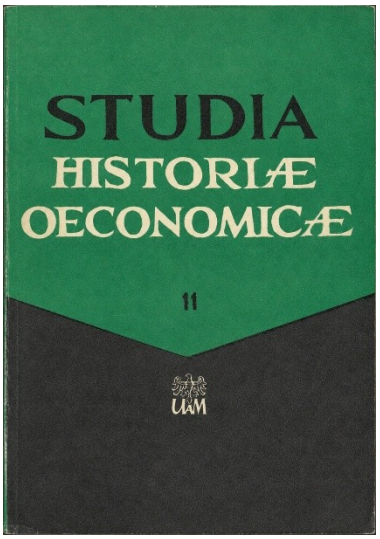


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Irena Pietrzak-Pawłowska (Warszawa)

THE INDUSTRIAL REVOLUTION AND ASYNCHRONISM IN SOCIAL DEVELOPMENT*

The subject of this paper covers two basic aspects of the formation of modern societies during the industrial growth in the nineteenth century:

a) universal trends in the first industrial revolution, which was carried out by means of the spread of the British machine technology (after 1760),

b) different conditions and socio-economic effects of the industrial revolution in various countries.

Contemporary historians treat the notion "the first industrial revolution" as a complex phenomenon: a set of correlated technological, economic, social and civilizational factors observed mainly in European countries.[1] The term "first industrial revolutions" is used in comparative studies on the industrial development in some countries on other continents, namely, the United States of America and Japan in the nineteenth century. Studies of this kind are based mainly on such sources as the nineteenth century statistical registers[2]

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* This paper is an extended version of the one read at the XIV International Congress of Historical Sciences in San Francisco (August 22 - 29, 1975).

[1] The world historiography referring to the XVIII - XIX Century industrial revolution, represented (from 1905 onwards) by classical publications of P. Mantoux, T. S. Toynbee and others, gradually broadened its scope by monographies, methodological, studies (quantitative) and attempts at a synthesis in cooperation with other disciplines (history of technology, economic geography, historical demography). Bibliographies: E. Power: *The Industrial Revolution 1750 - 1850*. A select bibliography, London 1929; T. S. Ashton: *The Industrial Revolution*. A Study in Bibliography. London 1937; R. Braun: *Industrielle Revolution*. Köln 1972; W. Rusiński: *Pierwsza rewolucja przemysłowa z perspektywy dwóch stuleci* [The first industrial revolution from the perspective of 200 years]; Roczniki Dziejów Społecznych i Gospodarczych [Annals of the Social and Economic History] vol. 31: 1970, Poznań; J. Purš: *Promyslová revoluce. Vyvoj pojmu a koncepce*. Praha 1973 (bibliography).

[2] Quantitative methods in the interpretation of economic cycles and the theory of the economic growth, among other authors S. Kuznets: *Quantitative Aspects of the Economic Growth of Nation*, II Industrial Distribution of National Product and Labor F rce. Economic Development and Cultural Change, V, 1957; J. Marczewski: *Introduction à l'histoire quantitative*, Genève 1965; A. D. Gayer, W. W. Rostow, A. Schwartz: *The growth and fluctuation of the British economy 1790 - 1850*. Oxford 1953; W. W. Rostow:

and results of modern quantitative analyses carried out in long chronological trends by historians and economists in many countries (the first pioneering studies being those of Ph. Deane and W. A. Cole, Great Britain (1962) and T. J. Markovitch, France (1965).

Asynchronous tendencies in the development of industrial societies resulted from the two aspects mentioned above (a, b), the part they played, however, was different. The durability of the historically formed structures of the late-feudal economy was a factor which was hindering the formation of the capitalist social systems in the eighteenth century. The introduction of the machine technology into industry, on the other hand, was a factor which accelerated changes in the socio-economic structure of various areas and countries.

Thus the main aim of this paper is to explain conditions which determined progress and effectiveness of the technological revolution in industry, and to show the part the technological revolution played in the process of social changes and uneven division of labour in the nineteenth century Europe. I shall limit myself to the analysis of three elements: 1) asynchronism in the diffusion of the British machine technology, 2) asynchronism in the development of the industrial economy (in terms of time and space), 3) asynchronism in the transformation of demographic and social structures.

1. ASYNCHRONISM IN THE DIFFUSION OF THE BRITISH MACHINE TECHNOLOGY

The technological and industrial revolution in Great Britain was manifested by the replacement of manual production by machines; this gave rise to the universal mechanization of industry and transport, due to the use of the steam engine (from 1783) and the introduction of new technology into metallurgy which made it possible to start mechanical production of more and more new types of machines.

