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SOME QUESTIONS OF WORLD ECONOMIC COMPETITION

ABSTRACT

The paper searches for an answer to the following questions**:** why had the situation in Japan and the European Union situation improved in comparison with the one in United States prior to the first oil price shock; what factors altered this tendency later, especially from the 1990s onwards; what was the role of the international economic conditions in all that? Applying the models of mathematical economics, the authors have proven their main statements by an econometric investigation. The most important conclusion that can be drawn is that in the world economic competition the situation both in Japan and the European Union was primarily determined by the changes in the world economic conditions, chiefly the oil prices in the world market and the exchange rates, what can less be said of the United States.

Key words: world economic competition, USA, European Union, Japan, long-term tendencies, main determinant factors.

In our globalising world, development is taking place under the conditions of an increasingly sharp international economic competition, in which an extremely great role is played by world economic centres formed after the Second World War, namely the United States, Japan and the European Union. Recently a further economic centre has been

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emerging with the participation of China and India, but in this paper they will be disregarded because we are going to analyse long-term tendencies. The study of international competition is indispensable for understanding and forecasting fundamental processes of the modern world economy. Here an attempt is made to reveal *what main factors determine the competition of three centres of world economy.*

We set out from the consideration that world economic competition fundamentally depends on the rate of economic growth, on its determinant factors making their impact interwoven with one another. They include regularities, factors of technical progress and growth mechanism, respectively, as well as international economic conditions. The interweaving of different effects complicates but does not make it impossible to analyse the individual components and the problems connected with them. We can rely on models of mathematical economics, on an econometric investigation, the results of which, in case of analysing a longer period, provide relatively reliable information. We carried out an investigation covering more than four decades (1960-2003), using economic development data on the United States, Japan and the European Union. Thus, one can reveal what led to the emergence of present tendencies, which, as will be seen, are unfavourable primarily for Japan and the European Union.

GENERAL CHARACTERISATION OF WORLD ECONOMIC COMPETITION

The foregoing development of world economic competition can be divided into two main phases, between which it is essentially the two oil price shocks (1973 and 1979-1981) that can be considered as a watershed. It should be noted that the term European Union in the present paper, unless otherwise indicated, covers the 15 larger European economies to ensure comparability between these two periods.[2] Until the first oil price shock, Japan's and the European Union's economic performance had greatly improved as compared to the United States

2 Of course, the countries that accessed EU after May 2004 could not be included in this research.

representing the advanced world level. The catch-up in the case of Japan continued to the early 1990s, but more slowly than earlier. As for the European Union, the favourable trend calculated per inhabitant had already turned about during the first oil price shock, while in terms of productivity the loss of space in relation to the United States began in the period of the second oil price shock in the early 1980s. The competition of world economic centres since the early 1990s has unambiguously turned to the disadvantage of Japan and the European Union; it was particularly Japan that got into trouble (Table 1).

Table 1. GDP per inhabitant and per employed in the three centres of the world economy

(in dollars of 1995, at purchasing power parity – PPP)

Year	GDP per inhabitant						GDP per employed					
	United States		Japan		European Union		United States		Japan		European Union	
	$	%	$*	%	$**	%	$	%	$*	%	$**	%
1960	12 468	100.0	4 325	34.7	8 178	65.6	33 758	100.0	9 124	27.0	19 041	56.4
1973	16 454	100.0	12 622	76.7	13 700	83.3	45 797	100.0	26 089	57.0	33 962	74.2
1982	20 126	100.0	15 705	78.0	15 710	78.1	47 047	100.0	33 008	70.2	40 278	85.6
1991	25 310	100.0	21 581	85.3	19 088	75.4	54 637	100.0	42 016	76.9	45 824	83.9
2003	32 333	100.0	24 017	74.5	23 210	71.8	68 290	100.0	48 559	71.1	54 049	79.1

* US Dollar 1 = Yen 178. - ** US Dollar 1 = PPS 0.839.

Sources: Alan Heston, Robert Summers and Bettina Aten, *The Penn World Table Version 6.1*, Center for International Comparisons at the University of Pennsylvania (CICUP), October 2002; National Accounts Statistics, United Nations, New York; National Accounts, OECD, Paris; Yearbook of Labour Statistics, ILO, Geneva, various volumes; New Cronos Eurostat database.

One of the most important factors of the "Japanese economic miracle", i.e. Japan's extraordinary rapid post-war economic development, was the adoption, introduction, diffusion and improvement of new technologies. Bridging the technology gap was from the beginning one of the basic considerations in the European integration, too. The European Union has had a comparative advantage over the United States and Japan in nuclear power industry, aircraft construction, pharmaceuticals, manufacture of telecommunication equipment and, among the traditional sectors, food processing, car industry and many branches of engineering. At the same time, Europe lagged behind in the

development, production and sale on the world market of some high-tech products (computers, semi-conductors, robots, etc.). The loss of world market positions by European industry is attributable not really to technological backwardness but to other factors such as slower innovation or insufficiencies in modern company organisation and management. In a number of fields, notably in telecommunications, air transportation and the banking sphere, Europe's disadvantage is due to the high proportion of public ownership, over-regulation and the relatively closed nature of internal markets. As a result of the single market and privatisation gathering momentum, some improvement has been observable in these fields since the turn of the millennium.[3]

The Lisbon strategy approved in March 2000 wished to make the European Union the world's most dynamic and competitive knowledge-based economy. A goal was set for GDP per inhabitant to exceed the U.S. level by 2010, for the share of employed in working age population to rise from 63.4 to 70.0 percent and for the rate of unemployment to fall from 7.8 to 4.0 percent.[4] The EU, by carrying out liberalisation, would have liked to catch up with the United States, simultaneously preserving its social system. The strategy at issue did not yield the expected results. Therefore, the European Council in March 2005, on the basis of the Commission's mid-term review published in the preceding month, re-launched the Lisbon process. Creation of more and better jobs, knowledge and innovation growth and improvement of business environment were then determined as its main objectives. Proceeding from the fact that Europe is lagging behind Japan and the United States particularly in research and development (R&D) spending, the Barcelona European Council in March 2002 set a goal to increase R&D expenditure to 3 percent of GDP by 2010.[5] As seen from Table 2, this task has so far been completed only by Sweden and Finland.

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3 Tibor Palánkai, Economics of Enlarging European Union, Akadémiai Kiadó, Budapest, 2004, pp. 198-201.

4 Gács János, "A lisszaboni folyamat – egy hosszú távú stratégia rejtélyei, elméleti problémái és gyakorlati nehézségei", Közgazdasági Szemle, 52. évf., 3. sz., 2005. március, 213. old.

5 Marján Attila (szerk.), Az Európai Unió gazdasága. Minden, amit az EU gazdasági és pénzügyi politikáiról tudni kell, HVG Kiadói Rt, Budapest, 2005, 31, 85, 86, old.

Table 2. Gross domestic expenditure on R&D as a percentage of GDP

Country/group	1981	1985	1990	1995	2000	2002	2003	2004
Austria	1.13	1.24	1.39	1.54	1.91	2.12	2.19	2.26
Belgium	1.57	1.62	1.64	1.67	1.97	1.94	1.89	1.90
Denmark	1.06	1.21	1.57	1.82	2.24	2.51	2.56	2.58
Finland	1.17	1.55	1.88	2.26	3.38	3.43	3.48	3.51
France	1.93	2.22	2.37	2.29	2.15	2.23	2.18	2.16
FRG*	2.43	2.68	2.75	2.19	2.45	2.49	2.52	2.49
Greece	0.17	0.27	0.37	0.49	0.66	0.63	0.61	0.57
Ireland	0.68	0.77	0.83	1.26	1.13	1.10	1.16	1.20
Italy	0.88	1.12	1.29	0.97	1.05	1.13	1.11	n.a.
Luxembourg	n.a.	n.a.	n.a.	n.a.	1.65	1.66	1.66	2.00
Netherlands	1.79	1.99	2.07	1.99	1.90	1.72	1.76	1.78
Portugal	0.30	0.38	0.51	0.54	0.76	0.78	0.74	1.00
Spain	0.41	0.53	0.81	0.79	0.91	0.99	1.05	1.07
Sweden	2.17	2.71	2.84	3.32	3.91	4.09	3.95	3.70
United Kingdom	2.38	2.24	2.16	1.95	1.84	1.89	1.88	1.79
European Union**	1.69	1.86	1.96	1.85	1.91	1.95	1.95	1.92
United States	2.34	2.76	2.65	2.49	2.73	2.64	2.67	2.66
Japan	2.11	2.54	2.85	2.92	3.05	3.18	3.20	n.a.

