

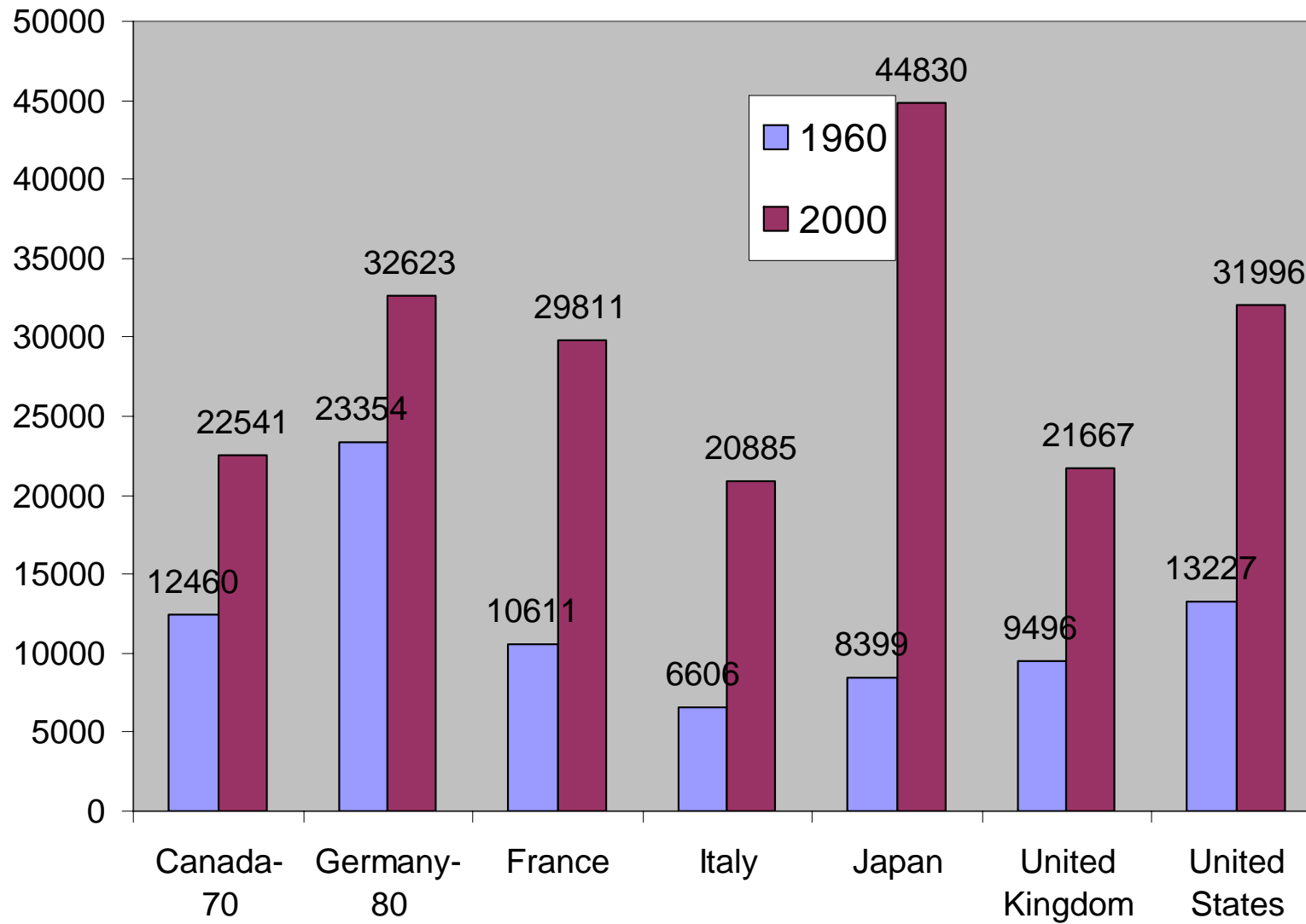
Macroeconomic Theory and Policy

Lecture 9 Growth Facts

Study of Growth Facts from a Cross Section of Countries

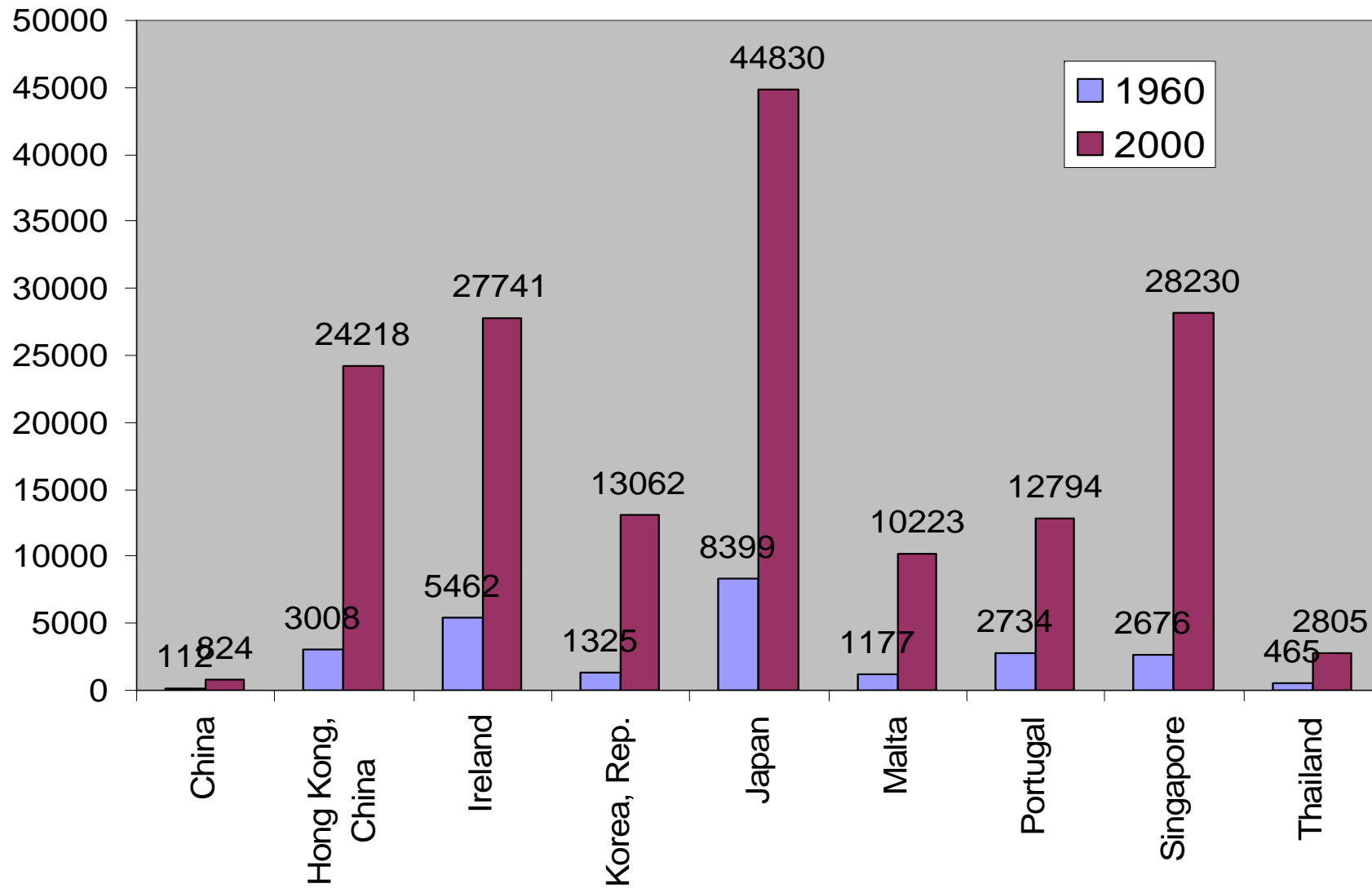
- Growth of Per Capita GDP in G7 Countries from 1960-2000
- Change in the Level of Income in G7 countries from 1960 to 2000
- Growth Miracles
- Growth Disasters
- UK in EU
- Exercises on how long does it take to catch up or bridge the gap in income levels

