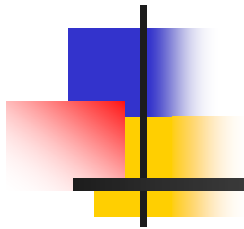


Modern International Macroeconomics



Prof. Dr. Paul J.J. Welfens

www.eiiw.eu

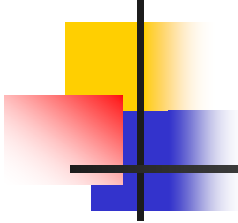
Wuppertal University (Schumpeter
School) and Sciences Po,
Paris 2008/2009; this version update 2015
© Welfens, 2015



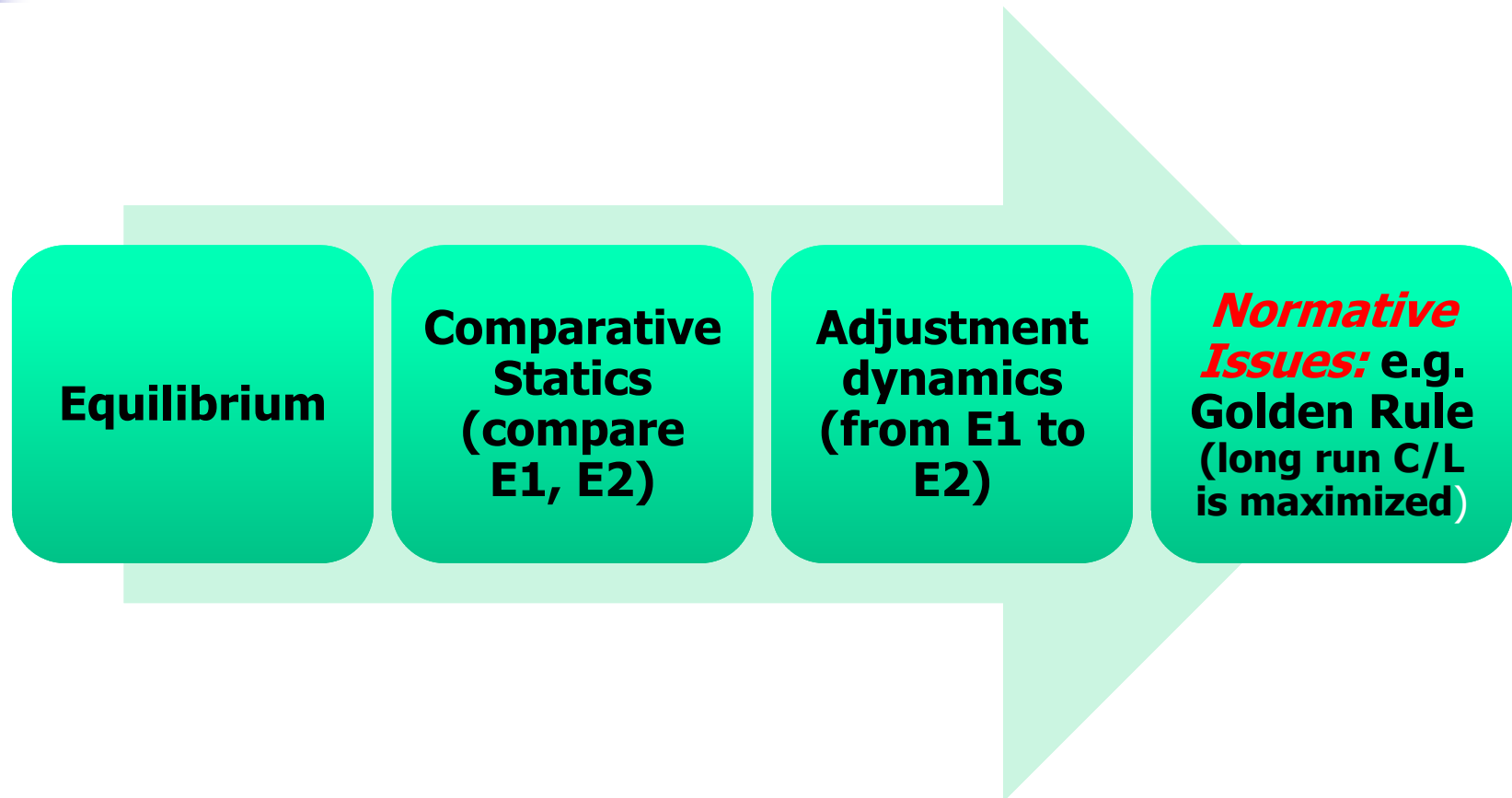


Macroeconomics as an Analytical Tool

- Standard international macroeconomics is a refined body of research (and teaching; Obstfeld/Rogoff, Foundations of International Macroeconomics):
 - Intertemporal Trade and the Current Account Balance
 - Dynamics of Small Open Economies
 - The Life Cycle, Tax Policy and the Current Account
 - The Real Exchange Rate and the Terms of Trade
 - Uncertainty and International Financial Markets
 - Imperfections in International Capital Markets
 - Global Linkages and Economic Growth
 - Money and Exchange Rates under Flexible Prices
 - Nominal Price Rigidities: Empirical Facts & Basic Open-Economy Models
 - Sticky-Price Models of Output, the Exchange Rate and the Current Account



Explaining Equilibrium and Dynamics of Adjustment



What is required in modern macroeconomics

- i) explaining **normal** output changes, current account dynamics; unemployment, inflation, oil price (?deflation)
- ii) explaining international **economic crisis** (start, diffusion), policy options and policy actually implemented
- iii) macroeconomic dynamics in a **period of economic globalization**: trade, foreign direct investment, migration, internet, regional integration

A decorative graphic on the left side of the slide features a vertical black line intersected by a horizontal black line. To the left of these lines are three overlapping squares: a yellow one at the top, a red one in the middle, and a blue one at the bottom.

Macroeconomics

- Explaining changes in the
 - **real economy** – output (GDP), real gross national product (GNP; real income), unemployment rate (u), consumption (C), investment (I), government expenditure (G , exogenous?), exports X , imports J ; capital intensity $k := K/L$; $y := Y/L$; A knowledge
 - and the **monetary economy**: exchange rate (e), price level (P ; $d \ln P / dt$ inflation rate), stock market price (P^*), nominal interest rate (i), real interest rate (r), price of non-renewable resources (P''); $q^* := eP^*/P$

A decorative graphic is positioned to the left of the title. It features a vertical black line intersected by a horizontal black line. To the left of these lines are three overlapping squares: a yellow one at the top, a red one in the middle, and a blue one at the bottom.

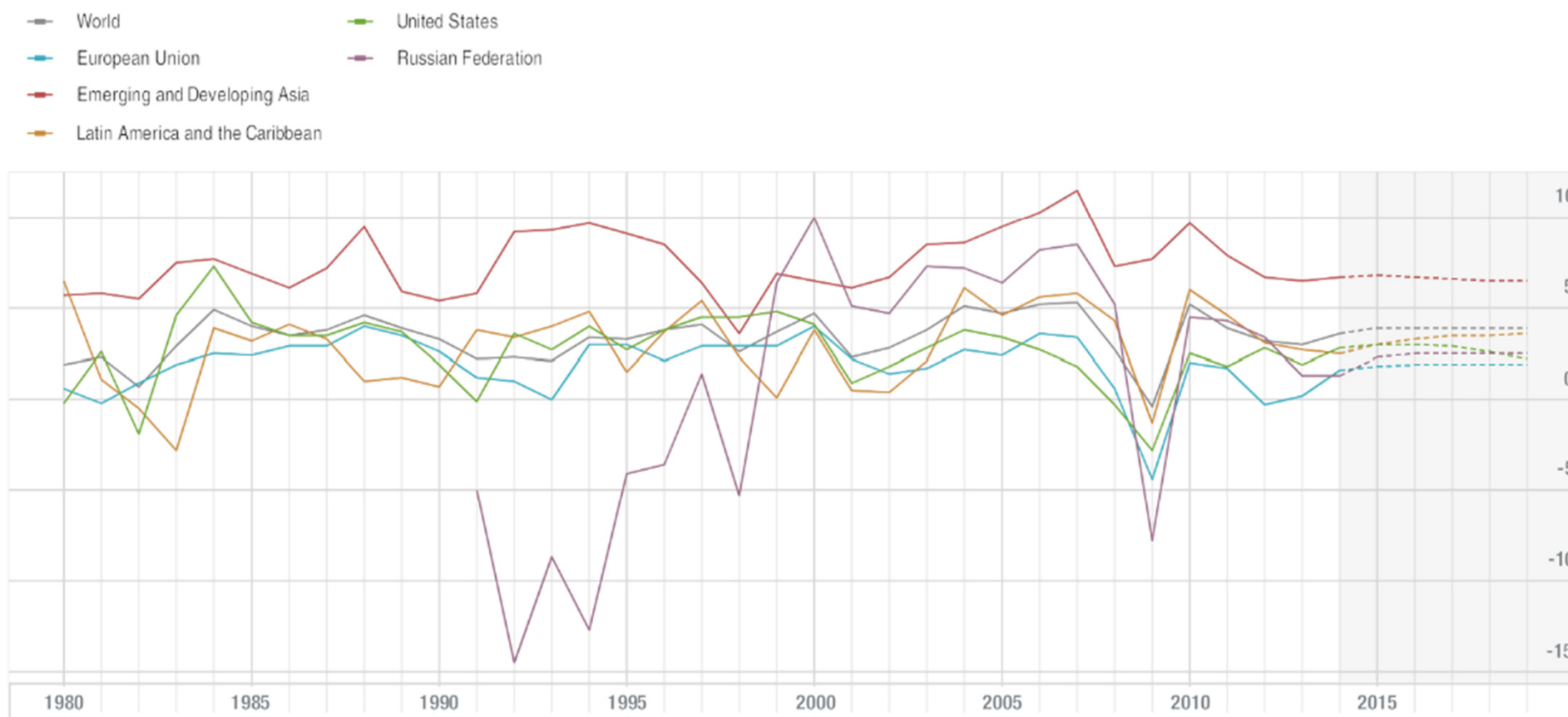
Macroeconomics

- Understanding how **economic systems** and **macro markets** work (and microeconomic foundation to that extent necessary)
- **Capital accumulation** dynamics and other real developments
- **Financial market dynamics**
- **Policy Issues**
 - Monetary policy (in country 1 and 2...)
 - Fiscal policy (in country 1 and 2); other policy

Fig. 1. Output Growth

IMF Data Mapper ®

Real GDP growth (Annual percent change)



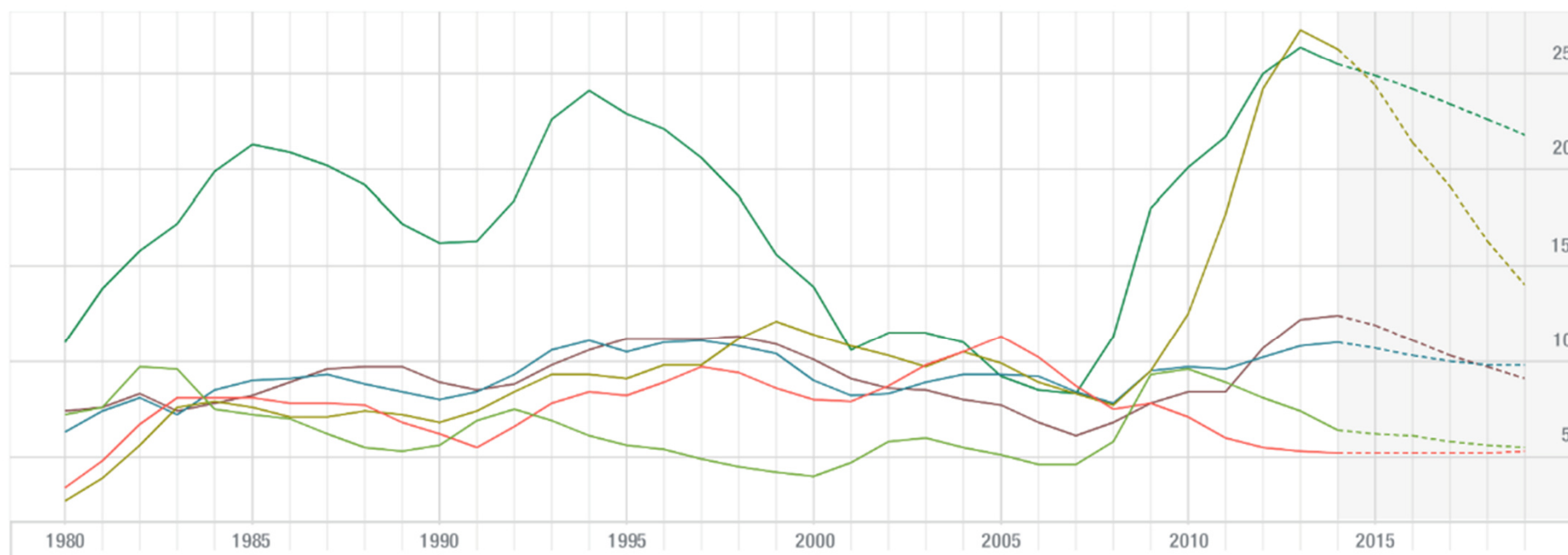
©IMF, 2012, Source: World Economic Outlook (April 2014)

Fig. 2. Unemployment Rate

IMF Data Mapper ®

Unemployment rate (Percent)

- United States
- Greece
- Germany
- France
- Spain
- Italy

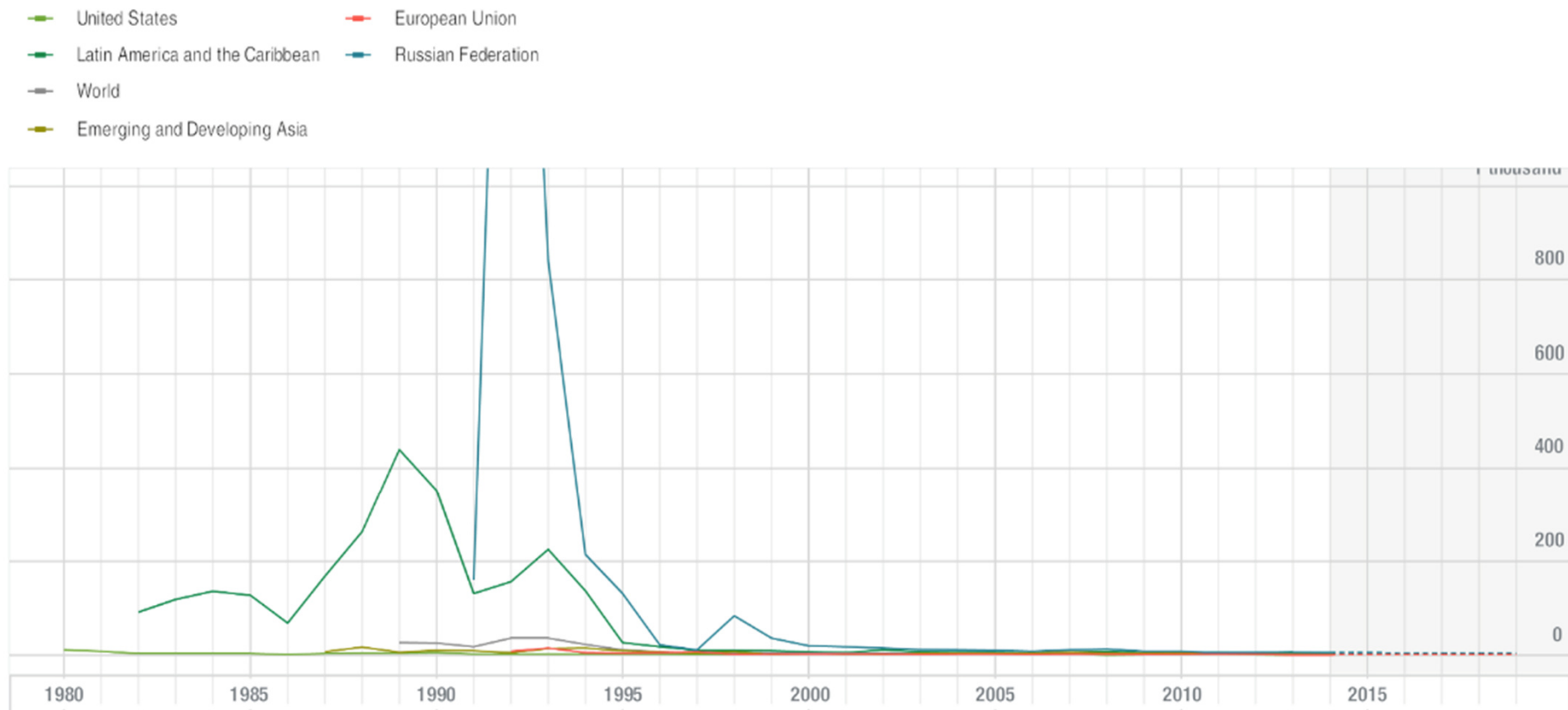


©IMF, 2012, Source: World Economic Outlook (April 2014)

Fig. 3. Inflation Rate

IMF Data Mapper ®

Inflation rate, end of period consumer prices (Annual percent change)



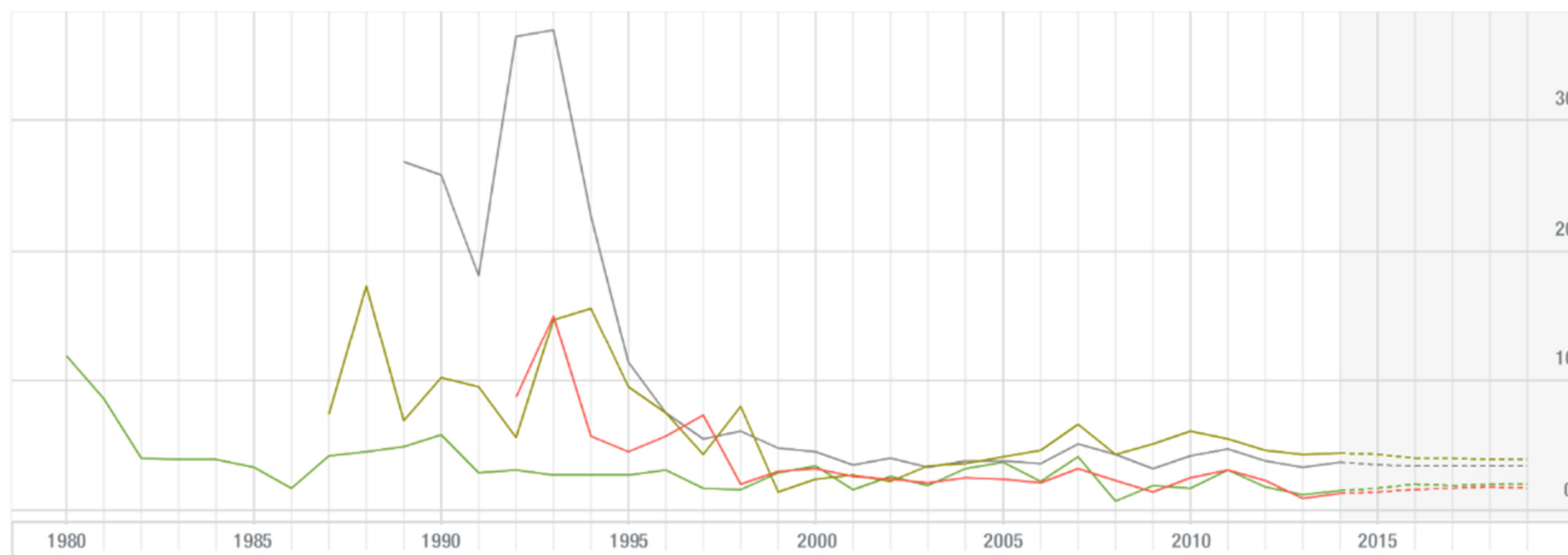
©IMF, 2012, Source: World Economic Outlook (April 2014)

Fig. 4. Inflation Rate

IMF Data Mapper ®

Inflation rate, end of period consumer prices (Annual percent change)

- United States
- World
- Emerging and Developing Asia
- European Union



©IMF, 2012, Source: World Economic Outlook (April 2014)



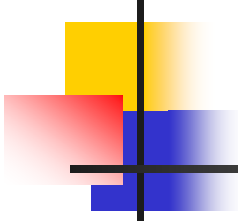
Deflation also as a problem

- **Deflation** means a negative inflation rate; that is a fall of output price index
- Deflation problems in the 1930s; generally real debt of firms and governments rises: $B/P!$; will reduce investment and output growth; fall of P raises real wage rate(unemployment!)
- Deflation possibly related to deflation expectation and negative output gap (recession) – and appreciation of the currency!
- Small inflation rate in Eurozone in late 2014/early 2015; ECB has adopted Quantitative Easing – expansionary open market policy (ECB will buy government bonds and other assets for about 1100 bill. € in 2015/2016)

A decorative graphic is positioned to the left of the title. It features a black crosshair centered over a square area. The top-left quadrant of the square is yellow, the top-right is red, and the bottom-left is blue. The bottom-right quadrant is white.

