

GERMANY AND THE EUROPEAN ECONOMY

ABSTRACT

Germany has traditionally been the powerhouse of the European economy and integration. In this article, an attempt is made to put its economic development in a European context by comparing it with the achievements of the total group of more developed members of the European Union, the EU-15, prior to the current global crisis. The author applies both the methods of statistical analysis and models of mathematical economics to show the combined influence of growth mechanism regularities, economic policy and international economic relations on the long-term development of the German and European economy. Viewing economic growth as the central problem, he investigates the factors of its deviations from the equilibrium state, as well as the regularities affecting productivity and technical progress. His main conclusion is that the current economic crisis can be surmounted with the help of a growth-oriented economic policy based on the intensification of technical progress and, first of all, of its creative component, which would create favourable conditions for improving competitiveness.

Keywords: economic growth, European integration, productivity, technical progress, Germany.

The European integration is one of the determinant phenomena of the modern world economy, in which the Federal Republic of Germany (FRG) traditionally plays a key role. The driving force of this process is *economic growth*, usually considered as a quantitative change, which is one of the most important if not the *central question* of economic science. In practice, economic growth is closely related to economic development which implies qualitative improvements in the use of production factors and structural change.

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Moreover, these two concepts are actually inseparable from each other, as all countries and social systems are always in the process of development, in which even small quantitative changes of population or wealth can lead to major systemic qualitative changes.

The subject of the present article is the investigation of general regularities of Germany's long-term economic development compared to the entire group of more developed member states of the European Union (EU-15),² which in 2009 produced 87.7 percent of the total present Union's (EU-27) gross domestic product (GDP).³ In the relevant special literature, some aspects of this subject have already been touched. Thus, Vanhoudt⁴ investigated the impact of European integration on labour productivity growth in 1950-1990 and found that market enlargement had not resulted in an obvious return to scale. Buch, Doepke and Pierdzioch⁵ examined the dynamics of output in Germany and other OECD countries between 1970 and 2001. They revealed a decreasing volatility of business cycles. Kamps, Meier and Oskamp⁶ considered the real GDP, rate of employment and number of working hours in determining the growth potential of German economy. These authors constructed a Cobb-Douglas (CD) production function augmented with human capital for the period 1960-2003 and examined the impact of interest policy on investment. They revealed that the weakening of growth potential was essentially a consequence of a decelerating increase in labour productivity and a decrease in the population of working age. Palánkai⁷ analysed the theoretical aspects of international integration, including the economics of its costs and benefits. He also gave a detailed review of the processes of European integration and separately dealt with their implications for Central and Eastern Europe. Siebert⁸

2 See their list in the Appendix.

3 According to the Eurostat's New Cronos database.

4 Patrick Vanhoudt, "Did the European Unification Induce Economic Growth? In Search of Scale-Effects and Persistent Changes", Working Paper Series in Economics and Finance, No. 270, Stockholm School of Economics, 1998.

5 Claudia M. Buch, Joerg Doepke and Christian Pierdzioch, "Business Cycle Volatility in Germany", Kiel Working Paper No. 1129, Kiel Institute for World Economics, 2002.

6 Christophe Kamps, Carsten-Patrick Meier and Frank Oskamp, "Wachstum des Produktionspotentials in Deutschland bleibt schwach", Kieler Diskussionsbeiträge, No. 414, Institut für Weltwirtschaft an der Universität Kiel, 2004.

7 Tibor Palánkai, Economics of Enlarging European Union, Akadémiai Kiadó, Budapest, 2004.

8 Horst Siebert, The German Economy: Beyond the Social Market, Princeton University Press, Princeton, New Jersey, and Oxford, 2005.

emphasised such current weaknesses of the German economy as poor growth performance, a malfunctioning labour market with high unemployment and an unsustainable social security system. He considered Germany's fiscal policy stance, product and capital market regulation, environmental, aging, immigration and educational policies, as well as its role in the EU, including the euro area. He argued that Germany needed above all a market renaissance. In his opinion, it must throw off the shackles of the social welfare economy and its hallmark consensus approach, whereby group-based cooperative decision-making has undermined competition and markets.

The purpose of this investigation is to prove that certain *parallels* can be observed in the long-term development of the German and European economies prior to the current global crisis. The author relied in his research on both the neoclassical and endogenous theories of economic growth. Because of data problems, the investigated period covers here 1961-2008 for the EU, contrary to 1951-2008 for Germany. The article has the following structure. After theoretical considerations, including the presentation of main integration theories, the long-term growth regularities of Germany's and the EU's economy will be investigated in three sections. The first of them is devoted to the analysis of the demand side of economic growth and its main international factors. The second will deal with economic policy implications. The third section will examine the supply side of growth, focusing on productivity and technical progress. Finally, the relevant conclusions will be made.

THEORETICAL BACKGROUND

The Standard Neoclassical Growth Model

Neoclassical economists have elaborated a model of economic growth, which is in essence a dynamic production function. The foundation of the neoclassical school of growth theory is related to the name of R. Solow, who introduced the CD production function into the analysis of economic growth.⁹ According to his viewpoint, two growth factors are of key importance: (1) physical or human capital accumulation per person employed or per inhabitant and (2) changes in the economy's technological level also reflecting structural shifts expressed by technical progress, later called total factor productivity (TFP). All the other factors, such as public policies, consumer preferences and

9 See Robert M. Solow, "A Contribution to the Theory of Economic Growth", *Quarterly Journal of Economics*, Vol. 70, No. 1, 1956, pp. 65-94.

market institutions determining the investment climate or the level of development of infrastructural sectors, exert a positive or negative effect on the rate of economic growth through these two processes. In the process of economic growth, the most important role is played by the supply and efficient use of resources. The basic technological coefficients change depending on the price of production factors (capital and labour) and the character of technical progress.

Let us set off from the standard neoclassical production function presented as follows:

$$Y_t = A_o K_t^{\alpha_o} L_t^{\beta_o} e^{\lambda t} \quad (1)$$

where Y is output, A_o is a multiplier of efficiency, K is capital, L is labour, t is time, while α_o , β_o and λ are the elasticity of output by capital, labour and time, respectively. It is assumed that $\alpha_o + \beta_o = 1$, from which $\beta_o = 1 - \alpha_o$. The model assumes that, in a situation of equilibrium, the parameter α corresponds to the profit share, including the share of consumption of fixed capital in the gross domestic product (GDP), which regarding the developed countries is usually taken as 1/3. Then for the rates of economic growth the following relation can be defined:

$$\Delta \frac{\dot{Y}}{Y} = \alpha \Delta \frac{\dot{K}}{K} + (1 - \alpha) \Delta \frac{\dot{L}}{L} + \Delta \frac{\dot{A}}{A} \quad (2)$$

Here the expression $\Delta \frac{\dot{A}}{A}$ can be interpreted as the rate of technical progress, or TFP.

This residual means that fluctuations in output are closely followed by technological changes. In the neoclassical growth models, capital and labour can be permanently and unrestrictedly substituted, while the *Inada conditions* are fulfilled. The latter imply that the specific marginal product of both capital and labour tends to zero if the amount of the given factor is increased beyond all frontiers (diminishing return to factors), and it also tends asymptotically to infinity if the amount of the factor approaches zero (assuming that other factors do not change).¹⁰

10 Ken-Ichi Inada, "Some Structural Characteristics of Turnpike Theorems", *Review of Economic Studies*, Vol. 31, No. 1, 1964, pp. 43-58.

In addition to the diminishing return to factors, another essential feature of neoclassical models is their *homogeneity of degree one* with a variable marginal efficiency, i.e. a *constant return to scale*, a situation when a proportional increase in the quantity of all production factors used leads to an increase in output in the same proportion. The Solow model determines the rate of growth entirely by the factors of production, disregarding the impact of the increase in demand on the growth of output. On the basis of this definition, Solow attempted, relying on US data, to separate from each other the effects of technical progress and substitution, and thus construct an aggregate production function. Thus, the neoclassical school came to a conclusion that *the most important strategic factor of long-term economic growth was technical progress* and its determinants, viz. the improving quality of productive equipment, as well as the rising qualification of workforce and organisational level of production.¹¹

On the Function of Technical Progress

The technical progress function is a concept originally developed by N. Kaldor to explain the growth rate of *labour productivity as a measure of technical progress*, which idea is also accepted in this paper. Kaldor described his function in the following statements:

1. The larger the growth rate of capital/input per worker, the larger the growth rate of output per worker, or labour productivity. The latter is thus explained by the growth rate of capital intensity.
2. In equilibrium, capital/input per worker and output per worker grow at the same rate, the equilibrium growth rate.
3. At growth rates below the equilibrium state, the growth rate of output per worker is larger than the growth rate of capital/input per worker.
4. At rates above the equilibrium state, the growth rate of output per worker is smaller than the growth rate of capital/input per worker.¹²

Solow discerned two types of technical progress. He contended that the *disembodied technical progress* implied improvements in the organisation and operation of production factors, independent of their character. On the other

11 Robert M. Solow, "Technical Change and Aggregate Production Function", *Review of Economics and Statistics*, Vol. 39, No. 3, 1957, pp. 312-320.

12 See Nicholas Kaldor, "A Model of Economic Growth", *The Economic Journal*, Vol. 47, No. 268, 1957, pp. 591-624.

hand, the *embodied technical progress* concerns only the capital of latest vintage. According to this assumption, all capital goods at the time of their appearance embody the most advanced technology but do not participate in further technological development.¹³

Let us set off from production function (1). In that case it is true that

$$\frac{Y_t}{L_t} = A_o \cdot \left(\frac{K_t}{L_t} \right)^{\alpha_o} e^{\lambda \Delta t} \quad (3)$$

By putting in a logarithmic form both sides of this relation, we obtain

$$\ln \frac{Y}{L} = \ln A_o + \alpha \ln \frac{K}{L} + \lambda \Delta t \quad (4)$$

If $A_o = 1$, then $\ln A_o = 0$. In order to quantify the role of embodied technical progress in productivity growth, the standard neoclassical model can be written down in the following form:

$$\Delta \ln \frac{Y}{L} = \alpha \Delta \ln \frac{K}{L} + \lambda \Delta t + \Delta \varepsilon \quad (5)$$

In relation (5), *productivity growth* is broken down into *three main components*. The first component is the *embodied technical progress*, showing the effect of change in capital intensity, the second is *neutral technical progress* (elasticity of output by time), and the third is a logarithmic *residual* ($\Delta \varepsilon$), which for the most part depends on *cyclical fluctuations*.

The Simon Model: Basic Variant

Economic growth is essentially an interaction of fundamental production factors, which results in the emergence of output. On this basis, György Simon Sr. elaborated and first applied for the US and Indian economy an *endogenous*

13 Robert M. Solow, "Investment and Technical Progress", in: Kenneth J. Arrow, Samuel Karlin and Patrick Suppes (eds.), *Mathematical Methods in the Social Sciences*, 1959. Proceedings of the First Stanford Symposium, Stanford University Press, Stanford, California, 1960, pp. 89-104.

growth model that can map *three fundamental types of technical progress*, and thus economic growth and development, based on *immobile, mobile and creative effects*. These effects reflect learning by doing, the equipment of workers with physical capital (in our case, fixed assets and arable land) and the joint result of research intensity and education, respectively. *The first two components operate at the place of application of new technology, the third one at the place of its creation*. Any type of technical progress emerges as a common effect of several growth factors; therefore its mapping function is a *complex factor*.¹⁴ The variables of the basic Simon model,¹⁵ with the exception of *M* which means working years, can be found in the Appendix and are a function of time. The time index (*t*) is put out in the case of retarded effects. In the formulas, a capital letter denotes a function and a small letter a parameter, except the variable *t*.

The model can be written down as follows:

$$Y = gM \exp[F_K(G_I + G_M + G_{KR})], \quad (6)$$

where the parameter *g* is the output produced without fixed capital during a working year that approximately corresponds to an economy's initial level of productivity. Among the components in parentheses, G_I is a function concerning the immobile, G_M the mobile and G_{KR} the creative technical progress.

In formulas:

$$G_I = 1 - \exp\{-g_I F_K - g_Z F_Z\};$$

$$G_M = gM F_K \exp(-g_{KM} F_K - g_{ZM} F_Z);$$

$$G_{KR} = G_H G_R G_T,$$

where $G_H = gH F_H \exp(-g_{KM} F_K)$, $G_R = 1 + g_R F_R^2$ and $G_T = \exp(g_T \Delta t)$, where $\Delta t = t - 1950$.

Intensity functions:

$$F_K = \ln(1 + n_K K/L) \text{ (capital intensity function);}$$

14 See György Simon Sr., "Basic Questions of Economic Growth Mechanism", *Economic Annals*, Vol. 53, No. 176, 2008, pp. 7-37.

15 First called so in: Zsombor Ligeti, *Gazdasági növekedés és felzárkózás*, Ph.D. thesis, BKÁE, Budapest, 2002, p. 134.

$F_H = \ln(1 + n_H H/L)$ (education function);

$F_R = \ln(1 + n_R R_{t-2}/L)$ (research intensity function);

$F_Z = \ln(1 + n_Z Z/L)$ (arable land intensity function).

The normalising coefficients are $n_K = 1/385$, $n_H = 1$, $n_R = 1$ and $n_Z = 1$, where the parameter n_K refers to the 2000 dollar prices. These are rounded values, which do not differ significantly from the estimated ones.

Table 1. Parameters of the basic Simon model

No.	Denotation	Estimated value	t statistics
1.	g	522	22.46
2.	gI	0.0781	22.45
3.	gM	0.319	22.42
4.	gH	0.273	22.29
5.	gR	278	17.44
6.	gT	0.0065	20.28
7.	gZ	0.082	20.95
8.	gKM	0.34	-22.52
9.	gZM	0.30	-19.14

Source: György Simon, "Basic Questions of Economic Growth Mechanism", *Economic Annals*, Vol. 53, No. 176, 2008, p. 20.

