

# The Sources of East Asian Economic Growth Revisited

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# 1. The Sources of East Asian Economic Growth

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# East Asian Economic Growth

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- ◆ East Asia is the fastest-growing region in the world over the past two decades, the East Asian currency crisis of 1997-1998 notwithstanding
- ◆ East Asia has done exceptionally well despite relatively unfavorable resource endowment and population density. How has it been able to achieve this economic growth?

# 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		Employment	Labor Hours	Human Capital	Average
			Stock	Utilized Capital				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

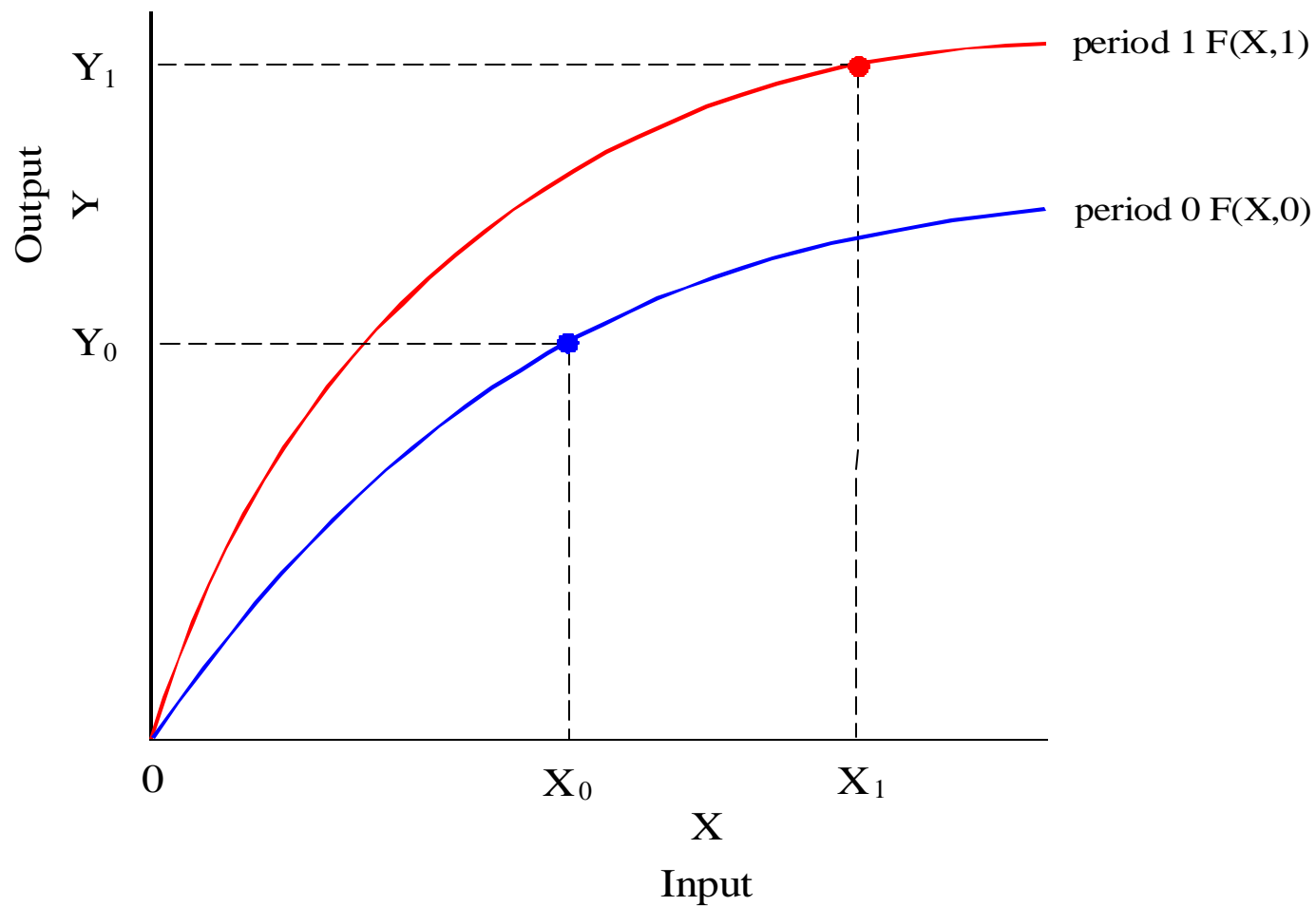
# The Measurement of Technical Progress, aka the Growth of Total Factor Productivity

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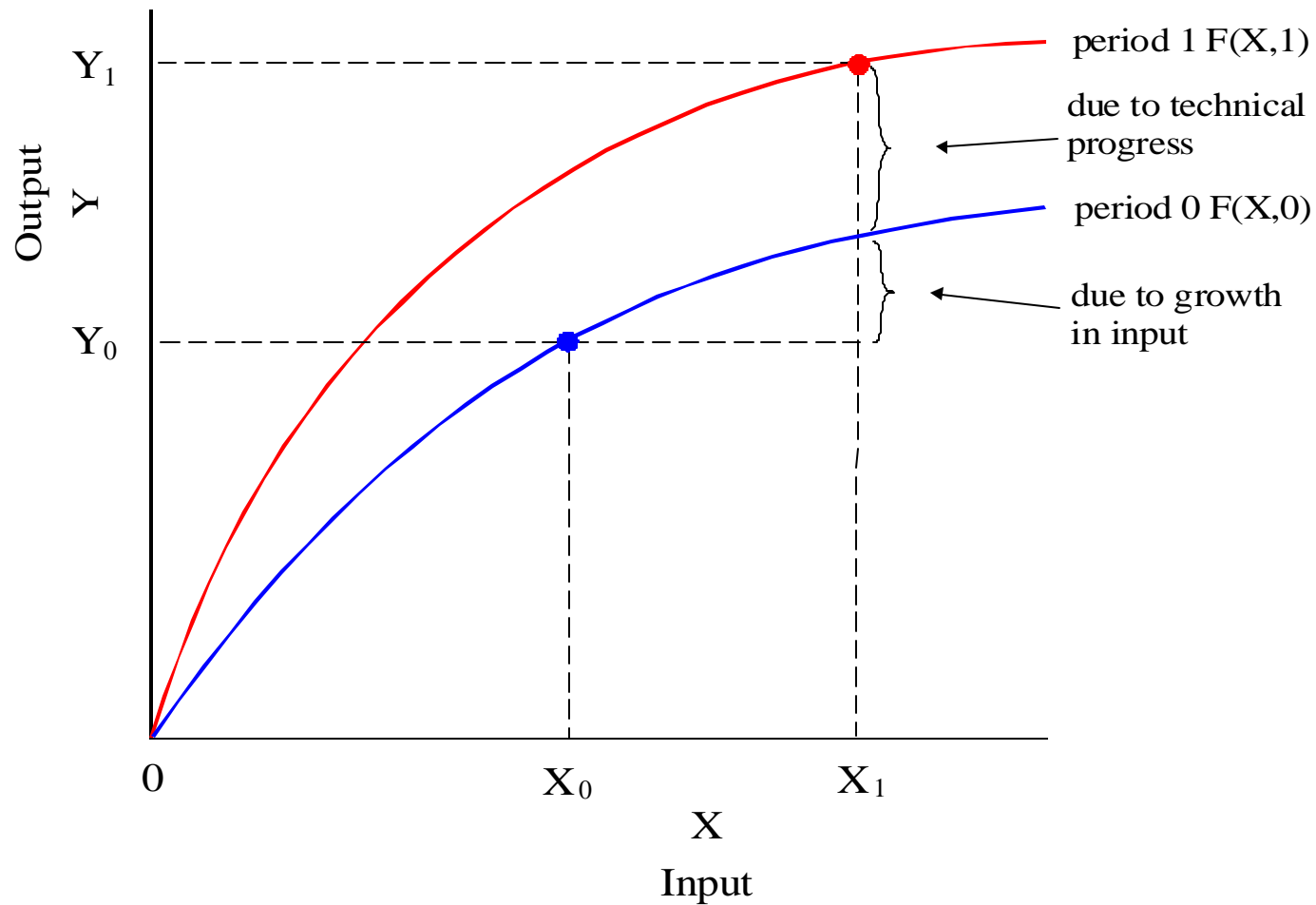
- ◆ How much of the growth of output can be attributed to the growth of measured inputs? and
- ◆ How much of the growth of output can be attributed to technical progress, i.e. improvements in productive efficiency over time?
- ◆ **TECHNICAL PROGRESS (GROWTH IN TOTAL FACTOR PRODUCTIVITY) = GROWTH IN OUTPUT HOLDING ALL MEASURED INPUTS CONSTANT**

# Technical Progress: The Single-Output, Single-Input Case

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# Decomposition of the Growth of Output



# Interpretation of Technical Progress (Growth of Total Factor Productivity)

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- ◆ Not “Manna from Heaven”
- ◆ Growth in unmeasured Intangible Capital (Human Capital, R&D Capital, Goodwill (Advertising and Market Development), Information System, Software, etc.)
- ◆ Growth in Other Omitted and Unmeasured Inputs (Land, Natural Resources, Water Resources, Environment, etc.)
- ◆ Improvements in Technical and Allocative Efficiency over time
- ◆ “Residual” or “Measure of Our Ignorance”



# The Findings of Kim & Lau (1992, 1994a, 1994b); Reported by Krugman (1994)

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- ◆ (1) No technical progress in the East Asian NIEs but significant technical progress in the IEs
- ◆ (2) East Asian economic growth input-driven, with tangible capital accumulation as the most important source of economic growth (the latter applying also to Japan)
  - ◆ Working harder as opposed to working smarter
- ◆ (3) Technical progress is the most important source of economic growth for the IEs, with the exception of Japan
  - ◆ NOTE THE UNIQUE POSITION OF JAPAN!
- ◆ (4) Technical progress is purely tangible capital-augmenting and hence complementary to tangible capital