* Figures for FRG after 1990 refer to unified Germany.

** Prior to 2000, excluding Luxembourg.

Sources: OECD Science, Technology and Industry Scoreboard, Paris, various volumes; New Cronos Eurostat database.

The level of investment in scientific and technological activities is so diverse across the EU countries that it does not merge into a single innovation system.[6] Between 1991 and 2001, the share of the United States in the world's R&D expenditure rose from 36.7 to 41.4 percent, whereas that of European Union lessened from 31.5 to 23.7 percent and that of Japan from 23.3 to 20.6 percent. At the same time, the share of business enterprises in financing that expenditure increased from 71.3 to 72.6 percent in the United States, while in Japan and the European Union

6 See Daniele Archibugi and Alberto Coco "Is Europe Becoming the Most Dynamic Knowledge Economy in the World?", Journal of Common Market Studies, Vol. 43, No. 3, September 2005, pp. 433-459.

it somewhat diminished (from 70.7 to 69.3 percent and from 64.2 to 63.8 percent, respectively).[7]

It is striking that the so-called "*Irish economic miracle*" has very little connection with changes in R&D. Only until 1995 was some growth observable, thereafter a rather decreasing trend prevailed, whereas Ireland's R&D level was not much exceeding *half* of the Union's average. It was not own R&D but the working capital representing high technology flowing from abroad, first of all from the United States, that resulted in the Irish "economic miracle", as shown in an earlier study.[8]

World economic competition in international respect is waged mainly for market acquisition and is manifested in world trade (Table 3).

Table 3. Share of three economic centres in world trade

(percentage)

Year	EC/EU		United States		Japan	
	exports	imports	exports	imports	exports	imports
1958	23.6	22.9	18.5	14.5	3.0	3.0
1973	38.5	39.2	12.7	13.0	6.7	6.8
1981	32.5	33.2	12.4	13.8	7.9	7.2
1986	38.8	36.6	11.1	17.9	10.3	6.0
1995	40.2	38.0	11.4	14.8	8.6	6.5
2003	38.2	35.9	9.7	17.1	6.4	5.0

Source: International Financial Statistics Yearbook, IMF, Washington, D.C., various volumes.

On the basis of data in Table 3, it can be ascertained that in world trade the greatest weight to the end belonged to the European Union and its predecessor, the European Community. This is mostly connected with the fact that EU countries have a much smaller internal market than the United States or Japan, which induce a relatively larger share of foreign trade. Also a substantial circumstance is that the bulk of EU "world trade" is directed towards a protected internal market inside the centre.

7 World Investment Report, United Nations, New York and Geneva, 2005, p. 287.

8 György Simon Jr., "Ireland's 'Economic Miracle' and Globalisation", International Problems, Vol. LVII, No. 1-2/2005, pp. 5-30.

Conclusions about world economic competition can be drawn on the basis of changes in export and import shares.

1. Until the first oil price shock, the share of EU and Japan in world trade had greatly increased, while that of the United States had considerably decreased, particularly concerning exports.

2. The EU's share in the period of two oil price shocks had significantly fallen back; afterwards, until the mid-1990s, it had increased again and then diminished once more. In 2003 it was lower than the level of 1973, mainly regarding imports. At the same time, some export surplus was achieved.

3. Japan was able to have increased its share in world exports until the mid-1980s; thereafter, a large-scale setback occurred. Its foreign trade in the mid-1980s was characterised by a significant export surplus which later on considerably decreased, essentially as a consequence of currency revaluations by far exceeding the PPP level. In 2003, even the import share was lower than in the mid-1980s.

4. The United States' export share was barely touched by the two oil price shocks, but later on a certain decrease could be observed. Import shares until the early 1980s were mostly in accordance with export shares, but afterwards they significantly diverged from each other, the trade balance was upset and a very large import surplus emerged, which is today a serious problem of the U.S. economy.

5. The joint share of three economic centres in world trade had increased until the first oil price shock; in the period of two oil price shocks, it diminished; thereafter, it increased again and then decreased once more. In 2003, it was lower than the level of 1973 and was characterised by a considerable import surplus. In that the effect of intensifying competition of newly industrialising countries (including China and India) was manifested.

The relations of the United States, European Union and Japan are a specific blend of cooperation and trade wars, a hard competition with reprisals. Earlier Japanese economic successes were accompanied by deep export market penetration and accumulation of a significant deficit in the U.S.-Japan and EU-Japan trade (Table 4).

Because of increasing trade deficit, the European Commission, from the mid-1970s to the early 1990s, imposed so-called voluntary export restraints on the Japanese government. Besides, it took various anti-dumping measures against Tokyo between 1979 and 1995, which restricted mainly the imports of Japanese electronic products. In July 1991, a joint declaration on the relations between the European Community and Japan was adopted in The Hague, in which both sides confirmed their commitment to market principles, free trade, prosperity and healthy development of the world economy. In the same month, an agreement was reached limiting Japanese automobile exports to the EC, which was in effect until the end of 1999 but did not pertain to vehicles produced by Japanese firms in Western Europe. In June 1996, the European office of the EU-Japan Industrial Cooperation Centre was opened in Brussels. This centre is a joint venture of the Brussels commission and Japanese government, established in 1987 to promote industrial cooperation.[9]

Table 4. Japan's share in United States and EC/EU foreign trade

(percentage)

Year	Japan/United States			Japan/European Community/Union		
	exports	imports	imports as a percentage of exports	exports	imports	imports as a percentage of exports
1958	5.5	5.0	148.2	0.9	0.6	118.8
1973	11.8	14.1	85.9	2.9	4.0	53.9
1981	9.3	13.8	58.0	2.1	5.3	34.6
1986	11.8	21.4	32.8	3.3	9.9	34.3
1995	11.0	16.5	50.5	5.7	10.0	60.6
2003	7.2	9.3	43.0	4.1	6.9	57.0

Note. EC/EU foreign trade does not contain the turnover of internal market.

Sources: Brian R. Mitchell, *International Historical Statistics. The Americas 1750–2000*, Palgrave Macmillan, Houndmills, Basingstoke, Hampshire and New York, 2003, pp. 439, 441, 480; 50 years of figures on Europe. Data 1952–2001, Eurostat, Luxembourg, 2003, pp. 137, 139; Direction of Trade Statistics Yearbook, IMF, Washington, D.C., 2004, pp. 34, 36, 511.

9 Desmond Dinan (ed.), Encyclopedia of the European Union, Macmillan Press Ltd., London, 2000, pp. 305-309.

Increasing import surpluses have aggravated commercial contradictions not only between the EU and Japan but also between the United States and Japan. Because of its extreme dependence on imported raw materials, Japan is compelled to export finished goods. With respect to the United States, 90 percent of Japan's trade surplus falls on automobiles, computers, video cassette recorders and semi-conductors.[10] The post-war history of American-Japanese trade relations is long and complicated and will not be worked out in detail here.[11] In recent years, Japan, struggling with significant structural problems, has attempted to break through the isolation and has been endeavouring to increase its regional influence. The EU, too, has been drawing increasing attention to the local processes of world economy, an important expression of which is the Asia-Europe Meeting (ASEM), a cooperative forum initiated in 1996.[12]

In the world economic competition, an increasing role is played by foreign direct investment (FDI, see Table 5). Considering the whole investigated period (1968-2003), the EU and Japan are net capital exporters, while the United States is, to a minimal extent, a net capital importer. Whereas in the case of Japan net capital exports dominated to the end, with respect to the United States and European Union sharp turns occurred. Until the oil price shock of 1973, the United States had been the dominant net capital exporter and the EU the working capital importer number one. Thereafter, the situation changed: the EU became the largest capital exporter. At the same time, the United States transitorily (see the 1981 and 1986 data) turned into the largest working capital importer. In our days, America advanced to the position of a net capital exporter again, but in this regard it must now share the first place with the European Union.