Three Types of Variables

- Endogenous (explained by model)
- Exogenous (e.g. fiscal policy: rise or fall of G)
- Pre-determined: K_{t-1} (t is time index)
- Sometimes **deviation from equilibrium value $x\#$** is considered: **say $x - x\#$** where $x\#$ is equilibrium value (New Keynesian Models; DSGE model); **$Y - Y\#$ is dubbed the output gap**: crucial; e.g. hypothesis: **$\pi_t = \pi_{t-1} + h(Y - Y\#)$**



Open Economy (2 countries, n countries)

- **Trade, capital flows, international migration**
- **Comparative analysis** (Comparative Systems)
- **Systemic competition:** partly related to international capital flows – particularly Foreign Direct Investment (FDI) – and migration
- *1 country, 2 countries (big), regional integration of several small and big countries, regional integration of many small countries; links between regional integration clubs; cooperation via Internat. Organizations*

Key Questions in Open Economy

- **Allocation of resources:** free competition, free trade, free capital flows, internalization of negative external effects (trans-border pollution) and of positive external effects (e.g. innovation)
 - **More or less market power** in bigger markets
 - With better exploitation of economies of scale
- **Economic stability** (financial market problems, government problems)
- **Income inequality** (globalization effects...)

A decorative graphic is positioned to the left of the title. It features a vertical black line intersected by a horizontal black line. To the left of these lines are three overlapping squares: a yellow one at the top, a red one in the middle, and a blue one at the bottom.

Foreign Exchange Market

- In open economy we have foreign exchange market
 - A) **under fixed exchange rate regime** (with respect to \$ until 1971/73; gold convertibility of \$ ended under president Nixon in 1971: 2 country-model has only one exchange rate; US big country, Germany is small country: US determines tradables price level P^T (and P^* is given from perspective of small open economy); Germany's central bank cannot control domestic money supply and the inflation rate, respectively – determined in the US (Mundell/H.G. Johnson: Monetary Approach to the CA bal.)
 - B) **under flexible exchange rate:** central bank can control domestic money supply M

Fixed Exchange Rate Regime

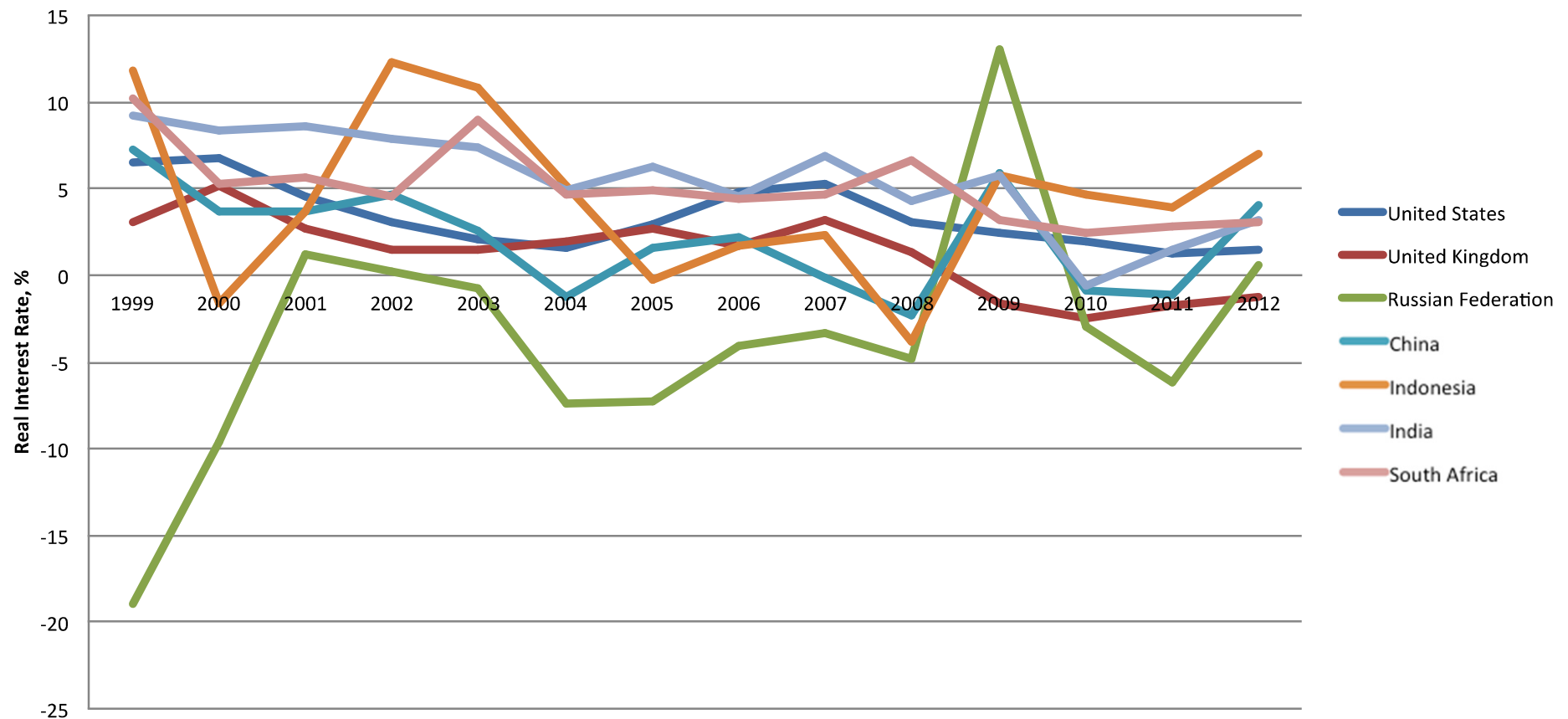
(until 1972: DM German currency)

- **Mundell/Johnson: Monetary approach to the balance of payments;** tradable goods (T), non-tradables (N)
- Free trade and full international arbitrage
 - $P^T = eP^{T*}$ (e is the nominal exchange rate DM/\$)
 - Price level $P = (P^N)^v (eP^T)^{1-v}$; $0 < v < 1$
 - Money market equilibrium condition is given by $M/P = h''Y_0$; parameter $h'' > 0$, Y is given in short term; restatement $M = Ph''Y$.
 - What happens if P^{T*} is rising (in the US)?

Monetary Policy Is Inefficient Under Fixed Exchange Rate (Mundell Fleming Model)

- **Expansionary monetary policy (rise of M)** in small open economy (in Europe, Asia, Latin America, Africa) – under fixed exchange rate regime – and perfect capital mobility
 - Will only temporarily reduce the interest rate
 - Will cause high net capital outflows increasing the demand for \$: Hence excess demand in FOREX market, central bank has to sell reserves (\$) so that M is reduced (**no rise of M!**)

Fig. 5. Real Interest Rate (%)



Source: World Bank, World Development Indicators

Tab. 1. Current Account Balance (Percent of GDP)

| Country | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 |
|----------------|-------|-------|------|------|------|-------|-------|-------|-------|-------|-------|------|------|------|
| France | 1,5 | 1,8 | 1,2 | 0,7 | 0,5 | -0,5 | -0,6 | -1 | -1,7 | -1,3 | -1,3 | -1,8 | -2,2 | -1,6 |
| Germany | -1,7 | 0 | 2 | 1,9 | 4,7 | 5,1 | 6,3 | 7,4 | 6,2 | 5,9 | 6,4 | 6,8 | 7,4 | 7,5 |
| Greece | -7,8 | -7,2 | -6,5 | -6,5 | -5,8 | -7,6 | -11,4 | -14,6 | -14,9 | -11,2 | -10,1 | -9,9 | -2,4 | 0,7 |
| Ireland | -0,4 | -0,6 | -1 | 0 | -0,6 | -3,5 | -3,6 | -5,3 | -5,6 | -2,3 | 1,1 | 1,2 | 4,4 | 6,6 |
| Italy | -0,2 | 0,3 | -0,4 | -0,8 | -0,3 | -0,9 | -1,5 | -1,3 | -2,9 | -2 | -3,5 | -3,1 | -0,4 | 0,8 |
| Portugal | -10,3 | -10,3 | -8,2 | -6,4 | -8,3 | -10,3 | -10,7 | -10,1 | -12,6 | -10,9 | -10,6 | -7 | -2 | 0,5 |
| Spain | -4 | -3,9 | -3,3 | -3,5 | -5,2 | -7,4 | -9 | -10 | -9,6 | -4,8 | -4,5 | -3,8 | -1,1 | 0,7 |
| United Kingdom | -2,9 | -2,3 | -2,1 | -1,7 | -2 | -1,8 | -2,8 | -2,2 | -0,9 | -1,4 | -2,7 | -1,5 | -3,7 | -3,3 |
| United States | -4 | -3,7 | -4,2 | -4,5 | -5,1 | -5,6 | -5,8 | -4,9 | -4,6 | -2,6 | -3 | -2,9 | -2,7 | -2,3 |

Source: IMF, World Economic Outlook

Current account deficit implies rising **foreign indebtedness** (USA can finance 1% deficit from international seigniorage gain: foreign central banks holding \$ reserves, obtaining low yield (1%) while global rate of return on capital is ca. 3-4%; international reserves rising over time (\$, €, Yen, Yuan? key currencies)

Real External Debt Burden

(B^{**} real foreign indebtedness)

- Trade balance is X^* (data: Obstfeld/Rogoff 96 p.69):
 - $-(X^* - r^*B^{**}) = dB^{**}/dt$; note that supply of foreign exchange = X^* , demand for FOREX is r^*B^{**} ; divide equation by Y ; denote B^{**}/Y as b^{**} , g_Y output growth
 - $-(X^*/Y - rB^{**}/Y) = db^{**}/dt + g_Y b^{**} = (dB^{**}/dt)/Y$
 - $-(X^*/Y - (r - g_Y)b^{**}) = 0$; assuming db^{**}/dt is zero
 - $X^*/Y = (r - g_Y)b^{**}$; trade balance surplus/GDP > 0; we assume $r > g_Y$. Real external debt burdens (% of GDP), 1970-91: Argentina 1970: 0.5, 1983 2.9%, 1991: 3.9%; Nigeria 1991: 4.8%, Hungary: 1991: 3.8%

Tab. 2. General Government Consolidated Gross Debt:
Excessive Deficit Procedure (based on ESA 1995),
(Percent of GDP)

| Country | 2000 | 2001 | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 |
|----------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| Germany | 60,2 | 59,1 | 60,7 | 64,4 | 66,2 | 68,6 | 68,0 | 65,2 | 66,8 | 74,5 | 82,5 | 80,0 | 81,0 | 79,6 |
| Ireland | 37,0 | 34,5 | 31,8 | 31,0 | 29,4 | 27,2 | 24,6 | 24,9 | 44,2 | 64,4 | 91,2 | 104,1 | 117,4 | 122,3 |
| Greece | 103,4 | 103,7 | 101,7 | 97,4 | 98,9 | 110,0 | 107,8 | 107,3 | 112,9 | 129,7 | 148,3 | 170,3 | 156,9 | 177,3 |
| Spain | 59,4 | 55,6 | 52,6 | 48,8 | 46,3 | 43,2 | 39,7 | 36,3 | 40,2 | 54,0 | 61,7 | 70,5 | 86,0 | 94,3 |
| France | 57,5 | 57,1 | 59,1 | 63,3 | 65,2 | 66,8 | 64,1 | 64,2 | 68,2 | 79,2 | 82,4 | 85,8 | 90,2 | 93,9 |
| Italy | 108,6 | 108,3 | 105,4 | 104,1 | 103,7 | 105,7 | 106,3 | 103,3 | 106,1 | 116,4 | 119,3 | 120,7 | 127,0 | 132,7 |
| Cyprus | 59,6 | 61,2 | 65,1 | 69,7 | 70,9 | 69,4 | 64,7 | 58,8 | 48,9 | 58,5 | 61,3 | 71,1 | 85,8 | 112,0 |
| Portugal | 50,7 | 53,8 | 56,8 | 59,4 | 61,9 | 67,7 | 69,4 | 68,4 | 71,7 | 83,7 | 94,0 | 108,2 | 124,1 | 129,4 |
| United Kingdom | 40,5 | 37,3 | 37,1 | 38,7 | 40,3 | 41,7 | 42,7 | 43,7 | 51,9 | 67,1 | 78,4 | 84,3 | 88,6 | 91,4 |
| United States | 53,0 | 53,0 | 55,4 | 58,5 | 65,4 | 64,9 | 63,8 | 64,4 | 73,3 | 86,3 | 95,2 | 99,5 | 102,9 | 103,8 |

Source: AMECO Database

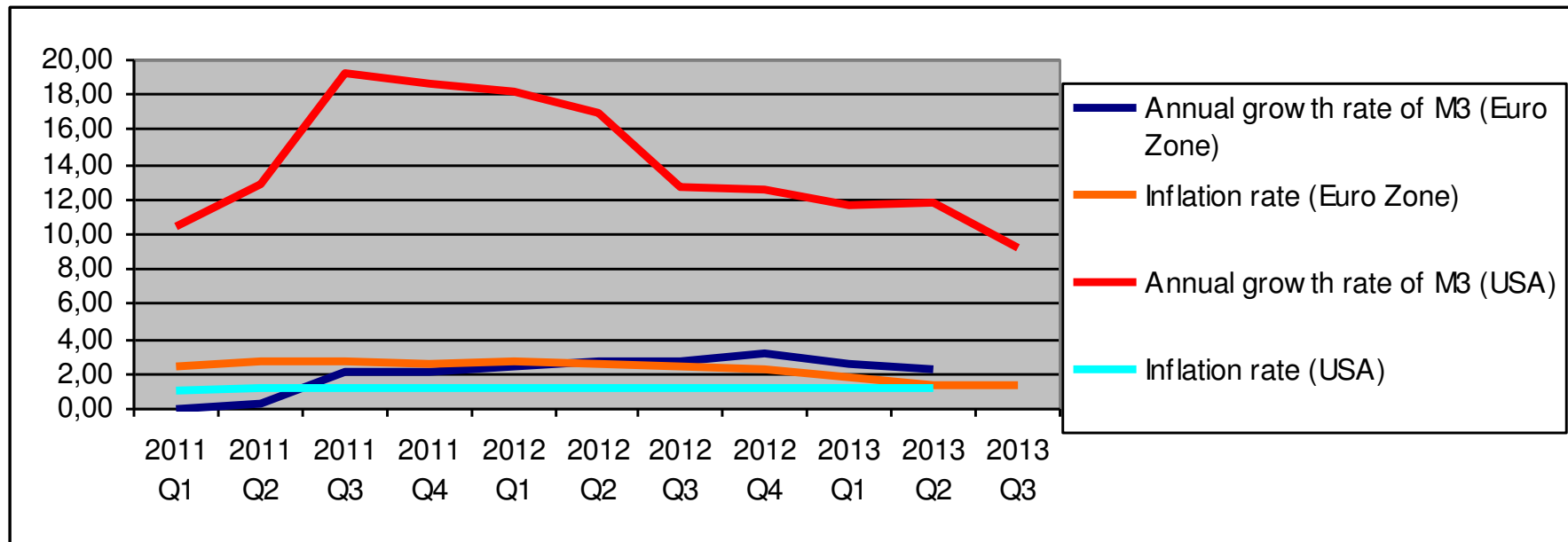
Under Fixed Exchange Rate Regime (Mundell Fleming): Expansionary Fiscal Policy Will Work

- Rise of real government expenditures (rightward shift of IS curve);
 - **increase of real interest rate**
 - = high **net capital inflows** so that there will be an excess supply in the foreign exchange market
 - = **real devaluation of the currency** ($eP^*/P - e$ in price notation: $\text{€}/\text{\$}$ - will rise) so that
 - **net exports** of goods and services will increase
 - Equilibrium **real income goes up**; employment +

A Look at Fiscal Policy in the US

- Traditional challenge of market economies concern stabilization of output, prices; and achieving full employment
- Extreme challenge was post-Lehman Brothers situation in the US, Europe, China, Japan etc.
 - US: 2008 Economic Stimulus Act = **1,2% of GDP**
 - US: 2009 and 2010: 2.1% and 2.4% of GDP
 - EU: fiscal stimulus 1,1% in 2009, 0.8% in 2010; China 2009+; 2015: US 2015/08 + is 10% compared to €area

Fig. 6. Annual Growth Rate of M3 and Inflation Rate in Euro Zone and USA



Source: OECD

Monetary Approach to Balance of Payments: Fixed Exchange Rate (central bank has to defend parity)

- P^T^* rises, hence P^T will rise (since $P^T = eP^T^*$);
 - if P^T rises P is raised and hence there is an excess demand in the money market ($P^h \cdot Y > M$); companies will raise exports in order to increase liquidity. Higher exports of goods = excess supply in foreign exchange market: central bank has to intervene (buying foreign exchange, paying with newly printed money) = raising money supply. **Current account has improved, money supply has increased (M is endogenous)**

Total Factor Productivity Growth (K capital, L labor, A knowledge, δ depreciation rate of capital; production function is **linear-homogenous**)

- 1) $Y(K, L, A)$: production function; 1') $Y = K^\beta (AL)^{1-\beta}$
 - 2) $Y = Y_K K + Y_L L + Y_A A$; Y_K is marginal product of capital (Y_L ...of labor; Y_A ...of knowledge)
 - 3) With profit maximization $Y_K - \delta = r$; $Y_L = w$ (real wage), $Y_A = p''$ (real price of innovation)
 - 1'') $\ln Y(t) = \beta \ln K(t) + (1-\beta)(\ln A(t) + \ln L(t))$
 - $d \ln Y / dt := g_Y = \beta g_K + (1-\beta)(a + n)$; $\beta = rK/Y$ profit ratio; $a = g_A$ (g is growth rate) $n = g_L$; here $a =$ is total factor productivity growth; empirical analysis based on **growth accounting**...a stands for process innovations; competitiveness+

Explaining Innovation Dynamics

- Process innovations
- Product innovations
- Endogenous Growth Theory explains innovation dynamics; e.g. through research and development
- Important aspect of internat. competitiveness is total factor productivity (growth); & **unit labor cost $W/(Y/L)$** ; nominal wage relative to labor productivity = **WL/Y** (Cobb-Douglas: $W/(Y/L) = (1-\beta)P$; $P = (W/y)/(1-\beta)$; here $y := Y/L$; with CES function different...); wage pressure stimulates labor-saving technological progress.