# Capital-Augmenting Technical Progress

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$$\begin{aligned} Y &= A_0(t) F(A_K(t)K, A_L(t)L) \\ &= A_0 F(A_K(t)K, A_L L) \\ &= A_0 F(A_K e^{c_k \cdot t} K, A_L L) \end{aligned}$$

# Accounts of Growth:

## Kim & Lau (1992, 1994a, 1994b)

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

# The Sources of Economic Growth: Selected East Asian and Western Economies

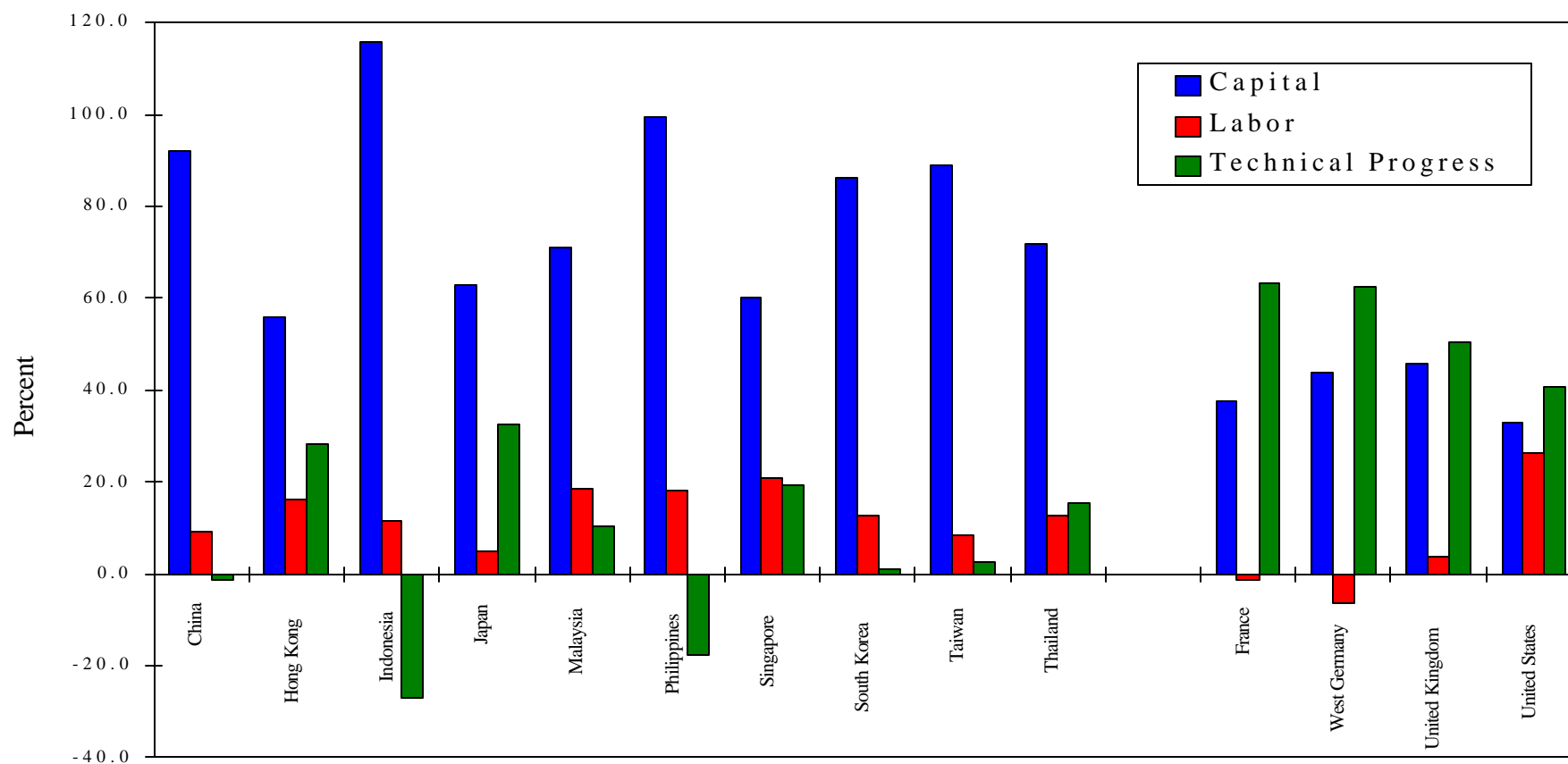
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The Contributions of the Sources of Growth (percent)

	Capital	Labor	Technical Progress
East Asian Economies			
China	92.2	9.2	-1.4
Hong Kong	55.8	16.0	28.2
Indonesia	115.7	11.5	-27.2
Japan	62.9	4.7	32.4
Malaysia	70.9	18.7	10.4
Philippines	99.5	18.0	-17.5
Singapore	60.0	20.9	19.1
South Korea	86.3	12.7	1.0
Taiwan	88.9	8.6	2.5
Thailand	71.9	12.7	15.4
Western Industrialized Economies			
France	37.8	-1.3	63.5
West Germany	43.7	-6.3	62.6
United Kingdom	46.0	3.7	50.3
United States	32.9	26.2	40.9

# The Sources of Economic Growth: Selected East Asian and Western Economies

The Contributions of the Sources of Economic Growth:  
Selected East Asian and Western Economies



# Why is There No Measured Technical Progress in East Asian NIEs? (1)

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- ◆ (1) Low level of investment in intangible capital (human capital, R&D capital, knowledge capital and other forms of intangible capital)
  - ◆ Utilization of other countries' intangible capital is not costless
  - ◆ Complementary indigenous investment is required, e.g., the Green Revolution
- ◆ (2) The distribution of "Innovation Rents" favors the innovators and investors
  - ◆ Fully priced capital goods and technology
  - ◆ Monopolistic pricing of capital equipment, technology licenses and critical components
  - ◆ Transfer pricing by foreign direct investors
  - ◆ Limited value added, e.g., notebook computers
  - ◆ Monopsonistic pricing for OEM manufacturers

# Why is There No Measured Technical Progress in East Asian NIEs? (2)

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- ◆ (3) Problems of Measurement of Capital
- ◆ (4) Aggregation
- ◆ (5) Omission of the value of the quality of life

# Incorporation of More Recent Data

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- ◆ Replicability of past results
- ◆ Testing the possibility of changes in the rates of capital augmentation (1973, 1985)



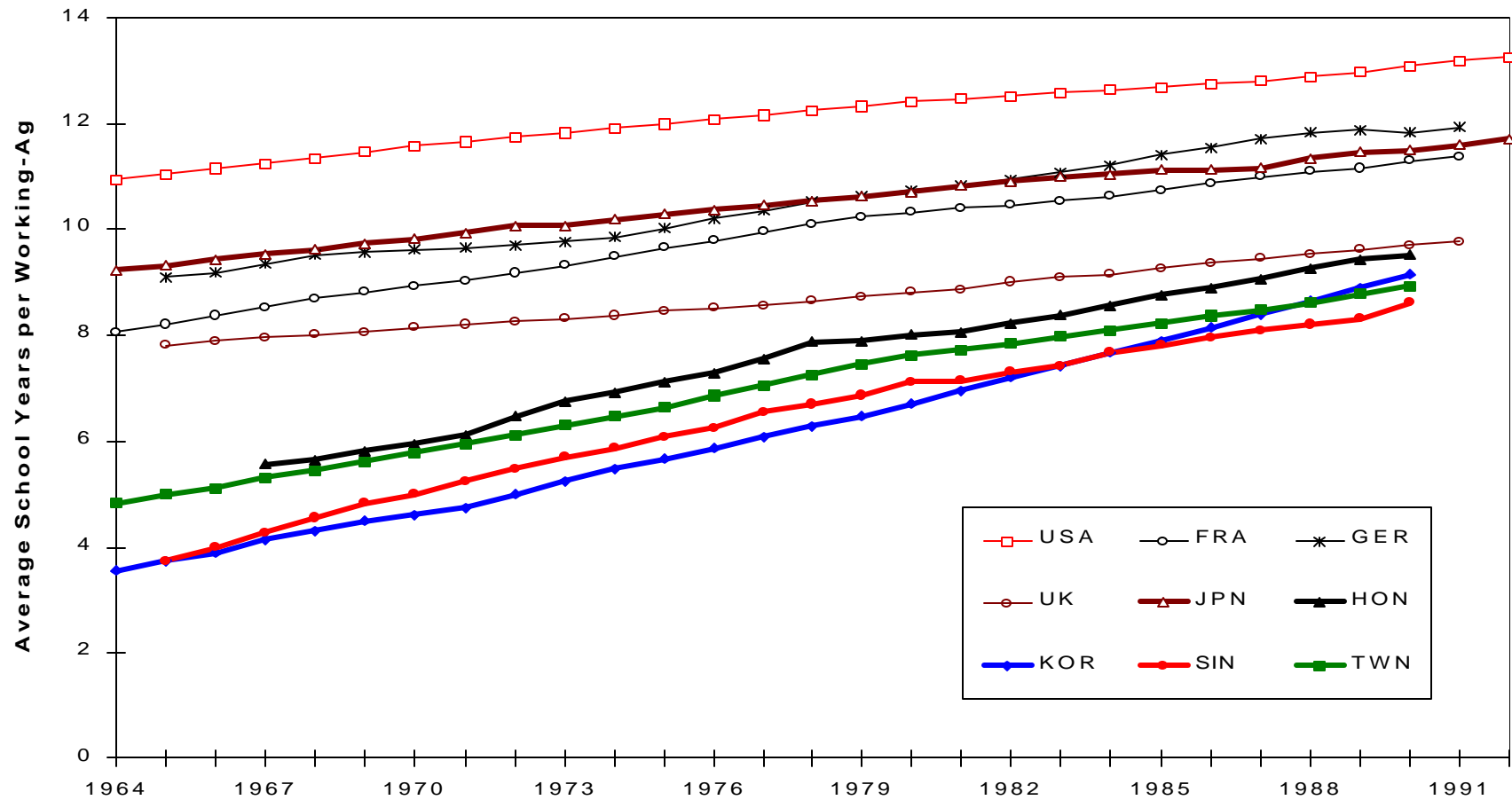
# The Sources of Growth: Some Further Results