From the perspectives of 200 years, the technological revolution in industry is seen to have had three major functions (cf. D. S. Landes among other authors): a) replacement of manual production (based on a long-term training) by multifunctional rapid-working, precision machinery, b) replacement of quantitatively limited natural sources of power (changeable with respect to the putout)

Industrialization and Economic Growth. Première Conférence Internationale d'Histoire Economique. Stockholm 1960 pp. 17 - 34; W. W. Rostow: *The Stages of Economic Growth,* Cambridge 1960; Ph. Deane and W. A. Cole: *British Economic Growth (1688 - 1959). Trends and structure.* Cambridge 1962. T. J. Markovitch: *L'industrie française de 1789 à 1964. Sources et méthodes.* Paris 1965.

by powerful machinery capable of producing almost infinite number of products and successfully applicable in various sectors of economy, c) replacement (or replenishment) of natural resources (plant and animal ones) by derivative materials, which guaranteed a steady growth of the quantity and quality of material goods. It should be added here that the mechanization of transport and the development of the energetics infrastructure on the nation-wide and international scale enlivened intensively the capitalist market relations.[3] The diffusion of the classical model of the British technology on the European continent took different forms and was carried out stage by stage to meet the situation on the capital market, and the labour market of the countries which were adapting it. It should be emphasized that these countries were not passive as regards handicraft creativity but had also their own contribution to the modernization of the proto-industrial technology (this refers especially to Bohemian countries, Silesia and the Kingdom of Poland).

Empirical phase of the adoption of the British technology patterns was connected with the migration of trained specialists who directly introduced new technologies into production establishments. The comparison of the calculation of costs and economic results achieved by means of traditional or modern technology led to the rational selection of mechanization patterns to be taken over by a particular country (e.g. the textile industry). At the same time, representatives of traditional industrial centres visited Great Britain and Western European universities, initiated the transfer of technological thought commonly associated with rationalism movement of Enlightenment.

The creative phase of independent technological thought in the countries which were adopting British technology is reflected in the technical periodicals, development of technical and polytechnical education, and in the foundation of research centres. Similar tendencies can be discerned in the Kingdom of Poland, i.e., more attention was given to education and publishing; in 1800 the Society of the Friends of Sciences in Warsaw started actively supporting the development of sciences (mathematics and physics); in 1816 the Academy of Mining was founded in Kielce; in 1826 the Polytechnic

[3] Ph. Deane: *The First Industrial Revolution*. Cambridge 1965; C. Fohlen: *Qu'est-ce que la révolution industrielle*. Paris 1971. Technical aspects: D. S. Landes: *The Unbound Prometheus, technological change and industrial development in Western Europe from 1750 to the present*. Cambridge 1969; *L'acquisition des techniques par les pays non initiateurs*. CNRS. Colloque (no 538) organisé avec la collaboration du International Cooperation in History of Technology Committee (ICOHTEC). Paris 1973; R. L. Hills: *Power in the Industrial Revolution*. Manchester 1970; cf. E. Olszewski: *Badania nad wdrażaniem postępu technicznego przez kraje nie będące jego inicjatorami* [Studies on the adaptation of technological progress by the countries which were not its initiators]. Kwartalnik Historii Nauki i Techniki 1971 z. 3 [Quarterly of the History of Science and Technology 1971 vol. 3]. Warsaw.

Institute of the University of Warsaw started preparatory courses (analogical initiatives were undertaken in Lvov). Excellent publication *Polish Isis, or the journal of abilities, inventions, skills and handicrafts*, (Izys Polska, czyli dziennik umiejętności, wynalazków, kunsztów i rękodzieł, 1820 - 1828) acquainted its readers with the western European technological thought.

The adoption of new technology was encouraged by the policy of the government of the Kingdom of Poland by means of the legislature which supported home industry and inventiveness. In 1817 a decree was issued concerning letters patents for establishing factories and protecting new inventions or improvements. These regulations were extended in 1837. The register of patents on inventions and improvements in "Journal of Laws" (1815 - 1863) shows that out of the total number of 246 patents, 71% of them were Polish and 25% of patents were granted to foreign inventors, the quality of their inventions being in most cases higher than that of the Polish ones.

Comparative studies undertaken earlier by western European historians show that registers of patents to protect new inventions provide important information about phases of technological advancement and the progress in the modern civilization. A hypothesis has been put forward that the success of the technological revolution in less advanced countries was achieved only when pattern of new technologies introduced directly by British specialists were counterbalanced by innovations of native specialists.

Data concerning power potential of individual countries have been utilized to serve as the basic and universal measure of progress in the adaptation of machine technology; these data allow us to discern different asynchronous tendencies in the technological revolution in industry. In the first half of the nineteenth century they resulted from the fact that certain countries and areas "lagged behind" Great Britain, the country which initiated machine technology. After 1870, however, countries such as Germany und the United States of America, which having initiated new technologies began spreading their own achievements in this field, appeared to outpace Great Britain.

Methods used in the analysis of asynchronism (worked out by J. Purš)[4]

[4] J. Purš: *La diffusion asynchronique de la traction à vapeur dans l'industrie en Europe du XIX^e siècle*. In: L'acquisition des techniques par les pays non initiateurs, op. cit., pp. 75 - 124; Ch. Singer, E. J. Homlayrs: *History of Technology*. Vol. IV: The Industrial Revolution c. 1750 - c. 1850; Vol. V: The late nineteenth Century c. 1850 - c. 1900 Oxford 1958; J. Payen: *Histoire des sources d'énergie*; Lausanne 1960; M. Daumas (dir.): *Histoire générale des techniques*. Vol. I: Les origines de la civilisation technique; Vol. II: Les premières étapes du mechanisme; Vol. III: L'expansion du mechanisme. Paris 1962, 1965, 1968; Vol. IV: La civilisation industrielle (sous presse); M. Daumas: Le mythe de la révolution technique. Revue d'histoire des sciences. Vol. XVI: 1963 no 4; L. Bulferetti: *Quelques méthodes proposées pour une technometrie historique*. XIVth International Congress of the History of Science Proceedings no 3. Tokyo-Kyoto 1974. pp. 126 - 129.

aimed at defining: a) chronological indices (table 1), i.e. the time-lag of the examined countries in comparison with Great Britain (h.p. per 1000 inhabitants) or with the country representing the highest level of technological advance (in 1900); b) quantitative indices concerning the development of the industrial technology potential, i.e. the difference between the capacity of steam engines used in the industry of the technologically leading countries and the "less advanced" ones.

