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# Growth, Innovation and International Competitiveness

by Paul J. J. Welfens, Duisburg\*

**The past two decades have witnessed considerable shifts in the world income and technology pyramid. A major factor in this was the differing ability of economic systems to bring forth innovations under the pressure of a highly dynamic environment. This article analyses the link between innovation, international competitiveness and growth in the world economy from a Schumpeterian perspective.**

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The world economy has drastically changed over the past few decades, during which the most significant shifts were the collapse of the Bretton-Woods system, the double oil price explosion of 1974 and 1979 and the reverse price shock in 1985/86. Real supply shocks played a prominent role in the 1970's, the key factors evoked being the revolution in microelectronics, the energy price shocks and advent of the Newly Industrializing Countries (NICs), which captured considerable market segments formerly exclusively claimed by advanced industrialized countries. The emergence of supply-side economics was part of the political answer to the real and monetary supply shocks and shifts. On the financial side, the major shocks affecting the world economy were the external debt crisis and the excessive volatility of exchange rates, which – together with the recent high volatility of inflation and interest rates – have triggered a host of financial innovations.<sup>1</sup>

The following paragraphs focus on the question of the regions and economic system which have rather successfully coped with the challenges of the past two decades. They have witnessed considerable shifts in the world income and technology pyramid, where major influences came from the diverging ability of systems to bring forth innovations and imitations under the pressure of a highly dynamic environment. Innovations in products, production processes, organizations and marketing have been key factors for the shifts in international competitiveness.<sup>2</sup> These were also the

main features in Schumpeter's description of capitalist dynamics which has recently enjoyed a revival.<sup>3</sup>

## Process of Creative Destruction

Schumpeter wrote in his book "Capitalism, Socialism and Democracy": "The essential point to grasp is that in dealing with capitalism we are dealing with an evolutionary process. . . Capitalism, then, is by nature a form of method of economic change and not only never is but never can be stationary. And this evolutionary character of the capitalist process is not merely due to the fact that economic life goes on in a social and natural environment which changes . . . Nor is this evolutionary character due to a quasi-automatic increase in population or to the vagaries of monetary systems. . . The fundamental impulse that sets and keeps the capitalist engine in motion comes from the new consumers' goods, the new methods of production and transportation, the new markets, the new forms of industrial organization that capitalist enterprise creates."<sup>4</sup>

Entrepreneurship and thus the creative process of the destruction of established product and technology patterns were, in Schumpeter's view, an important source of the business cycle.<sup>5</sup> Disputing (Keynesian) stagnation theories which were popular in the late 1920's, he argued that invention and innovation, which stimulate growth and structural adjustment, were principally uncertain and thus not foreseeable.<sup>6</sup>

<sup>3</sup> Recent theoretical advances in a Schumpeterian spirit include C. A. Futia. Schumpeterian Competition, in: Quarterly Journal of Economics, 45 (1980), pp. 675-695; K. Herdizina. Wirtschaftliches Wachstum, Strukturwandel und Wettbewerb, Berlin 1981; R. R. Nelson, S. G. Winter: The Schumpeterian Tradeoff Revisited, in: American Economic Review, 72 (1982), pp. 114-132; J. F. Reinganum: Innovation and Industry Evolution, in: Quarterly Journal of Economics, 50 (1985), pp. 81-99; H. Giersch: The Age of Schumpeter, in: American Economic Review, 74 (1984), pp. 103-109. Contributions to the Schumpeter revival are A. Heertje (ed.): Schumpeter's Vision. Capitalism, Socialism and Democracy after 40 Years, New York 1981; H. Frisch (ed.): Schumpeterian Economics, New York 1982; D. Bös, H. D. Stolper (eds.): Schumpeter oder Keynes, Heidelberg 1984.

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<sup>1</sup> For a survey of international financial innovations see Bank of International Settlements: Recent Innovations in International Banking, Basle 1986. The implications of the recent supply shocks for stabilization policy are analyzed in P. J. J. Welfens: Theorie und Praxis angelsorbientierter Stabilitätspolitik, Baden-Baden 1985.

<sup>2</sup> See D. D. Roman, J. F. Puett Jr.: International Business and Technological Innovation, Amsterdam 1983.