Increase in Per Capita Income in G7 Countries 1960-2000



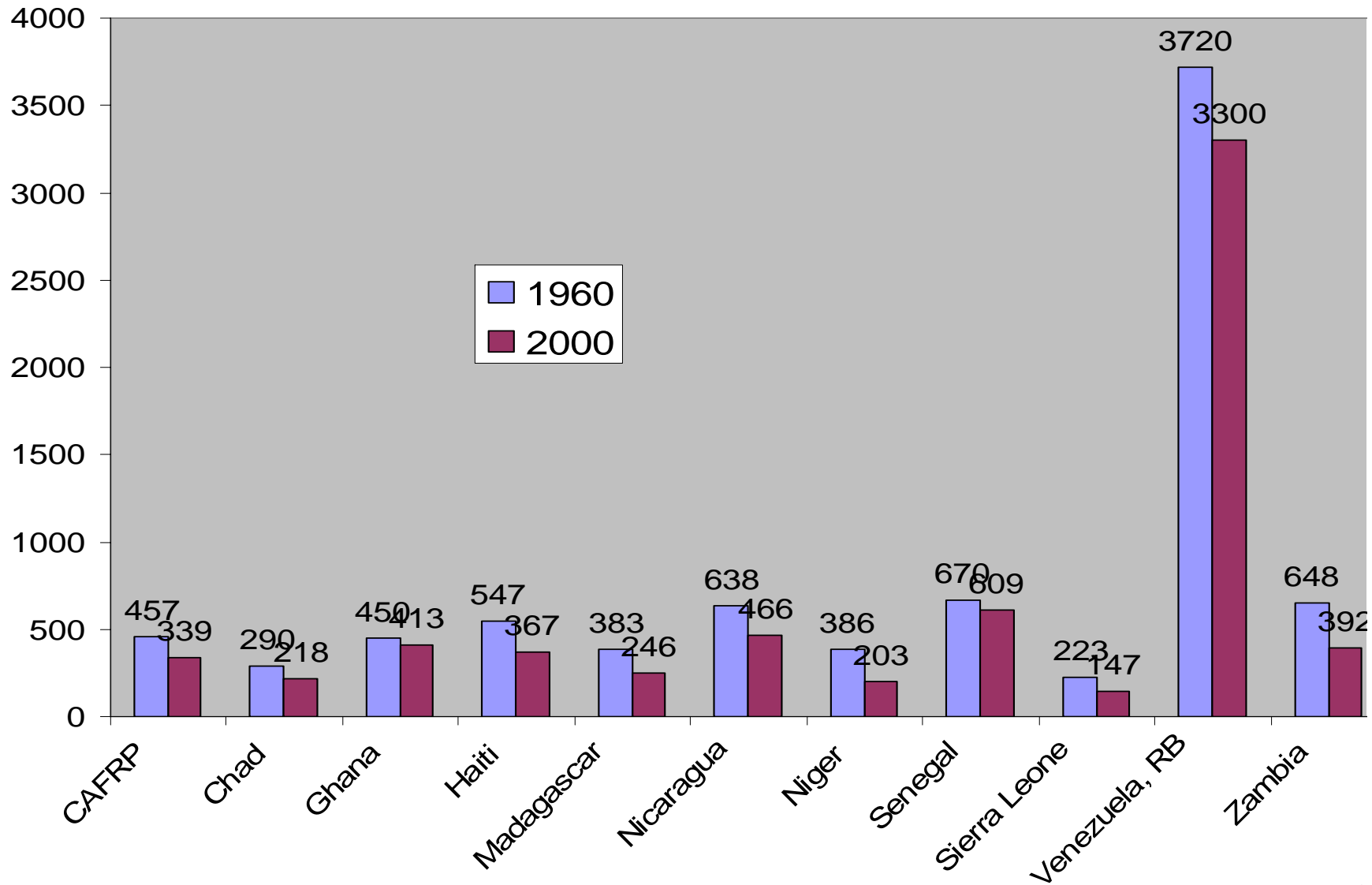
- Source: World Bank-CD at Hull University Network.

Increase in Per Capita Income in 40 Years 1960-2000



- Source: World Bank-CD at Hull University Network.

Decline in Per Capita Income in 40 Years 1960-2000



- Source: World Bank-CD at Hull University Network.

Growth Accounting

$$Y = AK^\alpha L^{1-\alpha}$$

$$\frac{\Delta y}{y} = g_y = g_a + \alpha g_k + (1-\alpha)g_L$$

g_y = growth rate of output ;

g_a = growth rate of technology or total multifactor productivity

g_k = growth rate of capital input;

g_L = growth rate of labour input;

If $\alpha = 0.3$ and $g_k = 3\%$ $g_L = 1\%$ and $g_a = 2\%$, what is g_y ?

Why Growth Rates Differ Across Countries?

Because of differences in

- Capital Stock (Buildings, Transportation and Communication Networks, Machines)
- Labour input (Health and education of working populations, their productive skills, knowledge)
- Technology (knowledge on how to combine inputs in production; formula, design, software and management)
- Economic Policy
- Natural resources?