## Lau and Park (2000)

<b>Sample (G-5 + 4 NIEs)</b>			
	<b>Tangible Capital</b>	<b>Labor</b>	<b>Technical Progress</b>
<b>Hong Kong</b>	<b>74.46</b>	<b>25.54</b>	<b>0</b>
<b>South Korea</b>	<b>78.2</b>	<b>21.8</b>	<b>0</b>
<b>Singapore</b>	<b>64.8</b>	<b>35.2</b>	<b>0</b>
<b>Taiwan</b>	<b>84.04</b>	<b>15.96</b>	<b>0</b>
<b>Japan</b>	<b>49.9</b>	<b>4.84</b>	<b>45.26</b>
<b>Non-Asian G-5</b>	<b>38.71</b>	<b>2.77</b>	<b>58.52</b>
<b>Sample (G-5 + 9 Asian)</b>			
	<b>Tangible Capital</b>	<b>Labor</b>	<b>Technical Progress</b>
<b>Hong Kong</b>	<b>74.61</b>	<b>25.39</b>	<b>0</b>
<b>South Korea</b>	<b>82.95</b>	<b>17.05</b>	<b>0</b>
<b>Singapore</b>	<b>63.41</b>	<b>36.59</b>	<b>0</b>
<b>Taiwan</b>	<b>86.6</b>	<b>13.4</b>	<b>0</b>
<b>Indonesia</b>	<b>88.79</b>	<b>11.21</b>	<b>0</b>
<b>Malaysia</b>	<b>66.68</b>	<b>33.32</b>	<b>0</b>
<b>Philippines</b>	<b>66.1</b>	<b>33.9</b>	<b>0</b>
<b>Thailand</b>	<b>83.73</b>	<b>16.27</b>	<b>0</b>
<b>China</b>	<b>94.84</b>	<b>5.16</b>	<b>0</b>
<b>Japan</b>	<b>55.01</b>	<b>3.7</b>	<b>41.29</b>
<b>Non-Asian G-5</b>	<b>41.51</b>	<b>1.97</b>	<b>56.53</b>

# Human Capital

Figure 3.1 Human Capital



# Sources of Economic Growth with Explicit Inclusion of Human Capital

**Table 2.3: Relative Contributions of the Sources of Economic Growth (percent)**

			Intangible Capital			
	Tangible	Labor	Human	R&D	Technical	Total
	Capital		Capital	Capital	Progress	
<b>Hong Kong</b>	<b>66</b>	<b>22</b>	<b>11</b>	<b>NA</b>	<b>0</b>	<b>11</b>
<b>Singapore</b>	<b>63</b>	<b>25</b>	<b>13</b>	<b>NA</b>	<b>0</b>	<b>13</b>
<b>S. Korea</b>	<b>67</b>	<b>19</b>	<b>14</b>	<b>NA</b>	<b>0</b>	<b>14</b>
<b>Taiwan</b>	<b>75</b>	<b>14</b>	<b>11</b>	<b>NA</b>	<b>0</b>	<b>11</b>
<b>Japan</b>	<b>48</b>	<b>6</b>	<b>3</b>	<b>NA</b>	<b>43</b>	<b>46</b>
<b>Non-Asian G-5</b>	<b>32</b>	<b>7</b>	<b>5</b>	<b>NA</b>	<b>57</b>	<b>62</b>

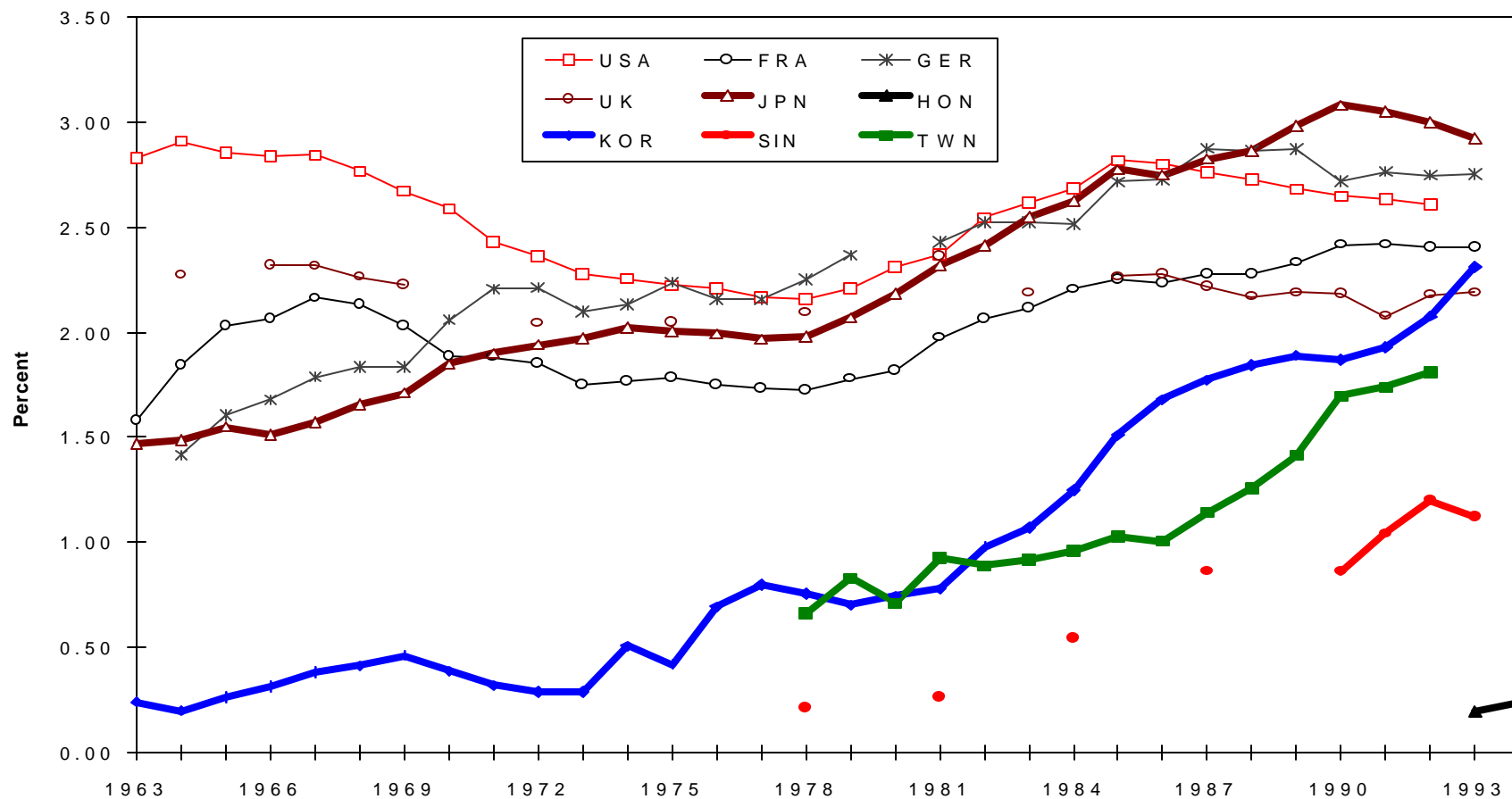
# Human Capital: Some Further Results

## Lau and Park (2000)

<b>Sample (G-5 + 4 NIEs)</b>				
	<b>Tangible Capital</b>	<b>Labor</b>	<b>Human Capital</b>	<b>Technical Progress</b>
<b>Hong Kong</b>	<b>62.85</b>	<b>31.38</b>	<b>5.77</b>	<b>0</b>
<b>South Korea</b>	<b>62.34</b>	<b>30</b>	<b>7.67</b>	<b>0</b>
<b>Singapore</b>	<b>56.5</b>	<b>36.36</b>	<b>7.14</b>	<b>0</b>
<b>Taiwan</b>	<b>70.16</b>	<b>23.37</b>	<b>6.47</b>	<b>0</b>
<b>Japan</b>	<b>40.01</b>	<b>8.77</b>	<b>1.81</b>	<b>49.4</b>
<b>Non-Asian G-5</b>	<b>31.15</b>	<b>6.22</b>	<b>2.92</b>	<b>59.71</b>
<b>Sample (G-5 + 9 Asian)</b>				
	<b>Tangible Capital</b>	<b>Labor</b>	<b>Human Capital</b>	<b>Technical Progress</b>
<b>Hong Kong</b>	<b>69.37</b>	<b>29.08</b>	<b>1.55</b>	<b>0</b>
<b>South Korea</b>	<b>75.44</b>	<b>22.33</b>	<b>2.23</b>	<b>0</b>
<b>Singapore</b>	<b>59.36</b>	<b>38.82</b>	<b>1.82</b>	<b>0</b>
<b>Taiwan</b>	<b>80.83</b>	<b>17.37</b>	<b>1.8</b>	<b>0</b>
<b>Indonesia</b>	<b>77.49</b>	<b>17.36</b>	<b>5.15</b>	<b>0</b>
<b>Malaysia</b>	<b>59.48</b>	<b>37.68</b>	<b>2.83</b>	<b>0</b>
<b>Philippines</b>	<b>54.6</b>	<b>41.24</b>	<b>4.16</b>	<b>0</b>
<b>Thailand</b>	<b>73.91</b>	<b>22.66</b>	<b>3.44</b>	<b>0</b>
<b>China</b>	<b>83.75</b>	<b>14.12</b>	<b>2.13</b>	<b>0</b>
<b>Japan</b>	<b>50.44</b>	<b>5.7</b>	<b>0.56</b>	<b>43.3</b>
<b>Non-Asian G-5</b>	<b>37.79</b>	<b>3.54</b>	<b>0.86</b>	<b>57.81</b>

