THE START UP OF MODERN INDUSTRY IN ROMANIA – 1886-1914

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***Abstract**: Based on an ample documentation and on novel analysis, the study exceeds the current opinions existing in the literature about the delayed character of mechanisation absorption within Romania's agricultural economy. Based on statistical data, it deals with the dynamics of a rapid and massive process of introducing mechanization in production and transports due to the contribution of the foreign capitals and of the Romanian state. On this background the change in the old industrial system, based on manual technique and labour into the modern industrial system was triggered - the mechanized industry gaining predominance in just three decades 1886-1914 within the system.*

***Key words**: industrial revolution, industrial system, mechanized technique, change, industrialisation.*

***JEL Classification**: B1*

1. Introducing mechanisation within the national economy

It is a historically obvious fact that the founding of the mechanised industry required more conditions aside from introducing machinery in other fields. This explains why in the first stage of mechanised development – 1859-1866 – not industry but agriculture and transports were the main beneficiaries of introducing mechanisation. After putting into operation the first railway – in the year 1830 – in England, for which traction was insured by the steam engine, concomitantly with the explosive expansion of railways construction, the factories in Europe shifted to the use of steam for agricultural machinery; first of all the issue of threshing needed to be solved and the construction of threshing portable engines with their tandem threshing machines started; steam ploughs followed.

In Romania, the need for improving the quality of export grains and timely finishing threshing sped up the introduction of mechanisation in the field. All in all, leaving aside

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railways, mechanisation spread out at the quickest pace up to the end of the 19th century in agriculture, for threshing grains. In the year 1865, when there is an attempt for a first statistic on tools and machines in agriculture, the census records 156 portable engines with their tandem threshing machines and 8 steam ploughs having a motor force of about 4200 hp. In the survey from the year 1888 there were recorded 986 portable engines with their threshing machines and 15 steam ploughs having together 25250 hp[1]. Heavy and inefficient steam ploughs were present only as attempts, while grain threshing machines covered the majority of the estates' needs.

The construction of railways, as of 1869 on the then territory of Romania led to an increase in the number of haulage machines – of locomotives – and of their motor power; in 1870 were functioning about 20 locomotives with a force of 9000 hp, and in the year 1888 their number was 241 with a capacity of 130298 hp[2]. Hence, agriculture and the railways transportation apparatus mobilised approximately 165 thousand horse power, ten times more than installed in industry.

For the first decades of the Union we don't have yet information on engine powered machines in other production activities and services. Aside from industry, the use of power capacities in agriculture was reduced to only a few months per year, save for portable engines used in mills, but for haulage on railways they were used throughout the year.

2. Start up of mechanised industry

The adverse conditions during the first stage of this process did not favour the emergence of mechanised enterprises in Romania, at the pace specific for Western countries. But the mechanic technique could not be blocked in its breakthrough in industrial activity. The objective hindrances were surpassed by favourable internal and external factors, among these, strong and beneficial effects had the State and foreign investments. The Romanian State was involved in two directions of the industrial landscape by building up a series of mechanised enterprises [3] required for its

[1] *Analele statistice ale României (Statistical Annals of Romania) 1865; Statistica agricolă a României (Agricultural statistics of Romania), 1871.*

[2] *Buletinul Ministerului Agriculturii, Comerţului şi Domeniilor nr.3-5, 1891 (Bulletin of the Ministry of Agriculture, Commerce and Lands no. 3-5, 1891).*

[3] *After N. Paianu, in the year 1906 the State owned 31 various industrial enterprises : 16 in metal industry, railway workshops, and trade schools, two tobacco factories, 3 matches and explosives factories, 3 bread factories of the army, 2 print houses, 1 tanning house and 1 factory for stamps and post marks; to these, the author adds yet 21 electric factories of the municipalities or of some institutions, totaling 53 large mechanized enterprises. N. Paianu in Industria mare (Large Industry) 1866-1906, Bucharest, 1906.*