Simon Sr. considered the rise in productivity (Y/L , Y/M) due to technical progress embodied in physical and human capital as the *main characteristic of economic development*. He denied the existence of disembodied technical progress depending exclusively on time. In this connection, it is noticeable that Kaldor in his function of technical progress, like Simon Sr., counted with the rise in the elasticity of output by capital owing to an increasing intensification of production, but in contrast to the latter author, regarded the given phenomenon through the prism of investment. Kaldor's growth model based on a function of technical progress assumes a single relationship between the increases in capital and productivity, which includes the effect of both factors. It indicates at what rate labour productivity grows in the course of rising capital accumulation which makes possible an increasing use of inventions. Technical progress in Kaldorian terms is realised in the wake of investment; thus, the function of technical progress is closely related to an investment function. Investment is a function of the growth rate of production through the

accelerator effect, and the relationship between capital and production is also a function of the expected profit rate.¹⁶

*Technical progress can also be interpreted with the help of the Simon model described above, which is homogeneous of degree one, similarly to the neoclassical production function. As its parameters were determined on the basis of a worldwide investigation using data on 131 countries (see Table 1), this is a world model supposed to be applicable for any country is at issue.*¹⁷

Similarly to the Solow model, the returns to factors of technical progress can be written down additively by a logarithmic conversion of both sides of relation (6). The difference is that in our case, the returns to factors of technical progress are at issue, except labor. For this investigation, the following form of the Simon model was used with the parameters listed in Table 1:

$$\Delta \ln (Y/gM) = \Delta F_K G_I + \Delta F_K G_M + \Delta F_K G_{KR} + \Delta \varepsilon, \quad (6a)$$

where ε is the estimation error and $\Delta \varepsilon$ characterizes the deviations from the world level, reflecting changes which do not explicitly figure in the model. Thus, joint factor efficiency can be compared to international standards.

Table 2. Fit of the world model for Germany and the EU
(Dependent variable: Y/M)

Sphere	Number of observations	R^2		Standard error (%)	
		Annual	Cumulative	Annual	Cumulative
<i>Germany</i>					
National economy*	308	0.9147	0.9953	4.2	1.0
Manufacturing	209	0.9516	0.9996	7.5	1.8
<i>European Union</i>					
National economy*	298	0.9649	0.9981	1.9	0.5
Manufacturing	199	0.9598	0.9959	4.1	1.0

*Aggregated.

Note: Here R^2 is the uncorrected coefficient of determination, considering that the parameters of the model were not estimated specially for Germany and the European Union.

Source: calculated from the Appendix.

16 Cf. Antal Mátyás, *A modern gazdaságtan története*, Aula, Budapest, 1999, pp. 541, 543.

17 See György Simon Sr., "Növekedélmélet - világmodell - gazdaságfejlesztési stratégia", *Külgazdaság*, Vol. 49, No. 3, 2005, pp. 31-51. Here the list of investigated countries can be found, including all the 15 developed member states of the European Union.

As seen from Table 2, the *high determination fits the actual productivity values* of Germany and the EU, and the standard errors are also acceptable. The cumulative results are better than the annual ones, i.e. the estimation errors do not cumulate but decrease in time. This is a general feature of the fit of this model, describing in essence the process of economic development.

Theories of Economic Integration

As the European Union is today the largest and strongest organisation of economic integration in the world, it is expedient to review here the relevant theoretical considerations. Generally, *integration is a process of unification*, which can be conceived as cooperation among its participants, harmonising their operation, reciprocal influence and interconnection. In this context, theories of international integration usually focus on *five dimensions* of that field: (1) the content or essence of integration processes; (2) the organisational forms and institutions of integration; (3) its regulation (policies) and governance; (4) its advantages and disadvantages (cost-benefit analysis); and (5) the problems of integration maturity (capacities or capabilities for integration).¹⁸

For pragmatic reasons, the specialist literature had long attached particular importance to the forms of integration and to cost-benefit analysis. It distinguishes the following forms, or stages, of macro integration:¹⁹

(1) *Preferential customs area* means that countries participating in it on the basis of a preferential trade agreement offer each other customs and other trade policy preferences. These preferences can include a tariff lower than applied to outsiders and a mutual duty-free trade.

(2) In a *free trade area*, trade is liberalised; but towards outsiders, each country pursues its own customs policy.

(3) In a *customs union*, not only is trade totally liberalised, but also common tariffs and trade policy are applied towards non-member countries.

(4) The *common market* is more than a customs union in that, beyond ensuring a free internal movement of goods and services, it also liberalises capital and labour flows.

(5) In an *economic and monetary union*, the participants, in addition to creating a common market, harmonise, coordinate and standardise and, in the final phase,

18 Tibor Palánkai, *Economics of Enlarging European Union*, op. cit., 2004, p. 18.

19 See Béla Balassa, *The Theory of Economic Integration*, R. D. Irwin, Homewood, Illinois, 1961.

unify their national economic policies. This largely corresponds to the present stage of development of the European Union and especially the Euro Area (EA).

(6) *Political union* leads to the creation of a single state. However, this objective currently poses many problems and difficulties for the EU.

Regarding the content, forms and mechanisms of integration, a number of theoretical schools have emerged, each emphasising a different aspect of the process. Thus, *theories of the division of labour* (O. T. Bogomolov, M. M. Maximova, Z. Kamecki, F. Kozma and others) separated the simple transactions or “cooperation” and contrasted them with “integration”, interpreting the latter as a new quality. According to these theories, which define integration as an intensive, lasting and long-term, organised and institutionalised division of labour embracing the whole reproduction process, the main motivating factor of integration is enhancement of efficiency and prosperity.

The *liberal or neo-liberal theories* (R. Aron, J. Pelkmans, P. Robson, W. Röpke and others), which rest on the principles of unlimited free competition and free trade, emphasise that integration is achieved through the “four freedoms” implying a free flow of goods, services, capital and labour. The *communication and cooperation schools* (B. Hughes, J. Schwarz, P. McGowan and others) even go further, extending the free flow requirement to every area of social life, including not only economic but also political and cultural relations.

Institutional theories comprise several schools or trends, depending on how they see the relations between the integration institutions and the national states. Thus, A. Moravcsik by elaborating a state-centric theory of liberal inter-governmentalism describes the EU as a regime that makes inter-state bargaining more efficient, while enhancing the role of national leaders.²⁰ The main aspiration of “Euro-federalists” (J. Pinder, G. Montani and others) is the creation of a real political union, the *United States of Europe*. According to J. Tinbergen and other *functionalists*, the most important question is the expedience and efficiency of the regulation of integration processes, as in their opinion, the national state is increasingly incapable of completing its basic social, economic and political tasks. Therefore, more and more shared aims and functions should be delegated to the more efficient integration organisations. The functionalists acknowledge that shifts in the exercising of functions require institutional changes. Similarly to classical federalism, they were originally in favour of universal peace and against regional integration rejected for Europe

20 Andrew Moravcsik, “Preferences and Power in the European Community”, *Journal of Common Market Studies*, Vol. 31, No. 4, 1993, p. 507.

by D. Mittrany. The *neo-functionalists* (E.B. Haas or L. Lindberg), along with peace and prosperity, emphasise external security, the role of national elites and, in contrast to the globalist view, the possibility of regional integration. They point out that the functions of supranational institutions of integration organisations may be economic, political, social, infrastructural or military.²¹

ECONOMIC GROWTH IN GERMANY AND THE EUROPEAN UNION

General Characteristics and International Factors

Today Germany has the largest economy in the European Union and the third largest in the world.²² This social market economy²³ exerted a profound influence not only on the western world, but also on many former socialist countries, including Hungary. In the post-war economic development of FRG several phases can be discerned, which will be characterised below relying on data cited in the Appendix. It should be noted that in our dynamic investigations, we counted with *West German* data to 1991 and afterwards compared the indicators of FRG and EU to 1991 data considering the *united* Germany.

The *first phase* was the period of the *Wirtschaftswunder* (German “economic miracle”), which lasted in essence until the early 1960s. Its outstanding performance was encouraged by effective management and a mass resettlement of highly qualified East German specialists. From the mid-1950s, a partly illegal immigration of Turkish and South European guest workers began who worked for relatively low wages and thus enabled the German employers to accumulate significant investment surpluses.

In the *second phase*, from the early 1960s to the oil price shock of 1973, Germany’s rate of economic growth practically halved (the first post-war recession in the FRG broke out in 1967), and there was an accelerating inflation. The rate of unemployment, however, declined to one-fifth of the preceding period. Migrant workers were now entering the country in general legally, while their role in the national economy increased even more. Between 1967 and 1972, German economic policy was determined by a coordinated

21 See Tibor Palánkai, *Economics of Enlarging European Union*, op. cit., pp. 18-46.

22 World Development Indicators, The World Bank, Washington, D.C., 2009, p. 14 and Eurostat, New Cronos database.

23 See its main characteristics in Horst Siebert, *The German Economy*, op. cit., pp. 24-37.

action of its main subjects (Globalsteuerung), and from the early 1970s controls on the movement of capital were abolished.

In the *third phase*, lasting until the German reunification in 1990, economic growth was further decelerating, mostly under the impact of the oil price shocks of 1973 and 1979. During the stagflation of the 1970s, the first measures restricting the immigration of foreign workers were introduced, and a discussion began on the demolition of the welfare state. At the same time, declining activities (e.g. coal mining) received increasing state aid. Following the recessions of 1974-1975 and 1981-1982, Germany's economy had developed for some years under relatively favourable conditions, and the upswing continued up to the early 1990s.

In the *fourth, present phase*, the united Germany became one of the greatest economic and trade powers in the world. Nevertheless its economic growth sharply decelerated, and unemployment has become a grave problem, especially in recent years.

Table 3. Some demand side indicators in Germany and the European Union
(average annual percentage change)

Period	GDP	Consumption	Investment	Exports	Terms of trade*	Exchange rate (V)**
<i>Germany</i>						
1951-2008	3.7	3.6	3.7	7.7	1.556	1.19
1951-1960	8.0	7.2	9.7	16.1	1.450	1.73
1961-1973	4.5	4.7	4.4	7.9	1.093	1.44
1974-1991	2.3	2.3	1.7	4.7	0.980	1.01
1992-1998	1.3	1.5	0.8	2.1	1.055	0.81
1999-2008	1.5	0.9	1.2	7.3	0.950	0.95
1961-2008	2.8	2.9	2.5	6.0	1.073	1.08
<i>European Union</i>						
1961-2008	3.1	2.9	2.9	5.8	0.939	1.18
1961-1973	4.9	6.2	5.6	8.0	1.038	1.54
1974-1991	2.3	2.5	1.7	4.4	0.936	1.14
1992-1998	2.0	1.6	1.4	5.7	0.997	0.93
1999-2008	2.2	1.7	2.6	5.1	0.969	0.98

* Figure of the final year of the period.

** Average of annual indicators.

Calculated from: Statistisches Jahrbuch für die Bundesrepublik Deutschland, Statistisches Bundesamt, Wiesbaden; National Accounts Statistics, UN, New York; National Accounts, OECD, Paris, various volumes; Alan Heston, Robert Summers and Bettina Aten, Penn World Table 6.2, Center for International Comparisons of Production, Income and Prices (CICUP), Philadelphia, 2006; IMF, World Economic Outlook database. This also concerns Tables 4 and 5.

In our days, it is mostly the investment- and export-led economic growth that is considered efficient and, correspondingly, the economic policy encouraging that investment and exports increase more rapidly than GDP.²⁴ As can be ascertained from Table 3, *Germany's and the EU's economic growth in 1961-2008 was on the whole led by exports, but not by investment*. Moreover, in the case of Germany, this statement is also true for the longer period 1951-2008. The export-led character of growth was retained to the end in both cases. If shorter periods are considered, we can see that the growth rate of investment on average exceeded that of GDP in Germany from 1951 to 1973, and in the EU from 1961 to 1973 and once again from 1999 to 2008. It is noteworthy that *the slowdown in economic growth in both cases occurred under the impact of decelerating investment*. Consumption usually increased slightly less rapidly than production in Germany in 1951-2008 and in the EU in 1961-2008. However, in the German case, the situation in 1961-2008 was vice versa (Table 3). In the years of *Wirtschaftswunder*, the German economy generated a higher income and a larger bundle of consumption good than people had hoped for. It was a period of positive surprises when today's success was the fuel for greater effort tomorrow.²⁵ The two oil crises in 1973-1974 and 1979-1980 caused a serious shock to the German economy with the two ensuing recessions, but did not seem to have changed the pattern of growth. Nevertheless, in the early 1980s, the Federal Republic moved to a lower potential path of economic growth as its economic system had changed its properties and the high growth rates of the 1950s could no longer be reached.²⁶

Data in Table 3 also show how the *terms of trade* modified and how the relationship (V , $V = V_N/V_R$) between the *actual* (nominal, V_N) and *purchasing power parity* (PPP, real, V_R) *exchange rate* evolved.²⁷ It is evident that overall Germany's terms of trade have improved, while the EU's have somewhat worsened. On the other hand, the German exchange rate seems to have reflected more over-appreciation than the average exchange rate of the EU.

24 Tibor Erdős, *Növekedési potenciál és gazdaságpolitika*, Akadémiai Kiadó, Budapest, 2006, p. 26.

25 Horst Siebert, *The German Economy*, op. cit., p. 3.

26 Ibid., pp. 3-4.

27 The actual exchange rate is kept on file by statistics. The *PPP exchange rate is determined for the GDP* (see the Appendix where the calculation results can also be found), using the national currency/dollar (and, in the Euro Area, from 1999, the euro/dollar) exchange rate. An increase in this indicator means currency devaluation, whereas a decrease is currency revaluation for a given country or region.