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10 J. Barkley Rosser Jr. and Marina V. Rosser, Comparative Economics in a Transforming World Economy, MIT Press, Cambridge, Massachusetts, 2004, pp. 172-173.

11 See e.g. John Kunkel, America's Trade Policy Towards Japan: Demanding Results, Routledge, London, 2003.

12 Blahó András, Világgazdaságtan. Globális fejlődés, gazdaságdiplomácia, Aula Kiadó, Budapest, 2002, 381-382. old.

The three world economic centres *together* behaved to the end as net capital exporters and the rest of the world as a net capital importer. From this, it can be concluded that a good deal of capital flows at issue is induced by the extra-profit achievable in connection with the relatively lower wage level of less developed regions if other requirements are also met, notably the adequate training of labour force, as well as political and economic (primarily general government) stability. At the same time, the major part of all direct investment flows, as seen from cited data, is today occurring *within* the three world economic centres, and in this not wage differences but strategic standpoints of the transnational corporations are determinant.

Table 5. Distribution of FDI flows between 1968 and 2003

Year	Inflows				Outflows			
	EC/EU	USA	Japan	Other countries	EC/EU	USA	Japan	Other countries
Percentage: world = 100.0								
1968	23.9	11.9	1.1	63.1	18.5	63.0	2.5	16.0
1973	45.7	17.1	–	37.2	35.0	49.1	8.1	7.8
1981	21.8	40.2	0.3	37.7	53.0	18.7	9.8	18.5
1986	26.5	45.2	0.3	28.0	46.5	18.7	15.8	19.0
1995	35.6	17.6	0.0	46.8	48.4	29.6	6.7	15.3
2003	51.2	10.7	1.0	37.1	57.4	22.7	4.7	15.7
USD billion								
1968–2003	3743.6	1917.6	58.8	3001.5	4838.6	1829.0	537.8	1651.8

Source: Balance of Payments Statistics Yearbook, IMF, Washington, D.C., various volumes.

The rise of the European dollar market in the 1960s was what first raised the necessity of a monetary union, the creation of which was decided in 1969. This decision was concretised by the Werner plan of 1970, which, however, because of the collapse of the Bretton Woods system, practically failed the next year. The promotion of European competitiveness was served by the so-called currency snake (1972-1979), as well as the European Monetary System (EMS), established in 1979, where the stable German mark was playing the leading role. Within the latter's framework, the former European Unit of Account (EUA) was replaced by a European Currency Unit (ECU), determined considering national currencies by weighting correspondent to EC

member states' economic strength. The EMS encouraged the reduction of inflation, stabilised and opened more widely the capital markets, expanded international trade flows and foreign investment.[13]

In the European Community, from the late 1970s, stability replaced full employment as the overriding political objective and, in economic policy, neo-liberalism expanded in the next decade. At the same time, in the 1980s the volatility of the international monetary system was aggravated by a rapid increase in capital mobility. The unstable situation was characterised by wide parity swings and manageable only, at least for the medium term, by means of the Plaza and Louvre accords of 1985 and 1987 reached by the leading industrial countries, which established rules for coordinating central-bank intervention in order to realign currency values. The industrial and financial reorganisations of the decade were accompanied by rising unemployment, whereas the speculative attacks on EC currencies in 1992 and 1993 threatened to wreck the EMS. The Economic and Monetary Union required that criteria determined in the Delors plan of 1989 and Maastricht Treaty of 1992 should be met. As a result, in 1999, with the participation of 11 countries, a euro zone emerged, which was joined by Greece in 2001.[14]

After the eastern enlargement of 2004, the contradictions between the old and new member states of the European Union threatened the normal functioning of the single internal market, first of all because of restricting the free movement of workforce. This crisis of integration was

13 John Gillingham, European Integration, 1950–2003: Superstate or New Market Economy?, Cambridge University Press, New York, 2003, pp. 57-59, 82-83, 133-135, 226, 271, 454; Tibor Palánkai, Enlarging European Union, op.cit., pp. 113-118; Maurice Obstfeld and Alan M. Taylor, Global Capital Markets: Integration, Crisis, and Growth, Cambridge University Press, New York, 2005, pp. 160, 163, 164.

14 John Gillingham, European Integration, 1950-2003: Superstate or New Market Economy?, op. cit., pp. 82, 150, 157; Maurice Obstfeld and Alan M. Taylor, Global Capital Markets: Integration, Crisis, and Growth, op.cit., p. 164; Tibor Palánkai, Enlarging European Union, op. cit., pp. 118-123. Of the EU-15, currently the United Kingdom, Denmark and Sweden are not members of the euro zone, their average economic growth after 1992 was more rapid than that of the euro zone. See e.g. György Simon Jr., "Economic Growth in the European Union", International Problems, Vol. LVIII, No. 4/2006, pp. 387-413.

aggravated by the rejection of the EU constitutional treaty in the French and Dutch referenda of 2005.

THE EFFECT OF GROWTH FACTORS

Analysing some characteristics of world economy's development using models of mathematical economics, we are, first of all, to examine the role of growth factors, the fundamental operative causes determining the diverse growth rates of world economic centres from the production side. We are to apply an endogenous model which is homogeneous of degree one, i.e. its use does not lead to economically absurd results.[15]

According to the neoclassical approach, while proceeding to a higher level of development, the rate of economic growth should lessen, particularly in the most developed region, the United States. However, this is not true, as already seen earlier (see Table 1). Economic development data since the 1990s have also been contradicting to the conception that in connection with the adoption of advanced American technology the less developed competitors, notably the European Union and Japan, should develop more rapidly than the leader.

Endogenous models suppose that it is not enough to take only physical capital into consideration, because in the modern economy a very significant role is played by human capital, namely the education of workers, R&D activity and the effect of learning by doing.[16]

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15 Robert M. Solow, "Perspectives on Growth Theory", Journal of Economic Perspectives, Vol. 8, No. 1, Winter 1994, pp. 45-54; Simon György, "Növekedéselmélet – világmodell – gazdaságfejlesztési stratégia", Külgazdaság, 49. évf., 3. sz., 2005. március, 31-51. old.

16 See e.g. Paul M. Romer, "Increasing Returns and Long-Run Growth", Journal of Political Economy, Vol. XCIV, No. 5, October 1986, pp. 1002-1037 and "The Origins of Endogenous Growth", Journal of Economic Perspectives, Vol. 8, No. 1, Winter 1994, pp. 3-22; Robert E. Lucas Jr., "On the Mechanics of Economic Development", Journal of Monetary Economics, Vol. XXII, No. 1, July 1988, pp. 3-42; N. Gregory Mankiw, David Romer and David N. Weil, "A Contribution to the Empirics of Economic Growth", Quarterly Journal of Economics, Vol. 107, No. 2, May 1992, pp. 407-437; Robert J. Barro and Xavier Sala-i-Martin, Economic Growth, MIT Press, Cambridge, Massachusetts, 2004. For a critical assessment of earlier endogenous models, see Robert M. Solow, "Perspectives on Growth Theory", Journal of Economic Perspectives,, op.cit. and Charles I. Jones, "R&D-Based Models of Economic Growth", Journal of Political Economy, Vol. CIII, No. 4, August 1995, pp. 759-784.

