COMMENTS ON "A UNIFIED APPROACH TO MEASURING u^*"

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The goal of this paper by Richard Crump, Stefano Eusepi, Marc Giannoni, and Aysegul Sahin (CEGS) is to estimate the natural rate of unemployment, or u_t^*, in the postwar period. The authors combine two measurement approaches, one based on detailed data on flows into and out of unemployment for many demographic groups, and the other on the traditional Phillips curve relationship and data on aggregate unemployment, inflation and inflation expectations. The paper provides three main takeaways. First, u_t^* is estimated to be around 4% in 2018. Second, u_t^* appears to have been trending down since the late 1980s. Third, this downward trend is due to the secular decline in the separation rate, which, in turn, was caused by the increased labor force attachment of women, the decline in job destruction and reallocation intensity, and the dual aging in the labor market of workers and firms. Overall, this paper is an impressive piece of work with crucial policy implications. The most obvious of them is that the current low level of unemployment is roughly sustainable in terms of inflation, given that it is similar to the estimated natural rate and the unemployment gap is thus close to zero.

I will organize my comments around two main points. I will first try to unpack the estimates of u_t^* presented by CEGS, to shed light on their essential drivers. My conclusion will be that data on inflation expectations seem crucial for the measurement of u_t^* in the paper. In contrast, the detailed labor market flow data play a less central role for the measurement of u_t^*, although they are of course crucial for the interpretation of its secular trend. I will then analyze the implications of this unpacking exercise for the New-Keynesian Phillips curve, which seems in better shape than what some recent critics have suggested.

1. What Drives the CEGS Estimate of u_t^*?

The baseline estimate of u_t^* provided by CEGS has three key features: (i) u_t^* has been trending down since the 1980s; (ii) it is approximately equal to 4% in 2018; and (iii) the uncertainty around its path is sizable, but not overwhelming. My objective here is to

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understand what ingredients of the CEGS's complex empirical model are essential to these findings. To this end, I will present a battery of u_t^* estimates, obtained using a sequence of progressively more complex models, the last of which corresponds to the CEGS baseline model.

Model 1. The starting point of my unpacking exercise is the traditional backward-looking Phillips curve,

$$\pi_t - \pi^* = \gamma\left(\pi_{t-1} - \pi^*\right) - \kappa\left(u_t - u_t^*\right) + s_t. \tag{1.1}$$

According to this "Triangle model" (Gordon, 1977 and 2013), deviations of inflation (π_t) from its target value (π^*) depend on an inertial term, a "demand factor" represented by the gap between unemployment (u_t) and its natural rate (u_t^*), and a supply shock (s_t). In the estimation, u_t^* is treated as an unobservable variable and modeled as a random walk process, to capture the idea that its movements are very persistent. Like CEGS, I assume that the unemployment gap and the supply shock follow an AR(2) and an AR(1) process respectively, although these two assumptions are not crucial for the results. Figure 1.1.a presents the implied estimate of u_t^*, which is quite different from the baseline estimate of CEGS: u_t^* is relatively stable over time, it is approximately equal to 6% in 2018, and the uncertainty around its path is large. [1]

Model 2. I will now augment model 1 with all the ingredients of the CEGS baseline setup, adding these components one at a time to understand their specific role. The first step in this direction consists of turning the backward-looking Phillips curve of equation (1.1) into a more modern New-Keynesian forward-looking Phillips curve, based on sticky wages and indexation to past and steady-state inflation:

$$\pi_t - \pi^* = \gamma\left(\pi_{t-1} - \pi^*\right) - \kappa\ E_t \sum_{j=0}^{\infty} \beta^j \left(u_{t+j} - u_{t+j}^*\right) + s_t. \tag{1.2}$$

The main new feature of (1.2) is that inflation depends on the expected present discounted value of the future unemployment gaps, and not just on the current level of this gap, as in (1.1). However, this change has a relatively minor impact on the measurement of u_t^*, as evident from comparing figure 1.1.b to 1.1.a.