How did international factors affect Germany's and the union's economic development? Of these factors, it is the above-mentioned exchange rates and terms of trade that are most important here from our viewpoint. Therefore, it is expedient to examine whether they influenced economic growth, and if so, in what degree and direction. For that purpose, the growth effect of these factors will be directly analysed by the example of Germany and the European Union. This effect is described by the following relation:

$$\ln(Y_{Nt}/Y_{Nt0}) = n_1 \Delta t + (n_2 \ln V_t + n_3 \ln P_t). \quad (7)$$

In the model, Y_{Nt} is the volume of GDP in the reference and Y_{Nt0} in the base year, n_1 , n_2 and n_3 are parameters, $\Delta t = t - t_0$, V_t was defined above, $P_t = P_{Et}/P_{It}$ is the ratio of export and import prices in dollars (on 1950 base for Germany and on 1960 base for the EU), and \ln is the sign of natural logarithm.

Economically, relation (7) implies that the rate of economic growth in a logarithmic form is equal to the growth rate that can be achieved in the case of PPP exchange rate if terms of trade do not change in comparison with the base year (n_1)²⁸ and with the modifications caused by *deviations* of the actual exchange rate from the PPP one and by *changes* in terms of trade in relation to the base year.

Table 4 contains the *main results of regression analysis*. The estimation here and below was made by the ordinary least squares (OLS) method.

Table 4. Empirical results obtained for the demand side of economic growth in Germany and the EU

Period	n_1		n_2		n_3		R^2	Standard error (%)
	parameter	t statistic	parameter	t statistic	parameter	t statistic		
Germany (58 observations)								
1951-2008	0.0188	6.46	0.2373	5.18	0.1576	5.56	0.9809	4.4
European Union (48 observations)								
1961-2008	0.027	6.02	0.0395	5.93	0.7496	2.98	0.99	1.9

28 Such a growth rate is called *equilibrium growth rate*.

What *conclusions* can be drawn from this investigation?

1. *The accuracy of estimation is favourable.* The determination is very high and the relative standard error is less than 5 percent.

2. As seen from t statistics, *the parameters are significant*; their sign and magnitude meet theoretical expectations.

3. The *equilibrium growth rate* in Germany is 3.3 percent and in the EU 3.1 percent per annum if the terms of trade are of 1950 and 1960 level, respectively.

4. Trends in terms of trade *really* explain deviations from the equilibrium growth rate.

5 By using the model, the effect of individual international factors on Germany's and the EU's economic growth can be estimated (see Table 5, calculated from logarithmic values).

In the case of Germany, terms of trade accounted on average for 56.9, exchange rate for 33.3 and other factors for 9.8 percent of the total positive surplus over the equilibrium growth rate achieved in 1951-2008. If a shorter period of 1961-2008 is considered, the exchange rate will contribute with 60.6, terms of trade with 36.4 and other factors with 3 percent. We can state that *the German "miracle" from 1951 to 1960 was primarily ensured by factors of institutional character*, i.e. the initial success of the social market economy. Between 1961 and 1973, it was the strong Deutschmark (DEM) that had a decisive role in keeping the country's rate of economic growth above the equilibrium level. However, after 1973, the growth path of German economy was permanently pushed under the equilibrium state, and the two oil price shocks substantially worsened the terms of trade. After 1991, the latter significantly improved, but the exchange rate became much less favourable, which can be explained by the costs of German reunification and speculative attacks in the international markets. The introduction of the euro in 1999 made the situation with respect to Germany's equilibrium growth even worse, as the deviation of terms of trade from its rate became negative again. Overall, unfavourable trends in terms of trade after 1973 significantly decreased the EU countries' economic growth falling below the equilibrium level, especially under the impact of the oil price shocks. Even more significant was the growth-restraining effect of currency revaluations. According to the empirical results, other factors did not considerably affect the deviations of growth rates from the equilibrium value (Table 5).

Table 5. Factors of deviations from the equilibrium growth rate
in Germany and the EU
(equilibrium growth rate = 100)

Period	Fact	Exchange rate	Terms of trade	Other factors
<i>Germany</i>				
1951-2008	110.2	3.4	5.8	1.0
1951-1960	200.3	34.5	15.6	50.2
1961-1973	141.2	25.1	4.1	12.0
1974-1991	99.8	0.4	-0.8	0.0
1992-1998	68.3	-55.8	9.4	14.7
1999-2008	89.2	-7.3	-4.8	1.3
1961-2008	103.3	2.0	1.2	0.1
<i>European Union</i>				
1961-2008	96.9	0.6	-4.2	0.5
1961-1973	112.8	4.3	7.1	1.4
1974-1991	90.9	1.2	-11.2	0.9
1992-1998	97.3	-1.6	-1.2	0.1
1999-2008	91.0	-0.3	-9.6	0.9

What was the role of Germany's and the EU's economic policy in these developments? As for terms of trade, it is fundamentally the world economic situation, mainly the oil price trends that determine their change; therefore, the scope for action of economic policy in this respect is relatively narrow. It is primarily the *intensification of research and development (R&D)* that can bring a positive shift, which will be discussed below. In addition, there may be relatively more opportunities in regard to exchange rates, though today the latter are also determined on the world market. However, the economic policy of individual countries and the union, respectively, does influence their volatility.

Economic Policy Issues

Germany is an *open economy* with a strong industrial base, producing about a third of its GDP for export, in which social protection and the state play dominant roles. It joined the GATT in 1951 and the World Trade Organisation in 1995. Between 1995 and 2008, the degree of openness, expressed as a ratio of the sum of exports and imports to GDP, rose from 47.5 to 88.5 percent in Germany, including the former GDR, and from 56.9 to 79.5 percent in the EU-

15, respectively (calculated at current prices from Eurostat, New Cronos database). Because of its economic openness, the German economy is influenced both by the intense competition on the world product markets and by the competition among locations for the internationally mobile capital and technology. Economic decisions are therefore subject to the Federal Republic's need to compete in the world economy. With current trade policy being implemented at the European level, the principle of an open economy is by now well entrenched. Openness means that, by and large, free trade policy and free product markets prevail. The exceptions are regulations in specific areas and subsidies to sectors like coal mining and agriculture.²⁹

The European integration supposes a continuous, balanced and harmonic economic development, a rapid rise in living standard and tightening relations among the participating states by a gradual convergence of their economic policies.³⁰ The basic idea of the *European social model*, which is essentially of *German origin*, is a welfare state where a simultaneous presence of social cohesion, competition and collective bargaining, solidarity and a strong state regulation are the key elements. In a broader sense, the concept of this model imply along with systems of social insurance (e.g. pensions, health care) such spheres as aid policy, social dialogue, lifelong learning and other active instruments of employment policy. In this context, the three factors that are to ensure a sustainable equilibrium between the market economy and social security on the one hand, and solidarity and competitiveness on the other comprise (1) economic policy (competitiveness and growth), (2) employment policy (full employment and quality work), and (3) social policy (social protection and cohesion).³¹

The *integration process* in the European Communities (EC) has gone through several phases after the signing of the Treaty of Rome in 1957, as the originally six-member organisation³² was enlarged in 1973, 1981, 1986, 1995, 2004 and 2007 to include today 27 member states. The programme of the customs union and common market was implemented by 1968. It liberalised intra-EC trade, ensuring a free flow of goods, services, capital and labour (the

29 Horst Siebert, *The German Economy*, op. cit., pp. 1, 4, 5.

30 Zoltán Horváth, *Kézikönyv az Európai Unióról*, HVG-ORAC Lap- és Könyvkiadó Kft., Budapest, 2007, p. 34.

31 Attila Marján (ed.), *Az Európai Unió gazdasága. Minden, amit az EU gazdasági és pénzügyi politikáiról tudni kell*, HVG Kiadói Rt., Budapest, 2005, pp. 70-71.

32 The Federal Republic of Germany was one of its founding members.

so-called *four freedoms*, as referred to above), introduced a common trade policy and imposed a common external tariff on the outsiders.³³ The years between the first EC enlargement in 1973 and the 1985 Milan European Council on the single market when little progress in integration was made came to be known as a period of *euro pessimism*. The 1986 Single European Act had by 1993 largely removed all non-trade, i.e. physical, financial and technical barriers, constraining the four freedoms, in which the German government had a key role.³⁴ The 1992 Maastricht Treaty also known as the Treaty on European Union³⁵ (TEU) envisaged beyond the common (single) market the integration of national economic policies, which implied their coordination, harmonisation and, as an ultimate goal, unification at a community level. It set up the *criteria for joining the single currency area*, making possible the introduction of the euro in 1999, according to which the general government deficit should not exceed 3 percent and the gross public debt should not be more than 60 percent in each of the Euro Area member states. To promote the cause of *political union*, the TEU began the process of gradual transfer of government and legislature to the community level. The 1997 Amsterdam Treaty envisaged a harmonisation in the field of employment policy. Under the rules on budgetary discipline within the EU *stability and growth pact* of 1997, member states were obliged to avoid situations of “excessive government deficits”. They should thence notify the European Commission before 1 April and 1 October of each year under the “excessive deficit procedure”. In 1998, the European Central Bank (ECB) defined *price stability* as a year-on-year consumer price increase for the Euro Area of below, but close to 2 percent over the medium term. The 2001 Nice Treaty concentrated on the so-called Amsterdam residuals related to institutional and procedural issues, creating conditions for the 2004 and 2007 eastern enlargements and drafting of a European constitution which was ultimately adopted in 2007 as the Lisbon Treaty.³⁶

A *specific case of EC enlargement* took place in 1990. Then with the implementation of German Monetary, Economic and Social Union on 1 July and the subsequent reunification on 3 October, special shock therapy was applied in

33 Tibor Palánkai, *Economics of Enlarging European Union*, op. cit., pp. 83-84.

34 Emese Pupek, *Az Európai Unió integrációtörténete és szakpolitikái*, Századvég Kiadó, Budapest, 2010, pp. 51-62.

35 The European Union officially came into existence on 1 November 1993.

36 See Pál Dunay, “Monetáris politika”, in: Tamás Kende and Tamás Szűcs (eds.), *Az Európai Unió politikái*, Osiris Kiadó, Budapest, 2002, pp. 126-133, 137-141; Emese Pupek, *Az Európai Unió integrációtörténete és szakpolitikái*, op. cit., pp. 63-112.

Germany's new eastern *Bundesländer*. Liberalisation was implemented in a "big bang" manner, and the economy was exposed to a "revaluation shock". East Germany's *shock therapy* integrated the less developed German Democratic Republic (GDR), with lower labour and capital productivity and distorted structures, into a single monetary area with the West German economy. All barriers to the free movement of products and factors between the economies of East and West Germany were immediately removed. However, full membership of the former GDR in the Single European Market exposed its producers to unprotected competition from West German firms and in some degree from the wider world market. This instant and complete exposure to international competition was executed before the East German economy could adjust to the different structure of demand and price system of the Federal Republic. There was a wage explosion in terms of relative productivity differences, which in addition, contributed to drastic worsening of competitiveness. The tremendous costs have been overtaken by West Germany. At the same time, living standards were gradually catching up and investments were strong. In spite of huge transfers, general German inflation remained low and the DEM intact.³⁷

Table 6. GDP per inhabitant and per person employed

Year	GDP per inhabitant			GDP per person employed		
	Germany	EU	Germany/EU, %	Germany	EU	Germany/EU, %
	In dollars of 2000, at PPP*			In dollars of 2000, at PPP*		
1960	10 670	8 650	123.4	21 690	20 130	107.7
1973	17 010	14 660	116.0	37 830	36 330	104.1
1991	24 960	20 760	120.2	53 870	50 300	107.1
1991**	22 410	21 110	106.2	47 850	50 760	94.3
1998	23 960	23 690	101.1	54 800	57 740	94.9
2008	27 680	28 040	98.7	58 710	62 280	94.3

* Purchasing power parity: USD 1 = DEM 1.96 for Germany and USD 1 = PPS 0.92 for the EU.

** Including the former GDR.

Source: calculated from Appendices 1a and 2a.

37 Tibor Palánkai, *Economics of Enlarging European Union*, op. cit., p. 252; Johannes Stephan, *Economic Transition in Hungary and East Germany: Gradualism and Shock Therapy in Catch-up Development*, Macmillan Press Ltd., Houndmills, Basingstoke, Hampshire and St. Martin's Press, Inc., New York, 1999, pp. 5, 13, 27.

Yet, to this day, the eastern *Länder* remained a crisis area within the FRG, contributing to the protracted economic crisis. As seen from data in Table 6, *German reunification worsened the country's living standard and competitiveness in terms of labour productivity*, both of which fell to the level below the EU average. According to the dominant opinion, the present German economy suffers from competitive disadvantages of structural character that emerged owing to high wages, wide-scale social benefits and an excessive regulation of the labour market. All this necessitates a demolition of the welfare state. An alternative explanation focuses on the costs of German reunification, especially on the one-by-one conversion of the GDR to the FRG mark, which increased unemployment and worsened the country's competitiveness. The solution for these problems cannot be addressed to EU institutions, as it must be sought for in such areas as productivity, reunification, wage policy and taxation which all belong to national competence, whereas policy instruments for Germany and other EU member states are no longer available nationally in monetary policy, trade policy, the more important part of competition policy, subsidy control and a large number of the regulations in the product market, the environmental arena and the capital market. On the other hand, this solution will undoubtedly have a decisive impact on the future of the entire union, including its new member states.³⁸

Regarding the role of economic policy, it is expedient to briefly touch upon the question *how the introduction of the euro has influenced the economic growth* of Germany and the EU. It should be noted that of the 15 more developed EU members considered here 11 have participated in the Euro Area since 1999 and Greece joined in 2001, whereas the United Kingdom, Denmark and Sweden belong to the Non-Euro Area. The EA-12 is currently giving about four-fifths of EU-15's GDP, according to the Eurostat.