The *endogenous model* used by us[17] reckons with the effect of both education and R&D, as well as the effect of learning by doing and, at the same time, as already referred to above, is homogeneous of degree one. It also gives, inter alia, an opportunity to compare productivity to the world level, with the results that would be ensured by any factor combination in case of world-level efficiency,[18] since the structure and parameters of the model were determined on the basis of a worldwide investigation using data on 131 countries, i.e. in such a sense, a *world model* is at issue.

The *general form* of the model is $Y = gM \exp[F_K (G_I + G_M + G_{HR})]$, where Y is the volume of output, namely GDP and value added, respectively, in billions of 1995 USD, at PPP, M is the number of working years, the parameter g is the output per working year produced without fixed capital,[19] F_K is the capital intensity function, approximately the natural logarithm of K/L ratio, K is the average annual gross fixed capital (including dwellings) in billions of 1995 USD, at PPP and L is the average annual number of employed in millions. G_I, G_M and G_{HR} are functions determining the elasticity of output by capital intensity, mapping the combined effect of physical and human capital, the mechanism of technical progress (technical progress functions). We used the parameters of the world model for the investigation, applying the following logarithmic version of the endogenous model.

$$\Delta \ln Y = \Delta \ln M + \Delta F_K (G_I + G_M) + \Delta F_K G_{HR} + \Delta\varepsilon \quad (1)$$

17 See Simon György, "Növekedéselmélet – világmodell – gazdaságfejlesztési stratégia", op. cit.

18 We do not deal with the latter question here. For Japan, Germany and the European Union, such an investigation has already been carried out. See György Simon and György Simon, Jr.: "The Japanese Economic Enigma", International Problems, Vol. LVII, No. 4/2005, pp. 449-483; Simon György, ifj.: "A gazdasági növekedés problémái Németországban", Statisztikai Szemle, 84. évf., 1. sz., 2006. január, 6-24. old., 2. sz., 2006. február, 130-149. old. and "Economic Growth in the European Union", op. cit.

19 It is 363 dollars at the 1985 price level. We converted the economic indicators at 1985 prices into the 1995 price level on the basis of U.S. data, using the following indices (1995/1985): 1.331 for GDP, 1.187 for manufacturing value added and 1.31 for fixed capital.

The *technical progress functions* of the endogenous model are as follows.

$$G_I = 1\text{-}exp\{- F_K [g_I F_K \, exp(g_L \, \Delta t \, exp(-F_K/5)) + g_Z F_Z]\};$$

$$G_M = g_M F_K^2 \, exp[-F_K /2 - g_{MZ} F_Z + g_O F_O \, exp(- F_H^3 /3)];$$

$$G_{HR} = g_{HR} (F_H \; F_R)^2 \quad exp(- F_K /3) .$$

$\Delta t = t - 1950$, where 1950 is the base year. The estimated values of the *parameters* are as follows: $g_I = 0.0033$, $g_L = 0.028$, $g_Z = 0.0372$, $g_M = 0.317$, $g_{MZ} = 0.43$, $g_O = 0.16$, $g_{HR} = 0.00883$. The values of variables mostly refer to the year *t*; the time index, for the sake of simplicity, is put out only in the case of retarded effects.

$F_K = ln[(L+n_K K)/L]$ (*capital intensity function*);

$F_H = ln\,[(L+ n_H H)/L]$ (*education function*);

$F_R = ln\,[(L+ n_R R_{t-2})/L]$ (*research intensity function*);

$F_Z = ln\,[(L+ n_Z Z)/L]$ (*arable land intensity function*);

$F_O = ln\,[(L+ n_O O_{t-1})/L$ (*mineral resource intensity function*).

$n_K = 1/0.250$ (in dollars of 1985); n_H=1; n_R=1000, n_Z=1; n_O=1/200.

In the *intensity functions*, n_K, n_H, n_R, n_Z and n_O are *normalising coefficients*, ln is the sign of natural logarithm. These functions express the magnitude of various kinds of physical and human capital (e.g. *K*, *H*, *R*, etc.) per employed (*L*).[20]

20 For the economic verification of the endogenous model and the method of parameter estimation, see Simon György, "Növekedéselmélet – világmodell – gazdaságfejlesztési stratégia", op. cit. The endogenous model contains the following variables: YM = manufacturing value added (MVA) in billions of 1995 USD, at PPP; M = number of working years in millions; K = average annual gross fixed capital (including dwellings) in billions of 1995 USD, at PPP; L= average annual number of employees in millions; H = number of schooling years (for population aged 15 and over); Rt-2 = number of scientists and engineers engaged in R&D, considering a two-year lag, in thousands; Z = arable land in million hectares; Ot-1 = oil and natural gas resources at the end of the year proceeding

In putting the data on world economic centres (see Table 9) into relation (1), Δε characterises deviations from the world level concerning regions and periods. Macroeconomic empirical results are contained in Table 6, those for manufacturing in Table 7.[21]

It can be asserted that the growth of world economic centres in the investigated period (from 1960 to 2003) approximately followed world economic standards and that is valid for the manufacturing sector, too (see Table 6).

At the same time, it can also be seen that the United States achieved somewhat better, the two other centres slightly worse results than the world economic average, despite the fact that Japan's growth considering the entire period was substantially more rapid than that of the United States. In the individual phases of development, the picture is mostly similar; however, it is striking that in the post-1991 period only the United States managed to achieve results better than the average.

Examining the role of individual factors, it can be stated that the increase in the amount of work and number of employed had the greatest role in U.S. economic development, which is partly connected to a more rapid growth of population but also to the fact that the previously low share of employed in the population was, by the end of the period, approaching the Japanese level and exceeding that of the European Union. In manufacturing, the situation was different: U.S. employment was decreasing; true, that of the EU much

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the reference year, in million tonnes of oil equivalent. The other variables of our investigation: N = average annual number of population in millions; I = investment (gross fixed capital formation) in billions of 1995 USD, at PPP; C = consumption (personal and government) in billions of 1995 USD, at PPP; E = exports (of goods and services) in billions of 1995 USD; IM = imports (of goods and services) in billions of 1995 USD; PN = GDP deflator (1995 = 1); PE = export (goods and services) price index (1995 = 1); PIM = import (goods and services) price index (1995 = 1); PM = MVA price index in manufacturing (1995 = 1); PCP = personal consumption price index (1995 = 1); Pt = indicator of terms of trade (PE /PIM , 1960 = 1); Vt = actual/PPP exchange rate ratio (in the United States, dollars/SDR; in the euro zone, from 1999, euros/dollar, in other cases, national currency/dollar); Ut = number of unemployed in thousands; Wo = manufacturing hourly wages at PPP, in dollars of 1995 (in the European Union, the average of German, French, UK and Italian data).

21 The data sources are cited at Table 9 below.

more. In Japan, considering the entire period, there was some staff increase in manufacturing, but after 1991 it was here that the largest downsizing occurred.

Table 6. Growth factors of the world economic centres

Indicator	Centre	1961-2003		1961-1973		1974-1991		1992-2003	
		Annual average	%	Annual Average	%	Annual average	%	Annual average	%
$\Delta \ln Y$	U.S.	0.0330	100.0	0.0424	100.0	0.0273	100.0	0.0312	100.0
	Japan	0.0470	100.0	0.0934	100.0	0.0371	100.0	0.0114	100.0
	EU	0.0300	100.0	0.0473	100.0	0.0244	100.0	0.0195	100.0
$\Delta \ln M$	U.S.	0.0166	50.3	0.0189	44.6	0.0175	64.3	0.0126	40.4
	Japan	0.0081	17.2	0.0126	13.5	0.0106	28.6	-0.0008	-7.0
	EU	0.0057	19.0	0.0028	5.9	0.0078	32.0	0.0058	29.7
$\Delta F_K(G_I+G_M)$	U.S.	0.0112	33.9	0.0105	24.8	0.0107	39.2	0.0128	41.0
	Japan	0.0387	82.3	0.0746	79.9	0.0260	70.1	0.0188	164.9
	EU	0.0230	76.7	0.0334	70.6	0.0205	84.0	0.0163	83.6
$\Delta F_K G_{HR}$	U.S.	0.0024	7.3	0.0014	3.3	0.0032	11.7	0.0021	6.7
	Japan	0.0046	9.8	0.0069	7.4	0.0044	11.9	0.0025	21.9
	EU	0.0026	8.7	0.0025	5.3	0.0022	9.0	0.0032	16.4
$\Delta \varepsilon$	U.S.	0.0028	8.5	0.0116	27.3	-0.0041	-15.0	0.0037	11.9
	Japan	-0.0044	-9.4	-0.0007	-0.7	-0.0039	-10.5	-0.0091	-79.8
	EU	-0.0013	-4.3	0.0086	18.2	-0.0061	-25.0	-0.0058	-29.7

Of the other factors, particular attention should be paid to the model component $\Delta F_K G_{HR}$ expressing the combined effect of education and R&D, the role of which has tendentially increased and is particularly significant in manufacturing, the pulling sector of the modern economy. Additionally, education also functions as a factor of complementary, implicit character. In the endogenous model, one more important factor connected to human capital is explicitly taken into consideration – the effect of learning by doing in the function G_I. In applying relation (1), this does not appear separately in the empirical results.