However, he doubted that the capitalist system could maintain its innovation dynamics, as the rising standard of living – a result of dynamic capitalism – slows down the incentive for further capital accumulation and reduces, together with a rising bureaucracy (including "corpocracy", to use a modern term), the entrepreneurial quality of the system. The declining innovation dynamics could be reinforced by a higher share of state-managed firms – a benchmark-case being the socialist economic system – which he viewed to be generally less innovative than private firms.<sup>7</sup>

The innovative process of creative destruction requires adjustment on the side of the passive market participants: with respect to the world market, the "Schumpeter countries" Japan, the US and the leading EC-countries shape the innovative process in the First World, while the NICs – being themselves imitators with respect to the advanced market economies – play a similar role in the Third World. The Second World stands between the great technological gravity centres and shows a high degree of innovativeness in some niche fields – particularly the military.

### Shifts in World Export Shares

The slowdown of productivity growth in industrialized countries during the 1970's was coupled with supply shocks, an increasing weight of the welfare state and, testifying to the perverse incentive effects of an overregulated economic system, a booming shadow economy.<sup>8</sup> The oil price shocks of the '70s which rendered part of the capital stocks obsolete also gave new opportunities for entrepreneurship, namely in the field of innovations in resource-saving technologies and products. The young newly industrialized market economies (NICs) successfully continued their outward-oriented industrialization strategy: by combining capital deepening (thus realizing a high rate of embodied technical progress), technology imports and improved human capital formation, they achieved high rates of growth in national income, productivity and, due to improved international competitiveness, growing real exports. In the 1970's, the communist countries – except for the USSR which benefited from the oil price hikes – suffered from an ongoing bureaucratization, increased centralization, declining productivity growth

and declining terms of trade. Only in the new era of Gorbachev have economic reforms which aim at increasing productivity, flexibility, growth and international competitiveness been implemented in the CMEA countries.

Hence, there have been remarkable shifts in the share of world exports over the past decades (see Table 1). While the share of the developed market economies changed little between 1950 and 1983, there have been considerable shifts within the group: Japan's share increased by nearly the same amount as the share of the United States dropped. The recent sharp fall of the dollar and the continuing high US current account deficits accentuate this question. The remarkable success of the Japanese economy has much inspired the Asian NICs, such as Korea, Taiwan, Singapore and Malaysia.

As the population in Asia is growing at the fastest rate of all continents,<sup>9</sup> the growth-cum-export strategy is likely to remain a feasible and valid policy option in Asia, especially in the Pacific basin. The developing countries with a per capita income over \$ 1500 – to be roughly associated with the NICs – have considerably increased their share between 1960 and 1983, whereas the low income group (LDCs) has lost ground in international markets.

The CMEA share has remained relatively constant over the years. If we take intraregional trade (within the EC and the CMEA countries) into account, the period 1970-83 shows a drop of the socialist countries' share in world exports. In highly competitive world markets, new and better products crowd out the traditional ones, so

<sup>8</sup> For the slowdown of productivity growth see the empirical evidence in A. Lindbeck: The Recent Slowdown of Productivity Growth, in: *Economic Journal*, 93 (1983), pp. 13-34. The declining competitiveness of the EC in Asia is symptomatic: R. J. Langhammer, U. Hiemenz: Declining Competitiveness of EC Suppliers in ASEAN Markets: Singular Case of Symptom, in: *Journal of Common Market Studies*, 24 (1985), pp. 105-119. The decline of US competitiveness is analyzed in R. Z. Lawrence: Can America Compete?, Washington 1984. Different strategies of industrialized market economies for increasing competitiveness are analyzed by M. Dauderstädt: Free Markets versus Political Consensus, in: *INTERECONOMICS*, 22 (1987), pp. 21-28. As a matter of fact, the innovative shadow economy was booming both in capitalist and socialist systems in the 1970's. D. Cassel, E. U. Cichy: Explaining the Growing Shadow Economy in East and West: A Comparative System Approach, *Comparative Economic Studies*, 28 (1986), pp. 20-41.

<sup>9</sup> Europe's share in the world population is gradually declining, while Asia, Africa and Latin America will increase; see World Bank: *World Population Projections 1985*, Washington 1985.