Kaldors' Stylized Facts of Economic Growth-1960

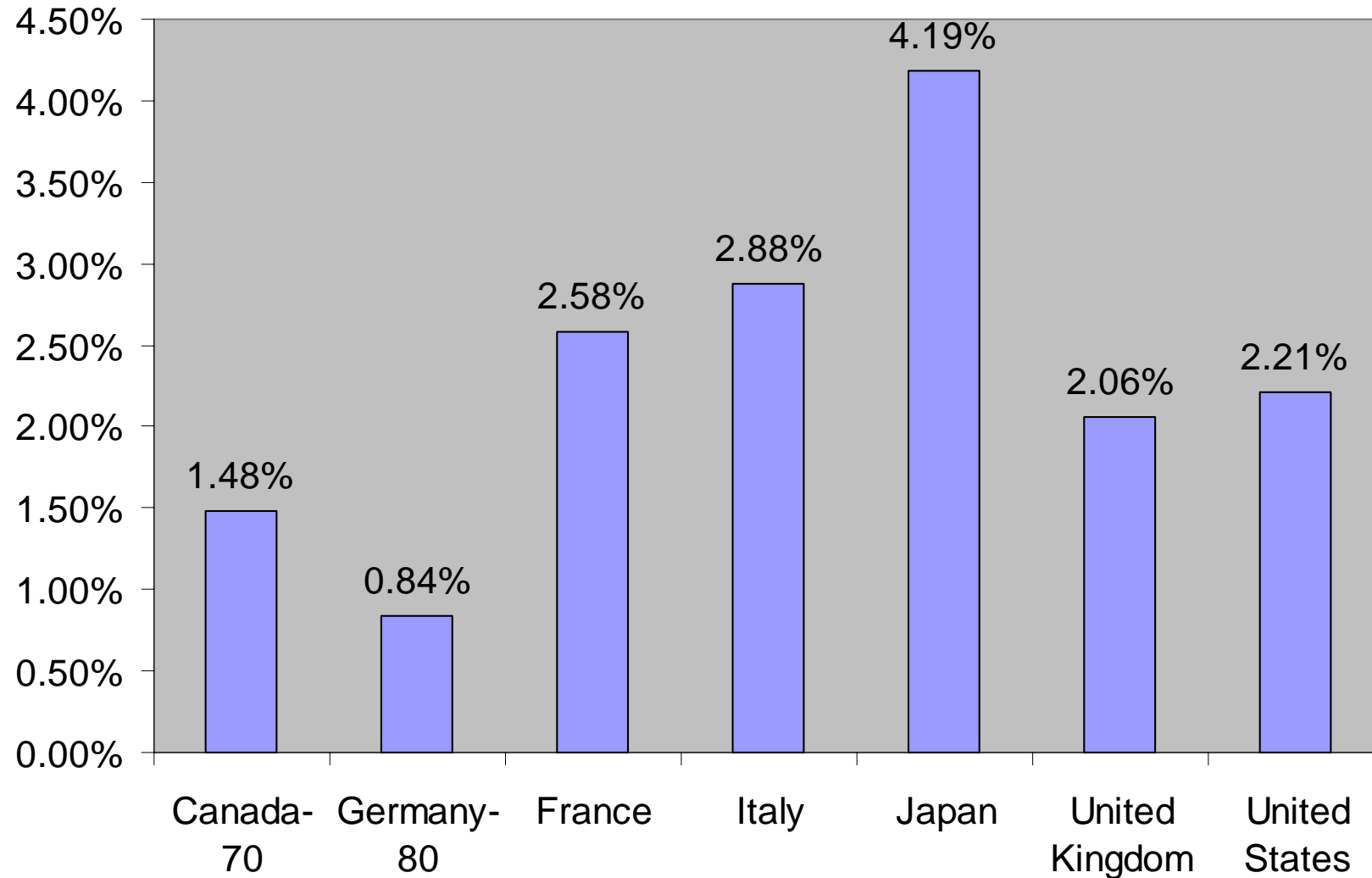
1. Labour input grows more slowly than capital and output, therefore capital labour ratio (K/L) and per capital output (Y/L) have increased secularly.
2. Capital output ratio (K/Y) has remained fairly constant, has no discernible trend. These have more or less converged across industrialised economies.
3. Rate of return on capital (profit) and the real interest rate (r) have no trend whereas real wages follow a secular rising trend. Secular rise in (Y/L) and (K/L) are translated into higher real wages.
4. Share of income devoted to the capital (rK/Y) and labour (wL/Y) shows no trend and remain fairly constant.
5. Capital stock per person tends to grow along with output per person.

Characteristics of Modern Economic Growth

1. There is enormous variation in per capita income across countries. The poorest countries have per capita income less than 5 percent of per capital incomes in the richest countries.
2. Rates of economic growth vary substantially across countries.
3. Growth rates are not necessarily constant over time.
4. A country's relative position in the world distribution of per capita incomes is not immutable. Countries can move from being "poor" to being "rich" and vice-versa.
5. Growth in output and growth in the volume of international trade are closely related.
6. Both skilled and unskilled workers tend to migrate from poor to rich countries or regions.

Per Capita Income (\$)

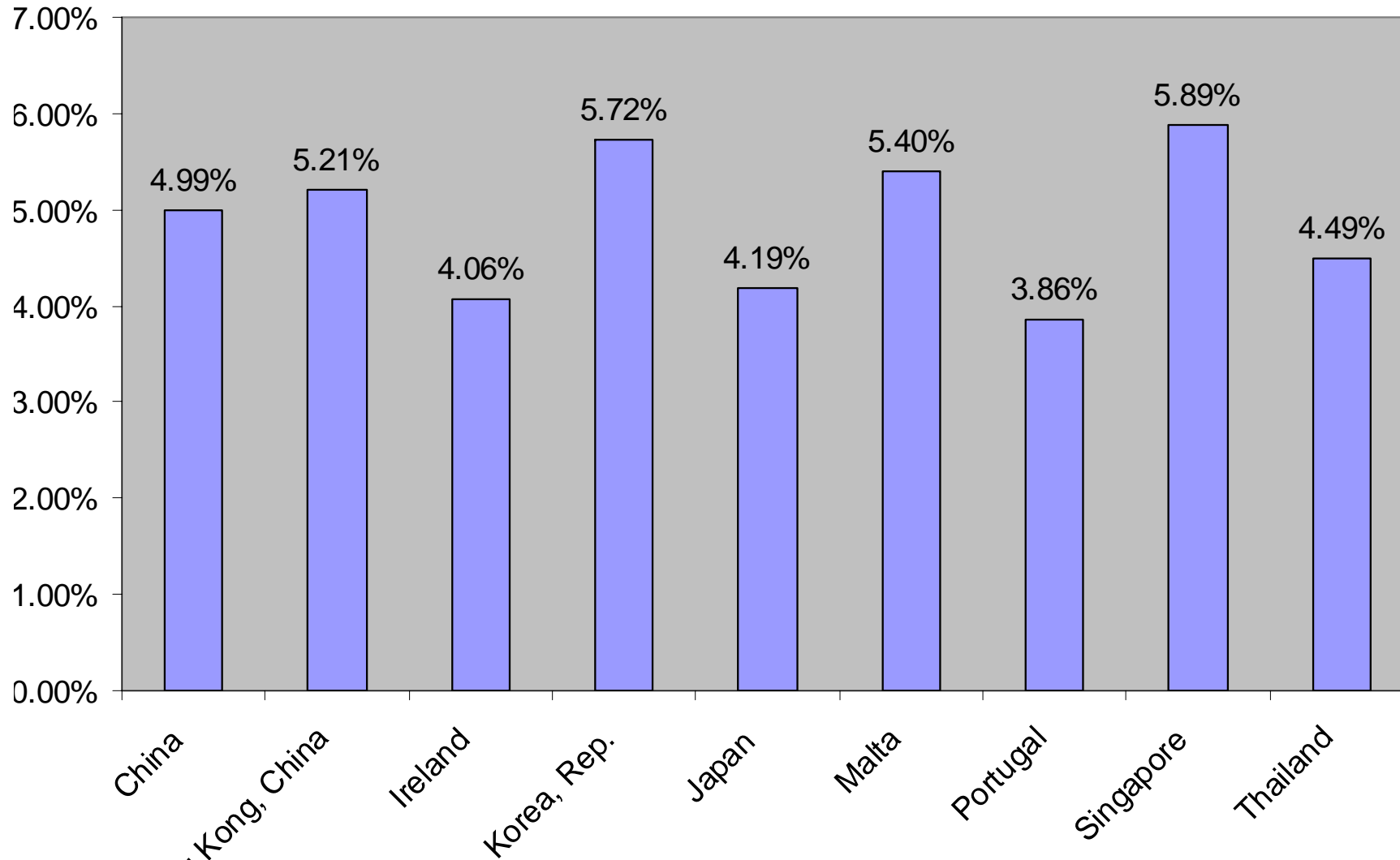
Average Growth Rates in G7 Countries 1960-2000 (DWI)



- Source: World Bank-CD at Hull University Network.