Fig. 7. Total Factor Productivity, 2000-2014

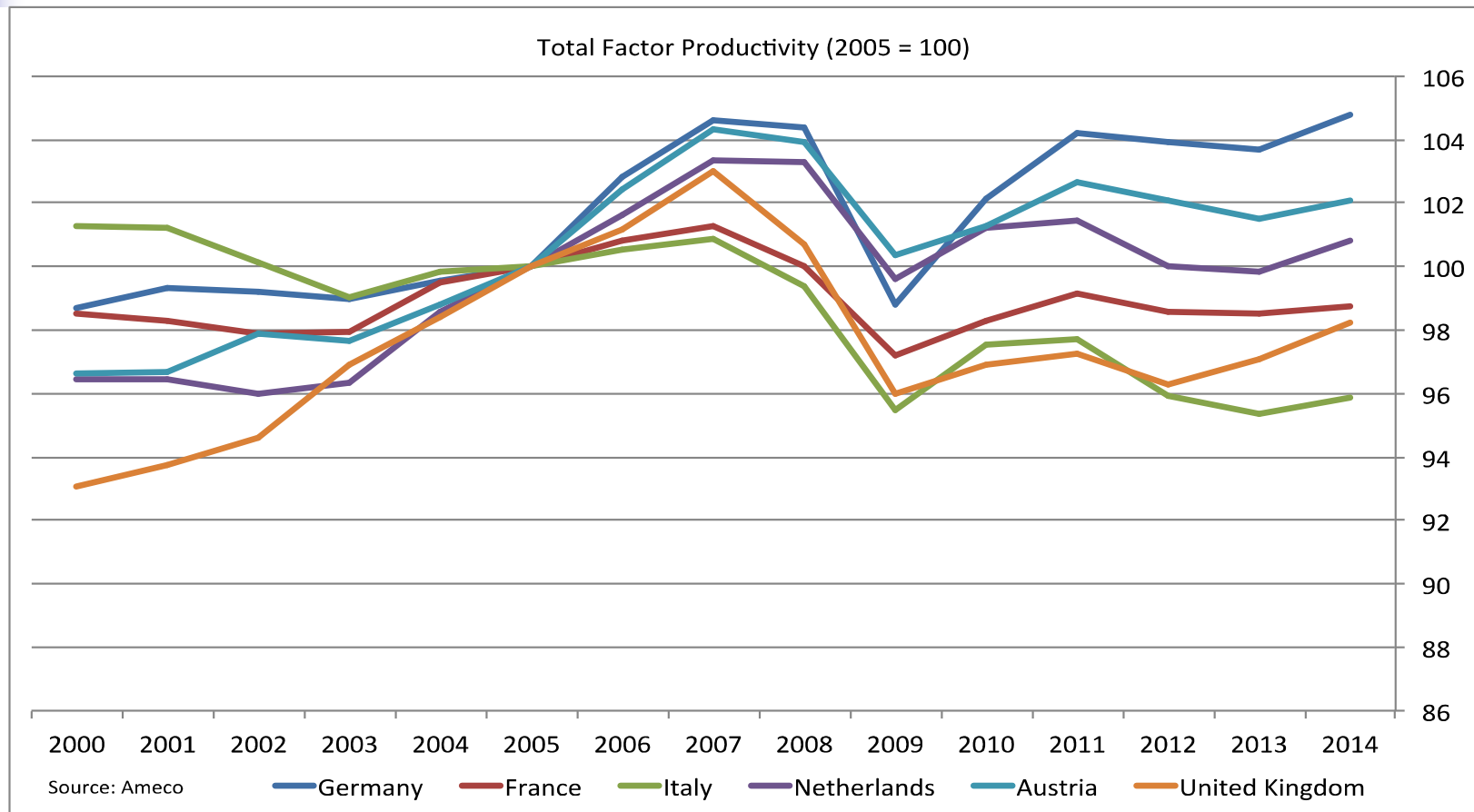


Fig. 8. Nominal Unit Labour Costs in Total Economy

Nominal Unit Labour Costs in Total Economy (PLCD), National Currency, 1995=100.
Source: AMECO Database

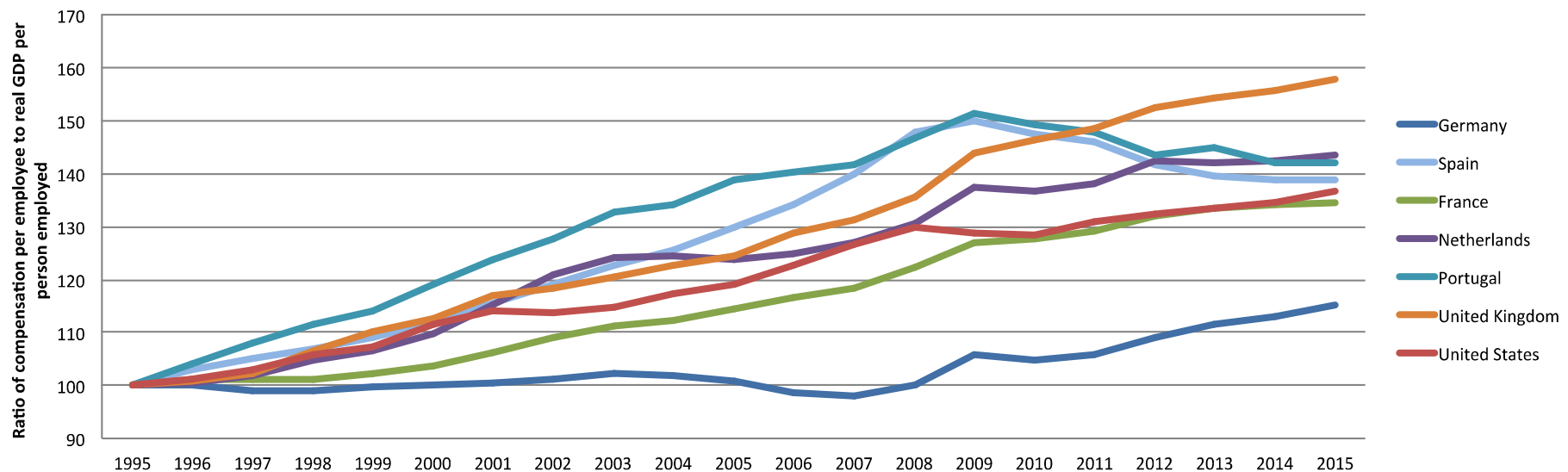
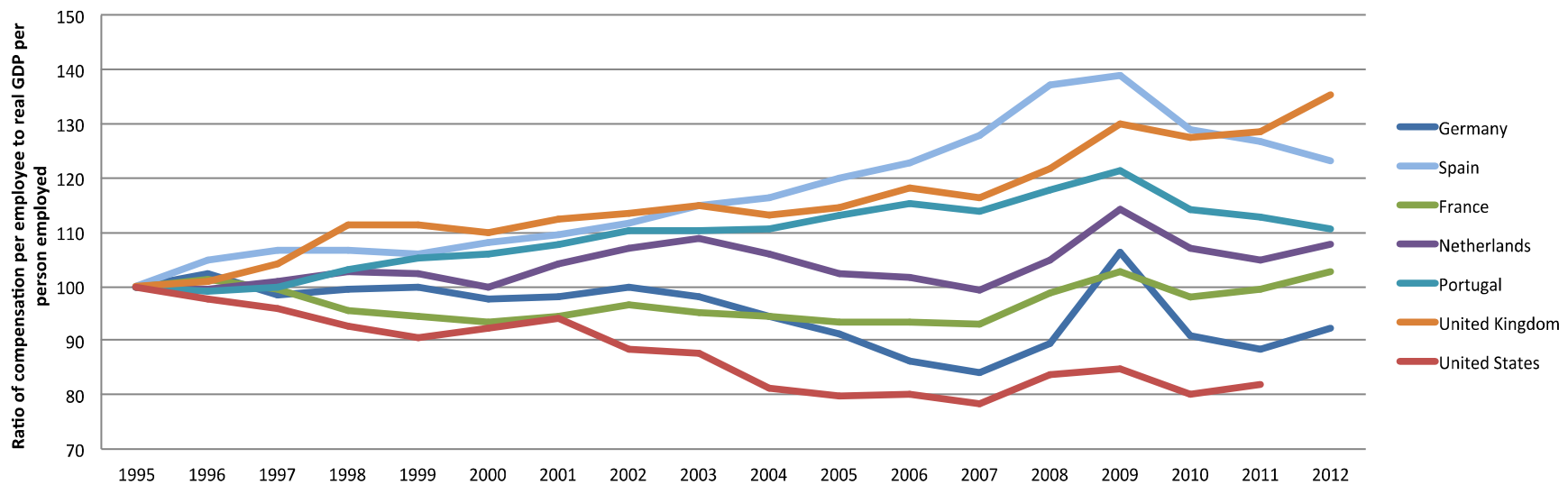


Fig. 9. Nominal Unit Labour Costs in Manufacturing Industry

Nominal Unit Labour Costs in Manufacturing Industry (PLCM), National Currency, 1995=100.
Source: AMECO Database



Oil Price Inflation...Some Microeconomic Aspects (t time index)

- Growth rate of oil price (P'') is determined by the nominal interest rate i (H is unit cost);
- Intertemporal profit maximization (**Hotelling**)
 - 1) $i(P'' - H) = dP''^E/dt$; taking one unit of oil out of the resource site generates a cash flow $P'' - H$; cash flow at the bank yields $i(P'' - H)$; if the marginal resource unit is left in the ground expected yield is dP''^E/dt . Equality sign of alternatives = max. profits
 - 2) if H is zero (Hotelling) we get $i = (dP''/dt)/P''$;

Consider Modified Hotelling (Welfens, 2011; Innovations in Microeconomics)

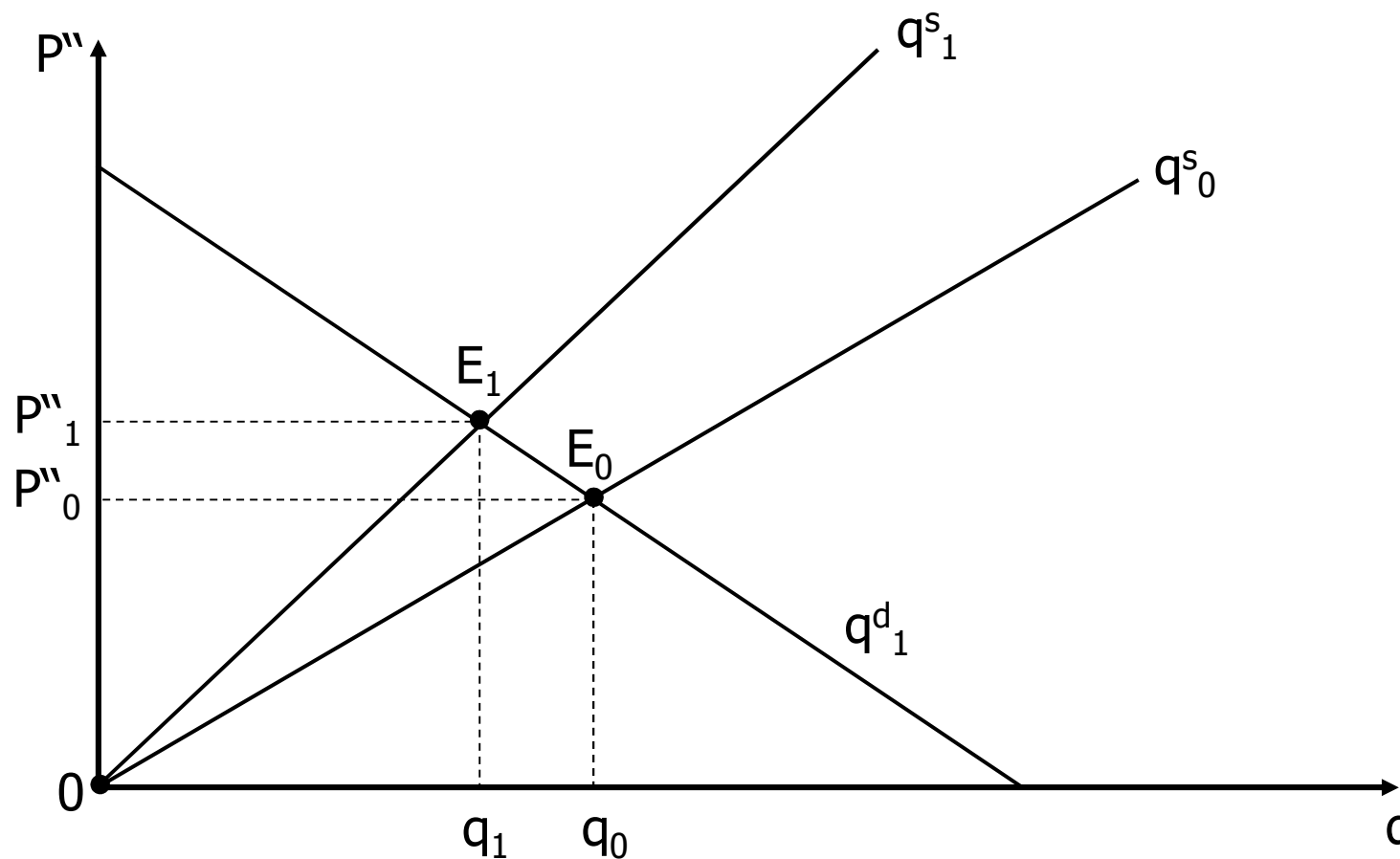
- $i(P'' - H) = dP''^E/dt$ (t is time index); divide by P''
- $i(1 - H/P'') = \pi''^E$; if $H = H'q$ ($H' > 0$), q quantity
- $\ln i - H'q/P'' = \ln \pi''^E$; H' is a cost parameter
- Hence quantity supplied $q^s = \ln(i/\pi''^E)P''/H'$ and with $i = r + \pi^E$ and $\pi := v\pi' + (1-v)\pi''$ ($0 < v < 1$) for case $\pi' = \pi''$ (constant rel. price) and with $\ln(1+x) \approx x$ (small r/π''^E)
- $q = (r/\pi''^E)P''/H'$ or $P'' = H'(\pi''^E/r)q$; $q^d = V'Y - V''P''/P$
- Equilibrium $P'' = V'Y / ((r/\pi''^E)/H' + V''/P)$; $v' > 0$; $v'' > 0$
- $\ln P'' = \ln V' + \ln Y - \ln((r/\pi''^E)/H' + V''/P)$; r is real interest rate

Will the Oil Price Always Increase...

- Certainly not; role of expectations, Y^{world} etc.
- Technological progress (Welfens, 2011)
 - $i(P'' - H) = (dP''^E/dt)(1 + x'')$; x'' is technological magnification factor that allows resource site to be profitably exploited more fully relative to physical maximum
 - Technological progress can concern cost parameter H or H' ($H = H'q$); and magnification parameter x'' (see e.g. fracking)

Figure: Equilibrium Oil Price

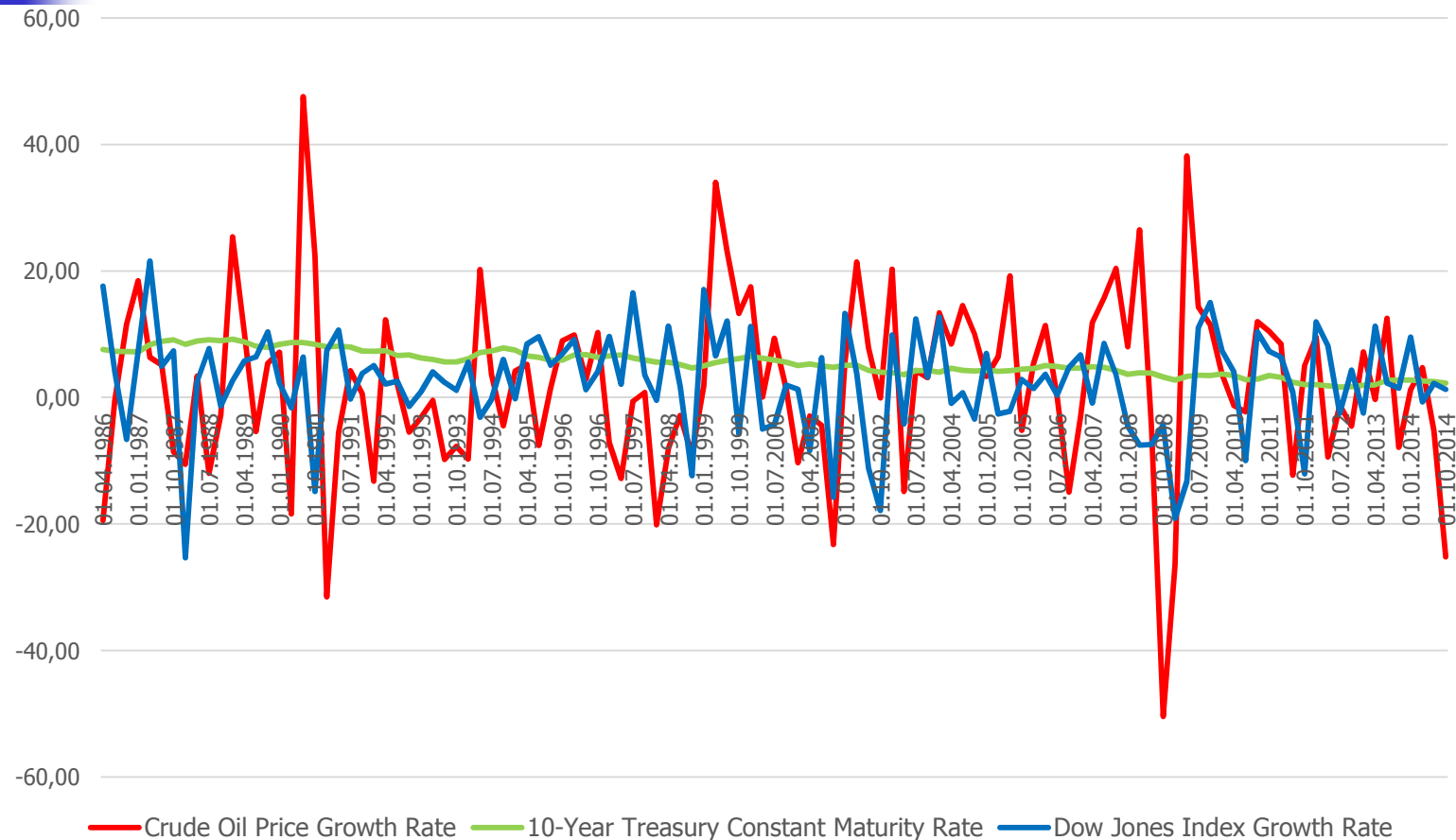
- derived from *intertemporal profit-maximization* of suppliers; rise of expected oil price inflation rate...



Role of Oil Price Inflation...

- if the growth rate of oil prices fully would determine inflation rate then the real interest rate would be zero – hence Hotelling rule not convincing: $i - g_p = r$;
- Here inflation rate g_p may be assumed as follows:
 $g_p = \theta g_{p^o} + (1-\theta) g_{p^*}$ where g_{p^*} is the inflation rate of non-oil products; $0 < \theta < 1$ and indicates the share of oil in households' total consumption; is g_{p^*} negative?
- In reality oil price rather **determined by a political deal** between the Saudis (OPEC) and the US...

Fig. 10. Oil Price Growth, Dow Jones Index Growth and 10-Year Treasury Interest Rate in USA



Source: Federal Reserve Economic Data

15.04.2015

Paul Welfens, www.eiiw.eu (2015)

36

Which Analytical Elements Do We Need in Macroeconomics? (FDI is foreign direct investment; FDI plus trade; role of MNCs...)

- 1) Short-term *financial market* Branson model (e,i)
- 2) Inflation π analysis based on Phillips curve
- 3) Medium term Keynesian macro model (r, Y, e)
- 4) Solow Growth Model (other growth models; including endogenous growth model); long term per capita income $y^* = Y/L$; and Y^*
- 5) NKM: New Keynesian Macroeconomics which combines 2), modified 3) and forward-looking behavior (rational expectations)

Some Mathematical Rules

- 1) $Y = X Z$; $dY = ZdX + XdZ$ and $\ln Y = \ln X + \ln Z$
- 2) $Y = X/Z$; $dY = dX/Z - XdZ/Z^2$
- 3) $Y = X^n$; $\ln Y = n \ln X$
- 3) $Y = X + Z$; $dY = (X/Y)dX + (Z/Y)dZ$; denoting $X/Y = x$ we can write instead of X/Z now $1-x$
- 4) $Y = \ln X$; $dY/dX = 1/X$
- 6) $d \ln Y / dt = g_Y := (dY/dt)/Y$ growth rate! (t time index)
- 7) $\ln(1+x) \approx x$ if x is very small

Additional Issues...

