Stagnation Traps

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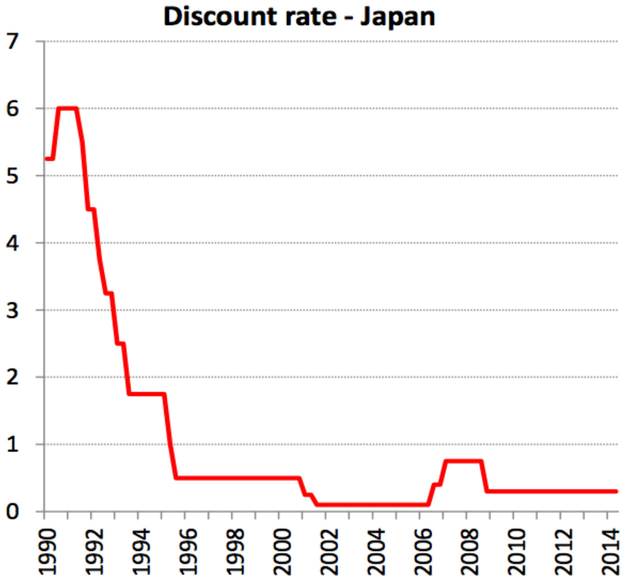
Research question and motivation

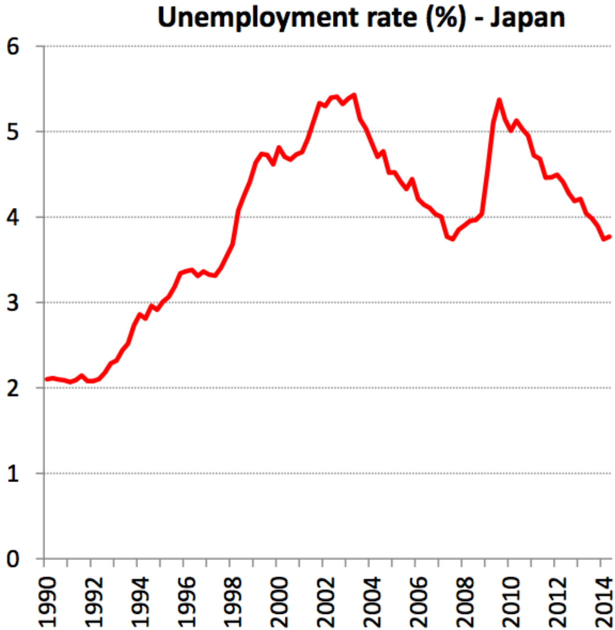
Can insufficient aggregate demand lead to economic stagnation?

- This question goes back, at least, to the Great Depression
- Recently, renewed interest due to:
  - Two decades-long stagnation affecting Japan since early 1990s
  - Slow recoveries from 2008 financial crisis in US and Euro Area
- All these episodes featured:
  - Long-lasting slumps with policy rates close to zero lower bound
  - Weak potential output growth

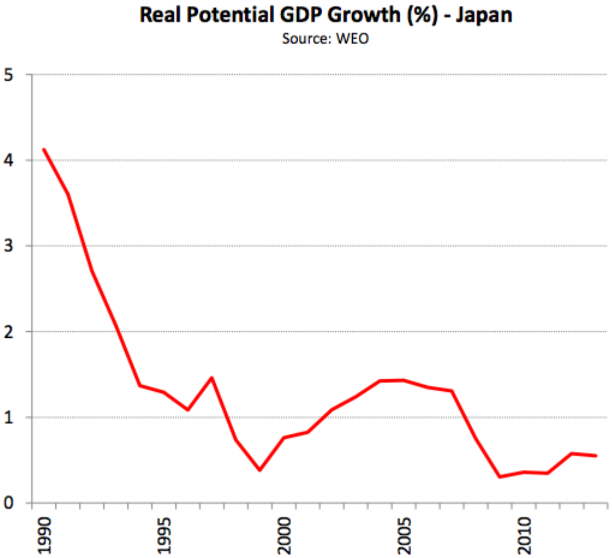
Discount rate - Japan (1990-2014)



