Technology and Capital Formation in East Asia

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Rates of Growth of Inputs & Outputs of the East Asian Developing & the G-7 Countries

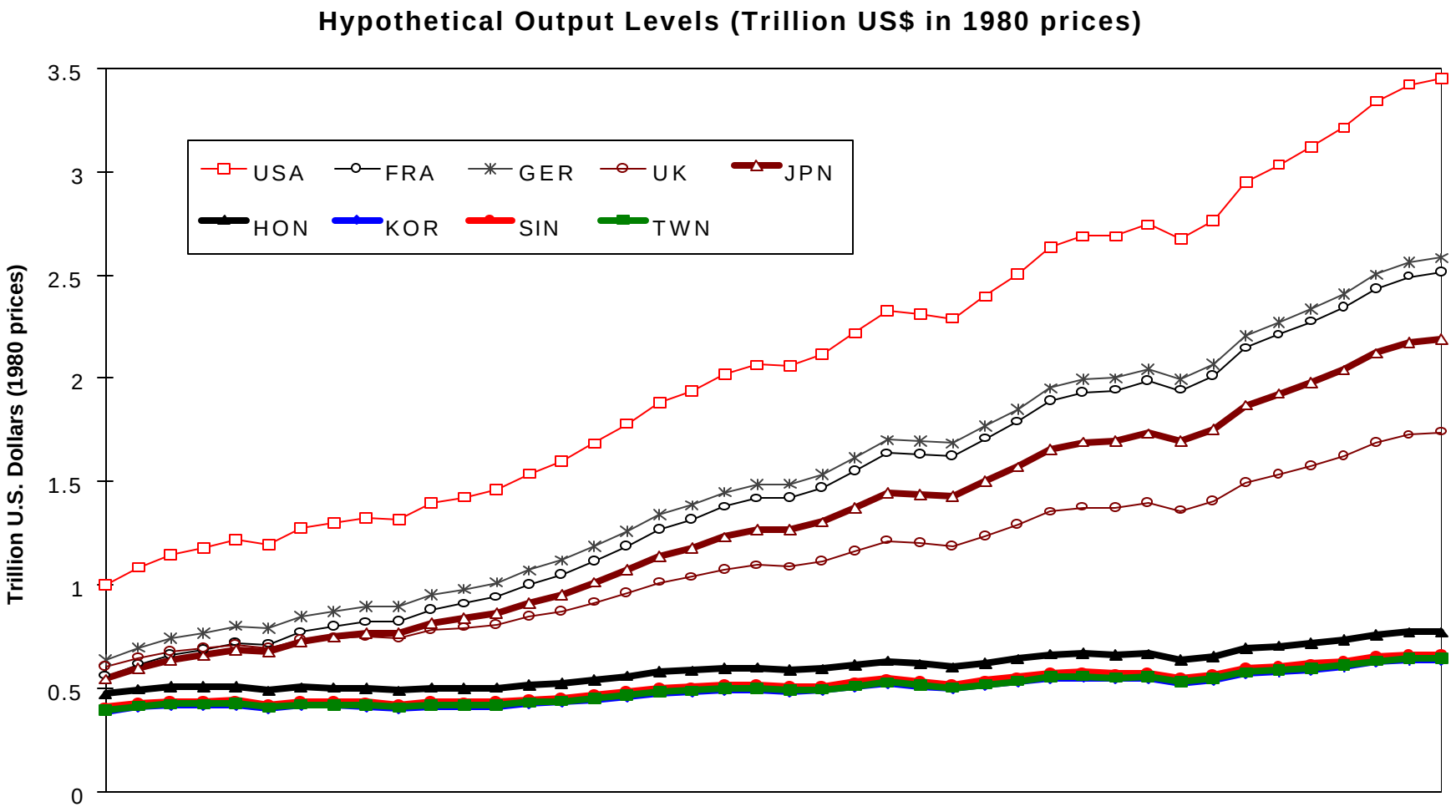
Table 3.1: Average Annual Rates of Growth of Real GDP, Capital, Labor and Human Capital (percent)
(Extended sample period)