- Model of National/International Banking Crisis?
- Stock market price index (P^*) dynamics; price of stocks = **discounted expected** future cash flows;
 - discounting 1 € next year = $1/(1+i)$ as present value, $1/(1+i)^2$ for 1 € in year 2 etc., hence level of nominal interest rate plays a role for P^*
 - High volatility; problem could be intra-day/high frequency trading – most orders not executed (...flash crash?)
 - $MV = PY + P^*K\theta$ (Welfens, 2011); if $P^* = v^*P$, $\beta Y/K = r$ and hence $K = \beta Y/r$ we can write that $MV = PY(1 + \theta v^* \beta/r)$; $\ln P = \ln M + \ln V - \ln Y - \theta(r) v^* \beta/r$; θ is portfolio turnover frequency

Implication for Deflation Analysis (2014, Euro Zone)

- $\ln P = \ln M + \ln V(r) - \ln Y - \theta(r) v' \beta / r$; v is a positive function of r (with expected price stability), E denotes elasticity
- $d \ln P / dt = d \ln M / dt - d \ln Y / dt + (\theta \beta / r) (dv' / dt)$
 $+ E_{v,r} dr / dt - (v' \beta / r) \theta_r dr / dt + (\theta v' \beta / r^2) dr / dt$; fall of the real interest rate and rise of P'/P (hence rise of v') will lead to deflation if growth rate of money supply is equal to growth rate of Y ($d \ln M / dt = d \ln Y / dt$)
 Critical point could be that $dv' / dt = v'' de / dt + v'' dv^* / dt$ (v^* US stock market price index; „arbitrage condition $P' = e P^*$)
 Portfolio turnover parameter could also be a negative function of transaction costs/internet price variable; internet cheaper... θ goes up

A decorative graphic is positioned to the left of the title. It features a black crosshair centered over a square area. The square is divided into four quadrants, each with a different color: yellow in the top-left, red in the top-right, blue in the bottom-left, and a darker blue in the bottom-right.

Some Critical Aspects of Financial Markets

- **Bias in pricing of risk possible** (too low: 2004-2006 in the US; risk premium = interest rate of corporate bonds with AAA rating relative to US government bond interest rate; Euro crisis...explaining i_j (Gärtner)?)
- **Overshooting:** exchange rate (Dornbusch model); $eP^* = P$ through arbitrage, so that purchasing power parity exchange rate $e = P/P^*$ in the long run; short-term e_t can differ from PPP exchange rate: overshooting related to expectation dynamics; $q^* = eP^*/P$
- **Self-fulfilling prophecy** in financial markets

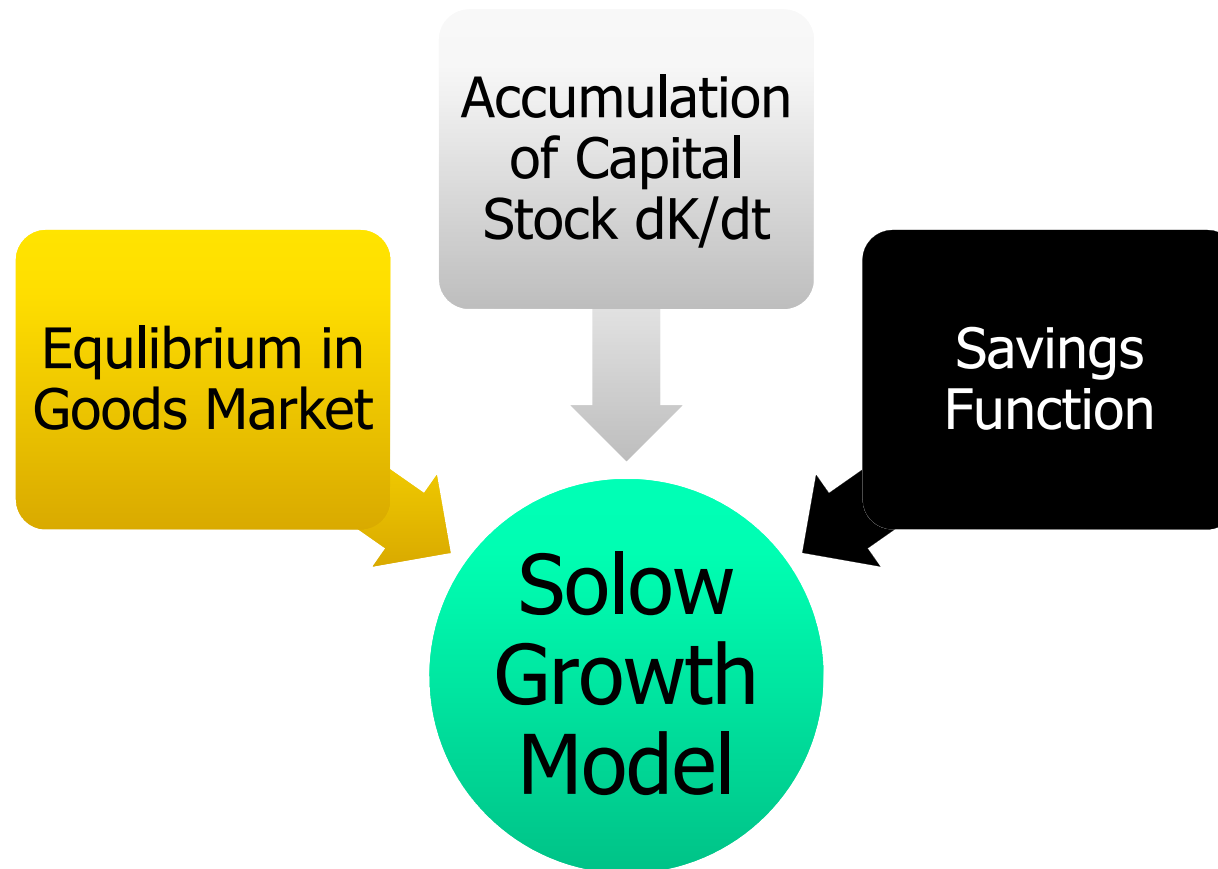
A Look at Inflation (Quantity Equation)


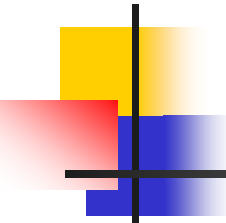
- Inflation rate g_P (we also use π);
- If we consider $MV = PY$ (V as velocity that is assumed to be constant) we get (with g for growth rate $g_M := d\ln M/dt$):
 - $g_M + 0 = g_P + g_Y$ and therefore
 - $g_P = g_M - g_Y$; the inflation rate (in the long run) is equal to the difference of the money supply growth rate g_M and the real output growth rate g_Y (if long run output growth is determined in a neoclassical growth model we have $g_Y = n + a$ (sum of population growth rate (n) and growth rate of knowledge (a)))

Recall Production Potential; Macroeconomic Cobb Douglas Production Function (or CES...)

- $Y = K^\beta (AL)^{1-\beta}$; K capital, A knowledge (Harrod-neutral progress...), L labor, ($0 < \beta < 1$);
- β is the output elasticity of capital; in a setting with competition in goods and labor markets – plus profit maximization – (real interest rate r = marginal product of capital = $\beta K^{\beta-1} (AL) = \beta / k^{1-\beta}$ ($k := K/(AL)$); real wage rate $w := W/P$ = marginal product of labor; β is also equal to the income share of capital rK/Y

Neoclassical Growth Model: (L is growing over time; and knowledge A; sometimes $A=1$ constant)





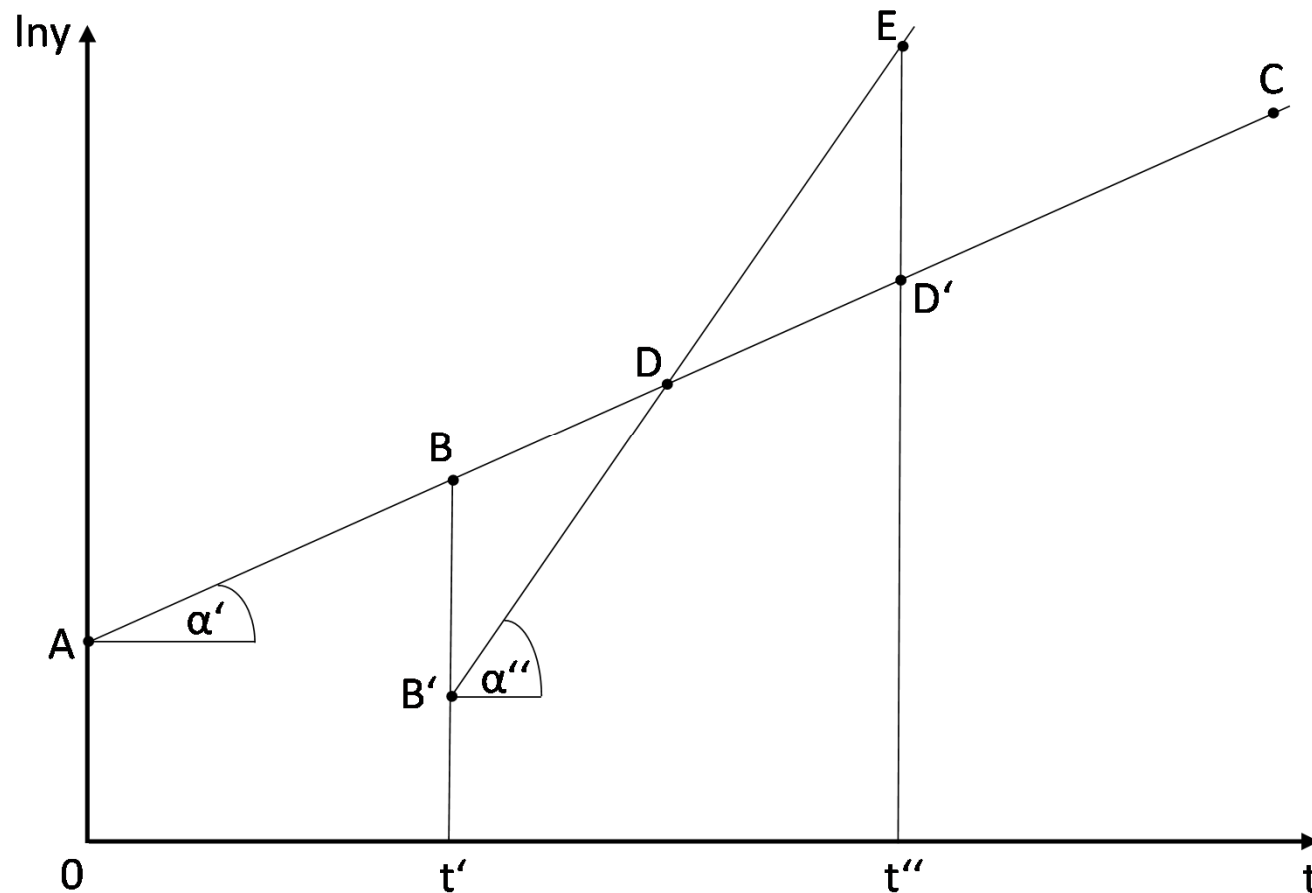
Consider the Building Blocs (in simple case with $A=1$): $Y=K^\beta L^{1-\beta}$; $y:=Y/L = k^\beta$ (capital intensity $k=K/L$; t is time)

- Savings function (1) $S = sY$ ($0 < s < 1$; $s := 1 - c$); and obviously (1.1) $S/L = sy = sk^\beta$
- Goods market equilibrium condition: Savings (2) $S = \text{gross investment } dK/dt + \delta K$ (δ is depreciation rate = reinvestment rate)
 - (2.1) $S/L = (dK/dt)/L + \delta k$;
 - (2.2) $dk/dt = (dK/dt)/L - nk$ (where $n := (dL/dt)/L$)
 - (2.3) $dk/dt = sk^\beta - (n + \delta)k$; long run equilibrium (steady state #) means $dk/dt = 0$; $k^\# = (s/(n + \delta))^{1/(1-\beta)}$

Per Capita Income in Steady State (recall $y=k^\beta$); e` Euler number:

- $y^\# = (s/(n+\delta))^{\beta/(1-\beta)}$
- $(Y)^\# = (s/(n+\delta))^{\beta/(1-\beta)} L_0 e^{nt}$; L_0 is initial population;
- Level of the growth path in $\ln Y$ - t diagram:
- Growth rate of Y in steady state is n since
 $\ln Y = (\beta/(1-\beta)) \ln(s/(n+\delta)) + \ln L_0 + nt$
- $d \ln Y / dt = n$; is the growth rate of $Y^\#$

Level of Growth Path and Growth Rate (Iny –t graph, OA= level of growth path; tg α' is growth rate n)



Neoclassical Growth (Solow) Model: Y is GDP, L is labor, K capital, s savings rate

- Growth of real gross domestic product (Y)
- **Neoclassical Model** uses production function and a simple savings function; Solow model imposes equilibrium condition on goods market to determine the **level of the growth path** & **the growth rate** itself
 - In a setting with constant growth rate n of population (and hence labor input; $A=1$) the long run growth rate of Y is n
 - In a setup **with exogenous technological progress rate (a) and population growth** the steady state growth rate of Y is given by **$a+n$** (at first we will ignore technological progress)
 - **The level of growth path** $Y^* = L(s/(n+\delta))$; δ depreciation rate of

Explaining Long Term Dynamics in Market Economies **and** in Socialist Countries...

- Market economy: Assume production function
 - 1) $Y(t) = K^\beta L^{1-\beta}$; $0 < \beta < 1$; 1') $y := Y/L = k^\beta$; $k := K/L$, t time index
 - Savings function 2) $S = s(1-\tau)Y$. **Equilibrium** condition goods market:
 - 3) $dK/dt + \delta K = s(1-\tau)Y$; δ depreciation rate; divide equation 3) by L
 - 3.1 $(dK/dt)/L + \delta k = s(1-\tau)k^\beta$; this picks up the equilibrium condition from 3)& takes into account 1'): Gross per capita investment = per capita savings
 - 4) $dk/dt = (dK/dt)/L - nk$; $n := (dL/dt)/L$ is the growth rate of population; 4) is mathematical rule for differentiation of $k := K/L$
 - 5) $dk/dt = s(1-\tau)k^\beta - (n+\delta)k$; set for simplicity $n=0$; long run equilibrium requires $dk/dt=0$; 5') $k^\# = (s(1-\tau)/\delta)^{1/(1-\beta)}$; steady state ($\#$)/long run 6) $y^\# = (s(1-\tau)/\delta)^{\beta/(1-\beta)}$;

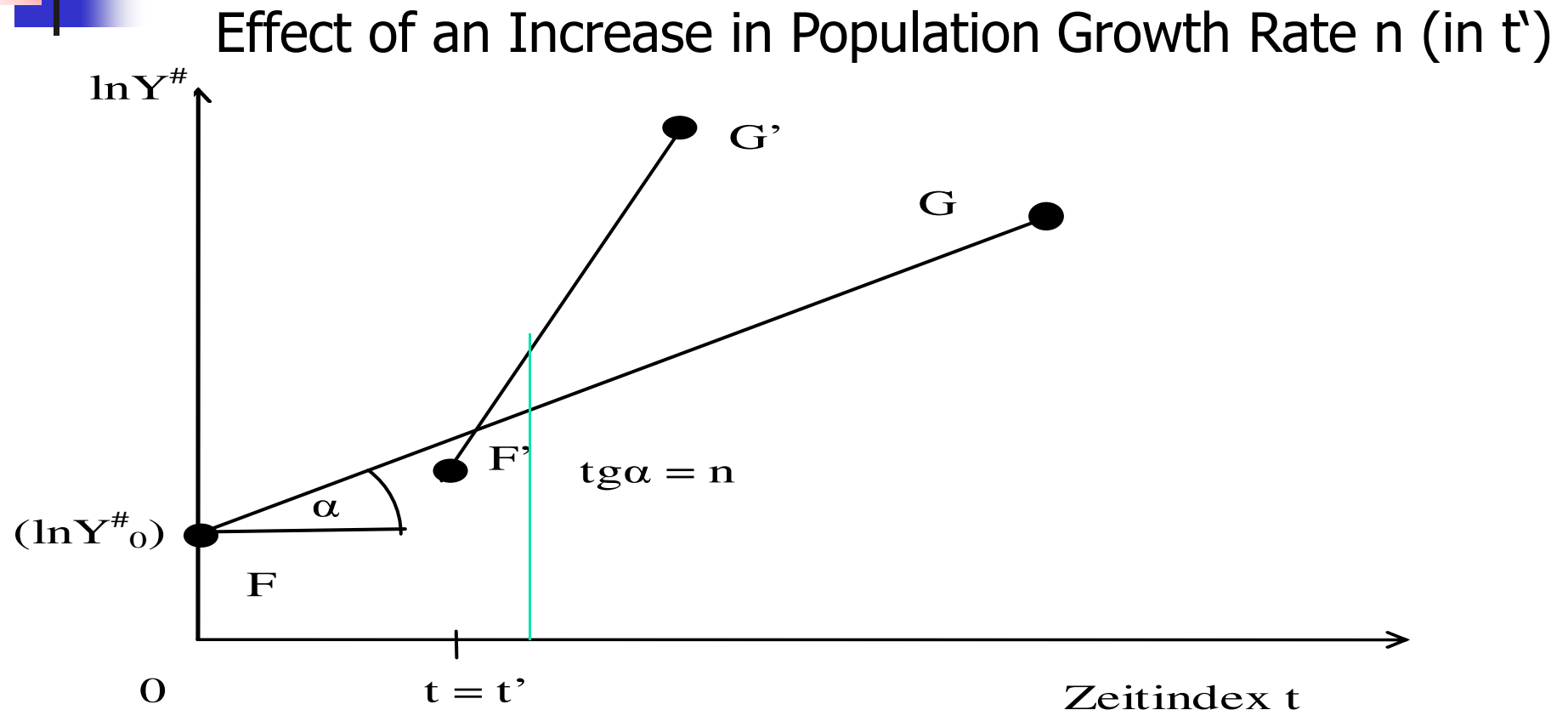
Compare Growth Model (long run) and Keynesian Medium Term Macro Approach (note: savings rate $s = 1 - c$)

- **Using $y := Y/L$: (6') $Y^\# = L(s(1-\tau)/\delta)^{\beta/(1-\beta)}$**
- **Keynesian approach** (Y is demand-determined)
 - I) $Y = c(1-\tau)Y + v'(\beta Y/K - \delta - r) + \delta K + G$; $v' > 0$;
investment proportionate to marginal product of capital $\beta Y/K - \delta$ minus r ;
- **money market equilibrium:**
 $M/P = hY/(h'r)$; $h'' := h/h'$ replacing r in goods
 market equilibrium gives
 - $Y = ((K - v')\delta + G) / (1 - c(1-\tau) - v'\beta/K + h''v'/(M/P))$
 - $Y = ((K - v')\delta + G) / (s(1-\tau) + \tau - v'\beta/K + h''v'/(M/P))$

Key Insight From Neoclassical Macro Model ($y := Y/L$); $\beta = 0,33$

- 6) $y^* = (s(1-\tau)/\delta)^{\beta/(1-\beta)}$; 6') $Y = L(s(1-\tau)/\delta)^{\beta/(1-\beta)}$
- 6'') $\ln Y = \ln L + \beta''(\ln s - \tau - \ln \delta)$; $\beta'' := \beta/(1-\beta)$; $\ln(1-\tau) \approx \tau$
- Long run per capita income y is a positive function of the savings rate; a negative function of tax rate; negative function of capital depreciation rate; positive function of β (next: e Euler number; A is knowledge, t time)
- If $Y = K^{\beta}(AL)^{(1-\beta)}$; $A(t) = A_0 e^{at}$; $L(t) = L_0 e^{nt}$
- 7) $y^* = e^{(a+n)t} A_0 L_0 (s(1-\tau)/(a+n+\delta))^{\beta/(1-\beta)}$
blue term is the level of the growth path

Level of Growth Path (point F) and Growth Rate (tang α)



Key Question in Growth Theory

- In the Solow (neoclassical) model the growth rate of per capita income determined by progress rate (a)
 - **Endogenous growth theory:** how to explain technological progress a ; e.g. through R&D expenditures (relative to GDP); or the use of information and communication technology; or higher education (natural sciences +...)
 - In poor countries explanation of progress rate a also by looking at international diffusion/catching-up, FDI inflows etc. (bring some technology transfer); FDI outflows also potentially important – *if asset-seeking FDI* (EU firms in US)

Market Economy with Institutions

(Institutional Capital H (Welfens, 2004); $0 < \beta' < 1$)

- $Y = H^{\beta'} K^{\beta} L^{1-\beta-\beta'}$
- $y = h^{\beta'} k^{\beta}$; $S/L = s(1-\tau)Y/L$; $h := H/L$
- $dk/dt = sh^{\beta'} k^{\beta} - (n+\delta)k$; $k^{\#} = (sh^{\beta'}/(n+\delta))^{1/(1-\beta)}$
- $y^{\#} = h^{\beta'} (h^{\beta'} s(1-\tau)/(n+\delta))^{\beta/(1-\beta)}$
- $Y = Lh^{\beta'} (h^{\beta'} s(1-\tau)/(n+\delta))^{\beta/(1-\beta)}$
- Hence institutional capital raises the level of the growth path of the economy; also institutional capital could stimulate **growth rate of population or of innovations...**

Endogenous Growth Theory and New Growth Theory

- Endogenous Growth (growth rate of knowledge is „a“):
 - Explaining the growth rate of knowledge a by a technological progress function (Kaldor already);
 - 1) $a = vR\&D/Y + v'j'a^* + v''x + z''FDI/Y$ (WELFENS, 2014)
 - Coe/Helpman: analysis of import-based technology spillovers (weighted imports: foreign R&D intensity feeds into importing country's innovation dynamics; or embodied tech.)
 - R&D sector: Modeling of the innovation process in which society has to invest resources (see $v' = R\&D/Y$: Welfens, 2014)
 - $da/dt = v'(a^*)^\lambda - \delta''a$; $a^\# = (v'a^*/\delta'')^{1/(1-\lambda)}$; $0 < \lambda < 1$
 - **Or** $dA/dt = v'A^*(A)^\lambda - \delta''A$; $A^\# = (v'A^*/\delta'')^{1/(1-\lambda)}$ technology convergence if $v' = \delta''$.