As seen from data in Table 7, Germany in the almost six decades between 1951 and 2008 showed on average a slightly better economic performance than the United States. But if a shorter period of 1961-2008 is considered, it is visible that Germany in this respect fell behind not only the US, but also the EU and EA. In the decade of *Wirtschaftswunder* from 1951 to 1960, the economy of FRG grew more than twice faster than the economy of US. Yet from the early 1960s Germany lagged behind both the US and EU in terms of economic growth. Within the EU, between 1961 and 1991, the Euro Area developed more

38 See Horst Siebert, *The German Economy*, op. cit., pp. 292-324; Zoltán Pogátsa, *Álomunió: Európai piac állam nélkül*, Nyitott Könyvműhely, Budapest, 2009, pp. 182-186.

Table 7. Average annual growth rate of GDP
(at comparable prices of 2000, %)

Period	Germany	European Union	Euro Area	Non-Euro Area	United States
1951-1960	7.95	-	-	-	3.51
1961-1973	4.52	4.94	5.46	3.35	4.33
1974-1991	2.34	2.32	2.48	1.75	2.77
1992-1998	1.33	1.97	1.82	2.60	3.55
1999-2008	1.47	2.17	2.11	2.39	2.52
1951-2008	3.70	-	-	-	3.30
1961-2008	2.84	3.07	3.27	2.44	3.25

Calculated from: National Accounts, OECD, Paris, various volumes; Eurostat, New Cronos database.

rapidly than the outsiders, but during the preparatory phase of the introduction of the euro (1992-1998), the situation changed to the latter's advantage. After the introduction of the euro in 1999, the difference decreased but still remained considerable. *Though the economic expedience of the introduction of the euro should not be questioned, the present difficulties in the Euro Area point to a possibility of two-speed integration regarding the single currency, as the less developed members of this area (Greece, Ireland, Portugal and Spain³⁹) are facing increasing problems in meeting the Maastricht criteria.*

A successful economic development is characterised not only by a rapid and efficient economic growth, but also by ensuring the existing or restoring the upset economic equilibrium. The success of an economic policy can be described by indices constructed with the aid of basic macro indicators.⁴⁰ The structure of these indices is such that their *negative values are favourable*, whereas *the positive ones are unfavourable*. Among the indices figure the average annual growth rate of GDP, as the most important characteristic of economic growth, and the four basic indicators connected with economic equilibrium: inflation (consumer price index), the rate of unemployment (inflation and unemployment exert a particularly great influence on public opinion and can be considered as components of the *misery index*), as well as the general government and the current account balance in percentage of GDP (see Table 8).

39 Sometimes Italy is also included in this group.

40 József Veress (ed.), *Bevezetés a gazdaságpolitikába*, Aula, Budapest, 1997, pp. 239-240.

Table 8. Calculated macro indices of Germany and the EU
(average of annual values, %)

Period	Inflation: consumer price index <i>a</i>	Rate of unemploy- ment <i>b</i>	Misery index <i>c</i> (<i>a+b</i>)	Real GDP <i>d</i>	Unpopu- larity index <i>e</i> (<i>a-3d</i>)	General govern- ment	Current account	Disequili- brium index <i>h</i> – (<i>f+2g</i>)	Total <i>c+e+h</i>
						balance in percentage of GDP			
						<i>f</i>	<i>g</i>		
<i>Germany</i>									
1951-2008	2.8	5.2	8.0	3.7	-8.3	-1.7	1.4	-1.1	-1.4
1951-1960	1.8	4.1	5.9	8.0	-22.2	-0.8	2.1	-3.4	-19.7
1961-1973	3.5	0.7	4.2	4.5	-10.0	-0.4	0.6	-0.8	-6.6
1974-1991	3.4	4.2	7.6	2.3	-3.5	-2.4	1.7	-1.0	3.1
1992-1998	2.6	8.4	11.0	1.3	-1.3	-3.7	-0.9	5.5	15.2
1999-2008	1.7	9.1	10.8	1.5	-2.8	-1.9	3.1	-4.3	3.7
1961-2008	3.0	5.4	8.4	2.8	-5.4	-1.9	1.3	-0.7	2.3
<i>European Union</i>									
1961-2008	5.0	6.6	11.6	3.1	-4.3	-2.5	-0.4	3.3	10.6
1961-1973	4.5	2.1	6.6	4.9	-10.2	-1.0	-0.4	1.8	-1.8
1974-1991	7.6	7.2	14.8	2.3	0.7	-4.0	-1.4	6.8	22.3
1992-1998	2.9	9.9	12.8	2.0	-3.1	-4.1	1.0	2.1	11.8
1999-2008	2.4	7.8	10.2	2.2	-4.2	-0.7	0.6	-0.5	5.5

Note. Prior to 1992, the EU's general government balance excludes Luxembourg.

Sources: National Accounts, Economic Outlook, OECD, Paris; Yearbook of Labour Statistics, ILO, Geneva; International Financial Statistics Yearbook, IMF, Washington, D.C., various volumes.

What *conclusions* can be drawn from the long-term macro indices of Germany and the EU?

1. As already noted above, economic growth in Germany after the *Wirtschaftswunder* was usually slower than in the European Union as a whole.

2. The rate of inflation in Germany was on average lower than in the EU, and the German economic policy even managed to bring it between 1999 and 2008 to a level corresponding to the price stability required by the ECB.

3. Overall, Germany had a lower rate of unemployment than the EU average, which after the reunification became much higher than previously. At the same time, the corresponding indicator of the EU somewhat decreased after 1998.

4. The general government deficit remained on the whole within the Maastricht criteria both in Germany and the EU. In the former, this indicator was above the 3 percent threshold only in 1992-1998 due to the increased costs of reunification. In the latter, it was generally unfavourable between 1974 and 1998 because of excessive spending by South European states.

5. The current account balance used to be positive in Germany and slightly negative in the EU. It is notable that Germany managed to achieve a higher current account surplus after reunification in 1999-2008 than under the *Wirtschaftswunder* in 1951-1960.

6. *The German government was usually more popular than the European Commission*, except in 1961-1973 when the EU's economy grew somewhat more rapidly and had a better equilibrium.

According to A.W. Phillips, unemployment is related to inflation through money wages. György Simon Sr. has verified this assumption. Yet his empirical results make it possible to conclude that this is not the only relevant regularity. The level of unemployment and even more its change are sensitive indicators of cyclical movements, and in this respect, they represent a cyclical factor affecting price fluctuations in addition to money wages. Therefore, Simon Sr. directly examined the relationship between unemployment and inflation. In the case of FRG, he found that the inflationary mechanism was shaped by changes in the rate of unemployment and in the level of not only the consumer, but also the export and import prices.⁴¹

Since reunification, Germany's geopolitical role has increased, but its economic success continuously diminished. Thus, the Federal Republic has been put in a *dilemma* on the solution of which the preservation of its leading role deriving from its size and level of development depends. The deteriorating economic situation is primarily connected with the long-time latent, but never consequently handled *structural problems*. Therefore, it is necessary to reform the social safety net, the pension system, health care and the labour market; to revise the rules of employment and the unemployment benefits; to slash the budget deficit and the indebtedness of local governments. *The reform concepts of federal government have not been much realised in practice.* Moreover, the effective dealing with problems is made more difficult by restrictions imposed on fiscal policy by the Treaty of Maastricht and the stability and growth pact.⁴²

41 See György Simon Sr., "Inflációs mechanizmus a modern piacgazdaságban", *Műhelytanulmányok*, 7. sz., MTA KTI, Budapest, 1992.

42 See Horst Siebert, *The German Economy*, op. cit., pp. 365-377.

As the costs of reunification boosted the budget deficit in the early 1990s, the Bundesbank significantly raised the interest rates, which due to the dominant position of German economy and the leading role of the mark in the Exchange Rate Mechanism rose in other countries, too. A recession broke out not only in Germany, but in the whole EU, which reached its nadir in 1993. From the mid-1990s, the German economy began growing again, but at a slower rate than earlier, which could, *inter alia*, be related to tax and employment policies not flexible enough. The reconstruction programme of former GDR (Aufbau Ost) was largely financed from taxes raised in the western *Länder*. The energy sector reform decreased the subsidies to coal mining. However, the curbing of inflation failed to stimulate adequately the real sphere, and decelerating growth aggravated the problem of unemployment.⁴³

Table 9. Gross expenditure on research and development (GERD)
in percentage of GDP

Country, group	1960	1973	1991	1998	2008
Germany	1.17	2.10	2.47	2.27	2.63
European Union	0.72	1.10	1.90	1.84	1.99
United States	2.60	2.24	2.69	2.58	2.76

Sources: UNESCO Statistical Yearbook, Paris, various volumes; Eurostat, New Cronos database; OECD, Main Science and Technology Indicators database.

As noted above, economic policy can positively affect economic development by intensifying research and development. In this connection, the *Lisbon strategy* approved in March 2000 wished to make the European Union the world's most dynamic and competitive knowledge-based economy. As part of this strategy, the Barcelona European Council in March 2002 set up a goal to increase R&D spending to 3 percent of GDP by 2010. As seen from Table 9, this task has not been accomplished by the EU-15 as a whole, although between 1960 and 2008, Germany, always being above the union average in this respect, managed to come nearer to the advanced world level represented by the United States. (Within the EU, beside Germany, it is primarily Sweden and Finland that have today relative R&D expenditure comparable to the advanced American and Japanese levels.)

43 Horst Siebert, *The German Economy*, op. cit., pp. 34, 39, 40; Johannes Stephan, *Economic Transition in Hungary and East Germany*, op. cit., pp. 40-47.

Table 10. The capital-output ratio (K/Y) in Germany and the EU

Sphere	1950	1960	1973	1991*	1998	2008
<i>Germany</i>						
National economy	4.10	3.20	3.60	3.89	4.31	4.49
Manufacturing	2.27	1.57	1.81	1.83	2.08	1.95
Manufacturing/ National economy		0.49	0.50	0.47	0.48	0.43
<i>European Union</i>						
National economy	-	3.23	3.35	3.93	4.08	4.25
Manufacturing	-	2.14	2.16	2.62	2.66	2.63
Manufacturing/ National economy	-	0.66	0.64	0.67	0.65	0.62

* Prior to 1991, excluding the former GDR.

Source: calculated from Appendices 1a and 2a. This also concerns Tables 11, 12 and 13.

A separate economic problem of Germany and the wider EU is *capital deepening*, which is connected with investment policy. As shown in Table 10, the capital-output ratio is essentially lower in manufacturing than in the total economy. This is presumably a consequence of an above-average R&D activity in manufacturing, the pulling sector of the modern economy. At a macro level, the capital-output ratio has continuously worsened since 1960, although in Germany, it significantly improved during the decade of the *Wirtschaftswunder*, both in the national economy and manufacturing. In the latter sphere, the indicator at issue became somewhat lower between 1998 and 2008, too; but its decrease was more pronounced in the case of Germany than regarding the entire EU.

Productivity and Technical Progress

There is no technical progress without economic growth, which is affected by many factors, as discussed above. In this connection, it is expedient to examine how the main growth factors and *total factor productivity* changed in the German and European economies over the respective investigated periods of 1951-2008 and 1961-2008. To answer this question, the TFP indicator was calculated for Germany and the EU using relation (2) and taking the value of parameter α as 1/3.

Table 11. Total factor productivity in Germany and the EU

Period	Average annual change								Contribution to output growth					
	in percent													
	Y		K		L		A		K		L		A	
	DE	EU	DE	EU	DE	EU	DE	EU	DE	EU	DE	EU	DE	EU
National economy														
1951-2008	3.70	-	3.86	-	1.02	-	1.73	-	34.9	-	18.3	-	46.8	-
1951-1960	7.95	-	5.30	-	2.41	-	4.58	-	22.1	-	20.3	-	57.6	-
1961-1973	4.52	4.94	5.47	5.25	0.15	0.28	2.60	3.00	40.3	35.4	2.2	3.9	57.5	60.7
1974-1991	2.34	2.32	3.06	3.36	0.35	0.49	1.09	0.87	43.6	48.3	9.8	14.2	46.6	37.5
1992-1998	1.33	1.97	2.82	2.51	-0.01	0.11	0.40	1.06	70.7	42.6	-0.8	3.6	30.1	53.8
1999-2008	1.47	2.17	1.88	2.60	0.77	1.40	0.33	0.37	42.9	40.1	34.7	42.8	22.4	17.1
1961-2008	2.84	3.07	3.57	3.67	0.73	0.67	1.16	1.40	41.9	39.7	17.3	14.7	40.8	45.6
Manufacturing														
1951-2008	3.75	-	3.47	-	0.43	-	2.30	-	30.9	-	7.8	-	61.3	-
1951-1960	10.57	-	6.55	-	3.55	-	6.02	-	20.6	-	22.4	-	57.0	-
1961-1973	5.16	5.72	6.36	5.83	0.44	0.49	2.75	3.45	41.1	33.9	5.6	5.8	53.3	60.3
1974-1991	1.68	1.57	1.59	2.64	-0.00	-0.01	1.15	0.70	31.5	56.1	-0.0	-0.7	68.5	44.6
1992-1998	-0.06	1.35	1.21	1.62	-0.04	-0.03	-0.43	0.83	-	40.0	-	-1.5	-	61.5
1999-2008	1.77	1.67	1.10	1.55	0.07	-0.01	1.35	1.16	20.9	31.1	2.8	-0.6	76.3	69.5
1961-2008	2.38	2.69	2.84	3.14	-0.21	-0.01	1.57	1.65	39.9	39.0	-5.9	-0.3	66.0	61.3

Note. DE = Germany; EU = European Union.

