École Nationale Supérieure d'Informatique pour l'Industrie et l'Entreprise

MACROECONOMICS

Vasilis Zervos (DPhil)

Associate Professor Economics and Policy, International Space University/ Associate member University of Strasbourg (BETA)

email: vasilis.zervos@gmail.com

MACROECONOMICS Introduction

- Introduction-Basics
- Economic systems
- Money Market/ IS-LM
- Aggregate Demand and Supply
- Macroeconomic Analysis
- Revision (time permitting)
- Exam

Schedule…(upd 25/05)

Séances	Date	Durée	Début	Fin	Intitulé du cours	Salle
1…	18/02/2016	04h00	14h00	18h00	Macroeconomics	Kosmos
2…	26/02/2016	04h00	14h00	18h00	Macroeconomics	Kosmos
3…	10/03/2016	04h00	14h00	18h00	Macroeconomics	Kosmos
4…	18/05/2016	04h00	TBD	TBD	Macroeconomics	Kosmos
5…	25/05/2016	04h00	14h00	18h00	Macroeconomics	Kosmos
6…	26/05/2016	02h00	09h00	11h00	Macroeconomics	Kosmos
7…	26/05/2016	02h00	11h00	13h00	Macroeconomics	Kosmos

Economics- Basics

By the end of these presentations students should be able to:

◆ describe the functions of money and key macroeconomic aggregate variables (economic growth, inflation, unemployment, imports and exports).

◆ Explain the role of the government (spending and taxation) at the aggregate level

◆ Explain key global trade balance characteristics with a focus on the aerospace sector

◆ Explain the use of IS-LM and agreggate Demand/ Aggregate Supply tools in Macroeconomic Analysis

◆ Describe key differences between Monetarist and Keynesian schools of Macroeconomics

◆ Explain the short-run and long-run implications for macroeconomic analysis

outline

- Notes on historical background
- Macro and micro economics at a glance
- Money and key macroeconomic variables
- Government in the economy
- Trade balance in aerospace: stylized facts
- MacroEconomic Modeling and the IS-LM
- Using the IS-LM framework for analysis
- Aggregate Demand and Supply (TF)
- Key elements of Monetarists and Keynesian Approaches

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Main economic schools include Classical/neoclassical, marxist and keynesian

- Adam Smith/ Maynard Keynes: moral philosophers

- 1st was motivated for his work on competition (arguably named as the 'invisible hand') by the waste and inefficincies. as well as exploitation generated by monopolies. 2nd was motivated by recession and the inhumanity of depression, as oposed to growth and employment which must be supported by 'expansionary government' when markets are dysfunctional and expectations pessimistic.

Famous Quotes...

AS: "People of the same trade seldom meet together, even for merriment and diversion, but the conversation ends in a conspiracy against the public, or in some contrivance to raise prices."

AS: "It is not from the benevolence of the butcher, the brewer, or the baker that we expect our dinner, but from their regard to their own self-interest. We address ourselves not to their humanity but to their self-love, and never talk to them of our own necessities, but of their advantages"

AS: "How selfish soever man may be supposed, there are evidently some principles in his nature, which interest him in the fortune of others, and render their happiness necessary to him, though he derives nothing from it, except the pleasure of seeing it."

AS: "Civil government, so far as it is instituted for the security of property, is in reality instituted for the defense of the rich against the poor, or of those who have some property against those who have none at all."

AS: "Science is the great antidote to the poison of enthusiasm and superstition."

Stalin: Ideas are more powerful than guns. We would not let our enemies have guns, why should we let them have ideas?

MK: "The ideas of economists and political philosophers, both when they are right and when they are wrong, are more powerful than is commonly understood. Indeed, the world is ruled by little else. Practical men, who believe themselves to be quite exempt from any intellectual influences, are usually the slaves of some defunct economist. Madmen in authority, who hear voices in the air, are distilling their frenzy from some academic scribbler of a few years back. I am sure that the power of vested interests is vastly exaggereated compared with the gradual encroachment of ideas…. But, soon or late, it is ideas, not vested interests, which are dangerous for good or evil…"

Macroeconomics vs. Microeconomics

Macroeconomics (*Income and Employment Theory*)

- Studies the behaviour of aggregate (total) economic variables such as income, employment, price level etc…

Microeconomics (*Price Theory*)

- Studies the behaviour of individuals and groups of individuals , such as consumers, households and businesses.

In more detail…

- Macro-Economics and Micro-Economics…macro-looks at the (national) economy as a whole and its three main sectors:
  - ◆ primary (agriculture, fisheries, mining etc);
  - ◆ secondary (manufacturing);
  - ◆ tertiary (services)
- Most popular macroeconomic themes divide between real economic and monetary:
  - ◆ Gross Domestic (or national) Product- GDP/GNP, relates to the size/growth of economy;
  - ◆ changes in the consumption price indexes- inflation/deflation (p);
  - ◆ price of money- Interest rate(s)- r;
  - ◆ employment- levels of unemployment (e);
  - ◆ income distribution- gini coefficient, relates to distributional aspects;
  - ◆ Exports- imports (X, M)

Production and Allocation-based Tools of analysis: The PPF

- Productive Efficiency: Economy is at its production frontier: 'Full Employment'

- Allocative Efficiency: allocates the goods in an efficient way: nobody's welfare can be improved without negatively affecting someone else's welfare: Pareto Efficiency
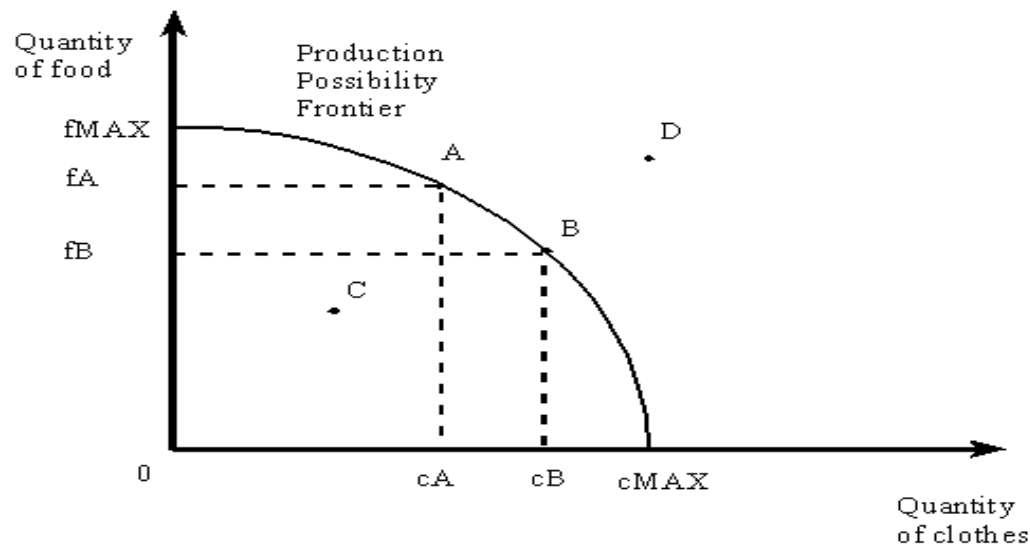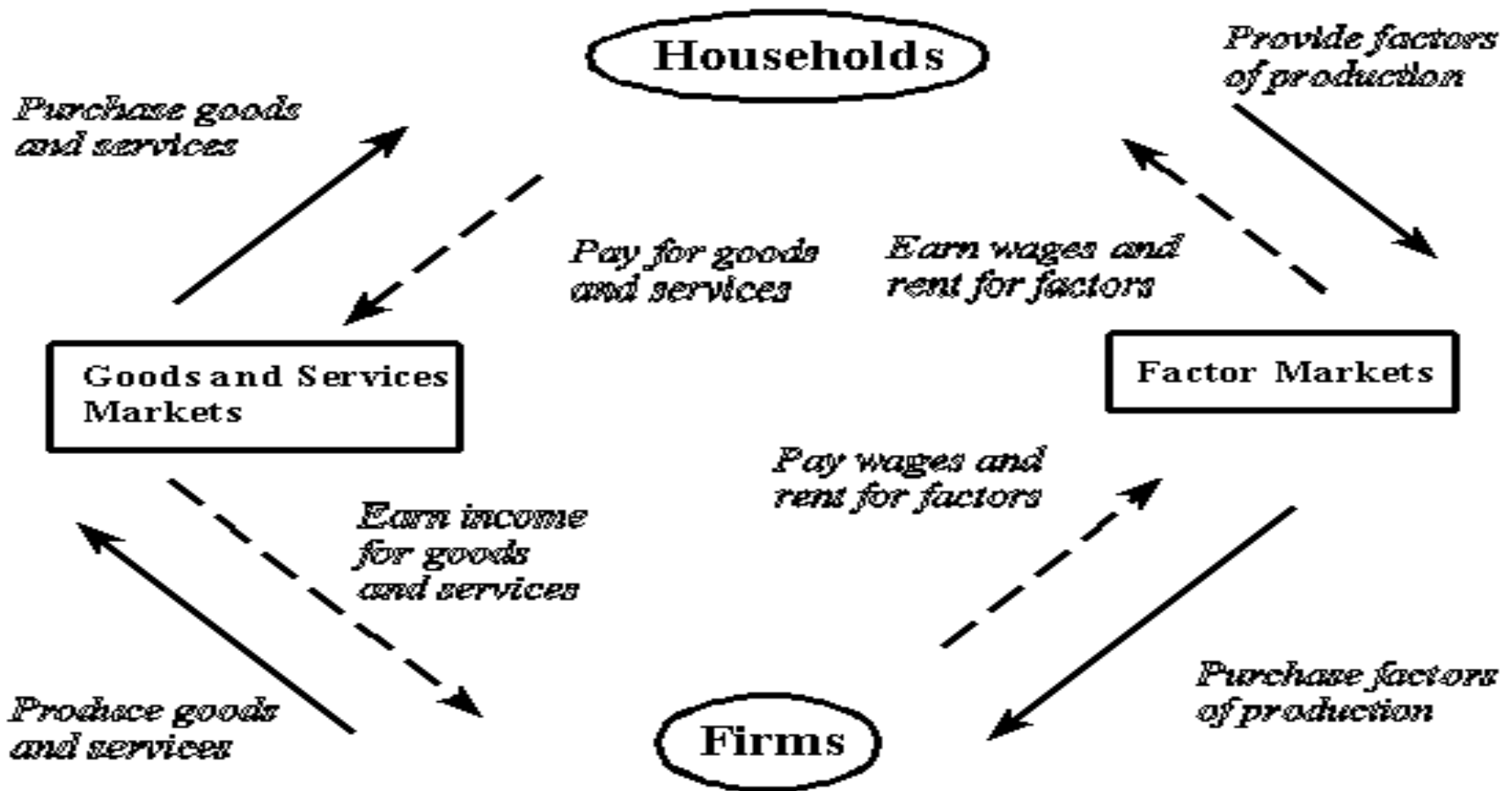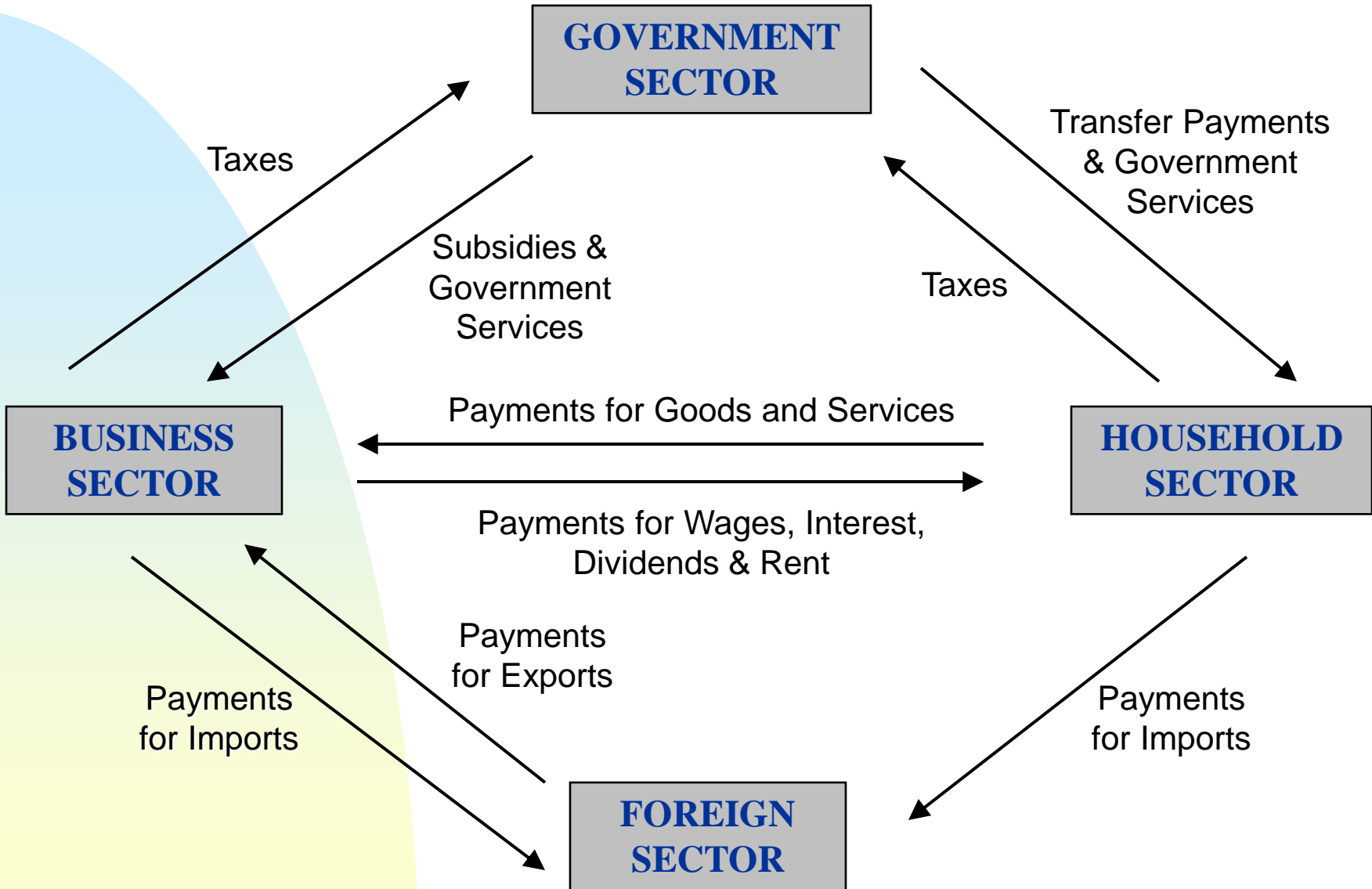
The Circular Flow Model

- traces the exchange of goods and services in the economy

- use of money in the economy results in a two-way circular flow - of goods and services in one direction and money in the other direction - between:

> *Consumers (Households)*

> *Businesses (Firms)*

> *Government*

> *Other Countries*

The Market Economy as the Organisation of Production and Exchange

Households

Purchase goods and services

Provide factors of production

Pay for goods and services

Earn wages and rent for factors

Goods and Services Markets

Factor Markets

Earn income for goods and services

Pay wages and rent for factors

Produce goods and services

Purchase factors of production

Firms

GOVERNMENT SECTOR

BUSINESS SECTOR

HOUSEHOLD SECTOR

FOREIGN SECTOR

Taxes

Transfer Payments & Government Services

Subsidies & Government Services

Taxes

Payments for Goods and Services

Payments for Wages, Interest, Dividends & Rent

Payments for Exports

Payments for Imports

Payments for Imports

Economic Growth

- *Annual % increase in GDP*
- Causes*: ?*
- Effects: greater material welfare?

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Y=C+I+G

- Incomes = value of output produced = Expenditure

- Can measure as sum of (C)onsumption, (I)nvestment, (G)overnment spending and Net Exports (NX). What does it measure? Inequality-quality of life?...

- Can be looked as either supply, or demand side (aggregate Supply/ Aggregate Demand…)

Mixed Market Economy Sectors

Consumption (C)

- spending by households on consumer goods and services including:

  > non-durable goods eg. food
  > durable goods eg. cars, appliances

- primarily affected by consumer's *disposable income* (income remaining after taxes)

Gross Investment (I)

- creation of a new business or expansion of an existing one or the improvement in the production capability of a business through:

  - *a new factory, new equipment, better technology, worker retraining, new management techniques etc…*

- gross investment also includes:

  - changes in inventories (*stocks of unsold goods and materials*)

  - construction of all buildings, such as houses and apartments

  - expenditures by government agencies on equipment and machines

- decision to invest affected by *expectations of profit* and *interest rates (borrowing costs)*

Government (G)

- government purchases include current spending by all levels of government on goods and services

  - *Government purchase of aircraft/battleship for armed forces*

  - *municipality contracts firms to repave a road*

- government spending affected by tax revenues and spending priorities

Foreign Sector (X - M)

- **exports include purchases of French goods and services by foreigners**
  - *Airbus sales to foreign countries*
  - *Foreign tourist spends a week in a Alsatian hotel*
- payments for exports remain in French circular flow of money and thus add to GDP
- **imports include French purchases of foreign goods and services**
  - *French imports of Italian wine…*
  - *French tourists spending abroad*
- payments for imports leave the French circular flow of money and are subtracted from GDP
- **Statistics Canada uses Net Exports (X-M) to reconcile spending inside and outside France**

Gross Domestic Product (Total Spending)

- adding together (aggregating) the four categories of spending gives us the GDP expenditure equation:
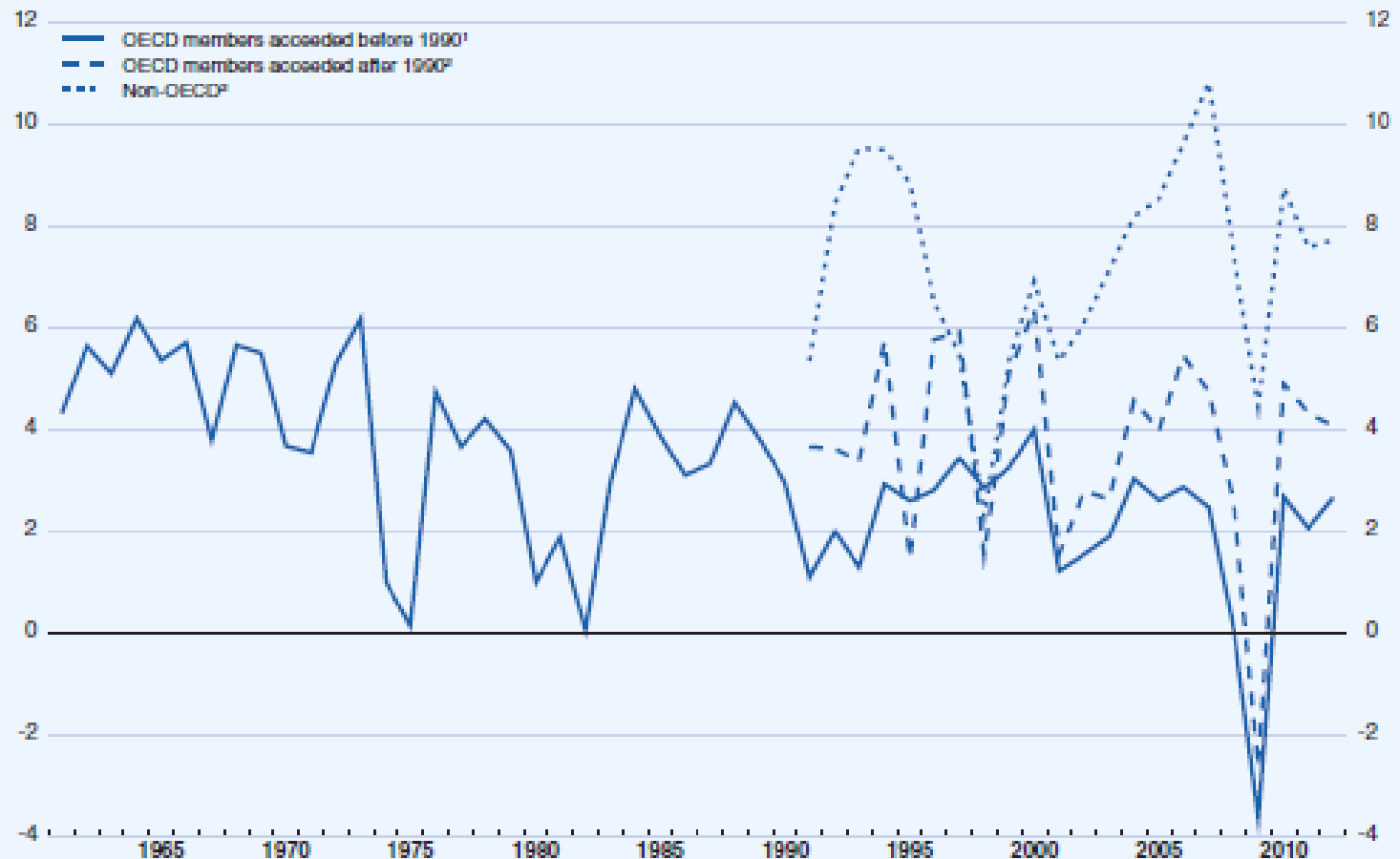
$$GDP = C + I + G + (X - M)$$

Excluded Items from GDP

- Financial exchanges

  > *gifts of money between friends & family; bank deposits or stocks purchases*

- Second Hand Purchases

  > *purchases of second-hand or used goods*

Output growth

Legend:
- OECD members acceded before 1990[1]
- OECD members acceded after 1990[2]
- Non-OECD[3]

1. Refers to Australia, Austria, Belgium, Canada, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Japan, Luxembourg, Netherlands, New Zealand, Norway, Portugal, Spain, Sweden, Switzerland, Turkey, United Kingdom and United States. The weight in world and total OECD GDP equal, respectively, 60 and 89% in 2005 (calculated at purchasing power parity).
2. Refers to Chile, Czech Republic, Estonia, Hungary, Israel, Korea, Mexico, Poland, Slovak Republic, Slovenia. The weight in world and total OECD GDP equal, respectively, 7 and 11% in 2005 (calculated at purchasing power parity).
3. Refers to Enhanced Engagement countries (Brazil, China, India, Indonesia, South Africa and Russia). The weight in world GDP equal 23% in 2005 (calculated at purchasing power parity).
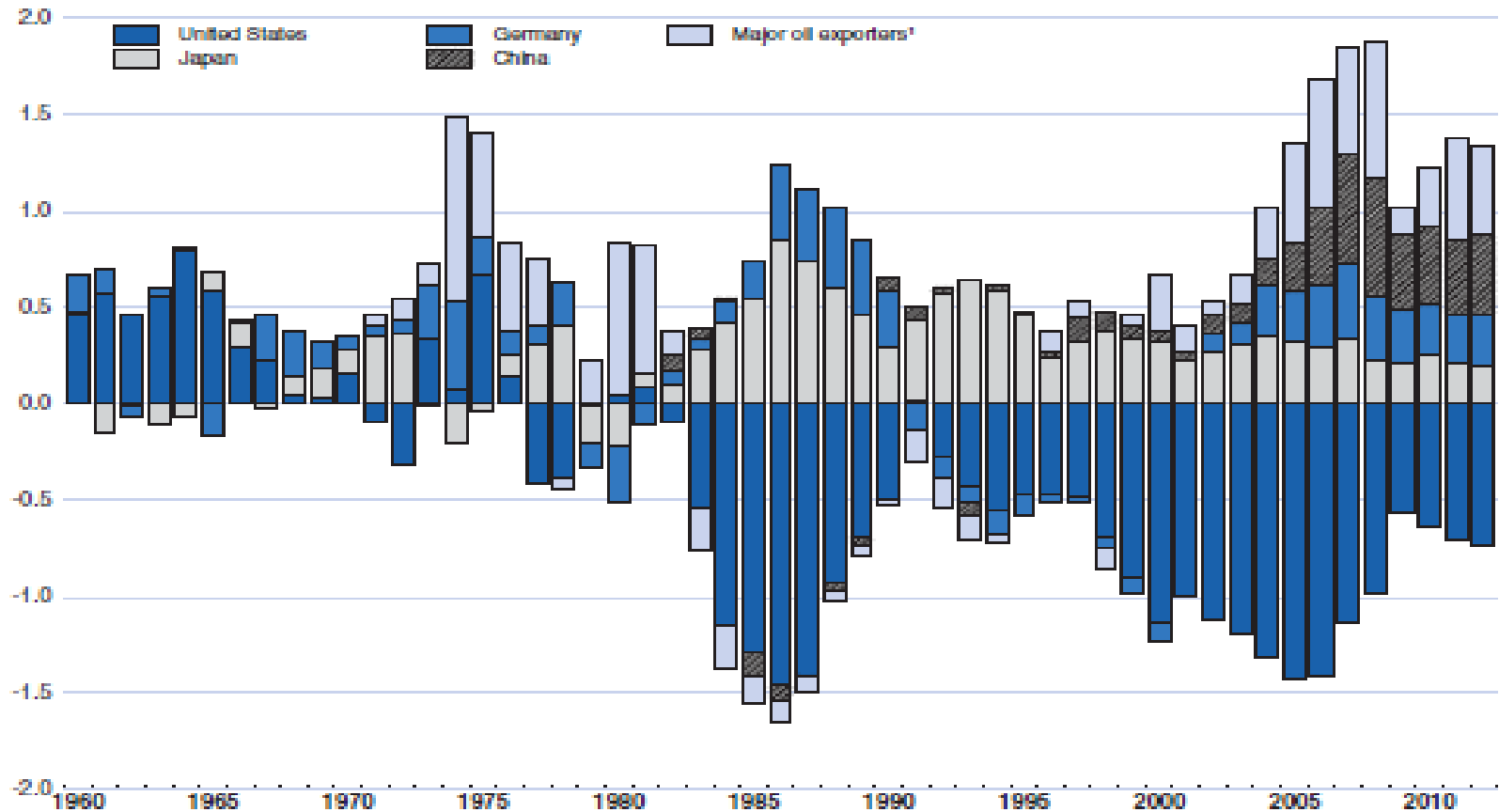
Source: OECD Economic Outlook 89 database.

