Traded and non-traded goods

ECON4330 Spring 2010 Lecture 12

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April 29, 2010

Different market structures

Mundell-Fleming

- all goods are traded
- law of one price holds for all goods
- producers are price setters, even small countries have market power

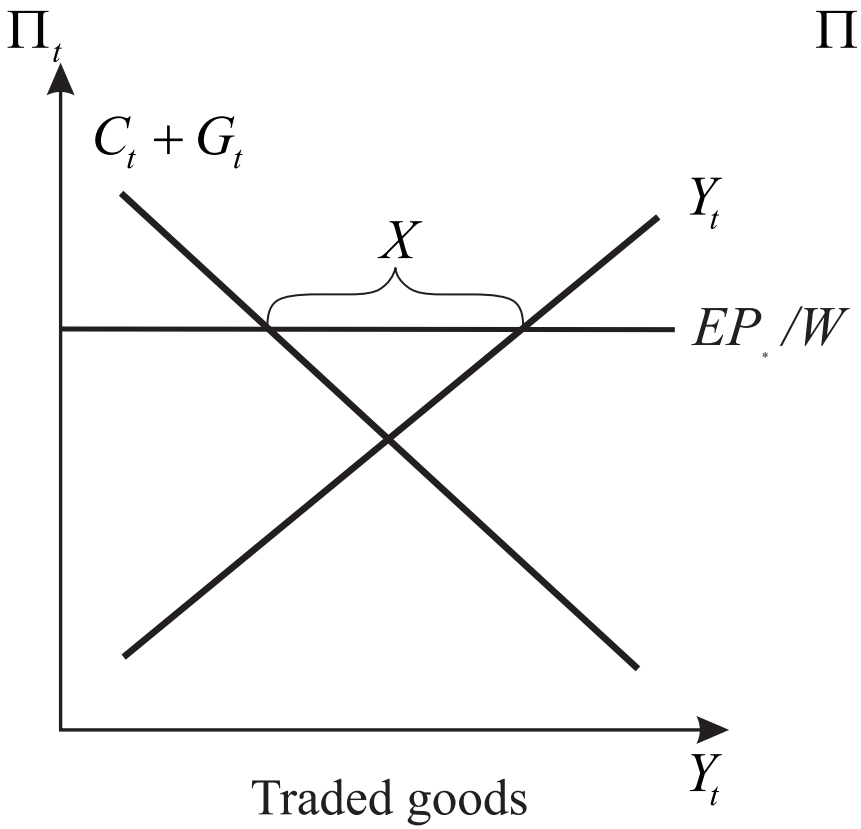
Alternatives

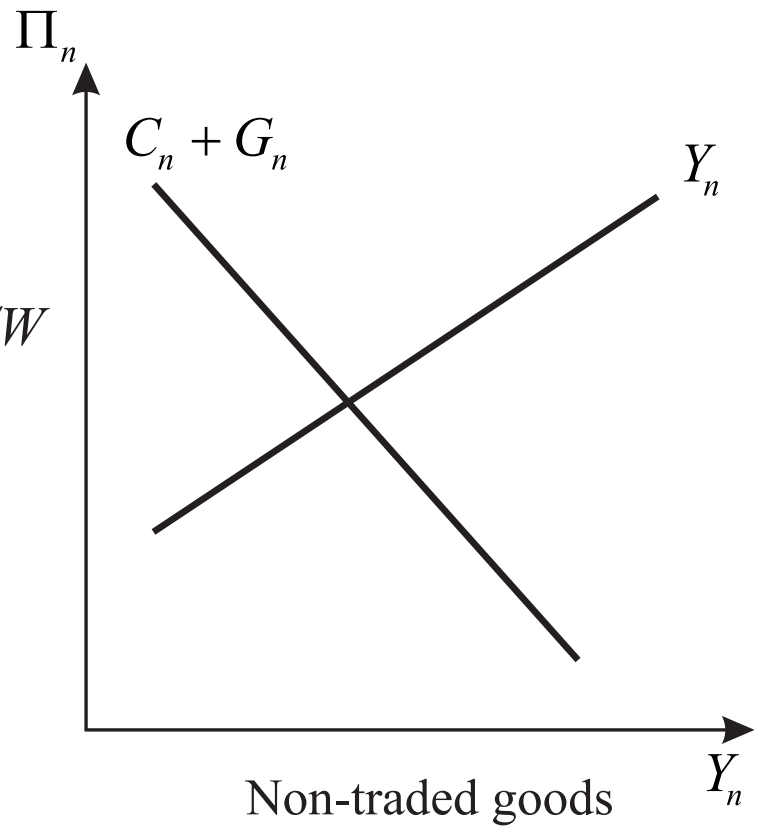
- non-traded goods
- competitive international markets
- pricing to market (price discrimination)
- local currency pricing
- multinationals, outsourcing