Endogenous Growth Model (Aghion et al.)

- Ingredients: Utility-maximizing households (infinite time horizon); $U(C) = (C \exp(1-\varepsilon) - 1)/(1-\varepsilon)$; intertemporal elasticity of substitution $\eta = 1/\varepsilon$;
- Relevant Euler equation is:
 - $-\varepsilon(dC/dt)/C = \rho - r$ (r is real interest rate)
 - Note $(1/(1+\rho))$ is discount factor; $\rho > 0$

$$\text{Growth rate } g = (\rho - r) \eta$$

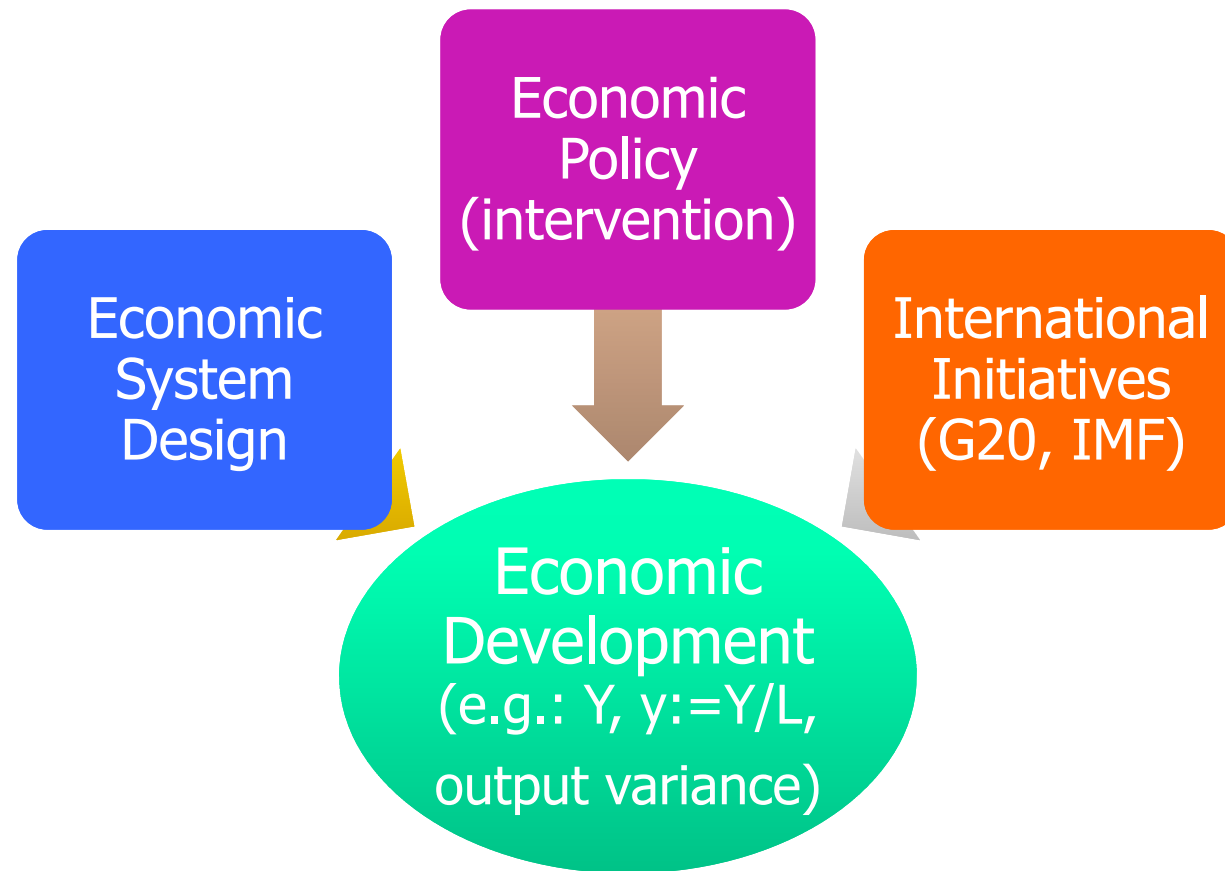
Aghion/Howitt (2009, pp.74-76)

- In the context of a simple **Romer model** – with λ denoting a productivity parameter in the research sector **where product varieties are produced that feed into output** (output parameter $\alpha'' > 0$) we get for growth rate g in steady state:
 - $g = (\alpha'' \lambda L - \rho) / (\alpha'' + \varepsilon);$
 - a bit strange that size of economy (L) affects g

Piketty Debate Since 2014: Book Capital in the 21st Century...

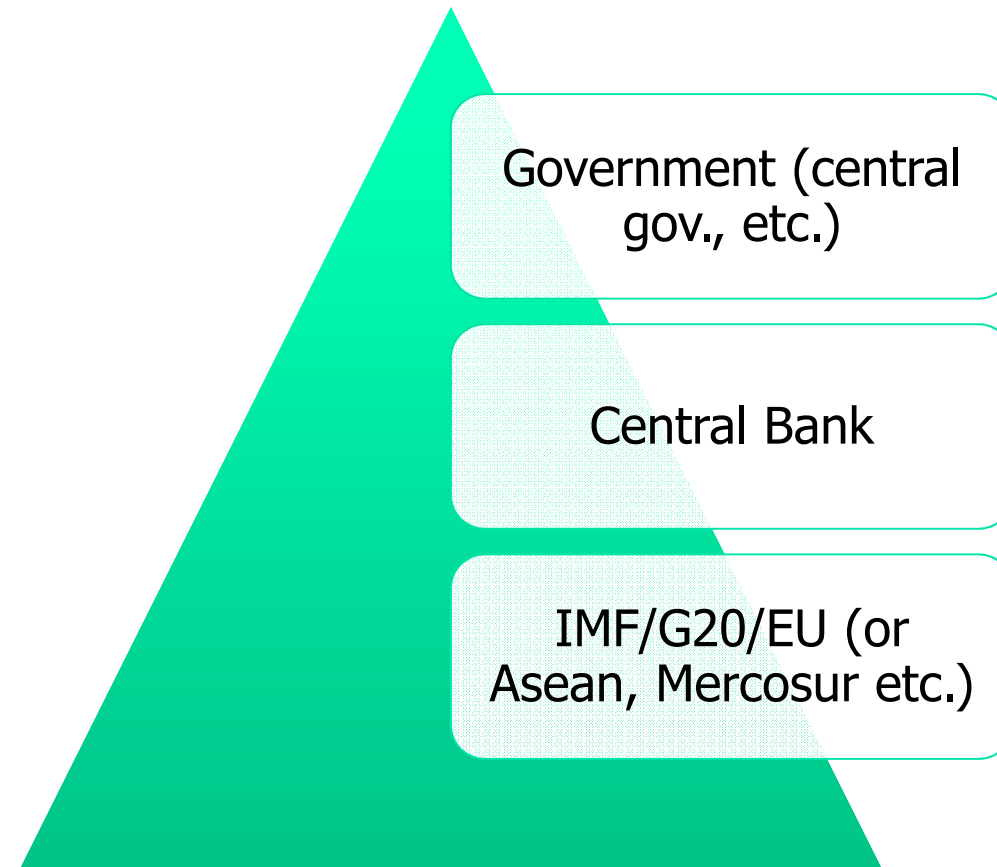
- **Thomas Piketty argues:** Capital income share in 19th century much determined by land, has increased over decades; in the 20th century some decades with decline of capital income; rising again e.g. in the 1990s and early 21st century in US, UK, France (land no longer so important)
- Piketty: **If r exceeds g capital income share is rising**
- How could such episodes be explained? Paper (IZA) Welfens, 2015: consider role of size of R&D sector β' (β' is share of workers in R&D sector); **output elasticity of capital is $\beta + \beta''\beta'$** ($\beta'' > 0$); Kaldorian **progress function $da/dt = \lambda''\beta'a^v - \lambda'a$** ($0 < v < 1$). One can derive for golden age – maximizing per capita consumption in sttdy state – optimal **$\beta' = (s - \beta)/\beta''$**

Government Has Impact Upon Economic Development Through





Main Government Institutions





Role of Expectations

- Current policy measure = intervention plus impulse for **expectations**
- Future policy intervention: efficiency and effectiveness partly rely on **reputation**
 - What has been announced? **Keeping promises = basis of reputation; how strong opportunistic behavior?**
 - **Communication policy** of institutions (e.g. FED, ECB, BoE): Explain what you do...(Eijffinger, 2014)

A decorative graphic on the left side of the slide features a vertical black line intersected by a horizontal black line. To the left of these lines are three overlapping squares: a yellow one at the top, a red one in the middle, and a blue one at the bottom.

Role of Multi-layered Government (some basics...)

- Theory of Fiscal Federalism (OATES, 1999, in JEL)
 - on efficiency grounds mobile units should pay taxes for benefits obtained – in this perspective local government should set adequate prices; property taxation can play an important role (e.g. a city that has built a dam should charge implicit flood protection prices proportionate to the market value of the house).
 - Federal grants given to states (looking at US) should be such that spillovers are adequately internalized; EU countries(?); state innovation policy..
 - Central government: Defence, part of social security, income redistribution; stabilization policy

Selected Statistics (annual data)

- (I) Growth rate real output: US, UK, Germany, France, Spain, Italy, China, Korea, Australia, Indonesia, Brazil, Russia 1990-2020
- Unemployment rates:
- Inflation rate (as I) 1970-2012
- Total factor productivity growth EU big 5, US
- Share of Product Innovations by EU Country
- Income Tax Rate (OECD countries, 1970, 80, 90, 2000, 2010)
- Income Tax Rate plus Social Security Contrib.
- *HDI index* (Top 20, Bottom 10), www.worldbank.org

A decorative graphic consisting of overlapping yellow, red, and blue squares with a black crosshair.

Role of Government

- **Fiscal policy:** G , income tax rate τ , VAT (value-added tax) rate τ' , social security contribution rate τ''
- **Monetary policy** (M stock of money)
- **Innovation policy** (v' is product innovation)

Model of a Closed Economy ($C=cY$ consumption demand); gross investment is $\delta K - b''r$; δ depreciation rate of capital

- is useful to understand the world economy
 - which is a closed economy
 - Goods market equilibrium condition is given as
 - 1) $Y = cY + \delta K - b''r + G$; 1.1) $sY = \delta K + G - b''r$
 - 2) Money market equilibrium 2) $M/P = hY - h'r$;
2.1) $r = \mathbf{h''Y - (1/h')(M/P)}$; $h'' := h/h'$. 2.1) in 1.1) gives
 - $(s + b''h'')Y = \delta K + G + \mathbf{(b''/h')(M/P)}$;
multiplier $dY/dG = 1/(s + b''h'')$; $dY/dM = 1/(sh'/b'' + h)$
- Expansionary fiscal policy & monetary policy raise Y

A decorative graphic on the left side of the slide features a vertical black line intersected by a horizontal black line. To the left of the intersection are three overlapping squares: a yellow one at the top, a red one in the middle, and a blue one at the bottom.

Fiscal Policy

- Expansionary fiscal policy ($dG > 0$, or $dT < 0$; or $d\tau < 0$; reduction of income tax rate) in order to raise aggregate demand
- Expansionary monetary policy ($dM > 0$; M is nominal stock of money)
- in a *growing economy* $d(M/Y) > 0$
- Crowding-out problems(?); higher G is financed

A decorative graphic on the left side of the slide features a vertical black line intersected by a horizontal black line. To the left of these lines are three overlapping squares: a yellow one at the top, a red one in the middle, and a blue one at the bottom.

Basic Inflation Problems

- **Fisher equation $MV = PY$** ; V is velocity;
 $V=V(i)$; velocity is a positive function of
nominal interest rate i
- $M/P = V^*Y$; $V^* = 1/V(i)$; i is the nominal interest
rate. For simplicity assume V^* constant
- $P = M/(V^*Y)$
- $g_P = g_M - g_{V^*} - g_Y$; if V^* and hence V is
constant the inflation rate $g_P = g_M - g_Y$

Problem of Currency Substitution

- Overall money supply $M' = M + eM^*$
 - Typical situation with high domestic inflation; often black currency exchange rate (higher than official rate)
 - e is the nominal exchange rate (in price notation: euro/\$); M^* is foreign stock of money in country I.
 - A rise of e – a currency depreciation – raises the overall money supply M' ; the price level P can increase due to rise of M , e or M^* !

Where did we see currency substitution

- a) Latin America: high inflation countries of the 1970s; 2014 Argentina (with black currency market)
- b) in socialist eastern European countries in the crisis of the 1980s – collapse of socialism in Poland in late 1989; sept. 1989 Mazowiecki government; with Leszek Balcerowicz as minister of finance. Later president of the Polish central bank. 1991 collapse of the Soviet Union; new Russia, new country Ukraine

A decorative graphic is positioned to the left of the title. It features a vertical black line intersected by a horizontal black line. To the left of these lines are three overlapping squares: a yellow one at the top, a red one in the middle, and a blue one at the bottom.

Rise and Collapse of Socialist System and the USSR, respectively

- Russian Revolution of 1917: Collectivization of capital, farms – millions starved in the 1920s and 1930s
- USA 1929-1933 almost collapse of the world's biggest market economy: Output decline - 25%
- Russian modernization of the economy through central planning, growth of electricity, schooling, using labor from agricultural surplus sector for industrialization

Which problems emerged in socialist economies?

- Korea, Taiwan, Singapore, Hongkong catching-up with growth rates of 7% or more over decades;
- but slow growth in low per capita income countries of eastern Europe in the 1980s;
 - terms of trade of socialist countries declined (competing against NICs; see Korea, Taiwan etc.).
 - Elastic labor supply from agriculture no longer existing;
 - endogenous money supply growth and rising inflation pressure emerged; growth of socialist shadow economy and massive **corruption; inflation** pressure, **output decline!**
 - massive depreciation in black foreign exchange market

Socialist System: socialist command economy; 1917 Soviet Union – until 1991

- Government-owned firms, now bankruptcy
- Firms should (over)achieve output plans
- Central planning bureau allocates inputs to firms (discrimination of services – due to Marx; poor innovation record)
- No domestic competition = poor quality
- Money plays no active role; no unemployment
- Not much private ownership = poor incentive to invest and to use assets efficiently
- Monopoly external trade sector
- Monopoly central bank: with banks being a subsidiary of the central bank



Politico-economic Perspective on Decline of Socialist System

- Soviet reformers (Gorbachev's economic reform team) did not understand key challenges in the 80s; military rivalry US-USSR
- Lack of innovation dynamics in socialist countries; declining terms of trade: countries had to export more goods in order to obtain required import volume – consumption declines, working motivation falls, queuing getting worse, shadow economy growing further, corruption, collapse of the system; strikes (Solidarnosc Poland 82, Martial Law. 89: Gorbachev: **end of Cold War**)
- Lack of elastic labor supply in agriculture implied that socialist firms would outbid each other in order to attract workers from other firms to fulfill central plan; monetary credits for firms increased=inflation pressure, output decline, collapse of system

Crisis of socialist countries



1980s

- **Expansion of black markets** – in socialist shadow economy market price is higher than state-administered price in the official system (in contrast to market economy)
- Black foreign exchange market: typically **hidden devaluation of economy** = inflation; advantage for households with hard currency income; **inequality in society is rising**
- Economic stagnation, open inflation

What Market Economies Can Deliver If System Is Stable (t time index)

- Maximize **per capita consumption C/L** in a simple growth model (population growth rate: n)
 - **Golden rule: growth rate of output (n) should be equal to the real interest rate:** $C/L = Y/L - I^{\text{gross}}/L$; savings $S = sY$; **goods market equilibrium condition** $S = dK/dt + \text{reinvestment } \delta K$; if $Y = K^{\beta} L^{1-\beta}$ ($0 < \beta < 1$): $y^{\#} := Y/L = (s/(\delta + n))^{\beta/(1-\beta)}$; golden age: **$s = \beta!!$**
 - Golden rule not fully clear in an open economy with cumulated FDI inflows: $C = cZ$ where Z is gross national product (not equal to GDP: Y)!



1. Recalling the Basics

- **Open economy: big vs. small; big-big!!**
- Trade (tradable goods vs. non-tradable goods)
- Capital flows (portfolio capital flows; or foreign direct investment of Multinational Companies – the latter almost never considered)
- Financial markets in a nutshell = one interest rate that reflects **perfect financial markets:** BUT lessons from transatlantic banking crisis...

Four basic + 2 additional constraints for economic policy

- 1a) **Domestic equilibrium** = full employment
- 1b) Domestic monetary equilibrium: stable P
- 2) **External equilibrium** = **current account balance**; we have to make distinction between fixed exchange rate and foreign exchange rate
- 3) **Government budget constraint**
- 4) **Ecological constraint** (global warming problem)
- 5) Government must find **majority** – in democracy
- 6) Get along with International Organizations (IMF, OECD)

Government Budget Constraint (r is real interest rate; D^n is nominal debt of government)

- $G + rD^n/P = \tau Y$; budget constraint if deficit=0
- Assume that $G/Y = \gamma$; defined D^n/P as real debt
- $\tau = \gamma + rD/Y$; define $D/Y := b''$ hence
- $\tau = \gamma + rb''$; the expected income tax rate
therefore is the sum of the expected G/Y and the product of the real interest rate r and the debt-GDP ratio b'' ; if b'' is 30% and r is 4% the income tax rate is 1,2% higher than with 0 debt; if b'' is 100%, r is 6%, the tax rate is raised by 6 points!

Full Employment (Y^d is aggregate demand)

- If labor markets for **skilled labor** and **unskilled labor** are in equilibrium we have full employment;
- In simple Keynesian model (without inflation) – with Y^d determining Y - there is homogenous labor (L_0):
 - Goods market equilibrium: $Y = C(Y-T) + I(r) + G$; T is tax revenue; $Y-T$ disposable income, r is the real interest rate (nominal interest rate minus inflation rate); production function $Y = K^\beta L^{1-\beta}$; $0 < \beta < 1$; $L^d = Y^{\beta''} / K^{\beta/(1-\beta)}$; $\beta'' = 1/(1-\beta)$. Aggregate demand should raise Y to level required for $L_0 = L^d$.
 - Monetary policy can lower r , raise investment, hence Y^d ; fiscal policy can raise Y^d through higher G , lower T (or τ

In medium term Keynesian model with price level P is exogenous

- Money market equilibrium (M money stock):
 - 1) $M/P = hY/(h'r)$; 2) $r = h''Y/(M/P)$; $h'' := h/h'$;
money market determines equilibrium interest rate which in turn will determine investment that in turn will determine Y and Y determines $C(Y-T)$
 - Alternative ([Welfens, 2013](#)) is long run assumption from profit maximization $r = \beta Y/K$ (marginal product of capital); inserted in 2) we get equation
 - 2.1) $M/P = h''K$; given K, M we have: $P = M/(h''K)$ or
Inflation rate $g_P = g_M - g_K$; g is growth rate in %

A decorative graphic on the left side of the slide, featuring overlapping yellow, red, and blue squares with a black crosshair.