administration and economy, on one hand, and, on the other hand, by stimulating private initiative through a series of laws. Even though after the building up of the modern state up to the year 1886 the economic policy was one of free exchange without promoting any kind of customs protection, the governments still undertook some actions of supporting certain activities[1]. Industrial creation, with all difficulties and hindrances encountered pursued an ascending trend but still the phenomenon was not statistically followed up at that time. Yet, it can be partially reconstituted for the first time. At the basis of the calculations are the data of the work of N. Paianu, Industria mare (Big Industry) 1866-1906. The study represents a "picture" in figures about the large industry of the year 1906 and it does not answer to the title which suggests a dynamic capture of the industry between 1866 and 1906. But what another contemporary paper does not contain is a list of all enterprises with the names of the owners and the year in which they were set up. Based on the establishment year of the enterprises the following statistic was realised.

Table 1

Distribution of big industry enterprises existing in 1906, by activities after the set up periods, between 1859 and 1906

- number -

Activity	Until 1859	1861-1870	1871-1880	1881-1885	1886-1890	1891-1895	1895-1900	1901-1906	Total
1	2	3	4	5	6	7	8	9	10
Total No.	18	41	46	46	84	84	80	76	475
Shares	3.8	8.3	9.9	9.7	17.6	17.8	16.5	16	100
Construction materials	-	3	3	-	3	6	11	6	32
Metal processing	-	11	7	4	7	10	5	13	57
Wood processing	2	1	4	2	9	10	15	22	64

[1] *The same provided the law about stimulating the sugar beet industry in the year 1873. Based on the granted advantages, that is tax exemptions: customs taxes on import of machines and installations, any taxes on production, etc. During 1875 and 1876 two sugar factories were set up at Chitila and Sascut, but foreign competition determined them to cease their activity after few years. In 1882 a new special law of encouraging this activity is issued by granting new advantages, through the Ministry of Finance: a bonus of 0.16 Lei for each kg of sugar produced in the country, when the sale price was 1.20 lei as well as 250000 lei each for compensating the damages born by the two factories. Another activity under the auspices of the state is the paper industry. A draft law from 1874 ensured for the paper factory which would provide the supplies for the requirements of the State; after 6 years of discussions a new draft is promulgated, after debates in the year 1881. Based on this law the paper factory Letea is established, which enters into production in the year 1884. By such measures also some enterprises in the cloth and tanning industry as their products were constituted in state supplies. Such partial actions of stimulating some factories were only mitigating measures for the wide and urgent needs of supporting the set up of the large industry in Romania.*

Activity	Until 1859	1861-1870	1871-1880	1881-1885	1886-1890	1891-1895	1895-1900	1901-1906	Total
Textiles and clothing	-	1	1	7	6	5	5	8	33
Leather	-	-	3	3	9	2	1	-	19
Food	1	2	3	3	10	7	9	10	45
Paper and graphic arts	3	2	3	3	8	4	2	1	26
Chemicals	2	2	4	3	2	5	5	4	27
Refinery	-	2	3	1	5	5	3	3	22
Large mills	2	9	9	18	17	17	12	3	87
Alcohol factories	7	5	4	4	-	6	2	-	28
Beer factories	1	1	2	1	1	2	1	1	12
Electricity plants	-	-	-	1	3	5	9	5	23
Farmer Mills	33.0	229.0	286.0	181	180	178.0	186.0	475	1808

The table contains three categories of enterprises: 1) large private ones, encouraged by the state based on the criteria of the law of the year 1887 – at least 50000 lei capital or minimum 25 workers and the use of improved tools and machines; 2) large public State and jointly owned enterprises; 3) private large enterprises which were not encouraged and not included in the benefits of the law of 1887 due to the fact that they disposed of abundant raw and cheap materials in the country – among these were the large mills with engines of over 50 hp, alcohol and beer factories. The overwhelming majority of enterprises taken into account had machines and tools and in the statistics they were registered with indicators of the engine power. We mention that the enterprises presented in the table were those operational in 1906; there were discounted hundreds of entities set up and wound up in the meantime for various reasons. Even if those from 1906 were considered as large enterprises, many of them on set up, save for the ones mechanised due to their nature, as paper, sugar, cement, steam mills, etc. did not have machines, being, in conclusion, manufacturing plants or workshops. We emphasise that the table does not include extractive industries. To the data computed after N. Paianu we have added for a more rounded up picture also the figure of the steam mills, the so-called small farmer mills computed according to the statistics from the years 1863, 1873, 1896, 1901 and 1912.