Table 1

Index of the chronology of the time-lag in the industrial development of some European countries in comparison with Great Britain (in terms of h. p. per 1000 inhabitants)

Countries				Time-lag (years)
Russia 1900	8,0	Great Britain 1814	7,9	86
Austria 1900	29,6	Great Britain 1859	29,8	41
France 1900	46,0	Great Britain 1873	44,8	27
Bohemia 1900	56,0	Great Britain 1876	54,7	24
Germany 1900	73,6	Great Britain 1889	76,6	11

Source: J. Purš; *La diffusion asynchronique de la traction à vapeur dans l'industrie en Europe au XIX^e siècle.* Colloque International (1970): L.Acquisition des techniques par les pays non-initiateurs, p. 78, 110.

The above index reveal a characteristic feature of the chronological distance in the development of technology in some industrial countries of the nineteenth century Europe in comparison with Great Britain: in 1900 the minimal time-lag was noted in case of Germany (11 years) and the developed areas of Bohemia and France (less than 30 years), while the time-lag of other countries of Central and Eastern Europe ranged from 41 to 86 years.

Table 2

The capacity of steam power in industries of some European countries in 1900 as compared with Great Britain. Index of the distance (h.p. per 1000 inhabitants)

Countries	Capacity of steam power in industry (h.p./1000 pop.)	Index of distance (h.p./1000 pop).
Great Britain	164,2	—
Russia	8,0	156,2
Austria	29,6	134,6
Cislitavia	29,6	134,6
France	46,0	118,2
Bohemia	56,0	108,2
Germany	73,6	90,6

Source: J. Purš, op. cit. p. 109-112.

Table 2 shows that in 1900 the highest potential of mechanical production forces was concentrated in the British industry, and it also shows the polarization in the geographical distribution of that potential. Germany, however, outdistanced Great Britain as regards the development of modern branches of industry: energy-electrical, chemical and machine production.

A critical analysis of the discussed methodological propositions put forward by historians of technology and economy, enables us not only to establish a chronological order in which various European countries underwent the industrial revolution, but also to specify the potential of mechanical production forces which these countries achieved in the final phase of the revolution. The table below shows characteristic tendencies: the nineteenth century Britain and other industrial countries of western Europe attained a higher degree of industrialization by means of a much lower potential of mechanical production forces than those countries which adopted and spread machine technology after 1850.

Table 3

Chronological order in which the technological revolution affected some European countries, and the potential of mechanical production forces in the industry of these countries

Countries	Period of time	Potential of mechanical production forces in thousands of h.p.
Great Britain	(1760) 1783—1830	350,0 (1840)
France	1830—1860	178,0 (1860)
Belgium	1833—1860	—
Prussia	(1836) 1850—1875	632,1 (1875)
Silesia		251,6 (1893)
Kingdom of Poland	1850—1890	302,0 (1910)
Austria (Cislitavia)	1867—1890	849,6 (1902)
Bohemia	1867—1913	576,6 (1902)
Russia	(1861) 1877—1913	1744,2 (1908)

Source: Chronology according to the Revue Economique, vol. 23. 1972, no. 5. pp. 723 - 750. Cf. C. Fohlen: Qu'est-ce que la révolution industrielle? Paris 1974 p. 61. Statistics of the h. p. according to the Critical analysis of sources, J. Purš, op. cit. pp. 104-117; *The industrialization of Polish territories*, op. cit. p. 75. Data in h.p. do not cover all the sources of power (e.g. those used in land and water-borne transport).

Quantitative indices of technological potential in the industry of the Western European countries show an enormous growth ("leap") after 1870. This was a symptom of qualitative changes, i.e. modernization of the classical model of British mechanization. The implementation of more effective technologies in steel production (methods worked out by H. Bessemer 1856; Siemens-Martin 1865; S. Thomas 1877) and the production of new types of

machines brought about changes in the industrial structure of the developed countries, in which the production of means of production was higher than the production of consumer goods. After 1880 new sources of power — gas and electricity — were introduced into all sectors of production, transport and telecommunication. The importance of the so-called second technological revolution in the nineteenth century was manifested not only in the more rapid economic growth but also in the overall change of the living and civilizational conditions of the population (mainly inhabitants of towns).

At the time when less "advanced" countries of Southern and Central Europe were fully launched into the process of industrialization in the second half of the nineteenth century, the requirements of new technology they had to meet were much higher than before. The constantly growing amount of capital investments in the modern infrastructure and heavy industry (group A) was larger than the size of the accumulation in agricultural countries. Demand for investment credits opened up possibilities for the penetration of the foreign capital.