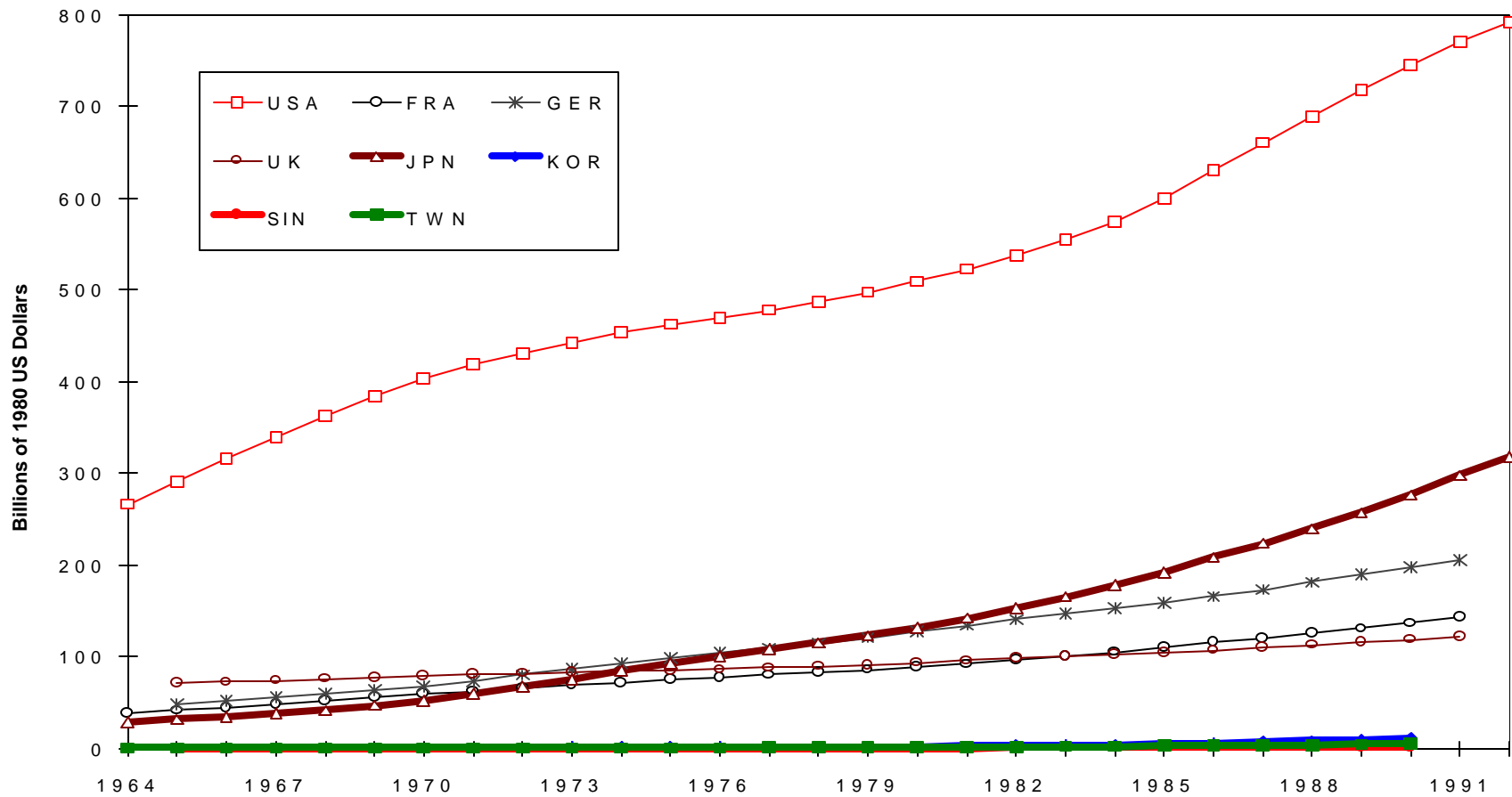
# R&D Expenditure as a Percentage of GDP

Percentage of Total R&D Expenditure in GDP (Current Prices)



# R&D Capital

Figure 3.2 R&D Capital



# Sources of Economic Growth with Explicit Inclusion of Human and R&D Capital

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<b>Table 2.4: Relative Contributions of the Sources of Economic Growth (percent)</b>						
			<b>Intangible Capital</b>			
	<b>Tangible</b>	<b>Labor</b>	<b>Human</b>	<b>R&amp;D</b>	<b>Technical</b>	<b>Total</b>
	<b>Capital</b>		<b>Capital</b>	<b>Capital</b>	<b>Progress</b>	
<b>Korea</b>	<b>62</b>	<b>18</b>	<b>5</b>	<b>15</b>	<b>0</b>	<b>20</b>
<b>Singapore</b>	<b>56</b>	<b>22</b>	<b>5</b>	<b>16</b>	<b>0</b>	<b>21</b>
<b>Taiwan</b>	<b>65</b>	<b>15</b>	<b>4</b>	<b>16</b>	<b>0</b>	<b>20</b>
<b>Japan</b>	<b>37</b>	<b>5</b>	<b>1</b>	<b>8</b>	<b>49</b>	<b>58</b>
<b>Non-Asian G-7</b>	<b>40</b>	<b>4</b>	<b>4</b>	<b>10</b>	<b>43</b>	<b>56</b>

# Human and R&D Capital: Some Further Results (Lau and Park (2000))

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	<b>Tangible Capital</b>	<b>Labor</b>	<b>Human Capital</b>	<b>R&amp;D Capital</b>	<b>Technical Progress</b>
<b>South Korea</b>	<b>63.35</b>	<b>13.61</b>	<b>2.1</b>	<b>20.94</b>	<b>0</b>
<b>Singapore</b>	<b>47.33</b>	<b>21.55</b>	<b>1.37</b>	<b>29.75</b>	<b>0</b>
<b>Taiwan</b>	<b>58.73</b>	<b>11.42</b>	<b>1.32</b>	<b>28.54</b>	<b>0</b>
<b>Japan</b>	<b>44.83</b>	<b>5.2</b>	<b>0.82</b>	<b>14.63</b>	<b>34.52</b>
<b>Non-Asian G-7</b>	<b>33.71</b>	<b>3.71</b>	<b>1.32</b>	<b>12.53</b>	<b>48.72</b>



# Sources of Economic Growth with Breaks in the Rates of Capital Augmentation (1985)

<b>Sample (G-5 + 4 NIEs)</b>				
	<b>Tangible Capital</b>	<b>Labor</b>	<b>Human Capital</b>	<b>Technical Progress</b>
<b>Hong Kong</b>	<b>48.41</b>	<b>27.57</b>	<b>8.16</b>	<b>15.86</b>
<b>South Korea</b>	<b>51.23</b>	<b>24.78</b>	<b>11.59</b>	<b>12.4</b>
<b>Singapore</b>	<b>46.73</b>	<b>32.43</b>	<b>10.86</b>	<b>9.99</b>
<b>Taiwan</b>	<b>58.26</b>	<b>21.61</b>	<b>9.87</b>	<b>10.27</b>
<b>Japan</b>	<b>38.89</b>	<b>9.17</b>	<b>3.24</b>	<b>48.7</b>
<b>Non-Asian G-5</b>	<b>30.13</b>	<b>7.09</b>	<b>5.21</b>	<b>57.57</b>
<b>Sample (G-5 + 9 Asian)</b>				
	<b>Tangible Capital</b>	<b>Labor</b>	<b>Human Capital</b>	<b>Technical Progress</b>
<b>Hong Kong</b>	<b>56.89</b>	<b>23.65</b>	<b>2.51</b>	<b>16.94</b>
<b>South Korea</b>	<b>65.45</b>	<b>18.62</b>	<b>3.84</b>	<b>12.08</b>
<b>Singapore</b>	<b>53.1</b>	<b>33.94</b>	<b>3.23</b>	<b>9.73</b>
<b>Taiwan</b>	<b>71.26</b>	<b>15.61</b>	<b>3.15</b>	<b>9.99</b>
<b>Indonesia</b>	<b>71.2</b>	<b>14.59</b>	<b>9.38</b>	<b>4.83</b>
<b>Malaysia</b>	<b>54.22</b>	<b>32.47</b>	<b>5.12</b>	<b>8.19</b>
<b>Philippines</b>	<b>54.05</b>	<b>37.81</b>	<b>8.15</b>	<b>-0.01</b>
<b>Thailand</b>	<b>60.84</b>	<b>18.06</b>	<b>5.65</b>	<b>15.44</b>
<b>China</b>	<b>83.87</b>	<b>11.92</b>	<b>4.21</b>	<b>0</b>
<b>Japan</b>	<b>49.04</b>	<b>5.23</b>	<b>1.08</b>	<b>44.65</b>
<b>Non-Asian G-5</b>	<b>37.44</b>	<b>3.36</b>	<b>1.7</b>	<b>57.49</b>