Country	Period	GDP	Capital Stock	Utilized Capital	Employmen	Labor Hours	Human Capital	Average Human Capital
Hong Kong	66-95	7.4	8.8	8.6	2.6	2.4	4.8	2.1
S. Korea	60-95	8.5	12.3	12.3	3.1	3.3	6.2	4.0
Singapore	64-95	8.8	10.3	10.3	4.3	4.7	5.9	3.5
Taiwan	53-95	8.4	11.8	11.8	2.7	2.3	5.3	2.8
Indonesia	70-94	6.7	8.9	9.8	3.1	3.1	9.6	7.7
Malaysia	70-95	7.3	11.8	11.8	3.7	3.7	7.7	4.9
Philippines	66-95	4.0	5.8	5.9	3.2	3.2	10.8	8.5
Thailand	66-94	7.6	9.1	9.4	2.8	2.8	8.5	5.8
China	65-95	8.4	10.3	10.3	3.0	3.0	5.9	3.3
Japan	57-94	5.9	8.1	8.0	1.1	0.6	2.1	0.9
Canada	57-94	3.8	4.8	4.7	2.3	1.9	3.0	1.1
France	57-94	3.3	3.9	3.9	0.4	-0.2	2.0	1.1
W. Germany	57-94	3.2	3.3	3.1	0.1	-0.3	1.5	1.0
Italy	59-94	3.5	5.2	5.3	0.0	-0.3	1.8	1.3
UK	57-94	2.4	3.9	3.8	0.2	-0.1	1.2	0.8
US	49-94	3.1	3.0	3.3	1.7	1.3	2.1	0.8

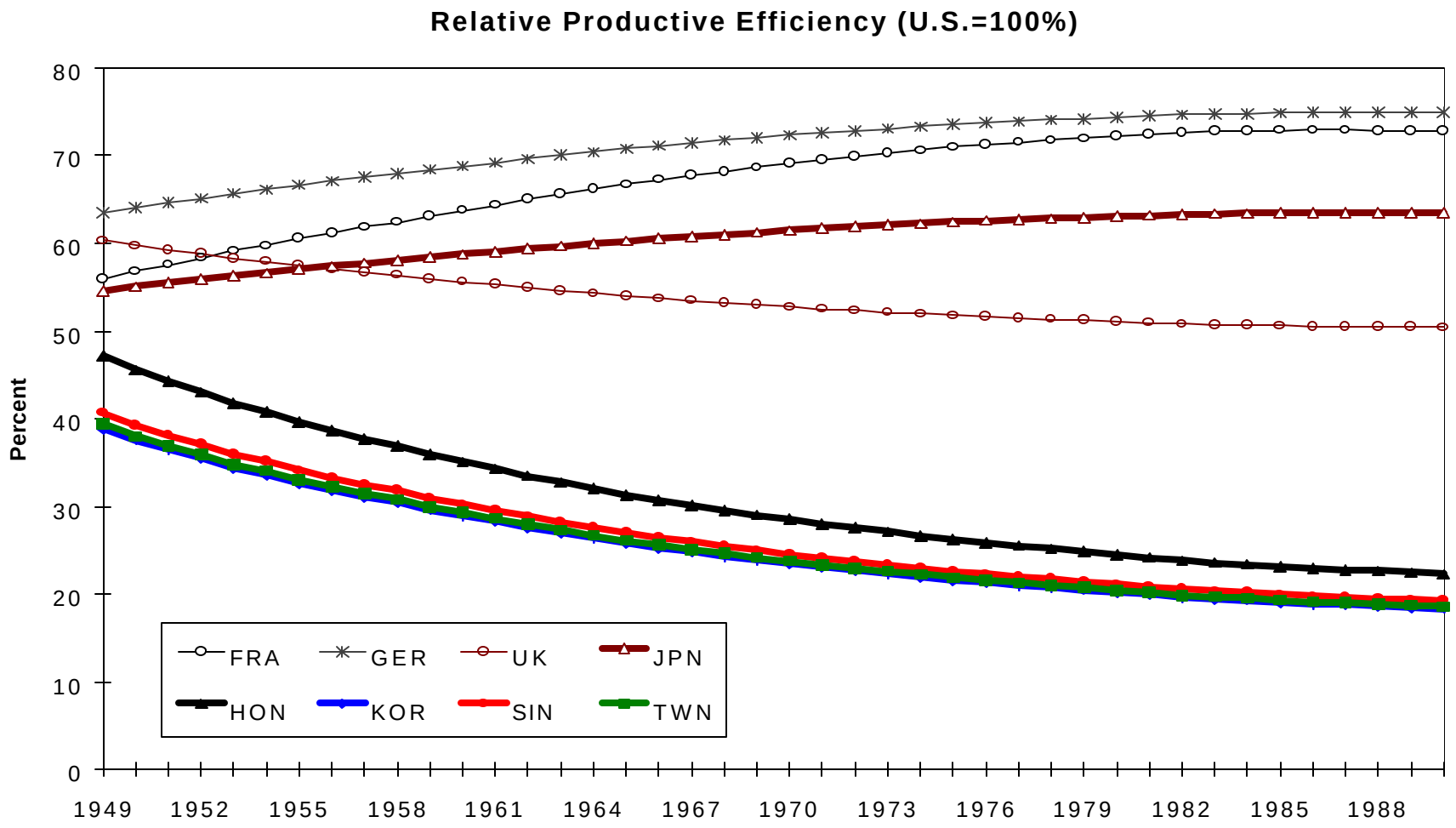
Accounts of Growth: Kim & Lau (1992, 1994a, 1994b)