How can the retardation of Japan's and European Union's rapid economic development after the first oil price shock be explained?

Table 7. Factors of manufacturing development

Indicator	Centre	1961-2003		1961-1973		1974-1991		1992-2003	
		Annual average	%	Annual average	%	Annual average	%	Annual average	%
$\Delta \ln Y_M$	U.S.	0.0328	100.0	0.0528	100.0	0.0182	100.0	0.0330	100.0
	Japan	0.0583	100.0	0.1248	100.0	0.0435	100.0	0.0083	100.0
	EU	0.0272	100.0	0.0556	100.0	0.0163	100.0	0.0127	100.0
$\Delta \ln M$	U.S.	-0.0046	-14.0	0.0015	2.8	-0.0012	-6.6	-0.0163	-49.4
	Japan	0.0055	9.4	0.0321	25.7	0.0039	9.0	-0.0208	-250.6
	EU	-0.0058	-21.3	0.0049	8.8	-0.0063	-38.7	-0.0165	-129.9
$\Delta F_K(G_I+G_M)$	U.S.	0.0202	61.6	0.0241	45.6	0.0174	95.6	0.0202	61.2
	Japan	0.0490	84.0	0.0898	72.0	0.0349	80.2	0.0260	313.3
	EU	0.0264	97.1	0.0371	66.7	0.0222	136.2	0.0211	166.1
$\Delta F_K G_{HR}$	U.S.	0.0109	33.2	0.0065	12.3	0.0130	71.4	0.0124	37.6
	Japan	0.0087	14.9	0.0104	8.3	0.0089	20.5	0.0067	80.7
	EU	0.0071	26.1	0.0046	8.3	0.0066	40.5	0.0098	77.2
$\Delta \varepsilon$	U.S.	0.0063	19.2	0.0207	39.2	-0.110	-60.4	0.0167	50.6
	Japan	-0.0049	-8.4	-0.075	-6.0	-0.042	-9.7	-0.0036	-43.4
	EU	-0.0005	-1.8	0.0090	16.2	-0.062	-38.0	-0.0017	-13.4

An often mentioned cause, the role of which has already been questioned in connection with the development of U.S. economy above, is that at a higher level of development the growth mechanism functions otherwise, which has an effect in the direction of slower development. The neoclassical model[22] assumes a diminishing return to factors, which can induce such an effect. However, in the same model figures a component characterising the so-called total factor productivity (TFP) that is not ascribed to concrete operative causes and, as a function of time, can, in principle, take any value. Thus, economic growth at a higher level of development can not only decelerate but also accelerate. However, we would not get an answer to the question what factors cause an occasional *acceleration* of economic growth.

22 See e.g. Robert M. Solow, "A Contribution to the Theory of Economic Growth", Quarterly Journal of Economics, Vol. LXX, No. 1, February 1956, pp. 65-94.

What is the situation with the endogenous model used by us? Here the return to labour is not diminishing but constant. The returns to capital (physical and human), depending on the levels of intensity and partly on time, can be diminishing, constant or increasing. There is no TFP; at the same time, as a separate factor there appear the staff, the basic component of human factor, the return to which is negative. The situation is more complicated than in the case of neoclassical model. However, it is possible to determine the factor combinations, including the effect of R&D, education and learning by doing, using which economic growth will most likely decelerate or accelerate. On the basis of the endogenous model, it can be asserted that *the rate of economic development depends primarily on the dynamics of growth factors, though growth mechanism, working differently at various levels of development, also affects the results.*[23]

Table 8. Dynamics of growth factors

(average annual change, %)*

Factor	Centre	1961-2003	1961-1973	1974-1991	1992-2003
L, M	U.S.	1.67	1.91	1.77	1.27
	Japan	0.81	1.27	0.70	-0.01
	EU	0.45	0.28	0.49	0.58
K	U.S.	2.89	3.00	2.89	2.66
	Japan	6.59	11.18	5.34	2.99
	EU	3.73	5.22	3.44	2.55
H/L	U.S.	0.84	0.97	1.12	0.26
	Japan	0.49	0.00	0.91	0.55
	EU	0.82	0.58	1.03	0.76
R_{t-2}	U.S.	3.05	3.04	3.32	2.65
	Japan	5.76	11.94	4.27	1.58
	EU	4.51	6.75	3.58	3.50

* Calculated from data in Table 9. Growth indicators of the European Union were determined without the former GDR to 1991 and considering the total German economy thereafter. All these also refer to the further tables.

23 For a more detailed discussion of the question, see Simon György, "Növekedéselmélet – világmodell – gazdaságfejlesztési stratégia", op. cit.

Data in Table 8 gives a picture of changes in the most important growth factors of world economic centres in the investigated over four-decade period. A general regularity is that fixed capital grows more rapidly than the number of employed, thus *capital intensity*, *K/L* becomes higher. A fundamental condition of rise in capital intensity is R&D activity, the more developed technology created through it, necessitating the employment of a more qualified labour force. In the investigated period, the *K/L* ratio increased most rapidly not in the United States but in the other two regions, first of all in Japan, which refers to the fact that the latter adopted the more developed technology largely from the United States and this ensured a significant advantage as regards economic growth and, much rather, the rate of rise in productivity.

In the period after the first oil price shock and particularly since the early 1990s the growth of capital intensity (*K/L*) in Japan and the European Union has taken a nose dive, whereas in the United States the situation was different. The former 4–8-fold differences in comparison with the United States fell back to 1.5–2-fold ones, which was essentially caused by slackening rates of fixed capital growth in Japan and the European Union, in a tight connection with investment trends. Why did all that happen? As will be seen further, a very serious role was played by the shaping of international economic conditions.

The initial data of our investigation are summarised in Tables 9 and 10 below.