# Sources of Economic Growth with Breaks: Sub-periods

<b>Sample (G-5 + 9 Asian)</b>					
<b>1960s-1985</b>					
	<b>Tangible Capital</b>	<b>Labor</b>	<b>Human Capital</b>	<b>Technical Progress</b>	
<b>Hong Kong</b>	<b>65.34</b>	<b>31.65</b>	<b>3</b>	<b>0</b>	
<b>South Korea</b>	<b>74.66</b>	<b>20.58</b>	<b>4.76</b>	<b>0</b>	
<b>Singapore</b>	<b>60.09</b>	<b>35.97</b>	<b>3.94</b>	<b>0</b>	
<b>Taiwan</b>	<b>79.92</b>	<b>16.43</b>	<b>3.64</b>	<b>0</b>	
<b>Indonesia</b>	<b>76.44</b>	<b>12.41</b>	<b>11.15</b>	<b>0</b>	
<b>Malaysia</b>	<b>61.14</b>	<b>32.69</b>	<b>6.17</b>	<b>0</b>	
<b>Philippines</b>	<b>55.78</b>	<b>35.36</b>	<b>8.86</b>	<b>0</b>	
<b>Thailand</b>	<b>70.77</b>	<b>20.92</b>	<b>8.31</b>	<b>0</b>	
<b>China</b>	<b>83.05</b>	<b>12.36</b>	<b>4.59</b>	<b>0</b>	
<b>Japan</b>	<b>50.84</b>	<b>5.48</b>	<b>1.06</b>	<b>42.62</b>	
<b>Non-Asian G-5</b>	<b>39.69</b>	<b>0.88</b>	<b>1.71</b>	<b>57.72</b>	
<b>1986-1995</b>					
<b>Hong Kong</b>	<b>40.81</b>	<b>8.61</b>	<b>1.58</b>	<b>49</b>	
<b>South Korea</b>	<b>44.96</b>	<b>14.19</b>	<b>1.8</b>	<b>39.06</b>	
<b>Singapore</b>	<b>37.35</b>	<b>29.19</b>	<b>1.6</b>	<b>31.86</b>	
<b>Taiwan</b>	<b>41.45</b>	<b>12.61</b>	<b>1.4</b>	<b>44.53</b>	
<b>Indonesia</b>	<b>60.25</b>	<b>19.09</b>	<b>5.63</b>	<b>15.03</b>	
<b>Malaysia</b>	<b>43.3</b>	<b>32.04</b>	<b>3.44</b>	<b>21.22</b>	
<b>Philippines</b>	<b>49.71</b>	<b>44.03</b>	<b>6.29</b>	<b>-0.03</b>	
<b>Thailand</b>	<b>49.01</b>	<b>14.61</b>	<b>2.51</b>	<b>33.86</b>	
<b>China</b>	<b>85.75</b>	<b>10.9</b>	<b>3.35</b>	<b>0</b>	
<b>Japan</b>	<b>34.99</b>	<b>5.17</b>	<b>1.19</b>	<b>60.64</b>	
<b>Non-Asian G-5</b>	<b>27</b>	<b>14.66</b>	<b>1.63</b>	<b>56.72</b>	

# The Sources of Economic Growth--Developing Economies in East Asia

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- ◆ 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 in the postwar period
  - ◆ 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

# The Sources of Economic Growth-- Industrialized Countries

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- ◆ The most important source of economic growth for industrialized countries is technical progress, accounting for more than half of the growth of output
- ◆ Tangible capital is the next important source of economic growth, accounting for almost a third
- ◆ Technical progress reflects the effects of investment in intangible capital--R&D capital, knowledge capital, goodwill, etc.
- ◆ The United States is a leader in human capital and R&D capital

# The Non-Uniqueness of the Postwar East Asian Experience

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- ◆ 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)

## 2.The Recovery from the Currency Crisis

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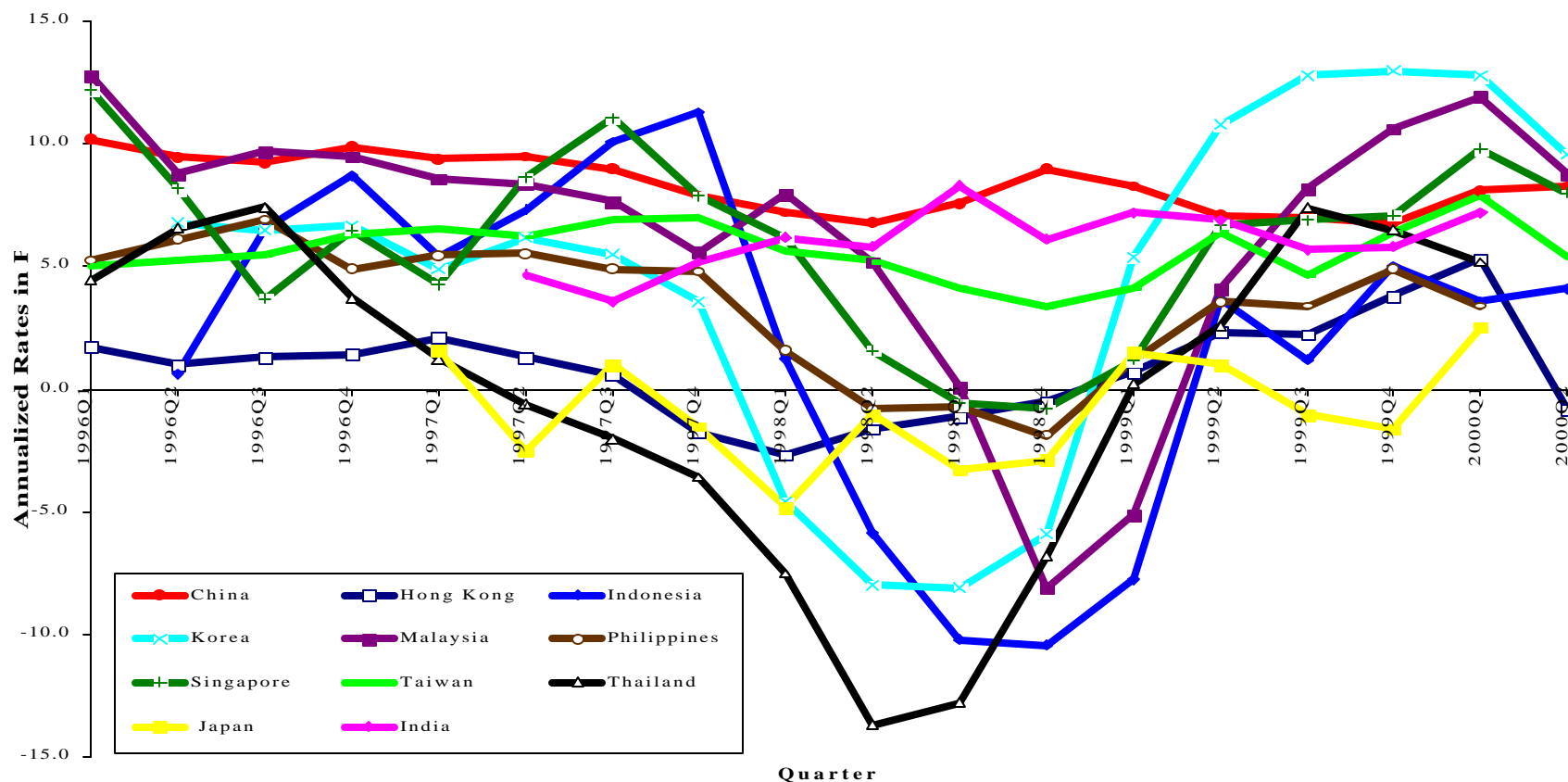
## Is the Recovery Real?

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- ◆ For most of the East Asian economies, the bottom has been reached (0% rate of growth) in 2Q/1999
- ◆ The recovery is most tentative in Indonesia, with its political problems
- ◆ In quantity terms, exports have been growing very rapidly
- ◆ Foreign exchange reserves have been largely replenished
- ◆ Inflation caused by the devaluation has largely subsided
- ◆ The stock markets have rebounded
- ◆ The recovery has been much stronger than expected because of synchronization across the East Asian economies