Assumptions

- Small open economy
- Two goods:
  - traded, subscript t
  - non-traded, subscript n
- Producers of traded goods are price takers
- Labor is mobile between sectors
- Nominal wage given
- Fixed exchange rate

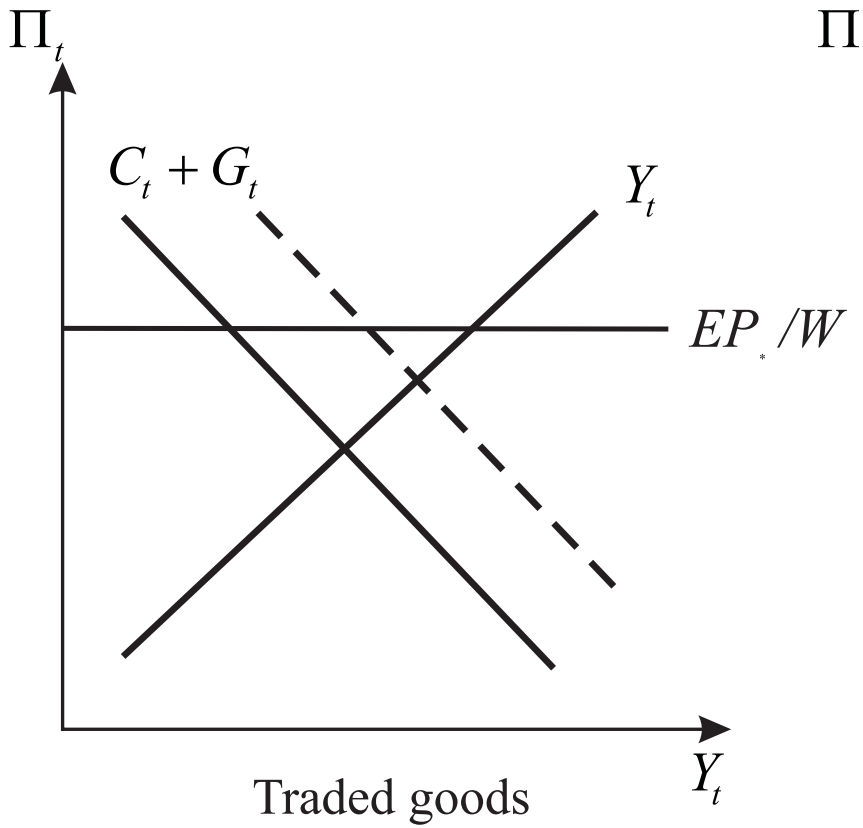
Short-run equilibrium

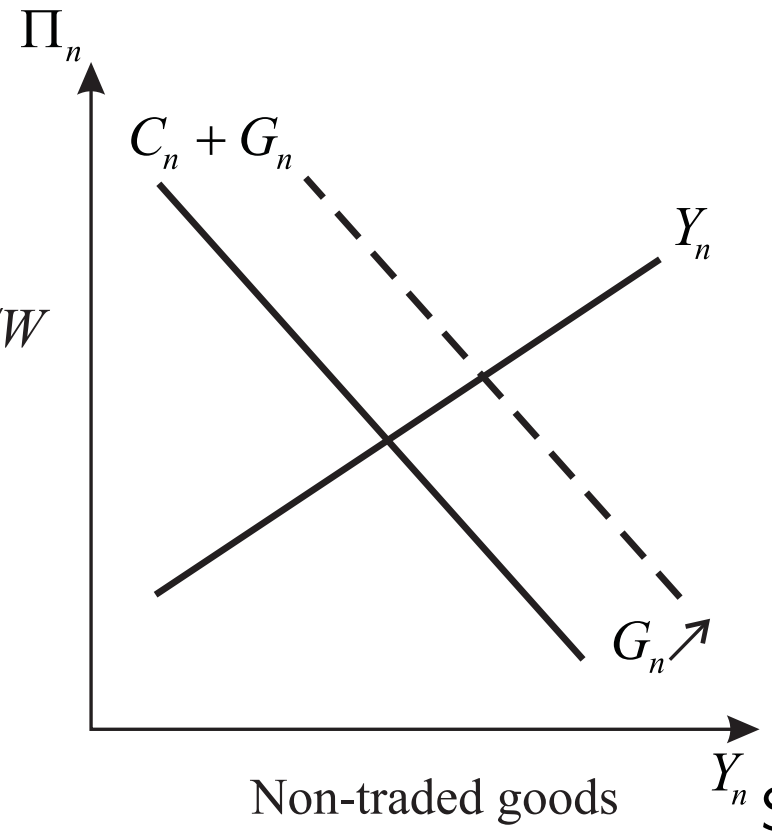




$\Pi_i = P_i/W$ = real price, Y_i = output, C_i, G_i = consumption, $\Pi_t = EP*/W$