From the table we can deduce the development of the number of industrial enterprises in the period from 1859 up to 1886, called the period of preparing the start-up, here being counted also the introduction of protectionism and the general encouragement of large industry. Thus, the number of entities established in the decades 1861-1880 is maintained around 41 to 46 entities. It is significant that in the first 20 to 25 years, per total, due to the less favourable general conditions the progress was weak from the quantitative perspective, but one should not omit the fact that the factories established in the sixth decade were qualitatively different from those set up in the eighth decade as the latter were better endowed, mechanised, having much higher and more diversified production capacities.

The data from the second stage are also suggestive, the initial period of the start up of the nineties when the establishment of industrial enterprises, under the domination of the protectionist and encouraging policy, recorded a spectacular growth, of three-four times compared with the seventh and eighth decade. In these decades were set up, on the average, 3.6 to 5 entities, and after 1886 there were established, on the average, 16 enterprises per year. One cannot ignore the process of mechanisation in the field of small farmer mills, as was often practiced in the analysis of our economic history, because the annual number of engine driven mills increased from 6.6 units before 1859 to 23 in the seventh decade and to 35 in the eighth decade. In fact, they represented the largest category of mechanised enterprises, created in this stage. The first mechanised enterprises took roots in the still adverse environment of the preparation state of the mechanised development in Romania, in the interval from 1859 to 1886 due to the action of the young Romanian State and with considerable financial efforts, by foreign loans which were to be born also by future generations as an assembly of actions of economic, social and cultural modernisation were initiated and realised, without which the Romanian social body and, respectively, industry could not register progress.

The new revolutionary production forces from Western Europe have changed the fundamentals of the technical-economic and social structures and the way of life. A new era of material civilisation could also be foreseen in Romania due to the first steam machines for threshing grains, to the railways and to the few factories created with difficulties at that stage. It was, in fact, the beginning of the transition from the century-old production based on manual technique and labour to the new mechanised one, which infiltrated the traditional goods economy – a transition that lasted more than a century.

The second stage of spreading mechanisation in Romania, 1886–1914, expresses an extraordinary leap in intensifying the energy capacity of the national economy.

3. Increasing the mechanised potential of national economy

The creation of the mechanised economy in the system of its sectors and activities takes place in the European context of industrialisation in most Western States and of the penetration of mechanisation in a wider field within our national economy. The capacity indicator of our economy could be constituted by the engine power installed between the years 1888-1915.

Table 2

Mechanic engine power installed in main fields[1)] of national economy in the period 1888-1915, selected years

in kW

Years	Agriculture	Medium and small industry[2)]	Encouraged large industry	Extractive industry	State industry	Electri-city industry	Railways	Maritime and river fleet	Total
1	2	3	4	5	6	7	8	9	10
1888	18584	11137	8130[6)]	-	598	851	102304	-	141654
1901	61850	11262	33423	1038	1137	13410	306912	16707	445739
1910	85137[3]	25766	54404	9521[4]	7278	33137	530656	39891	785790
1913	112292	48175	93226	18272[5]	8105	61657[5]	761760	45551	1149038

Notes: 1) The sources show the data in kW for the extractive and electricity industry, and for the other industries in horse power; for the purpose of totalling hp were transformed into kW by using the relationship 1 hp = 0.736 kW.

2) Only small farmer mills. After one statistic of the Ministry of Industry and Commerce in the year 1913 were also specified next to machinery in agriculture and in mills also an amount of installations from the small industry, representing in total 372 units with 7675 hp and 272 electric engines with 8261 kW. L'industrie Roumaine, No. 25, 1913.

3) for 1905.

4) for 1906.

5) for 1912.

6) for 1893.