[1] All the estimates in this comment are obtained using the same priors for the parameters also appearing in the CEGS paper, and the same data.

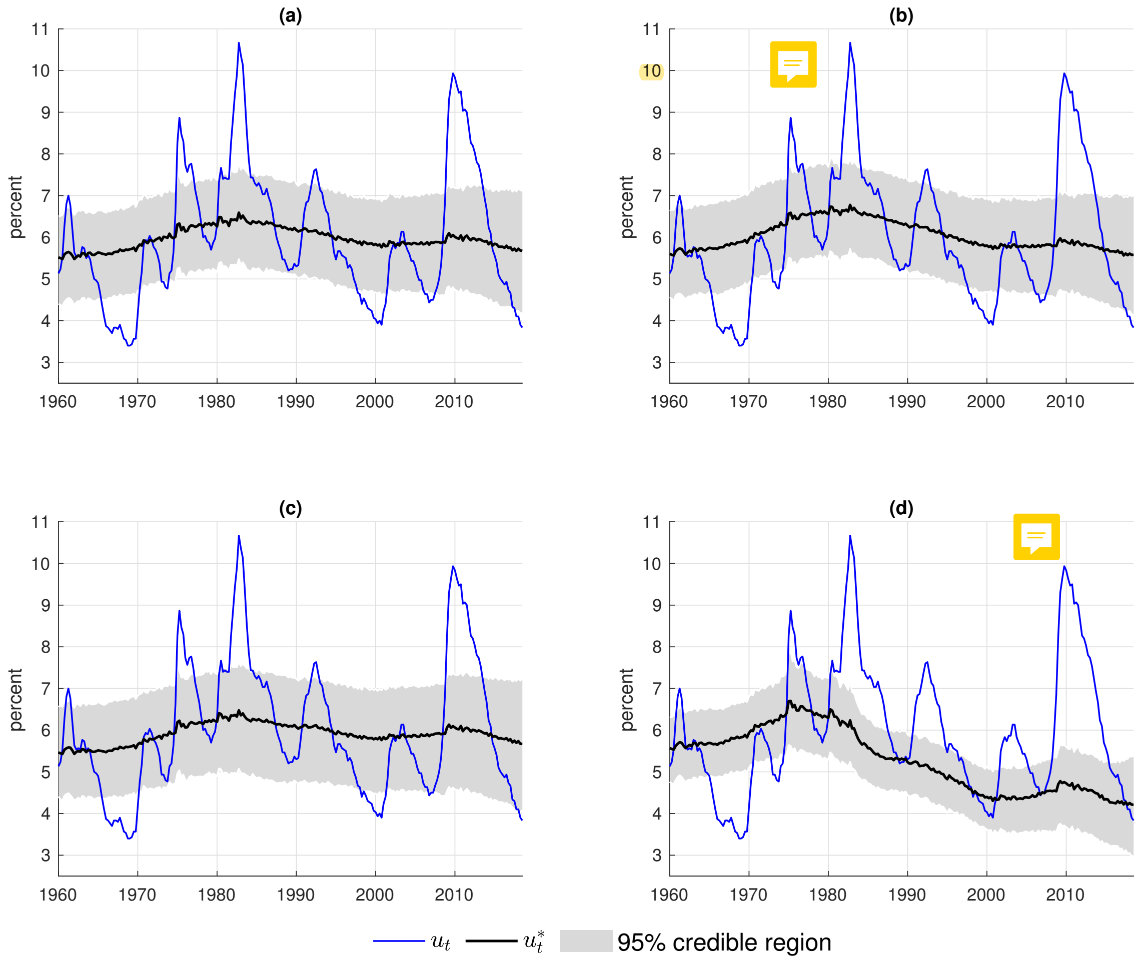

FIGURE 1.1. Estimates of u_t^* based on model 1 (a), model 2 (b), model 3 (c), and model 4 (d).