StatLink http://dx.doi.org/10.1787/888932428880

Trade Statistics (X, M)

Current account balance, in per cent of world GDP

Legend: United States, Japan, Germany, China, Major oil exporters[1]

1. Refers to Saudi Arabia before 1992.

Source: OECD Economic Outlook 89 database; OECD Economic Outlook 21 database; and IMF, International Financial Statistics.
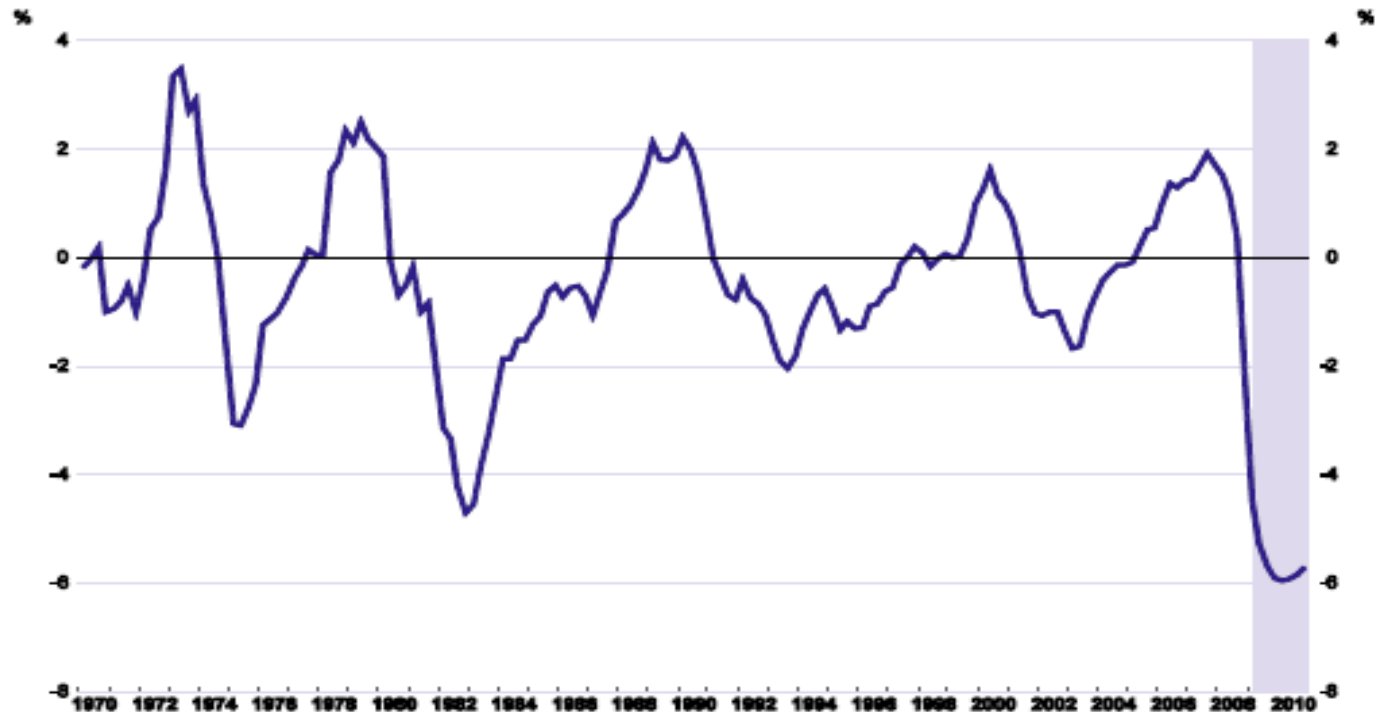
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Crisis? –output…

The OECD output gap will be the largest in four decades

In percentage of potential output

Note: The output gap is the difference between actual and potential output.

Source: OECD Economic Outlook 85 database.

http://www.oecd.org/dataoecd/41/33/35755962.pdf

http://manyeyes.alphaworks.ibm.com/manyeyes/visualizations/oecd-june-2009-gdp-growth-projection

Jump to first page

Inflation

- *Annual % increase in overall (consumer) price level*
- Causes*: demand-pull, cost-push, expectations, supply of money, government spending*
- Effects: redistribution, uncertainty, transaction cost, balance of trade, lower growth
- Remedies: monetary policy, budgetary prudence

Faith...

Money

'Your card is fine. I'm just checking that your bank hasn't expired'

- Stores value
- Medium of exchange
- Unit of account

Legal tender

'A piece of metal, as gold, silver, copper, etc., coined, or stamped, and issued by the sovereign authority as a medium of exchange in financial transactions between citizens and with government; also, any number of such pieces; coin' – Webster's. True, or False?

Economy

- Monetary
- Real
  - ◆ $MV = PY$
    - ☞ M=supply of money
    - ☞ V= velocity of circulation
    - ☞ P=price level
    - ☞ Y=output

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Assume

- V=dependent on interest rate (1*r)
- Then r=P*Y/M
  - If P and M constant, then as income increases so is the price of money, which becomes dearer.

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Monetary…

- M0=amount of currency, in circulation or as central bank reserves- monetary base.

- M1=M0+current and checking accounts

- M2=M1+most saving accounts + money market accounts

- M3=M2+other certificates of deposit

- see a generally not academically esteemed site
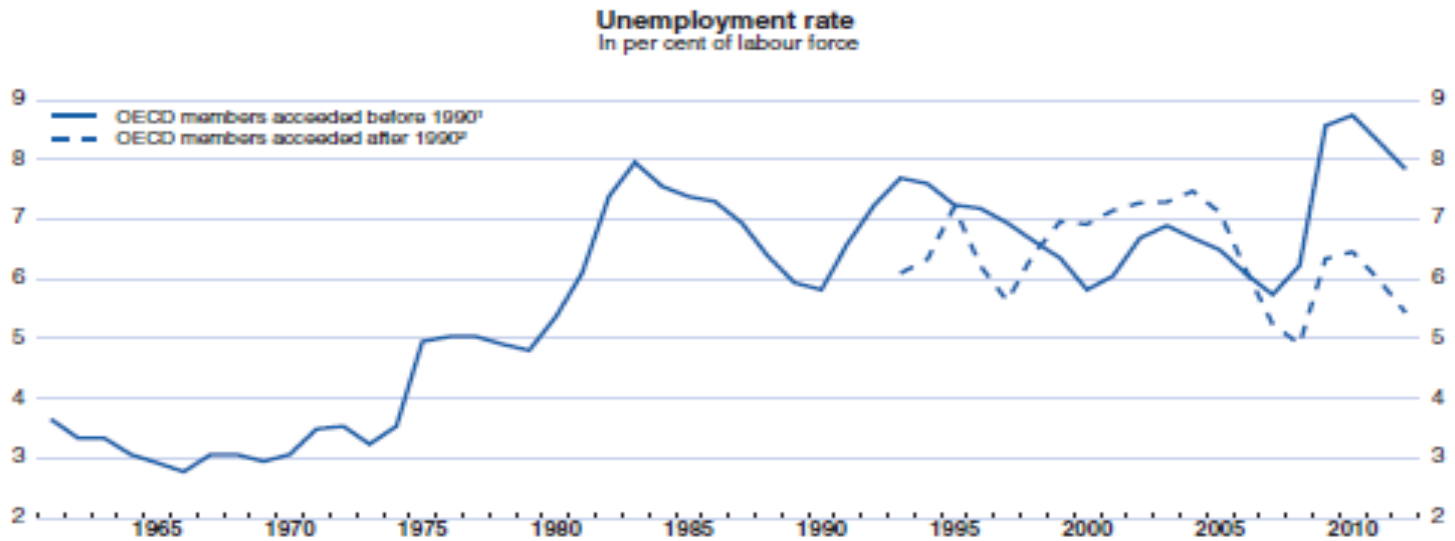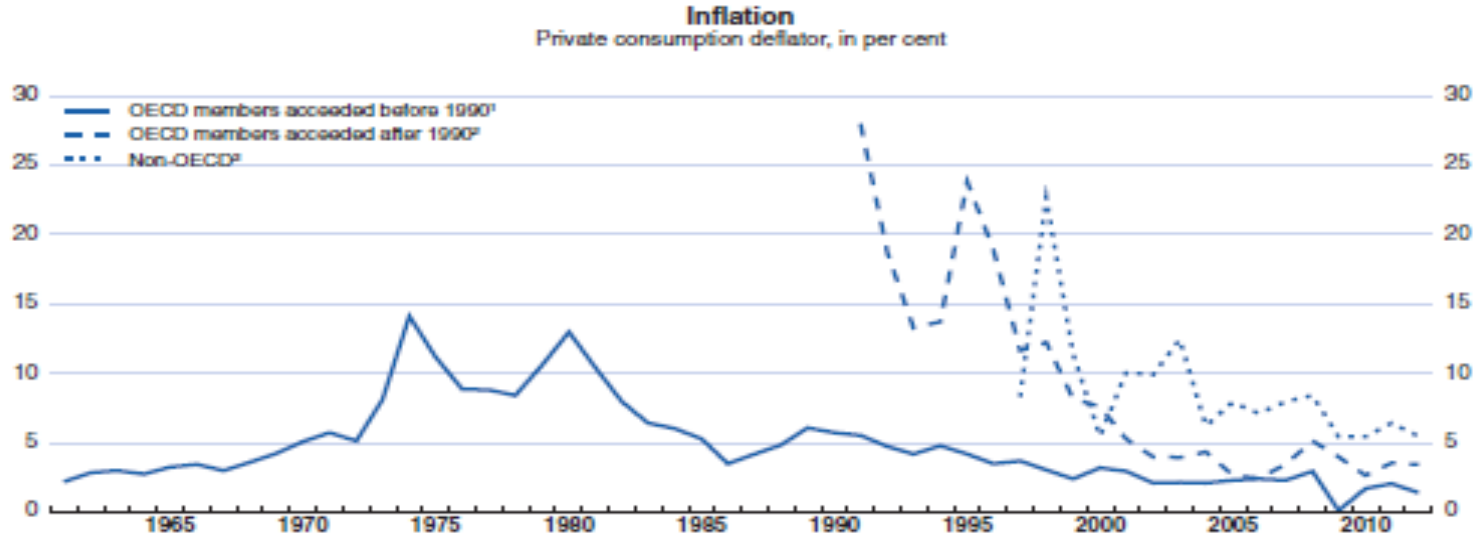http://en.wikipedia.org/wiki/Money_supply#cite_note-SgsM3Data-18

Unemployment

- *% of the labour force not employed*
- Causes*: equilibrium (frictional, structural, cyclical), disequilibrium (labour laws, minimum wage)*
- Effects: personal, negative externalities, economic efficiency
- Remedies: Demand and supply side labour market policies

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Stylized facts...

Inflation
Private consumption deflator, in per cent

- OECD members acceded before 1990[1]
- OECD members acceded after 1990[2]
- Non-OECD[2]

Unemployment rate
In per cent of labour force

- OECD members acceded before 1990[1]
- OECD members acceded after 1990[2]

Business Cycle

- *cyclical movements of output and employment around a long-term trend*
- Causes*: accelerator-multiplier effect, expectations, government policy, shocks*
- Effects: uncertainty, transaction cost, economic inefficiency, lesser growth
- Remedies: stabilisation policy

So?

- Importantly, if both Taxes and G increase by the same amount, the net effect on Y may be positive…

- 1$ increase in G is directly 'injected' into the economy's spending, whereas 1$ increase in tax affects indirectly spending through disposable income. So, if G pays me 1$ to produce a paper bag, this is a direct addition; if this is derived from 1$ tax extra, then some of this dollar will be financed by my savings, thus my direct spending will go down less than 1$ I paid for the tax…

- During cyclical downturns, the government can try and 'stimulate' the economy, with savings during the upturns…
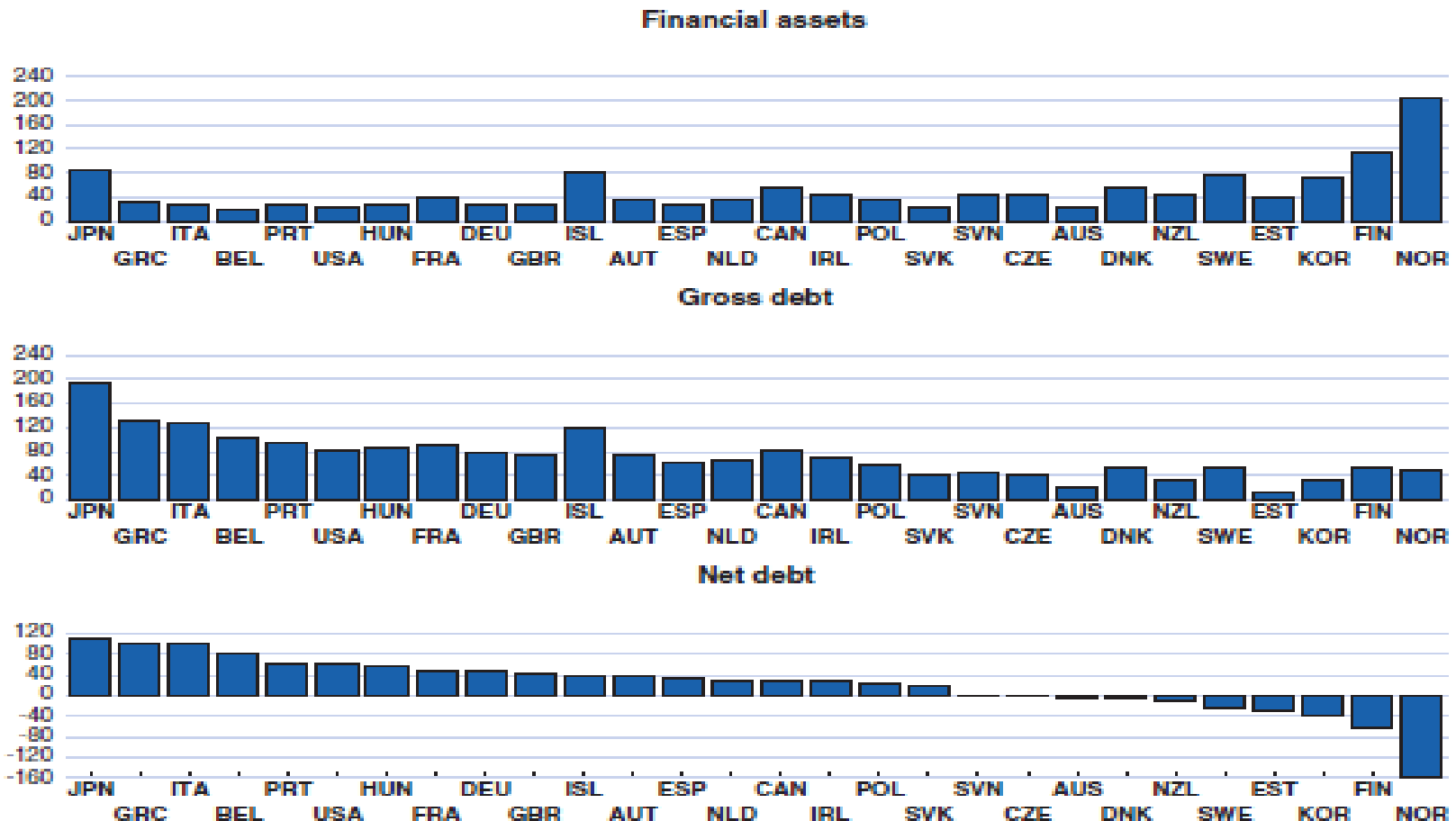
G, T refer to Government Behaviour

- Government size and spending, of particular importance for aerospace, defence and space sub-sectors…
- What determines its behaviour?

And its Debt?

General government debt and financial assets in OECD countries, 2009 (% of GDP)
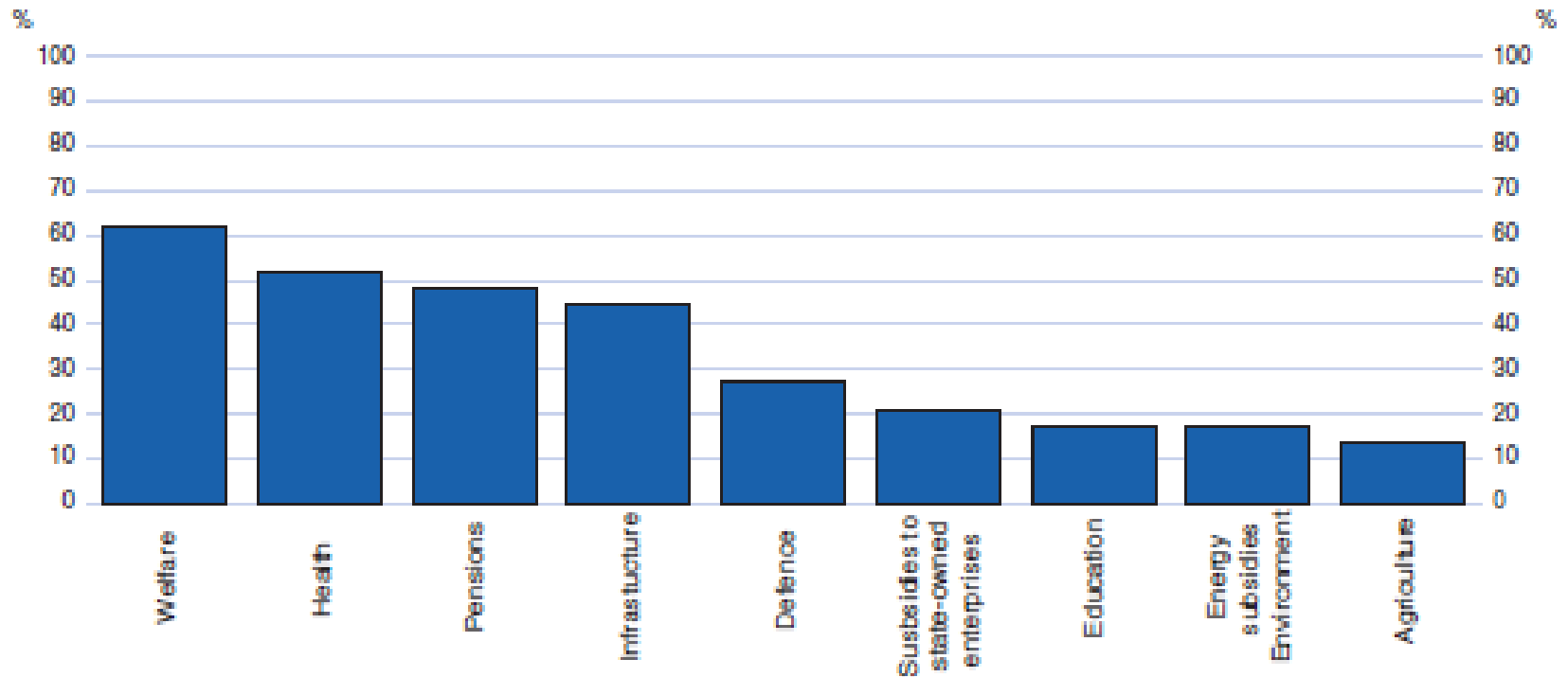
Note: Based on the ESA95/SNA (as opposed to Maastricht) definition. Financial assets are consolidated across layers of government, with the exception of Korea. Countries are sorted by net debt ratios.

Source: OECD Economic Outlook 89 database.

StatLink http://dx.doi.org/10.1787/888932434029

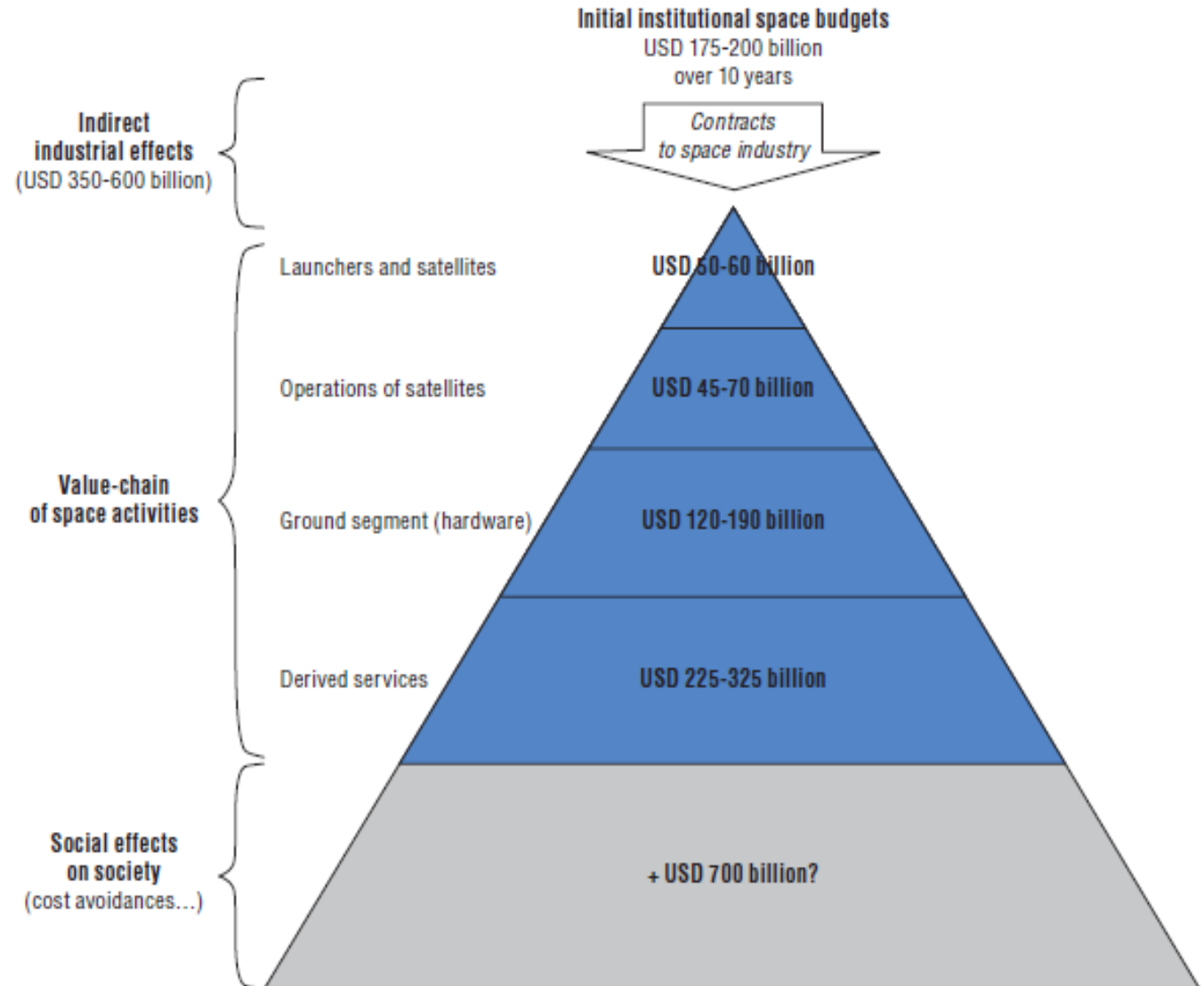# And Subsequent Reductions...

Note: Based on 29 countries.

Aggregate data…

- Is a snapshot that is a good attention-grabber is understood by all but explains very little. The 'real' story is at the micro-level…space and aerospace industries…

- Individual Markets…

& Measuring its Impact on Economy

Initial institutional space budgets
USD 175-200 billion
over 10 years

Contracts to space industry

Indirect industrial effects
(USD 350-600 billion)

Launchers and satellites	**USD 50-60 billion**
Operations of satellites	**USD 45-70 billion**
Ground segment (hardware)	**USD 120-190 billion**
Derived services	**USD 225-325 billion**

Value-chain of space activities

Social effects on society
(cost avoidances…)

+ USD 700 billion?

Source: Adapted from Cohendet (2010).