From the results summarised in Table 11, it is apparent that at a macro level, fixed assets used to increase more rapidly than output both in Germany and the EU, despite the reverse situation during the German “economic miracle” in 1951-1960. This regularity was also valid for the average performance of the German and European manufacturing industries in 1961-2008. Thus, capital intensity, K/L , became higher. This can be interpreted as a *rise in the level of capital accumulation*, to which the neoclassical approach likes to reduce economic development. Overall, *TFP showed a slower rise in the total economy than in manufacturing*. It made the highest contribution to economic growth at both the macro and manufacturing levels in Germany in 1951-2008 and in the EU in 1961-2008, followed by fixed capital and employment. However, if we regard the latter period for Germany, the order will change, as fixed capital takes over the relative leading position from TFP. In the same period, manufacturing employment was diminishing not only in Germany, but also in the EU, and thus its role in the growth of manufacturing value added (MVA) became negative (see Table 11).

Table 12. Growth of labour productivity in Germany and the EU

Sphere	1950	1960	1973	1991*	1998	2008
Germany (1950=1)						
National economy	1.00	1.69	2.95	3.74	4.28	4.58
Manufacturing	1.00	1.93	3.50	4.24	5.57	6.59
Manufacturing/ National economy	1.00	1.14	1.19	1.13	1.30	1.44
European Union (1960=1)						
National economy	-	1.00	1.80	2.52	2.87	3.09
Manufacturing	-	1.00	1.93	2.91	3.90	5.03
Manufacturing/ National economy	-	1.00	1.07	1.15	1.36	1.63

* Prior to 1991, excluding the former GDR.

German and EU data on *labour productivity* change are cited in Table 12. Two main conclusions can be drawn from them.

1. Labour productivity in the FRG and EU rose continuously until the end of the respective investigated periods, both in the national economy and manufacturing.

2. It was rising more rapidly in manufacturing than in the total economy.

Table 13. Contribution of productivity and staff change
to economic growth in Germany and the EU
(in %, $\Delta \ln Y = 100.0$)

Period	Germany				European Union			
	National economy		Manufacturing		National economy		Manufacturing	
	$\Delta \ln Y/L$	$\Delta \ln L$	$\Delta \ln Y/L$	$\Delta \ln L$	$\Delta \ln Y/L$	$\Delta \ln L$	$\Delta \ln Y/L$	$\Delta \ln L$
1951-2008	72.2	27.8	88.4	11.6	-	-	-	-
1951-1960	68.9	31.1	65.3	34.7	-	-	-	-
1961-1973	95.8	4.2	91.3	8.7	94.2	5.8	91.2	8.8
1974-1991	84.8	15.2	120.3	-20.3	78.8	21.2	163.2	-63.2
1992-1998	147.1	-47.1	-	-	94.4	5.6	313.1	-213.1
1999-2008	47.2	52.8	96.0	4.0	35.3	64.7	153.0	-53.0
1961-2008	74.1	25.9	109.0	-9.0	77.8	22.2	126.6	-26.6

What was the *role of productivity and staff change in economic growth*? Using the relation $\Delta \ln Y = \Delta \ln(Y/L) + \Delta \ln L$, the data in Table 13 were obtained. The calculations show that in the German economy, the rise in productivity accounted over the investigated six decades (1951-2008) for about three-fourths and the expansion in employment for the remaining one-fourth of GDP growth. We get roughly the same proportions if the shorter period of 1961-2008 is considered. In manufacturing, rising productivity ensured almost nine-tenths of the value added increase in 1951-2008, whereas in 1961-2008 this increase was achieved totally due to this factor. In the case of EU, improving productivity contributed with more than three quarters to macroeconomic growth over the period 1961-2008 when, similarly to Germany, manufacturing employment was contracting. It is interesting that at a macro level, economic development after 1998 became predominantly extensive in both cases, presumably due to the increased role of migrant workforce.

Table 14. Factors of productivity growth in Germany according to the standard neoclassical model

Period	Annual average in percent				In percentage of $\Delta \ln(Y/L)$		
	$\Delta \ln(Y/L)$	$\alpha \Delta \ln(K/L)$	$\lambda \Delta t$	$\Delta \varepsilon$	$\alpha \Delta \ln(K/L)$	$\lambda \Delta t$	$\Delta \varepsilon$
National economy							
1951-2008	2.625	0.926	1.948	-0.249	35.3	74.2	-9.5
1951-1960	5.266	0.927	1.462	2.877	17.6	27.8	54.6
1961-1973	4.279	1.724	1.820	0.735	40.3	42.5	17.2
1974-1991	1.964	0.886	2.087	-1.009	45.1	106.3	-51.4
1992-1998	1.937	1.133	2.157	-1.353	58.5	111.4	-69.9
1999-2008	0.689	0.365	2.205	-1.881	53.0	320.0	-273.0
1961-2008	2.074	0.925	2.049	-0.900	44.6	98.8	-43.4
Manufacturing							
1951-2008	3.250	0.995	2.061	0.194	30.6	63.4	6.0
1951-1960	6.559	0.951	1.524	4.084	14.5	23.2	62.3
1961-1973	4.600	1.907	1.892	0.801	41.5	41.1	17.4
1974-1991	2.004	0.638	2.212	-0.846	31.8	110.4	-42.2
1992-1998	3.902	1.913	2.260	-0.271	49.0	57.9	-6.9
1999-2008	1.684	0.341	2.406	-1.063	20.2	142.9	-63.1
1961-2008	2.561	1.004	2.172	-0.615	39.2	84.8	-24.0

Note. The value of parameter α is 1/3. This also concerns Table 15.

Source: calculated from Appendix 1a.

Table 15. Factors of productivity growth in the European Union according to the standard neoclassical model

Period	Annual average in percent				In percentage of $\Delta \ln (Y/L)$		
	$\Delta \ln (Y/L)$	$\alpha \Delta \ln (K/L)$	$\lambda \Delta t$	$\Delta \varepsilon$	$\alpha \Delta \ln (K/L)$	$\lambda \Delta t$	$\Delta \varepsilon$
National economy							
1961-2008	2.353	0.975	2.054	-0.676	41.4	87.3	-28.7
1961-1973	4.542	1.611	1.803	1.128	35.5	39.7	24.8
1974-1991	1.808	0.939	2.066	-1.197	51.9	114.3	-66.2
1992-1998	1.841	0.789	2.199	-1.147	42.9	119.4	-62.3
1999-2008	0.757	0.561	2.265	-2.069	74.1	299.2	-273.3
Manufacturing							
1961-2008	3.366	1.266	2.029	0.071	37.6	60.3	2.1
1961-1973	5.075	1.724	1.667	1.684	34.0	32.8	33.2
1974-1991	2.538	1.196	2.014	-0.672	47.1	79.4	-26.5
1992-1998	4.213	1.489	2.203	0.521	35.3	52.3	12.4
1999-2008	2.536	0.804	2.403	-0.671	31.7	94.8	-26.5

Source: calculated from Appendix 1b.

According to the data cited in Tables 14 and 15, the average growth rate of productivity used to be higher in manufacturing than in the total economy. This was true not only for the German, but also for the wider European economy in the respective periods under consideration.

What role was played by the *embodied and disembodied technical progress* in productivity growth? To quantify this role, relation (5) was applied considering the relevant data from the Appendix. Assuming that the value of parameter α had already been known both for the national economy and manufacturing, only the second component of the relation at issue had to be estimated here. The obtained results are summarised in Tables 14 and 15. They show that it was the disembodied and therein neutral technical progress that generally ensured the largest part of productivity growth, while the embodied technical progress was predominant at a macro level in Germany from 1992 to 2008, and in the EU from 1974 to 1991 and from 1999 to 2008. At the same time, the neutral technical progress was more rapid than the embodied one, with the exception of manufacturing in 1961-1973.

Table 16. Returns to factors of technical progress in Germany

Period	Annual average in percent					In percentage of $\Delta \ln (Y/gM)$			
	$\Delta \ln (Y/gM)$	ΔF_{KGI}	ΔF_{KGM}	ΔF_{KKR}	$\Delta \epsilon$	ΔF_{KGI}	ΔF_{KGM}	ΔF_{KKR}	$\Delta \epsilon$
National economy*									
1951-2008	2.624	0.908	1.588	0.118	0.010	34.6	60.5	4.5	0.4
1951-1960	5.263	2.326	2.679	0.316	-0.058	44.2	50.9	6.0	-1.1
1961-1973	4.279	1.553	2.512	0.210	0.004	36.3	58.7	4.9	0.1
1974-1991	1.964	0.611	1.261	0.079	0.013	31.1	64.2	4.0	0.7
1992-1998	1.936	0.620	1.224	0.081	0.011	32.0	63.2	4.2	0.6
1999-2008	0.691	0.215	0.443	0.026	0.007	31.1	64.1	3.8	1.0
1961-2008	2.075	0.676	1.297	0.087	0.015	32.6	62.5	4.2	0.7
Manufacturing									
1951-2008	3.250	0.582	2.265	0.390	0.013	17.9	69.7	12.0	0.4
1951-1960	6.557	1.075	4.315	1.180	-0.013	16.4	65.8	18.0	-0.2
1961-1973	4.600	0.796	3.160	0.575	0.069	17.3	68.7	12.5	1.5
1974-1991	2.004	0.367	1.423	0.198	0.016	18.3	71.0	9.9	0.8
1992-1998	3.902	0.726	2.774	0.398	0.004	18.6	71.1	10.2	0.1
1999-2008	1.684	0.315	1.199	0.168	0.002	18.7	71.2	10.0	0.1
1961-2008	2.560	0.463	1.802	0.274	0.021	18.1	70.4	10.7	0.8

* Calculated from aggregated data.

Source: see Appendix 1a.

One of the most serious problems with the neoclassical model is that the *concrete causes of changes* in TFP are not known. It is primarily this problem that theories of endogenous growth have tried to solve. The most obvious explanation is that it is not enough to consider only physical (fixed) capital, since in the modern economy a very significant role is also played by human capital, i.e. the education of workers and R&D. In essence it is this conception that took a concrete form in the endogenous growth models known from special literature.⁴⁴ Here we will endeavour to surmount this problem by using the *Simon model* described above. For the purpose of our investigation relation (6a)

44 Cf. György Simon Jr., "Economic Growth in the European Union", *International Problems*, Vol. 58, No. 4, 2006, p. 399.

Table 17. Returns to factors of technical progress in the European Union

Period	Annual average in percent					In percentage of $\Delta \ln(Y/gM)$			
	$\Delta \ln(Y/gM)$	ΔF_{KG_I}	ΔF_{KG_M}	$\Delta F_{KG_{KR}}$	$\Delta \varepsilon$	ΔF_{KG_I}	ΔF_{KG_M}	$\Delta F_{KG_{KR}}$	$\Delta \varepsilon$
National economy*									
1961-2008	2.353	0.984	1.271	0.096	0.002	41.8	54.0	4.1	0.1
1961-1973	4.541	2.243	2.057	0.213	0.028	49.4	45.3	4.7	0.6
1974-1991	1.807	0.755	0.988	0.076	-0.012	41.8	54.7	4.2	-0.7
1992-1998	1.840	0.697	1.075	0.072	-0.004	37.9	58.4	3.9	-0.2
1999-2008	0.757	0.268	0.458	0.030	0.001	45.4	60.5	4.0	0.1
Manufacturing									
1961-2008	3.366	0.629	2.410	0.324	0.003	18.7	71.6	9.6	0.1
1961-1973	5.076	0.898	3.548	0.685	-0.055	17.7	69.9	13.5	-1.1
1974-1991	2.538	0.477	1.827	0.236	-0.002	18.8	72.0	9.3	-0.1
1992-1998	4.211	0.809	3.053	0.320	0.029	19.2	72.5	7.6	0.7
1999-2008	2.537	0.500	1.842	0.183	0.012	19.7	72.6	7.2	0.5

* Calculated from aggregated data.

Source: see Appendix 2a.

was applied considering Germany's and the EU's data from the Appendix. The results thus obtained are shown in Tables 16 and 17.

What *conclusions* can be drawn from these calculations?

1. The German and EU economy's actual performance was on the whole *higher* than according to the model, but in certain sub-periods, such as the German "economic miracle", it could be lower.

2. The *share of mobile technical progress was the largest* with a usually increasing tendency both at a national economy and manufacturing levels. The immobile technical progress stood second with a diminishing role (here the only exception was German manufacturing during the "miracle" decade), while the creative technical progress used to occupy the third place.

3. *In manufacturing, the creative technical progress had a greater relative weight than in the total economy*, which can be related to a more intensive R&D activity, as referred to above.