Per Capita Income (\$)

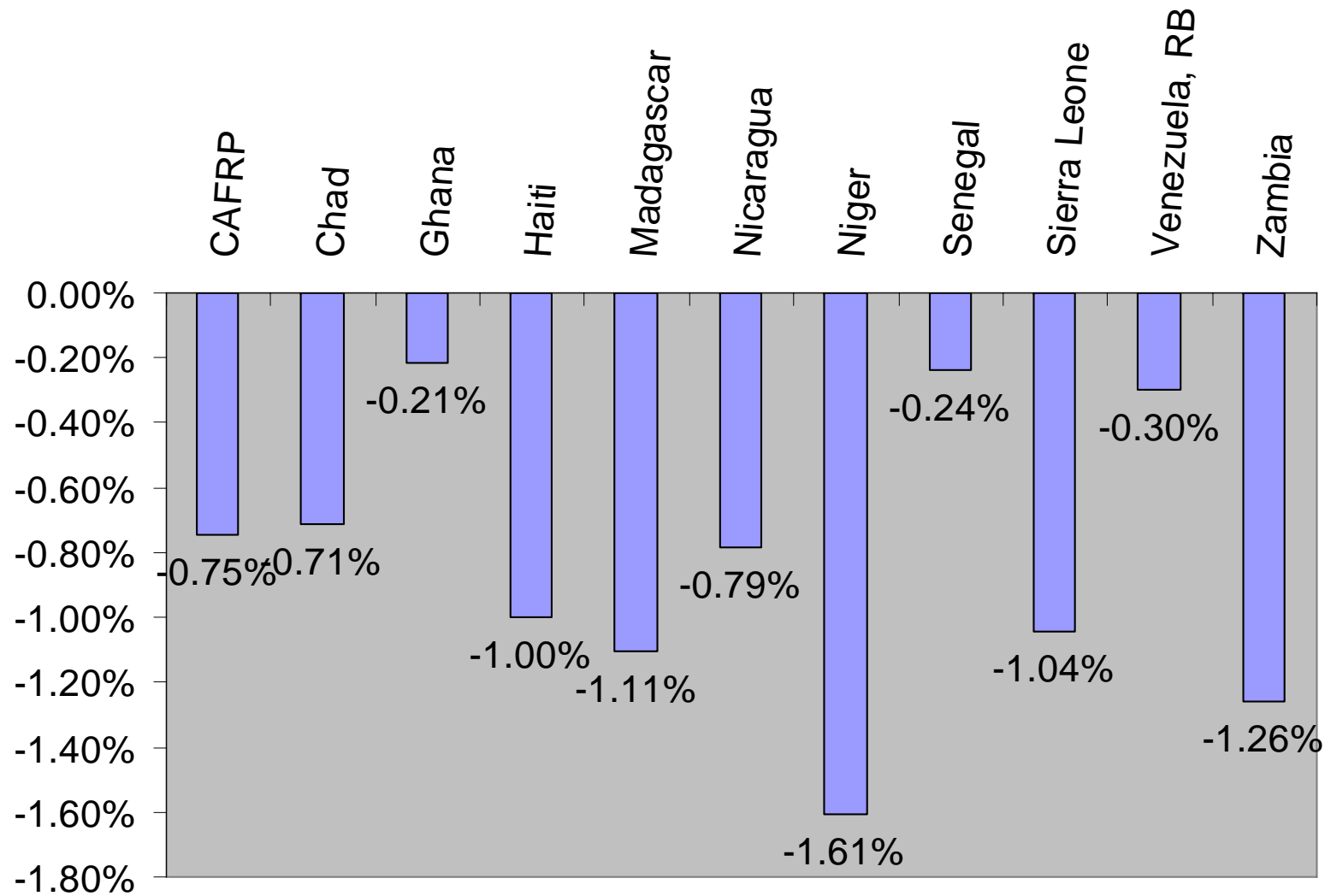
Growth Miracles, Average Annual Growth Rate 1960-2000



• Source: World Bank-CD at Hull University Network.

Per Capita Income (\$)

Growth Disasters, Average Annual Growth Rate 1960-2000



- Source: World Bank-CD at Hull University Network.

Reasons for Growth Miracle

- Higher saving and investment rates
- Higher rate of technology adoption
- Better economic policy: close co-operation between the public and the private sector
- Realistic Trade and exchange rate policies
- Control of population growth rate

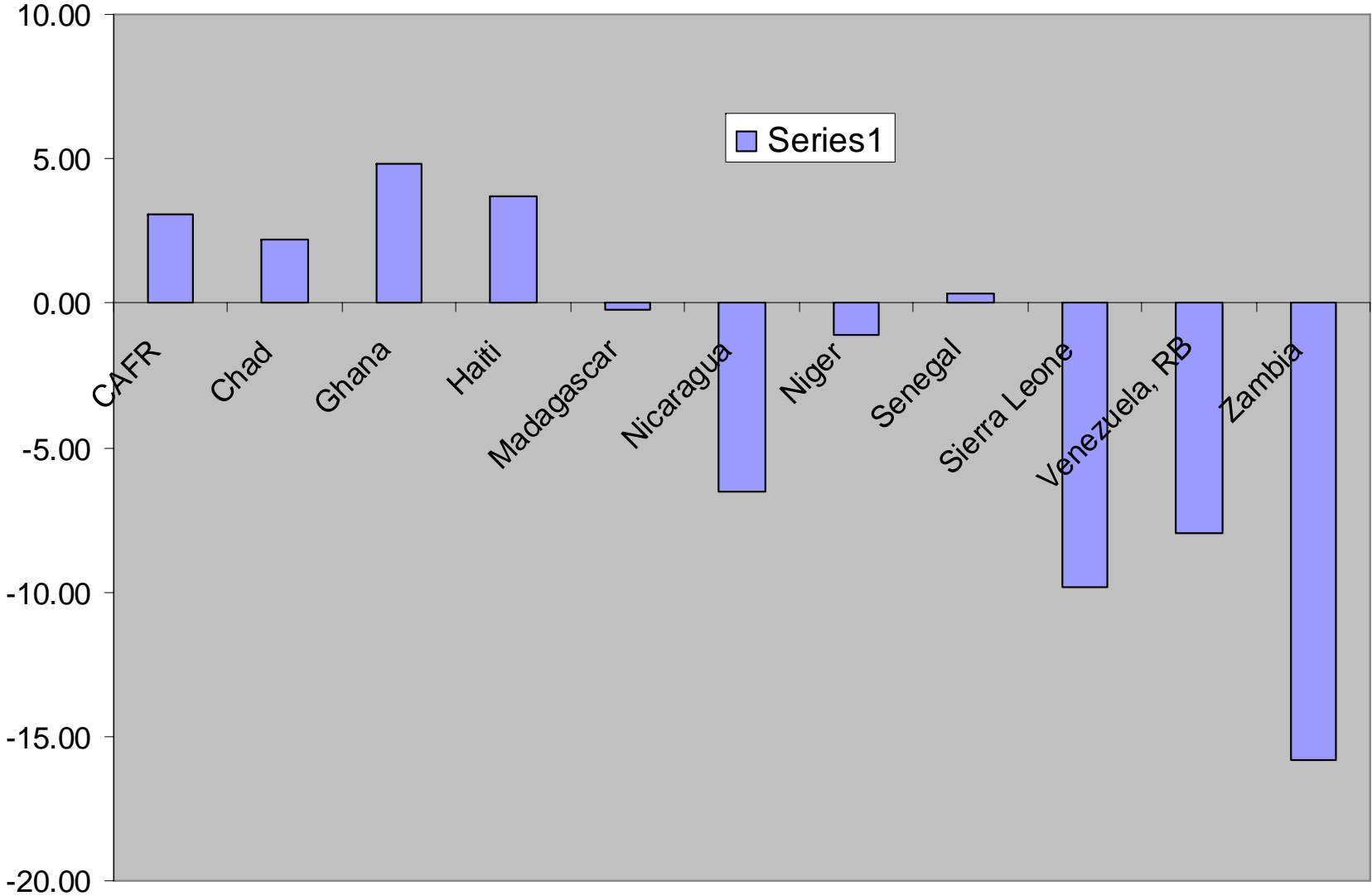
Macroeconomic Characteristics of Super Growing Economies Annual Averages from 1980-2000