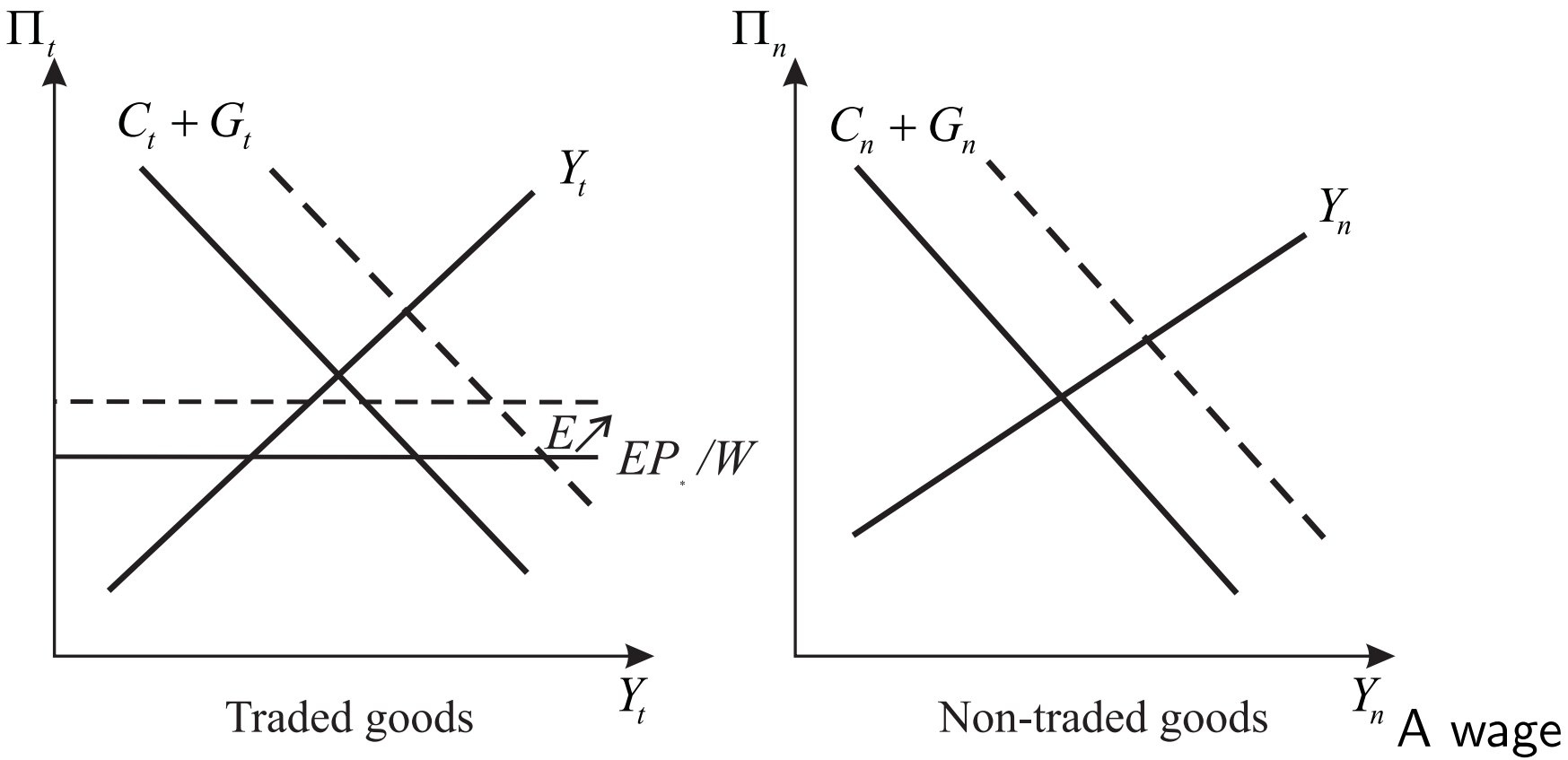
Effect of increased G_n





Start with Y_t, then Y_n, then C_t, then X_t

Devaluation



increase has the opposite effect of a devaluation

Medium-run dynamics