Model 3. The next step in the direction of the CEGS model is to introduce time variation in the inflation target. More precisely, π^* in (1.2) is replaced by π_t^*, which is modeled as a random walk to capture the low frequency hump-shaped behavior of inflation during the 1970s and 1980s. The role of this modification, however, is also relatively marginal, resulting again in nearly unchanged estimates of u_t^* relative to model 1 and 2 (figure 1.1.c).

Model 4. Moving on, I now estimate the model by also using data on short- and long-term inflation expectations. As in CEGS, these data are equated to the short- and long-term forecasts of inflation implied by the model, up to a measurement error. These survey data help pin down the level of the time-varying inflation target, π_t^*, among other things. Notice that the implied estimate of u_t^*, presented in figure 1.1.d, is now quite different from the previous ones: u_t^* clearly trends down starting in the 1980s, it is close to 4% in 2018, and its uncertainty is lower. Overall, the path of u_t^* is quite similar to the baseline estimate of CEGS, suggesting that the use of data on inflation expectations is a crucial component of their empirical model.

Model 5. The final ingredient of the CEGS model is the assumption that u_t^* cannot permanently deviate from the secular trend of the unemployment rate ($\bar{u}_t$). In particular, CEGS rewrite u_t^* as

$$u_t^* = (u_t^* - \bar{u}_t) + \bar{u}_t,$$

where $\bar{u}_t$ is measured independently using disaggregated labor market flow data, and the term in parentheses—the distance between natural and secular unemployment—is assumed to follow an AR(1) process. I estimate this model using CEGS's exact measure of $\bar{u}_t$, and present the implied estimate of u_t^* in figure 1.2. By construction, this estimate is identical to CEGS's "inflation-only" estimate of u_t^*.

It is important to notice that the evolution of u_t^* in figure 1.2 is overall similar to the path of u_t^* displayed in figure 1.1.d. A possible interpretation of this finding is that disaggregated labor market flow data are not terribly useful to estimate u_t^*, because they do not drastically change our view about the time-series behavior of this variable. This interpretation, however, would probably be too literal and a bit naive. A more compelling view is that this consistency result—the fact that aggregate data on unemployment, inflation and inflation expectations deliver estimates of natural unemployment in line with its secular trend—is remarkable, and provides an important external validation of the traditional Phillips curve framework.

2. Implications for the New-Keynesian Phillips Curve

The New-Keynesian Phillips curve has recently been criticized because inflation fell little relative to the increase in unemployment during the Great Recession, the so-called "missing disinflation" phenomenon (e.g. Hall, 2011). However, as stressed by Coibion and Gorodnichenko (2015), Del Negro et al. (2016) and Carvalho et al. (2017), this somewhat puzzling behavior of inflation can be explained by the fact that inflation expectations were well anchored during the same period. By this logic, the explicit use of inflation survey data should