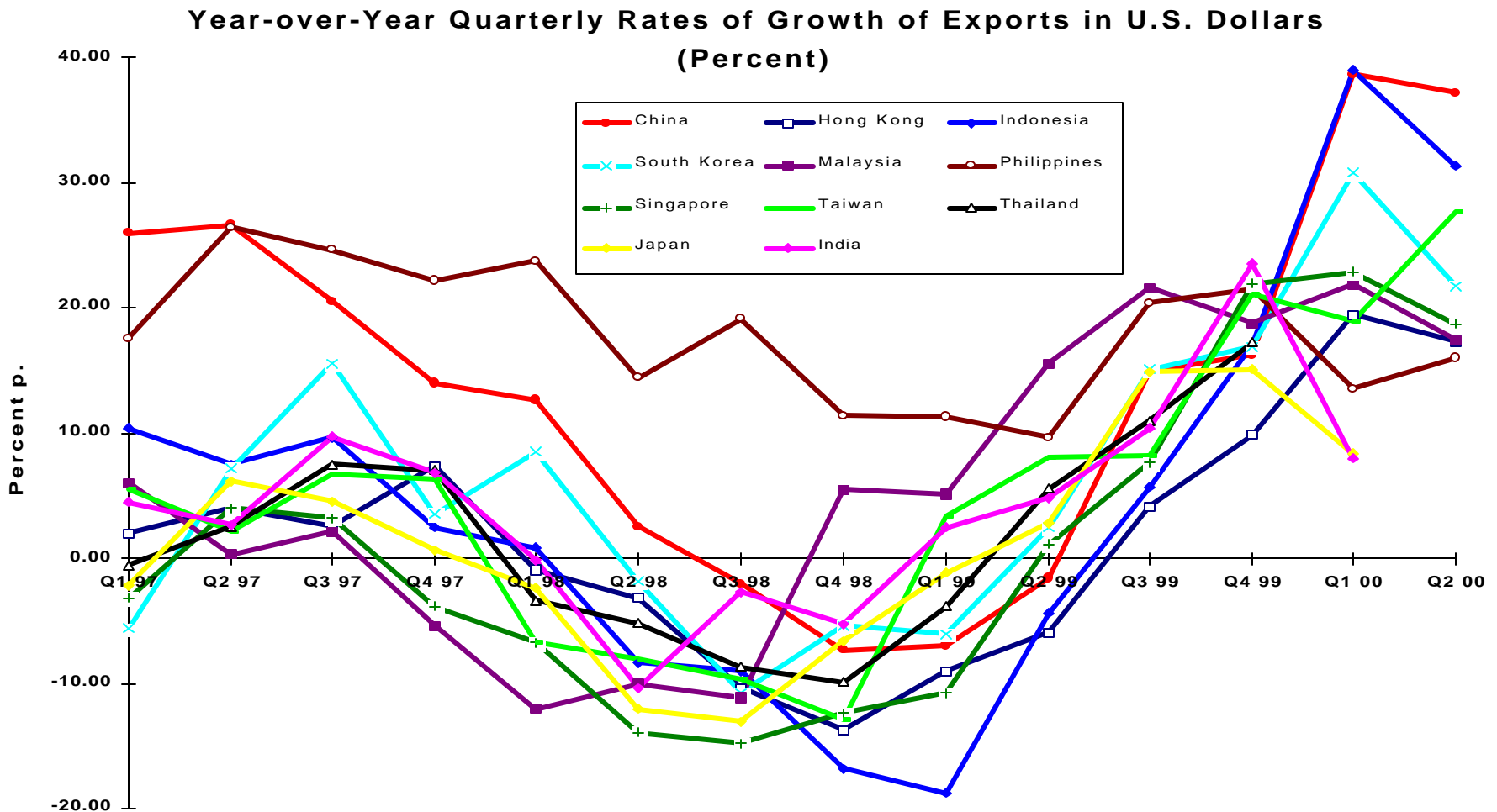
# The Rates of Growth of Real GDP Have Turned Significantly Positive

Quarterly Rates of Growth of Real GDP, Year-over-Year, Selected East Asian Economies



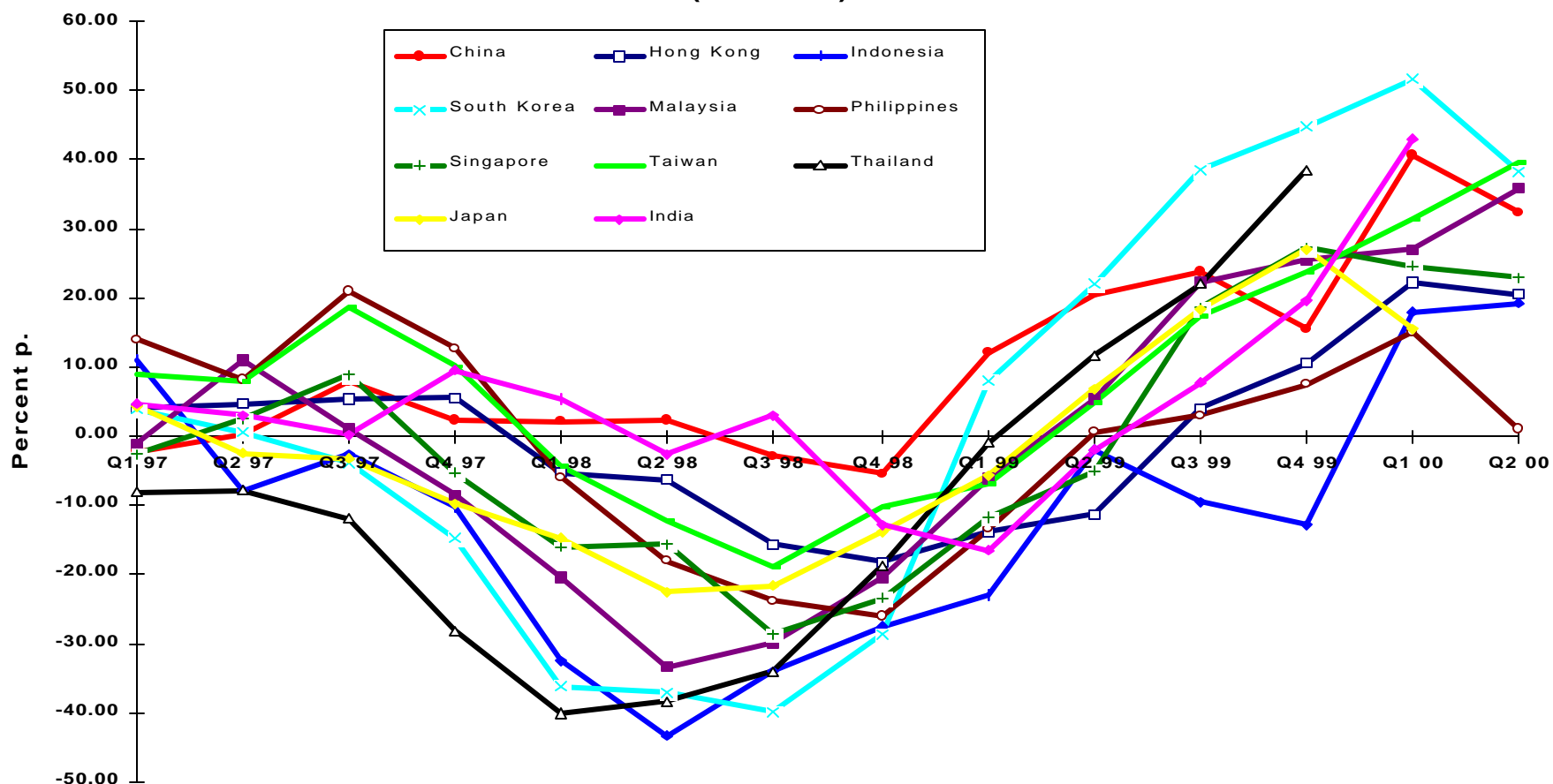


# Rates of Growth of Exports in US\$ Terms Have Turned Positive



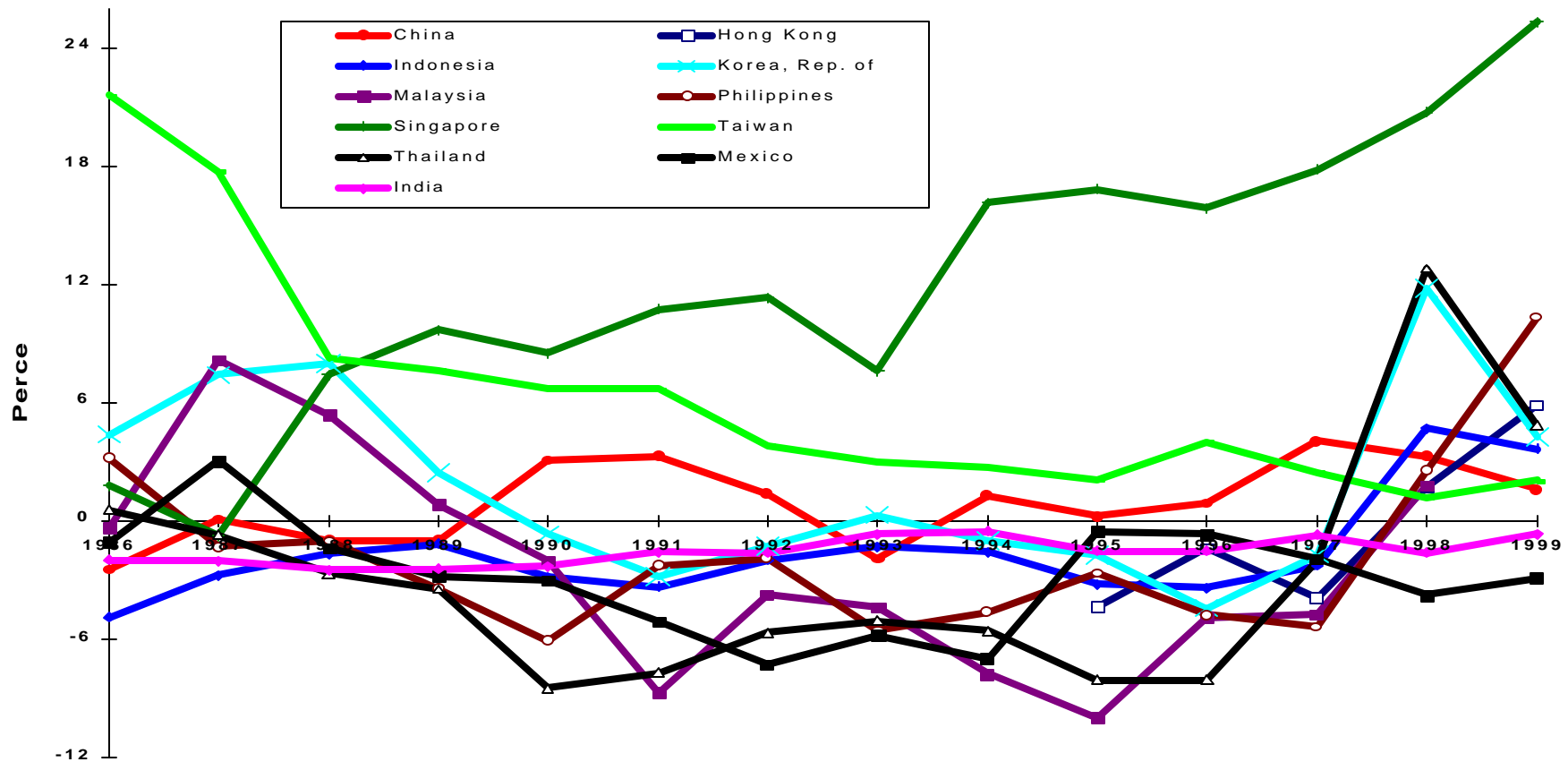
# Rates of Growth of Imports in US\$ Terms Have Also Turned Significantly Positive