Table 9. Main macroeconomic and manufacturing indicators of world economic centres

Year	Centre	Y	N	L	K	H/L	R_{t-2}	Z	O_{t-1}	Y_M	L	K	R_{t-2}
		National economy								Manufacturing			
1960	U.S.	2304	184.8	68.25	12117	8.49	355	184	10639	392	20.66	902	274
	Japan	407	94.1	44.61	676	7.78	60.9	6.07	9	61.7	9.51	84.4	41.0
	EU	2441	298.5	128.2	7986	6.31	148	94.8	464	502	38.2	1044	104
1973	U.S.	3999	216.7	87.32	17999	9.63	524	189	10837	779	21.05	1499	385
	Japan	1372	108.7	52.59	2892	7.65	264	5.65	17	313	14.43	507	170
	EU	4517	329.7	133.0	15478	6.80	346	86.6	4660	1034	40.7	2168	243

Year	Centre	Y	N	L	K	H/L	R_{t-2}	Z	O_{t-1}	Y_M	L	K	R_{t-2}
		National economy								Manufacturing			
1982	U.S.	4780	237.5	101.6	23609	11.74	659	190	9297	844	20.29	2001	490
	Japan	1861	118.5	56.38	4853	8.60	374	5.43	22	433	13.80	849	238
	EU	5365	341.5	133.2	22017	7.54	462	85.7	3857	1112	35.2	2845	321
1991	U.S.	6540	258.4	119.7	30048	11.77	943	188	7691	1081	20.58	2398	742
	Japan	2676	124.0	63.69	7376	9.01	560	5.20	37	684	15.50	1469	381
	EU	7011	367.3	153.0	29056	8.18	652	88.5	4034	1386	36.30	3481	451
2003	U.S.	9506	294.0	139.2	41194	12.14	1291	176	8256	1606	16.90	3045	1033
	Japan	3067	127.7	63.16	10802	9.62	676	4.73	36	755	12.07	2093	441
	EU	8864	381.9	164.0	39309	8.96	985	83.7	4329	1615	29.8	4278	657
1991	EU*	6715	351.3	145.2	28475	-	-	84.1	-	1368	34.1	3436	-

* Excluding the former GDR.

Sources: National Accounts Statistics, Industrial Statistics Yearbook, Statistical Yearbook, International Trade Statistics Yearbook, Energy Statistics Yearbook, United Nations, New York; National Accounts, Labour Force Statistics, Flows and Stocks of Fixed Capital, OECD, Paris; Yearbook of Labour Statistics, ILO, Geneva; UNESCO Statistical Yearbook, Paris; FAO Production Yearbook, Rome; Japan Statistical Yearbook, White Paper of Japan, Government of Japan, Tokyo; Statistical Abstract of the United States, Survey of Current Business, U.S. Department of Commerce, Washington, D.C.; International Financial Statistics Yearbook, IMF, Washington, D.C.; UN Monthly Bulletin of Statistics, New York, various volumes; Robert J. Barro and Jong-Wha Lee, "International Data on Educational Attainment: Updates and Implications", Center for International Development at Harvard University, *CID Working Paper* No. 42, Cambridge, Massachusetts, 2000. Appendix Data Tables, http://www.cid.harvard.edu/ ciddata/ciddata.html; Alan Heston, Robert Summers and Bettina Aten, *The Penn World Table Version 6.1*, op.cit.; Economic and Social Research Institute, Tokyo, http://www.esri.cao.go.jp; New Cronos Eurostat database.

Table 10. Further indicators connected to demand and supply

Year	Centre	I	E	I_M	C	P_N	P_E	P_{IM}	P_M	P_{CP}	P_t	V_t	U	W_o
1960	U.S.	444	113	108	1864	0.228	0.241	0.212	0.362	0.194	1	0.555	3852	11.44
	Japan	75.8	11.1	14.8	326	0.223	0.868	0.607	0.491	0.183	1	2.00	496	2.78
	EU	533	299	289	1836	0.139	0.241	0.235	0.207	0.145	1	1.81	3252	2.69
1973	U.S.	819	263	281	3178	0.346	0.361	0.327	0.438	0.291	0.971	0.822	4365	13.77
	Japan	426	60.6	82.4	960	0.462	1.045	0.746	0.709	0.419	0.980	1.11	693	5.90
	EU	1082	814	826	3340	0.250	0.343	0.323	0.302	0.244	1.035	1.24	3418	4.98
1982	U.S.	768	351	351	4095	0.681	0.822	0.865	0.780	0.633	0.836	0.712	10678	13.39
	Japan	486	149	103	1327	0.851	1.487	1.982	1.014	0.819	0.525	1.12	1386	6.84
	EU	1073	1172	1060	4097	0.560	0.757	0.836	0.623	0.561	0.833	1.25	12940	6.43

Year	Centre	I	E	I_M	C	P_N	P_E	P_{IM}	P_M	P_{CP}	P_t	V_t	U	W_o
1991	U.S.	1003	618	641	5581	0.917	0.968	0.972	0.965	0.894	0.876	0.906	8628	12.47
	Japan	798	227	181	1820	0.983	1.158	1.216	1.052	0.968	0.664	0.683	1366	8.13
	EU	1516	1758	1782	5399	0.879	0.923	0.927	0.912	0.866	0.973	0.911	15016	7.13
2003	U.S.	1925	1079	1653	8125	1.154	0.969	0.934	0.919	1.213	0.913	0.837	8810	13.03
	Japan	778	375	277	2236	0.911	0.882	1.032	0.993	0.973	0.598	0.797	3500	8.97
	EU	1833	3351	3314	6776	1.184	1.071	1.094	1.081	1.177	0.955	0.958	11703	8.46
1991	EU*	1453	1818	1759	5220	-	-	-	-	-	-	-	-	-

* Excluding the former GDR.

Source: see Table 9.

Conversion to 1995 dollar was made on the basis of New Cronos Eurostat database using the following PPP rates per USD. For Japan: Y, E, I_M = Yen 178; C = Yen 176; K, I = Yen 184; Y_M = Yen 173. For the European Union: USD 1 = PPS 0.839.[24]

THE ROLE OF WORLD ECONOMIC CONDITIONS

How was world economic competition affected by the *international economic conditions*? In today's globalising world economy, a manifold effect is at issue, in striving for whose revelation several basic indicators (terms of trade, oil prices on the world market, exchange rates, FDI, etc.) can be counted. According to our empirical results, world economic competition considering the rate of economic growth is *relevantly* influenced by the terms of trade and oil prices on the world market, respectively; as well as, regarding Japan and the European Union, the exchange rates. Let us first consider the problem in principle.

A favourable change in the *terms of trade*, namely a more rapid export than import price increase results in a larger usable GDP; therefore, for instance, more can be invested. Besides, more profitable exports stimulate export growth. Furthermore, the absolute or relative

24 For the annual data on the three world economic centres and Germany, as well as world-market prices (crude oil, manufactured goods and exports), see Simon György és Simon György, ifj., Japán és a világgazdasági centrumok versenye, MTA KTI, Budapest, 2006.

diminution in import costs has a positive impact on the whole economy. The opposite of all these happens if terms of trade are worsening.

In our days, changes in the terms of trade are mostly, in a very large measure, affected by *energy prices on the world market*, notably the formation of crude oil and connected natural gas prices. The latter's *rise* improves the terms of trade of hydrocarbon exporters and deteriorates those of the importers. All three world economic centres belong to the importer category but not to the same extent. Japan, in the given respect, is almost exclusively compelled to imports. By contrast, the European Union has significant own sources. Similar is the situation in the case of the United States. The energy prices on the world market affect not only the terms of trade; their considerable rise rearranges internal price relations, alters, mostly *worsens the profitability of enterprises*; and, in this connection, retards economic growth, as well. Essentially this caused the beginning of a new era in world economy in the 1970s. It is not surprising that in the course of our investigation the world-market oil price proved to be more important than the terms of trade. Therefore, in this paper, while examining the rate of economic growth, we take this factor into account.

In connection with the *exchange rates*, it can be seen that economic growth is generally affected positively by currency devaluation and negatively by revaluation. The latter has a negative effect first of all because currency revaluation makes the given country's products more expensive for foreign buyers. Two cases and, of course, their combinations are possible. In one case, the exporter even after currency revaluation does not lower the price expressed in domestic currency, therefore demand falls back or entirely ceases. In the other case, he lowers the price, which, in turn, worsens the profitability of exports; production may suffer losses and, in this connection, exports also fall back, investment mood worsens and economic growth is decelerating.

Currency revaluation has further consequences, too, connected chiefly to the fact that imports become cheaper. A positive effect is that production costs and consumer prices are decreasing to a certain extent. At the same time, however, because of an intensifying import

competition, domestic producers may get into a difficult situation and even fail, which can decelerate economic growth in addition to retarding exports. In the case of currency devaluation, the opposite of all these happens, therefore *a relatively cheap currency generally encourages rapid economic growth*.