<sup>10</sup> Intrapreneurship as a form of intra-firm entrepreneurship is discussed in G. Pinchot: *Intrapreneuring*, New York 1985. On politico-economic aspects of innovation in advanced market economies see R. R. Nelson: Incentives for Entrepreneurship and Supporting Institutions, in: *Weltwirtschaftliches Archiv*, 120 (1984), pp. 646-661; W. Kingston: The Political Economy of Innovation, The Hague 1984; P. J. J. Welfens: Gesamtwirtschaftliche Steuerung als Politische Ökonomie der Innovation, in: E. U. Cichy, G. Neumann (eds.): *Probleme monetärer und finanzwirtschaftlicher Steuerung im Systemvergleich*, Duisburg 1986.

<sup>4</sup> J. A. Schumpeter: *Capitalism Socialism and Democracy*, 2nd ed., New York 1947, pp. 82 f.

<sup>5</sup> See J. A. Schumpeter: *Business Cycles*, New York 1939.

<sup>6</sup> See J. A. Schumpeter: Wandlungen der Weltwirtschaft, in: *Der Deutsche Volkswirt*, 10th September 1930.

<sup>7</sup> See J. A. Schumpeter: *Capitalism, Socialism and Democracy*, op. cit., part II, III; J. A. Schumpeter: *Unternehmer*, in: *Handwörterbuch der Staatswissenschaft*, Jena 1928, pp. 476-487.

**Table 1**  
**Value of World Exports and Country Groups' Export Shares**

	1950	1960	1970	1975	1976	1977	1978	1979	1980	1981	1982	1983
	Value of World Exports (in US\$ billion)											
World	61	129	315	878	993	1130	1302	1646	2010	1980	1852	1810
	World Export Shares (in %)											
Developed Market Economies	61.1	66.3	68.5	71.4	65.9	64.5	67.0	65.1	62.8	62.6	63.4	64.0
America	21.7	20.3	19.0	18.9	15.9	14.3	14.5	14.4	14.1	15.2	14.9	15.0
Europe	33.4	39.6	42.0	43.7	41.5	40.8	42.7	42.3	40.1	37.7	38.9	38.8
Japan	1.4	3.1	4.5	6.1	6.4	7.1	7.5	6.3	6.5	7.7	7.5	8.1
Developing Countries	30.8	21.5	19.5	17.9	24.2	25.9	23.5	25.7	28.4	28.2	26.3	24.9
>1500\$	18.0	12.9	11.8	11.5	18.5	19.9	18.1	19.9	22.2	22.4	20.8	19.5
< 500\$	7.3	4.5	3.7	2.9	2.5	2.6	2.4	2.4	2.5	2.6	2.6	2.6
CMEA	6.8	10.1	10.5	9.8	8.9	8.8	8.7	8.3	7.8	8.0	9.0	9.8

Source: United Nations: Handbook of International Trade and Development Statistics, Supplement 1985, p. 1 and p. 26, New York 1985.

that innovative and creative countries gain at the expense of the ones which progress slowly.

In Schumpeter's view innovations are bred under the pressure of crisis by a dynamic entrepreneurial minority which reacts to expected differential incomes. Entrepreneurship and intrapreneurship transform inventions in a risky (or uncertain) and costly process into commercial success.<sup>10</sup> However, creativity also manifests itself in the ability to imitate new solutions, a field in which the NICs have shown remarkable success. While Taiwan, the Republic of Korea, Hong Kong and others have managed to successfully embark on a global marketing strategy for their host of "clone" products (computers, electrical machinery), the CMEA countries have failed to do so. The poor average quality of products from the CMEA, where lack of competition reduces the incentive for quality control, is another important factor that explains slow export growth and declining terms of trade. Due to these and other influences the world income and technology pyramid has dramatically changed over the past 20 years.

### Productivity Growth Trends

After a slowdown of productivity growth in Western industrialized countries in the 1970's, productivity growth has increased again in the mid-1980's, especially in the Federal Republic of Germany, in the UK and most noticeably in the US, which had reached, together with the UK, an average annual labour productivity growth rate of less than 2.5% p.a. in the important manufacturing subsector of metal products, machinery and equipment in 1975-80. Germany, France and Italy had achieved more than 4% p.a. in that period, while Japan reached 13.9% p.a.<sup>11</sup> Long run innovation dynamics has improved in the United States recently:

during the period 1981-86, US manufacturing productivity – as measured by output per hour – resumed growing at a high rate, namely at an annual average of 3.8 as compared to 1.5% in the 1970's. This fact is only partly explained by the drop of the work force (in manufacturing industry) from 21 to 19 million between 1979 and 1986 and by the associated increase of the average quality of human capital coupled with the rise of average capital intensity.