Table 2.2: Relative Contributions of the Sources of				
	Economic Growth (percent)			
Economy	**Tangible Capital**	**Labor**	**Technical Progress**	
Hong Kong	**74**	**26**	**0**	
Singapore	**68**	**32**	**0**	
S. Korea	**80**	**20**	**0**	
Taiwan	**85**	**15**	**0**	
Japan	**56**	**5**	**39**	
Non-Asian G-5	**36**	**6**	**59**	

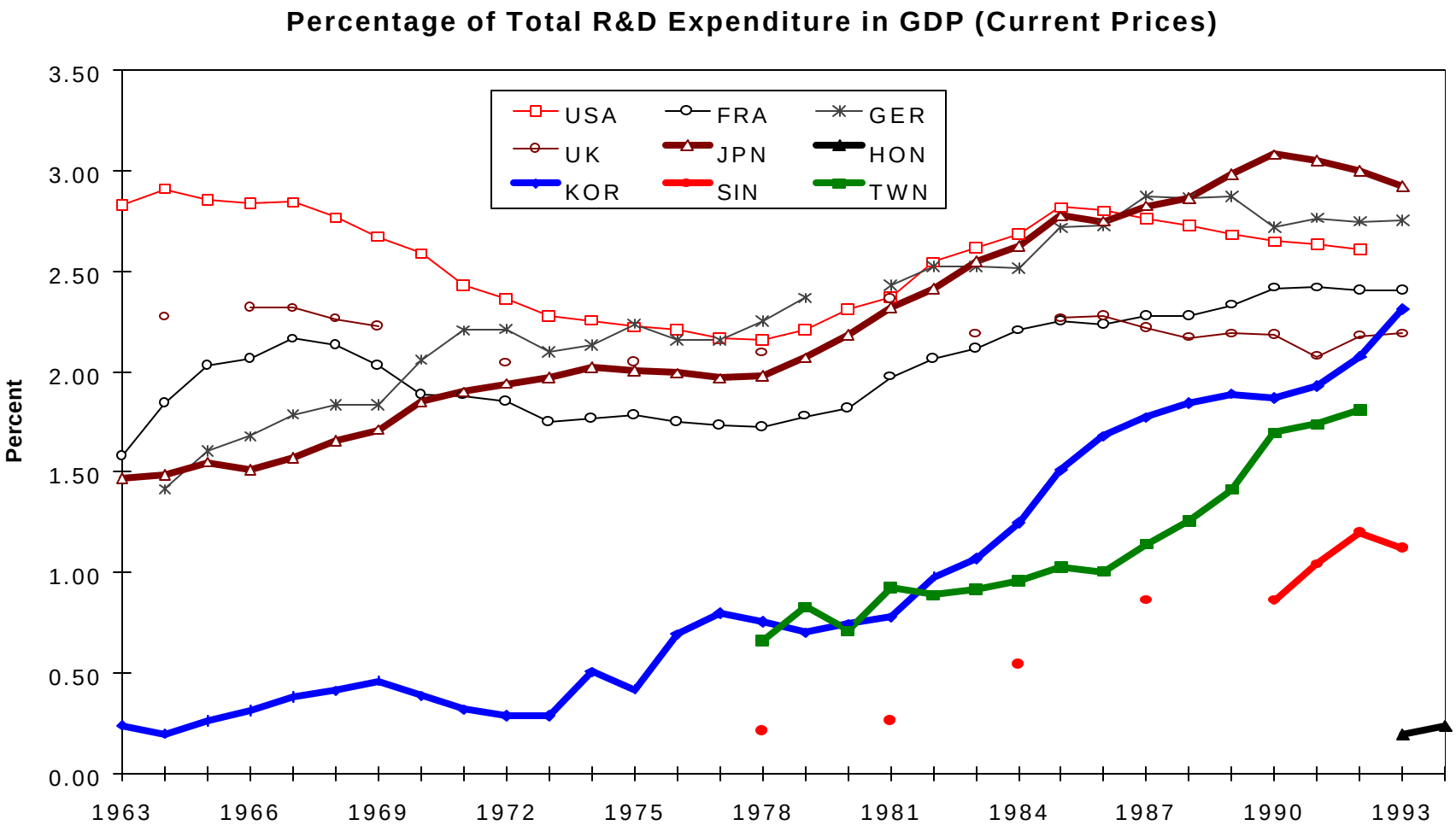
Hypothetical Output Levels



Relative Productive Efficiency (U.S.=100%)