	Growth F	S/Y	I/Y	(X+M)/Y	Inflation r	Real Intrt	REX95=1	Tax/Y	Gov/Y	popg
China	8.15	18.40	36.88	31.44	10.14	2.33	107.63	4.78	18.40	0.95
Hong Ko	4.22	23.01	28.84	245.16	9.95	4.61	..		23.01	1.99
Ireland	4.71	16.77	20.31	120.58	8.49	4.22	91.17	32.40	16.77	1.06
Korea, R	5.81	24.47	32.24	67.78	10.97	3.71	..	15.66	24.47	0.26
Japan	2.33	20.43	29.50	20.77	1.17	3.85	95.56	13.16	20.43	0.78
Malta	4.11	23.47	28.40	178.94	3.30	4.85	105.71	26.30	23.47	
Portugal	2.85	14.03	26.79	67.30	36.77	5.30	96.40	27.74	14.03	0.2
Singapor	5.02	33.56	38.58	360.17	2.34	4.96	95.47	16.50	33.56	2.9
Thailand	4.74	21.07	32.30	73.40	6.03	8.49	..	15.02	21.07	1.34

Reasons for Growth Disasters

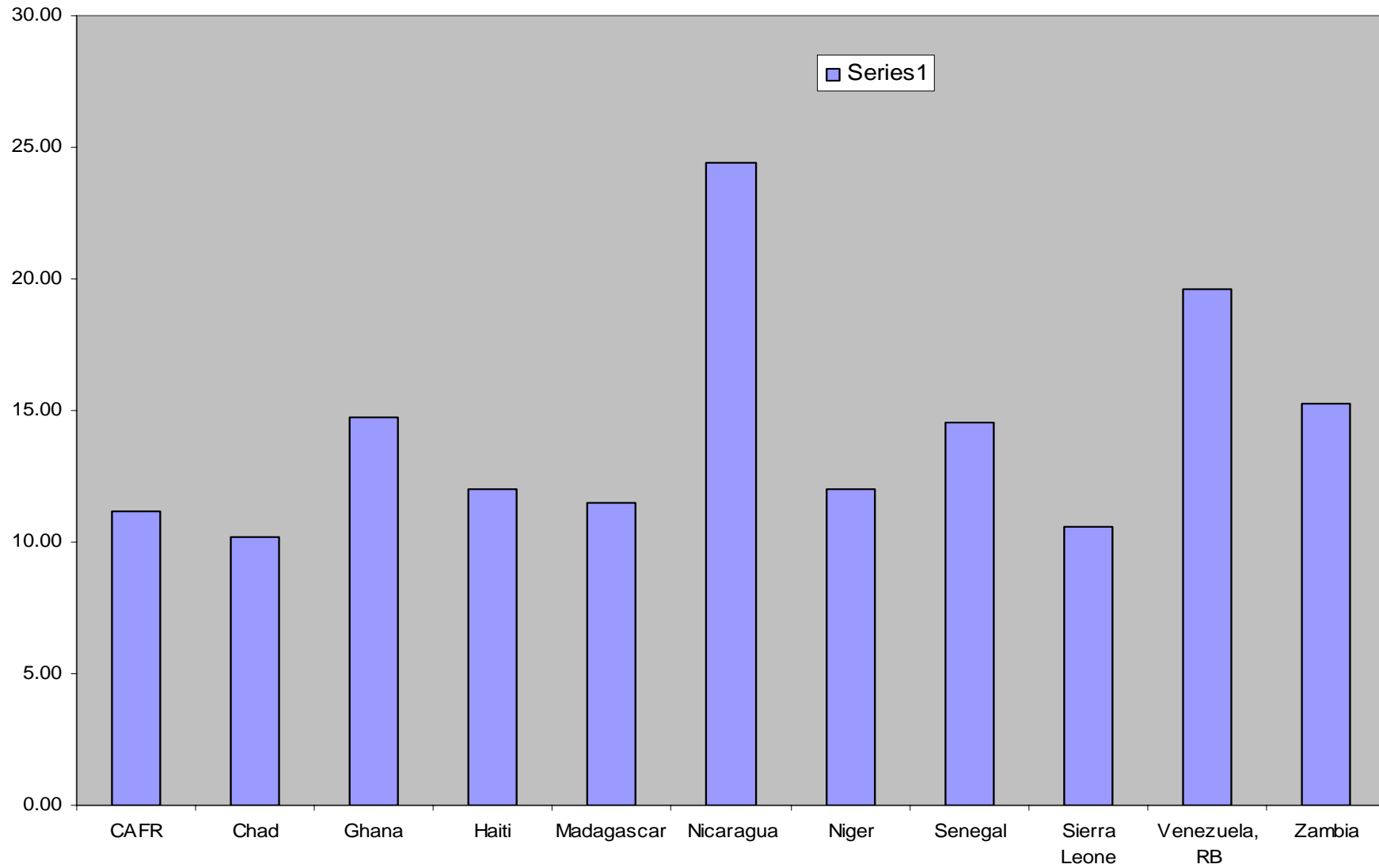
- Low Saving and Investment Rates
- Higher level of inflation and economic uncertainty
- Negative real interest rates
- High population growth rates
- Low exports and more imports and trade and balance of payment imbalance
- Weak Governments

Average Saving Rate in Growth Disaster Countries (1980-2000)