Year-over-Year Quarterly Rates of Growth of Imports in U.S. Dollars  
(Percent)



# The Current Account Balances Have Turned Positive

The Current Account Surplus (Deficit) as a Percent of GDP



## 3. Prospects for the Future

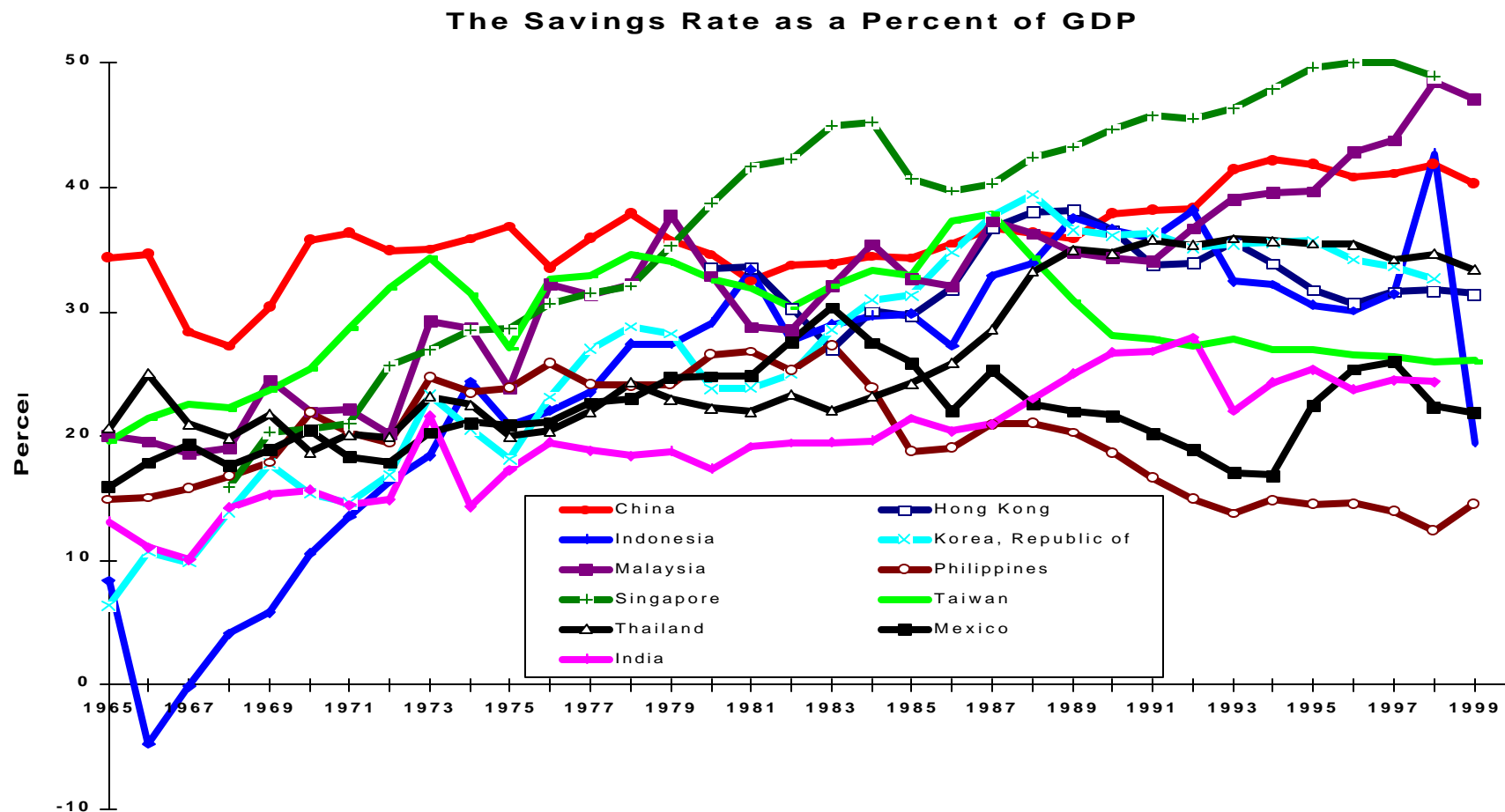
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# Is East Asian Economic Growth Sustainable?

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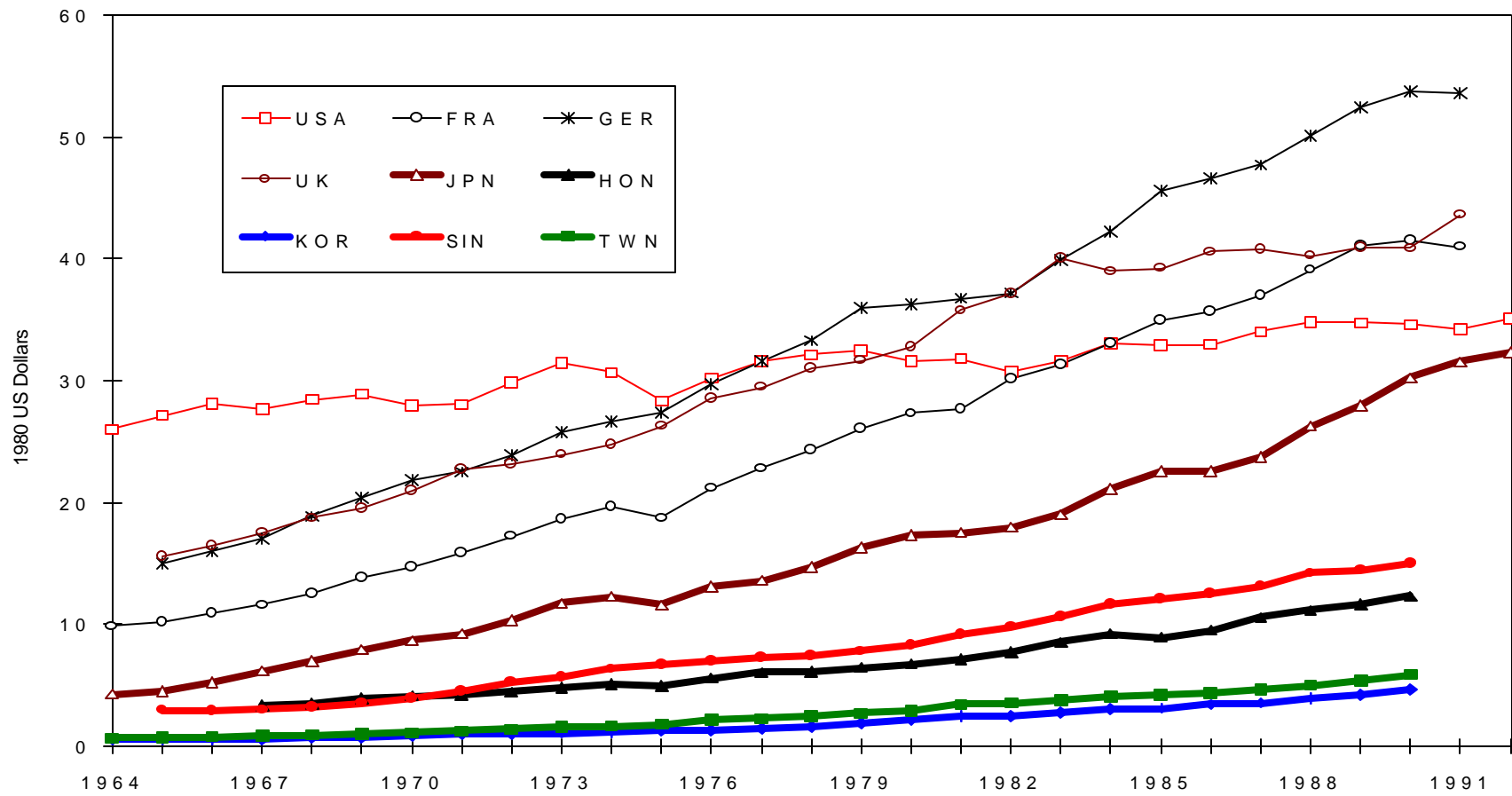
- ◆ Past economic growth neither a miracle nor a mere bubble
  - ◆ Economic growth experience replicated in different East Asian economies
  - ◆ Sustained economic growth over decades
  - ◆ Recent crisis due to many factors, of which “irrational exuberance” was a major one
  - ◆ Economic fundamentals remain sound--high savings rates, investment in human capital, and more recently in R&D capital, entrepreneurship, market orientation
- ◆ Past economic growth input-driven rather than technical progress-driven--it is attributable to growth in inputs, particularly the efficient and rapid accumulation of tangible capital
- ◆ Considerable room for continuation of rapid tangible inputs-driven economic growth--tangible capital per unit labor still lags significantly behind the developed economies
- ◆ Intangible capital per unit labor, e.g., R&D capital, lags even further behind, offering additional opportunities for investment