Unemployment - Japan (1990-2014)



Potential output growth - Japan (1990-2014)



This paper

- Keynesian Growth framework
  - Unemployment due to weak demand when monetary policy is constrained by the zero lower bound
  - Growth is the result of investment by profit-maximizing firms
- Two-way interaction between aggregate demand, interest rates and growth
  - Weak aggregate demand has a negative impact on firms' profits and investment in innovation, resulting in low growth
  - Low growth depresses interest rates, thus undermining the central bank's ability to sustain demand by cutting policy rates

Overview of results

- Key result: Permanent, or very persistent, slumps characterized by high unemployment and low growth are possible

- Two steady states

  - Full employment, high growth, positive nominal rate

  - Unemployment, low growth, zero lower bound binds → stagnation trap

- Fluctuations determined by expectations and sunspots

- Policies that foster growth can eliminate the stagnation trap equilibrium if they are sufficiently aggressive

Model

Grossman and Helpman (1991) model of vertical innovation, augmented with nominal wage rigidities and zero lower bound on nominal interest rate

- Infinite-horizon closed economy, discrete time
- Continuum of measure one of differentiated goods produced by monopolistic firms
- Continuum of measure one of identical households that supply labor and consume
- Central bank that sets monetary policy

Households

- Consume differentiated goods. Quality of goods grows over time
- Unit labor endowment, no labor disutility, but unemployment possible due to nominal wage rigidities
- Own the firms. Have access to nominal bonds paying nominal interest rate i
- Households' optimization gives the Euler equation

$$c_t^\sigma = \frac{\bar{\pi} g_{t+1}^{\sigma-1}}{\beta(1+i_t) E_t \left[c_{t+1}^{-\sigma} \right]}$$

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- Focus on $\sigma > 1$: increase in growth ($\uparrow g_{t+1}$) generates rise in demand for consumption ($\uparrow c_t$)

Firms and production

- Output produced using labor $y_t = L_t$
  - $y_t = 1 \rightarrow$ full employment
  - $y_t < 1 \rightarrow$ unemployment and negative output gap
- Output can be consumed or invested in research

$$y_t = c_t + \iota_t$$

- Output produced by monopolistically competitive firms, profits are increasing in y_t

Research and innovation

- Outsiders can innovate on a product and capture monopoly profits by investing in research

- Value of a successful innovation

$$V_t = \beta E_t \left[\frac{\lambda_{t+1}}{\lambda_t} \left(\underbrace{y_{t+1} W_{t+1} (\gamma - 1)}_{\text{profits in } t+1} + \underbrace{(1 - \chi \iota_{t+1}) \, V_{t+1}}_{\text{value of leadership in } t+1} \right) \right]$$

- Growth rate of the economy (productivity growth)

$$g_{t+1} = \exp \left(\chi \iota_t \ln \gamma \right)$$

- Growth increasing in investment in innovation (ι).

Nominal wage rigidities and monetary policy

- We start by considering a simple case of constant nominal wage inflation
$$W_t = \bar{\pi} W_{t-1}$$
- Prices are proportional to wages, so CPI inflation is constant and equal to $\bar{\pi}$

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Confidence, growth and stagnation traps

Non-stochastic steady states

- **Aggregate demand**

$$\max\left((1+\bar{i})\,y^{\phi},1\right)=\frac{g^{\sigma-1}\bar{\pi}}{\beta} \tag{AD}$$

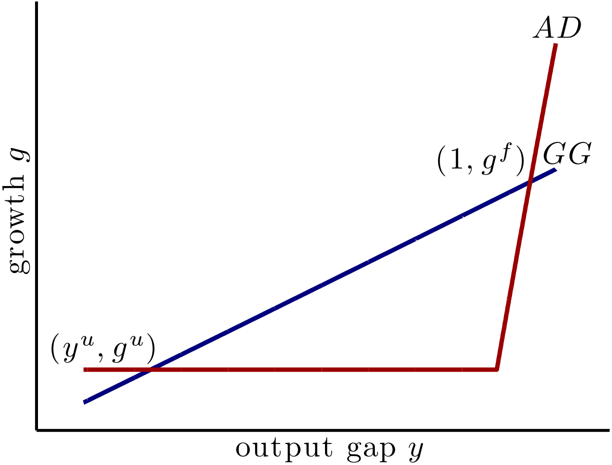
- **Growth equation**

$$\frac{g^{\sigma-1}}{\beta}+\frac{\ln g}{\ln\gamma}=\chi\frac{\gamma-1}{\gamma}y+1 \tag{GG}$$