Table 18. Average elasticity of output by growth factors in Germany

Period	<i>K</i>	<i>H</i>	<i>R</i>	Δt	<i>Z</i>	<i>L</i>	<i>L+M</i>
National economy*							
1951-2008	1.107	0.192	3.508	0.01436	0.058	0.110	0.134
1951-1960	0.589	0.030	1.766	0.00466	0	0.234	0.293
1961-1973	1.283	0.010	2.320	0.00776	-0.144	0.024	0.059
1974-1991	1.392	1.158	1.857	0.01494	-0.046	0.126	0.148
1992-1998	2.228	1.733	3.347	0.02099	0.263	-0.440	-0.421
1999-2008	1.305	1.453	1.264	0.02660	0.011	0.509	0.526
1961-2008	1.544	0.462	2.722	0.01634	0.148	0.147	0.169
Manufacturing							
1951-2008	0.839	0.187	3.386	0.00748	-	0.038	0.068
1951-1960	0.512	0.020	1.169	0.00191	-	0.241	0.316
1961-1973	1.329	0.008	1.955	0.00349	-	0.063	0.106
1974-1991	0.938	1.713	2.916	0.00709	-	-0.169	-0.143
1992-1998	-1.986	-3.794	-6.207	0.01125	-	6.183	6.207
1999-2008	0.602	1.191	1.038	0.01624	-	0.037	0.056
1961-2008	1.360	0.628	3.667	0.00862	-	-0.046	-0.019

* Calculated from aggregated data. $\Delta t = g_T F_K G_{KR}$. This also concerns Table 19.

Source: see Appendix 1a.

How did the average *elasticity of output by growth factors* changed in Germany and the EU over the respective investigated periods? Data in Tables 18 and 19 allow us to draw several conclusions in the given respect.

1. The elasticity of output by growth factors has significantly changed and is also different by economic spheres.

2. Overall, the *elasticity by fixed capital* was lower in manufacturing than in the total economy. In the EU, it had increased until the early 1990s, but then began to decline in both spheres. In the German economy, its rise at a macro level continued up to 1999.

3. In Germany, the *weight of education* was on average greater in the national economy than in manufacturing, while in the EU the situation was vice versa.

4. The *elasticity by researchers* in 1961-2008 was generally better in manufacturing than in the total economy, but in the case of Germany, the opposite was true for the longer period 1951-2008.

*Table 19. Average elasticity of output by growth factors
in the European Union*

Period	<i>K</i>	<i>H</i>	<i>R</i>	Δt	<i>Z</i>	<i>L</i>	<i>L+M</i>
National economy							
1961-2008	1.416	0.230	2.192	0.01623	-0.044	0.116	0.138
1961-1973	1.084	0.227	1.534	0.00796	-0.099	0.043	0.079
1974-1991	1.591	0.477	1.729	0.01483	-0.056	0.351	0.374
1992-1998	1.297	0.512	1.991	0.02137	-0.216	0.054	0.072
1999-2008	1.223	0.395	1.824	0.02562	-0.215	0.622	0.639
Manufacturing							
1961-2008	1.322	0.291	2.397	0.01089	-	-0.111	-0.082
1961-1973	1.026	0.186	1.259	0.00395	-	0.062	0.116
1974-1991	1.855	0.755	2.649	0.00848	-	-0.502	-0.471
1992-1998	1.205	0.759	2.493	0.01466	-	-1.842	-1.820
1999-2008	0.920	0.524	1.835	0.02115	-	-0.467	-0.450

Source: see Appendix 2a.

5. The role of *time factor* increased as the time of creative economic activity in the model made it possible to achieve increasingly large results.

6. The *elasticity by arable land* showed a diminishing trend, characteristic for developed economies, which was, however, temporarily reversed in Germany by the country's reunification.

7. The situation of *workers in production* is fundamentally determined by the sum of elasticities of output by the factors *L* and *M*, the indicator *L+M*. If it is positive, it will pay off for the entrepreneurs to draw new workers into production. If it is negative, reducing personnel will be more advantageous. In Germany, the indicator at issue was on the whole positive both in the national economy and manufacturing, but in the latter sector it became negative after 1960. At the same time, this indicator was generally positive in the EU's total economy and negative in its manufacturing over the entire study period.

CONCLUSIONS

Germany has traditionally been the powerhouse of the European economy and integration. Its business cycle volatility exerts a strong influence on other Western countries, but particularly on such former socialist states as Hungary

and Serbia. Our investigation has shown that certain *parallels* can be found in the long-term economic development of FRG and the EU-15.

1. In both cases, economic growth after 1960 was generally led by exports, but not by investment, and the later slowdown in economic growth occurred under the impact of decelerating investment.

2. The capital-output ratio was essentially lower in manufacturing than in the national economy, presumably due to a more intensive R&D activity in the former sphere.

3. The predominantly intensive long-term development of the German and wider European economies was ensured by a continuous rise in productivity that lasted until the current global crisis, being more rapid in manufacturing than at a macro level.

4. In both cases and spheres, it was the disembodied and therein neutral technical progress that accounted for the largest part of productivity growth according to the standard neoclassical model.

5. The application of an endogenous growth model revealed that technical progress had a mostly mobile character, implying that it was primarily ensured by an increasing equipment of workers with physical capital.

At the same time, there were also some *differences*.

1. In the deviations from the equilibrium growth rate, terms of trade in the longer run played a positive role in Germany, but a negative one in the wider union.

2. The German exchange rate seems to have been more over-appreciated than the average exchange rate of the European Union.

3. The EU, with the exception of the United Kingdom, followed a model based on Germany's social market economy, but the economic policy of European Commission was on the whole less successful and less popular than that of the German government, despite the tremendous costs and problems related to the reincorporation of the former GDR.

4. R&D spending used to be above the EU average in Germany, but even there it did not attain the advanced world level of the United States.

Finally it is important to emphasise that the current economic crisis in Europe can, in our view, be surmounted with the help of a *growth-oriented economic policy* based on the intensification of technical progress and, first of all, of its creative component, which would create favourable conditions for improving competitiveness.

Appendix 1a

Germany's main macroeconomic and manufacturing indicators

Year	Y_N	N	L_N	K_N	I	R_{Nt-2}	H/L	Z	Y_M	K_M	L_M	R_{Mt-2}
	National economy								Manufacturing			
1950	276	49.99	21.54	1132	52.3	10.6	4.95	8.55	58.2	132	6.65	8.4
1951	304	50.53	22.41	1179	55.0	11.9	4.96	8.54	66.7	137	6.72	9.4
1952	331	50.86	22.41	1228	59.8	13.2	4.98	8.65	75.7	144	6.68	10.4
1953	359	51.35	23.11	1284	70.1	14.7	4.99	8.65	84.5	152	6.88	11.7
1954	386	51.88	23.74	1348	78.8	16.5	5.01	8.71	94.1	160	7.22	12.7
1955	433	52.38	24.51	1423	95.1	18.4	5.02	8.65	109	170	7.73	14.6
1956	464	53.01	25.75	1509	109	20.6	5.04	8.73	117	182	8.35	16.3
1957	490	53.66	26.80	1598	103	23.0	5.06	8.70	125	194	8.75	18.2
1958	507	54.29	29.96	1690	108	25.7	5.08	8.68	130	207	9.03	20.3
1959	545	54.88	27.19	1786	120	28.7	5.10	8.64	142	235	9.17	22.7
1960	593	55.59	27.34	1898	132	32.1	5.12	8.55	159	249	9.43	25.4
1961	623	56.18	27.84	2029	142	34.8	5.14	8.50	169	271	9.66	27.5
1962	650	56.84	27.79	2157	149	37.6	5.17	8.46	177	295	9.83	29.8
1963	670	57.39	27.86	2284	150	40.8	5.19	8.43	182	318	9.82	32.3
1964	715	57.97	27.94	2417	167	44.2	5.22	8.42	198	340	9.83	35.0
1965	755	58.62	28.09	2563	175	47.8	5.24	8.27	213	365	10.02	37.9
1966	773	59.15	27.99	2712	178	51.8	5.20	8.23	217	391	9.97	41.0
1967	772	59.29	27.07	2852	165	55.3	5.15	8.20	212	413	9.49	43.8
1968	821	59.50	27.10	2989	172	59.1	5.11	8.19	235	431	9.57	46.8
1969	885	60.07	27.51	3130	190	63.1	5.06	8.19	263	452	9.99	50.0
1970	939	60.65	27.82	3278	211	68.8	5.02	7.57	276	475	10.22	54.5
1971	969	61.30	27.88	3443	224	74.9	5.07	7.58	279	505	10.15	59.4
1972	1005	61.67	27.78	3617	232	82.0	5.11	7.62	288	532	9.99	64.9
1973	1054	61.98	27.86	3791	232	90.0	5.16	7.59	306	555	9.98	71.3
1974	1059	62.05	27.31	3951	209	100.0	5.20	7.59	305	573	9.84	78.4
1975	1040	61.83	26.37	4090	201	101.0	5.25	7.57	290	585	9.30	78.3
1976	1094	61.53	26.13	4224	210	102.3	5.32	7.57	314	597	9.09	79.6
1977	1123	61.40	26.08	4363	219	103.7	5.39	7.53	321	608	9.05	80.9
1978	1160	61.33	26.25	4506	232	107.3	5.46	7.54	325	619	9.03	84.0
1979	1209	61.36	26.60	4657	248	111.0	5.54	7.52	341	630	9.09	86.3
1980	1220	61.57	26.87	4816	253	115.8	5.61	7.50	343	643	9.13	90.3
1981	1221	61.68	26.95	4969	240	120.8	5.69	7.48	339	655	9.04	94.4
1982	1210	61.64	26.77	5108	228	124.4	5.77	7.46	327	662	8.76	97.6
1983	1231	61.42	26.48	5242	234	128.2	5.86	7.45	332	666	8.25	100.9
1984	1266	61.18	26.61	5378	234	131.5	5.94	7.44	342	669	8.32	103.9

Year	Y_N	N	L_N	K_N	I	R_{Nt-2}	H/L	Z	Y_M	K_M	L_M	R_{Mt-2}
	National economy								Manufacturing			
1985	1290	61.02	26.63	5508	233	134.5	6.03	7.45	355	672	8.47	106.9
1986	1320	61.07	26.94	5639	241	140.8	6.39	7.46	360	679	8.51	112.9
1987	1341	61.08	27.08	5773	245	147.4	6.77	7.48	354	690	8.57	119.2
1988	1391	61.45	27.37	5912	256	156.4	7.17	7.47	365	712	8.66	127.1
1989	1441	62.06	27.74	6061	272	165.6	7.59	7.48	378	715	8.75	135.3
1990	1523	63.25	29.33	6225	295	170.9	8.04	7.49	398	733	9.27	139.5
1991	1792	79.98	37.45	6970	365	176.4	8.25	11.81	431	788	11.63	144.0
1992	1832	80.60	36.94	7191	381	182.1	8.47	11.71	422	818	10.82	146.6
1993	1812	81.18	36.38	7426	364	241.9	8.69	11.91	390	845	10.23	192.0
1994	1855	81.42	36.08	7652	379	234.3	8.92	12.04	401	859	9.64	186.0
1995	1886	81.66	36.05	7865	376	229.8	9.16	12.06	402	861	8.95	180.5
1996	1901	81.90	35.98	8072	373	230.5	9.31	12.06	390	860	8.54	180.9
1997	1927	82.05	35.81	8272	375	231.1	9.47	12.06	403	858	8.48	181.4
1998	1965	82.03	35.86	8469	386	233.4	9.63	12.11	412	857	8.46	183.4
1999	2005	82.02	36.40	8667	403	235.8	9.79	12.04	404	859	8.53	185.4
2000	2063	82.16	36.60	8869	413	237.7	9.95	12.02	422	862	8.54	186.8
2001	2088	82.28	36.82	9080	398	255.3	10.30	12.02	429	881	8.61	203.2
2002	2088	82.46	36.54	9271	374	257.9	10.67	12.00	420	894	8.48	205.8
2003	2083	82.50	36.17	9438	372	264.4	11.05	12.03	423	898	8.24	207.1
2004	2109	82.49	35.66	9589	371	265.8	11.44	12.10	438	900	8.14	210.7
2005	2125	82.47	36.57	9733	375	268.9	11.85	12.10	447	900	8.03	214.3
2006	2192	82.37	37.32	9869	404	270.2	11.84	12.06	477	904	8.16	215.8
2007	2246	82.26	38.16	10027	424	272.1	11.84	12.08	489	915	8.40	217.3
2008	2274	82.14	38.73	10207	437	279.8	11.83	12.13	491	956	8.52	219.9
1991*	1599	64.07	29.68	6520	313	-	-	7.41	413	737	9.39	-

* Excluding the former GDR.

PPP conversion rates. USD 1 = DEM 1.96 for GDP, 1.94 for MVA and 1.55 for fixed assets and investment.

Sources: Statistisches Jahrbuch für die Bundesrepublik Deutschland, Statistisches Bundesamt, Wiesbaden; National Accounts Statistics, Statistical Yearbook, Industrial Statistics Yearbook, UN, New York; International Yearbook of Industrial Statistics, UNIDO, Vienna; 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; International Financial Statistics Yearbook, IMF, Washington, D.C., various volumes; Robert J. Barro and Jong-Wha Lee, "A New Data Set of Educational Attainment in the World", NBER Working Paper, No. 159022, National Bureau of Economic Research, Cambridge, Massachusetts, 2010. Detailed data downloaded from: Internet, 25/10/10, <http://www.barrolee.com>; Alan Heston, Robert Summers and Bettina Aten, Penn World Table

6.2. Center for International Comparisons of Production, Income and Prices at the University of Pennsylvania (CICUP), Philadelphia, 2006; Marcel Timmer, Gerard Ypma and Bart van Ark, "PPPs for Industry Output: A New Dataset for International Comparisons", EU KLEMS Working Paper No. 16, Groningen Growth and Development Centre, University of Groningen, 2007, p. 28; Eurostat, New Cronos database; EU KLEMS database.