Some newly industrializing countries have also recorded a continuing growth of labour and capital productivity, whereas CMEA countries are suffering from very slow productivity increases coupled with declining terms of trade. Those countries which offer new products that are cheaper or qualitatively superior to old ones benefit in the worldwide competition process from rising market shares and (differential) incomes. The "Schumpeter countries", i.e. those countries leading their region's quest for innovativeness and achieving the necessary flexibility of economic and social structures, rapidly improve the standard of living of their citizens. The "turtle countries" suffer from slow growth of productivity and income, while running the risk of becoming structurally foreign-indebted countries: this occurs because the mismatch between citizens' and government's aspiration levels and the insufficient indigenous innovativeness leads to high and unsustainable current account deficits in the long run. In the following analysis we will focus on the link between systemic and system-indifferent aspects of innovativeness, growth and welfare in the world economy and its subregions.<sup>12</sup>

At first, we will take a look at the changing world income and technology pyramid: the convergence of the

<sup>11</sup> OECD: Productivity in Industry, Paris 1986, Tab. 2.

# ECONOMIC SYSTEMS

**Table 2**  
**GNP per Capita(y), Growth and Innovativeness<sup>1</sup>**

"winners" > +5 "losers" < -5	y in current US \$			1965 (100 %) rank	cumulated growth 64-84 1965=1	growth rates of y p.a.		EPA patents 1985
	+/- rank	1984 (100 %)	(80 %) <sup>a</sup>			60-77	60-82	
Kuwait	+2 (1)	16720	n. a.	3260 (3)	0.98	-3.1	-0.1	1
Switzerland	+4 (2)	16330	10124	2427 (6)	1.30	2.1	1.9	1541
United States	-1 (3)	15390	9249	3557 (2)	1.38	2.4	2.2	8709
Norway	+8 (4)	13940	8615	1882 (12)	1.85	4.2	3.3	53
Canada	0 (5)	13280	7968	2602 (5)	1.57	3.6	3.1	333
Sweden	-2 (6)	11860	6914	2808 (4)	1.40	2.9	2.4	474
Australia	+3 (7)	11740	6210	1976 (10)	1.38	2.9	2.4	116
Denmark	-1 (8)	11170	6858	2117 (7)	1.40	3.1	2.5	92
Germany, FRG	+2 (9)	11130	6734	1951 (11)	1.66	3.3	3.1	7610
Finland	+5(10)	10770	6720	1761 (15)	1.85	4.2	3.6	91
Japan	+13(11)	10630	6644	917 (24)	2.39	7.7	6.1	5795
Saudi Arabia	-11(12)	10530	n.a.	4108 (1)	0.81	6.7	7.5	3
France	-5(13)	9760	5290	2024 (8)	1.75	4.2	3.7	2951
Netherlands	+2(14)	9520	6074	1541 (16)	1.48	3.7	2.9	1103
Austria	+3(15)	9140	n.a.	1303 (18)	1.96	4.2	3.9	413
Belgium	-2(16)	8610	5510	1795 (14)	1.75	4.0	3.6	339
UK	-4(17)	8570	5168	1864 (13)	1.35	2.5	2.0	2367
Libya	+10(18)	8520	n.a.	826 (28)	0.81	6.6	4.1	0
New Zealand	-10(19)	7730	4275	2021 (9)	1.30	3.3	1.5	32
Singapore	+20(20)	7260	n.a.	405 (40)	4.17	7.5	7.4	4
Trinidad + Tobago	+9(21)	7150	3575	756 (30)	1.63	1.6	3.1	0
Italy	-2(22)	6420	3602	1208 (20)	1.66	3.7	3.4	1064
Hong Kong	+10(23)	6330	3355	600 (33)	n.a.	6.5	7.0	8
Israel	-7(24)	5060	3087	1332 (17)	1.66	4.8	3.2	92
Ireland	-3(25)	4970	3012	957 (22)	1.57	3.1	2.9	34
Spain	+5(26)	4400	2640	727 (31)	1.66	5.2	4.0	79
Greece	+5(27)	3770	n.a.	715 (32)	2.03	6.2	5.2	8
GDR	-9(28)	3505	n.a.	1260 (19)	n.a.	3.2	n.a.	36
Venezuela	-3(29)	3410	1569	878 (26)	1.19	2.7	1.9	1
CSSR	-5(30)	2803	n.a.	900 (25)	n.a.	2.6	n.a.	13
Algeria	+12(31)	2410	n.a.	300 (43)	1.96	2.1	3.2	0
South Africa	+3(32)	2340	n.a.	548 (35)	1.30	2.1	2.1	70
USSR	-12(33)	2244	n.a.	1100 (21)	n.a.	3.7	n.a.	1
Argentina	-11(34)	2230	1108	955 (23)	1.06	2.7	1.6	3
Yugoslavia	-1(35)	2120	1300	593 (34)	2.23	5.6	4.9	7
Korea, Rep. of	+9(36)	2110	1217	107 (45)	3.37	7.4	6.6	1
Hungary	-10(37)	2100	1348	870 (27)	3.14	2.9	6.3	55
Poland	-9(38)	2100	n.a.	790 (29)	1.33	4.1	n.a.	15
Mexico	-1(39)	2040	513	470 (38)	1.72	2.8	3.7	2
Bulgaria	-3(40)	2017	n.a.	480 (37)	n.a.	4.4	n.a.	23
Uruguay	0(41)	1980	n.a.	369 (41)	1.40	0.8	1.7	0
Panama	-6(42)	1980	756	519 (36)	1.63	3.5	3.4	2
Malaysia	-1(43)	1980	869	303 (42)	2.31	3.9	4.3	4
Portugal	-5(44)	1970	1003	427 (39)	1.92	6.0	4.8	5
Brazil	-1(45)	1720	574	284 (44)	2.35	4.9	4.8	1
Low-Income Economies (LDCs)		260	n.a.	n.a.	1.69	1.4	3.0	17