The impact of international economic conditions on economic growth can be examined in several ways. In connection with Japan, we analysed the effects on the volume of exports.[25] Another approach was applied for the German economy: estimating the effect on manufacturing development and then examining to what extent the latter determines economic growth.[26] The common in these approaches is that concerning economic growth, they are of indirect character. A *direct investigation* was first made regarding the European Union.[27] Here we applied the latter approach relating, with the above correction (world-market oil price instead of terms of trade), to all three world economic centres.

We set out from the consideration that the *rate of economic growth* is equal to a growth rate achievable in the case of a PPP exchange rate if oil prices on the world market compared to the *base year* (in our case, 1960) are not changing (n_T),[28] with the modifications caused by changes in oil prices on the world market and deviations of the actual exchange rate from the PPP one, as shown in relation (2). In the *model*, Y_t is the volume of GDP in the reference year, Y_{to} is that in the base year, n_T, n_o, $n_{o\Sigma}$ and n_V are the parameters of the model. The definitions of Δt, P_{ot} and V_t, are as follows: $\Delta t = t\text{-}t_o$, P_{ot} is the world-market price index of crude oil (1960 = 1), V_t is the relationship between the actual (nominal, V_N) and PPP (real, V_R) exchange rate in the year t ($Vt = V_{Nt}/V_{Rt}$),[29] ln

25 György Simon and György Simon Jr., "The Japanese Economic Enigma", op. cit.

26 Simon György, ifj.: "A gazdasági növekedés problémái Németországban", op. cit.

27 György Simon Jr., "Economic Growth in the European Union", op.cit.

28 Such a growth rate is called equilibrium growth rate in this paper. A conditional equilibrium is at issue, which can mean different growth rates by countries and regions, as will be concretely seen regarding world economic centres below.

29 The actual exchange rate is kept on file by statistics, the PPP exchange rate was determined for the gross domestic product (GDP). An increase in the Vt indicator means currency devaluation, whereas a decrease is currency revaluation for a given country or region.

is the sign of natural logarithm, ε is a logarithmic residual. In relation (2), there is no regression constant, since it proved to be significant with respect to neither of the world economic centres.

The *estimation of parameters* was made by the ordinary least squares (OLS) method on the basis of annual data for the period from 1960 to 2003 (43 observations). The value of non-significant parameters is considered as zero. All those also concern relation (3) to be expounded later. The main results of regression analysis are contained in Table 11.

$$\ln(Y_t / Y_{t0}) = n_T \Delta t + n_o \ln P_{ot} + \Sigma_t (n_{o\Sigma} \ln P_{ot} + n_V \ln V_t) + \varepsilon \quad (2)$$

Table 11. GDP model*

Country/group	n_T	n_o	$n_{o\Sigma}$	n_V	R^2
United States	0.04276 (6.45)	-0.02989 (-4.31)	-0.00473 (-5.93)	-	0.997
Japan	0.06009 (6.14)	-0.05299 (-4.68)	-0.00678 (-3.28)	0.06020 (5.62)	0.997
European Union	0.03892 (6.23)	-0.01463 (-4.12)	-0.00741 (-5.69)	0.01660 (3.69)	0.999

* In parentheses are the *t* statistics. For the data and their sources, see Tables 9 and 10.

What *conclusions* can be drawn from the investigation?

1. The accuracy of estimation is very favourable: the determination (R^2) is more than 99 percent; the relative standard error is 2.7 percent for the United States, 2.2 percent for Japan and 1.5 percent for the European Union. Therefore, *the rate of economic growth with respect to the world economic centres can probably be estimated with a good approximation by means of the model* if the oil prices on the world market and the exchange rates are known. In the case of the United States, the latter's knowledge is not necessary.

2. The *equilibrium growth* is most rapid in Japan, the second is the United States and the third, not lagging much behind, is the European Union.

3. The *deviations from the equilibrium growth* are connected negatively to the oil prices on the world market and positively to the deviations of exchange rates from the PPP level. The latter did not prove to be significant for the United States. Thus, the investigation essentially verified the fundamental assumptions in connection with the model.

4. The effect of *world-market oil price* formation is significant for all three world economic centres. Two kinds of effect prevail: a short-term, with one-year lag, and a long-term cumulative effect. The former is strongest in Japan, the latter in the European Union.

5. *The deviations of actual exchange rates from the PPP ones affected most of all Japan's economic growth.* On the economic growth of the United States, having a large internal market and an extraordinarily developed economy with a relatively smaller foreign trade, this factor has so far made no significant impact.

By using relation (2), we can examine more closely how the relevant characteristics of international economic conditions influenced the world economic competition in the most important area, that of economic growth. The main results of investigation are contained in Table 12.

Table 12. Causes of deviations from the equilibrium growth rate

(equilibrium growth rate = 100)*

Denomination	United States				Japan				European Union			
	1961-1973	1974-1990	1991-2003	1961-2003	1961-1973	1974-1990	1991-2003	1961-2003	1961-1973	1974-1990	1991-2003	1961-2003
Fact	99.1	67.9	67.0	77.1	155.6	62.2	22.3	78.2	121.6	59.6	46.5	74.5
Fact - equilibrium	-0.9	-32.1	-33.0	-22.9	55.6	-37.8	-77.2	-21.8	21.6	-40.4	-53.5	-25.5
World-market oil price	-1.5	-34.1	-27.8	-22.4	-2.0	-36.8	-28.7	-23.8	-0.7	-48.6	-46.4	-33.4
Exchange rate	-	-	-	-	56.1	-3.7	-38.2	4.0	19.4	6.4	-0.7	8.2
Other factors	0.6	2.0	-5.2	-0.5	1.5	2.7	-10.8	-2.0	2.9	-1.8	-6.4	-0.3

* Calculated from logarithmic values.

Considering the investigated over four-decade period (1961-2003), factors figuring in relation (2) explain with a *nearly hundred-percent accuracy* the process of economic growth in all the three world economic centres, despite the fact that in the individual sub-periods the actual growth rates greatly deviated from the equilibrium ones. *In the majority of cases, the most important factor proved to be the world-market oil price formation.*

With respect to Japan and the European Union, before 1974, in the economic growth more rapid than the equilibrium one, a decisive role was played by *a high-grade depreciation of the currency against the PPP level.* This later discontinued, moreover was *followed by overvaluation, mainly in the case of Japan. Primarily to this can be attributed a precipitate downswing in Japan's rate of economic growth in the post-1990 period.*

One of the most important questions of the investigation is *what causes the permanent exchange rate changes retarding economic growth.* Is it the interplay of effects *accidentally* generated by world economic processes and economic policy or something else? As will be shown below, the latter conjecture is closer to reality. Let us first consider the problem in principle.

To the question what fundamental causes determine the deviations of exchange rates from the PPP level, *in the first approximation* a relatively simple answer can be given: the divergences in *input proportions* in differently developed countries or regions. Under low wages, the same product can be made more cheaply, therefore world-market competition presses down the product's price and, with it, the exchange rate in relation to the leading currency, the U.S. dollar. If wage differences are decreasing, the exchange rates approximate the PPP level, i.e. in the formerly low-wage countries the depreciation of currency against the PPP level gradually lessens.

The outlined connection is an idealised picture of the process, not only because of market exchange rate fluctuations but also owing to the fact that *exchange rates can permanently break away from proportions justified by inputs*, as it has happened in the case of Japan

since the mid-1980s[30] and, to a relatively lesser extent, with respect to the European Union.[31]

For the investigation, an *exchange rate function* will be shaped, using which it can be decided whether the regularity outlined above is effective; furthermore, we shall also get an answer where and to what extent the actual exchange rates *permanently* lost touch with the level justified by the regularity in point. The function written in a logarithmic form contains an explanatory variable and a constant, as shown in relation (3) below.