Export market share (percentage) and current USD million

	%	USD million
OECD total	90.33%	73 111
United States	33.76%	57 826
France	16.60%	22 691
Germany	13.20%	4 574
Canada	4.99%	3 349
Italy	2.31%	3 203
Russian Federation	0.37%	806
Mexico	0.49%	506
Israel	0.54%	460
Poland	0.27%	370
Switzerland	1.07%	311
Netherlands	1.16%	226
Belgium	0.69%	225
Sweden	0.41%	98
Iceland	0.12%	93
Czech Repulic	0.30%	53
Slovak Republic	0.04%	9
Chile	0.01%	-27
Hungary	0.02%	-27
Spain	1.47%	-85
Slovenia	0.04%	-216
Finland	0.10%	-362
New Zealand	0.10%	-407
Argentina	0.28%	-446
Greece	0.16%	-473
Portugal	0.11%	-693
United Kingdom	9.33%	-764
Norway	0.31%	-815
Luxembourg	0.05%	-849
Austria	0.35%	-1 026
Denmark	0.10%	-1 148
Turkey	0.21%	-1 184
South Africa	0.25%	-1 506
Chinese Taipei	0.09%	-1 542
Korea	0.32%	-1 553
Ireland	0.41%	-2 284
Australia	0.37%	-3 168
Japan	1.53%	-5 584
Singapore	2.32%	-5 750
China	0.86%	-9 340

StatLink http://dx.doi.org/10.1787/888932400551

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Specialization in exports in 2008

Legend:
- Aircraft and spacecraft
- Radio, TV and communication
- Medical and precision instruments
- Office, accounting and computing
- Pharmaceuticals

Countries (top to bottom): France, Russian Federation, United States, United Kingdom, Italy, Germany, India, Japan, China

X-axis: 0 to 100 %
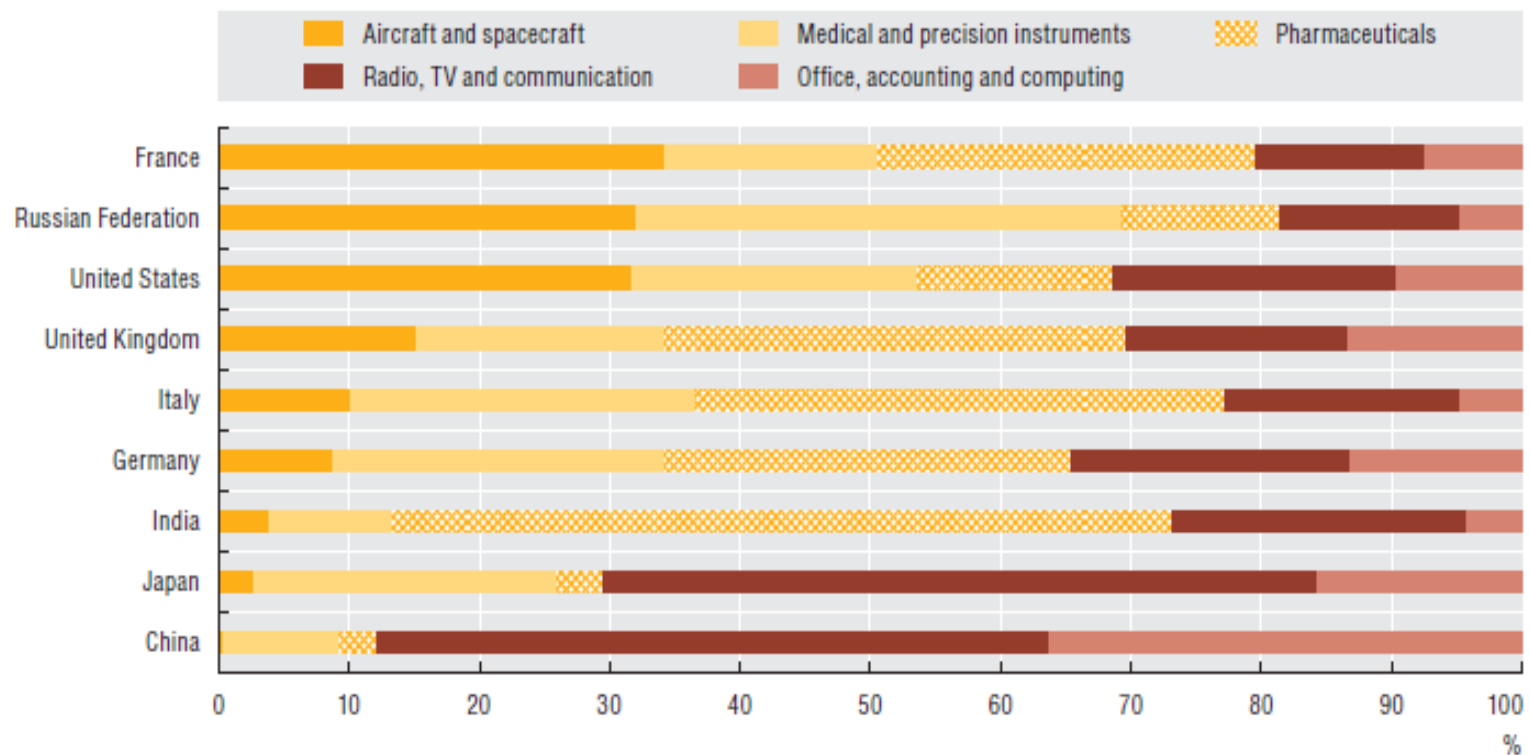
Aerospace manufacturing as a share of gross domestic output

Percentage of gross output, current price

Country	%
France	5.57
United Kingdom	3.94
United States	2.67
Canada	2.25
Germany	1.29
Sweden	1.06
Italy	0.75
Spain	0.74
Belgium	0.59
Norway	0.56
Czech Republic	0.40
Japan	0.39
Netherlands	0.28
Finland	0.27
Poland	0.26
Korea	0.19
Hungary	0.12
Austria	0.10
Slovenia	0.03

StatLink http://dx.doi.org/10.1787/888932400475
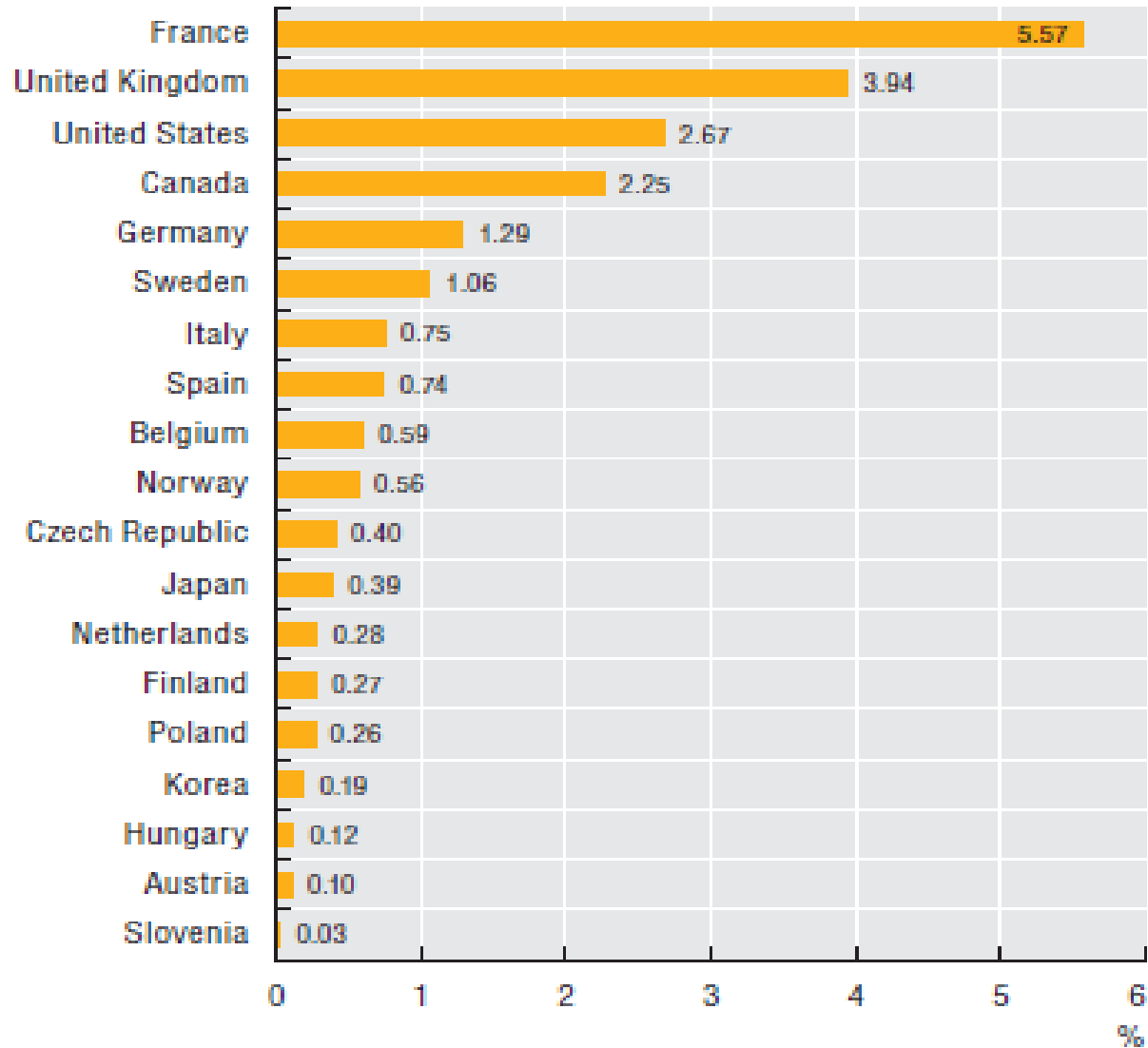
Guesses…

- During challenging recessions the governments respond during the 1st phase by increasing spending and budgets, while during later periods examine the benefits and make more educated allocations…

- …

Economic behaviour

- Motives enhanced by free competition?

- Role of income distribution and access to resources in society for innovation and growth? 'the invisible hand'

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Economic Analysis Tools

- Aggregate Demand, IS/LM
- Some Analysis…

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- Aggregate output/production/income reflect the equilibrium between aggregate demand (by market players) and aggregate supply (by firms)

- To the extend that policymakers can influence aggregate demand, aggregate supply will follow and the economy will move towards a desired equilibrium (at least in the short run)

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AD and AS…

- Aggregate demand: $Y^{ad} = C + I$.

- Aggregate supply comes from the firms/suppliers in the economy

- AD=AS for some equilibrium Y*: $Y^{as} = Y^{ad} = Y$

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AD...

Assume $C = a + mpc \cdot Y^d$, where

- ▶ a = autonomous consumer expenditure
- ▶ mpc = marginal propensity to consume (between 0 and 1)
- ▶ Y^d = disposable income = $Y - T$ (here T=0)

Assume for the moment that investments by firms are determined exogenously (i.e. not inside the model), i.e. $I = I_0$ (we will abandon this restrictive assumption shortly)

This means that $Y^{ad} = a + mpc \cdot Y + I_0$

The key intuition is that aggregate demand depends positively on output, so there will be only one level of output whose corresponding aggregate demand is exactly equal to that output

In order to characterize that level of output one can proceed in two ways:

Approach a): Solve for the reduced form of Y after imposing $Y = Y^{ad}$

$$Y = a + mpc \cdot Y + I_0$$

Solving for Y one gets
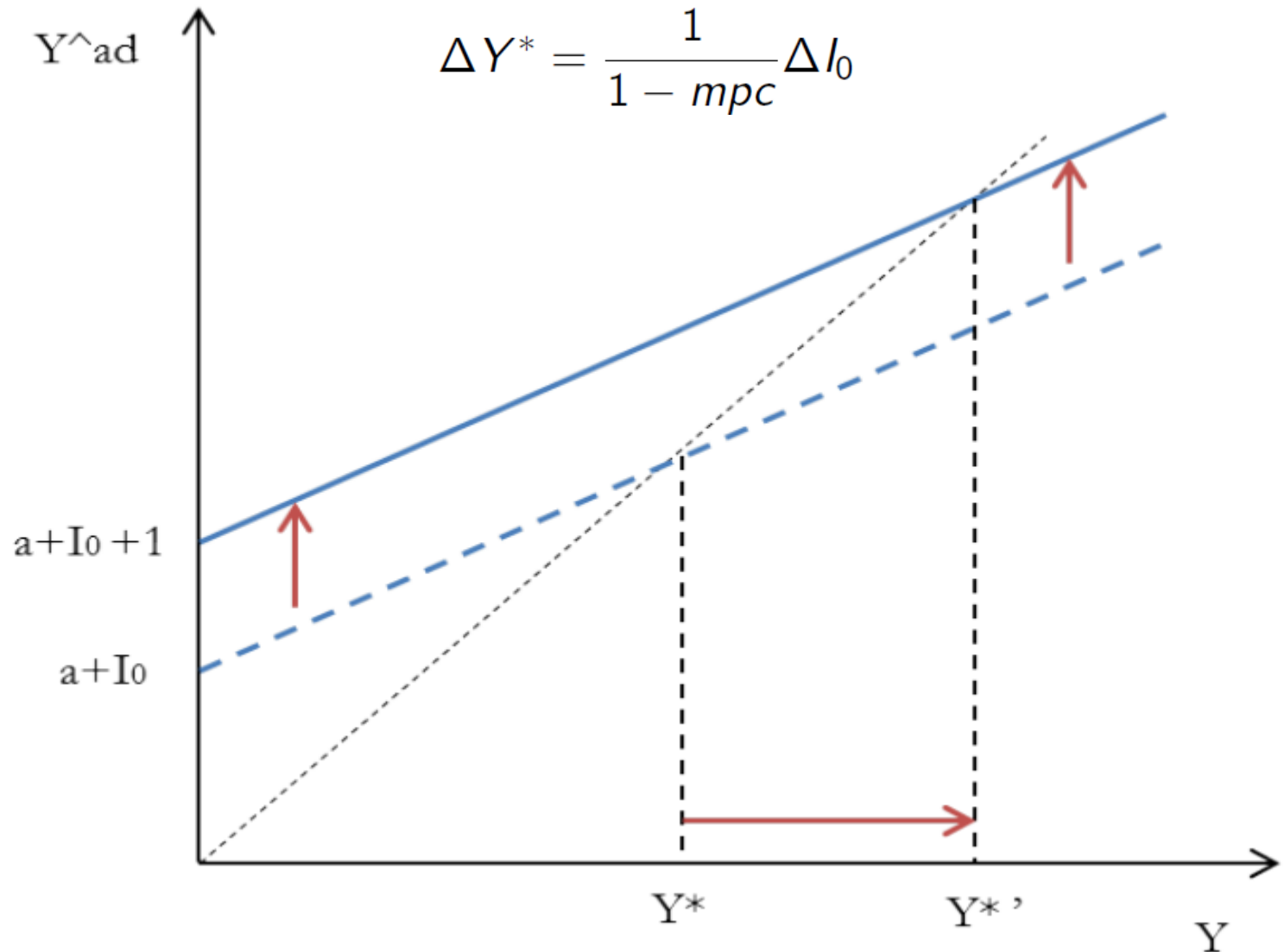
$$Y^* = \frac{1}{1 - mpc} \cdot (a + I_0) \tag{1}$$

Note, $\frac{1}{1 - mpc} > 1$

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Graphic Approach (b)…

The figure shows a graph with vertical axis labeled Y^{ad} and horizontal axis labeled Y. A dashed 45° line runs from the origin. A solid blue line (aggregate demand) starts at $a + I_0$ on the vertical axis with slope labeled mpc. The two lines intersect, with a dashed vertical line dropping to Y^* on the horizontal axis.
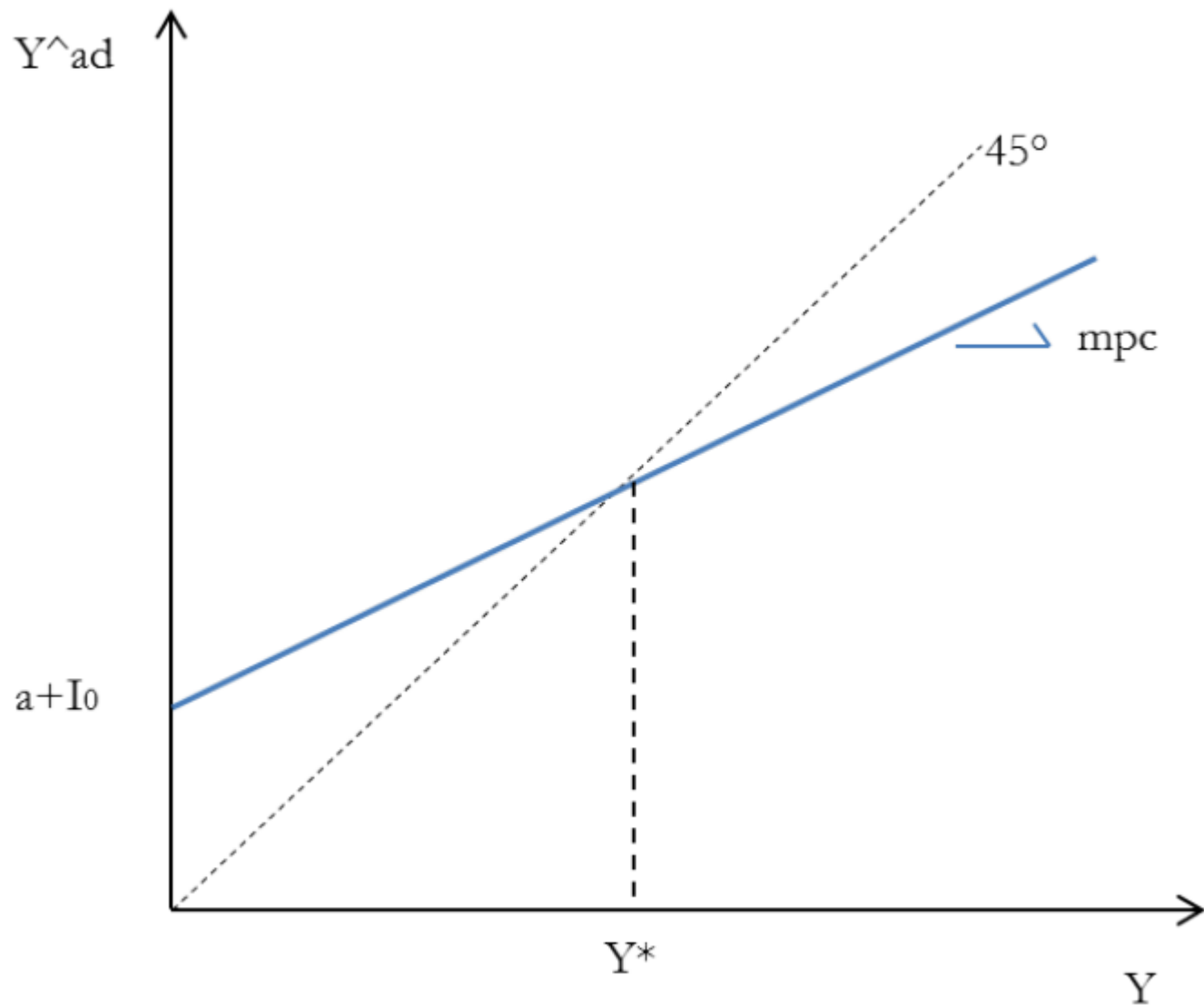
Change in Investment by 1 unit...

$$\Delta Y^* = \frac{1}{1 - mpc} \Delta I_0$$

Y^ad

a+I₀ +1

a+I₀

Y*

Y* '

Y

How is it possible that an increase in the exogenous investment by 1 increase equilibrium output by more than 1?

The intuition is the following: as firms demand for one extra good, some other firm will produce that extra good

This means that some consumer will earn a higher disposable income, since the profits (or simply the wage) from producing that extra good must go somewhere. As consumption increases, aggregate demand increases again, triggering the same mechanism

This mechanism is called multiplication process. For this reason we call $\frac{1}{1-mpc}$ the *expenditure multiplier*

Enter the Government (G=T)

In this new setting aggregate demand will be given by

$$Y = a + mpc \cdot (Y - T) + I_0 + G_0$$

Solving for Y one gets (substituting $G = T$)

$$Y^* = \frac{1}{1 - mpc} \cdot (a + I_0 + (1 - mpc) \cdot G_0) \tag{2}$$

Note that the multiplier on the government expenditure is 1. Let's see this graphically

Y^{ad}

$a+I_0 + (1-mpc)\ G_0 + (1-mpc)$

$a+I_0 + (1-mpc)\ G_0$

1

Y^* $Y^{*'}$

Y

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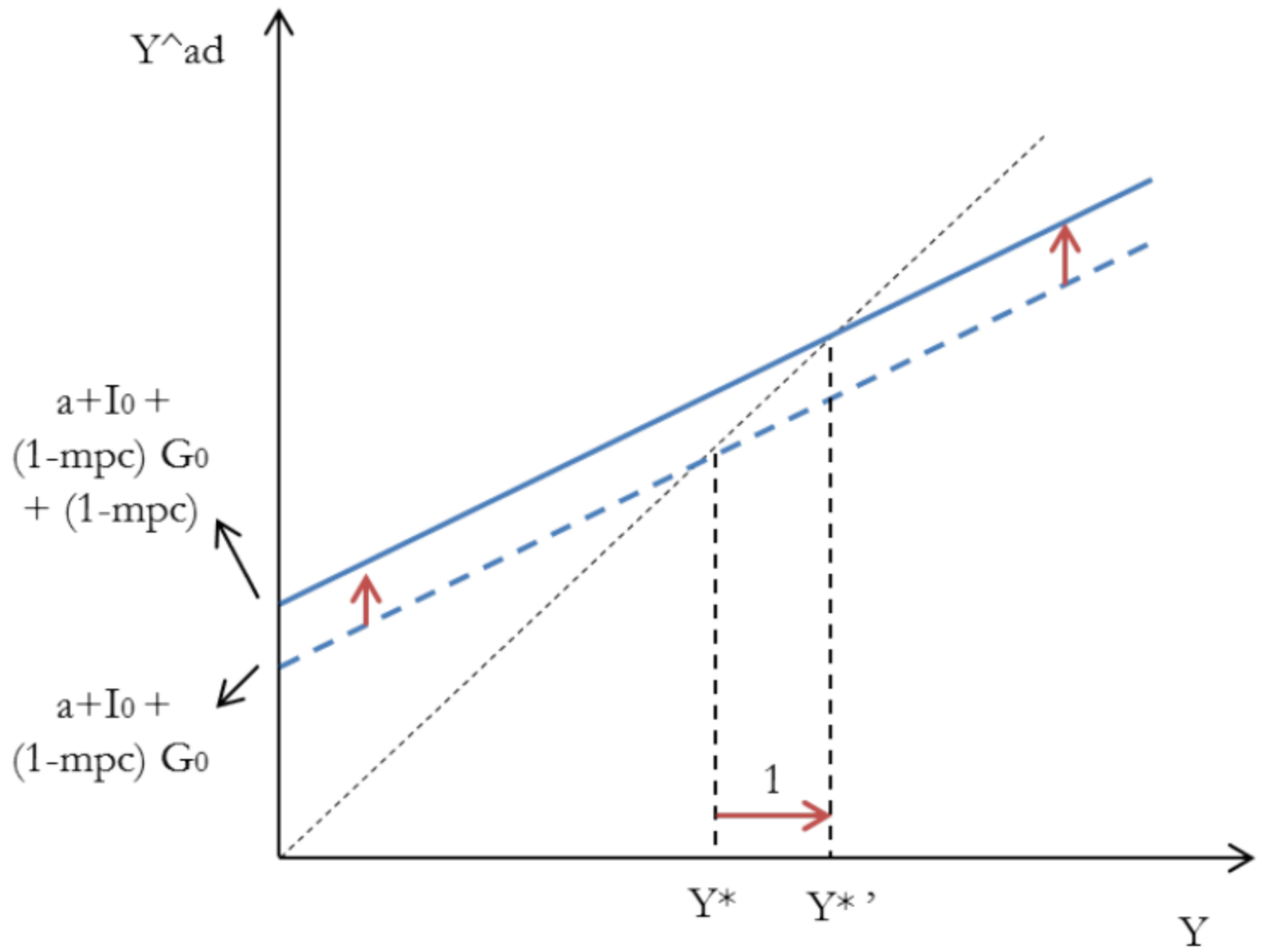
Enter the Interest Rate (investment)

Assume that investments have an exogenous component I_0 and an endogenous component that depends negatively on the interest rate, according to a factor b

$$I = I_0 - b \cdot r$$

Under this new environment aggregate demand is given by

$$Y = a + mpc \cdot (Y - T) + I_0 - b \cdot r + G_0$$

Following the same steps we get

$$Y^* = \frac{1}{1 - mpc} \cdot (a + I_0 - b \cdot r + (1 - mpc) \cdot G_0) \qquad (3)$$