Appendix 1b

Some indicators determining demand and supply in Germany

Year	Exports	Imports	C	GDP deflator 2000=1	Price indices (2000=1)				P_t	V_t	U thous- ands
	USD 10 ⁹				P_E	P_I	P_M	P_C			
1950	15.8	11.2	167	0.197	0.300	0.470	0.316	0.238	1	1.72	2002
1951	21.4	11.9	181	0.218	0.367	0.576	0.350	0.255	0.998	1.72	1814
1952	24.1	14.9	198	0.229	0.385	0.527	0.346	0.260	1.146	1.72	1682
1953	27.9	17.6	214	0.228	0.381	0.472	0.334	0.255	1.265	1.73	1534
1954	34.5	22.6	224	0.226	0.372	0.461	0.327	0.255	1.265	1.73	1463
1955	40.3	28.3	245	0.233	0.380	0.466	0.326	0.260	1.277	1.73	1078
1956	46.3	32.2	261	0.240	0.396	0.474	0.332	0.267	1.309	1.73	878
1957	53.6	33.8	276	0.247	0.406	0.479	0.337	0.273	1.329	1.73	733
1958	55.4	41.2	292	0.255	0.400	0.444	0.344	0.279	1.412	1.73	760
1959	62.1	47.4	311	0.259	0.400	0.436	0.344	0.282	1.437	1.73	520
1960	70.2	56.1	335	0.266	0.408	0.441	0.348	0.285	1.450	1.73	271
1961	73.0	60.8	355	0.276	0.409	0.428	0.361	0.293	1.498	1.69	181
1962	75.4	68.0	379	0.288	0.414	0.425	0.375	0.303	1.527	1.56	155
1963	81.5	71.2	394	0.297	0.418	0.435	0.380	0.312	1.506	1.54	186
1964	88.5	77.6	410	0.306	0.427	0.444	0.385	0.319	1.508	1.51	169
1965	94.5	88.9	436	0.316	0.437	0.456	0.394	0.330	1.502	1.49	147
1966	104	91.4	448	0.328	0.446	0.464	0.404	0.342	1.506	1.48	161
1967	112	89.7	455	0.333	0.450	0.460	0.415	0.348	1.533	1.50	459
1968	127	102	471	0.339	0.447	0.461	0.388	0.354	1.520	1.54	323
1969	140	118	504	0.350	0.461	0.472	0.397	0.360	1.531	1.54	179
1970	149	136	538	0.375	0.478	0.472	0.426	0.372	1.588	1.40	103
1971	158	149	567	0.404	0.495	0.476	0.453	0.392	1.630	1.30	132
1972	168	160	591	0.428	0.505	0.479	0.467	0.414	1.652	1.18	177
1973	188	164	610	0.453	0.530	0.524	0.494	0.443	1.585	0.980	208
1974	211	168	619	0.484	0.613	0.638	0.529	0.473	1.506	0.968	346
1975	199	177	640	0.517	0.642	0.642	0.553	0.500	1.567	0.944	613
1976	222	198	659	0.533	0.660	0.672	0.565	0.522	1.539	0.990	634
1977	232	206	676	0.554	0.668	0.681	0.585	0.541	1.538	0.934	600

Year	Exports	Imports	C	GDP deflator 2000=1	Price indices (2000=1)				P_t	V_t	U thousands
	USD 10 ⁹				P_E	P_I	P_M	P_C			
1978	241	220	699	0.575	0.674	0.664	0.613	0.556	1.591	0.834	566
1979	252	240	722	0.597	0.708	0.721	0.632	0.580	1.539	0.793	484
1980	265	249	734	0.627	0.752	0.813	0.649	0.612	2.517	0.818	483
1981	284	241	735	0.654	0.795	0.909	0.670	0.650	1.371	1.07	798
1982	295	239	726	0.682	0.823	0.934	0.708	0.684	1.381	1.17	1302
1983	292	242	733	0.704	0.839	0.943	0.731	0.706	1.395	1.23	1850
1984	316	255	748	0.719	0.867	0.991	0.741	0.722	1.371	1.39	1930
1985	340	266	762	0.733	0.891	1.017	0.762	0.736	1.373	1.46	1976
1986	338	273	786	0.757	0.878	0.898	0.805	0.735	1.533	1.07	1807
1987	339	284	809	0.771	0.869	0.857	0.825	0.737	1.589	0.891	1759
1988	358	299	830	0.783	0.885	0.873	0.836	0.747	1.589	0.886	1760
1989	393	324	844	0.802	0.909	0.918	0.849	0.767	1.552	0.960	1595
1990	438	357	882	0.827	0.909	0.911	0.870	0.788	1.564	0.831	1423
1991	493	429	1073	0.852	0.919	0.927	0.895	0.815	1.553	0.858	2159
1992	410	423	1109	0.894	0.931	0.921	0.924	0.856	1.585	0.787	2534
1993	390	403	1110	0.927	0.936	0.910	0.925	0.895	1.613	0.822	3057
1994	421	436	1125	0.951	0.946	0.916	0.934	0.919	1.619	0.804	3323
1995	448	464	1147	0.970	0.964	0.923	0.949	0.935	1.636	0.710	3228
1996	475	481	1161	0.980	0.965	0.928	0.978	0.949	1.630	0.753	3505
1997	530	520	1167	0.986	0.977	0.957	0.970	0.966	1.600	0.875	3808
1998	572	570	1188	0.997	0.980	0.938	0.988	0.976	1.638	0.887	3732
1999	606	618	1223	1.002	0.972	0.928	1.008	0.981	1.641	0.980	3403
2000	688	681	1244	1	1	1	1	1	1.567	1.11	3137
2001	733	690	1263	1.012	1.004	1.005	1.003	1.020	1.566	1.16	3193
2002	764	680	1260	1.026	1.002	0.983	1.020	1.034	1.597	1.10	3523
2003	783	716	1263	1.039	0.985	0.957	1.020	1.045	1.613	0.928	3918
2004	863	768	1261	1.048	0.985	0.959	1.021	1.062	1.610	0.859	4160
2005	930	819	1266	1.055	0.991	0.980	1.015	1.083	1.585	0.878	4601
2006	1051	917	1281	1.061	1.004	1.006	1.019	1.101	1.564	0.886	4227
2007	1129	961	1283	1.081	1.009	1.007	1.042	1.125	1.571	0.831	3602
2008	1162	1002	1293	1.097	1.015	1.022	1.042	1.154	1.556	0.786	3141
1991*	430	404	920	-	-	-	-	-	-	-	1266

* Excluding the former GDR.

PPP conversion rate. USD 1 = DEM 2.53 for consumption.

Sources: see Appendix 1a, as well as Brian R. Mitchell, International Historical Statistics: Europe 1750-2000, Palgrave Macmillan, Houndmills, Basingstoke, Hampshire and New York, 2003, pp. 167, 169, 170; IMF, World Economic Outlook database.

Appendix 2a

The European Union's main macroeconomic and manufacturing indicators

Year	Y_N	N	L_N	K_N	I	R_{Nt-2}	H/L	Z	Y_M	K_M	L_M	R_{Mt-2}
	National economy							Manufacturing				
1960	2581	298.5	128.2	8328	691	148	5.82	94.8	506	1081	38.2	104
1961	2728	301.2	130.5	8745	760	158	5.89	94.7	535	1150	39.1	110
1962	2859	304.3	129.9	9193	804	168	5.97	94.6	561	1229	39.6	118
1963	2996	307.7	129.9	9667	840	180	6.05	94.3	587	1309	39.9	126
1964	3179	310.0	130.8	10173	914	192	6.12	93.5	636	1391	40.1	135
1965	3322	312.7	131.2	10734	949	205	6.20	92.8	672	1487	40.5	144
1966	3447	315.1	131.2	11312	1000	220	6.29	91.8	701	1565	40.5	154
1967	3560	317.1	130.1	11907	1036	235	6.37	91.6	718	1647	39.7	164
1968	3751	319.0	129.9	12531	1092	252	6.46	90.8	780	1728	39.7	177
1969	3991	321.2	131.1	13187	1170	268	6.55	90.9	851	1816	40.7	188
1970	4201	323.5	131.7	13892	1238	286	6.64	89.6	899	1916	41.3	201
1971	4344	325.8	131.7	14635	1284	305	6.75	87.2	919	2031	41.1	214
1972	4544	327.8	131.4	15405	1336	327	6.86	87.0	963	2145	40.3	229
1973	4832	329.7	133.0	16203	1403	346	6.97	86.6	1043	2258	40.7	243
1974	4947	331.2	133.8	17031	1394	366	7.08	86.6	1064	2371	41.1	257
1975	4917	332.6	132.5	17810	1328	372	7.20	86.4	1011	2466	40.1	262
1976	5143	333.7	131.9	18562	1355	381	7.29	86.0	1078	2550	39.3	267
1977	5286	334.7	133.3	19317	1376	394	7.39	86.0	1103	2630	38.4	275
1978	5449	337.3	133.6	20063	1390	403	7.48	86.2	1122	2702	38.2	282
1979	5647	338.5	135.0	20826	1451	414	7.58	86.0	1162	2777	38.1	290
1980	5734	340.0	135.2	21604	1490	430	7.68	85.7	1158	2848	37.7	300
1981	5743	341.2	134.0	22369	1426	446	7.77	85.7	1142	2923	36.3	311
1982	5799	341.5	133.2	23104	1391	462	7.85	85.7	1122	2983	35.2	321
1983	5899	342.3	133.2	23803	1416	490	7.94	85.3	1132	3036	34.0	340
1984	6045	342.8	133.5	24495	1429	508	8.03	85.5	1160	3085	33.5	351
1985	6199	343.4	134.2	25166	1461	524	8.12	85.4	1190	3137	33.4	361
1986	6373	344.1	135.7	25847	1498	542	8.21	85.3	1211	3195	33.3	377
1987	6555	344.8	137.3	26535	1590	562	8.29	85.3	1227	3263	33.3	392
1988	6835	345.9	139.8	27301	1727	588	8.38	84.9	1292	3349	33.6	412
1989	7087	347.3	142.0	28161	1836	610	8.47	84.7	1344	3429	34.0	428
1990	7296	349.4	145.2	29023	1913	636	8.56	84.5	1378	3527	34.5	444
1991	7761	367.7	152.9	30502	1966	652	8.67	88.5	1398	3658	36.3	451
1992	7851	369.3	150.7	31415	1949	674	8.78	87.9	1391	3755	34.7	461
1993	7827	370.7	148.6	32287	1826	744	8.89	87.3	1340	3830	33.2	511

Year	Y_N	N	L_N	K_N	I	R_{Nt-2}	H/L	Z	Y_M	K_M	L_M	R_{Mt-2}
	National economy								Manufacturing			
1994	8047	371.8	148.3	33076	1865	770	9.00	86.7	1403	3880	31.8	523
1995	8258	372.7	149.3	33851	1932	785	9.11	85.5	1439	3923	31.1	531
1996	8408	373.7	150.3	34649	1966	813	9.18	86.0	1437	3970	29.4	544
1997	8639	374.6	151.7	35452	2027	829	9.25	86.1	1497	4026	29.4	554
1998	8897	375.5	154.1	36291	2163	842	9.32	85.7	1536	4093	29.7	562
1999	9171	376.6	157.3	37207	2270	855	9.39	85.2	1571	4171	29.5	573
2000	9530	378.0	159.7	38191	2369	885	9.46	84.9	1653	4256	29.5	592
2001	9719	379.7	162.0	39246	2388	928	9.57	84.3	1668	4342	29.5	624
2002	9833	381.7	163.1	40271	2371	961	9.68	84.0	1655	4415	29.0	641
2003	9949	383.9	164.8	41266	2400	985	9.79	82.8	1659	4470	28.4	657
2004	10180	386.2	166.3	42238	2468	1022	9.90	83.8	1699	4511	27.9	679
2005	10362	388.5	169.1	43234	2544	1060	10.01	82.8	1725	4549	27.5	698
2006	10670	390.6	172.2	44282	2691	1110	10.07	82.3	1792	4590	27.3	725
2007	10961	392.7	175.2	45513	2831	1162	10.14	81.5	1839	4645	27.3	731
2008	11023	393.1	177.0	46897	2788	1209	10.20	81.3	1813	4772	27.2	748
1991*	7303	351.8	145.2	29385	1884	-	-	84.1	1380	3611	34.1	-

* Excluding the former GDR.

PPP conversion rates. USD 1 = PPS 0.92 for GDP, 0.87 for MVA and 0.76 for fixed assets and investment.

Source: see Appendix 1a.