- **Market clearing**

$$c=y-\frac{\ln g}{\chi\ln\gamma} \tag{MK}$$

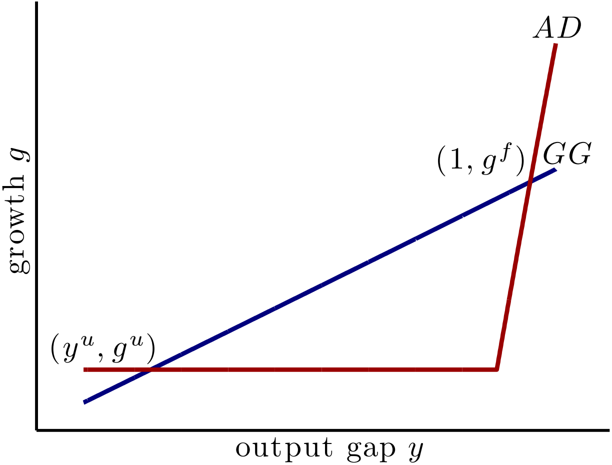
Two steady states



Understanding stagnation traps

- Aside from the usual full employment steady state, the economy can find itself in a permanent liquidity trap with:
  - Negative output gap ($y^u < 1$)
  - Weak growth ($g^u < g^f$)
  - Monetary policy constrained by zero lower bound ($i^u = 0$)
- The liquidity trap steady state can be seen as a stagnation trap, the combination of a liquidity and growth trap
- The zero lower bound constraint and the dependence of growth from the current output gap are both crucial in generating a stagnation trap

No zero lower bound



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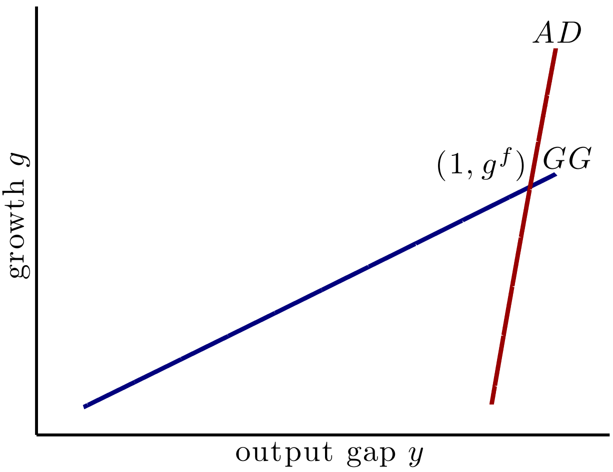
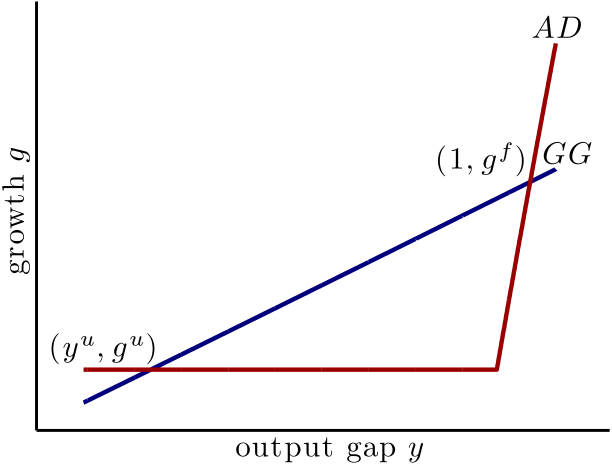