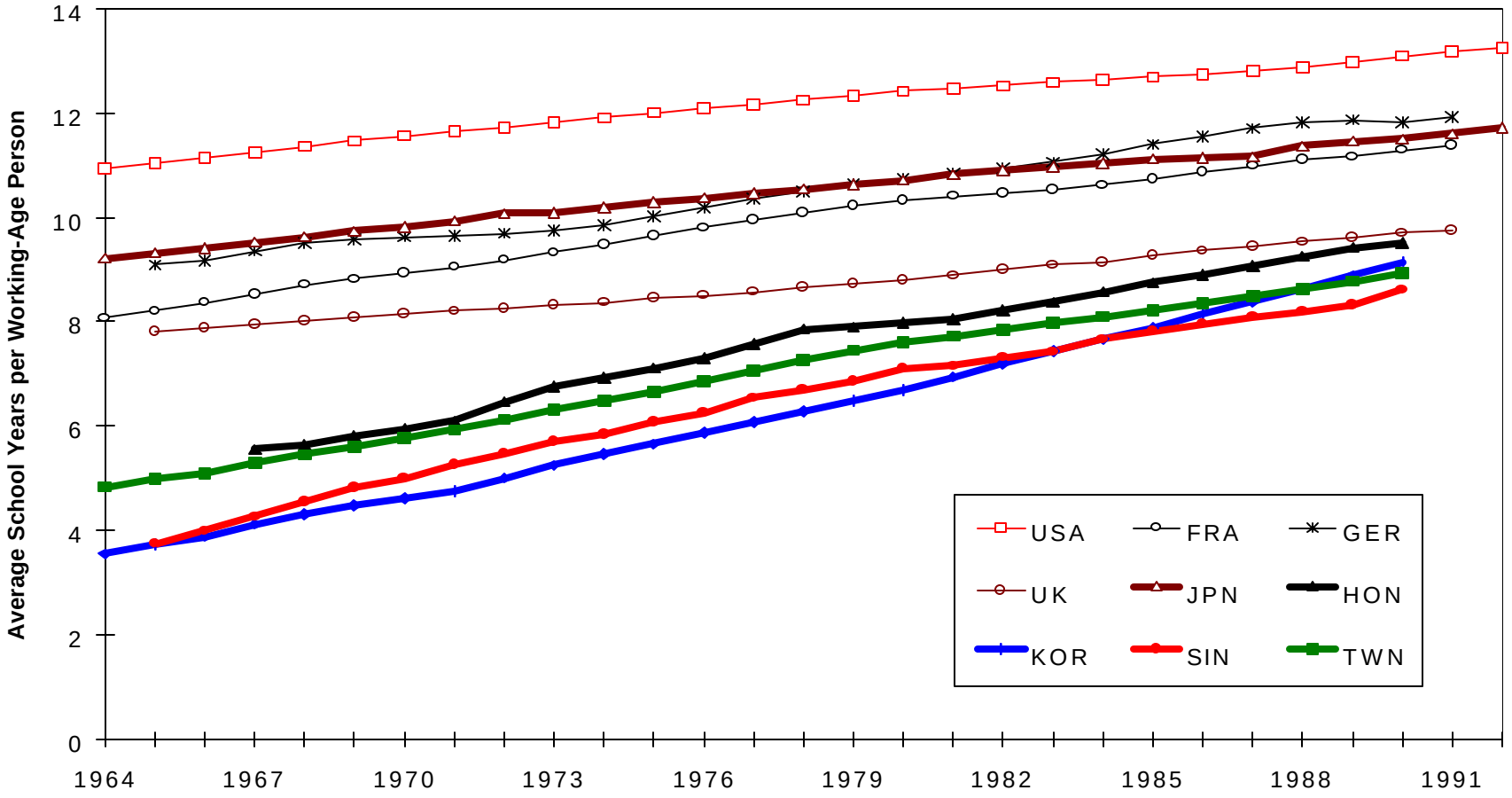


R&D Expenditure as a Percentage of GDP



Human Capital

Figure 3.1 Human Capital



Why is There No Measured Technical Progress in East Asian NIEs?

- (1) Low Level of Investment in Intangible Capital
- (2) The Distribution of "Innovation Rents"
  - Fully priced capital goods and technology
  - Monopolistic pricing of capital equipment, technology licenses and critical components
  - Transfer pricing by foreign direct investors
  - Monopsonistic pricing for OEM manufacturers

The Non-Uniqueness of the Postwar East Asian Experience

- Abramovitz and David (1973): U. S. economic growth in the 19th Century can be largely attributed to the growth of inputs
- Tostlebee (1956): The growth in U.S. agriculture in the 19th Century can be attributed to the growth of inputs, with a negative rate of growth of total factor productivity
- Hayami and Ogasawara (1999): Japanese economic growth between the Meiji Restoration and the World War I can be largely attributed to the growth of inputs, principally capital
- Godo and Hayami (1999): Confirms the lack of technical progress in prewar Japan (with human capital included)