Appendix 2b

Some indicators determining demand and supply in the European Union

Year	Exports	Imports	C	GDP deflator 2000=1	Price indices (2000=1)				P_t	V_t	U thousands
	USD 10 ⁹				P_E	P_I	P_M	P_C			
1960	318	309	2012	0.127	0.225	0.211	0.199	0.119	1	1.81	2978
1961	336	331	2122	0.130	0.223	0.208	0.205	0.122	1.006	1.75	2539
1962	352	354	2236	0.136	0.224	0.211	0.211	0.125	0.996	1.68	2436
1963	375	386	2360	0.140	0.229	0.212	0.214	0.130	1.013	1.63	2402
1964	409	421	2460	0.147	0.235	0.220	0.220	0.135	1.002	1.57	2186
1965	443	451	2564	0.153	0.239	0.228	0.227	0.141	0.983	1.54	2465
1966	477	481	2666	0.158	0.243	0.229	0.230	0.147	0.995	1.48	2611
1967	502	504	2764	0.161	0.247	0.224	0.231	0.152	1.035	1.48	3237
1968	556	554	2865	0.166	0.252	0.232	0.225	0.158	1.019	1.61	3210

*Simon G., Nemačka i evropska privreda, MP 1, 2011
(str. 52-98)*

Year	Exports	Imports	C	GDP deflator 2000=1	Price indices (2000=1)				P_t	V_t	U thou- sands
	USD 10 ⁹				P_E	P_I	P_M	P_C			
1969	621	628	3023	0.175	0.264	0.241	0.234	0.164	1.027	1.59	2857
1970	674	692	3156	0.187	0.279	0.254	0.250	0.172	1.030	1.59	2676
1971	724	730	3327	0.200	0.289	0.263	0.265	0.182	1.031	1.43	2966
1972	780	798	3487	0.213	0.297	0.265	0.277	0.194	1.052	1.39	3388
1973	865	883	3660	0.228	0.321	0.290	0.291	0.210	1.038	1.24	3130
1974	924	908	3735	0.251	0.393	0.382	0.320	0.235	0.965	1.20	3422
1975	892	862	3821	0.281	0.420	0.406	0.355	0.263	0.970	1.14	5145
1976	981	957	3963	0.305	0.453	0.448	0.376	0.290	0.948	1.23	5931
1977	1039	980	4048	0.332	0.534	0.480	0.408	0.318	1.044	1.18	6528
1978	1096	1025	4180	0.357	0.490	0.487	0.440	0.339	0.944	1.06	6947
1979	1168	1125	4330	0.388	0.531	0.536	0.473	0.366	0.930	0.959	7008
1980	1182	1145	4416	0.428	0.598	0.616	0.513	0.406	0.911	0.918	7625
1981	1228	1116	4441	0.468	0.655	0.703	0.548	0.451	0.874	1.13	9939
1982	1246	1133	4489	0.510	0.707	0.752	0.601	0.496	0.882	1.25	11851
1983	1280	1146	4553	0.548	0.747	0.792	0.643	0.535	0.885	1.37	13561
1984	1379	1217	4624	0.581	0.798	0.852	0.676	0.573	0.879	1.50	14283
1985	1442	1274	4731	0.612	0.832	0.878	0.716	0.607	0.889	1.54	14008
1986	1458	1338	4900	0.643	0.789	0.781	0.764	0.628	0.947	1.19	14918
1987	1517	1445	5078	0.667	0.784	0.765	0.784	0.648	0.962	1.02	15051
1988	1604	1569	5291	0.692	0.805	0.778	0.807	0.672	0.971	0.988	14142
1989	1725	1706	5445	0.725	0.948	0.823	0.830	0.706	1.081	1.04	13074
1990	1840	1809	5566	0.833	0.855	0.825	0.860	0.746	0.972	0.898	12368
1991	1933	1905	5916	0.801	0.864	0.834	0.879	0.786	0.972	0.911	13752
1992	1935	1971	6022	0.834	0.866	0.830	0.905	0.819	0.978	0.861	15316
1993	1967	1921	6019	0.863	0.892	0.849	0.923	0.850	0.986	0.963	16646
1994	2144	2069	6116	0.885	0.906	0.868	0.932	0.877	0.979	0.958	17306
1995	2319	2212	6256	0.911	0.935	0.899	0.964	0.903	0.976	0.889	16842
1996	2435	2307	6328	0.934	0.933	0.903	0.986	0.924	0.969	0.889	17109
1997	2680	2526	6446	0.952	0.958	0.932	0.989	0.942	0.964	0.971	16817
1998	2857	2781	6631	0.971	0.964	0.933	0.998	0.959	0.969	0.986	16041
1999	3013	2994	6846	0.985	0.964	0.937	0.999	0.973	0.965	1.04	14909
2000	3375	3329	7018	1	1	1	1	1	0.938	1.17	13559
2001	3497	3412	7172	1.017	1.002	0.997	1	1.029	0.943	1.21	12953
2002	3564	3452	7299	1.041	0.997	0.976	1.010	1.055	0.959	1.13	13747
2003	3605	3549	7418	1.048	0.976	0.947	0.992	1.079	0.967	0.958	14541
2004	3861	3795	7558	1.072	0.985	0.961	0.995	1.099	0.962	0.876	14932

Year	Exports	Imports	C	GDP deflator 2000=1	Price indices (2000=1)				P_t	V_t	U thou- sands
	USD 10 ⁹				P_E	P_I	P_M	P_C			
2005	4074	4028	7699	1.091	1.006	0.992	0.997	1.123	0.951	0.888	15197
2006	4431	4374	7853	1.115	1.033	1.029	1.001	1.149	0.942	0.885	14554
2007	4647	4584	8001	1.143	1.050	1.040	1.025	1.178	0.947	0.816	13349
2008	4695	4611	8064	1.134	1.069	1.068	1.002	1.219	0.939	0.796	13701
1991*	1869	1880	5720	-	-	-	-	-	-	-	12859

* Excluding the former GDR.

PPP conversion rate. USD 1 = PPS 0.98 for consumption.

Sources: see Appendix 1a, as well as Brian R. Mitchell, *International Historical Statistics: Europe 1750-2000*, op. cit., pp. 166-170; IMF, *World Economic Outlook* database.

Variables

Y_N = gross domestic product in billions of 2000 US dollars, at purchasing power parity (PPP);

N = mid-year population (in millions);

Y_M = manufacturing value added in billions of 2000 US dollars, at PPP;

K_N = average annual gross fixed capital in the national economy, including dwellings, in billions of 2000 US dollars, at PPP;

I = investment (gross fixed capital formation) in billions of 2000 US dollars, at PPP;

K_M = average annual gross fixed capital in manufacturing in billions of 2000 U.S. dollars, at PPP;

L_N = average annual number of persons employed in the national economy (in millions);

L_M = average annual number of persons employed in manufacturing (in millions);

R_{Nt-2} = full-time equivalent (FTE) number of all scientists and engineers engaged in R&D (considering a two-year lag, in thousands);

R_{Mt-2} = FTE number of manufacturing scientists and engineers engaged in R&D (considering a two-year lag, in thousands);

H/L = number of schooling years per capita (for population aged 15 and over);

Z = arable land (in million hectares);

C = consumption (final consumption expenditure) in billions of 2000 US dollars, at PPP;

P_E = export price index;

P_I = import price index;

P_M = price index of manufacturing value added;

P_C = consumer price index;

P_t = terms of trade (P_E/P_I);

V_t = exchange rate, viz. the ratio of actual and PPP values on the basis of national currency/dollar and, for the euro area, from 1999, euros/dollar;

U = unemployment.

Notes

Exports and imports contain goods and services and are expressed in 2000 US dollars at PPP by a conversion rate equivalent to that for GDP. Fixed capital values of the EU should have been partly estimated. The 1960 starting values were defined by the method expounded in an earlier paper by this author.⁴⁵ In the course of data estimations for further years, we added to the former the fixed investments of the preceding year and subtracted a 1.8 percent average real depreciation for both the national economy and manufacturing. The conversion to US dollars was made on the basis of PPP values of investments.

EU-15: Austria, Belgium, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Luxembourg, Netherlands, Portugal, Spain, Sweden, United Kingdom. Of these countries, Denmark, Sweden and the United Kingdom were not included in the Euro Area.

LITERATURE

1. Balassa, Béla, *The Theory of Economic Integration*, R.D. Irwin, Homewood, Illinois, 1961.
2. Barro, Robert J., and Lee, Jong-Wha, "A New Data Set of Educational Attainment in the World", NBER Working Paper, No. 159022, National Bureau of Economic Research, Cambridge, Massachusetts, 2010.
3. Buch, Claudia M., Doepke, Joerg and Pierdzioch, Christian, "Business Cycle Volatility in Germany", Kiel Working Paper No. 1129, Kiel Institute for World Economics, 2002.
4. Dunay, Pál, "Monetáris politika", in: Kende, Tamás and Szűcs, Tamás (eds.), *Az Európai Unió politikái*, Osiris Kiadó, Budapest, 2002, 117-149.

45 György Simon Jr., "Egy potenciális 'elefánt': India", *Statisztikai Szemle*, Vol. 79, No. 2, 2001, pp. 196-197.

5. Heston, Alan, Summers, Robert and Aten, Bettina, Penn World Table 6.2, Center for International Comparisons of Production, Income and Prices at the University of Pennsylvania (CICUP), Philadelphia, 2006.
6. Horváth, Zoltán, Kézikönyv az Európai Unióról, HVG-ORAC Lap- és Könyvkiadó Kft., Budapest, 2007.
7. Inada, Ken-Ichi, "Some Structural Characteristics of Turnpike Theorems", Review of Economic Studies, Vol. 31, No. 1, 1964, pp. 43-58.
8. Kaldor, Nicholas, "A Model of Economic Growth", The Economic Journal, Vol. 47, No. 268, 1957, pp. 591-624.
9. Kamps, Christophe, Meier, Carsten-Patrick and Oskamp, Frank, "Wachstum des Produktionspotentials in Deutschland bleibt schwach", Kieler Diskussionsbeiträge, No. 414, Institut für Weltwirtschaft an der Universität Kiel, 2004.
10. Ligeti, Zsombor, Gazdasági növekedés és felzárkózás, Ph.D. thesis, BKÁE, Budapest, 2002.
11. Marján, Attila (ed.), Az Európai Unió gazdasága. Minden, amit az EU gazdasági és pénzügyi politikáiról tudni kell, HVG Kiadói Rt., Budapest, 2005.
12. Mátyás, Antal, A modern gazdaságtan története, Aula, Budapest, 1999.
13. Mitchell, Brian R., International Historical Statistics: Europe 1750-2000, Palgrave Macmillan, Houndmills, Basingstoke, Hampshire and New York, 2003.
14. Moravcsik, Andrew, "Preferences and Power in the European Community", Journal of Common Market Studies, Vol. 31, No. 4, 1993, pp. 473-524.
15. Palánkai, Tibor, Economics of Enlarging European Union, Akadémiai Kiadó, Budapest, 2004.
16. Pogátsa, Zoltán, Álomunió: Európai piac állam nélkül, Nyitott Könyvműhely, Budapest, 2009.
17. Pupek, Emese, Az Európai Unió integrációtörténete és szakpolitikái, Századvég Kiadó, Budapest, 2010.
18. Siebert, Horst, The German Economy: Beyond the Social Market, Princeton University Press, Princeton, New Jersey, and Oxford, 2005.
19. Simon, György Jr., "Economic Growth in the European Union", International Problems, Vol. 58, No. 4, 2006, pp. 387-413.
20. Simon, György Jr., "Egy potenciális 'elefánt': India", Statisztikai Szemle, Vol. 79, No. 2, 2001, pp. 178-197.
21. Simon, György Sr., "Basic Questions of Economic Growth Mechanism", Economic Annals, Vol. 53, No. 176, 2008, pp. 7-37.
22. Simon, György Sr., "Inflációs mechanizmus a modern piacgazdaságban", Műhelytanulmányok, 7. sz., MTA KTI, Budapest, 1992.

23. Simon, György Sr., “Növekedésmélet – világmodell – gazdaságfejlesztési stratégia”, *Külgazdaság*, Vol. 49, No. 3, 2005, pp. 31-51.
24. Solow, Robert M., “A Contribution to the Theory of Economic Growth”, *Quarterly Journal of Economics*, Vol. 70, No. 1, 1956, pp. 65-94.
25. Solow, Robert M., “Investment and Technical Progress”, in: Kenneth J. Arrow, Samuel Karlin and Patrick Suppes (eds.), *Mathematical Methods in the Social Sciences, 1959. Proceedings of the First Stanford Symposium*, Stanford University Press, Stanford, California, 1960, pp. 89-104.
26. Solow, Robert M., “Technical Change and Aggregate Production Function”, *Review of Economics and Statistics*, Vol. 39, No. 3, 1957, pp. 312-320.
27. Stephan, Johannes, *Economic Transition in Hungary and East Germany: Gradualism and Shock Therapy in Catch-up Development*, Macmillan Press Ltd., Houndmills, Basingstoke, Hampshire and St. Martin’s Press, Inc., New York, 1999.
28. Tibor Erdős, *Növekedési potenciál és gazdaságpolitika*, Akadémiai Kiadó, Budapest, 2006.
29. Timmer, Marcel, Ypma, Gerard and van Ark, Bart, “PPPs for Industry Output: A New Dataset for International Comparisons”, *EU KLEMS Working Paper No. 16*, Groningen Growth and Development Centre, University of Groningen, 2007.
30. Vanhoudt, Patrick, “Did the European Unification Induce Economic Growth? In Search of Scale-Effects and Persistent Changes”, *Working Paper Series in Economics and Finance*, No. 270, Stockholm School of Economics, 1998.
31. Veress, József (ed.), *Bevezetés a gazdaságpolitikába*, Aula, Budapest, 1997.
32. *World Development Indicators*, The World Bank, Washington, D.C., 2009.

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NEMAČKA I EVROPSKA PRIVREDA

APSTRAKT

Nemačka je tradicionalno pokretač evropske privrede i integracije. U ovom radu autor nastoji da njen ekonomski razvoj stavlja u evropski kontekst putem njegovog upoređenja sa dostignućima čitave grupe razvijenijih članica Evropske unije, EU-15, pre sadašnje globalne krize. Autor primenjuje metode statističke analize, kao i modele matematičke ekonomije da bi pokazao kombinirani uticaj zakonitosti mehanizma rasta, ekonomske politike i međunarodnih ekonomskih odnosa na dugoročni razvoj nemačke i evropske privrede. Razmatrajući privredni rast kao centralni problem, on

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istražuje faktore njegovih odstupanja od stanja ravnoteže, a takođe zakonitosti koji utiču na produktivnost i tehnički progres. Njegov glavni zaključak je da tekuća ekonomska kriza može biti prebrođena uz pomoć ekonomske politike orijentisane prema rastu, koja se zasniva na intenzifikaciji tehničkog progressa i, pre svega, njegove kreativne komponente, što bi stvorilo povoljne uslove za poboljšanje konkurentnosti.

Ključne reči: privredni rast, evropska integracija, produktivnost, tehnički progres, Nemačka.