The temporary equilibrium:

$$N = N(\underset{-}{\omega_t}, \underset{+}{G_n}, \underset{-}{\tau}) \tag{1}$$

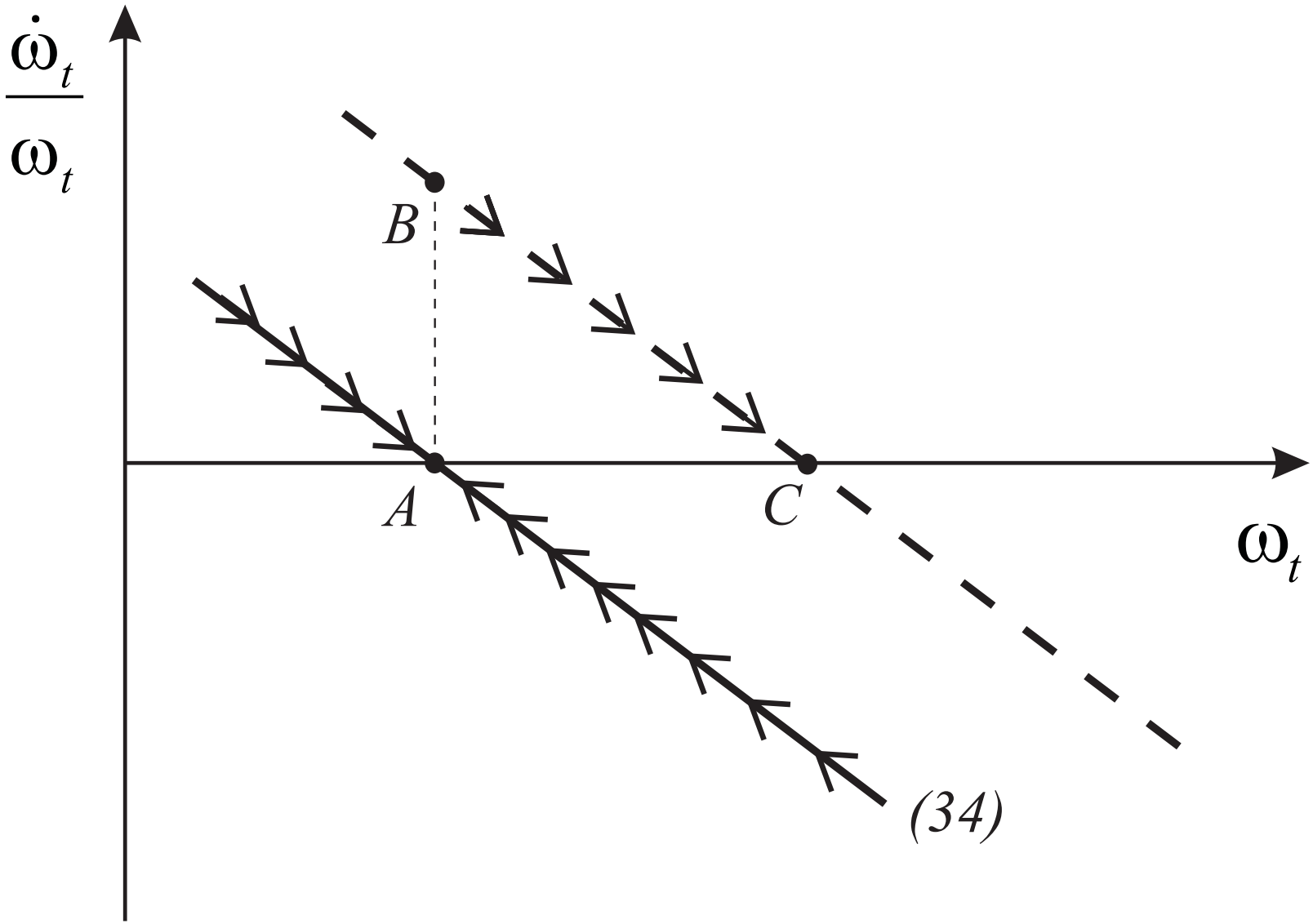
$\omega_t = W/EP_* = \Pi_t^{-1} =$ real wage
Phillips curve:

$$\frac{\dot{\omega}_t}{\omega_t} = \gamma[N(\omega_t, G_n, \tau) - \bar{N}] \tag{2}$$

Negative feed-back: High ω_t means $\dot{\omega}_t$ negative
Stationary equilibrium:

$$N(\omega_t, G_n, \tau) = \bar{N} \tag{3}$$

Wage dynamics



Hig

government expenditure - Smaller traded-goods sector

The Scandinavian model of inflation: Assumptions

- Two industries, traded and non-traded
- Small country, price taker for traded goods
- Fixed exchange rate
- Constant labor shares
- Same wages in both sectors

The Scandinavian model of inflation: Equations

$$
\begin{aligned}
p_t &= e + p_{t*} && (1)\\
w &= p_t + a_t && (2)\\
p_n &= w - a_n && (3)\\
p &= \alpha p_n + (1-\alpha) p_t && (4)
\end{aligned}
$$

Endogenous: p_t, p_n, p and w.
Exogenous: p_{t*}, e, a_t and a_n.

Symbols

p_t Traded goods inflation $\dot{P}_t/P_t$

p_n Non-traded goods inflation $\dot{P}_n/P_n$

p_{t*} Traded goods inflation abroad $\dot{P}_{t*}/P_{t*}$

p Average rate of inflation

e Rate of depreciation $\dot{E}/E$

w Rate of wage increases $\dot{W}/W$

a_t Rate of productivity growth in t-industry

a_n Rate of productivity growth in n-industry

α Weight on non-traded goods in the consumer price index

Solution: Fixed exchange rate

Wage growth determined by imported inflation and productivity growth in t-industry (insert (1) in (2)):

$$w = e + p_{t*} + a_t \tag{5}$$

Price growth on n-goods:

$$p_n = w - a_n = e + p_{t*} + a_t - a_n \tag{6}$$

Overall inflation rate determined by imported inflation and gap in productivity growth:

$$p = e + p_{t*} + \alpha(a_t - a_n) \tag{7}$$

Growth in real wage

$$w - p = \alpha a_n + (1 - \alpha)a_t \tag{8}$$

Summary of results

Nominal wage growth determined by the "scope", the sum of

- productivity growth in t-industry
- price increases on t-goods

Overall inflation determined by

- imported inflation (price growth on t-goods)
- the gap in productivity growth between the *t*- and *n*-industries.