The explanatory variable (Wo_t) is the proportion of U.S. manufacturing hourly wages to those of Japan and the European Union, respectively, and in the case of the United States, its invert[32] at PPP prices, in dollars of 1995. The parameter v is a *specific* effect of the logarithmic value of the explanatory variable. The constant (v_0) characterises the *permanent* deviations from the equilibrium situation.

$$\ln V_t = v_0 + v \ln Wo_t \qquad (3)$$

If real incomes (manufacturing hourly wages) are the same, i.e. their ratio is unity, $\ln Wo_t$ is zero. In an equilibrium situation, the left-hand side of the function must also be zero, as then V_t is unity, too; $\ln V_t$ is thus zero. Therefore, the values of v_0 different from zero give proof of a *non-equilibrium situation*, essentially of the fact that the actual exchange rate (V_N) differs significantly from the PPP one (V_R) even if incomes (manufacturing real hourly wages) are identical. *If v_o is negative, the own currency* (in our case, the yen, euro or dollar) will be *permanently overvalued and vice versa.*

30 György Simon and György Simon Jr., The Japanese Economic Enigma, op. cit.

31 György Simon Jr., "Economic Growth in the European Union", op. cit.

32 In the numerator, we reckoned with the average of Japan's and the European Union's manufacturing hourly wages, the denominator is the United States manufacturing hourly wage.

Table 13. Exchange rate function*

Denomination	v_o	v	R^2	
			Annual	Cumulative
US	-	0.317 (6.02)	0.682	0.982
Japan	-0.708 (-5.79)	0.893 (5.88)	0.863	0.957
EU	-0.263 (-3.99)	0.536 (5.22)	0.682	0.978

* In parentheses are the *t* statistics. For the data and their sources, see Tables 9 and 10.

The main statements issuing from Table 13 can be summarised as follows.

1. Relation (3) gives a good explanation of exchange rate (V_t) changes, particularly concerning cumulative values, figuring as an exogenous variable in the GDP model.[33]

2. The less accurate fit of annual data is attributable to exchange rate fluctuations in the market.

3. *In our days, Japan's and the European Union's currencies are permanently overvalued, which retards economic growth, worsens their situation as compared to the United States in world economic competition.*

4. Japan's situation is particularly unfavourable. However, Germany, the European Union's leading economy, is not in a much better position in the given respect either.

5. Exchange rate anomalies are not to a little extent the consequences of national and international economic policies. Taking relations (2) and (3) into consideration, it can be stated that *in Japan and the European Union, along with world-market oil price formation, economic growth was retarded by the fact that in the catch-up phase, wage proportions were approaching the US level, which affected the exchange rates, too. To this, economic policy contributed its share, essentially in such a way*

33 See relation (2).

that it encouraged or did not duly retard the permanent overvaluation of currencies in comparison with input proportions.

CONCLUSIONS

The investigation of world economic competition shows that in the globalising world economy of our days, economic growth is determined by not only, moreover often not primarily internal but international connections.

The role of internal factors of growth is relatively well characterised by the endogenous growth model. At the same time, empirical results show that *world economic competition is very significantly influenced by such characteristics of international economic conditions as oil prices on the world market and the exchange rates*.[34] The world-market price of crude oil and natural gas since the 1970s has been of a strongly increasing tendency, in which a great role is played by the price policy of OPEC uniting petroleum exporting countries. The rising prices of hydrocarbons have been decelerating economic growth in all the three world economic centres, but not to the same extent. The long-term fluctuations of *exchange rates* are essentially determined by the international projection of a known regularity, as well as national and international economic policies. The *regularity* is the alignment of price with input proportions, which in international respect approximately implies adjustment of exchange rates to manufacturing wage proportions. *Economic policy* aspires to devalue or revalue a currency on various considerations, which causes a serious problem from the standpoint of growth if results in a *permanent overvaluation*, as happened, for instance, in the case of Japan and, to a certain extent, the European Union, namely the EU-15 in our days.

What *answer* can be given to the most important questions arising in connection with *world economic competition*? (1) Why did Japan and

34 With respect to relatively small countries, a fundamental role can be played by other circumstances, chiefly a massive inflow of FDI, as referred to earlier. Essentially the latter is the background of the often mentioned "Irish economic miracle". See György Simon, Jr., "Ireland's 'Economic Miracle' and Globalisation", op. cit.

the European Union approximate in a relatively rapid pace the level of development of the United States in the period before the first oil price shock; (2) what altered this tendency later, especially from the early 1990s; and (3) what was the role of international economic conditions in all that? The answer to these questions is essentially that in the phase of approach, for Japan and the European Union international economic conditions were favourable, mainly concerning their own currencies strongly devalued against the PPP level, which later changed to the advantage of America. The *change* occurred primarily under the impact of economic regularities (limited natural resources becoming scarcer, input proportions approaching the U.S. level), but a great role was played, e.g. by exchange rate changes, leading to the yen's permanent overvaluation, which markedly worsened Japan's world-market competitiveness, retarded the increase in exports and investment and lastly economic growth. At the same time, in the United States the dollar ceased to be relatively overvalued against the PPP level, whereas investments were being strongly supported by the interest policy. All these have accelerated U.S. economic growth and facilitated that *in world economic competition since the early 1990s convergence has been succeeded by divergence.*

On the basis of empirical results, it is understandable, numerically too, why the main objective of the Lisbon strategy will not be fulfilled, i.e. that the European Union will by 2010 catch up with the United States in terms of per capita income (GDP). The main reason is essentially that the elaborators of the strategy have not reckoned with an unfavourable turn in international economic conditions for the Union in its competition with the United States. Neither have they considered the fact that *an economic policy oriented toward creating a stable currency, "the new political economy of the Stability and Growth Pact" does not lead to an acceleration in economic growth but, according to experience, rather decelerate it.* The introduction of a single and stable currency, the *euro*, *has undoubtedly been a right objective*, but measures taken to introduce it *as early as possible* can decelerate economic growth. To this refer, among others, the fact that the average growth rate of 12 countries that hitherto introduced the euro in the period from 1961

to 1992 corresponded to that of the countries outside the euro zone (United Kingdom, Denmark and Sweden). Afterwards, however, it became significantly lower, particularly in the preparatory phase for the introduction of the euro in 1992-1998.[35]

The empirical results put in a new light the problems of *sustainable growth*, too. In some cases, a comparatively rapid (currently, e.g. in the United States), moreover very rapid (formerly in Japan or South Korea, currently in China) economic growth can be sustained for a long time. However, such a situation in our days no longer exists regarding the majority of relatively developed countries or regions: *as a rule, the growth rate decreases in time, partly because of the regularities of technical progress, but much rather owing to changes in international economic conditions, therefore sustainable growth is, in many cases, an unsustainable, illusory objective.* A question arises: what can the *right aim of economic policy* be? It logically follows from the empirical results that economic development can be as rapid as possible if the country or region has entirely used the opportunities of the given phase of development; in other words, achieved an *achievable economic growth*, since *a once missed opportunity would not mostly return later but would be eventually lost.*

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NEKA PITANJA SVETSKE PRIVREDNE KONKURENCIJE

APSTRAKT

U članku se traži odgovor na sledeća pitanja: zašto se pre prvog naftnog šoka situacija u Japanu i Evropskoj uniji popravila u odnosu na situaciju u Sjedinjenim Državama; koji faktori su uticali da ova tendencija promeni svoj tok u kasnijem periodu, posebno od devedesetih godina 20. veka na ovamo; kakvu ulogu je igrala međunarodna ekonomska situacija u svemu tome? Primenjujući modele matematičke ekonomije autori su dokazali svoje glavne tvrdnje koristeći se ekonomometrijskim istraživanjem. Najvažniji zaključak je da je u svetskoj ekonomskoj konkurenciji situacija i u Japanu i u Evropskoj uniji prvenstveno bila određena promenama ekonomskih prilika na svetskom nivou, naročito cena nafte na svetskom tržištu i valutnih kurseva, što se manje može reći za Sjedinjene Države.

Ključne reči: Svetska privredna konkurencija, SAD, Evropska unija, Japan, dugoročne tendencije, glavni određujući faktori.