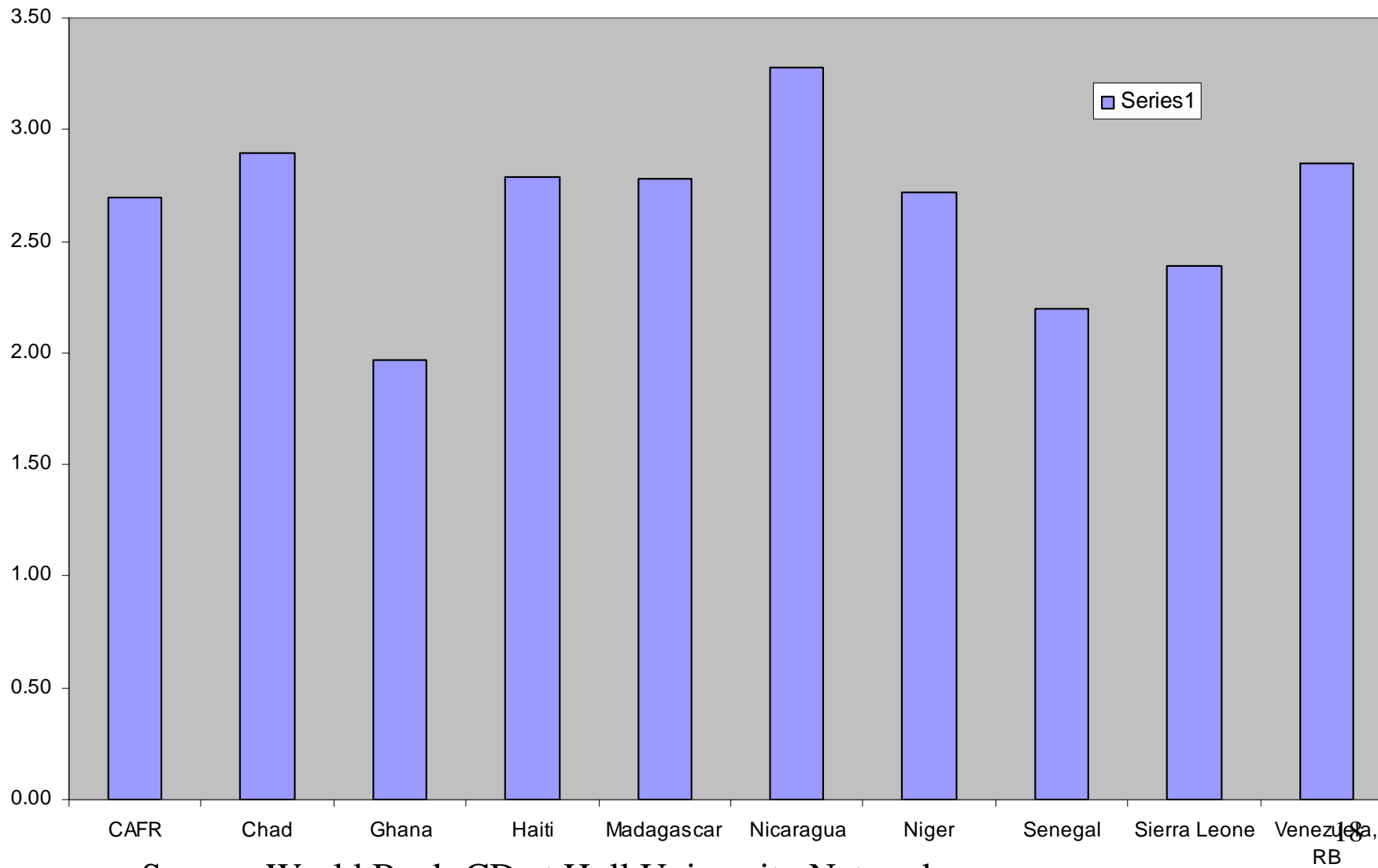
- Source: World Bank-CD at Hull University Network.

Average Ratio of Investment to GDP in Growth Disaster Countries 1980-2000



- Source: World Bank-CD at Hull University Network.

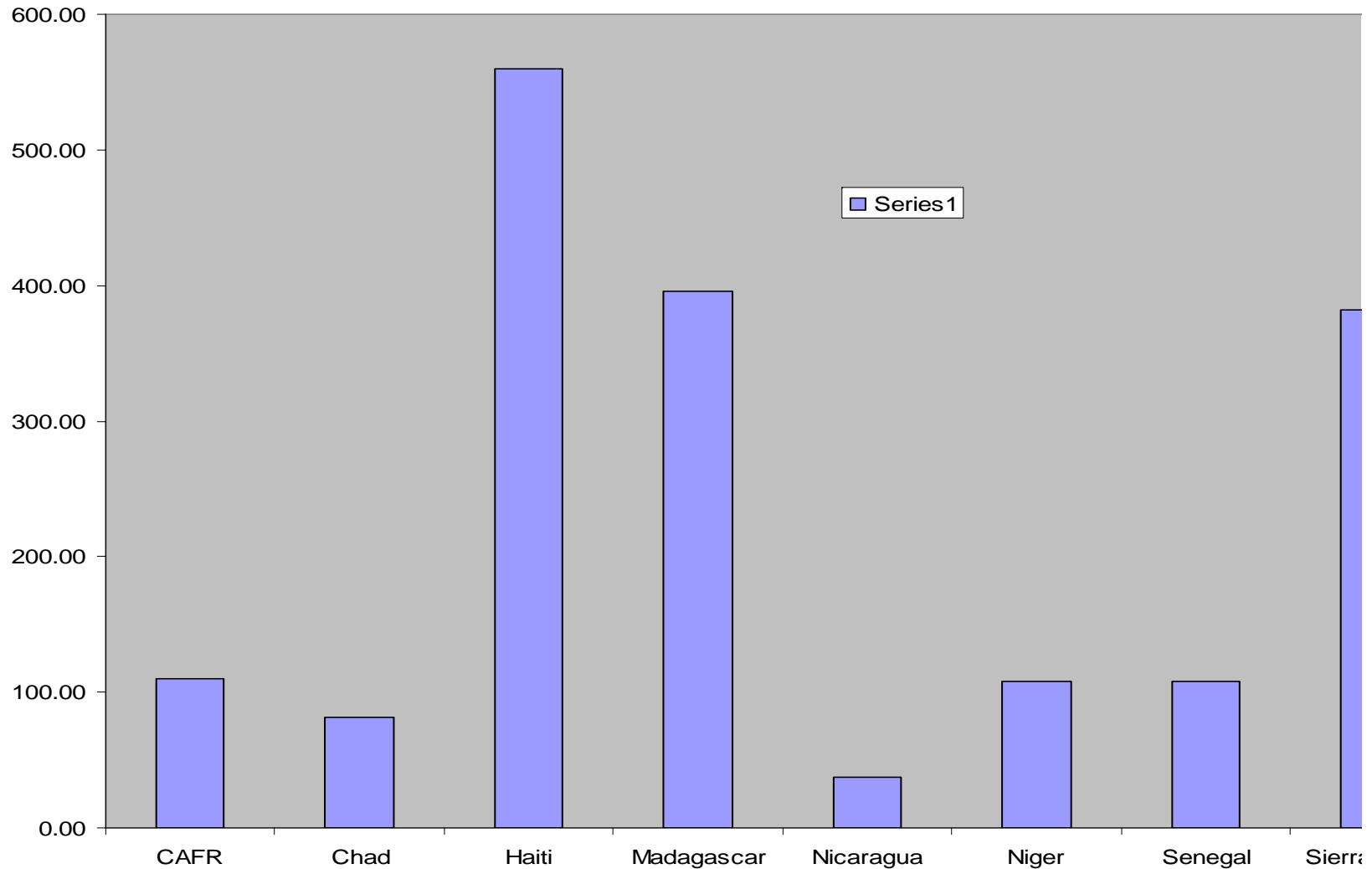
Population Growth Rates in Growth Disaster Countries 1980-2000



• Source: World Bank-CD at Hull University Network.