Inflation and Deflation

- Inflation is defined as a more than one-off increase of the output price level or the consumer price level (P)
 - **Increase of VAT tax rate** = one-off increase of the price level, but not inflation
 - **Measuring inflation:** on the basis of a representative consumer goods basket
 - Oil price „inflation“ in OECD countries in the 1970s (quadrupling oil prices 1974, 1979)? Energy-intensive goods will be more expensive, other goods could become cheaper (?). Counter argument: all prices are sticky, „energy everywhere“

A decorative graphic is positioned to the left of the title. It features a vertical black line intersected by a horizontal black line. To the left of these lines are three overlapping squares: a yellow one at the top, a red one in the middle, and a blue one at the bottom.

Inflation effects

- Inflation clouds the market economy's language of relative prices; with inflation there will be inefficiency in the allocation of resources
- Inflation favors the lender (if real interest rate is depressed – as in a period of unanticipated acceleration of inflation; adaptive inflation expectations? „Surprise inflation“ (rise of **growth rate of money supply: μ**) by central bank with weak credibility?
- Inflation=taxing the holding of nominal money stock; real seigniorage $(dM/dt)/P = \mu(M/P)$ where $\mu = \pi + g_Y$; consider that $M/P = f(\text{inflation rate})...$

A decorative graphic on the left side of the slide features a vertical black line intersected by a horizontal black line. To the left of these lines are three overlapping squares: a yellow one at the top, a red one in the middle, and a blue one at the bottom.

Deflation:

- More than one-off decline of price level
- Deflation causes problems:
 - Allocation inefficiency (relative price changes versus absolute price decrease)
 - Consumers postpone consumption – waiting for goods to become cheaper = reduction of aggregate demand $C_t = C(P_{t+1}/P_t, M/P)(1 - (D^n/P)/Y)$
 - Investment declines as $I(r, D^{\text{firms}}/P)$; as real debt increases net investment will decline; **imperfect capital markets**

Phillips Curve

- $u = u^{\#} - b^{\prime\prime}\pi$ (**conventional Phillips curve**); $u^{\#}$ is the natural/long run rate of unemployment that is determined by structural traits of the labor market;
- **Modified Phillips curve** (with π^E for expected inflation rate; only unexpected inflation helps...)
 - $u = u^{\#} - b^{\prime\prime}(\pi - \pi^E)$; $b^{\prime\prime} > 0$; long run $\pi = \pi^E$; hence $u = u^{\#}$ in the long run. Higher expected inflation rate shifts the conventional short term curve downwards; consistent with **Lucas Supply Curve: $Y = Y^{\#} + v^{\prime\prime}(\pi - \pi^E)$**

A decorative graphic is positioned to the left of the title. It features a black crosshair centered over a square area. The top-left quadrant of this square is yellow, the bottom-left is red, and the bottom-right is blue.

Rational Expectations: Muth

- In a stochastic world market participants will expect on average the correct value of macro variable; e.g. expected inflation rate = true inflation rate plus white noise error term (white noise= normal Gaussian distribution; 0 mean, 1 standard deviation).
- Lincoln: you can fool some people some time, but not all the people all the time (MILTON FRIEDMAN!)



Modern is Rational Expectations plus other elements

- Intertemporal optimization calculus of households and companies (profit maximization)
 - Time horizon: infinite time periods
 - Future utility (households) or profits (firms) are discounted on the basis of the time preference (or the interest rate)
 - Expectations will matter...; **except in neoclassical growth model.**

Define the Goals of Economic Policy in Quantitative Way; we assume

$Y^* = K^{*\beta^*} (A^* L^*)^{1-\beta^*}$; $0 < \beta^* < 1$; capital income $\beta^* Y^*$

- Operationalize – indicate concept of measurement
 - Price stability (e.g. **core** inflation rate below 2%);
 - **Unemployment rate u** (registered unemployed/gainfully employed or one can rely on household survey data); **long run (#) rate u# about 4%**

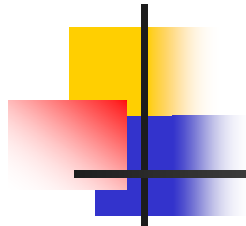
GDP versus Gross National Product (GNP) as Policy Goal

- **Economic growth:** Real output (GDP) = Y ;
- **real income Z** = Y plus balance of net international income (e.g. dividends accruing from abroad; asymmetric foreign direct investment means country I is the only FDI source country); **thus GNP is**
 $Z = Y + \alpha\beta^*Y^*q^*$; α is the share of (home) country I investors in foreign capital stock; $*$ foreign, P price level, $q^* := eP^*/P$ has dimension domestic good units per foreign units.
 - $\alpha\beta^*Y^*q^*$ is the dividend accruing from abroad – expressed in country I goods units

In an economy with both outward and inward foreign direct investment (FDI)...

- Role of gross national income is quite important since consumption depends on Z ; exports, imports are proportionate to Z^* and Z , respectively
- The asymmetric FDI case (only outward FDI)
 - $Z = Y + \alpha\beta^*Y^*q^*$; *factor markets competitive*
 - **The symmetric FDI case**
 - $Z^* = Y^*(1 - \alpha\beta^*) + \alpha^*\beta Y/q^*$; and in country I:
 - $Z = Y(1 - \alpha^*\beta) + \alpha\beta^*Y^*q^*$; note that a real depreciation will raise real profits from abroad

World Economy or country I/II



- Macroeconomic analysis for the **world economy** = closed economy
- Macro analysis for small open economy = all foreign variables are given; not effect of Y (etc.) on Y^* and other foreign variables
- Macro analysis for two big countries:
- Macro analysis for regional integration club (EU, ASEAN, MERCOSUR, NAFTA...)

Equilibrium Output of World Economy

(WELFENS, 2011); τ income tax rate, δ is capital depreciation rate, gross inv. $\delta K - \lambda r$

- (1) $Y = c(1-\tau)Y + (\delta K - \lambda r) + G$; $c+s+\tau=1$
- (1.1) $r = (1 - c(1-\tau))/(\lambda Y) + (\delta/\lambda)K + G/\lambda$
- (2) $M/P = hY/(h'r)$; hence (2.1) $r = hY/(h'M/P)$
- (1.2) $h''Y/(M/P) = (1 - c(1-\tau))/(\lambda Y) + (\delta/\lambda)K + G/\lambda$; here $h'' := h/h'$; $m := M/P$
- (1.3) $Y = ((\delta/\lambda)K + G/\lambda) / ((1 - (1-s-\tau)(1-\tau)) + h''/m)$
 - Y is raised by higher G and higher m ; rise of savings rate **will reduce** the medium term equilibrium Y

Budget Constraint (# denotes the long run „steady state“):

- Consider the government budget constraint (with stock of real government debt B/P ; B is nominal debt, t is time index):
 - $G + rB/P - \tau Y = (dB/dt)/P$; define $G/Y := \gamma$
 - $G/Y + rb - \tau = (dB/dt)/(PY)$; let us assume that deficit-GDP ratio is constant, namely v
 - DOMAR (1944) has shown that $b\# = v/g_Y$; if one assumes/shows that growth rate of real output g_Y is equal to the sum of technological progress a and the population growth rate n we get: **$b\# = v/(a+n)$**
 - **The long run(expected?)** $\tau = \gamma + \mathbf{v}((\mathbf{r}/(\mathbf{a+n})) - 1)$

A decorative graphic on the left side of the slide features a vertical black line intersected by a horizontal black line. To the left of these lines are three overlapping squares: a yellow one at the top, a red one in the middle, and a blue one at the bottom.

Domar Rule (AER 1944): deficit, output growth, debt-GDP ratio

- Consider an economy with constant growth of GDP, namely g_Y , and a constant deficit-GDP ratio d' then the long run debt-GDP ratio (b) is given ($\#$ for long run) by
 - **$b\# = d' / g_Y$**
- Deficit-GDP ratio of 1% and real output growth rate of 2% implies that b will be 0.5 (read 50%); if the interest rate is 6% the interest expenditures/GDP ratio will be 3%.

Intertemporal Government Budget

Perspective (B is nominal stock of government debt; t time index, T is tax revenue in real terms)

- **Current budget constraint**; r is real interest rate; debt-GDP ratio $b := (B/P)/Y$; assume P is constant:
 - 1) $G - T = (dB/dt)/P - rB/P$; divide by Y and let us assume $dB/dt=0$ in **a stationary economy**
 - 2) $(G-T)/Y = -rb$; define $G/Y := \gamma$ and $T/Y := \tau$
 - 3) $(\tau - \gamma)/r = b$; intertemporal budget constraint is fulfilled since the present value of all (primary) budget surplus ratios $\tau - \gamma$ is equal to b; recall **present value of eternal €** $= 1/(1+r) + 1/(1+r)^2$ etc. (for n periods; with n approaching infinity) $= 1/r$

A more realistic budget constraint and some problems with the minimum wage (parameter $\varepsilon > 0$)

- Let us consider production function ($\beta = 0.33$)
- 1) $Y = K^\beta (AL)^{1-\beta}$; MPL is marginal product of labor L
- Profit maximization: **MPL** = total real wage w'
- 2) $\partial Y / \partial L = (1-\beta) K^\beta A^{1-\beta} L^{-\beta} = w(1+\varepsilon\tau)$; w is net wage
- 3) $L^d = (w(1+\varepsilon\tau))^{-1/\beta} (1-\beta)^{-1/\beta} K/A^{(1-\beta)/\beta}$
- Minimum wage which leads to wage subsidies/rise of τ which effects? Taking logs gives approximation (using $\ln(1-\beta) \approx -\beta$)
- 4) $\ln L^d = (-1/\beta)(\ln w + \varepsilon\tau) + \ln K - ((1-\beta)/\beta) \ln A + 1$

Labor Demand Function in the Context of CES Function

- $Y = (a'K^{-\rho} (1-a')(AL)^{-\rho})^{-1/\rho}$ $\rho' = 1$ linear homogenous
- Assume profit maximization which implies marginal product of labor = real wage rate
- Koyck adjustment process for optimal $\ln L$:
 - $\ln L_t = \theta L_t^{\text{opt}} + (1-\theta)\ln L_{t-1}$; t is time index
 - Assume that $A(t) = A_0 e^{at}$; $\ln A = \ln A_0 + at$
 - For **regression analysis** (with error term ε_t) we get
- $\ln L_t = \beta_0 + \beta_1 t + \beta_2 (\ln(W/P)) + \beta_3 \ln Y_t + \beta_4 \ln L_{t-1} + \varepsilon_t$

A decorative graphic is positioned to the left of the title. It features a black crosshair centered over a square area. The square is divided into four quadrants, each with a different color: yellow in the top-left, red in the top-right, blue in the bottom-left, and a lighter blue in the bottom-right.

Parameters to be considered (with $\rho'=1$)

- β_0 cannot be identified (...)
- $\beta_1 = \lambda \rho a / (1 + \rho)$
- $\beta_2 = \lambda / (1 + \rho)$
- $\beta_3 = \lambda$
- $\beta_4 = 1 - \lambda.$

Wage Subsidies and Minimum Wage (see France)

- **In France** firms employing minimum wage earners get a **subsidy of 26% of wage costs** = € 22 bill. = about 1% of GDP; creates deficit-GDP ratio of 1% and implies (with output growth rate of 1,5%) a **long run debt-GDP ratio** – only from this wage subsidy – of 66.7%.
- If one assumes an interest rate of 4% the implied **interest expenditure-GDP ratio is 2.7%**; the income tax rate would have to be raised accordingly (at least partly; parameter ε). With $\beta=0.33$ employment is reduced by 8% (-4% realistic?);
 - you could roughly cut the long run unemployment rate by 50% if you could do away with wage subsidies! **Paradox!**

Deficit policy/debt policy of governments

- 1) discretion of central government – possibly good for **stabilization policy** – and **balanced budget requirements in 49 US states** (requirement in most state constitutions in the US)
- 2) **debt brake rules** (rainy day fund) as first established in the region of St. Gallen (1929)
- 3) **Maastricht Treaty of the EU**: euro area countries (started in 1999 with 11 countries) should have maximum of 3% deficit-GDP ratio – and balanced budget in medium term - and maximum of 60% debt-GDP ratio; Treaty did not work...euro crisis

Which deficit rules work?(on 2)- 4) see Jeffrey Frankel, 2005

- 1) **Constitutional** deficit rules/debt brakes: **YES**
- 2) Starve the beast (US Republicans in first Reagan Administration Term and Bush Sen. Term): „cut taxes and spend“, the rising deficit will force government to cut spendings! **NO**
- 3) Rigid rules (e.g. balanced budget rule): **NO**, as this does not allow anti-cyclical policy
- 4) „**Shared Sacrifice**“ (1990s, Clinton Admin.): Flexibility but useful rules and package deal: **YES**

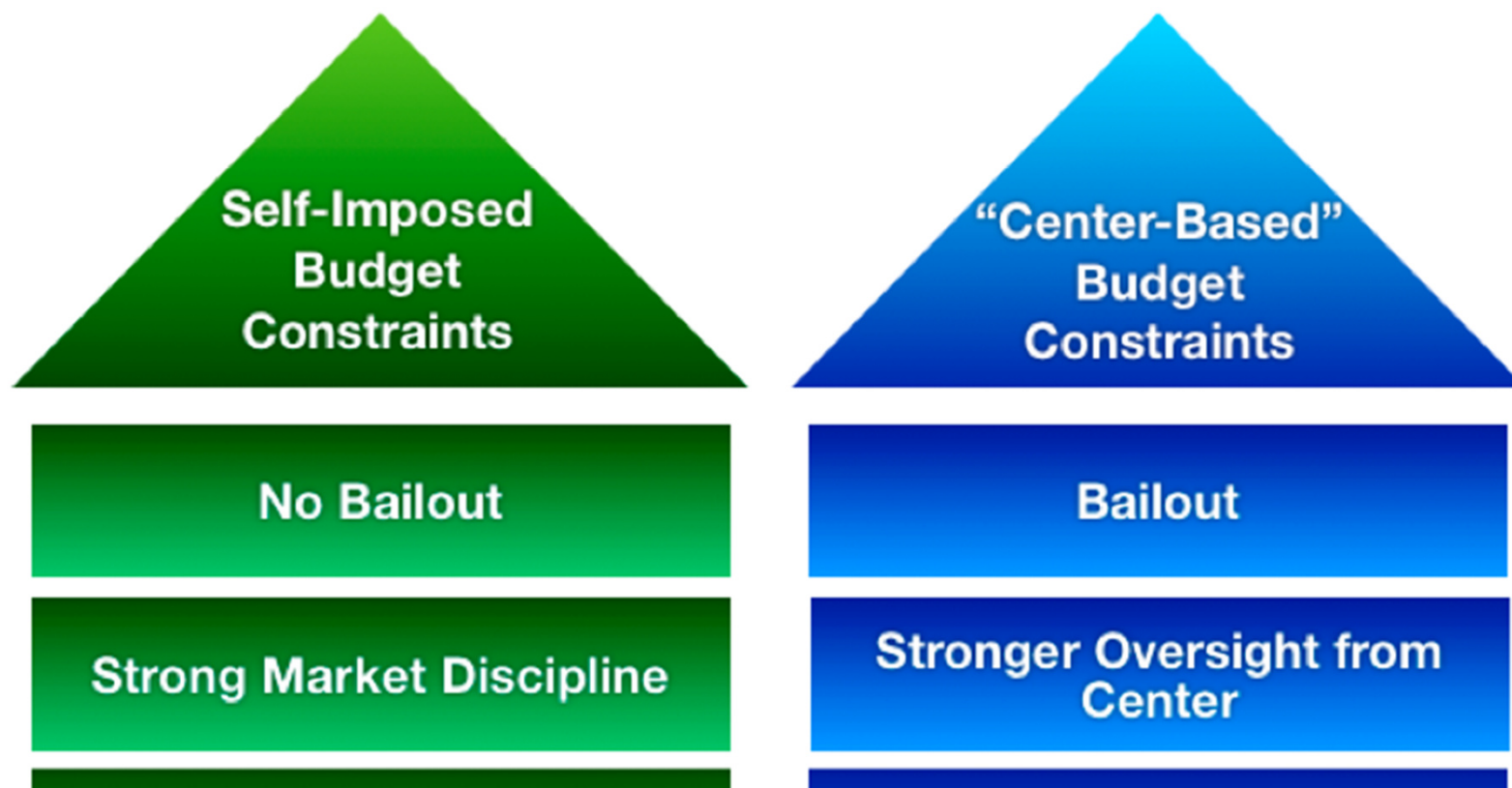
A decorative graphic on the left side of the slide features a vertical black line intersected by a horizontal black line. To the left of the intersection are two overlapping squares: a yellow one on top and a red one on the bottom. To the right of the intersection is a blue square.

Shared Sacrifice Fiscal Regime has three elements („I will agree to forego my tax cuts if you forego to raise expenditures“)

- 1) government puts **growth caps** on discretionary expenditures
- 2) **Paygo-rule**: members of parliament that suggest tax cut or rise of expenditure have to indicate how this is to be financed
- 3) **preserving the new on-budget surplus** under the slogan: Saving social security first
 - Jeffrey Frankel (2005), Comment, in: POSEN, A.S., ed., The Euro at Five: Ready for a Global Role?, Washington DC, 157-169

Two different regimes: central government, regional gov. (IMF, 2013)

Stylized Setups for Hard-Budget Constraints



Why are periods of debt crises so dangerous?

- 1) Risk of **sudden stop**: no more capital inflows, rapidly rising capital outflows; massive depreciation, rise of r !
- 2) If refinancing government debt is no longer possible there will be **debt restructuring** or **default** of country = **confidence problem**; **rating at C/D**
- 3) If government debt mainly is foreign indebtedness the current account can no longer be in deficit; now a CA surplus must be achieved – a) reducing absorption real $C+I+g$; b) improving competitiveness; for a) see

$$Y - (C+I+G) = X_{\text{net}}; C=C(Y,T); I=I(r,T^{\text{''}}); T \text{ tax rev.}$$

Improving CA: Expenditure Reducing, Expenditure Switching

- Consider the **tradables sector (T)** and the **non-tradables sector (N)** in a **small open economy**
 - **T-sector surplus = trade surplus** (current account surplus)
 - **T/N mix:** relative price of N-goods to T-goods should fall = production of N-goods falls; with given aggregate K and L the consequence is a rise of T-production so that current account will improve (N-sector price is partly determined by **public sector wages** – often rather high: Spain, Portugal, Greece in euro crisis), lack of competition in N sector; hence more active **competition policy**, deregulation etc.
 - Formal analysis is given by **MUNDELL** (Monetary Theory, chapter 9)



3 Questions

- 1) What happens with growth rate of knowledge (progress rate) if $G = G' + G''$ where G' is government consumption and G'' is promotion of research and development? (Welfens, 2011)
- 2) Are Government Bonds Net Wealth? Question of David Ricardo: Rise of B implies rise of future taxes; bonds are no net wealth..., **but what should we think about the „consumer surplus+producer surplus“; long term government bond raising time horizon (?)**
- 3) How to tame the problem of excessive debt?

