Why Does the Zero Lower Bound Cause High Unemployment? A Harder Question than You Think

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SED Zero Lower Bound Session
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Large adverse shift in product demand, resulting from the financial crisis and household deleveraging
The topic

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Monetary policy responded by cutting the short-term nominal interest rate to its minimum value of zero
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The real interest rate is stuck well above its market-clearing level.
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unless it is extended.
Technology, product demand, and derived unemployment

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\[ u = 1 - \frac{D(r)}{A\bar{n}} . \]
DMP model of unemployment

\[ u = U(A) \]
Equilibrium real rate

\[ U(A) = 1 - \frac{D(r^*)}{\bar{A}n} \]
The clash at the zero lower bound

At the zero lower bound, the real rate is minus the inflation rate: \( r = -\pi \).
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The unemployment rate derived from the DMP model differs from the unemployment rate on the right side, derived from the product market.
THE CENTRAL BANK’S INFLUENCE OVER INFLATION

Suppose the central bank has a policy lever that controls the rate of inflation $\pi$. 
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Any reasonable central bank would pick a rate of inflation that exceeded minus the equilibrium real interest rate ($\pi > -r^*$), so that the nominal rate would be positive in equilibrium and the zero bound would cause no mischief.
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The zero lower bound binds when the central bank loses control of the rate of inflation.
Some key papers on the sources of negative equilibrium interest rates

Krugman (1998) is the foundation of modern ZLB economics; expected consumption shrinkage the source of negative rate

Eggertsson and Woodford (2003) enriched the Krugman model; low rates from higher consumer patience

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Why the equilibrium real rate is low

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\frac{u'(c_t)}{\beta u'(c_{t+1})} = 1 + r
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(1) High value of the discount ratio \(\beta\).

(2) Consumption shrinkage, so marginal utility is higher next period.
Response to shock with standard DMP labor market
**Extended DMP model**

\[ u = U(A, \pi) \]
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Much of the rest of the talk is about the mechanism underlying the negative dependence.
EQUILIBRATION WITH A NEGATIVE DEPENDENCE OF DMP UNEMPLOYMENT ON INFLATION

[Graph showing the relationship between inflation rate and unemployment rate in the labor market and the product market, with a negative dependence indicated by the slopes of the lines.]
Basic conclusion

If the DMP curve is steeper than the product-market curve, a drop in product demand raises inflation.
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Evidence is reasonably conclusive that a drop in product demand lowers inflation.

Thus, to resolve the clash between theories of unemployment by introducing a dependence of DMP unemployment on the inflation rate, the DMP labor-market curve must be flatter than the product-market curve.
The DMP model of unemployment

The unemployment rate $u$ measures the tightness of the labor market.
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The increasing function $h(u)$ is the recruiting success rate, the per-period probability of filling a vacancy.
$J$ is the job value, the present value of the benefit of a match to the employer.
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The cost of recruiting (holding a vacancy open) is $\gamma$ per period.
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Result is a stable decreasing relationship, $J_Z(u)$, between unemployment and the job value.
Employer and job candidate bargain over the job value, \( J \).
Wage determination

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$$J = \tilde{J}(u, A, \pi)$$
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The only fundamental limitation is that $J$ lies in the parties’ bargaining set: $0 \leq J \leq \text{candidate’s reservation value}$. 

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DMP Account of an Increase in Unemployment Caused by a Decline in Productivity

Unemployment rises

Productivity falls

Zero profit, $J_z(u)$

Nash bargain wage determination, $J_D(u,p)$

Job value, dollars

Unemployment rate, percent

4,000
3,500
3,000
2,500
2,000
1,500
1,000
500
0
4 5 6 7 8 9 10 11
Getting inflation into the wage-determination function

Walsh (2003): Sticky prices result in variations in market power, which enters $\tilde{J}$ because market power shifts the marginal revenue product of labor.
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No departure from strict rationality.
Slope of the price- and wage-adjustment block in GST

Use monetary shock as an instrumental variable that moves the model along its price-wage adjustment curve without shifting that curve.
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Measure is the ratio of (1) the impulse response function of unemployment to the monetary shock to (2) the impulse response function of inflation to the monetary shock.
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Measure is the ratio of (1) the impulse response function of unemployment to the monetary shock to (2) the impulse response function of inflation to the monetary shock.

At four quarters past the shock, the ratio is 3.3 percentage points of increased unemployment per percentage point of decreased inflation.
Other measures of the labor-market slope

A simple calculation based just on the extended DMP model gives a slope of 3.8.
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Between October 2008 and October 2009, unemployment rose 3.5 percentage points and inflation fell by 0.5 percentage points, for a slope of 7, on the reasonable assumption of no shift of the labor-market curve.
SLOPE OF THE GST PRODUCT-MARKET CURVE

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PRODUCT-MARKET CURVE

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Slope is

\[
\frac{f_{u,\eta}}{f_{r,\eta} - f_{\pi,\eta}}
\]

where \( f_{u,\eta} \) is the impulse response function 4 quarters out for the effect of the wage markup shock \( \eta \) on unemployment \( u \), and similarly for the nominal interest rate \( r \) and the rate of inflation \( \pi \).
Value of the slope is 0.6.
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Thus the GST model easily satisfies the criterion for resolving the clash between the product market and the labor market.
The U.S. economy in October 2008 and October 2009, while at the zero lower bound.
The rightward shift of the product-market curve is 3.2 percentage points.
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If the rate of inflation had remained constant despite the recession, the unemployment rate would have risen from 6.6 percent to 9.8 percent rather than to 10.1 percent.
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The downward slope of the labor-market curve somewhat amplified the effect of the negative shock to product demand, from 3.2 percentage points of unemployment to 3.5 points.
Effect of Product-Demand Shock on Unemployment