From the chronological point of view, the economic development of the industrial sector in different areas of Europe went through a few phases, characterized by some typological features. The most essential phases involve economic conditions for the introduction of the mechanical production, and the achievement of "maturity" which would guarantee constant economic growth, outpacing the population growth of a given country (final phase) (W. W. Rostow).

More significant, however, is a controversy on turning points of the first industrial revolution in Europe and on other continents in connection with a complex of its components. The problem concerns different criteria (uni- and multifactorial) applied to marking the initial and final phases of technological economic transformations. Since the latter were simultaneous with transformations in the economic and demographic structures on the one hand (in relation "country": "region"), and the social structures — determined by the distribution of the national income — on the other, the chronology of these phenomena has not as yet been established.

2. ASYNCHRONISM IN THE DEVELOPMENT OF INDUSTRIAL ECONOMIES

If we accept a thesis that rapid technological changes combined with a complex of economic and social transformations constituted the essence of the industrial revolution in Europe, we shall have to consider the sources and characteristics of uneven levels of economy in individual countries (or on the scale of regions) and in various areas of the continent. Industrial revolution had an integral character in the domain of exchange because the dominating

branches of the industrial economy in Western European countries of the second half of the nineteenth century had a great impact on the whole continent. After the victory of liberalism in the international market relations, the range of the trade in investment goods increased as did the network of the railway transport joining the areas of the continent characterized by different economic systems. These two factors made it easier for the countries and regions which had already been industrialized to exploit raw materials and labour force, supplied by agricultural areas.[5]

Western European countries, similarly to Great Britain, developed manufacture industry, and due to the expansion of their trade onto the world (colonial) markets, they transformed late-feudal ownership relations into the early-capitalistic ones. They created a "proto-industrial" capitalist system on the basis of the internal accumulation of the trade capital, external accumulation (colonial exploitation) adding to it. The process of economic transformations affected the whole economy: agriculture→trade→manufacture industry→light factory industry→heavy industry, and the production of means of production.

In the Central and Eastern Europe, where the late-feudal relations in agriculture prevailed until the middle of the nineteenth century, autarkic tendencies were predominating mainly because of the rich natural resources (coal, metal ores) which were in the hands of big landowners or the State Treasury (regal privileges). Early-capitalist changes (of extensive type) were determined by the internal accumulation which followed two directions of development: a) agriculture→trade (in urban areas)→light industry b) agriculture and exploitation of the country's own (mineral) resources→heavy industry (in private and state-owned industrial plants).

After agrarian reforms (1848 - 1864) in the countries of Central and Eastern Europe, there still prevailed semi-feudal ownership relations in agriculture, which caused sharp disproportions in the rate of the production growth in this sector as compared with the industrial sector.

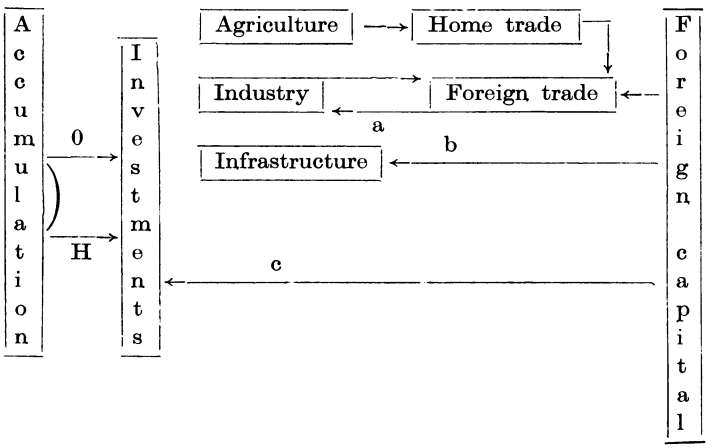
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[5] *The Cambridge Economic History of Europe*, vol. VI. (1 - 2); The Industrial Revolution and after: incomes, population and technological change, ed. by H. J. Habakkuk, M. M. Postan, Cambridge 1965; *Colloque International du C.N.R.S.: L'Industrialisation en Europe au XIX^e siècle. Cartographie et typologie.* (Lyon 1970). Publiés sous la direction de P. Léon, F. Crouzet, R. Gascon. Paris 1973; Ibid. J. Bouvier: *Rapports entre systemes bacaires et entreprises industrielles dans la croissance européenne au XIX^e siècle.* pp. 115 - 140; Cp. *Debates in Economic History: Capital formation in the idustrial revolution*, ed. by F. Crouzet, London 1972; F. Crozuet: *Problemy ekonomiczne historii industrializacji w XIX wieku* [Economic problems of the history of industrialization in the XIX century]. In: Gospodarka przemysłowa i początki cywilizacji technicznej w rozlicznych krajach Europy. Studia i Materiały [Industrial economy and the beginnings of the technological civilization in the agricultural countries of Europe. Studies and Materials] ed. by I. Pietrzak-Pawłowska, Wrocław—Warszawa (Ossolineum) 1976.

Industrial revolution which affected agricultural countries of Central and Southern Europe in the second half of the ninetenth century, took a specific course of development: 1) process of diffusion of the classical model of the British technology based on the internal accumulation curves extensive industrialization, 2) penetration of new technological and power engineering was combined with the expansion of foreign capital (intensive industrialization). The correlation between these two trends is outlined below (diagram 1).

