneous fiscal multipliers.

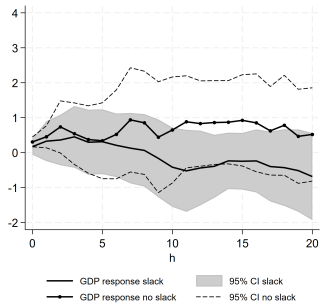
Gonçalves et al. (2024) argue that state-dependent local projections estimators may show an asymptotic bias (and may be inaccurate) when the ratio between the size of the shock (usually normalized to one) and its standard deviation is large. Drawing on Ramey and Zubairy (2018), for which this ratio equals 13, Gonçalves et al. (2024) show that fiscal multipliers under high unemployment tend to be under-estimated by the local projection estimate, whereas fiscal multipliers under low unemployment tend to be over-estimated by the local projection estimate. Overall, the asymptotic bias would be at most 4%. According to the fiscal shocks we have identified, the ratio between the size of the shock and its standard deviation is ten times lower than that of Ramey and Zubairy (2018). The inaccuracy of state-dependent local projection estimators if any may be very minimal in our case.

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.

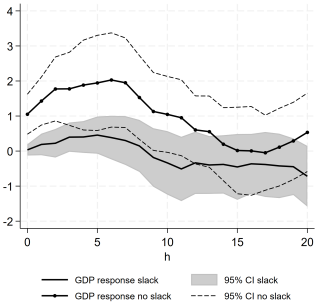
We compute the fiscal multipliers under the two states of the economy. The resulting impulse response functions are shown in Figure 6.



(a) CBO



(b) $U_{official}$



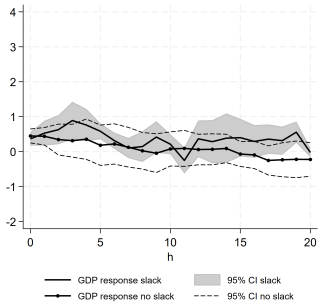
(c) V/U

Figure 6: State-dependent impulse response functions on GDP after a fiscal shock, threshold at 6.5% unemployment rate

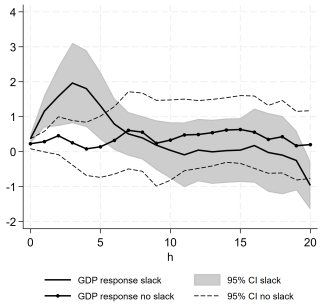
In line with the results of fiscal multiplier effects commented above, estimates based on either the CBO data or Okun's Law with the unemployment rate draw similar conclusions: fiscal multiplier effects are not state-dependent. The GDP reaction to fiscal shocks does not significantly differ between periods of slack and those without (top panels in Figure 6). The conclusion of Ramey and Zubairy (2018) is confirmed in these cases. However, the use of V/U as a measure of labor underutilization paints 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 for a period of two years after the shock when the economy is in a low-unemployment state with a peak at two. This outcome is consistent with Alloza (2022), who identified household confidence as a crucial explanatory variable: Individuals tend to become more pessimistic when a positive government spending shock reinforces their perceptions of bad economic conditions.

To further investigate these contrasting results, we introduce an alternative definition of slack: an unemployment rate above 8% of the labor force. We report state-contingent fiscal multipliers

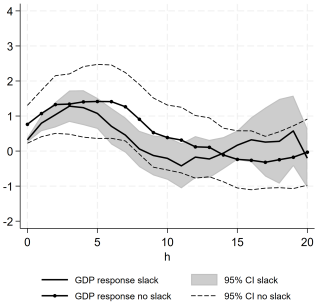
with this higher threshold in Figure 7.



(a) CBO



(b) $U_{official}$



(c) V/U

Figure 7: State-dependent impulse response functions of GDP, threshold at 8% unemployment rate (n=28)

The state-contingency of fiscal policy is quite sensitive to the new threshold. In the two first cases (CBO data, or Okun's Law based on the unemployment rate), fiscal policy is shown to have stronger and more significant real effects on the economy under high-unemployment states than under low-unemployment ones. The CBO slack fiscal multiplier peaks at one after one year, the $U_{official}$ at two, before both are statistically insignificant after seven quarters. With a higher unemployment threshold to illustrate the shift from economic slack to economic expansion, state-contingent local projections confirm Auerbach and Gorodnichenko (2012) initial results.

Using V/U now shows convergence between state-contingent fiscal multipliers: estimates are very close until 4 quarters after the fiscal shock independent of whether the unemployment rate is below or above the 8% threshold. After one year, the fiscal multiplier diminishes more rapidly under a high-unemployment state, showing thus a mix of Ramey and Zubairy (2018)'s and Alloza (2022)'s results: the former in the short run (no state-contingency), the latter after one year (confidence effect).