No dependence of growth from output gap



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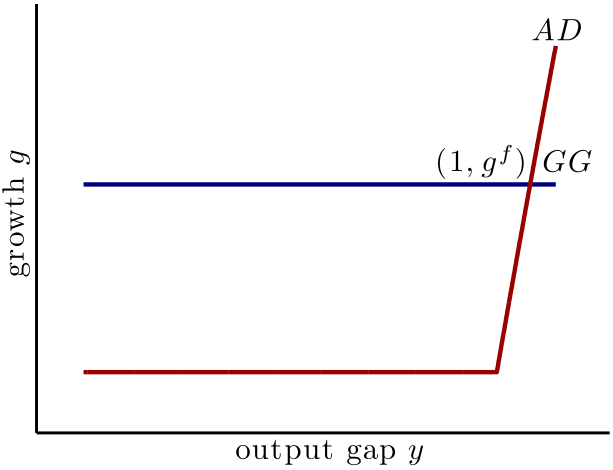


The role of confidence shocks

- Equilibrium is determined by expectations and sunspots
  - Suppose agents expect that growth will be low
  - Low expectations of future income imply low aggregate demand
  - Due to zero lower bound, central bank is not able to lower the interest rate enough to sustain full employment
  - Firms' profits are low, weak investment in innovation
  - Expectations of weak growth are verified
- $\rightarrow$ expectations of low growth can give rise to permanent, or very long lasting, liquidity traps characterized by low growth

Some extensions

1. Model can generate temporary liquidity traps arising from pessimistic expectations about future growth link

2. With precautionary savings, it is possible to have a liquidity trap steady state with positive inflation and positive growth link

3. Results robust to the introduction of a Phillips curve link

Policy implications

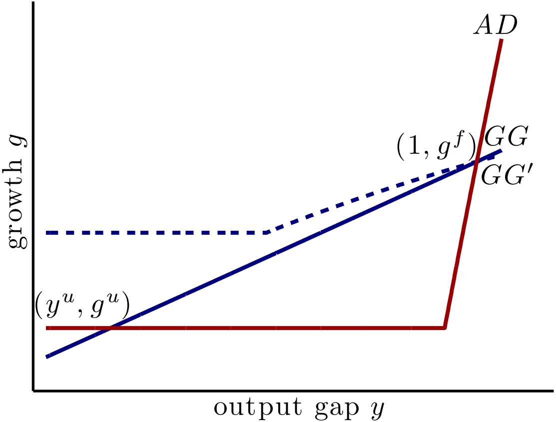
Growth policies during a stagnation trap

- Recent emphasis on job creating growth

- Indeed, an appropriately designed growth policy can eliminate liquidity traps driven by confidence shocks

- Consider a countercyclical subsidy to innovation $s_t = s(1 - y_t)$

Countercyclical subsidy (cont'd)



Conclusions

- We develop a Keynesian growth model in which endogenous growth interacts with the possibility of slumps driven by weak aggregate demand

- The model features two steady states. One is a stagnation trap, a permanent liquidity trap characterized by weak growth

- Large policy interventions to support growth can lead the economy out of a stagnation trap

Thank you!

Sunspots and temporary liquidity traps

- We can also have liquidity traps of finite expected duration
- Denote a sunspot by ξ_t. Agents form their expectations after observing ξ
- Two-state discrete Markov process, $\xi_t \in (\xi_o, \xi_p)$
- ξ_o is an absorbing optimistic equilibrium, in which agents expect to remain forever around the full employment steady state
- ξ_p is a pessimistic equilibrium with finite expected duration $1/(1-q_p)$. In this state the economy is in a liquidity trap with unemployment

SUNSPOTS AND TEMPORARY LIQUIDITY TRAPS (CONT'D)