Y^{ad}

45°

mpc

$a +$
$I_0 - b\, r +$
$(1 - mpc)\, G_0$

Y^*

Y

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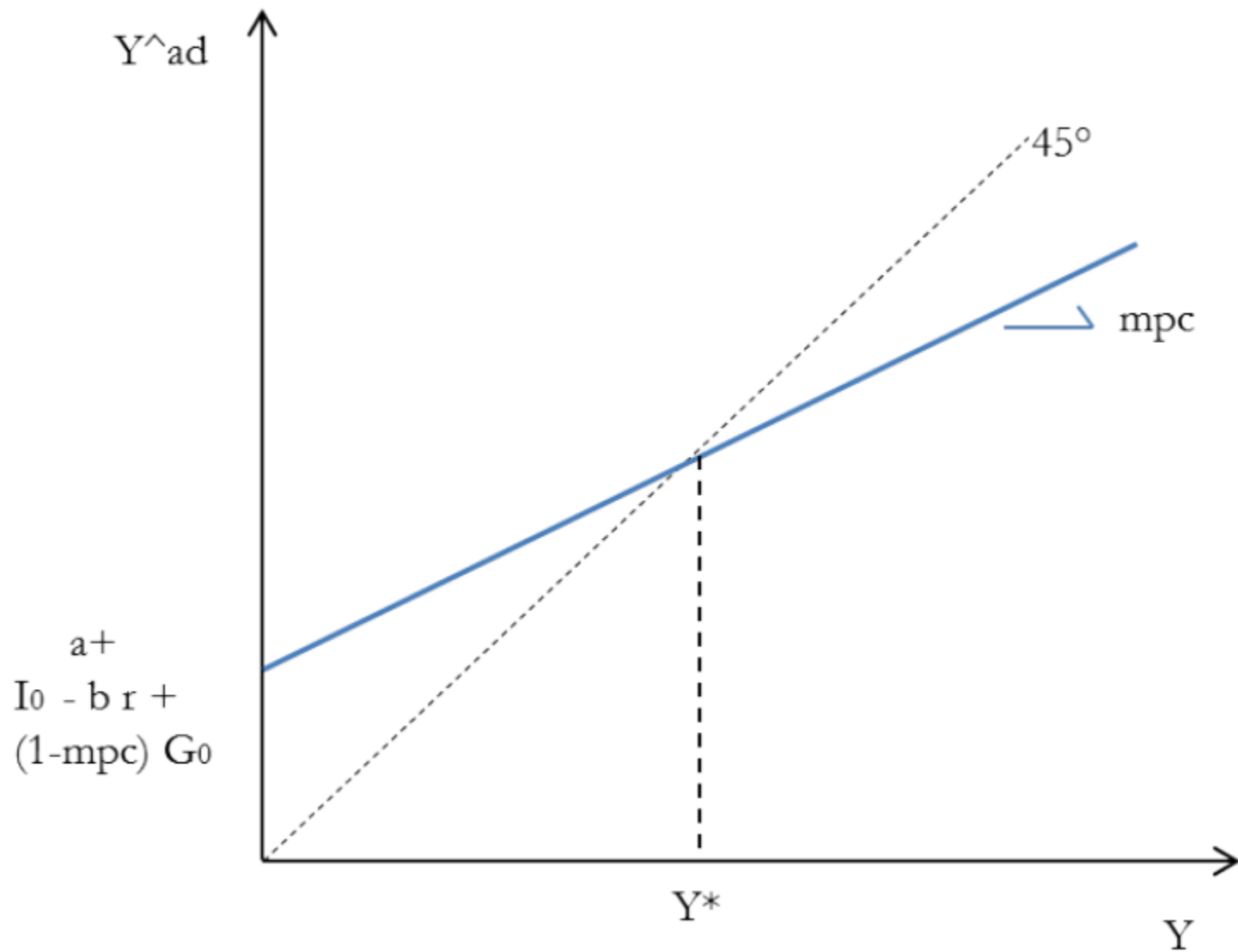
Note, equilibrium output Y^* is negatively related to the interest rate, as clearly displayed by (3). This is because a higher interest rate would reduce investments, decrease aggregate demand and hence equilibrium output

Equation (3) provides one of the two key equations of the model

So far the only endogenous variable was Y, which was representing the equilibrium variable for the goods market. But a monetary model of course considers the interest rate as well as an endogenous variable

We will derive the second equation after we introduce the money market

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Let's rewrite (3) in a more convenient form. We will refer to this as the *IS curve*

$$Y^* = \frac{1}{1 - mpc} \cdot (A - b \cdot r) \qquad \text{(IS)}$$

with $A = a + I_0 + (1 - mpc) \cdot G_0$, defined as the autonomous aggregate demand

The IS curve is defined as the combination of (r, Y) where the goods market is in equilibrium. Any disequilibrium will be eliminated by variations in output

The IS curve is negatively sloped on the the space (r, Y): higher interest rate reduces investments, aggregate demand and hence equilibrium output

Above the curve we have excess supply of goods; equilibrium output will decrease since firms realize that they are producing too much

Below the curve we have excess demand of goods; equilibrium output will increase since firms realize that they are producing too little

Excess Supply

$Y^s > Y^d$: Y down

Excess Demand

$Y^s < Y^d$: Y up

IS

r

Y

60
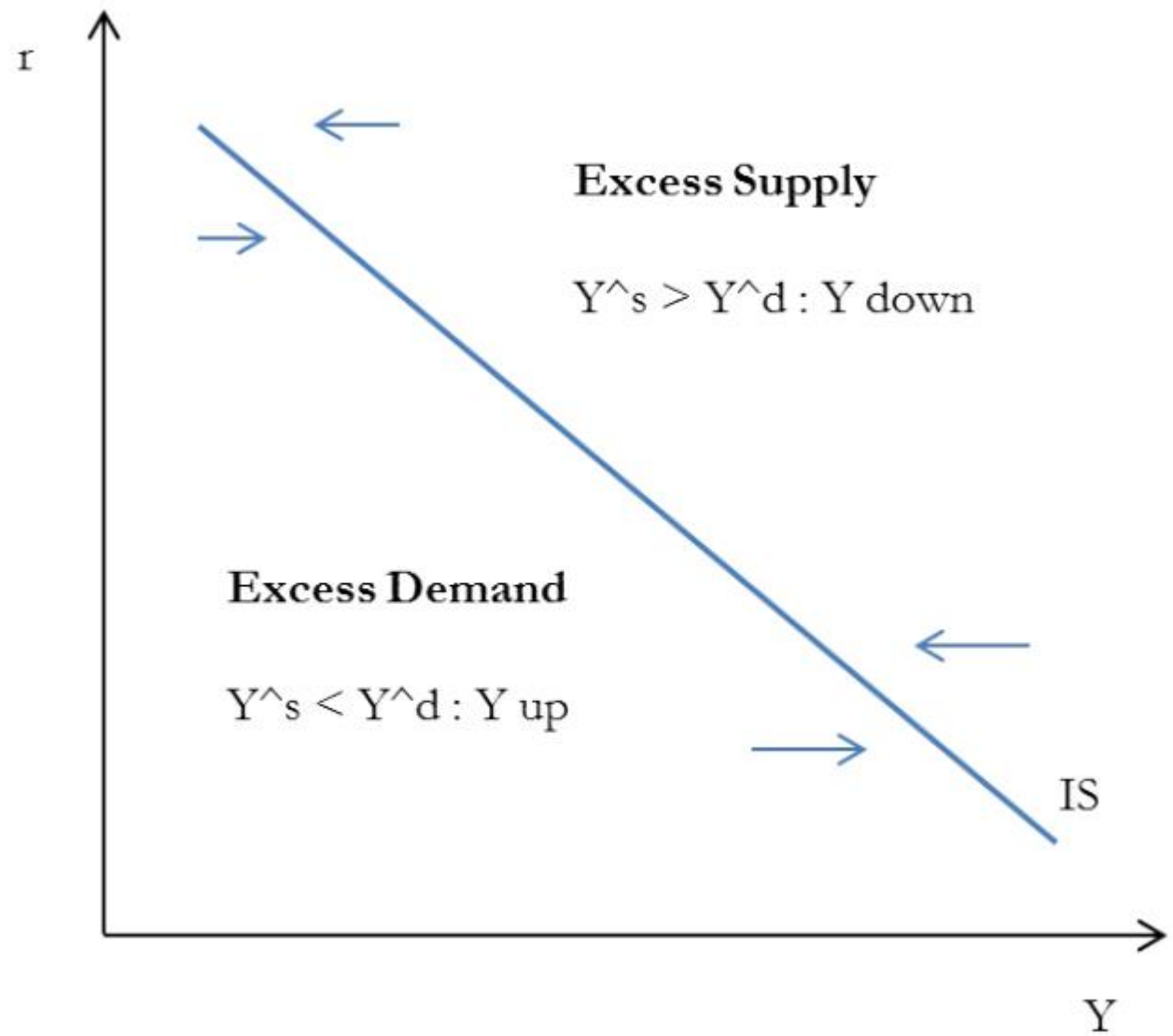
Alternative way to get IS...

- The IS curve shows all the combinations of interest rates i and outputs Y for which the goods market is in equilibrium

- A simplifying assumption we made initially was that investment I was exogenous
  - We know that investment actually depends negatively on the level of interest
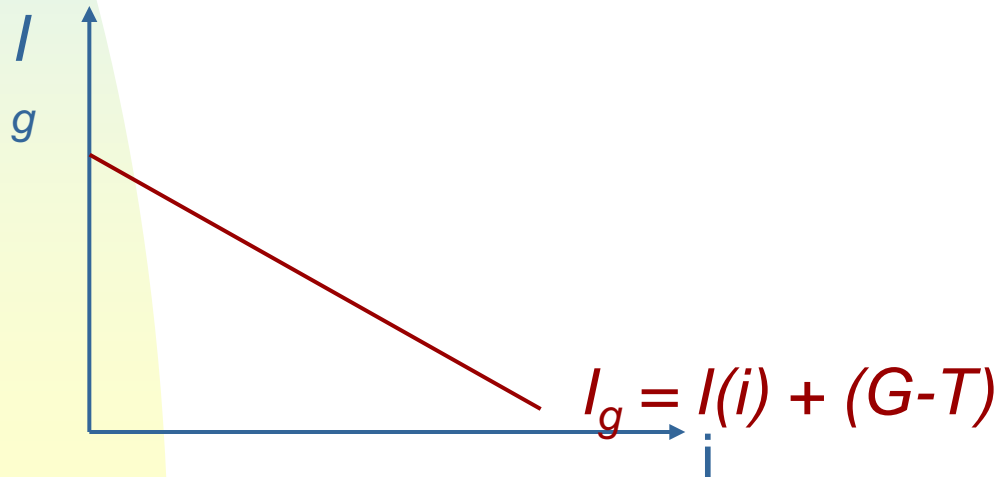
IS (Investment)

- The Investment function
  - Is the sum of private investment (endogenous) and public investment (exogenous)

$$I_g = I(i) + (G - T)$$

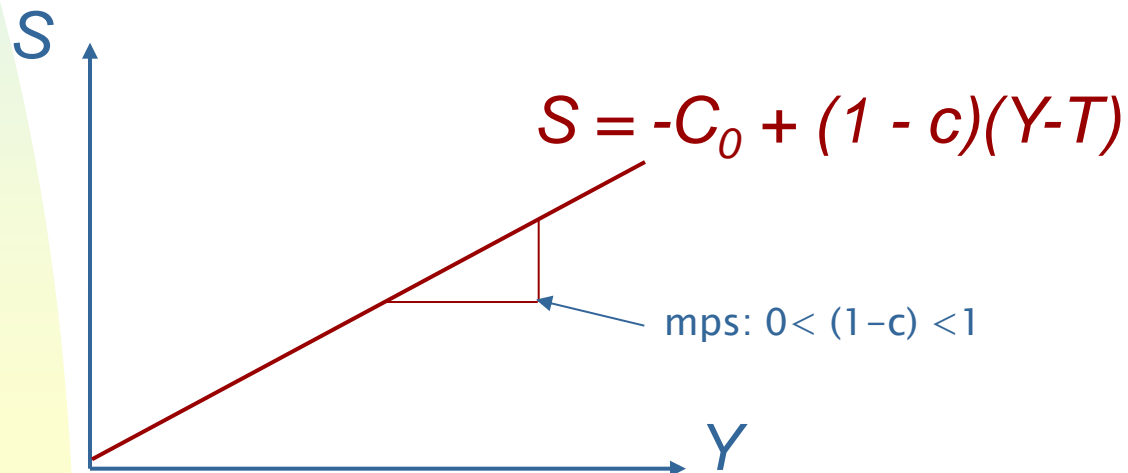 - Here, the interest rate has a real interpretation: it is the marginal profitability of investment
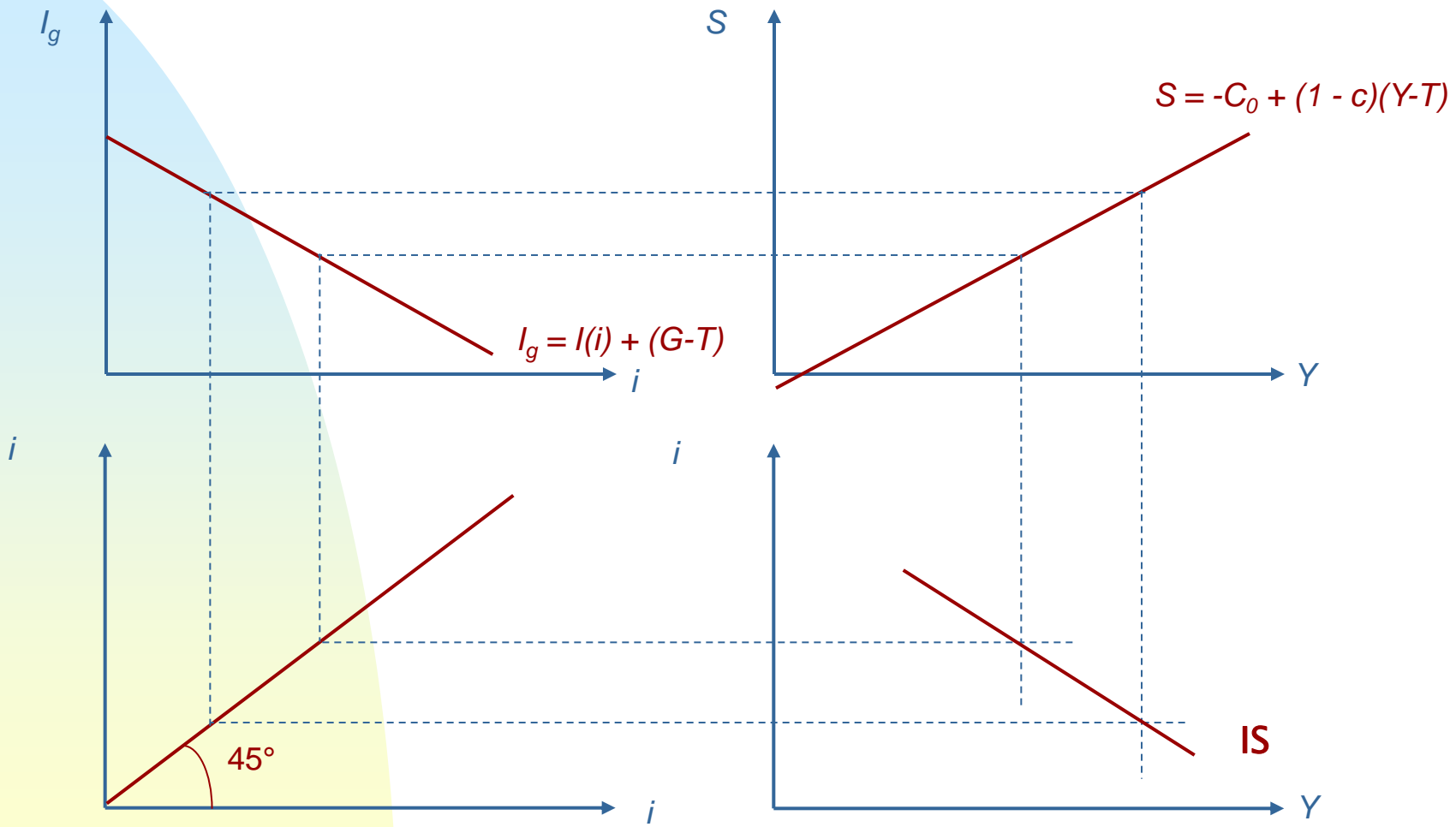
$$I_g = I(i) + (G\text{-}T)$$

Savings...

- The Savings function
  - Is obtained from the aggregate demand equation, subtracting investment and consumption:

$$S = Y - C - T$$
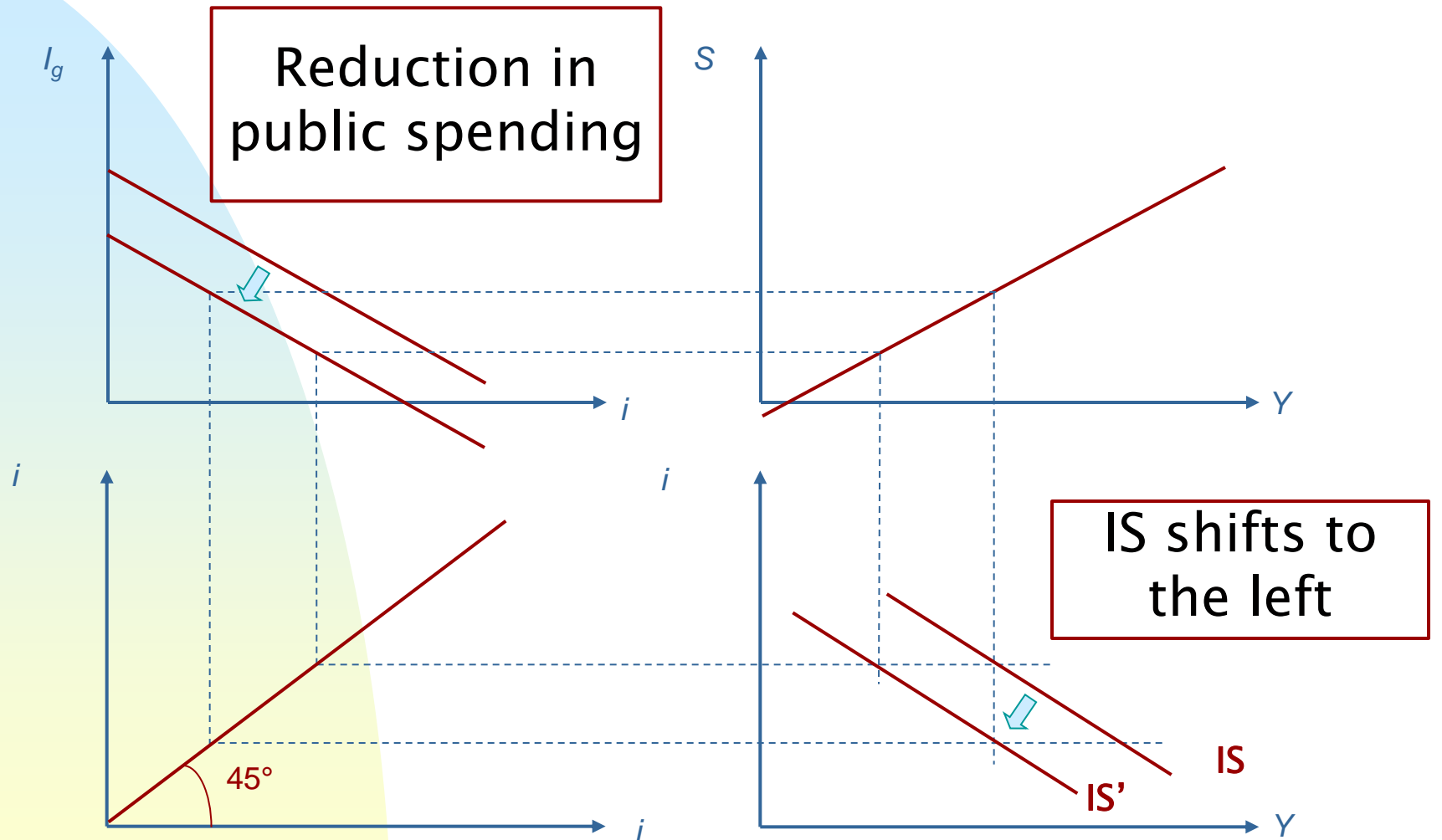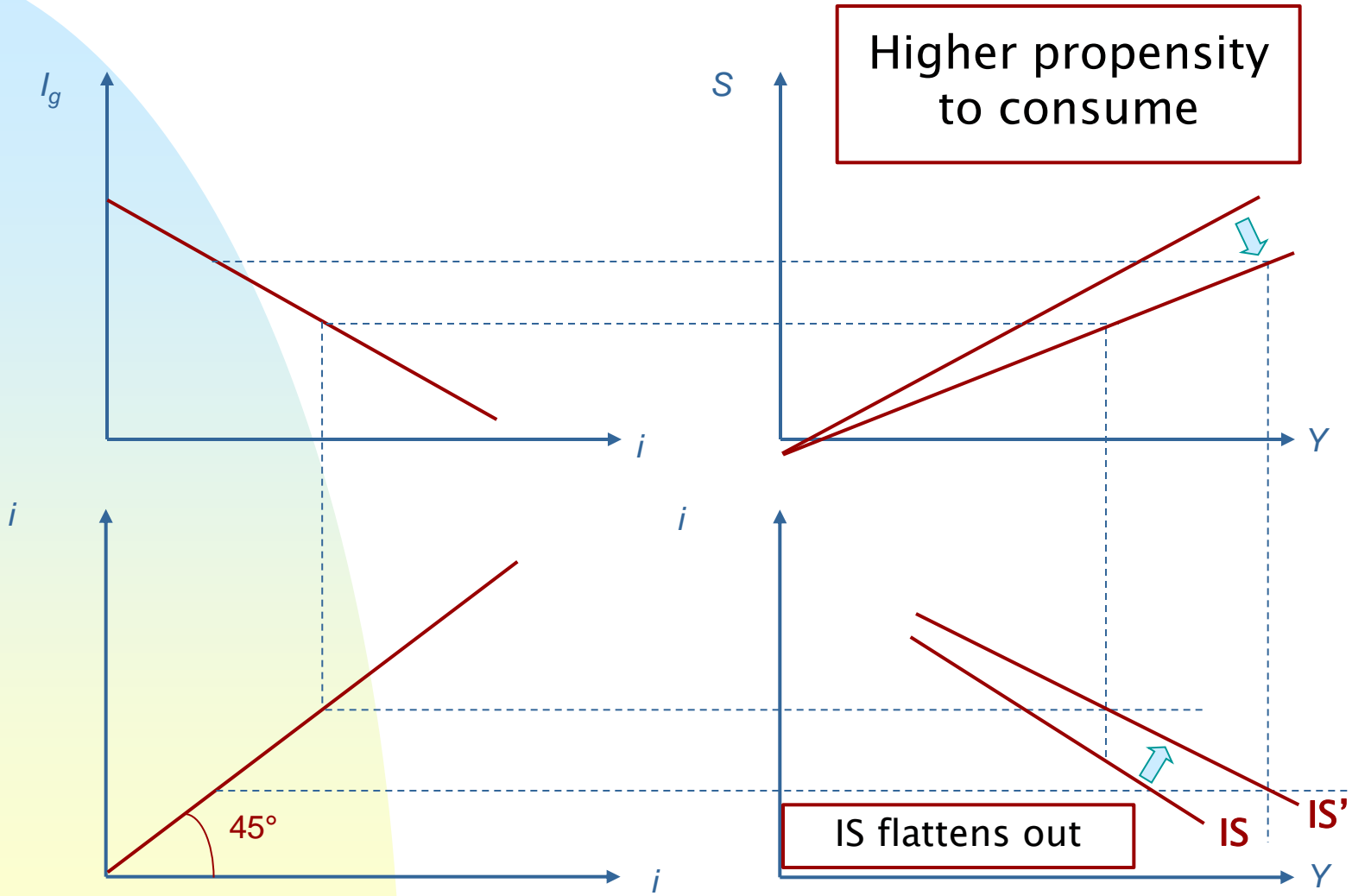
$$S = -C_0 + (1-c)(Y-T)$$

$S = -C_0 + (1 - c)(Y-T)$

mps: $0 < (1-c) < 1$

S

Y

I_g

S

$S = -C_0 + (1 - c)(Y-T)$

$I_g = I(i) + (G-T)$

i

i

i

$45°$

i

IS

Y

Y

64

Reductions in G…

Reduction in public spending

IS shifts to the left

I_g

S

i

i

Y

i

45°

i

Y

IS

IS'

I_g

S

Higher propensity to consume

i

i

45°

IS flattens out

IS

IS'

i

Y

Y

66

The LM curve

■ The LM curve shows all the combinations of interest rates i and outputs Y for which the money market is in equilibrium

■ Unlike our treatment of interest rate so far, this time i has a **monetary interpretation**:

◆ It is the opportunity cost of money, in other words the payment made for renouncing liquidity (preference for liquidity)

The LM curve

- Liquidity preference: Given a level of output *Y*, the level of interest *i* adjusts so that the demand for money (given by the liquidity function L) equals the exogenous supply:

$$\frac{\overline{M}}{\overline{P}} = L\left(\underset{+}{Y}, \underset{-}{i}\right)$$