The results indicate that the state-dependence of fiscal multipliers varies significantly based on the threshold used to distinguish economic conditions. While the fiscal multiplier effect shows limited state-dependence at lower thresholds, particularly with traditional measures from the CBO or Okun's Law using the unemployment rate, applying a higher threshold, such as 8%, reveals stronger and more significant multiplier effects during periods of high unemployment. Using V/U as an indicator of labor underutilization presents yet another perspective: with V/U, fiscal multipliers are larger in low-unemployment periods compared to periods of slack, although this difference diminishes when using a higher slack threshold. Overall, these findings suggest that the sensitivity of fiscal multiplier effects to economic conditions is influenced quite as much by the threshold distinguishing "bad" from "good" years as by the specific slack measure used in Okun's Law.

6 Conclusion

The use of Okun's Law to extract potential output and the output gap has some advantages. When estimating maximum or full use of economic resources which transmit to potential output, the first-difference method permits to foster the case for economic policies based upon transparent objectives (e.g. a target for the unemployment rate) rather than on unobservable variables (e.g. NAIRU). As it is economical to implement (only a few observable data are required), Okun's Law is easily replicable and easy to update. Transparency, replicability and updates: estimates of potential output (and the output gap) stemming from Okun's Law make it very suitable to assess the fiscal stance and its stabilizing (or destabilizing) properties.

The introduction of V/U instead of the unemployment rate in Okun's Law adds two more advantages: Firstly, the political bias behind the choice of an unemployment target disappears. Targeting V/U different from unity would clearly be interpreted as a willingness to under- or out-perform the labor market. The latter is efficient when V/U is equal to one. Secondly, recent research has highlighted the superiority of V/U compared to the unemployment rate as an indicator of labor slack in the economy. Since an indicator of economic resource utilization is at the heart of Okun's Law, including V/U improves the method.

In this paper, we have shown that the Okun coefficient was stable in the US and we have therefore used it to extract new measures of the cyclically-adjusted public deficit. We have compared measures drawing on CBO data with those drawing on Okun coefficient estimates obtained alternatively with the unemployment rate and V/U. While estimates of the Okun coefficients, output gaps and the cyclically-adjusted public deficit give quite similar results, the introduction of V/U has added a few interesting outcomes.

With this indicator of labor slack, the Okun coefficient aligns closely with those traditionally calculated using the unemployment rate. Moreover, the measured output gap has turned out to most accurately reflect the expected relationship with the inflation rate. Finally, the fiscal multiplier effect using V/U has been shown to be the closest to recent influential estimates, while highlighting the difficulty to reach clear-cut conclusions about the state-contingency of fiscal multiplier effects.

The preliminary results in this paper may motivate further research on economic stabilization. First, the above-mentioned relationship between the output gap and inflation may spur a systematic analysis of the Phillips curve, with new estimates using the Okun coefficient. Second, we may broaden the scope of the study to other countries and thus contribute to a comparison of fiscal multiplier effects across countries.

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7 List of Tables

	1948Q1 2013Q4	1980Q1 2013Q4	1960Q1 2013Q4	1960Q1 2019Q4
Ball et al.	-0.432 (0.035)	-0.443 (0.049)		
Replication		-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

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

Newey-West standard errors in brackets

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

	Replication	
Break Date	1960Q1 2009Q4	1960Q1 2019Q4
2010Q1	-0.423 (0.040)	-0.393 (0.048)
Newey-West standard errors in brackets		

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

Dependent Variable	$U_{official}$	V/U
GDP growth	-0.184***	0.037***
	(0.025)	(0.004)
L.GDP growth	-0.128***	0.018***
	(0.024)	(0.006)
L2.GDP growth	-0.081***	0.009***
	(0.019)	(0.004)
Constant	0.287***	-0.045***
	(0.047)	(0.009)
Observations	237	237
Time period	1960Q1-2019Q4	1960Q1-2019Q4
Standard errors	Newey-West	Newey-West
Adjusted R-squared	0.540	0.402
Standard errors in parentheses		
*** p<0.01, ** p<0.05, * p<0.1		

Table 4: Regression results of Okun coefficient with different labor slack indicators

Break Date	1960Q1 2010Q4	1960Q1 2019Q4
2011Q1	0.069 (0.008)	0.065 (0.008)

Newey-West standard errors
in brackets

Table 5: Okun coefficient testing potential structural break identified by Supremum Wald test when using V/U

	$U_{official}$	V/U
Okun coefficient	-0.393 (0.048)	0.065 (0.008)