Conclusions

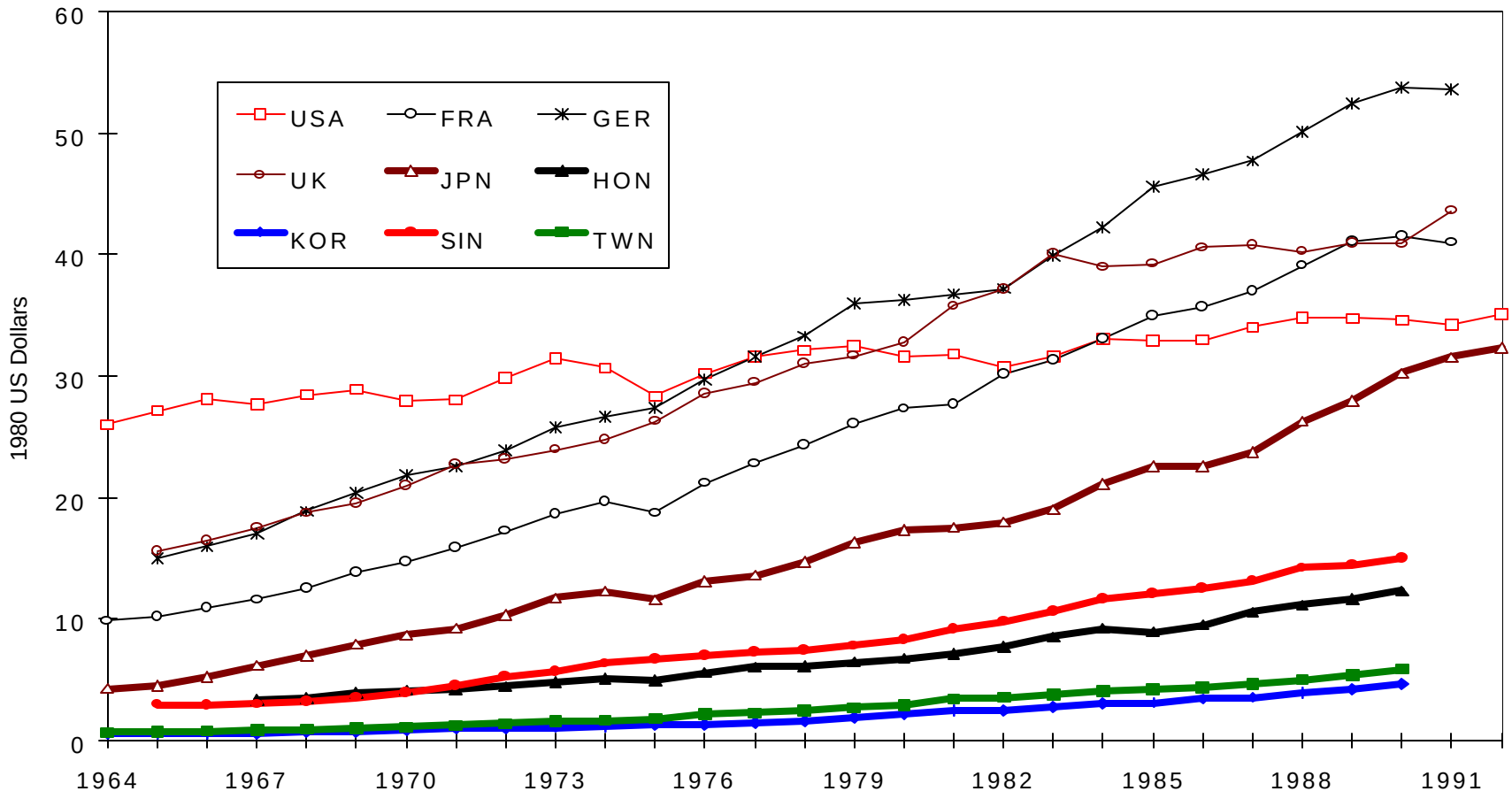
- Different types of measured inputs play different roles at different stages of economic growth
- Tangible capital accumulation is the most important source of growth in the early stage of economic development
- But simply accumulating tangible capital is not enough--it must also be efficiently allocated
- Efficient tangible capital accumulation is the major accomplishment of the East Asian NIEs
  - Market-directed allocation of new investment, aided by export orientation, promotes efficiency
  - Private enterprises have the incentives for prompt self-correction
- Intangible capital accumulation becomes important only after a certain level of tangible capital per worker is achieved

Is East Asian Economic Growth Sustainable?

- Neither miracle nor a mere bubble
  - Economic growth experience replicated in different East Asian economies
  - Sustained economic growth over decades
  - Recent crisis due to many factors, of which “irrational exuberance” is only one
  - Economic fundamentals remain sound--high savings rates, investment in human capital, entrepreneurship
- Past economic growth attributable to growth in inputs, particularly the efficient and rapid accumulation of physical capital
- Considerable room for continuation of rapid tangible inputs-driven economic growth--tangible capital per unit labor still lags behind the developed economies
- Intangible capital per unit labor lags even further behind
- Because of its complementarity with tangible capital, investments in intangible capital can retard the decline in the marginal productivity of tangible capital