- M = Money supple (exogenous)
- P = Level of prices (exogenous by assumption)
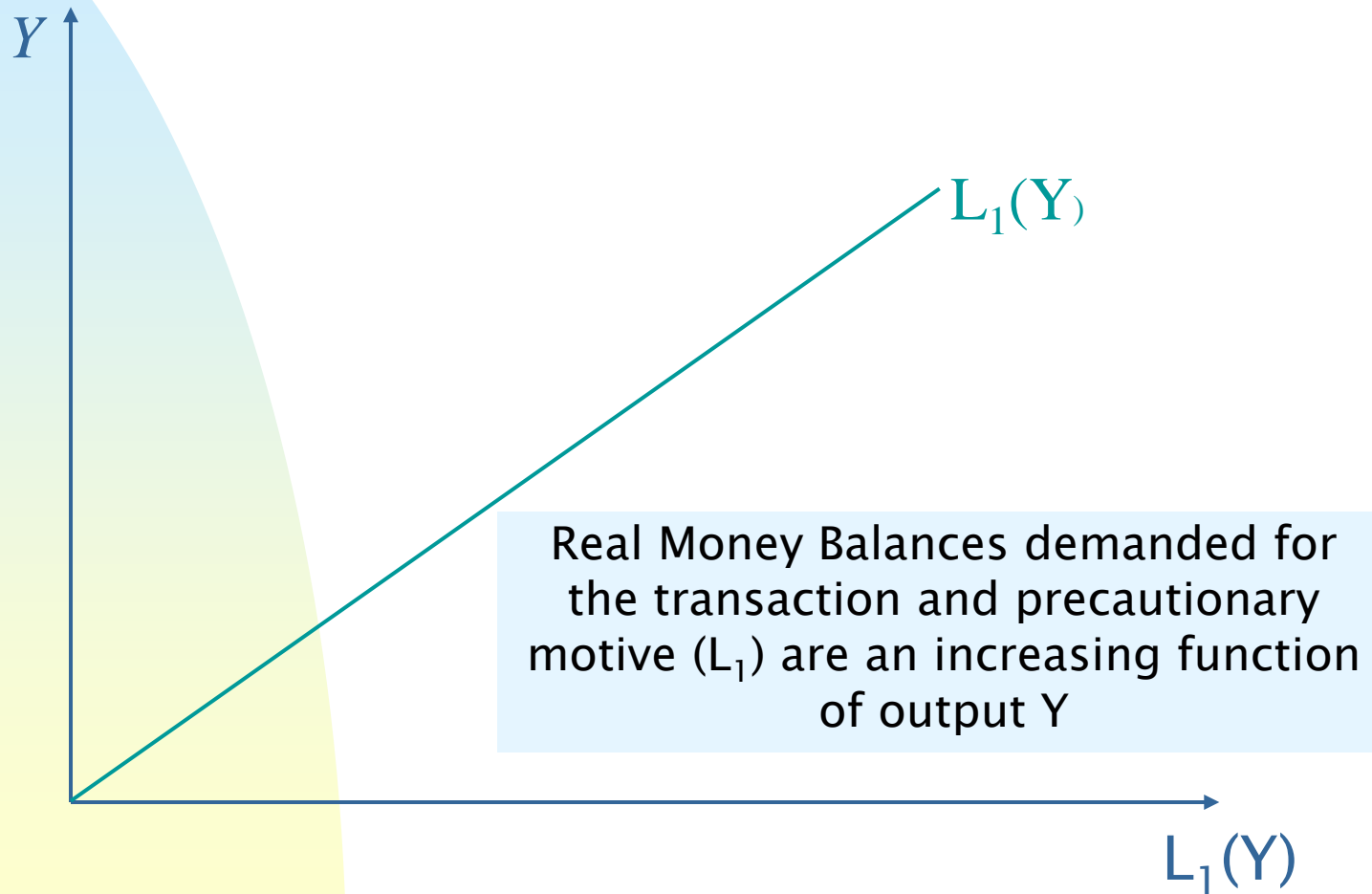
The LM curve

- Simplifying assumption: The liquidity function, which gives the demand for real money balances, can be decomposed depending on the type of demand
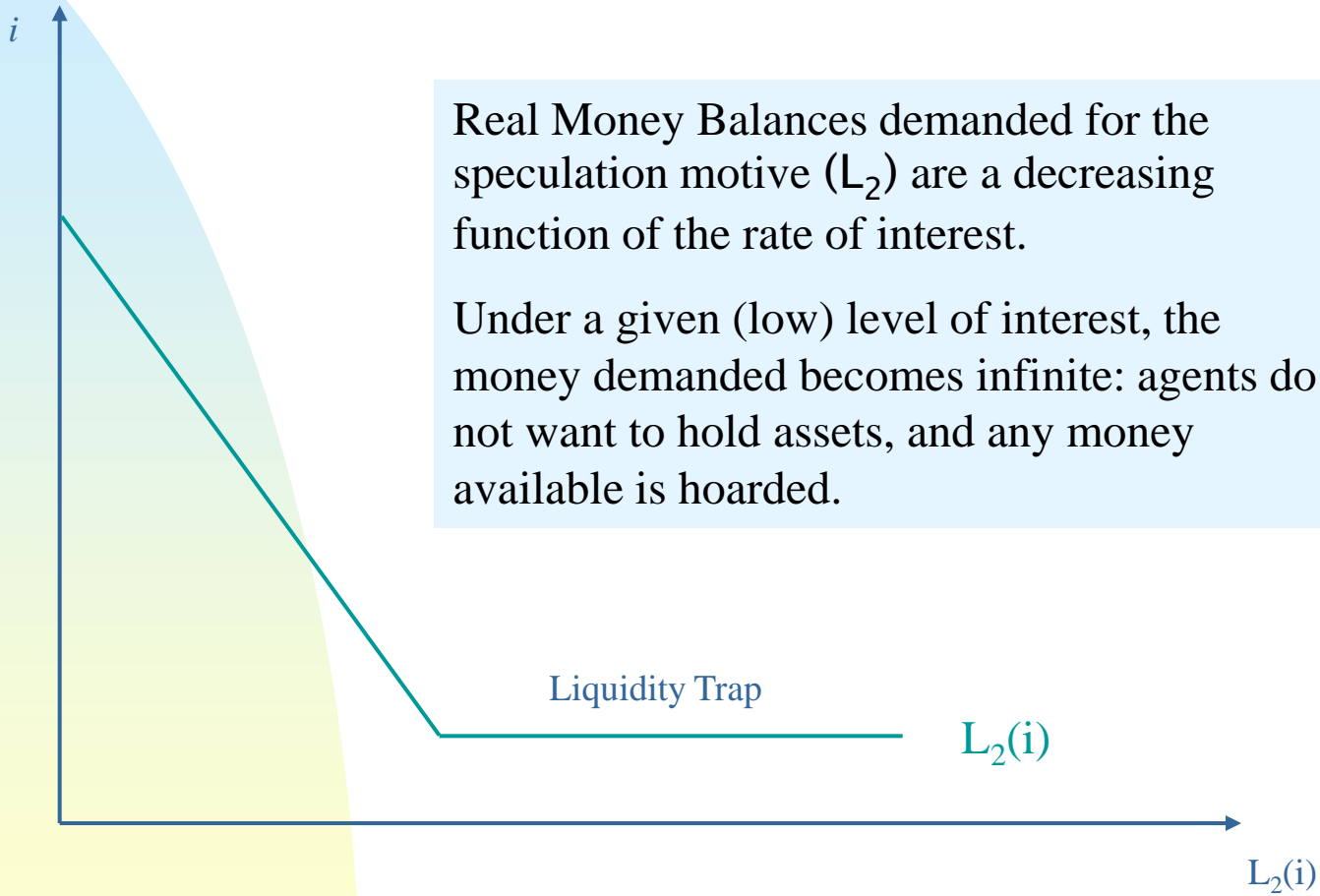
$$L(Y,i) = L_1(Y) + L_2(i)$$
$$\quad\quad\quad + \quad\quad\quad -$$

- There are two motives for demanding real money balances:
  - **The transaction and precautionary motive $L_1(Y)$** : The money demanded in order to be able to transact in the future (function of the level of output)
  - **The speculation motive $L_2(i)$** : The money demanded for purposes of speculation (opportunity cost of the interest rate). When interest is high, people don't want to hold money, whereas when the rates are low, money demanded increases.
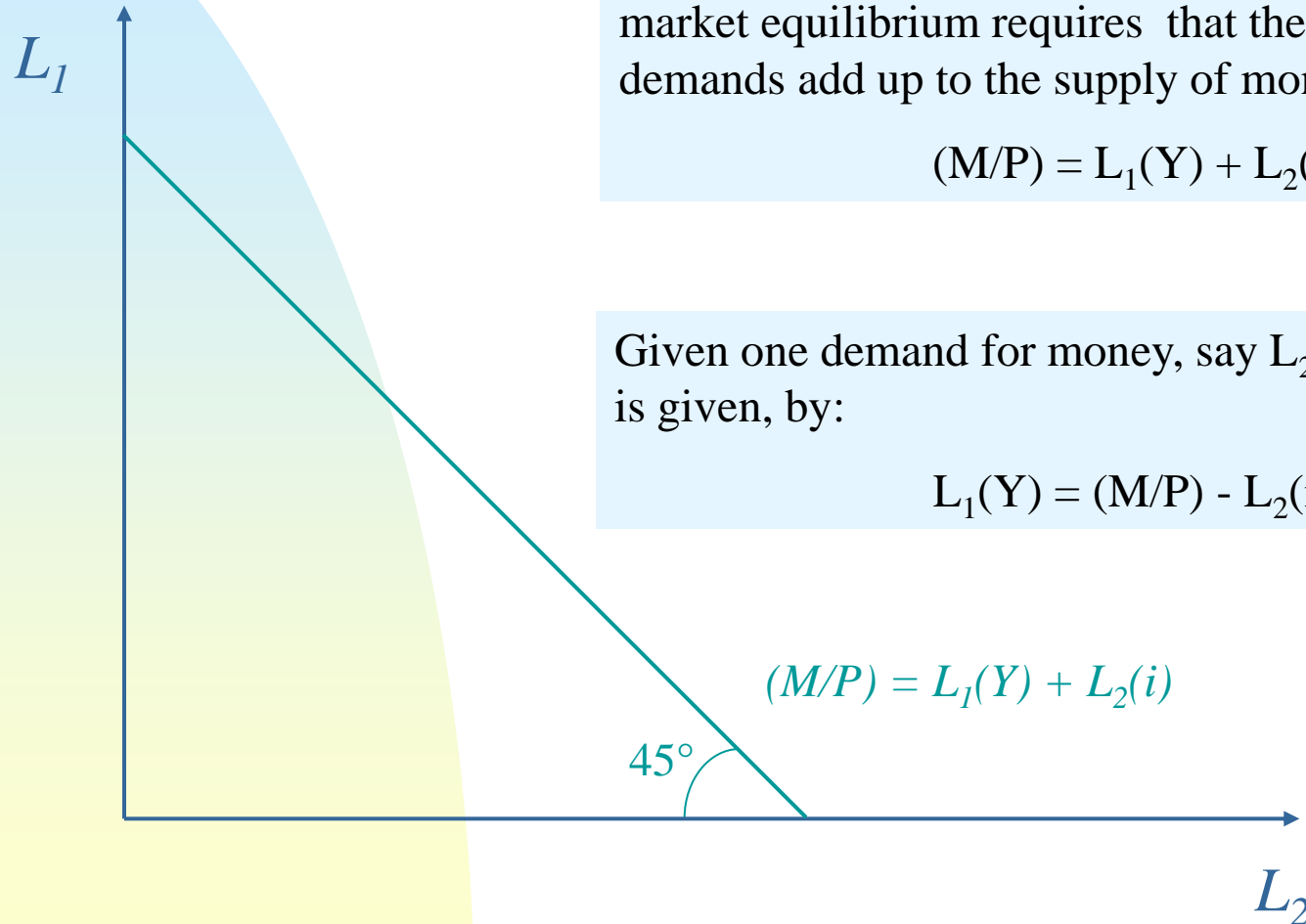
The LM curve

Y

$L_1(Y)$

Real Money Balances demanded for the transaction and precautionary motive (L_1) are an increasing function of output Y

$L_1(Y)$

The LM curve

Real Money Balances demanded for the speculation motive (L_2) are a decreasing function of the rate of interest.

Under a given (low) level of interest, the money demanded becomes infinite: agents do not want to hold assets, and any money available is hoarded.

i

Liquidity Trap

$L_2(i)$

$L_2(i)$

The LM curve

Money supply M is fixed and exogenous. The money market equilibrium requires that the sum of money demands add up to the supply of money

$$(M/P) = L_1(Y) + L_2(i)$$

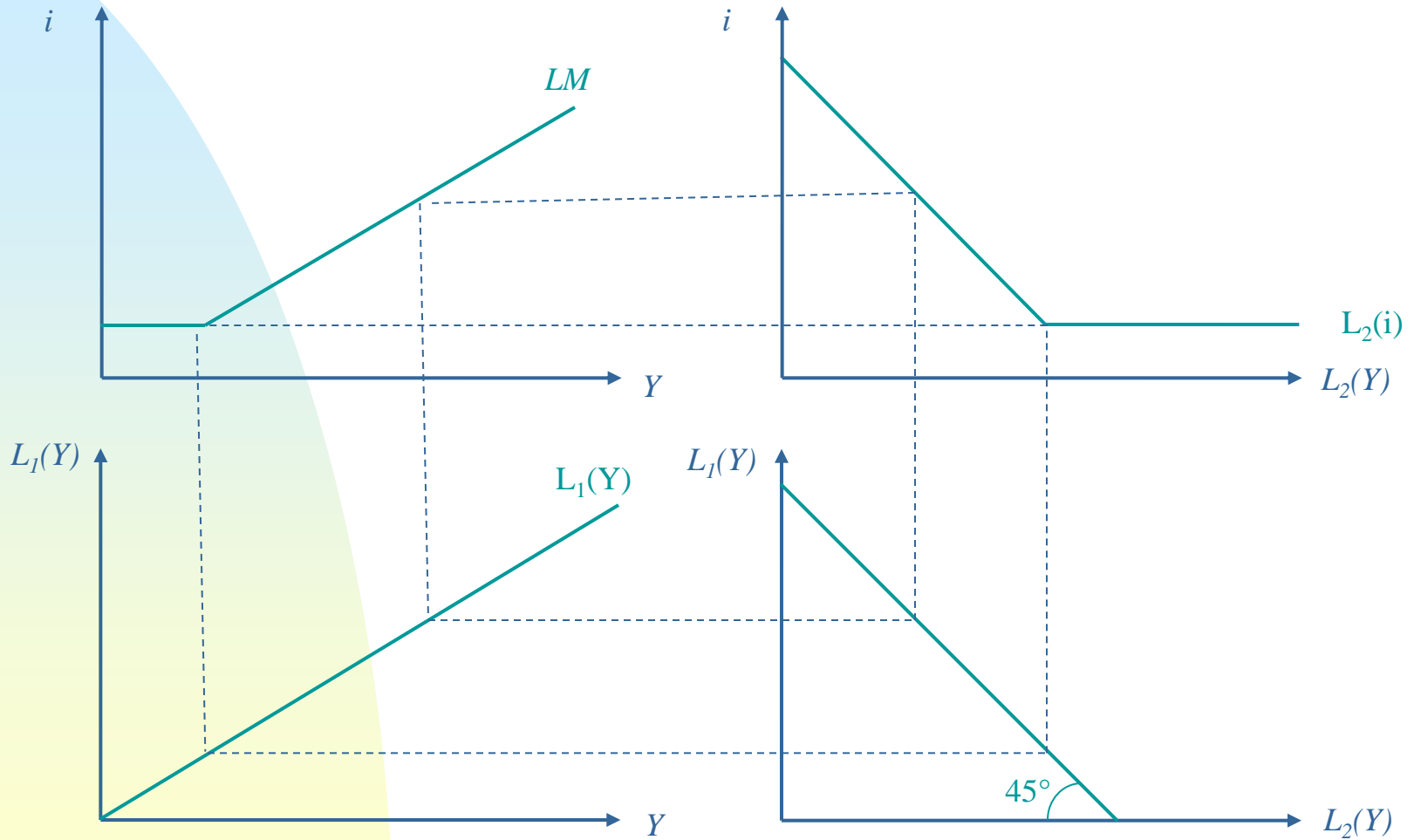Given one demand for money, say $L_2(i)$, then the other is given, by:

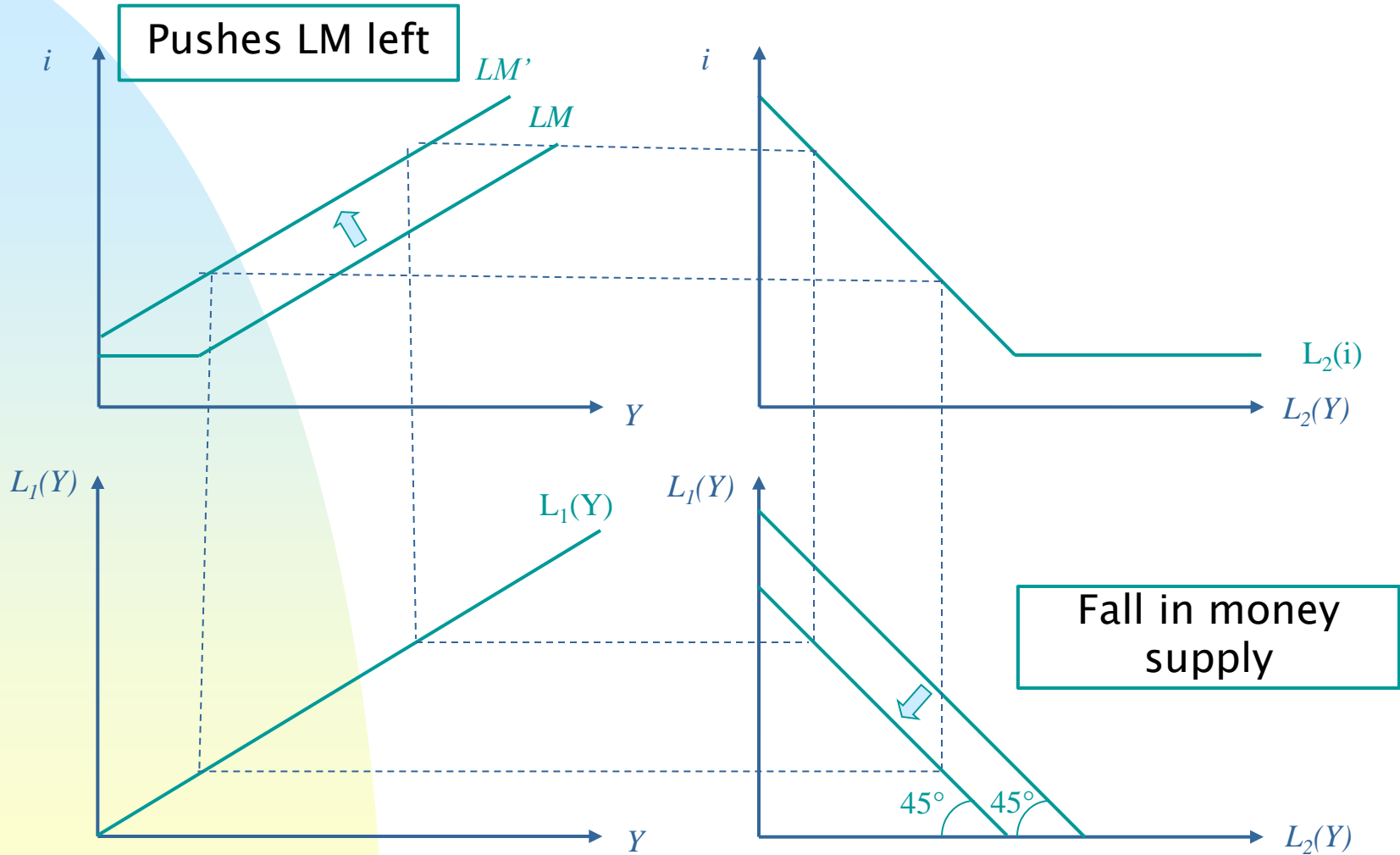$$L_1(Y) = (M/P) - L_2(i)$$

L_1

$(M/P) = L_1(Y) + L_2(i)$

45°

L_2

The LM curve

The LM curve

Pushes LM left

LM'

LM

i

Y

$L_1(Y)$

$L_1(Y)$

i

$L_2(i)$

$L_2(Y)$

$L_1(Y)$

$L_1(Y)$

Fall in money supply

45° 45°

Y

$L_2(Y)$

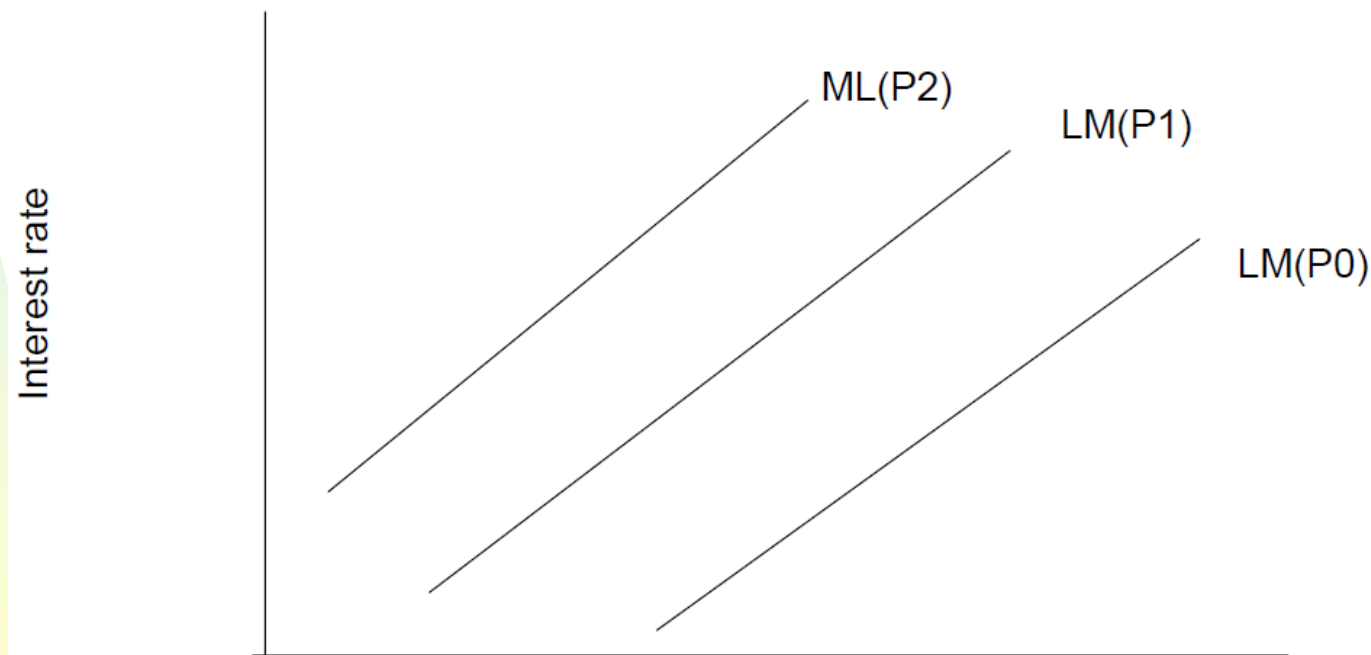# Price level shifts…
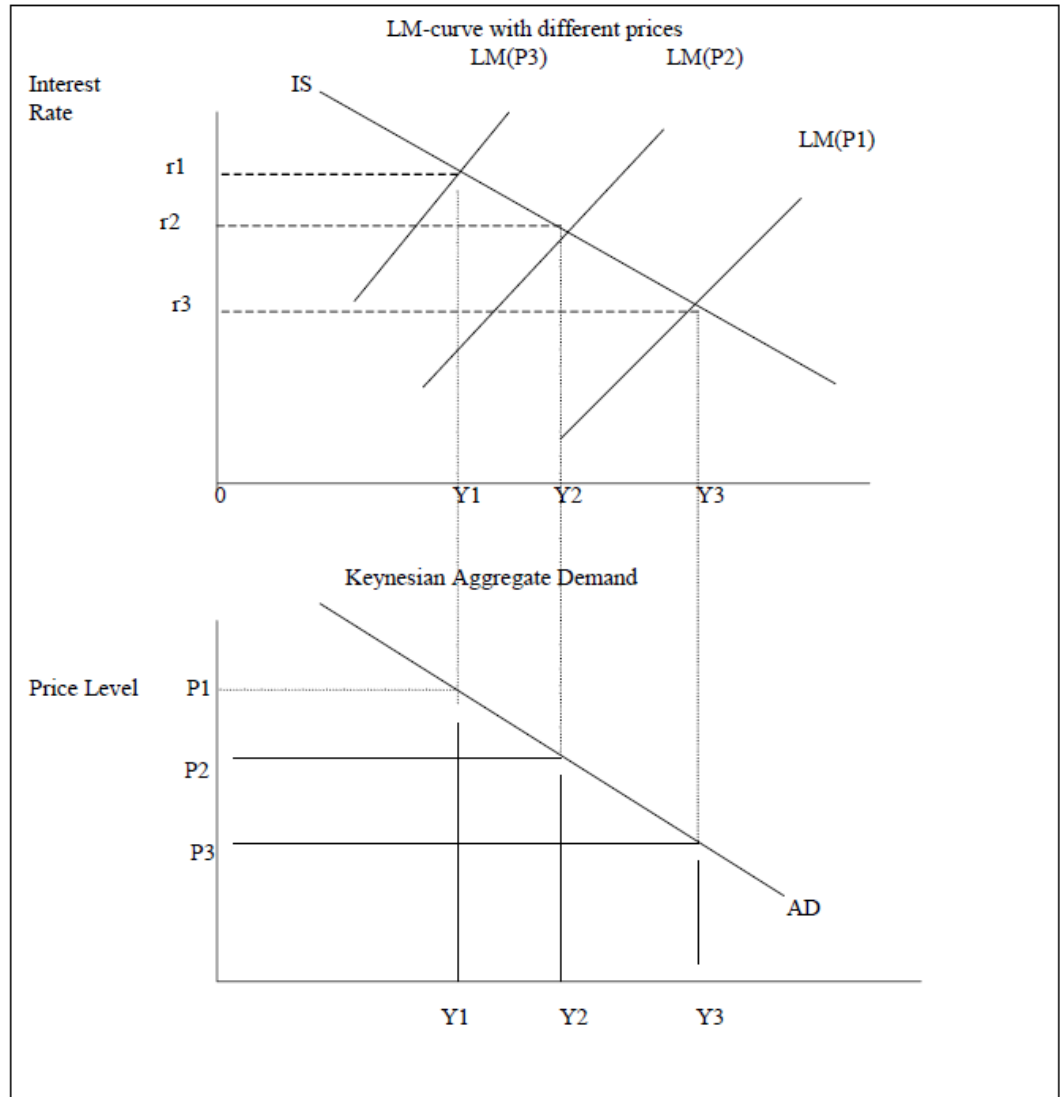
Price Level, Real Money Balance and LM Curve

$P_2 > P_1 > P_0$

$$\frac{M}{P_0} > \frac{M}{P_1} > \frac{M}{P_2}$$

Interest rate

ML(P2)

LM(P1)

LM(P0)

y

Derivation of Keynesian Aggregate Demand Curve

LM-curve with different prices

Keynesian Aggregate Demand

The IS-LM model

- The IS-LM model translates the General Theory of Keynes into neoclassical terms (often called the *neoclassic synthesis*)

- It was proposed by John Hicks in 1937 in a paper called "Mr Keynes and the "Classics": A Suggested Interpretation" and enhanced by Alvin Hansen (hence it is also called the Hicks-Hansen model).