Real wage growth determined by

- average productivity growth in the economy

Some questions

- Why fixed labor share?
  - Cobb-Douglas?
  - Monopolistic pricing in n-industry?
  - Property of bargaining outcome in t-industry?
  - Property of steady state when the required rate of return on capital is constant (perhaps given in international capital markets)
- Descriptive or normative?
- What if exchange rate is floating?

Solution: Inflation target

Same equations but $p = \bar{p}$ exogenous, e endogenous
Twist equation for growth in real wage (8):

$$w = \bar{p} + \alpha a_n + (1 - \alpha) a_t \tag{9}$$

$$p_n = w - a_n = \bar{p} + (1 - \alpha)(a_t - a_n) \tag{10}$$

$$p_t = w - a_t = \bar{p} + \alpha(a_n - a_t) \tag{11}$$

$$e = p_t - p_{t*} = \bar{p} - p_{t*} + \alpha(a_n - a_t) \tag{12}$$

Results: Inflation target

- Nominal wage growth equal to inflation target plus average productivity growth
- Real wage growth equal to average productivity growth
- Nominal rate of depreciation determined by
  - difference between inflation target and international inflation on traded goods
  - sectoral gap in productivity growth

Bringing in the rest of the world

Assume:

- same equations
- same share of non-traded goods
- always inflation target $\bar{p}_*$

Analogous to (11):

$$p_{t*} = w_* - a_{t*} = \bar{p}_* + \alpha(a_{n*} - a_{t*}) \tag{13}$$

Also

$$w_t - a_t = p_t = e + p_{t*} = e + w_{t*} - a_{t*}$$

Real exchange rates

Irrespective of monetary regime at home:

$$w - a_t = e + w_* - a_{t*} \tag{14}$$

$$p = e + \bar{p}_* + \alpha[(a_t - a_n) - (a_{t*} - a_{n*})] \tag{15}$$

(14) Implies constant real exchange rate in terms of unit wage costs for traded goods

(15) Implies relative PPP in consumer prices, but only if sectoral gaps in productivity growth are equal

(15) Can be used to determine p under fixed rates, e under inflation targeting

A wider context

Scandinavian model describes the relationship between the growth rates of prices and wages in the steady state of a dynamic two-sector model with:

- Competitive markets
- Homogenous production functions in labor and capital in both markets
- Labor mobile between sectors
- Capital for financing investments can be obtained from competitive international markets at a constant real rate

The dynamic model determines *levels*, not just rates of change (CH. 7.4-7.5)

Temporary deviations from the "main course"

Links between profitability, wage growth and investment help produce convergence to steady state

Wage formation as a stabilizing mechanism

Simplify:

- No productivity growth
- Prices on n-goods always grow with the same rate as wages

Assume wage growth determined by:

$$\dot{W}/W - \dot{P}_t/P_t = G(N(W/P_t), W/P_t) \tag{16}$$

1. Demand pressure in the labor market, $G_1 > 0$
2. Profitability in traded goods industry, $G_2 < 0$

Define real wage $\omega_t = W/P_t$, write (16) as

$$\dot{\omega}_t = G(N(\omega_t), \omega_t) \tag{17}$$

$$\dot{\omega}_t = G(N(\omega_t), \omega_t)$$

Stable differential equation in ω_t (assuming $N' < 0$)

$$\frac{d\dot{\omega}_t}{d\omega_t} = G_1 N' + G_2 < 0$$

Conclusions

- In steady state $\dot{\omega}_t = 0$, $\dot{w} = \dot{e} + \dot{p}_{t*}$, and the equations of the Scandinavian model holds
- Concern in wage bargaining for profitability of t-industry contributes to stability irrespective of monetary regime
- Shifts in labor demand may produce equilibria with different levels of N and ω_t (see Ch. 7.3).
- Active use of the interest rate still required to produce nominal stability both with an exchange rate target and an inflation target

Caution: An equilibrium with a high W/P_t can be undermined in the long run by lack of investment in traded-goods industry.