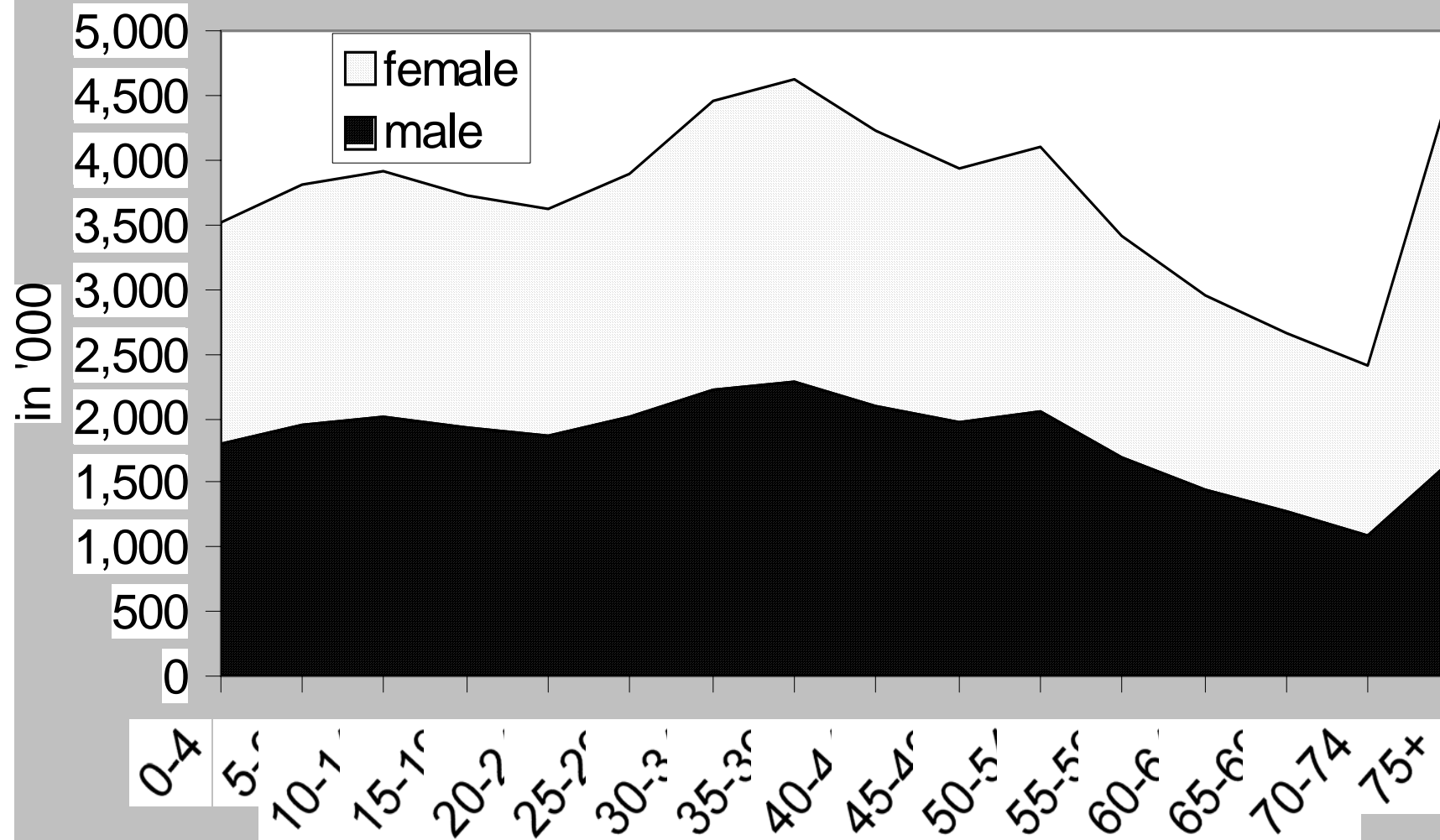
Average Annual Inflation Rate

Inflation Rates in Growth Disaster Countries 1980-2000



- Source: World Bank-CD at Hull University Network.

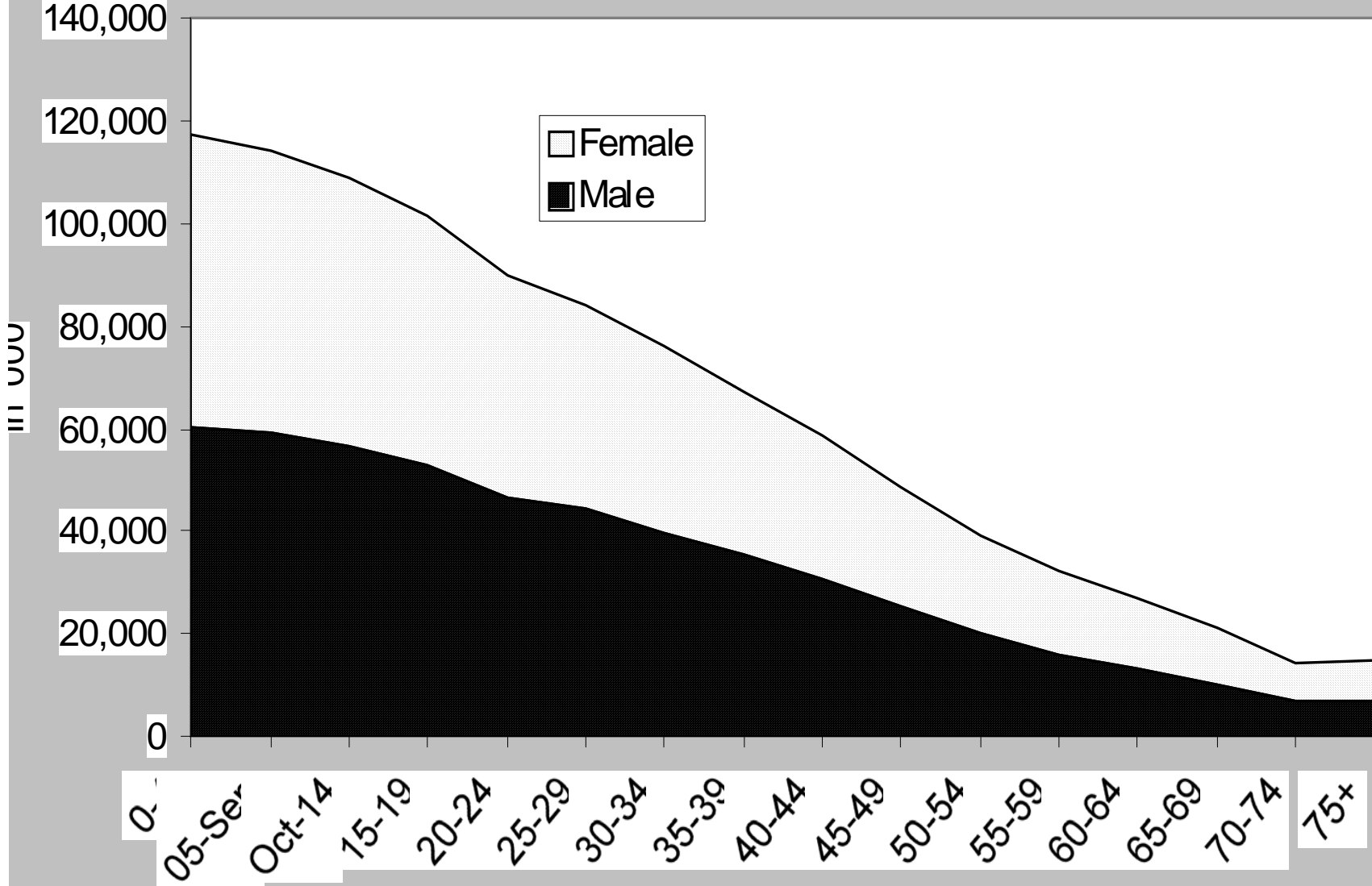
Population by Age and Gender in the UK in 2000 How Does it Affect Saving and Investment?