<sup>1</sup> Table adapted from P. J. J. Welfens: Global Political Economy. Stability, Innovation and Security in the World Economy, Heidelberg 1987 (forthcoming).

<sup>a</sup> Average per capita income for 80 % of the population, i.e. excluding the richest quintile. Income distribution data were taken from World Bank (1986). Sources: For 1984: World Development Report 1986, Tab. 1, 24, 27, figures for the USSR, CSSR, GDR and Bulgaria were calculated from the latest World Bank Atlas (1981) giving complete figures for CMEA countries assuming y relative to Hungary was the same in 1984 and in 1979. For 1965: IMF (1982), IFS Yearbook 1982, except for Eastern European countries, where world bank figures from P. M a r e r (1985), pp. 211-216 were used. Income growth rates are from World Development Report 1979 and 1984. Cumulated growth was calculated from average annual growth rates as contained in World Bank (1986). Iran, Iraq, Chile excluded. Number of patents at the EPA from European Patent Agency (1985), pp. 72-74.

US, Europe and Japan, and the diverging development of industrialized market economies and the CMEA countries become obvious. The relative decline of the latter is highlighted by the fact that the NICs will overtake the East European CMEA countries in the long run in terms of innovativeness and per capita income. While the USSR, the GDR and the CSSR were among the top 25 in the world per capita income list in 1964, no CMEA country ranked in this group in 1984. Many NICs moved toward the top of the world per capita income list, although the success of some of these is threatened by heavy external indebtedness. Resource transfer to Latin American countries has been negative since 1982/83, which reduces the prospects of investment and capital-embodied technical progress.<sup>13</sup>

### Income and Technology

With respect to innovativeness and growth, the structure of the world is changing gradually, but significantly. The structure of the world economy can be visualized as a stylized global hexagon with the points NICs/OPEC, Japan, US, EC, CMEA, LDCs; CMEA covers here only East European countries plus the USSR).<sup>14</sup> The ranking of per capita income in the global hexagon, which also provides a rough measure of the global productivity hierarchy, has dramatically changed over the past 20 years. We will argue that the shifts within the world income pyramid are partly explained by the diverging innovativeness of regions and systems.

