ECON 280 - Part 4: Extensions

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1. Extend one result from the paper. This can come in a variety of forms. For example, you can suggest a robustness check and then estimate the robustness check. You could explore heterogeneity across different covariates. For whatever extension you choose, write a paragraph that describes the extension. If appropriate you should also include equations that show the estimating equation for your extension.

The Phillips curve is a formal way of capturing the common idea that when the economy is booming, strong demand pushes workers to request higher wages, and firms respond by raising prices. One well-known version of this relationship is the New Keynesian Phillips Curve, expressed as:

$$\pi_t = \beta E_t \pi_{t+1} - \kappa \left(u_t - u_t^n\right) + \nu_t.$$

Here, inflation π_t is determined by three key factors: expected future inflation, $E_t\pi_{t+1}$; the output gap (the difference between the unemployment rate, u_t, and the natural rate of unemployment, u_t^n); and cost-push shocks, ν_t. The parameter κ represents how sensitive inflation is to changes in the output gap, essentially showing the impact of demand pressures.

In their main results, the authors calibrate $\beta = 0.99$ to reflect the idea that firms are highly forward-looking when setting prices. However, this assumption might overestimate how far ahead firms actually plan. To address this, they experimented with lower values of β and re-estimated κ. When β was reduced from 0.99 to 0.9, κ approximately doubled, indicating that the Phillips curve becomes steeper as firms become less forward-looking.

It is worth noting that β could have an even larger impact in certain scenarios. For instance, Galí (2008) demonstrates that if agents believe there is a 25% chance that others are not paying attention to policy announcements, this uncertainty could weaken the effectiveness of forward guidance by about 90% over five years. Furthermore, recent studies (e.g., Angeletos and Lian, 2018; Gabaix, 2020) show that similar deviations from full rationality lead to a Phillips curve that depends less on expectations.

To explore this further, I conducted a robustness check where β took on more extreme values, such as 0.80 or 0.75.

Table **??** presents the estimated slope of the Phillips curve (κ) under different calibrations of β, which reflects how forward-looking firms are in setting prices. When $\beta = 0.99$, the estimate for κ is

0.0062, indicating relatively low sensitivity of inflation to the output gap under the assumption that firms place significant weight on future expectations. However, as β decreases to 0.80, κ triples to 0.0189, and for $\beta = 0.75$, κ further increases to 0.0228. These results suggest that inflation becomes considerably more responsive to changes in demand as firms become less forward-looking.

The standard errors, reported in parentheses, increase as β declines, reflecting greater uncertainty in the estimates of κ for lower values of β. This could indicate heightened volatility in a world where firms rely less on future expectations. The inclusion of state and time effects in all specifications ensures robustness by accounting for unobserved heterogeneity across regions and temporal trends.

These findings have important implications for monetary policy. The steepening of the Phillips curve at lower values of β suggests that inflation reacts more strongly to fluctuations in demand, requiring more aggressive policy interventions to stabilize prices. While the standard assumption of $\beta = 0.99$ aligns well with the dynamics of developed economies, the higher κ values observed under $\beta = 0.80$ or $\beta = 0.75$ may be more relevant for contexts such as developing economies or settings characterized by greater uncertainty, higher deficits, or, in general, less anchored inflation expectations.

Table 1: Estimate of κ as Calibrated Value of β Varies

	$\beta = 0.99$	$\beta = 0.80$	$\beta = 0.75$
	(1)	(2)	(3)
κ	0.0062	0.0189	0.0228
	(0.0025)	(0.0074)	(0.0089)
State Effects	Yes	Yes	Yes
Time Effects	Yes	Yes	Yes

Notes: This table presents estimates of κ from regression equation (17), with different calibrated values of β. The outcome variable is cumulative non-tradeable inflation over four quarters, measured in percentage points. The regressors are discounted future sums of quarterly state unemployment, in percentage points, and the relative price of non-tradeables, in 100 x log points. Both sums are truncated at 20 quarters. In all columns, we estimate κ by two-sample two stage least squares, and apply the correction to our standard errors from Chodorow-Reich and Wieland (2019). We include time and state fixed effects. The sample period is 1978-2018. Standard errors are reported in parentheses, clustered by state.