- The model examines the combined equilibrium of two markets :
  - The goods market, which is at equilibrium when investments equal savings, hence IS.
  - The money market, which is at equilibrium when the demand for liquidity equals money supply, hence LM.
  - Examining the joint equilibrium in these two markets allows us to determine two variables : output Y and the interest rate i.

The IS-LM model

- The model rests on two fundamental assumptions
  - All prices (including wages) are fixed.
  - There exists excess production capacity in the economy

- This is a complete change in perspective compared to classical economics:
  - The level of demand determines the level of output and employment.
  - There can be an equilibrium level of involuntary unemployment.

- Why can there be insufficient demand ?
  - Criticism of Say's law: Uncertainty can lead to precautionary saving rather than consumption.
  - Monetary criticism: the preference for liquidity can lead to under-investment as savings are kept in the form of liquidity.

The IS-LM model

- The IS-LM model has become the "standard model" in macroeconomics.

- Its essential contribution (linked to that of Keynes) is this potential equilibrium unemployment:

  - ◆ Such a situation is impossible in earlier neoclassic models, as the price of labour (like all prices) is assumed to adjust naturally until supply and demand for labour are balanced.

- This is why IS-LM remains central to modern macroeconomics, and has been extended to explain more markets/ variables:

Macroeconomic equilibrium and policy

LM

IS

Interest rate i

$i*$

$Y*$

Income, Output Y
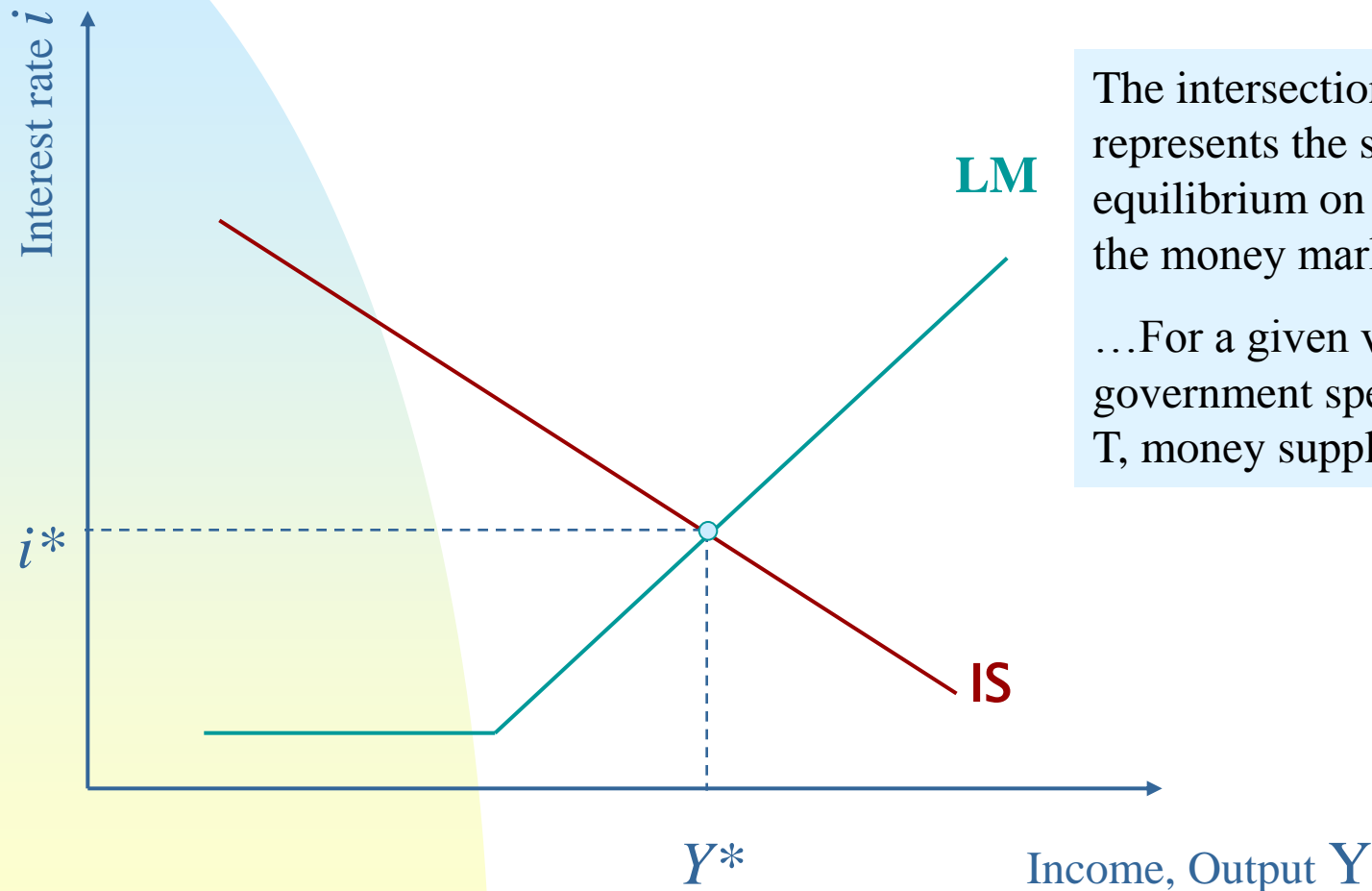
The intersection of IS and LM represents the simultaneous equilibrium on the goods and the money market…

…For a given value of government spending G, taxes T, money supply M and prices P

Macroeconomic equilibrium and policy

- IS-LM can be used to assess the impact of exogenous shocks on the endogenous variables of the model (interest rates and output)

- One can also evaluate the effectiveness of the policy mix, i.e. the combination of:
  - Fiscal policy: changes to government spending and taxes
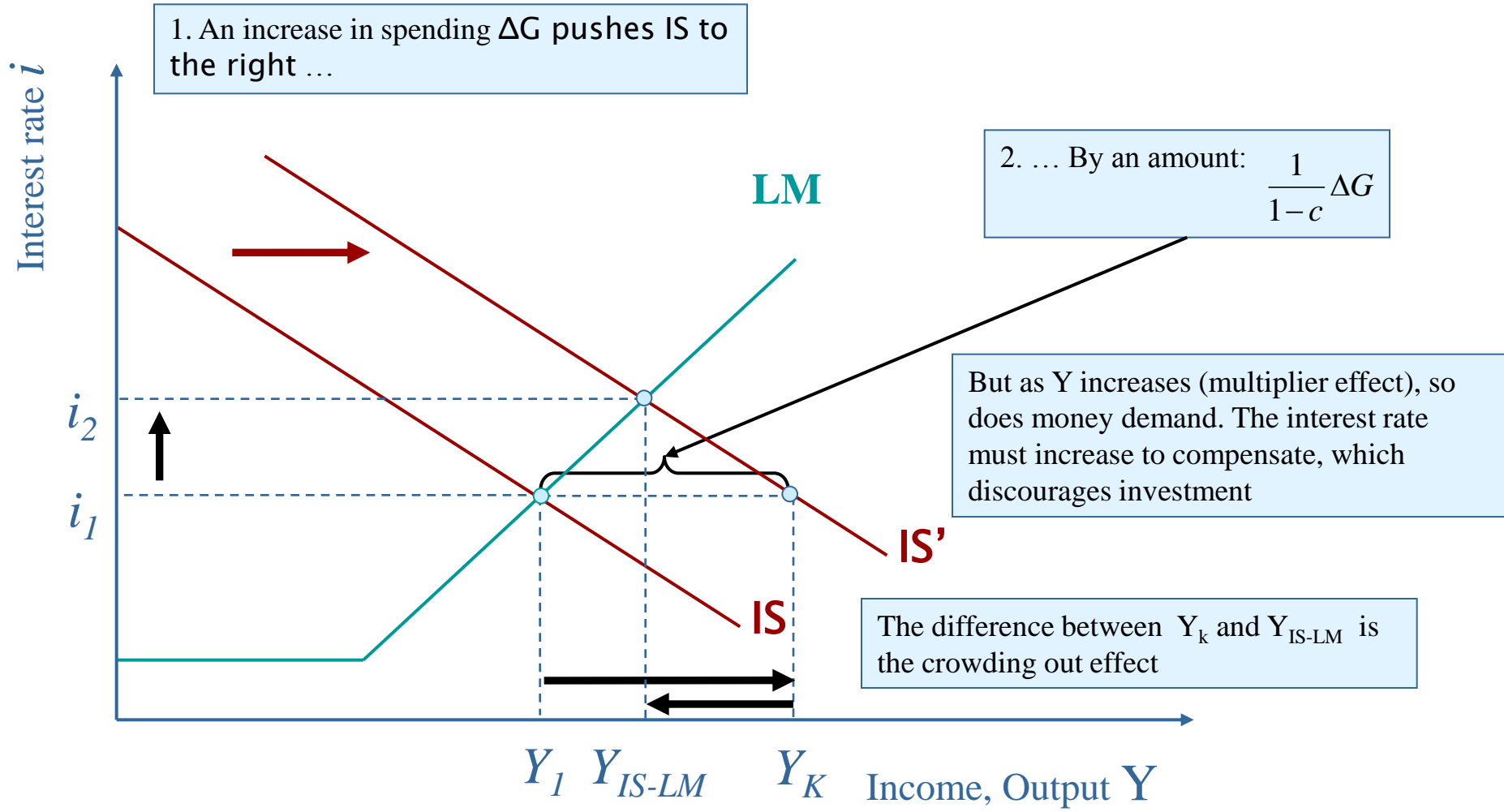 - Monetary policy: changes to money supply

Macroeconomic equilibrium and policy

- Fiscal policy affects the equilibrium in the goods market, *via* changes in G and T.
  - ◆ We've seen that this influences the IS curve.

- The shift in IS affects both endogenous variables (output and interest rate)
  - ◆ Previously, we assumed that investment was exogenous (There was no interest rate in the basic model)
  - ◆ *I* did not change when *G* or *T* were changed
  - ◆ This is no longer the case with IS-LM : there is a crowding out effect

Macroeconomic equilibrium and policy

1. An increase in spending ΔG pushes IS to the right …

2. … By an amount: $\dfrac{1}{1-c}\Delta G$

But as Y increases (multiplier effect), so does money demand. The interest rate must increase to compensate, which discourages investment

The difference between Y_k and $Y_{IS\text{-}LM}$ is the crowding out effect

Interest rate i

LM

i_2

i_1

IS'

IS

Y_1 $Y_{IS\text{-}LM}$ Y_K Income, Output Y

Macroeconomic equilibrium and policy

- Remember that the equilibrium condition of the economy can be expressed as:

$$G - T = S(Y) - I(i)$$

- Now that we have integrated interest rates...
- If G-T increases (fiscal policy), the economy attempts to correct the disequilibrium by:
  - ◆ Increasing S (multiplier effect on output)
 - ◆ Reducing I (crowding out on private investment)

Macroeconomic equilibrium and policy

- Monetary policy affects the equilibrium in the money market, *via* changes in M.
  - ◆ We've seen that this influences the LM curve.

- As for fiscal policy, the shift in LM affects both endogenous variables (output and interest rate)
  - ◆ Money is not neutral !!
  - ◆ This is one of the central contributions of Keynes
  - ◆ This conclusion changes somewhat when examine AS-AD (IS-LM with inflation)

Macroeconomic equilibrium and policy
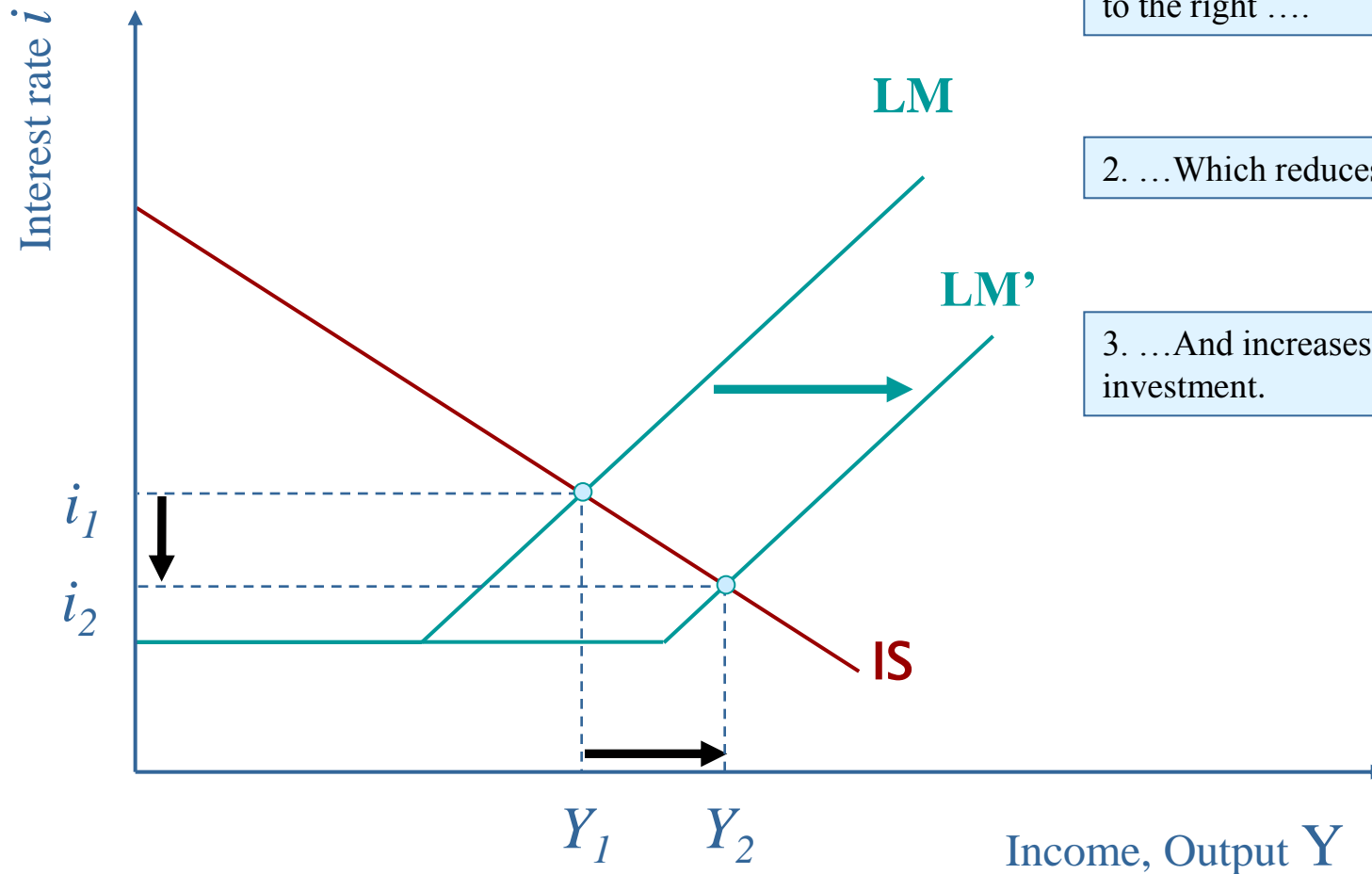
1. An increase in money supply shifts LM to the right ….

2. …Which reduces the rate of interest...

3. …And increases output by stimulating investment.

Macroeconomic equilibrium and policy

- The two policies are not independent, as they *both* affect the endogenous variables:
  - The interest rate i
  - Income Y
  - Hence the idea of a *policy mix*…

- **3 examples of policy mix issues**
  - The good: the Clinton deficit reduction in 1993,
  - The bad: the German reunification in 1992,
  - The ugly : the current debate on the "liquidity trap".

Macroeconomic equilibrium and policy

The Clinton deficit reduction in 1993
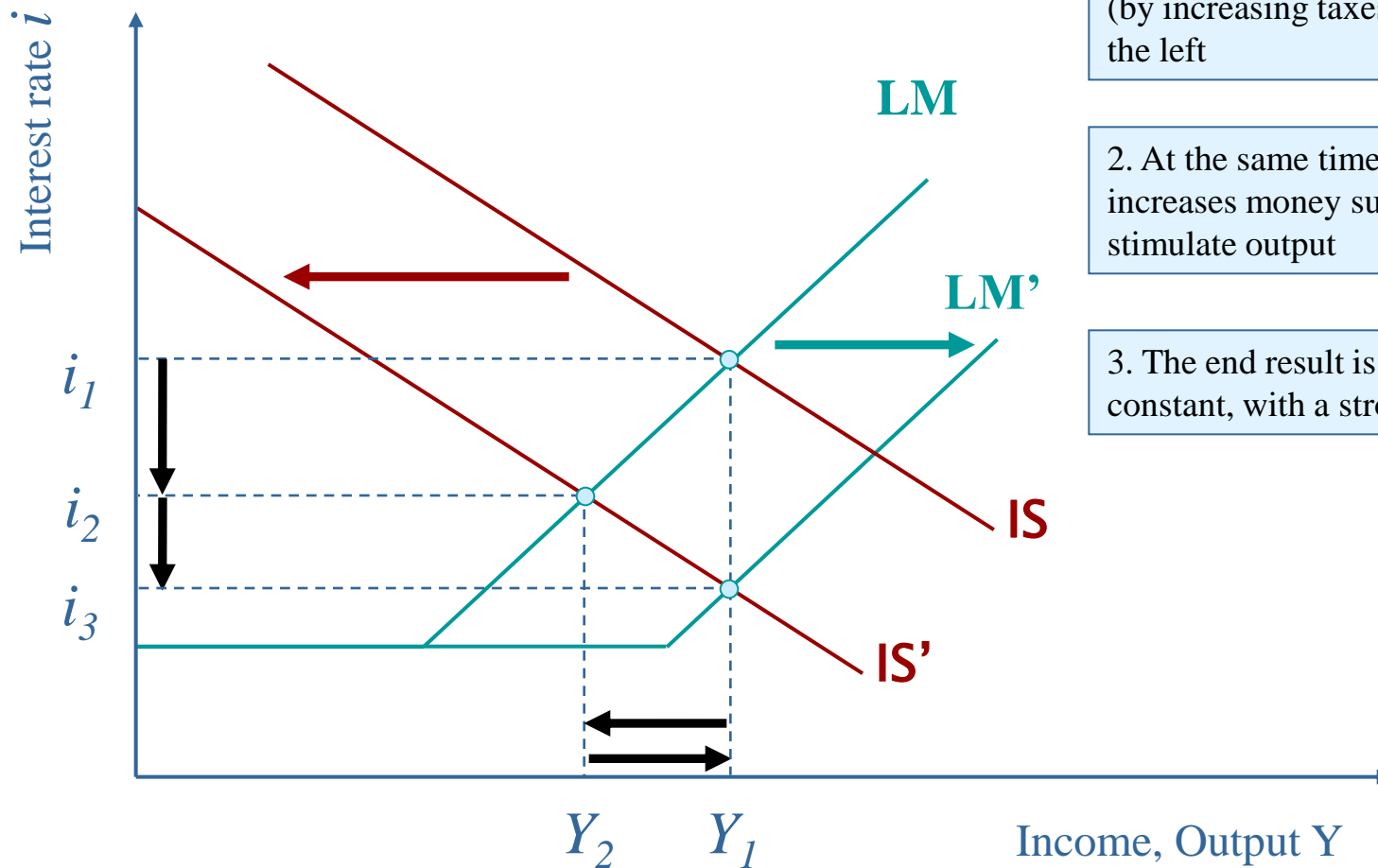
1. Clinton decides to reduce the US deficit (by increasing taxes) , which shifts IS to the left

2. At the same time, Alan Greenspan increases money supply in order to stimulate output

3. The end result is that output is held constant, with a strong fall in interest rates

Macroeconomic equilibrium and policy

The German reunification in 1992

Interest rate i

LM'

LM

IS'

IS

i_3

i_2

i_1

Y_1 Y_2

Income, Output Y
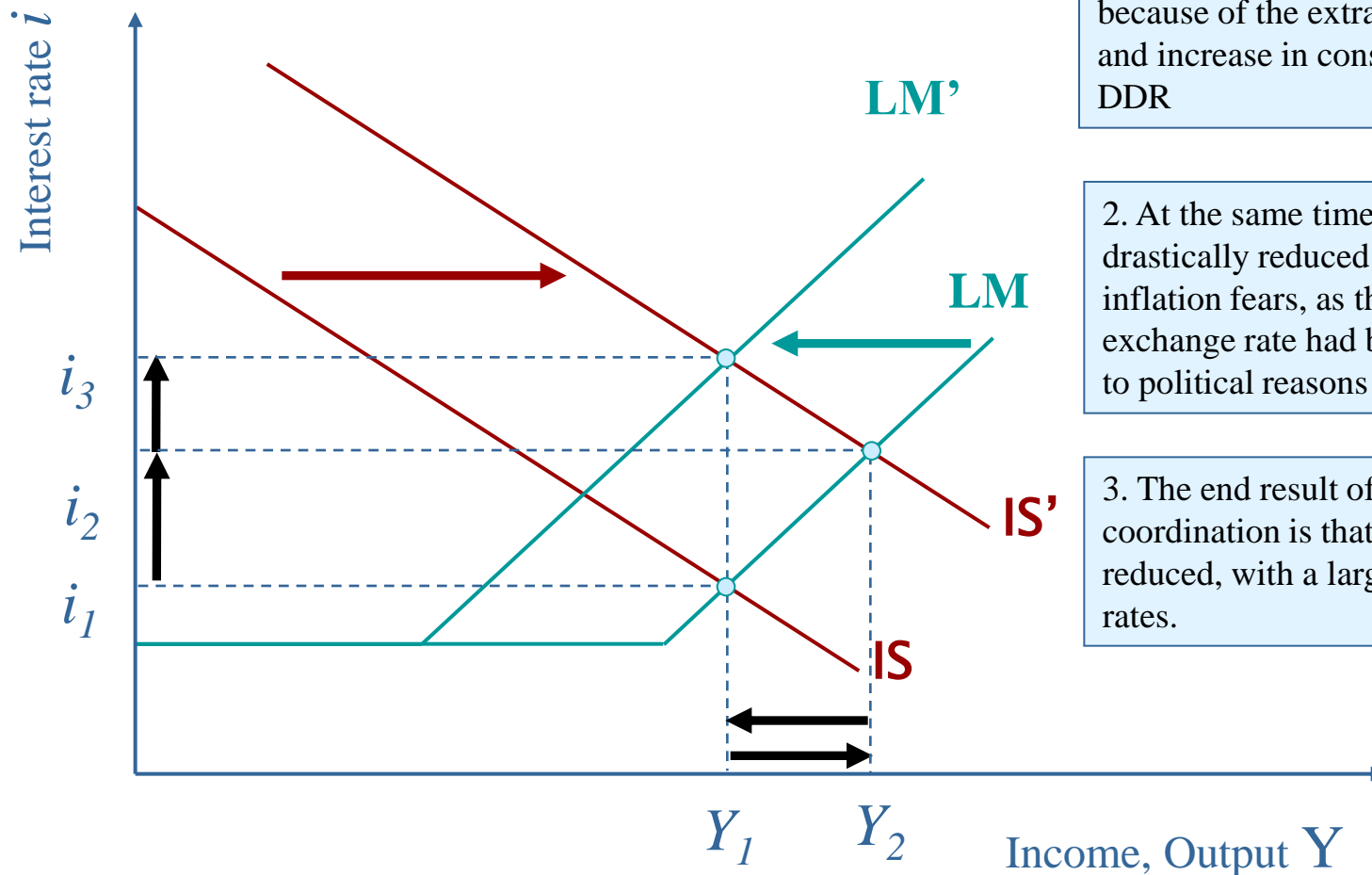
1. The German reunification resulted in a large shift of IS to the right, mainly because of the extra government spending and increase in consumption from the ex DDR

2. At the same time, the Bundesbank drastically reduced money supply due to inflation fears, as the ostmark/DM exchange rate had been set at 1 for 1 due to political reasons

3. The end result of this lack of coordination is that output was slightly reduced, with a large increase in interest rates.