Solow Growth Model, K capital, L labor; t is time, δ depreciation rate, n growth rate of L

■ $0 < \beta < 1$; production function **1) $Y = K^\beta L^{(1-\beta)}$**

1') $y := Y/L = k^\beta$ where capital intensity $k := K/L$

■ Savings function 2) $S = sY$; hence $S/L = sy$ ($y := Y/L$)

■ Goods market equilibrium condition is **$S =$
gross investment $dK/dt + \delta K$:**

■ 3) $(dK/dt + \delta K)/L = sY/L$; recall that $dk/dt = (dK/dt)/L - nk$ where n is the growth rate of labor, namely $(dL/dt)/L$; **insert 1') in 3):**

■ 4) $dk/dt = sk^\beta - (n + \delta)k$; 5) $k^\# = (s/(n + \delta))^{1/(1-\beta)}$
from $dk/dt = 0$; hence $y^\# = (s/(n + \delta))^{\beta/(1-\beta)}$

Conclusion for Long Run $Y^\#$ in this Supply-Side Full Employment Approach

- $y^\# = (s/(n+\delta))^{\beta/(1-\beta)}$
 - Recall that $y = Y/L$; $L(t) = L_0 e^{nt}$; L_0 is initial level of labor (size of population)
- $Y^\# = (s/(n+\delta))^{\beta/(1-\beta)} L_0 e^{nt}$
- What if the population is constant (**$n=0$**)?
 - $Y^\# = (s/\delta)^{\beta/(1-\beta)} L_0$
 - The long run real equilibrium output is determined by the savings rate and the capital depreciation rate; and given L .
 - The higher the savings rate the higher the long run output

Long Run: Modified Neoclassical Growth

Model (m is positive external production effect of households holding m : Welfens, 2011)

- (3) $Y = (M/P)^{\beta'} K^{\beta} (AL)^{1-\beta}$; (4) $y' = m'^{\beta'} k'^{\beta}$; $y' := Y/(AL)$
growth rate of knowledge a ; growth rate of L is n , e' Euler number, $m := m'/(AL)$, $k' := K/(AL)$;

$$I^{\text{gross}} = dK/dt + \delta K$$

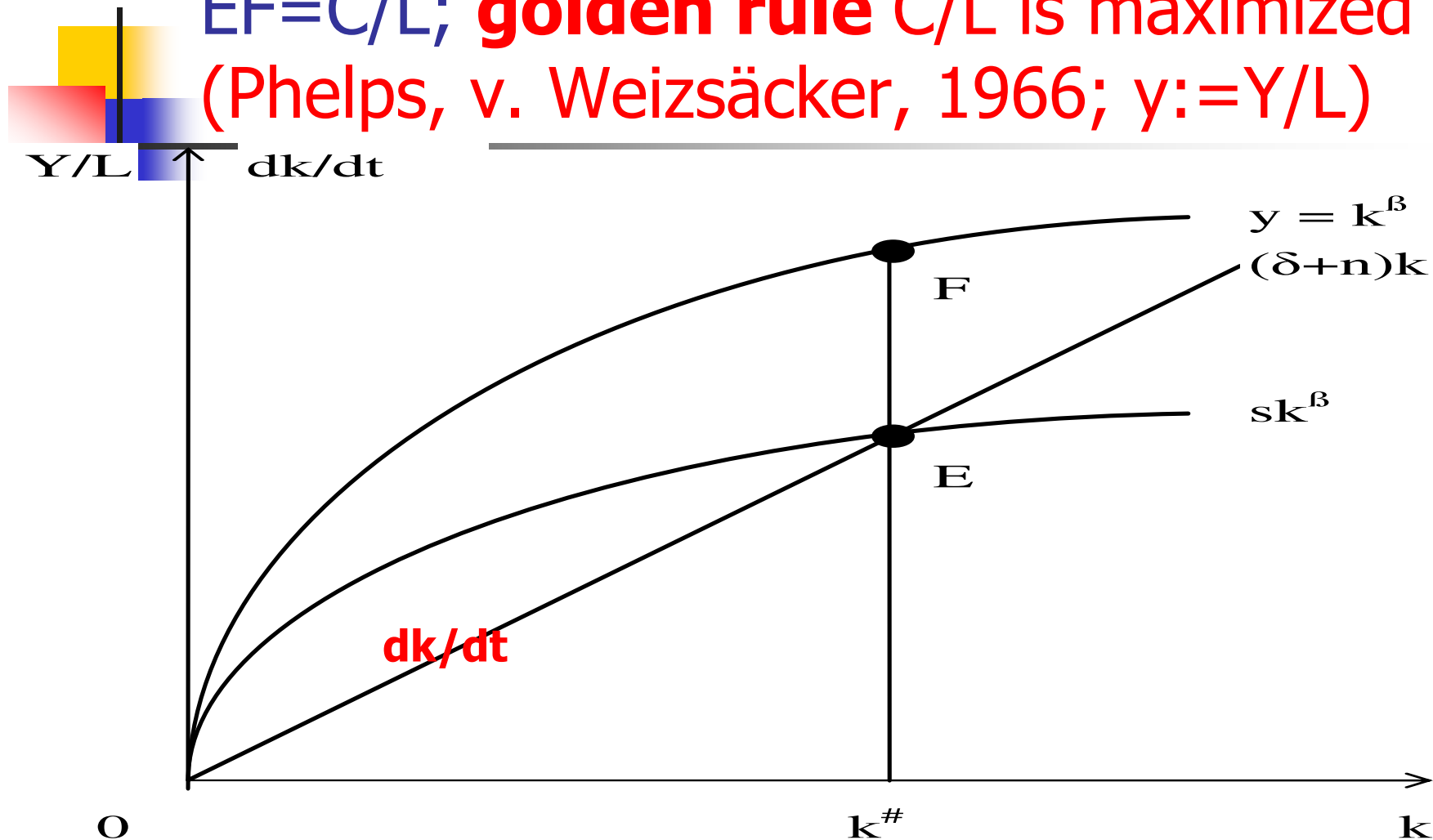
- Savings function (5) $S = s(1-\tau)Y$; note $0 < \beta' < 1$
- Equilibrium condition for goods market is here
(6) $S/(AL) = I^{\text{gross}}/(AL)$; AL is labor in efficiency units;
(7) $dk'/dt = (dK/dt)/(AL) - (a+n)k'$ according to differentiation rule; (4), (5), (6), (7), $dk'/dt = 0$ gives steady state #

$$\text{■ (3) } Y\# = e^{(a+n)t} m^{\beta'\beta'/(1-\beta')} A_0 L_0 (s(1-\tau)/(a+n+\delta))^{\beta/(1-\beta)}$$

$$Y\# = e^{(a+n)t} m^{\beta\beta'/(1-\beta)} A_0 L_0 (s(1-\tau)/(a+n+\delta))^{\beta/(1-\beta)}$$

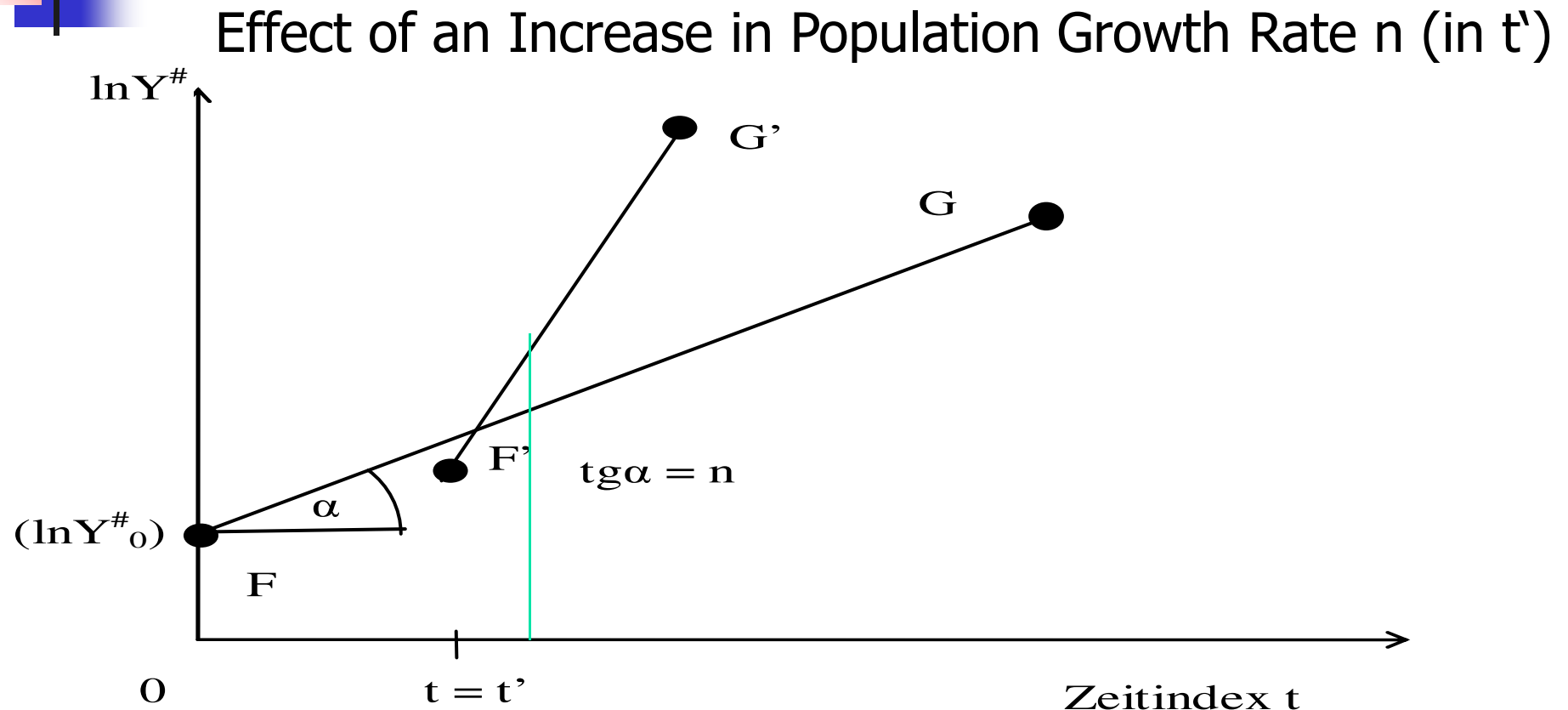
- Growth rate of output in the long run (steady state) is given by **a+n**; to compare this growth – supply-side – approach with Keynesian approach one may set $a=0$, $n=0$; thus we get the **level of the growth path**
- The long run (steady state) equilibrium output $Y\#$ is
 - a **positive function of the real money stock** (we have assumed zero inflation; inflation creates problems – e.g. instead of β we have $\beta'' = \beta - v''\pi$; the parameter v'' is positive (but leaving $\beta'' > 0$))
 - The **level of the growth path** is the higher **the higher s !**

Graphical Solution (with $\tau=0$); distance $EF=C/L$; **golden rule** C/L is maximized (Phelps, v. Weizsäcker, 1966; $y:=Y/L$)



Note: difference between y and per capita investment $((\delta+n)k) = C/L$; **MAX** C/L Gives $(\beta Y/K - \delta) = n$; or **golden rule** $r=n$! (n is growth rate of pop. and of output in steady state!); Piketty $r>n$!!

Level of Growth Path (point F) and Growth Rate (tang α)



A decorative graphic is positioned to the left of the title. It features a vertical black line intersected by a horizontal black line. To the left of these lines are three overlapping squares: a yellow one at the top, a red one in the middle, and a blue one at the bottom.

Current Account Balance

- **Merchandise Trade Balance** plus **Services Balance** plus capital balance (workers' remittances and unilateral transfers) = Current Account Balance
- If CA is negative there is rising foreign indebtedness – what is the limit(?); the rating position of the country: as long as A or B+ this is ok, below there is a problem as default probability of country seems to be high...

The Current Account X' Is Explained by...

- $X' = (Y - Y'') - (I - I'') - (G - G'')$
 - **Consumption smoothing** (Obstfeld/Rogoff. Ch2); If Y exceeds its **permanent level Y''** , exports rise; rather than increasing C households choose to accumulate foreign bonds (assets) as a natural way of smoothing planned consumption over the future. If investment exceeds I'' households borrow from abroad in order to finance extra investment instead of lowering C ; also if $G > G''$
- $Y - (C(\dots) + I(\dots) + G) = X'$
 - Here net exports/current account explained by domestic absorption ($C + I + G$); with production Y given



Fixed Exchange Rate vs. Flexible Exchange Rate

- Flexible exchange rate imply that current account deficit (if there is any) has been financed by net capital inflows – the latter amount to supply for foreign exchange; current account deficit implies a demand for foreign exchange: FOREX market always is in equilibrium, but sudden changes of e can have effects. E.g. a (strong) devaluation raises the real value of external indebtedness, expressed in domestic currency units.

A decorative graphic is positioned to the left of the title. It features a vertical black line intersected by a horizontal black line. To the left of these lines are three overlapping squares: a yellow one at the top, a red one in the middle, and a blue one at the bottom.

Central Banks (SDR = special drawing rights of the IMF)

- A) conducting monetary policy – autonomy only in system of flexible exchange rate
- B) sometimes responsible for prudential supervision (US FED, Bank of England, ECB since 2014)
- C) holding foreign reserves = short term bonds (+gold) = getting low interest payment; reserves will depreciate in domestic currency units if there is nominal appreciation of domestic currency; SDR (see IMF...)

Demand vs. Supply

Approaches; small vs. large

- 1) **Keynesian** demand approach
- 2) **Supply-driven** approach = growth model
 - Traditional neoclassical model vs. endogenous growth model (explaining technological progress)
- 3) ***Small Open Economy perspective*** vs. **Large Country** (2 country model)
 - Small country: all international prices given
 - Large countries: country I – economic policy (e.g. expansionary fiscal policy) affects country II; followed by repercussion effect on country I (e.g. US and Euro Area policy)

Aggregate Demand Perspective: Mundell Fleming Model (i is nominal interest rate)



- (1) $Y = c(1-\tau)Y + G - br + X - q^*J$; goods market equ.
 - $C = c(1-\tau)Y$; τ is income tax rate; investment $I = -br$ (r is real interest rate), parameter $b > 0$, G government consumption, Y is real gross domestic product
 - exports $X = xY^*q^*$; $J = jY/q^*$ as simple specification
- (2) money market equilibrium $M/P = hY - h'r$; positive parameters h, h' ; M nominal money supply; P is the output price level ($i=r!!$)
- (3) $v(r-r^*) = jY - xY^*q^*$ (foreign exchange market equilibrium)

A decorative graphic on the left side of the slide features a vertical black line intersected by a horizontal black line. To the left of these lines are three overlapping squares: a yellow one at the top, a red one in the middle, and a blue one at the bottom.

New Keynesian Economics

■ Key elements

- Monopolistic competition = market power = mark-up pricing
 $P = (W/(Y/L))(1 + \phi)$; $W/(Y/L)$ is unit labor cost; ϕ mark-up which is a cyclical variable
- **Rational expectations (John Muth)** = forward-looking behavior
- Market imperfections = wage and price stickiness
- Matching frictions in labor markets
- Moral hazard in labor markets
- System is no guarantee for full employment
- Possible multiple equilibriums

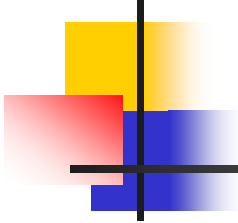
Simple New Keynesian Models in a Stochastic Context (stochastic disturbance terms u'' , v''); rational expectations

- (1) $Y_t^d = G_t'' + b(m_t'' - p_t) + u_t''$; (m'' is $\ln M$, p is $\ln P$)
- (2) $Y_t^s = Y\# + h(p_t - p_t') + v_t''$; b and h positive parameters
- (3) $Y_t = G_t'' + b(m_t'' - p_t) + u_t''$
- (4) $Y_t = Y\# + h(p_t - p_t') + v_t''$
- **Apply expectation operator E:** (5) $Y_t^E = G_t''^E + b(m_t''^E - p_t')$
- (6) $Y_t^E = Y\#$
- p' is expected price level: (7) $p_t' = m_t''^E - (Y\# - G_t''^E)/b$
- (8) $Y_t - Y_t^E = (G_t'' - G_t''^E) + b(m_t'' - m_t''^E) - b(p_t - p_t') + u_t''$
- (9) $Y_t - Y_t^E = h(p_t - p_t') + v_t''$

The Non-neutrality of Economic Policy in a Consistent New Keynesian Models

- (8) $Y_t - Y_t^E = (G_t'' - G_t^{E''}) + b(m_t'' - m_t^{E''}) - b(p_t - p_t')$ + u_t''
- (9) $Y_t - Y_t^E = h(p_t - p_t') + v_t''$
- **(10) $p_t = p_t' + [1/(b + h)] [(G_t'' - G_t^{E''}) + b(m_t'' - m_t^{E''}) + u_t'' - v_t'']$; b and h parameters**
- **(11) $Y_t = Y\# + [h/(b + h)] [(G_t'' - G_t^{E''}) + b(m_t'' - m_t^{E''}) + u_t'' + b/h v_t'']$**

Some Leading Scholars of NKE

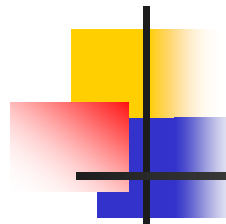
- 
- Mankiw & Romer: book New Keynesian Economics, Vol. 1, 2; (micro foundations, 1991)
 - Michael Woodford: **Interest and Prices: Foundations of a Theory of Monetary Policy**
 - Goodfriend, Gali, Blanchard, Kiyotaki

A decorative graphic on the left side of the slide features a black crosshair. The vertical line of the crosshair passes through a yellow square, and the horizontal line passes through a red square. Below the horizontal line, there is a blue square.

NKE DSGE Models

■ **Dynamic stochastic equilibrium models** (with rational expectations)

- Goods market and labor market etc. considered in a stochastic context;
- Random shocks: White noise error term (e.g. η) in each equation: expectation value $E(\eta)$ is zero, finite variance σ
- Monopolistic firms face price stickiness;
- Output is a function of household's real demand which is partly determined by (monopolistic) price level
- interaction of households, firms, gov., central bank; „Special technique“ to solve models with rational expectations



DSGE Models (continued)

- Dynamic model which shows how the economy system is developing over time
- Stochastic quasi-Walrasian system
- Households:
 - Maximize utility function (consumption, leisure)
- Firms
 - Profit maximization
- Government: Budget constraint (aim: e.g. full employment, welfare maximization?); central bank: low inflation rate (price stability)

Competing Schools of DSGE Modelling

Approaches:

- **Real business cycle (RBC)** model is based on neoclassical growth model in a setting with flexible prices: Real shocks to the system can cause business cycle fluctuations (KYDLAND/PRESCOTT, 1982; GOODFRIEND/KING, 1997); NO money!
- New-Keynesian DSGE based on a structure which is similar to RBC but here prices set in a system of monopolistic competition and adjustment costs (ROTEMBERG/WOODFORD, 1997; GOODFRIEND/KING, 1997; CLARIDA/GALI/GERTLER, 1999; GALI, 2008)



Read the following papers

- Goodfriend, M.; King, R. (1997), The New Neoclassical Synthesis and the Role of Monetary Policy, NBER Macroeconomics Annual 1997, Vol. 12, p. 231 -296.
- Clarida, R.; Gali, J.; Gertler, M. (1999), The Science of Monetary Policy: A New Keynesian Perspective, Journal of Economic Literature, Vol. 37, 1661-1707.
- Sbordone, A.; Tambalotti, A.; Rao, K.; Walsh K. (2010), Policy analysis using DSGE models: an introduction, Federal Reserve of New York Economic Policy Review 16 (2)
- Paper by STIGLITZ



Critique on DSGE

- Willem Buiter: DSGE models are unable to catch the largely non-linear economic dynamics
- Counter-argument/Woodward: DSGE is evolutionary development along Keynesian macro modeling...
- Kocherlakota (FED of Minneapolis): argues that DSGE models not useful for analyzing the financial crisis of 2007-2010
- US Congress hosted hearings on macroeconomic modeling approaches (July 20, 2010) to understand why financial crisis 07/08 not foreseen: Solow critique (assumptions: DSGE presents economy like a „machine“) ; V.V. Chari defends DSGE: heterogenous actors are considered