7) The installed power of public factories is comprised as well as of the ones supplying electric power to industrial enterprises, a fact which triggered a double registration with respect to the engine power of the factories, due to the last category.

Source: Computed after Victor Axenciuc, Evoluția economică a României. Cercetări statistico-istorice 1859-1947, volume I, (Economic evolution of Romania. Statistical-historical researches 1859-1947) Publishing House of the Romanian Academy, Bucharest, 1992.

We mention that the estimate of the entire mechanised engine power within the national economy, by calculating and summing up the main sources, is the first historical attempt and the data of the totalling table modifies radically the summary and incomplete image that we had up to now on the mechanic power of the country in that period; they reveal not only the increased endowment with mechanic energy power of production and transports, but also the dissemination of mechanisation in other fields: extractive industry, river and maritime fleet, and the new branch of electricity industry.

It should be noticed that the introduction of mechanisation within the national economy was developed on a wider area and with higher intensity hence creating an industrial climate with all positive consequences generated by it. Among others, an important mass of machines and tools need maintenance works, repairs, spare parts, a fact which triggered the emergence of maintenance and repair enterprises.

After the year 1886, the industry and its new activities are noticeable for higher rates of increase in investments in mechanised energy potential. Thus, as shown in Table 2, the

encouraged processing industry increases its energy potential between 1893-1913, in two decades, from 8130 kW to 93226 kW, over 11 times, and the extractive activity between 1902-1913 increases the energy capacity from 1038 kW to 18 272, and in the electricity one the engine power increases from 851 kW to 61 657 installed kW, a real technical revolution. The industrial growth in the start up period, with all its specific elements benefited, as already mentioned before, of three decades of preparing the economic-institutional field of the country, of modernising the general conditions required for the expansion and functioning of modern industry. New internal and external favourable factors have intervened in the new stage of industrial start up. Among the internal ones are counted, even at the period limit, the enforcement of the industrial protectionist policy – the year 1886 – and of material encouragement of the big industry – the year 1887 – by special legislation of the respective years and their development in the following period.

The effects of protectionism and of encouraging industry were also strengthened by the modernisation of the capital price on the domestic market as a consequence of establishing in the year 1880 the National Bank of Romania which institutionalised the interest for its credits granted to the economy to 6-8% (against the current one of 10-16% before 1880) and put into circulation under the form of cheap credits a high mass of capital[1]. Leaving this aside, the banking system in construction based on domestic and foreign capital began to make available to entrepreneurs significant capitals, of course at a higher interest rate of 8-12% against the rate of N.B.R.

The industrial progress of Romania during this period was due to putting to good use with priority some natural resources, first of all oil and wood fund; both supplied for export but especially for the internal market cheap fuel and construction materials, a fact which was an advantage mainly for the large mechanised industry. The external factors were, in their turn, also favourable: Europe after a peace of four decades recorded huge industrial and financial progress; it provided now, to shares unimagined before goods and machinery at low prices but also capitals with low interest rates – 3 to 4%. Hence the cheap capital, the diminishment of the industrial profit rate in the West and increasing the capital surplus provided across border by the large financial structures was positively articulated with increasing the safety of capital activity, the high profit perspectives, with the advantageous field for investments and profitability in Romania. The competition of large international companies, of placing goods and capitals in countries entering the era

[1] *Thus, according to the reports of the NBR the volume of credits increases considerably in thousands lei gold:*

1881……26.8
1881-1890……743.0
1891-1900……821.3
1901-1914……1729.4

of modernisation, as well as the necessity of ensuring the supply with raw materials included in their field of action also Romania. The foreign capital, despite all its contribution, financial means, production techniques and technologies, experts, enterprise managers, relations with suppliers and with the European markets, with large foreign banks, etc. constituted at the end of the 19th century the main factor of rendering fertile the field of mechanised industry in Romania.

The period of start up is characterised by massive imports of machines and installations, and foreign financial sources which, in fact, triggered also the import of machinery for the installations of the new enterprises.