Diagram 1

Economics of industrialization in agricultural countries of Europe in the second half of the nineteenth century



0=land capital; H=commercial capital; a+b=import of investment goods; c=foreign capital – direct investments

Those countries and regions which could not catch up with industrialization showed a characteristic tendency to invest both land and trade capital in industrial plants, ensuring thus the balance between material contribution (land, natural resources, natural fuel) and capital investments.

In the second half of the nineteenth century both land and industrial capital used to be jointly invested in railway engineering and the development of modern infrastructure (transport and urban infractructure), in addition to mining and steel production centres. Material contribution, accumulation and concentration of land capital in joint stock companies of this type, supported by foreign capital — these were the characteristic features of an intensive type of industrialization; consequently, landowners started indirectly cutting down on their investments in agriculture, which enlarged disproportions in the structure of both sectors.

Referring to the economic growth, some writers of modern world history ascribe particular importance to the state policy of industrialization carried out in agricultural countries.

State-owned industrial plants drew on funds from the public purse and invested them in mining, in metallurgy and the construction of machines. The aim of this policy was to develop a home power base (coal) and to spread mechanical means of production and transport on the home market, the import being gradually reduced. The protection (legislation, fiscal control, tariff policy) of the home industry initiated in the United States of America (influence of H. Carey's theories) was successfully utilized in Prussia in order to get control over the extended home market ("Prussian model"). After the formation of the Customs Association (Zollverein) in 1836 technological progress introduced into the industry and transport served also to intensify agriculture, which brought about a relative balance between the two sectors and guaranteed a wide development of infrastructure.

Similar conceptions of industrial policy as regards the Kingdom of Poland were outlined by Stanisław Staszic, the economist, and developed by the minister K. Drucki-Lubecki. They proved, however, to have been unsuccessful for a number of reasons: weak internal accumulation in agriculture, underdeveloped home market and trade, developmental prospects set back by political repressions (after the rise up in arms against Russia of Tzar in 1830), increase in the district differentiation caused by tariff barriers, and finally, the loss of the eastern market after 1831.

Economic success resulting from the technological revolution depended — as proved by the experience of industrialization of the Kingdom of Poland — not only on the size of investment capital (e.g. Polish Bank) but also on the development of the home market relations corresponding to the division of labour prevailing on the continent after the industrial revolution in Western Europe. It was imperative to create production and non-production infrastructure indispensable for keeping up continuity in the adoption of technological advances. At the end of the nineteenth century the infrastructure in the developed countries included: 1) a set of technological innovations and modern machinery to aid the development of industrial economy (building, transport, telecommunication, etc.), 2) human factor involved in the adoption of technological innovations, i.e. ingineering personnel (polytechnical institutes functioning as research and academic centres) and skilled workers.

Less advanced countries of Southern, Central and Eastern Europe did not have such a well developed infrastructure at that time: shortcomings in this field led to difficulties, set-backs, or even temporary failures in the implementation of the achievements of the industrial revolution on the nation-wide scale.[6]

[6] J. Kuczynski: *Zum Problem der industriellen Revolution*. Zeitschrift für Geschichtswissenschaft 1956, H. 4; K. Borchardt: *Die industrielle Revolution in Deutschland*. München 1972 (bibliography); W. Kula: *Some Observations on the Industrial Revolution in Eastern European Countries*, Ergon vol. I Warszawa 1958.

Contemporary historians (W. Kula; A. Gerschenkron) have devoted some attention to aspects of the industrialization policy initiated and carried out by the Sate administration; in the light of the "big push" conception, however, it proved socially ineffective whenever the human factor did not get due consideration.[7] In the case of the developed capitalism and manufacture production industry the scale of capital investments (home and foreign) kept constantly growing and so did the range of international trade in investment goods. W. W. Rostow's comparative studies in this field added to this conception of stages of the economic growth a hypothesis stating that the ratio of 5 - 10% of the national income marks the "maturity" threshold of the industrial economy, which ensures that it continues developing steadily. The above, universally accepted, limits have been criticized in the light of source studies.[8]

After 1870 there appeared a tendency to concentrate technological and production potential and to centralize investment capital in the developed countries. This fact had some impact on the transformation of horizontal geo-economic organization of Europe into a vertical industrialization structure. Centres which had at their disposal investment capital from many countries and enjoyed the support of big banks gained control of key branches of the industry: power engineering, machine construction, chemical production, involved in the modernization of the whole economy.

Agricultural countries of Europe began an intensive development of technology by engaging their own specialists in the modernization of home technology, by introducing modern technology into the steel production, and by developing new power system based on the native resources of coal, coke and gas.

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[7] A. Gerschenkron: *Typology of Industrial Development as a Tool of Analysis*, Deuxième Conférence Internationale d'Histoire Economique (Aix-en-Provence 1962). Paris 1965 pp. 487 - 505; A. Gerschenkron: *Notes of the Rates of Industrial Growth in Italy 1881 - 1913.* Journal of Economic History. XII. 1955; *L'Histoire économique. Au XIX^e siècle: industrialisation linéaire ou industrialisation par bond?* (sous la dir. J. Bouvier). Revue Economique vol. XXIII, no 5, 1972; M. Lévy-Laboyer, *La croissance économique en France au XIX^e siècle.* (Résultats préliminaires). Annales E. S. C. 1968 no 4; F. Crouzet: *Essai de construction d'un indice annuel de la production industrielle française au XIX^e siècle.* Annales E. S. C. 1970 no 1; P. J. Łukasiewicz: *Indeks produkcji przemysłowej na ziemiach polskich 1870 - 1913* [Index of industrial production on Polish territories 1870 - 1913]. In: Gospodarka przemysłowa, op. cit. (Industrial economy op. cit.)