Macroeconomic equilibrium and policy

The current liquidity trap ?

Interest rate i

LM

LM'

i_1

i_2

IS

IS'

Y_2 Y_1

Income, Output Y
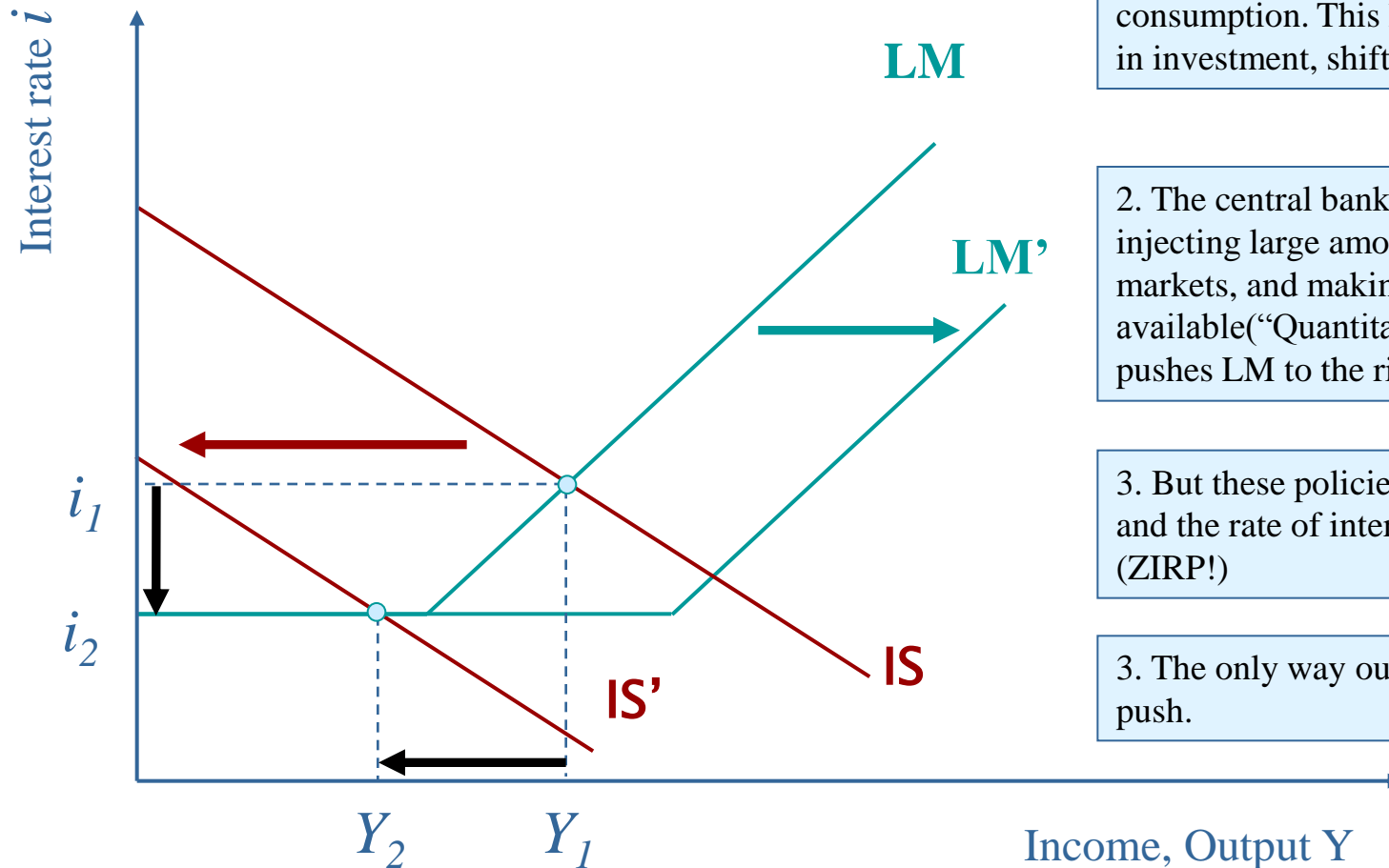
1. The subprime-based financial crisis has frozen credit markets as well as depressed consumption. This has caused a large fall in investment, shifting IS to the left

2. The central bank have responded by injecting large amounts of liquidity in the markets, and making credit easily available("Quantitative easing"). This pushes LM to the right.

3. But these policies have had no effect, and the rate of interest is practically zero (ZIRP!)

3. The only way out is a large fiscal policy push.

Supply-demand: $Y = C + I + G$

Consumption: $C = 250 + 0.75(Y - T)$

Investment: $I = 200 - 25r$

Balanced budget: $T = G = 100$

Derive IS curve:

$$Y = 250 + 0.75(Y - T) + 200 - 25r + 100$$

$$Y = 1900 - 100r$$

$$\frac{\partial y}{\partial r} = -100 :$$

a negatively sloped IS curve

The LM…

Money demand: $(M/P)^d = Y - 100r$

Money supply $\overline{M} = 1000$

Money market equilibrium:

$1000 = Y - 100r$

Or $r = -10 + 0.01Y$

=> $\dfrac{\partial r}{\partial y} = 0.01 > 0$

Economy wide Equilibrium

It is given by the intersection point of the IS and LM curves.

$$Y = 1900 - 100r$$

or $Y = 1900 - 100(-10 + 0.01Y)$

$$Y = \frac{2900}{2} \rightarrow Y = 1450$$

$$r = -10 + 0.01Y \Rightarrow$$

$$r = -10 + 0.01(1450) = 4.5\%$$

Impact of an Expansionary Fiscal Policy

G rises from 100 to 150

$$Y = 250 + 0.75(Y - T) + 200 - 25r + 150$$

$$0.25Y = 525 - 25r \rightarrow Y = 2100 - 100r$$

$$Y = 2100 - 100(-10 + 0.01Y) \rightarrow$$

$$Y = 3100 - Y \rightarrow Y = \frac{3100}{2} = 1550$$

$$r = -10 + 0.01Y \rightarrow r = -10 + 0.01(1550)$$

$$\rightarrow r = 5.5\%$$

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Impact of expansionary fiscal policy in the interest rate and output (G rises from 100 to 150)
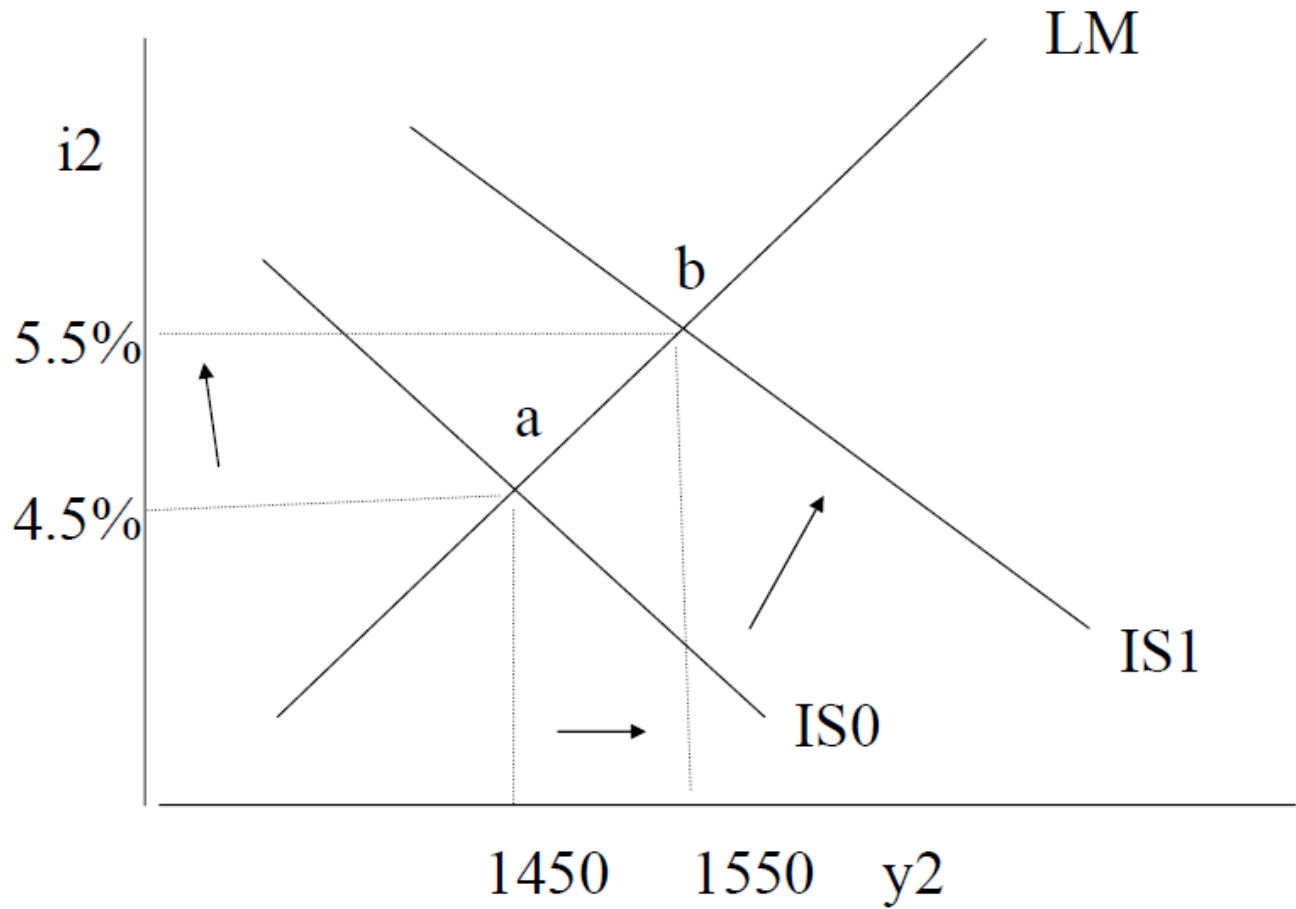
Impact of an Increase in Money Supply from 1000 to 1250 on the interest rate and output
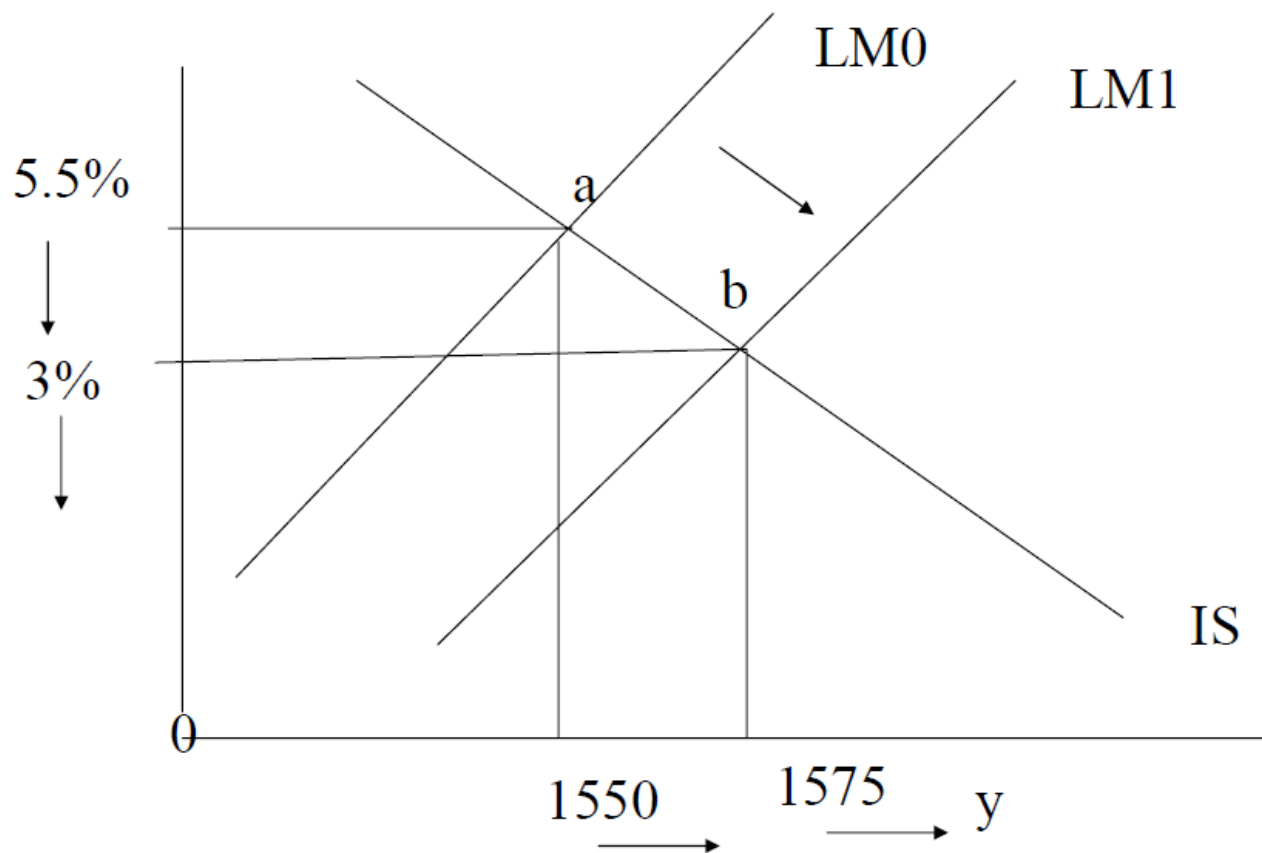
Real Balance Effect in the IS-LM Model with an increase in the price level from 1 to 2

Impact of increase in price level or reduction in real money balances

$r = -5 + 0.01Y$

7%

r

$r = -10 + 0.01Y$

4.5%

$Y = 1900 - 100r$

1200   1450

Y
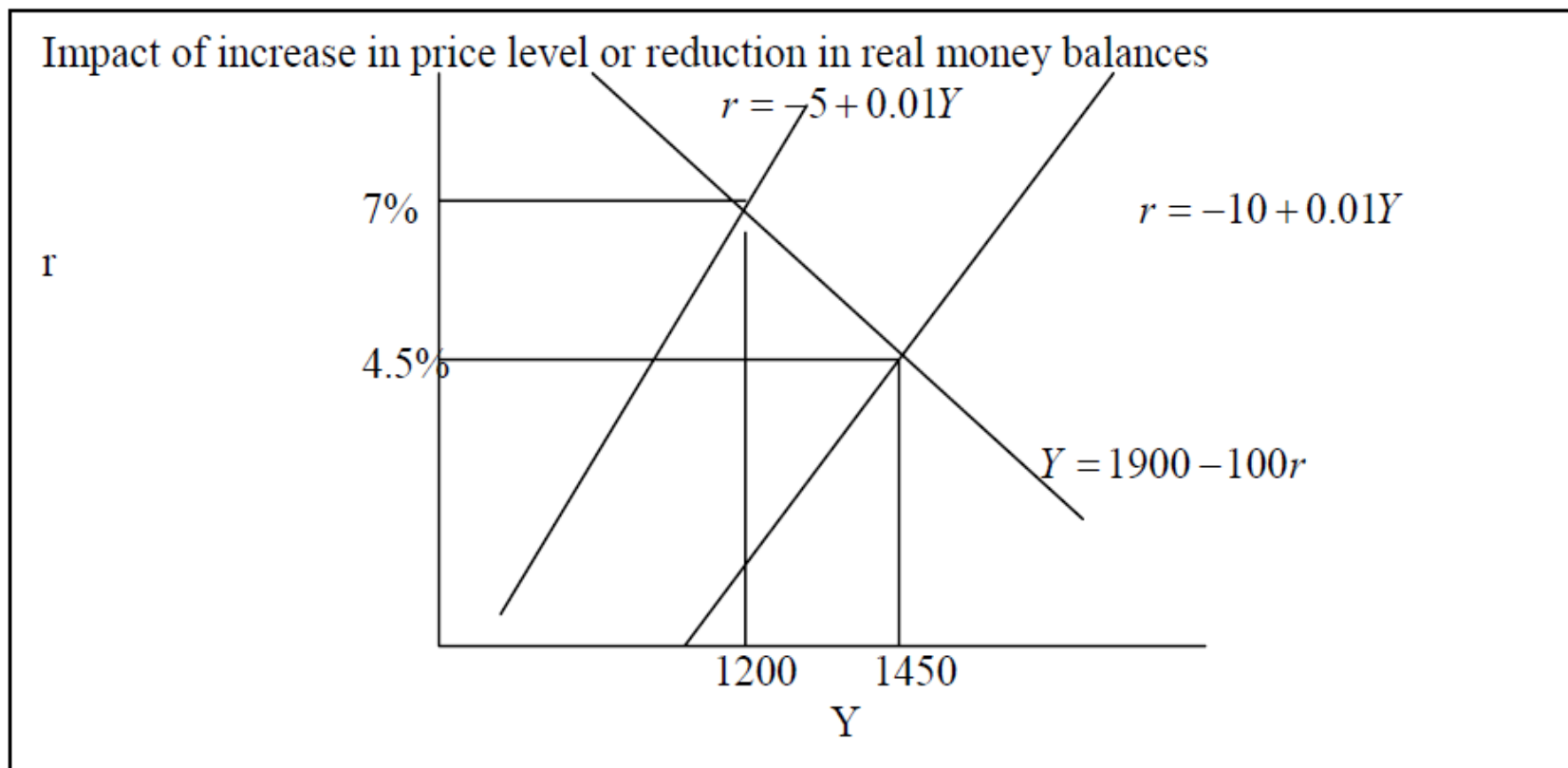
Why is the Aggregate Demand Downward Sloping?

Aggregate demand Using above Example

Price Level

P = 2

P = 1

Why is AD downward Sloping?
(1) real balance effect
(2) real exchange rate effect
(3) increase in the interest rate

1200   1450
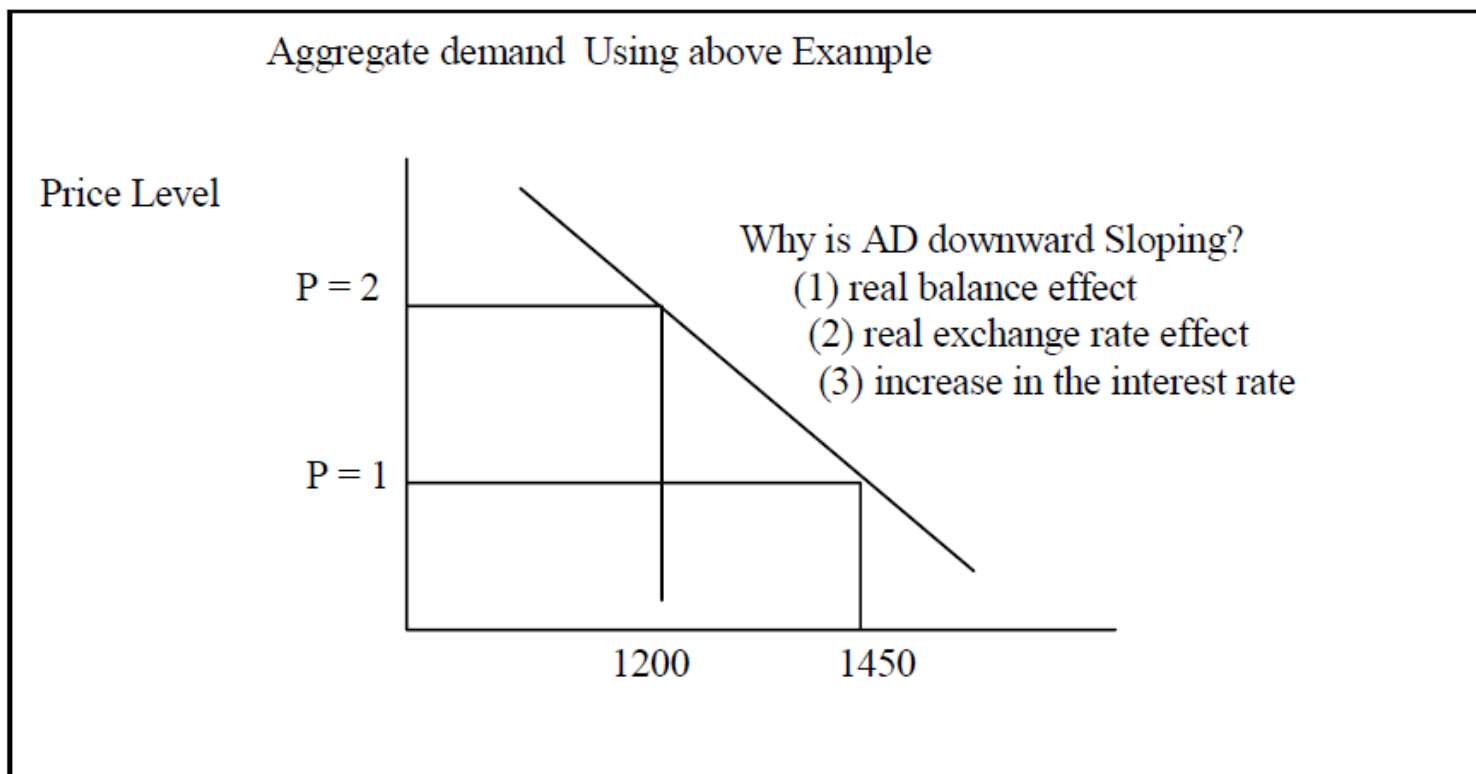
Keynesian View on Effectiveness of Fiscal policy and Ineffectiveness of Monetary Policy

Keynesian view on Fiscal Policy

Keynesian view on Monetary Policy

Interest rate

r

Y1   Y2
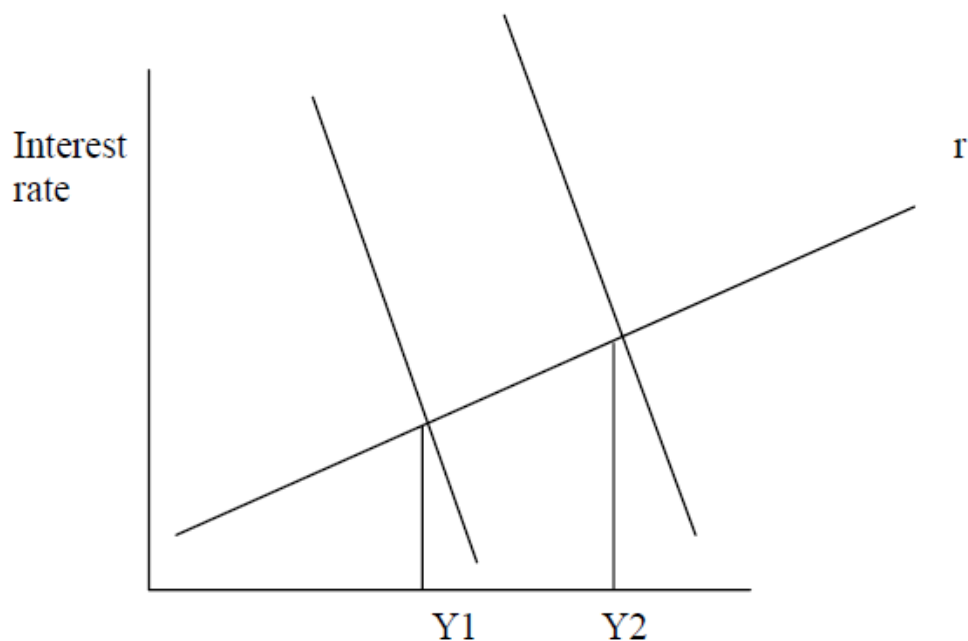
Fiscal policy is more effective (Flat LM)
Large output effect of fiscal policy   (Steep IS)
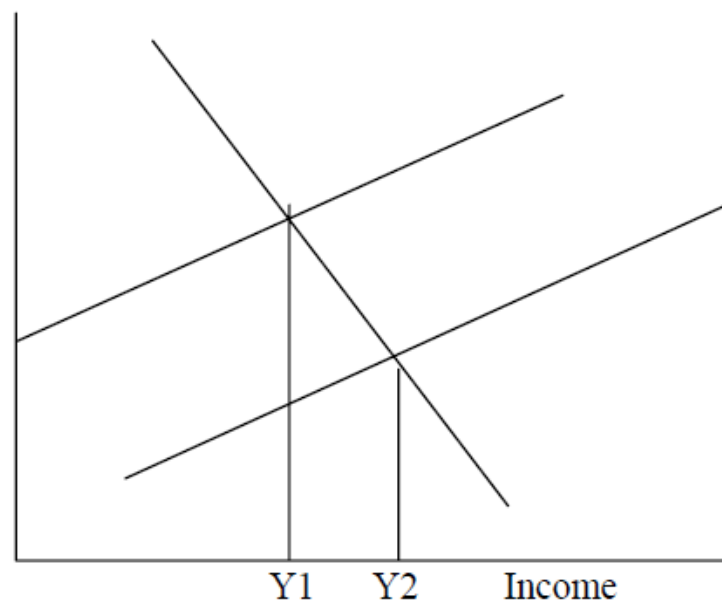
Y1   Y2   Income
Monetary policy is effective (Flat LM) and
Small output effect of Monetary policy (Steep IS)