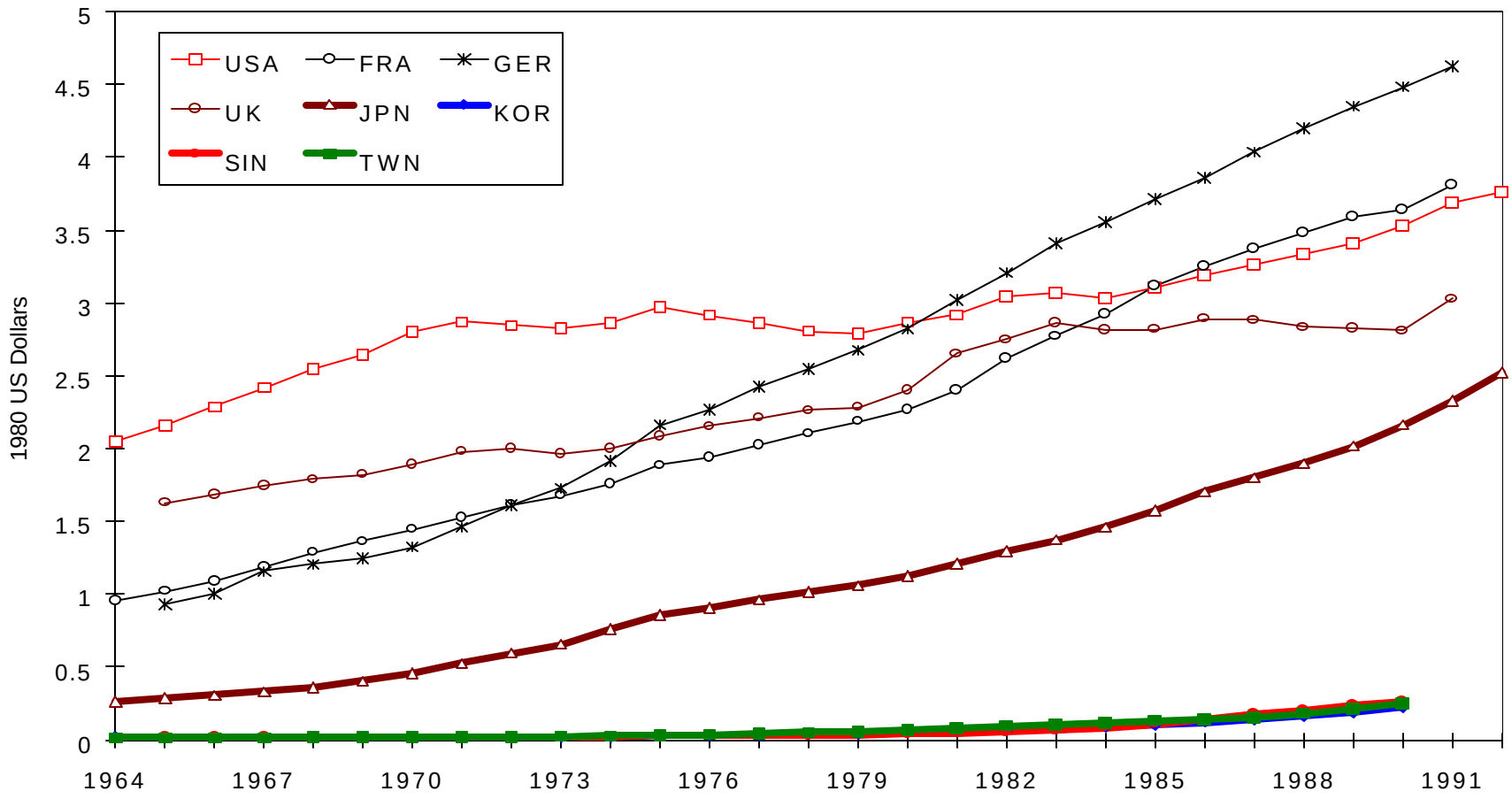
Capital Intensity

Figure 4.1 Tangible Capital Stock per Labor Hour



R&D Capital Stock per Unit Labor

Figure 4.3 R&D Capital Stock per Labor Hour



Quarterly Rates of Growth of Real GDP Selected East Asian Economies