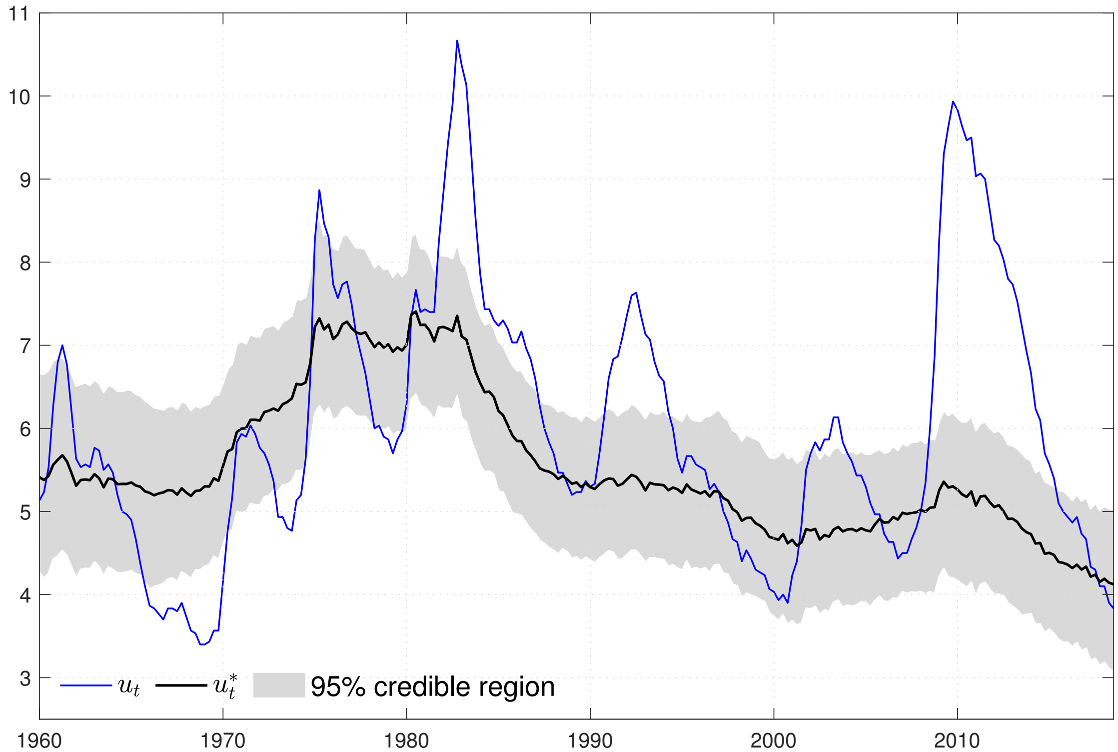

FIGURE 1.2. Estimate of u_t^* based on model 5.

robustify inference in the context of the New-Keynesian Phillips curve, and improve the estimation of u_t^*, which is exactly what the previous empirical results show.

To understand why these survey data play such a crucial role, let π_t^* replace π^* in the New-Keynesian Phillips curve (1.2), and rewrite this equation as

$$\pi_t - \gamma\pi_{t-1} - (1-\gamma)\,\pi_t^* - \beta E_t\left[\pi_{t+1} - \gamma\pi_t - (1-\gamma)\,\pi_{t+1}^*\right] = -\kappa\,(u_t - u_t^*) + \tilde{s}_t, \tag{2.1}$$

to make explicit the dependence of inflation on its expected future value.[2] The use of data on short- and long-term inflation expectations makes the variables $E_t\pi_{t+1}$ and π_t^* observable, up to some measurement error. As a consequence, it becomes easier for the econometrician to isolate the relationship between the left- and the right-hand side of (2.1), and to more precisely estimate the slope coefficients κ and the natural rate u_t^*. Furthermore, when using data on inflation expectations, inference about κ becomes also surprisingly stable over time.

[2]The term $\tilde{s}_t$ is equal to $(1-\beta\rho_s)\,s_t$, where ρ_s is the autocorrelation of the supply shock.