- Source: World Bank-CD at Hull University Network.

Population by age and Gender in India in 2000

What is the prospect of Saving and Investment?



• Source: World Bank-CD at Hull University Network.

Growth Rate Calculations

Discrete measure (good approximation for small interval of time):

Growth rate
$$g = \frac{(Y_t - Y_{t-1})}{Y_{t-1}} \times 100$$

Level of income in year t:
$$Y_t = Y_0 (1 + g)^t$$

Continuous measure (right for all time):

Level of Income:
$$Y_t = Y_0 (\exp)gt$$

Growth Rate
$$g = 100 * \frac{(\ln Y_t - \ln Y_0)}{t}$$

	1960 Y (\$)	2000 Y (\$)	Discrete	Continuous
United Kingdom	9496	21667	3.20%	2.06%
United States	13227	31996	3.55%	2.21%

Time Taken to Multiply the Initial Income and to Bridge the Income Gap

a. Initial income is:

$$y_0$$

b. Income in year t

$$y_t = y_0 e^{gt}$$

c. Double of the initial income

$$y_t = y_0 e^{gt} = 2y_0 \rightarrow$$

$$e^{gt} = 2$$

d. n-times of the original income

$$y_t = y_0 e^{gt} = ny_0 \rightarrow$$

$$e^{gt} = n$$

Take logs both sides of in (c) or (d)

$$\ln 2 = gt \quad \text{or} \quad \ln n = gt$$

$$t = \frac{\ln 2}{g} = ? \quad \text{Or} \quad t = \frac{\ln n}{g} = ?$$

Time Taken to Bridge the Income GAP

$$Y_{02}^{UK} = 23550; Y_{02}^{India} = 2340$$

Growth rate of Per Capita Income

$$\text{India } g^{India} = 3.81\%$$

$$\text{UK } g^{UK} = 1.83\%$$

Ratio of UK to Indian Income in 2002

$$\frac{Y_0^{UK}}{Y_0^{India}} = (23550/2340) = 10.06$$

Equalisation of Income in year t

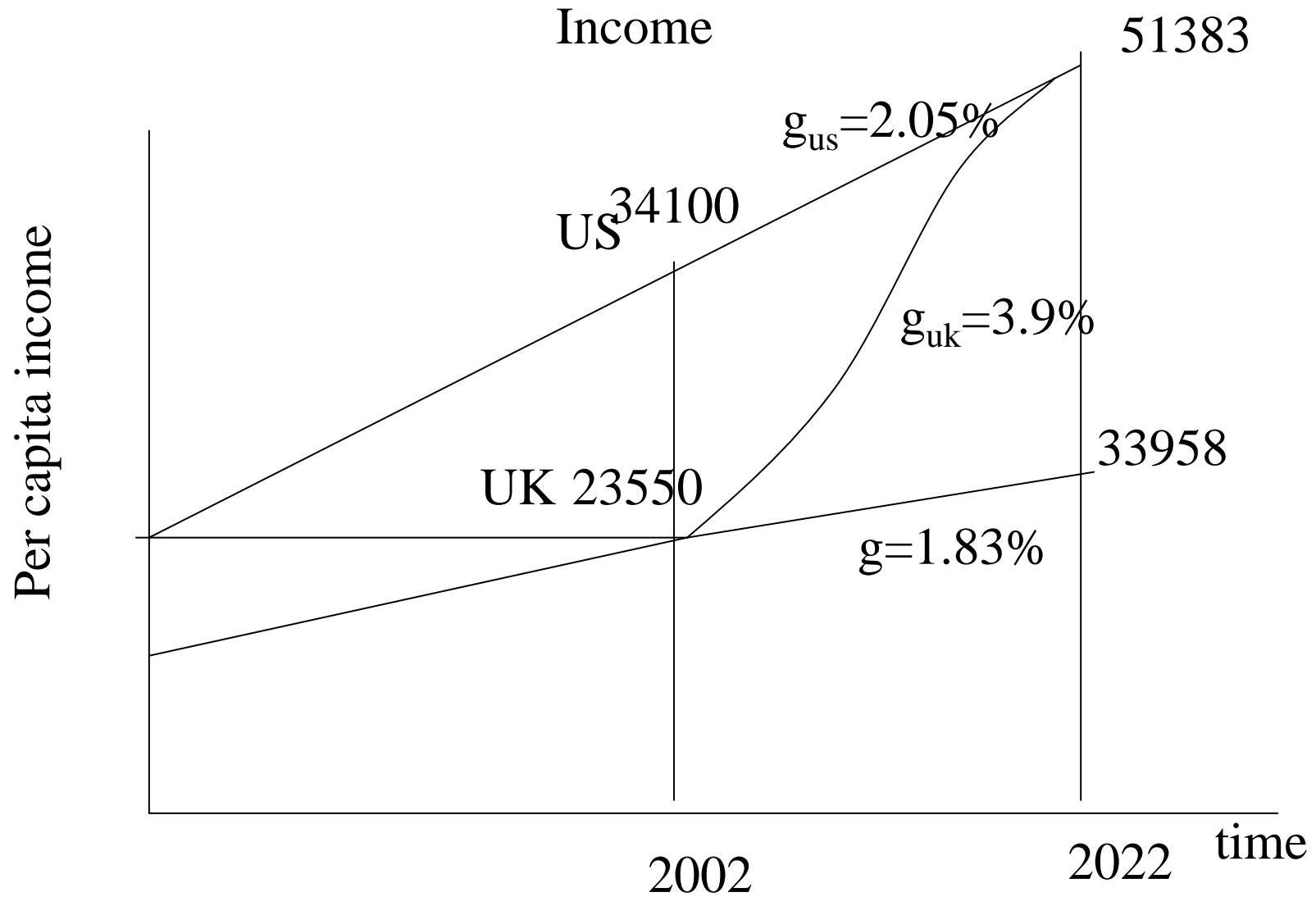
$$Y_0^{UK} e^{g^{UK}t} = 10.06 * Y_0^{India} e^{g^{UK}t} = Y_0^{India} e^{g^{India}t}$$

Take logs both side and solve for t

$$t = \frac{\ln(10.06)}{(g^{India} - g^{UK})} = \frac{2.31}{(0.0381 - 0.0183)} = \frac{2.31}{0.0198} = 116.6$$

Years.

UK Needs Higher Growth Rate to Catch the US in Per Capita



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