Monetarist's View of Effectiveness of Fiscal and Monetary Policies

Monetarist view on Fiscal Policy
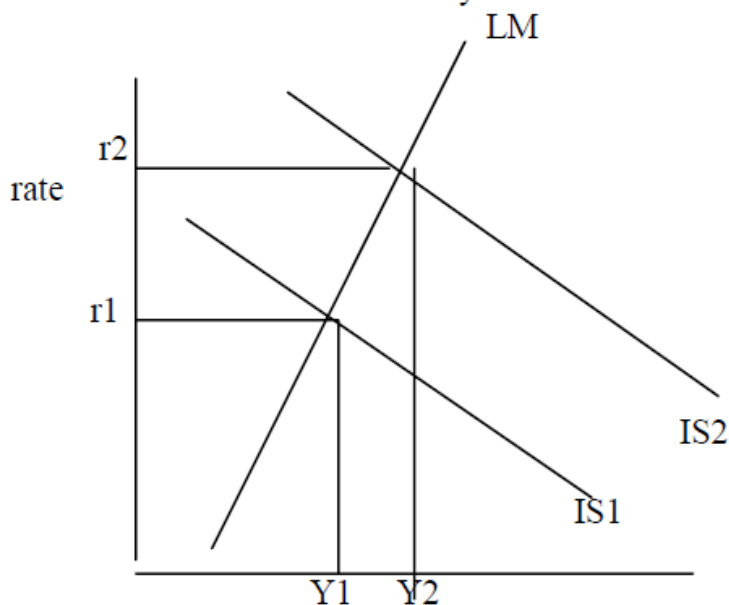
Fiscal policy is in effective (Steep LM)
Small output large interest effect of fiscal policy (Flat IS)

Monetarist view on Monetary Policy
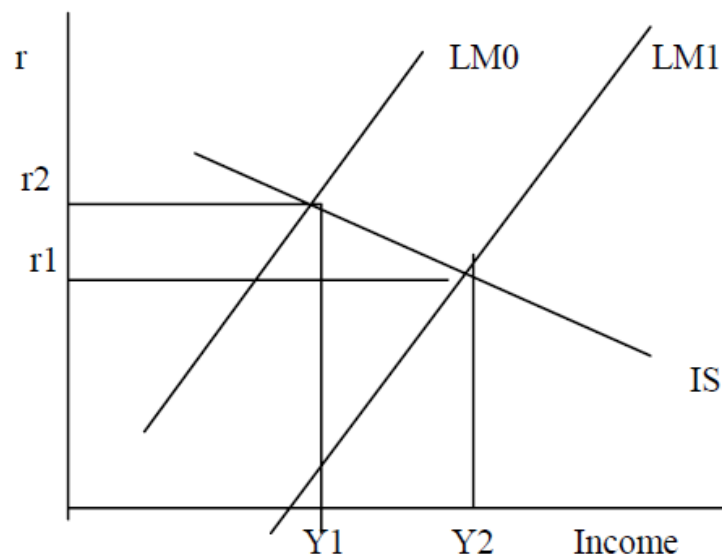
Monetary policy is effective (Steep LM) and
Large output small interest rate effect of monetary policy (FLAT IS)

Monetarists view on fiscal and monetary policy

- Flat Is curve: investment (AD) elastic to interest rates; portfolio effects
- Money demand is stable
- Velocity of circulation is stable and predictable
- Steep LM curve:low interest elasticity of money demand, people keep a certain fraction of wealth in the form of money
- Liquidity trap is impossible
- Monetary policy is more effective

Keynesian on effectiveness of fiscal policy

- Steep IS-curve :
  - investment (AD) is less responsive to the interest rates, fiscal policy is effective
  - Money demand is very elastic and velocity of circulation is not stable
  - Flat LM curve in the short run, monetary policy is ineffective
  - Effects of monetary policy are unpredictable
  - Possibility of liquidity trap

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Models are expandable…

- Lets look back at slide 83 on the impact of G increasing…

- But adding in our model a wealth effect, whereby an increase in G through bond issuing by the government NOW affects the demand for money because of an increased real total financial wealth…

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Macroeconomic equilibrium and policy

1. An increase in spending ΔG pushes IS to the right …

2. … By an amount: $\dfrac{1}{1-c}\Delta G$

The difference between $Y_{IS\text{-}LM}$ and $Y_{IS\text{-}LM2}$ is the financial assets effect

But as Y increases (multiplier effect), so does money demand. The interest rate must increase to compensate, which discourages investment

The difference between Y_k and $Y_{IS\text{-}LM}$ is the crowding out effect

Interest rate i

Income, Output Y

LM2

LM

IS'

IS
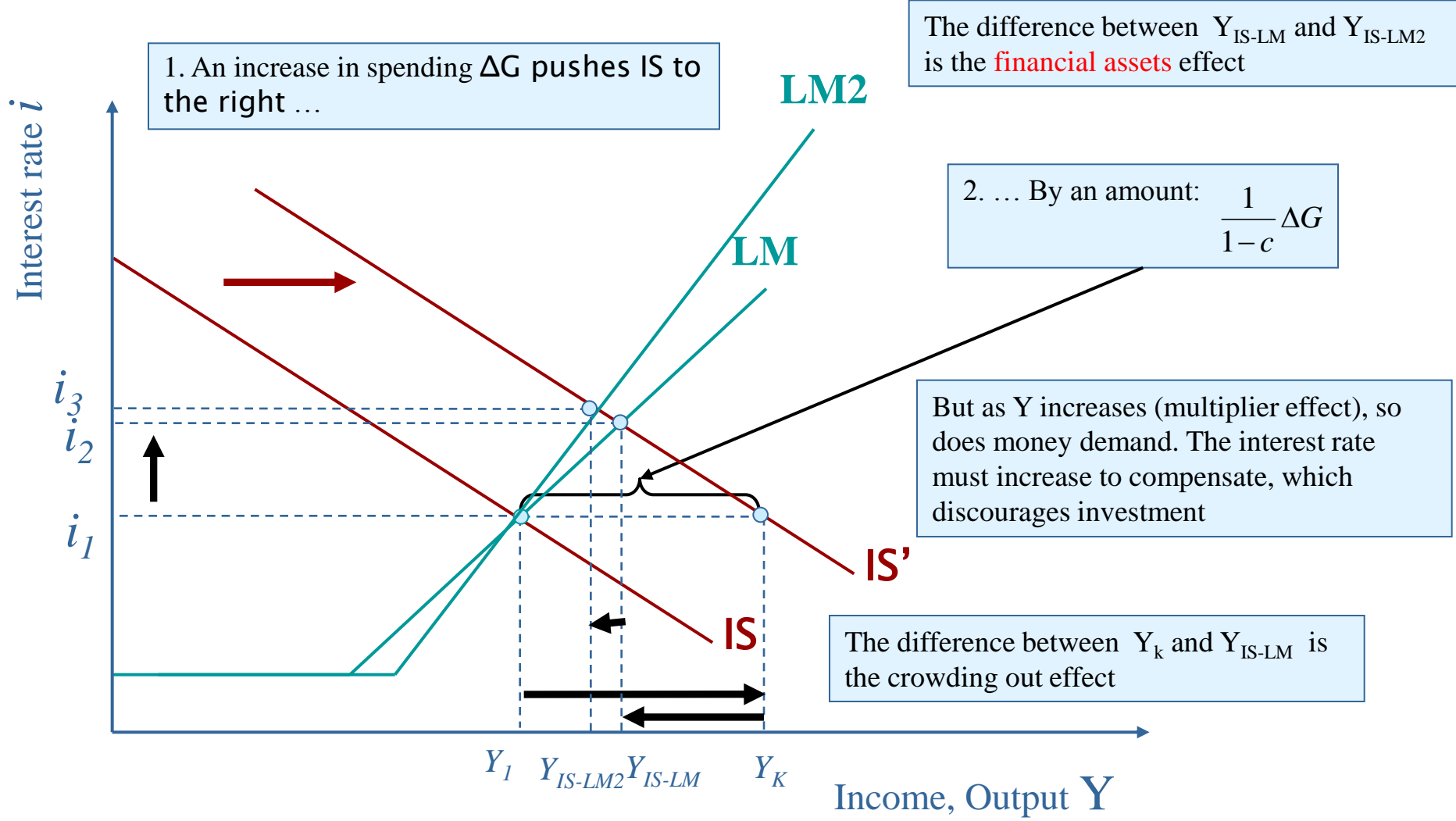
i_3
i_2
i_1

Y_1 $Y_{IS\text{-}LM2}$ $Y_{IS\text{-}LM}$ Y_K

The LM curve revisited…

- New Liquidity preference: Given a level of output Y, the level of interest i adjusts so that the demand for money (given by the liquidity function L) equals the supply:

$$\frac{\overline{M}}{\overline{P}} = L\left(Y, i, a\right)$$

Where now though we have:

- M = Money supple (exogenous)

- P = Level of prices (exogenous by assumption)

- a = Total financial assets

We can assume that total (financial) wealth at time t is

$$(\text{TFW}) \quad a_t = a_0 + s_t = a_0 + (y - t_1) - c(y - t_1)$$

Resulting in an assets/wealth effect that means that because people hold more bonds, their increased wealth effect means that they have a higher requirement for liquidity…

$$Y = C+I+G+(X-M)$$
$$C = C0+b(Y-T) \qquad C = 200+0.8(Y-T)$$
$$I = I0-dr \qquad I = 50-5r$$
$$T = t0+tY \qquad T = 30+0.2Y$$
$$M = m0+m1Y \qquad M = 20+0.25Y$$

Policy Scenarios in the IS-LM Model

	Parameter	Base Case	Tax cut	Spending	MPC	T &G	High X	High I	MMM
G	200	200	200	400	200	400	200	200	200
X	100	100	100	100	100	100	300	100	100
r	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
C0	300	300	300	300	300	300	300	300	300
b	0.8	0.8	0.8	0.8	0.9	0.8	0.8	0.8	0.8
I0	50	50	50	50	50	50	50	200	50
d	10	10	10	10	10	10	10	10	10
t0	30	30	30	30	30	30	30	30	30
t	0.3	0.3	0.2	0.2	0.3	0.2	0.3	0.3	0.3
m0	20	20	20	20	20	20	20	20	20
m1	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.4

Policy Scenarios of the Keynesian Model

$$Y=(C0-bT0+I+G+X-m0)/(1-b+bt+m1)$$

	Y	T	C	I	G
Base case	876.8	293.0	767.0	49.0	200.0
Tax cut	991.8	228.4	910.8	49.0	200.0
Spending	1166.7	380.0	929.3	49.0	400.0
MPC	971.0	321.3	884.7	49.0	200.0
T&G	1319.7	293.9	1120.6	49.0	400.0
High X	1166.7	380.0	929.3	49.0	200.0
High I	1094.2	358.3	888.8	199.0	200.0
MMM	720.2	246.1	679.3	49.0	200.0

Saving-Investment, Budget and Trade Gaps under various Policies In the Keynesian Model

	X	M	S	T-G	X-M	S-I	Bal
Base case	100.0	239.2	-183.2	93.0	-139.2	-232.2	-139.2
Tax cut	100.0	268.0	-147.3	28.4	-168.0	-196.3	-168.0
Spending	100.0	311.7	-142.7	-20.0	-211.7	-191.7	-211.7
MPC	100.0	262.7	-235.0	121.3	-162.7	-284.0	-162.7
T&G	100.0	349.9	-94.9	-106.1	-249.9	-143.9	-249.9
High X	300.0	311.7	-142.7	180.0	-11.7	-191.7	-11.7
High I	100.0	293.6	-152.8	158.3	-193.6	-351.8	-193.6
MMM	100.0	308.1	-205.2	46.1	-208.1	-254.2	-208.1

$$Y_t = \frac{\beta_0 - \beta_1 c_0 + \mu_0 - m_0 + G_t + X_t}{1 - \beta_1 + \beta_1 t_1 + m_1} + \frac{\mu_1 R_t}{1 - \beta_1 + \beta_1 t_1 + m_1} + \frac{\phi \Delta Y_{t-1}}{1 - \beta_1 + \beta_1 t_1 + m_1}$$

Model Parameters for the Policy Scenarios

beta0	10000	10000	10000	10000	10000	10000	10000	10000	10000	10000	22114.16
beta1	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.9	0.6	0.9	0.459078
mu0	500	500	500	500	500	500	1000	500	500	500	105457
m0	100	100	100	100	100	100	100	100	100	100	-65167
t0	200	500	200	500	200	200	200	200	200	200	-201384
t1	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.476403
m1	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.3	1.387408
mu1	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1720.051
phi	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6
G	20000	20000	25000	25000	20000	20000	20000	20000	20000	20000	155880
X	8000	8000	8000	8000	8000	8000	8000	10000	10000	8000	289225
y0	500	500	500	500	500	500	500	500	500	500	500
b0	800	800	800	800	800	800	800	800	800	800	-78809
b1	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.25	0.333992
b2	300000	300000	300000	300000	300000	600000	300000	300000	300000	300000	-1829.75
M4	10000	10000	10000	10000	15000	10000	10000	10000	10000	10000	10000
P	1	1	1	1	1	1	1	1	1	1	1

Solution of the IS-LM Model for Various Policy Scenarios

	R	Y	C	I	G	T	M	X	S	X-M	S-I	T-G
Base case	0.0251	66901	51968	525	20000	20270	13480	8000	-5337	-5480	-5862	270
More Tax	0.024	65640	50453	524	20000	20692	13228	8000	-5505	-5228	-6029	692
More Spending	0.0324	75660	57486	532	25000	22898	15232	8000	-4724	-7232	-5256	-2102
Tax and Spend	0.032	75187	56918	532	25000	23056	15137	8000	-4787	-7137	-5319	-1944
More money supply	0.0084	66872	51949	508	20000	20262	13474	8000	-5339	-5474	-5847	262
More Sensetive Asset demand	0.0126	66977	52015	513	20000	20293	13495	8000	-5332	-5495	-5844	293
More investment	0.0258	67777	52519	1026	20000	20533	13655	8000	-5276	-5655	-6301	533
More Exports	0.028	70405	54175	528	20000	21321	14181	10000	-5092	-4181	-5620	1321
Low MPC	0.0102	48985	30454	510	20000	14896	9897	8000	3636	-1897	3126	-5104
High MPM	0.0168	56928	45685	517	20000	17278	17178	8000	-6035	-9178	-6552	-2722

Aggregate Demand Analysis

beta0	beta1	mu0	m0	t0	t1	m1	mu1
10000	0.9	500	100	200	0.3	0.2	-1E+05
G	X	y0	b0	b1	phi	b2	M4
20000	8000	500	800	0.25	0.6	300000	10000

Solutions to the Aggregate Demand Model

P	R	Y	C	I	G	T	M	X	S	X-M	S-I	T-G	balance
1	0.0400297	84836	63266	-3503	20000	25651	17067	8000	-4082	-9067	-579	5651	5072
2	0.0538425	81411	61109	-4884	20000	24623	16382	8000	-4321	-8382	563	4623	5186
3	0.0584467	80269	60390	-5345	20000	24281	16154	8000	-4401	-8154	944	4281	5224
5	0.0621301	79356	59814	-5713	20000	24007	15971	8000	-4465	-7971	1248	4007	5255
10	0.0648927	78671	59383	-5989	20000	23801	15834	8000	-4513	-7834	1476	3801	5278

Long run…

On this matter, we have to leave the Keynesian way of thinking and rely on Classical economic theory

This theory predicts that, in the long run, the economy stays on the natural level of output Y_n, independently on what the aggregate demand is

This means that any difference between aggregate demand and the natural level of aggregate supply will be matched by price variations

Y_n is defined as the level of output where prices have no tendency to adjust, and reflects the potentials of the supply side of the economy

According to this theory, if output is above Y_n then prices will increase, and if output is below Y_n prices will decrease

This means that any economic policy that tries to to boost output permanently above Y_n will run into inflationary pressures that will cause a disequilibrium on the money market, increase interest rate and discourage investment, taking Y back to Y_n

The mechanism works through a variation in the real money supply

Consider a fiscal expansion that attempts to increase equilibrium output by shifting the IS curve to the right

We have seen that the increase in output will put upward pressure on the interest rate
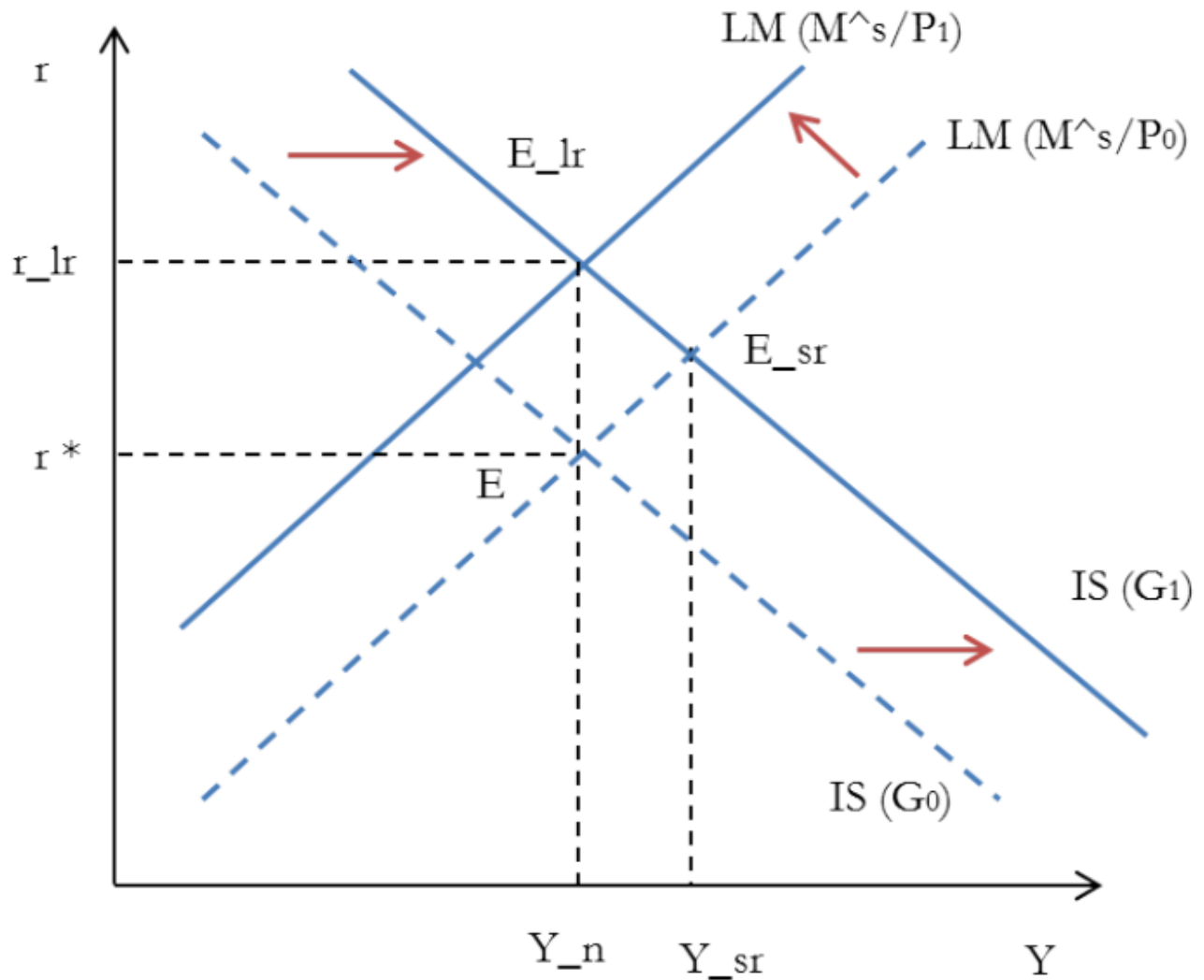
If we start from a situation where output is equal to its natural level, the fiscal policy will take the economy above its natural level, causing inflationary pressures
This will reduce the real money supply, shifting the LM curve up, increasing equilibrium interest rate and reducing output

The long run effect is only on prices, as output gets back to his original level

Consider a monetary expansion that attempts to increase equilibrium output by shifting the LM curve to the right

We have seen that the increase money supply will put downward pressure on the interest rate and increase output

If we start from a situation where output is equal to its natural level, the monetary policy will take the economy above its natural level,

This will reduce the real money supply, shifting the LM curve up, increasing equilibrium interest rate and reducing output, until the LM curve reaches its starting position

The long run effect is only on prices, as output gets back to his original level

Monetary expansion LR

LM (M^{s0}/P_0)
LM (M^{s1}/P_1)

LM (M^{s1}/P_0)

E

E sr

r *

r * sr

IS

Y_n Y_sr Y

r

Y
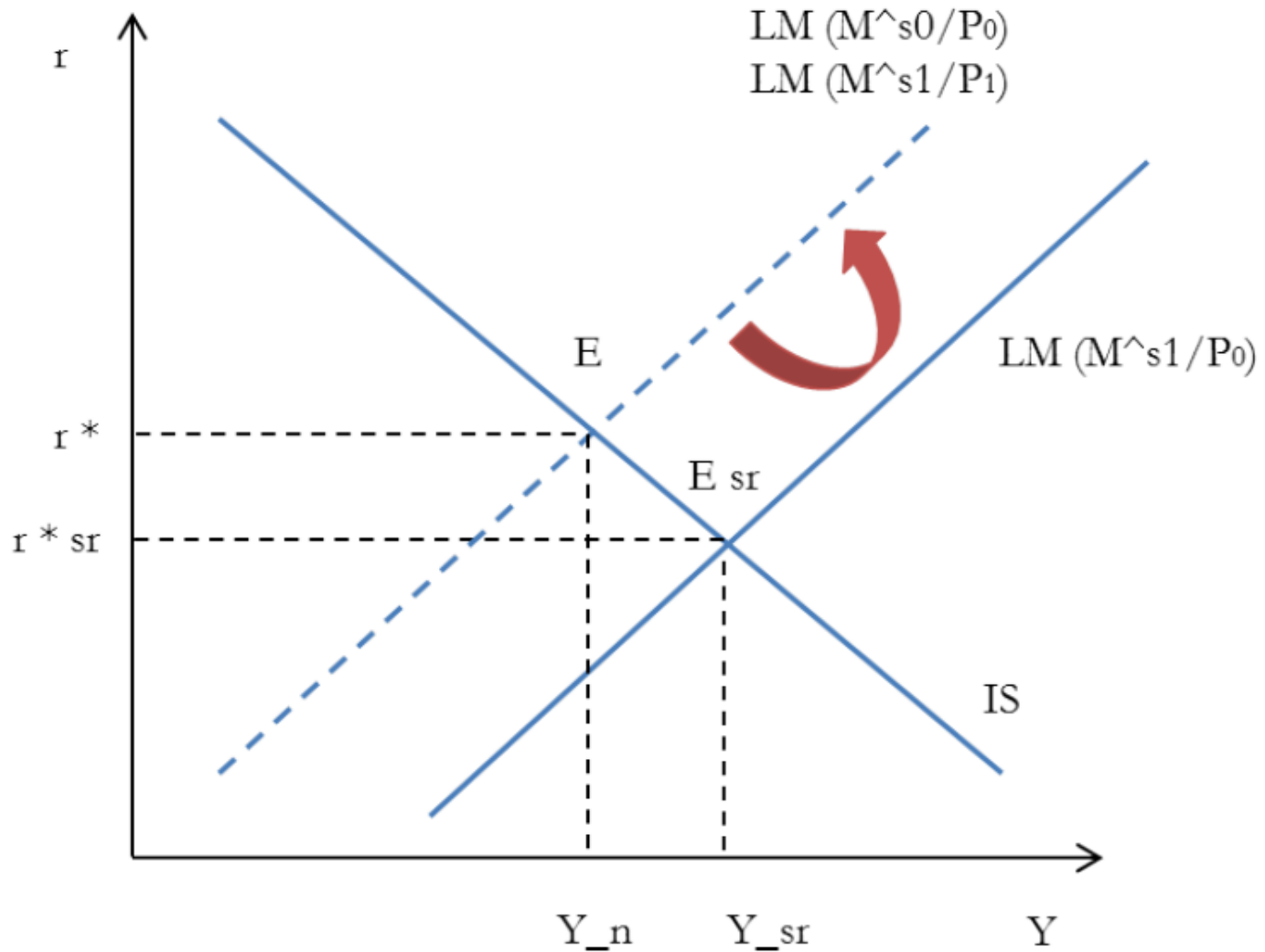
The only useful economic policy in the long run is the one targeted at increasing the natural level of output (reforms on the labor market, free trade areas, pension reforms,…)

Monetary and fiscal policies can affect output in the short run, not in the long run

But on the other hand, as Keynes said: in the long run we are all dead…

Bring me a one-handed economist…

Thank you and have a nice day

Some curriculum readings…

1. Blanchard and Johnson Macroeconomics
2. Mankiw Macroeconomics