- In the pessimistic sunspot state the equilibrium is described by

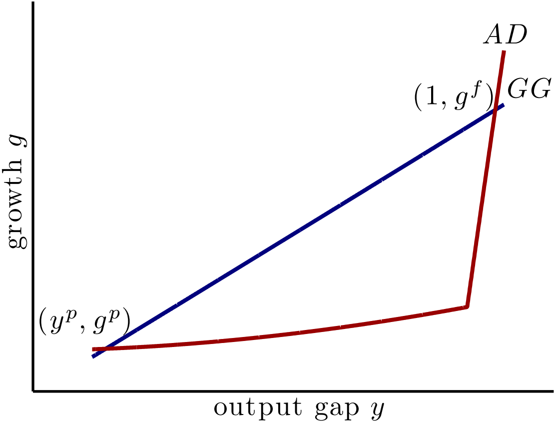
$$(g^p)^{\sigma-1} = \frac{\beta}{\bar{\pi}} \left(q_p + (1-q_p) \left(\frac{c^p}{c^f} \right)^{\sigma} \right)$$

$$\frac{(g^p)^{\sigma-1}}{\beta} = q_p \left(\chi \frac{\gamma-1}{\gamma} y^p + 1 - \frac{\ln g^p}{\ln \gamma} \right) +$$

$$+(1-q_p) \left(\frac{c^p}{c^f} \right)^{\sigma} \left(\chi \frac{\gamma-1}{\gamma} + 1 - \frac{\ln g^f}{\ln \gamma} \right)$$

$$\frac{c^p}{c^f} = \frac{y^p - \frac{\ln g^p}{\chi \ln \gamma}}{1 - \frac{\ln g^f}{\chi \ln \gamma}}$$

Sunspots and temporary liquidity traps (cont'd)



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Precautionary savings, inflation and growth

- In the benchmark model, positive inflation and positive growth cannot coexist in a permanent liquidity trap

$$g^u = \left(\frac{\beta}{\bar{\pi}}\right)^{\frac{1}{\sigma-1}}$$

- Assume that every period a household becomes unemployed with probability p

- An unemployed household receives a benefit, such that its income is equal to a fraction b of the income of employed households

- Unemployed households cannot borrow

Precautionary savings, inflation and growth (cont'd)

- Aggregate demand is given by the Euler equation of employed households

$$c_t^{\sigma} = \frac{\bar{\pi} g_{t+1}^{\sigma-1}}{\beta(1+i_t)\rho E_t\left[c_{t+1}^{-\sigma}\right]}$$

$$\rho \equiv 1 - p + p/b^{\sigma} > 1$$

- The unemployment steady state is now characterized by

$$g^u = \left(\frac{\rho\beta}{\bar{\pi}}\right)^{\frac{1}{\sigma-1}}$$

- Since $\rho > 1$, an unemployment steady state in which both inflation and growth are positive is now possible

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Introducing a Phillips curve

- Assume that nominal wages are downwardly rigid

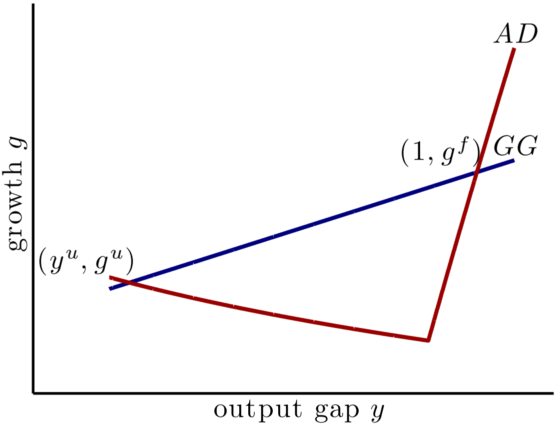
$$W_t \geq \psi\left(y_t\right) W_{t-1} \quad \text{with } \psi' > 0,\ \psi(1) = \bar{\pi}$$

- Wages more downwardly flexible if unemployment is higher $\rightarrow$ non-linear Phillips curve
- Full employment steady state is not affected ($y = 1$, $g = g^f$, $i = i^f$ and $\pi = \bar{\pi} \equiv \pi^f$)
- Growth in the unemployment steady state is now

$$g^u = \left(\frac{\beta}{\psi(y^u)}\right)^{\frac{1}{\sigma - 1}}$$

- $\uparrow$ output gap , $\uparrow$ inflation, $\downarrow$ real interest rate, $\downarrow$ growth

Steady state determination with variable inflation



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