The newly industrializing countries and the OPEC countries are the "nouveaux riches" of the world economy: while increasing their level of technology they are going through a rather successful dynamic

industrialization process which enables them to tap the "technology pool" of the advanced North of the globe to a considerable extent; this occurs mainly by imitation and license agreements, but also by first indigenous R&D efforts. Of the \$ 208 billion devoted to R&D in the world in 1980, the developing countries spent only \$ 12.5 billion: while their share in world R&D expenditures rose from 2.3 % in 1970 to 3.9 % in 1975 and to 6 % in 1980, expenditures relative to GNP reached only 0.4 % in 1980 as compared to 2.2 % in the industrialized countries; per capita expenditure reached \$ 9.14 in Korea in 1980 – as an example from the NICs – which was seven times as high as in India, an example from the LDC country group.<sup>15</sup> Compare to this the per capita expenditure in the US, Japan, Germany, the UK and France, respectively, of \$ 227, 125, 158, 125 and 130.<sup>16</sup>

In advanced market economies, the state interferes in the private R&D decision to some extent: standards (e.g. for pollution control), government-funded fundamental research and state-sponsored military R&D are important in this respect. SDI has played an important role for the US – and the USSR – in recent years. The question was raised whether increasing military R&D efforts would not divert resources from the civilian sector in a counterproductive manner. Much depends on the expected civilian spin-off from military R&D. However, one may ask whether Japan's economic success is not partly explained by its restriction of military expenditures to 1 % of GNP (it is currently about to lift that limit). Several NICs, e.g. Israel, Brazil, Korea and Argentina, have tried to broaden and upgrade their industrial base by building a high-tech military production sector. On the one hand, this diverts resources from civilian economic progress. On the other hand, these NICs have employed this strategy as both a means for import substitution and as a tool for creating a market niche in developing countries.<sup>17</sup>

### CMEA: Modest Innovativeness

The socialist economies have organized NIOKR (R&D) as part of their planning system. There are many recent theoretical and empirical studies of the relative backwardness in the innovation process in CMEA countries.<sup>18</sup>

The GDR and the USSR devoted nearly 4 % of national income to R&D in 1983. These countries have a

<sup>12</sup> We thus extend recent research on systemic aspects of innovativeness and growth, e.g. presented in A. Schüller, H. Leopold, H. Hamel (eds.): *Innovationsprobleme in Ost und West*, Stuttgart 1983; R. R. Nelson: *High-Technology Policies*, Washington 1984; R. C. Kormendi, P. G. Meguire: *Macroeconomic Determinants of Growth*, in: *Journal of Monetary Economics*, 16 (1985), pp. 141-163; K. Poznanski: *The Environment for Technological Change in Centrally Planned Economies*, World Bank Staff Working Paper, No. 718, Washington 1985; C. J. Dahmann, B. Ross-Larson, L. E. Westphal: *Managing Technological Development. Lessons from the Newly Industrializing Countries*, World Bank Staff Working Paper, No. 717, Washington 1985; H.-H. Höhmann, A. Nove, H. Vogel (eds.): *Economics and Politics in the USSR: Problems of Interdependence*, Boulder 1986; D. Lal, M. Wolf (eds.): *Stagnation, Savings and the State, Perspectives on the Global Economy*, Washington 1986; L. Balcerowicz, P. J. J. Wellens (eds.): *Innovationsdynamik im Systemvergleich*, forthcoming; P. J. J. Wellens: *Innovation, Trade, External Debt and Growth in the World Economy*, invited paper for the conference on Economic Development and the World Debt Problem, University of Zagreb, 1987.

<sup>13</sup> See J. Sachs: *Managing the LDC Debt Crisis*, Brookings Papers on Economic Activity, 1986, pp. 397-431.

<sup>14</sup> The hexagon model was developed in P. J. J. Wellens: *Global Political Economics: Developments and World Dynamics 1870-1985*, discussion paper University of Duisburg, FB 5, No. 81, Duisburg 1985.

<sup>15</sup> H. Helmschrott: *Industrielle Forschung und Entwicklung in den Entwicklungsländern*, in: *Ifo-Schnelldienst*, 21/1986, pp. 13-18.

<sup>16</sup> C. Freeman: *The Economics of Industrial Innovation*, 2nd ed., London 1982.

<sup>17</sup> See H. Wulf: *Arms Production in the Third World*, in: *SIPRI: World Armaments and Disarmament*, SIPRI-Yearbook 1985, pp. 329-344.

leading position in the CMEA country group. Despite massive R&D expenditures and – relative to OECD countries – high investment-GDP ratios of nearly 30 %<sup>19</sup> (in the market economy group only Japan's investment-GDP ratio matches that of CMEA countries), the innovativeness of most socialist CMEA countries is rather modest. The high investment-output ratio in CMEA countries would suggest that capital-embodied technical progress is diffusing at a high pace in these countries, generating high growth rates of private and public consumption; this is in obvious contrast to reality.