# Savings Rates as a Percent of GDP of Selected East Asian Countries



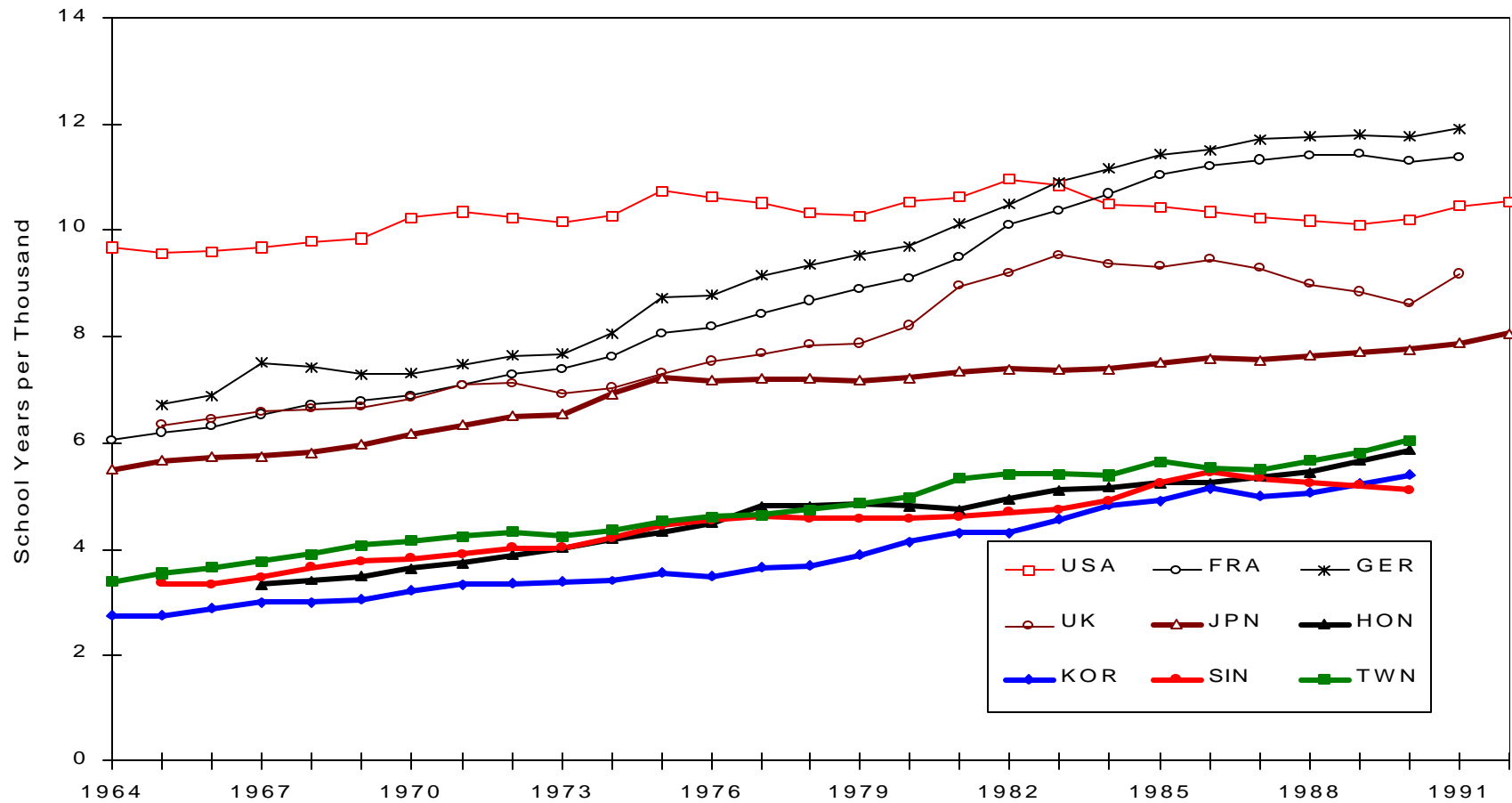
# Capital Intensity

Figure 4.1 Tangible Capital Stock per Labor Hour



# Human Capital per Unit Labor

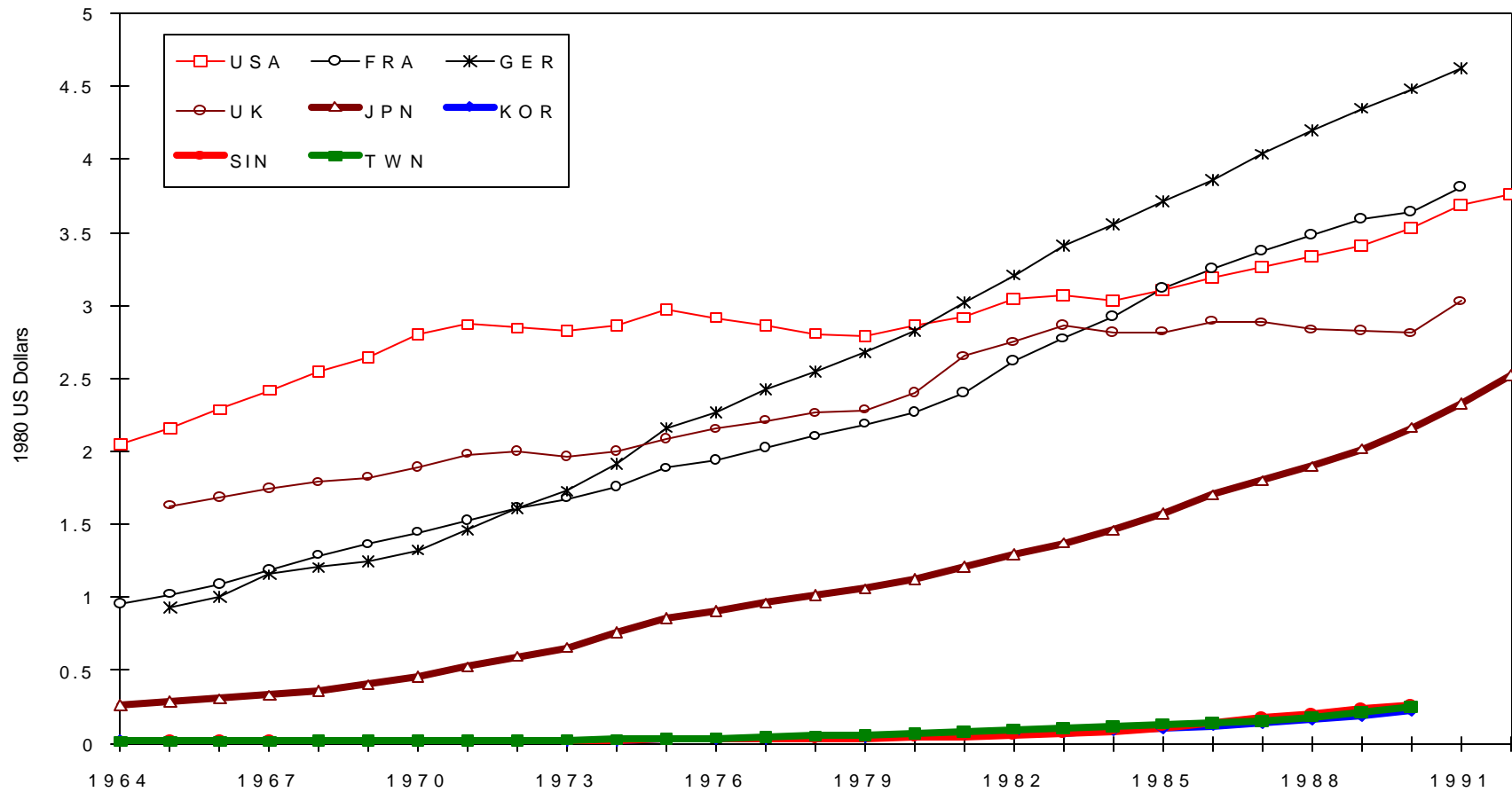
Figure 4.2 School Years per Labor Hour





# R&D Capital Stock per Unit Labor

Figure 4.3 R&D Capital Stock per Labor Hour



# Is East Asian Economic Growth Sustainable?

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- ◆ The attractiveness of investment in intangible capital depends on the protection of intellectual property rights, which in turn depends on whether a country is a producer of intellectual property
- ◆ Intangible capital is different from tangible capital in three important aspects:
  - ◆ Intangible capital is freely mobile across countries
  - ◆ Intangible capital is simultaneously deployable in different locations without diminution of its effectiveness (increasing returns in the utilization of intangible capital)
  - ◆ Intangible capital enhances the productivity of existing tangible capital whereas additional tangible capital diminishes the productivity of existing tangible capital

# Implications for East Asian NIEs

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- ◆ Maintaining the growth in tangible capital
- ◆ Assuring the efficiency of tangible capital
- ◆ Closing the gap on intangible capital

# Prospects for Future Economic Growth Remain Good

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- ◆ Prospects for continued economic growth in the East Asian NIEs will be good if these policies are pursued!
- ◆ The experience of developed economies, especially that of Japan, suggests that investment in R&D capital and other forms of intangible capital has high returns
- ◆ Because of its complementarity with tangible capital, investment in intangible capital can retard the decline in the marginal productivity of tangible capital
- ◆ There is evidence of positive technical progress in the more recent period
- ◆ Simultaneous expansions increase aggregate demands in all East Asian developing economies because of their significant intra-regional trade