[8] *Uprzemysłowienie ziem polskich w XIX i XX wieku. Studia i materiały* [Industrialization of Polish territories in the Nineteenth and Twentieth Centuries. Studies and Materials]. I. Pietrzak-Pawłowska (ed.). Wrocław—Warszawa 1970. (bibliography); В. И. Ленин: *Сочинения.* Том 3: Развитие капитализма в России. Изд. 4. Москва [1953]; П. И. Лященко: *История народного хозяйства СССР.* Том II: Капитализм. Изд. 2. Москва 1952; Social-Economic Researches on the History of East-Central Europe. Studia Historiae Academiae Scientiarum Hungaricae. Vol. 62. Budapest 1970; J. T. Berend, Gy.Ránki: *National Einkommen und Kapitalakkumulation in Ungarn 1867-1914*; L. Katuś: *Economic Growth in Hungary during the Age of Dualism (1867 - 1913).*

The world history writers have tried to compare the course the industrial revolutions took in Europe with the way they developed on other continents, in such countries as the United States of America and Japan, whose historical and economic conditions were completely different from those on the European continent.

In the United States of America there also dominated autarkic trends without late-feudal restraints. During the territorial expansion of the United States, which lasted until 1860-ies, the accumulation of capital was based on the extensive farming, stock-breeding and on the home trade. After the victory of the North over the South (1864) the technological revolution in industry was successfully accomplished thanks to the rapid development of transport and home trade, as well as the intensive mechanization of farming. To cultivate its large territory, covering 9,3 million km^2, the United States drew on its own rich natural resources, solid and liquid fuels.

The accumulation of capital made it possible to import investment goods and to develop heavy industry with the aid of modern technology (steel production, construction of machines).

The total capacity of steam power installed in the railway transport, inland and sea-shipping exceeded the potential of steam power in industry; new sources of power — natural gas and electricity — were used. As regards steam power potential, at the and of the nineteenth century the United States outpaced Great Britain (18 060 : 13 700 thousand h.p.) but still fell short of the European countries potential (18 060 : 26 600 thousand h.p. in 1896). Europe together with the British Isles held the highest world potential of steam power i.e. 40 300 thousand h.p. in 1896.[9]

As regards the value of the industrial output, the United States became the rival of Western European countries in the expansion on the Pacific and on the world markets. The value of its industrial output in 1894 reached the sum of 9498 million dollars, while that of the three most developed European countries — Great Britain, Germany and France taken together amounted to 10510 million dollars (Great Britain — 4263 million, Germany — 3357 mln, France — 2900 mln dollars).

Japan, which up to the middle of the nineteenth century constituted a closed area of feudal economy, was compelled to open her ports for the world trade (1859) due to the intervention of Western European countries and the United States of America. After the Mediji coup in 1869 and the centralization of the

[9] Historical Statistics of the United States 1789 - 1945. New York 1949. Statistical Abstract of the United States Am.; H. Landsberg: *Natural Resources for US Growth*, Baltimore 1964; *The Development of American Industries*. J. G. Glover, W. B. Cornell, G. R. Collins (eds). New York 1951; 3 ed. G. Owen: *Industry in the USA*. Manchester 1966; E. S. Woytinsky: *Profile of the US Economy*. New York 1967; C. Fohlen, *L'Amérique du Nord*. Paris 1969.

State authorities of the empire, these ports appeared to have initiated the development of the capitalist economy in that country. Other changes involved the diffusion of popular education and the introduction of the training of administrative and technological personnel. Agrarian reforms (1873) brought about the development of the home market; farming, however, had to be 30% taxed so that the accumulation of capital could be accelerated. After the agrarian crisis (1881 - 1885) Dutch and American patterns of farming were adopted. In handicrafts the technique of "small-scale mechanization" was encouraged.[10]

The characteristic feature of the Japanese model of industrial revolution was the investment policy controlled by the State sector. The State took over mining, steel production, transport engineering (railways, shipping), machine construction, production of cement, etc. State credits (Banks for Industry and Agriculture 1897 - 1900, Japan Industrial Bank 1902) helped to spread British technology and other most advanced technologies (e.g. steel production). Beginning in 1880-ies, the government started reducing its policy of developing state enterprises and started selling the enterprises it had run. This accelerated the development of big capitalist industrial enterprises (joint stock companies) which availed themselves of bank credits and had commercial connections with big trade factories on the Asian continent. Military expansion of Japan to the coasts of East Asia (war with China in 1894, war with Russia in 1904, conquest of the Korean Penninsula) proved her imperialistic tendencies based on industrial economy. Japanese economy, however, did not achieve the level of Western European countries until 1913 (in 1908 the power index for Japan was 0.7 h.p. per 100 population while that of Great Britain was 24 h.p. per 1000 population).