In view of the high investment-output ratio there is much self-deception in the table calculated by Roman:<sup>20</sup> having weighted labour with  $\frac{2}{3}$  in the calculation of the progress of total factor productivity, his table, based on CMEA statistics, shows average annual growth rates of CMEA countries for 1950-70 in the range of 5.6 to 9.3 for national income, 4.4 to 9.3 for labour productivity growth and 3.3 to 6.3 for total factor productivity growth (the top values are for Bulgaria, the bottom values for Hungary). Judging by CMEA statistical records, the CMEA countries' standard of living should be higher than that of the market economies; the gap between the two groups should at least be decreasing. Any personal inspection by neutral observers would tell a different story. On the contrary, there is little doubt that several Asian NICs are overtaking the CMEA countries in the 1980's with respect to the standard of living. There is only one recent study from GDR authors which provides an in-depth analysis of the link between innovation, efficiency and growth, while still revealing a self-deceptive evaluation of CMEA innovativeness.<sup>21</sup>

Whether one takes the trade in technologically advanced goods (SITC group 7: machinery and transport equipment) or the contribution of CMEA countries to global production of know-how, the innovativeness of CMEA countries is low: CMEA

countries accounted for 3.3 % of total world patent applications in 1974, while the six leading Western industrialized countries (US, FRG, Japan, UK, France and Switzerland) contributed nearly 80 %. Domestic patent applications per 100,000 inhabitants in the OECD were highest in 1965 and 1983 in the US, Japan, the FRG, France, the UK, Switzerland and Sweden, but lowest in Yugoslavia. During the past fifteen years the technology balance as measured by the net payments for patents and licences from abroad was always positive for the US, which benefits not only from its high technology standard, but also from the large number of subsidiaries of US multinationals paying royalties or fees for licences. Sweden, Denmark and the UK were the only other countries which had a positive technology balance both in 1973 and 1983. Japan has made the greatest progress of all countries in reducing its – meanwhile negligible – deficit position.<sup>22</sup>

Although the majority of the CMEA countries has been rather successful in copying Western technology and in promoting indigenous innovations in several fields, the systemic slow speed of adjustment of firms and managers works to the disadvantage of these countries in the global quest for markets. Two-tier exchange rate systems, overregulation, non-optimal tariffs and quotas impede the socialist countries. While these barriers to trade tend to isolate the CMEA economies somewhat from world market fluctuations and the capitalist business cycles, they reduce the intensity of price and quantity signals from the world market. However, slow adjustment in foreign trade is the more costly for socialist countries the greater the number of countries which act under the pressure of intensive internal competition or of high external indebtedness with a fast speed of adjustment.

Flexibility pays off in the competitive world market. The market shares of the flexibly adjusting and innovative countries increase, whereas the "slow-motion countries" suffer from a reduction of their piece of the world export pie. Those countries which imitate quickly contribute to melting away the differential profits of Schumpeterian pioneers, thus creating new incentives for technological development. The "I-5 scheme" of technical progress – as we may dub it – starts again: inspiration-invention-innovation-investment-imitation. Expected transitory extra profits, anticipated demand shifts and the continuous flow of new knowledge (generated by the scientific community and experience) inspire new efforts for R&D and novel product design. With further inventions, the markets'

<sup>18</sup> See e.g. J. Slama, H. Vogel: *Comparative Analysis of Research and Innovation Processes in East and West*, in: C. T. Saunders (ed.): *Industrial Policies and Technology Transfer between East and West*, New York 1977, pp. 103-120. Additional evidence is presented in E. Zaleski, H. Wiernert: *Technology Transfer between East and West*, Paris 1980. See also the arguments discussed by L. Balcerowicz: *Enterprises and Economic Systems: Organisational Adaptability and Technical Innovativeness*, in: H. Leipold, A. Schüller (eds.): *Zur Interdependenz von Unternehmens- und Wirtschaftsordnungen*, Stuttgart 1986, pp. 189-208.

<sup>19</sup> See K. Steinitz: *Produktivität unter veränderten Reproduktionsbedingungen*, in: A. Donda et al.: *Produktivität im entwickelten Sozialismus*, Berlin 1985, pp. 7-42.

<sup>20</sup> Z. Roman: *Produktivität und Wirtschaftswachstum*, in: A. Donda et al.: *Produktivität im entwickelten Sozialismus*, Berlin 1985, pp. 111-143.