Newey-West standard errors
in brackets

Table 6: Okun coefficient with different economic slack indicators

Output gap	CBO	$U_{official}$	V/U
Correlation coefficient	0.13	-0.05	0.16

Table 7: Correlation with CPI inflation

8 Appendix

8.1 Stationarity test results

Variable	Augmented Dickey-Fuller	Phillips-Perron
Δ unemployment rate	-6.790***	-6.891***
	(0.000)	(0.000)
GDP growth	-7.034***	-11.324***
	(0.000)	(0.000)
Δ V/U	-8.051***	-8.220***
	(0.000)	(0.000)

p-values in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Notes: The test statistics reported for the Augmented Dickey-Fuller test is the Dickey-Fuller t-statistic. The test statistic for the Phillips-Perron test is the Phillips-Perron tau test statistic. The term in brackets is the MacKinnon approximate p-value for both tests. For all three variables, the null hypothesis of non-stationarity is rejected at a one percent significance level in both tests.

Table 8: Stationarity test results

8.2 Data sources

Variable	Frequency	Source	Unit
unemployment rate	quarterly	BLS	% of civilian labor force
unemployed workers	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

Table 9: Data sources

8.3 Alternative unemployment targets

VARIABLE	Baseline	Low target	High target
$U_{official}$	4%	2.5%	5.5%
V/U	1	na	na

Table 10: Different unemployment targets

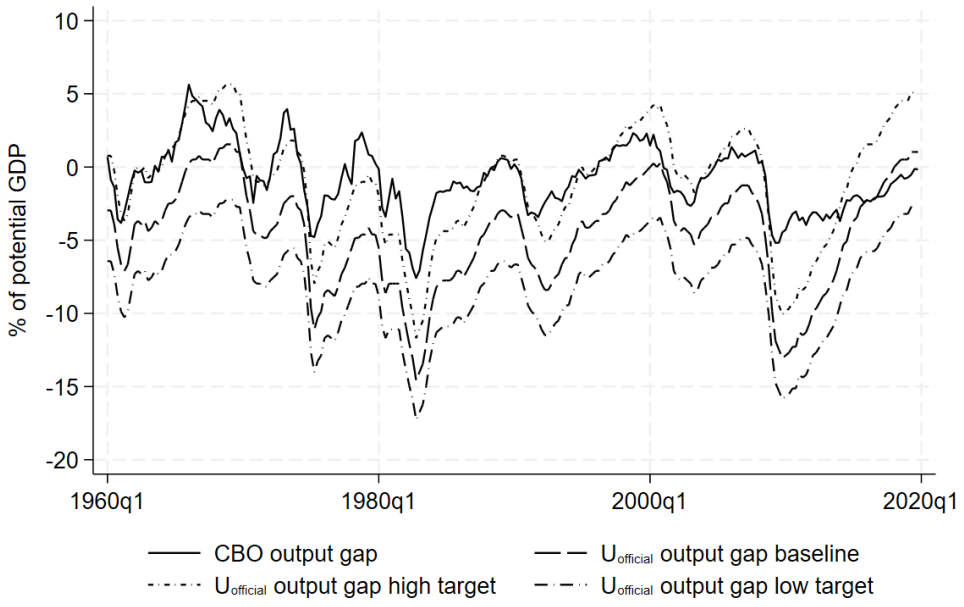
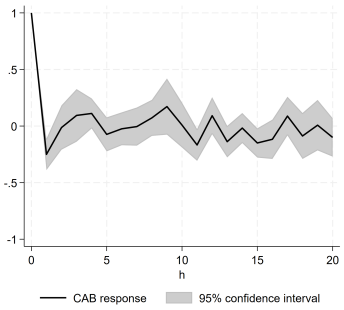
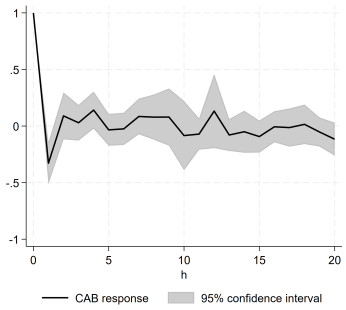


Figure 8: Output gap CBO and $U_{official}$ with different unemployment targets

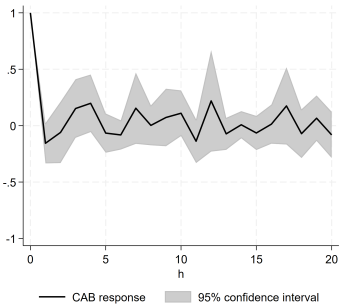
8.4 Impulse response function of cyclically-adjusted budget balance



(a) CBO



(b) $U_{official}$



(c) V/U

Figure 9: Impulse response functions of CAB

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The Paris-based Observatoire français des conjonctures économiques (OFCE), or French Economic Observatory is an independent and publicly-funded centre whose activities focus on economic research, forecasting and the evaluation of public policy.

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