The economic effect of the first industrial revolution of the nineteenth century was apparent in the transformation of the whole economic structure of the developed countries into tri-sectorial one, and in the increase of the production output, which guaranteed the constant growth of the national income. The distribution of the attained income was subordinated to the social class relations which existed in the capitalist system.

3. ASYNCHRONISM IN THE SOCIAL DEVELOPMENT IN THE PERIOD OF THE FIRST INDUSTRIAL REVOLUTION

British model of the industrial revolution — universal in the field of technology and economy — turned to have been unique as regards synchronization

[10] *Hundred Year Statistics of the Japanese Economy*. 1966; A. Butts: *Trends in Japan's Trade and Industries*. Washington 1929; T. C. Smith: *Political Change and Industrial Development in Japan*, Government Enterprise 1868 - 1880. London 1959; K. Emi: *Government Fiscal Activity and Economic Growth in Japan 1868 - 1960*. Tokyo 1962.

of social effects and formation of a modern class society (P. Mathias).[11]

On the European continent the process of transformation of the traditional late-feudal society into the class industrial one went unevenly both in terms of time and space. After agrarian reforms which gave rise to new production relations in agriculture, and after the changes in industry caused by the mechanization the development of labour market became the most important factor stimulating further transformations.

External conditions which determined the growth rate of the labour market resulted from the growing demographic trend and from the migration of people to urban areas in search of work. The differences in the population growth affected the polarization of the economy levels.

The industrial revolution in western areas of Europe affected only 8% of the continent until 1850 but these areas were populated by 27% of the total population. In the next half of the century (up to about 1900) industrialization reached Central Europe: Germany, Austria, Bohemia, western and central territories of Poland; Southern Europe (Italy) and the North (Sweden); together with the western part of Europe, industrialization affected about 30% of the continent. Agricultural areas constituted still about 70% of the continent in 1900 (mainly Russia and Balkan countries). It was in these areas that the population growth turned to be the highest (84%) while in the Western Europe population growth showed decreasing tendencies (32%) in comparison with the European average (50%).

This polarization prevailed throughout the first 30 years of the twentieth century, as the population in Western European countries was declining and the population growth in the south-western part of Europe remained on the same level. As for the rest of Europe, the peak of the population growth was noted in South-Eastern countries (124%); and those countries were at the same time the farthest behind in their economic development.[12]

Disproportions between the rate of the population growth and the development of industrial economy at the beginning of the twentieth century influenced directions of the trade exchange in Europe. There appeared a steady trend towards the export of industrial goods, equipment, investment capital and trained technical personnel from Western Europe to Eastern and South-Eastern countries. Labour force, on the other hand, migrated from the East and South to the eastern part of Europe. Both trends of these mobile elements of the in-

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[11] P. Mathias: *The first industrial nation*. Oxford 1969. Cp. C. Clark: The Conditions of Economic Progress. red. London 1957.

[12] S. Borowski: *Przemiany socjo-demograficzne na ziemiach polskich i w niektórych krajach europejskich w XIX i XX wieku* [Socio-demographic changes on the Polish territories and in some European countries of the nineteenth and twentieth centuries] In: The Memoirs of the Xth Congress of Polish Historians. 1968. vol. I. Warsaw 1968. pp. 392 - 413.

dustrial economy enlarged the range of social effects of the industrialization to a greater extent than it could have been expected, judging by the geographical distribution of industrial enterprises.

A general tendency towards changes in the professional structure of the population in various countries and regions of Europe at the beginning of the twentieth century was manifested in the decreasing employment in farming. As regards industry (mining and building) the employment was growing up in the less advanced countries of Central and Eastern Europe and lowering (in favour of services) in the industrially leading western part of the European continent.

Table 4

Population employed in various sectors of economy (1900 - 1931) in percentage

Continental countries	Years	Farming (a)	Industry (b)	Services	
				productive (c)	other (d)
Europe Great Britain	1901	12,4	55,7	12,1	19,8
	1931	5,9	46,1	20,9	27,1
France	1901	41,8	35,5	9,5	13,2
	1931	35,6	33,7	18,4	12,3
Sweden	1900	49,8	20,9	7,5	21,8
	1930	36,0	32,1	18,1	13,8
Czechoslovakia	1930	38,3	36,1	10,8	14,8
Poland	1938	59,1	23,2	9,6	8,1
U.S.S.R.	1939	50,1	30,1	4,9-	14,9
Europe — total	c. 1930	55,6	22,2	22,2	
America — total	c. 1930	36,7	20,0	43,3	
The United States of America	1930	22,0	(31,2)	31,2)	(23,4)

a — with forestry and fishing, b — with mining and building, c — trade and transport, d — and other professions, e — only trade.

Source: Revue de l'Institut International de Statistique no 3. The Hague 1938. W. S. Woytinsky: *Die Welt in Zahlen*, vol. I. Berlin 1925. S. Borowski — cf. note 12.

Asynchronization of the national income growth in countries with different economic structures resulted from the difference between the growth rate of the industrial sector (plus productive services) and the rate of the population growth. National income per capita is a generally accepted statistical measure, though it is a relative yardstick, as it does not take into account class differentiation in the distribution of that income.