Some Criticism (Welfens, 2012a,

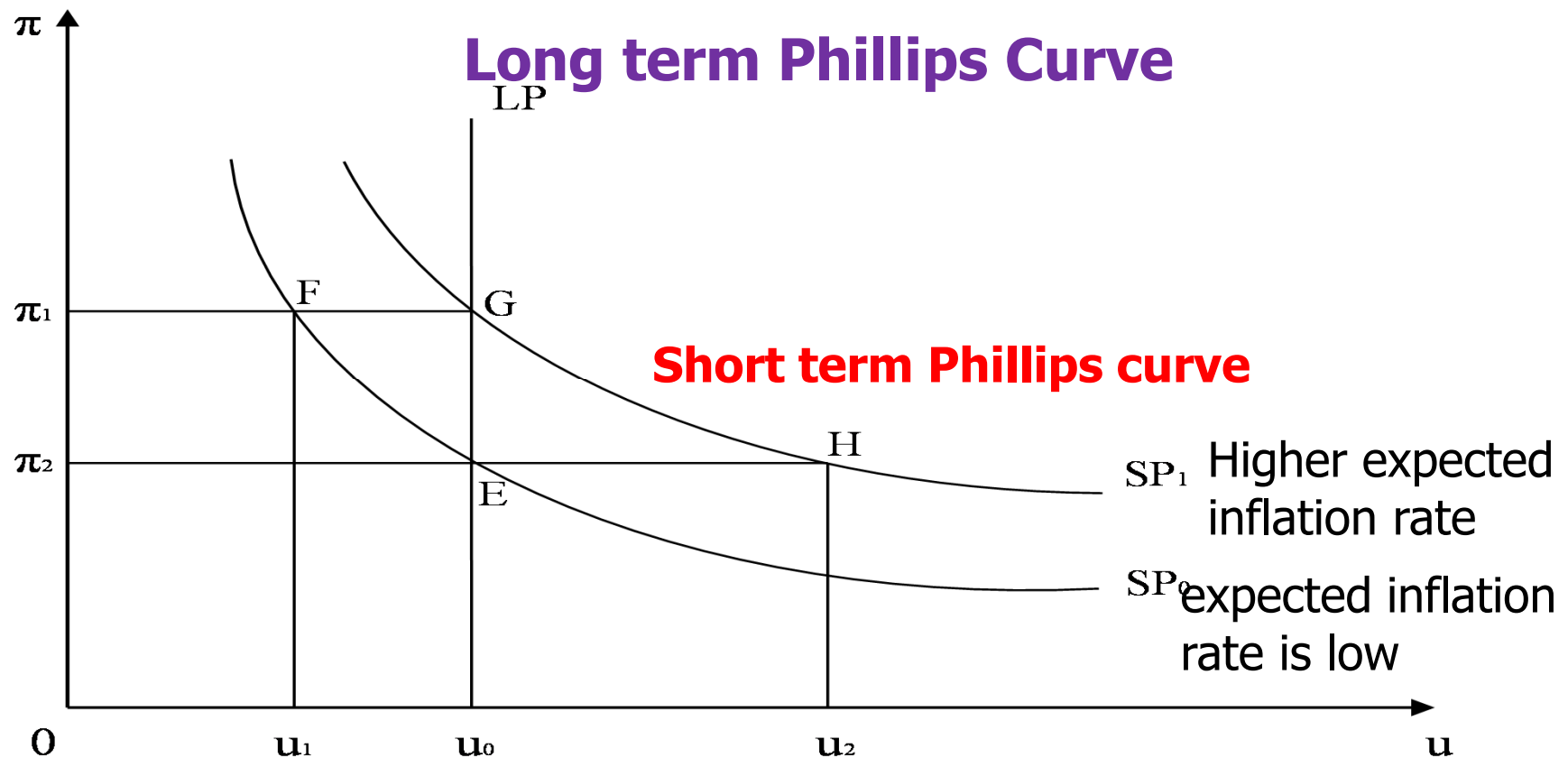
Welfens 2011: Innovations in Macroeconomics, 3rd edition)

- Moral hazard in capital markets/the banking system!
- Hybrid consumption function is more realistic (microfoundation can always be found if empirical finding for hybrid function ok; Welfens 2011)
- Investment function is not consistent with steady state: proposed solution see Welfens (2012a)
- Implausible that households behavior etc. is not affected by the size of the variance of disturbance terms (e.g. in the goods market; see Welfens 2012a and the following reflections)

Modern NKE Models: Rational Expectations and New Keynesian Economics (e.g. GOODFRIEND)

- **Rational expectations revolution (MUTH):**
 - Economic agents are forward-looking
 - Expectation formation based on a model of the economy = rational expectations
 - There are, however, random shocks so that people cannot adjust in a perfect manner; but people have „on average“ expectations which are correct.
 - Debate on Phillips curve looks different under rational expectations than under adaptive expectations: No short-term trade off that can be exploited by policymakers (here: central bank)

Short-term and Long-run Phillips Curve



Simple theoretical perspective:

V is velocity, Y is real GDP

- **Quantity equation $M V = P Y$**
- $g_P = g_M - g_Y$ (assuming V is constant; g is growth rate); central bank can raise the growth rate of stock of money (M); could be $M1$ (cash+time deposits) or $M3$
- If $Y = K^\beta (AL)^{(1-\beta)}$;
 - $g_Y = \beta g_K + (1-\beta)(a+n)$;

A decorative graphic is positioned to the left of the section header. It features a vertical black line intersected by a horizontal black line. To the left of these lines are three overlapping squares: a yellow one at the top, a red one in the middle, and a blue one at the bottom.

New Keynesian Models

- There are rigidities in labor markets or goods markets (realistic adjustment costs)
- People: rational expectations about inflation rate; expectations also relevant for other variables. *Unclear with respect to gov. Debt (see the debt crisis in OECD countries 2010/11)*
- Households maximize utility of consumption within a model of intertemporal optimization:
 - Infinitely lived households with time preference ρ
 - Ricardian households (Ricardo equivalence theorem)

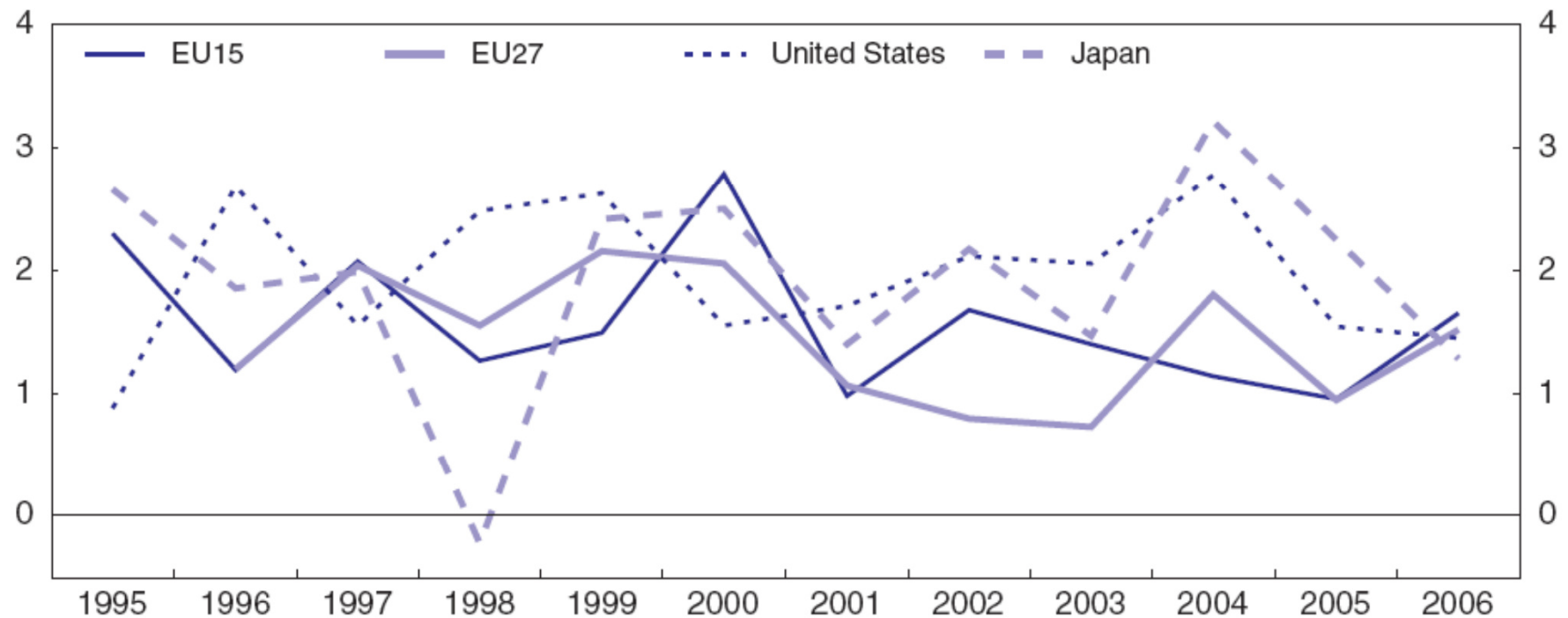
A decorative graphic is positioned to the left of the title. It features a vertical black line intersected by a horizontal black line. To the left of the vertical line are two overlapping squares: a yellow one on top and a red one on the bottom. To the right of the vertical line is a blue square. The title 'Some critical remarks' is written in a large, blue, sans-serif font to the right of this graphic.

Some critical remarks

- Banking crisis 2007/08 almost deadly for US system and UK system and euro system
- Unstable banking system? Why? Strange incentives (change in investment banking in US, financial innovations – see RAJAN paper) and insufficient regulation, naive prudential supervision. Big banks were bailed out, too big to fail-problem
- Inadequate innovation system in banking(Welfens, 2011); ***much fraud in big banks – e.g. fixing interest rates, exchange rates, bad advice to clients; not in our MACRO MODELS as problems***

Productivity¹ Growth

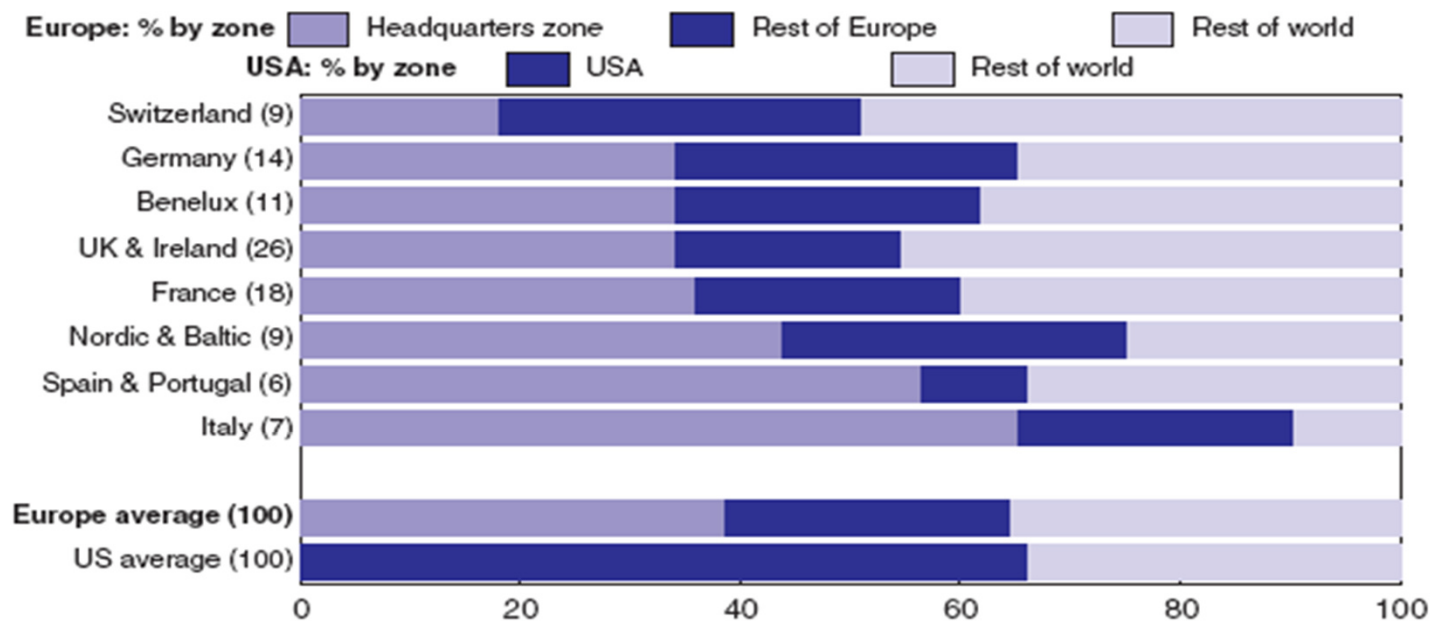
Annual percentage change



1. GDP per employee for the EU27 and GDP per hour worked for the others.

Source: Eurostat and OECD, Economic Outlook No. 81 Database.

Europe Top 100: Average revenue structure



Source: Véron, N. (2006), "Farewell National Champions", *Bruegel Policy Brief*, Issue 2006/04, June, Figure 4.

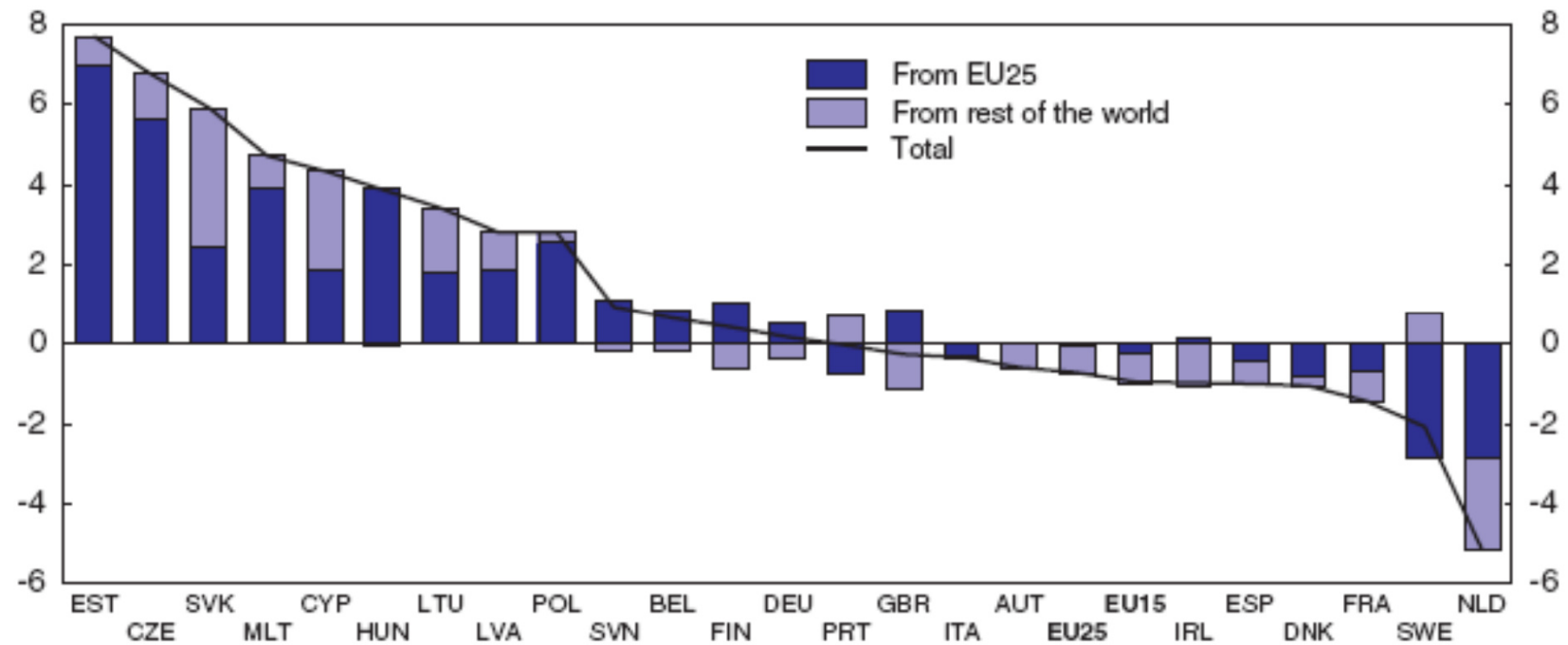
Export shares by skill intensity (2004)

| | High technology | ICT (part of high-tech) | Medium-high technology | Medium-low technology | Low technology |
|---------------------------|--------------------|----------------------------|---------------------------|--------------------------|-------------------|
| World | 23.5 | 15.4 | 41.3 | 14.1 | 21.1 |
| EU15 | 22.8 | 9.8 | 46.9 | 12.7 | 17.6 |
| EU12 | 14.1 | 13.9 | 41.3 | 18.5 | 26.1 |
| US | 32.8 | 17.5 | 43.6 | 9.7 | 13.9 |
| Japan | 23.8 | 18.4 | 59.9 | 12.1 | 4.2 |
| China | 27.7 | 24.9 | 27.7 | 12.8 | 31.8 |
| SE Asia (excluding China) | 36.9 | 32.5 | 32.4 | 9.3 | 21.4 |

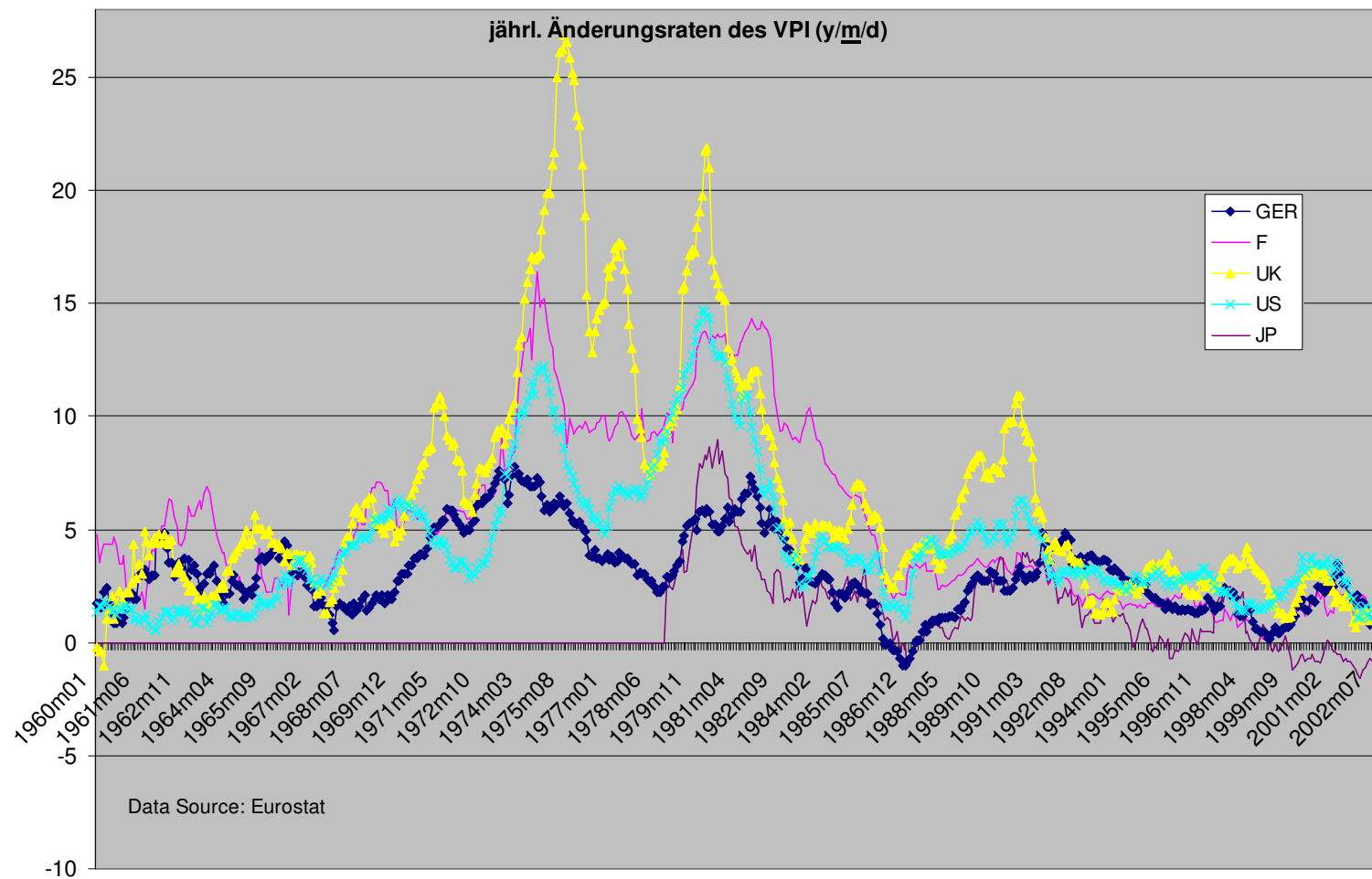
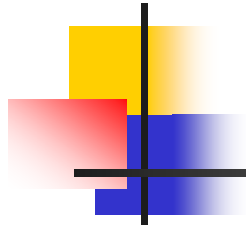
Source: OECD calculations based on UN Comtrade.

Net FDI inflows

In per cent of GDP, 2001-05



Source: Eurostat.



Thank you for your attention

Recommended: www.econ-international.net

Journal of International Economics and Economic Policy



EIIW is the European Institute for International Economic Relations

www.eiiw.eu