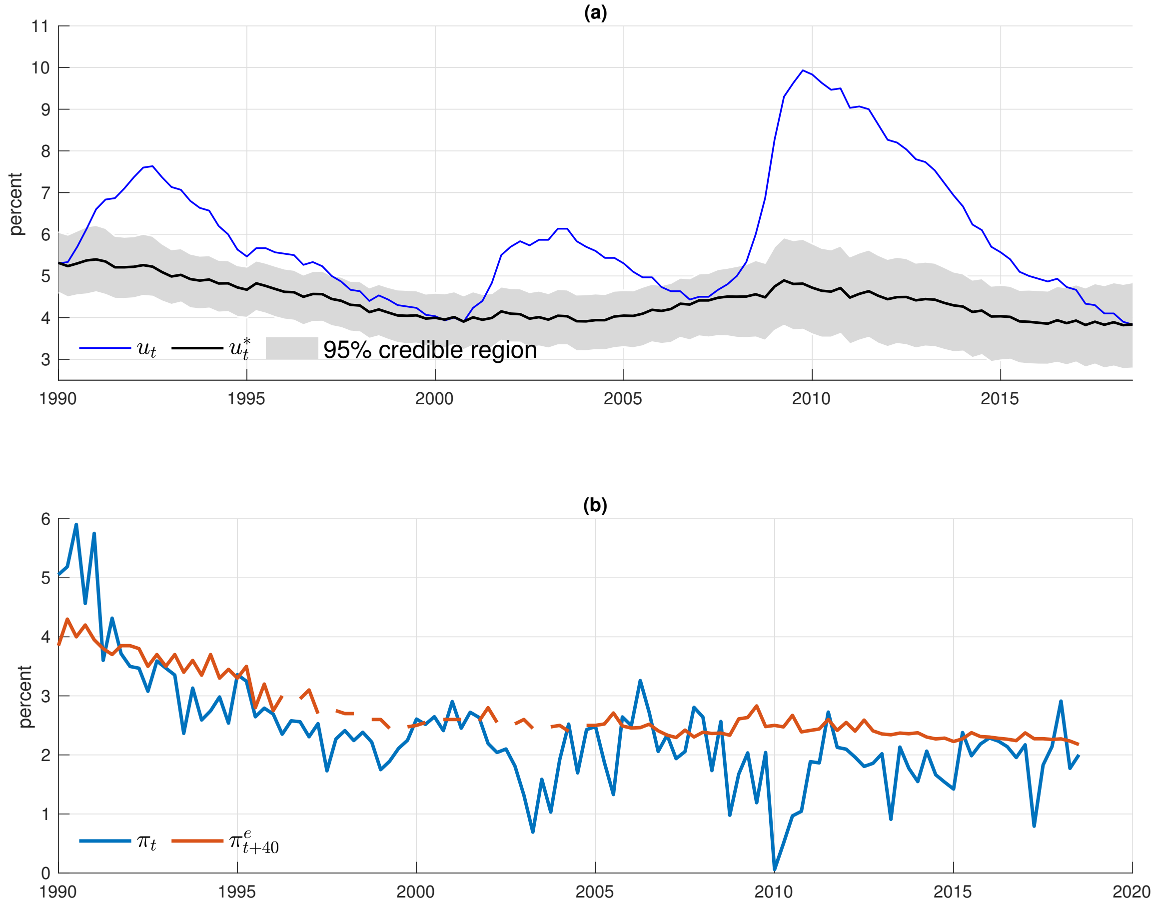

FIGURE 2.1. Post-1990 estimate of u_t^* based on model 4 (a) and data on inflation and long-term inflation expectations (b).

To illustrate this point, figure 2.1.a presents the evolution of u_t^* according to model 4, when this model is estimated using only post-1990 data. Notice that the implied path of u_t^* is remarkably similar to the one based on the full-sample estimation of the same model, plotted in figure 1.1.d.

It is important to realize, however, that this powerful role of inflation expectation data in the estimation of the Phillips curve also comes with a disadvantage. The cost is the sensitivity of the estimate of u_t^* to the exact measurement of inflation expectations, which is notoriously difficult. For example, figure 2.1.b plots the time series of long-term inflation expectations used for the estimation of model 4 (and the baseline model of CEGS). These expectations appear to be "upward biased," as agents systematically expect inflation in the long run to be higher than current inflation. Given that these survey data effectively pin down the level of π_t^*, this implies that actual inflation is almost always below target. In turn, this explains why the unemployment gap is almost always positive in figure 2.1.a.

To illustrate the sensitivity of u_t^* to the measurement of inflation expectations, figure 2.2.a plots the implied evolution of u_t^* when I re-estimate the model on post-1990 data, using a modified long-term inflation expectation series that is artificially set to 2% after year 2000 (figure 2.2.b). The figure makes clear that the estimate of u_t^* would shift considerably in this counterfactual scenario, implying a substantially negative unemployment gap in 2018. This finding suggests that the Phillips curve is still relatively flat, despite being estimated quite robustly due to the explicit use of data on inflation expectations.