In comparison with Great Britain, the richest country in the world in 1870,

whose national income per capita we shall assume to be 100, other countries remained far behind.[13]

Great Britain=	100,0 (1870)		
Belgium	69.7	Italy	57.5
The U.S.A.	68.9	Denmark	54.5
France	64.3	Norway	54.3
Germany	63.5	Russia	34.3
Canada	60.2	Japan	25.1

During the period from 1870 to 1913 this situation changed, as the rate of the national income growth per capita in Great Britain reached the annual average of 1.1%, while in France it was 1.4%, in Germany 1.6%, in Japan 1.7% and in the United States of America 2.1% (cf. Annex).

Annex

National income in some countries in 1938

	Population in millions income in mln.	National income gross national in dollars income in mln. dollars	per capita in dollars
The United States	129.8	67 375	519
Great Britain	47.5	22 100	465
Sweden	6.3	2 830	449
Switzerland	4.2	1 850	440
Canada	11.2	3 986	357
Norway	2.9	1 000	335
Germany	68.6	23 000	335
The Netherlands	8.7	2 730	314
Denmark	3.8	1 170	308
Belgium	8.4	2 200	262
France	41.1	10 800	260
Ireland	2.9	724	250
Argentine	14.3	2 657	186
Czechoslovakia	10.8	2 000	185
Chile	4.6	840	183
Spain (1939)	16.6	2 875	173
Finland	3.7	625	168
Soviet Union	170.0	17 850	105

Source: C. Clark: The Conditions of Economic Progress, 3rd edition, London 1957, pp. 510 - 520; S. Kuznets: *Quantitative Aspects of the Economic Growth of Nations*, II; Economic Development, op. cit., U. N. National Income Statistics of Various Countries 1938 - 1948, New York 1950.

The balance sheet of the twenty year interwar period (1918 - 1938), analysed in the context of indices of industrial production growth on a world scale,

[13] W. Woytinsky: *Die Welt in Zahlen*, Bd. I: Die Erde, die Bevölkerung, der Volksreichtum, Berlin 1925; W. S. Woytinsky, E. S. Woytinsky: *World Population and Production*. Trends and Outlook. New York 1953, Part IV, V.

shows changes in the distribution of most dynamic industrial centres, with shift towards the Soviet Union and Japan. In the last decade (1929=100) the world output of the industrial production was 119, while that of the Soviet Union — 413, and Japan — 175.[14] The former big industrial powers dropped down the scale: Germany 126, Great Britain 116, Italy 99, the United States 80, Frace 76. The highest growth rate of national income per capita (in 1913 - 1938) was attained by Japan — 2.6% and the Soviet Union — 1.9%.

International economic relations, formed after the first industrial revolutions, led to the division of the world into raw material-agricultural areas and industrial ones. European expansion in the second half of the nineteenth century on the world markets was based on the colonial exploitation. The United States of America carried out its first industrial revolution on principles of the autarkic economy — up to the time when it achieved the potential enabling its expansion on the South American continent — and on the world markets in the twentieth century.

International division of labour prevailing at the end of the nineteenth century revealed the economic dependence of the continents supplying raw materials and agricultural products on the industrial ones (Europe, The United States of America). It gave rise to asynchronous tendencies in the economic growth in the modern, post-colonial era. Up to the 1950-ies colonial countries had been developing the economy based on the export of raw materials and agricultural products to finance the import of investment means and industrial goods. This kind of policy adopted towards the economy of colonial areas made them even more "backward" in comparison with the rate of progress noted in the industrial countries over the last two decades.

The victory of the independence movements on all continents and the decolonization process (after 1945) deprived Europe of the world hegem ony. It was divided into two socio-political systems: socialism and capitalism. constantly competing with each other, peaceful coexistence being attained only in the 1960-ies.

In the above analysis of the conditions and effects of the asynchronous course of the first industrial revolution we have concentrated on the part the human factor played in it. It was this element that finally determined the pace at which a traditional agricultural economy was transformed into the modern one — containing three sectors, industry being the dominating one; it had an impact on the economic growth which decided about the positions of various countries in the international division of labour at the turn of the twentieth century and in the imperialistic era.

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[14] *Industrial Statistics 1900 - 1959*. OEEC. Paris 1960; *Statistical Yearbook 1966*. UN. New York 1967.

The source of asynchronism in the countries which were adopting modern technology during the first industrial revolution, e.g. the Kingdom of Poland, was related to the historical conditions (the so-called remnants of feudalism), as well as to the deformation in the structure of modern industrial economy. The asynchronism could be discerned in the underdevelopment of infrastructure, in the intensive investment policy, low efficiency of work, low internal accumulation and the lack of capital reserves, which opened up possibilities for foreign expansion.

The discussed phenomenon appeared also in the formation of modern national states in the nineteenth century; this, however, has been only mentioned in this paper. The economic growth in the era of industrialization activated the working classes, which gradually changed their statusfrom that of mere labour force to that of co-organizers of new forms of social life. Simultaneously with the contradictions and class struggle, there appeared signs of national consciousness as regards culture. The less advanced countries, however, revealed the asynchronism between the rate of economic growth and the rate of the general and professional education, which probably accounts for the slow progress in the democratization of these countries.

Translated by Aleksandra Mieszek