<sup>21</sup> H. D. Haustein, H. Maier: *Innovation and Efficiency*, Berlin 1985.

<sup>22</sup> OECD: *OECD Science and Technology Indicators*, Paris 1986.

adoption rate determines the rate of innovation, mostly coupled with additional investment and later with a worldwide imitation process, in which the innovative countries gain at the expense of the turtle countries.

### Winners and Losers

Contrary to the expectations of many experts, the world income pyramid has not become more flat. In addition, socialist countries did not manage to improve their position relative to Western industrialized countries. The outward-oriented NICs have been quite successful in their attempt to launch a long-run catching-up process. The world income pyramid has significantly changed during 1965-84. The countries identified by the World Bank as upper middle income countries had an average weighted per capita income of \$ 1950 in 1984, thus roughly matching that for the CMEA countries; Hungary's per capita income of \$ 2100 is supposed to be slightly above the weighted average of the CMEA group. Per capita income of South Korea was somewhat higher than that of Hungary in 1984, whereas Hungary's per capita income was eight times that of South Korea in 1965. While Brazil, Panama, Portugal, Malaysia, Mexico and Uruguay, Spain and Singapore were behind the CMEA countries in terms of per capita income in 1965, they had reached or even surpassed these in 1984. Except for Bulgaria, the CMEA countries – and Panama/Argentina and Saudi Arabia – were the main losers with respect to changes in the top 45 per capita income list. The main winners were the resource rich countries Norway, Libya, Algeria and Trinidad-Tobago, on the one hand, and the dynamic outward-oriented Japan and several NICs, among these Singapore, South Korea and Hong Kong, on the other hand. The only socialist state to be listed in the group of upper middle income countries – to be roughly identified as the NICs (the World Bank groups the European CMEA countries and the USSR as a separate item) – is Algeria. However, income distribution in NICs and LDCs is relatively uneven: the social fabric is not permeable enough and thereby causes the potential for social conflicts, which divert creativity potential from innovations in the economic system.

Mexico as well as Brazil are extreme examples among the NICs which show that leaving out the highest income quintile reveals a different picture of the average standard of living than overall figures for per capita income would suggest. The 80 % figure – as opposed to per capita income for 100 % of the population – shows that an international per capita ranking can change considerably when distributional aspects are taken into account.

The number of US patent applications at the European Patent Agency (EPA) was only slightly above the figures for Germany (and Japan) in 1985. Figures from the EPA are particularly interesting as applications made and patents granted are not distorted by diverging national practices. More than 40 % of the patent applications of EC members at the EPA came from West Germany in 1985. The application figures of the CMEA countries (with Hungary leading the group) were lower than the figures for Sweden or Finland/Norway alone and were matched by the NICs subgroup Israel-Hong Kong-Taiwan-Malaysia-Brasil-Singapore. India stands out in the LDC group.

### Topics for the Future

A rather even income distribution can accompany high income growth, outward-oriented policy and considerable innovativeness. The best example revealing the most significant change of per capita income over the period 1965-84 is, of course, Japan whose per capita income was slightly above that of Poland in 1965, but had reached a five-fold level in 1984. The second oil price shock affected the average per capita growth in Japan only slightly, as a comparison of the growth rates for the periods 1960-77 and 1960-82 demonstrates. From the non-oil producing countries Canada, Germany, Austria, Hungary, Singapore, Panama and Hong Kong were able to regain pre-oil shock per capita growth rates after 1977 (in Hong Kong growth rates even rose).

The former US lead in per capita income and innovativeness has come under pressure since the 1970's. Both NICs/Japan and the EC countries have played a major role in this context: they have especially improved on their abilities in global marketing. The fall of the dollar between 1984 and 1987 against the Yen, the Swiss Franc and the German DM reflects the eroding competitiveness of the US economy. However, part of the dollar decline is explained by an increased competitiveness of the US financial service industry with its host of financial innovations which contributed to rising capital imports and thus a deterioration of the current account balance. The link between the high tech SDI approach, higher government expenditures, public deficits, competitiveness and the current account deficit poses new and interesting questions. It remains to be seen whether the efforts of the US economy to streamline its corporate structure are successful in the medium term. Innovativeness and competitiveness will be highly important topics for the world economy in the future, and more research in a Schumpeterian spirit should be devoted to the associated theoretical and political issues.