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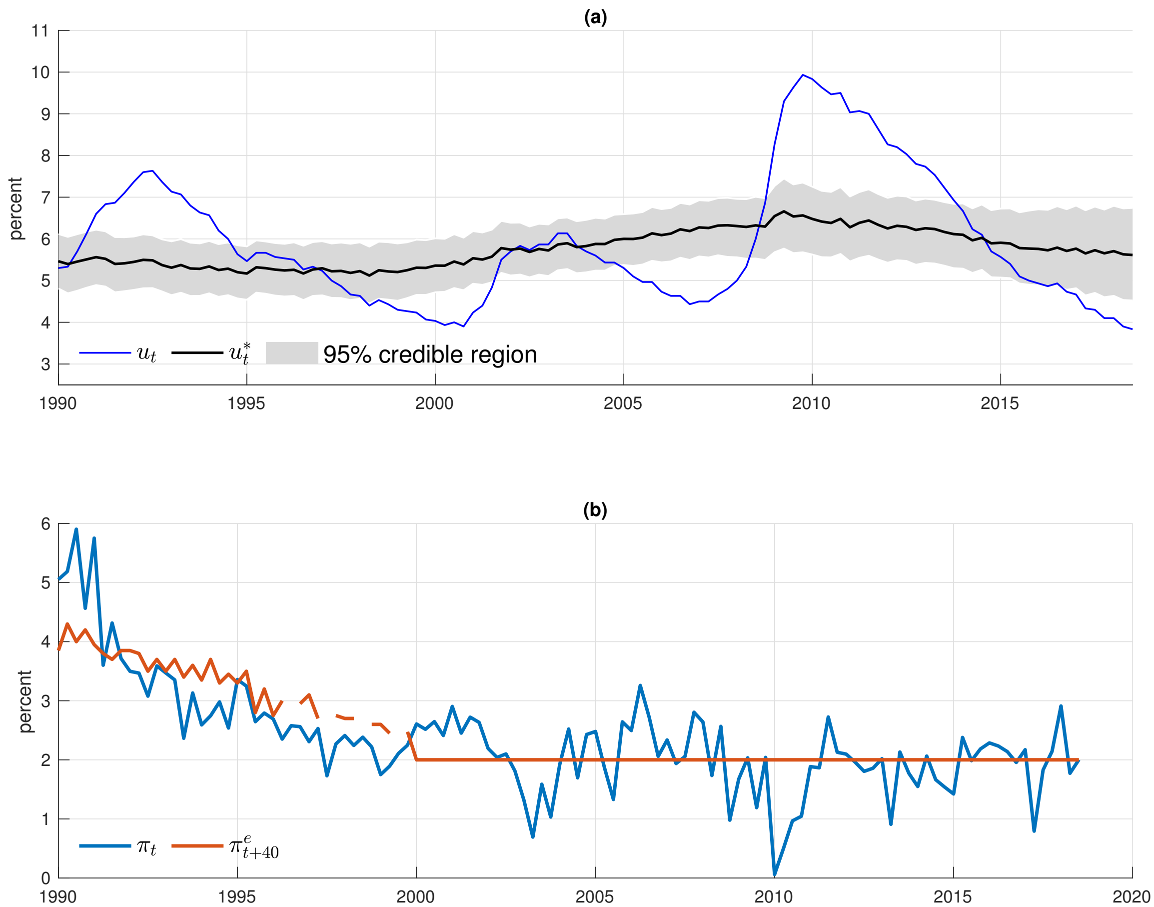

FIGURE 2.2. Post-1990 estimate of u_t^* based on model 4 (a) obtained using actual inflation data and artificial data on inflation expectations (b).