Table 3

Annual import of main metallurgical products in the period 1885-1913, selected years

tons, %

Years	Laminates, axes and moulded parts	%	Industrial and transport machines	%	Tools, devices and instruments	%
1	2	3	4	5	6	7
1885	23333	100	3190	100	46	100
1890	28517	122	4382	137	646	1404
1899	36448	156	16136[1]	506	887	1928
1913	146589	628	22310	699	1177	2559

Source: Computed after the Foreign Trade Statistics 1886-1914.

Increasing the tonnage of the categories of imported products outlines a suggestive image of the technical endowment of the mechanised economy; the most important growth, from 3.2 tons to 22.3 thousand tons annually is recorded by the machinery import, mostly for industry. The total volume of machinery imports in the three decades exceeds 426 thousand tons, the equivalent of 4.3 thousand trains of 10 wagons each. The data show unequivocally an accelerated process of endowing and furnishing the national economy with installations, machinery, and tools with the purpose of modernising and gradually adjusting it to the mechanised way of production. The research in the evolution of the mechanised industry in the period from 1887 to 1913 had available better statistical data than for the preceding time interval, even if those are without chronological continuity, and based on surveys for certain years, sometimes by differing criteria and indicators, which represented difficulties in studying the process.

4. Expansion of mechanised industry

The first information with summary data on activities with respect to this period cover the evolution of the number of enterprises encouraged after the year 1887. In the source, the data are presented by name and annually; with a view to a more compact presentation we have cumulated them on five years' averages, as shown in Table 4.

Table 4

The evolution of the number of encouraged industrial enterprises, set up according to periods, by activities, between the years 1887–1915

Period	Any type of construc-tions	Textiles and clothing	Food	Paper and graphic arts	Chemical	Electricity	Total	
							Existing	Created
1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**
Total	342	145	214	54	99	3	880	755
1887-1891	45	30	9	7	15	-	106	23
1892-1896	45	12	15	3	17	-	129	92
1897-1901	42	11	13	7	18	-	221	91
1902-1906	66	39	27	12	18	2	312	164
1907-1910	109	40	83	8	22	-	476	270
1911-1915	35	5	67	17	9	1	746	134

Source: 1. Draft law and motivation presentation with respect to encouraging the industry, Appendixes, Bucharest 1911. Statistical Bulletin of Romania, no. 2, 1919.

It can be seen that the number of large enterprises increased from one period to another reflecting the industrial drive characterising the period. We observe that during the years 1887-1891, the number of encouraged enterprises does not coincide with the one of created enterprises. Many entities were established before 1887, and in the next years requested and benefited from the advantages of encouragement resulting from the mentioned law. Also, in the period 1911-1915 the investment activity was moderated because of the tense conditions of the Balkan War in 1913, and of the following First World War, in August 1914.

The distribution of enterprises by activities, as realised by the source is not the most suitable one. It cumulated under the first category "constructions of any kind" several activities: construction materials, metal manufacturing, and wood processing. Very informative and important for the approached subject is to determine the mechanised

potential of the country: the primary scarce data from the statistical information did not allow until now for its presentation in the studies of economic history.

The way of exposing the data suffered due to the weak comparability of the number and value indicators of production. Hence, in the same evolution columns were positioned the data of the Industrial Survey from 1901-1902, of the Survey from the year 1910, and of the Statistics from 1912-1915[1].

In view of ensuring the less relative comparability of the data, we made use of the indicator "fixed invested capital", regarded as the most important in estimating the industrial potential. The fixed capital was constituted of the value of the lands, buildings, machinery and installations, and of the transport means, etc. which were required for the functioning of the enterprise.

Table 5

Evolution of the fixed capital of large and small industry by activities, in the period 1893-1915, different years

thou. lei

Industry Field	1893	1902	1915
1	2	3	4
Total	**122.4**	**305.3**	**965.2**
Dynamic:	100.0	249.4	789.0
Manufacturing, of which:	93.8	232.1[5)]	483.8
Encouraged	29.3	95.2	329.1
Not encouraged	30.9[1]	96.9	74.7
1	2	3	4
State owned	33.8[1]	40.0[6]	80.0[5b]
Extractive - oil	9.5[3]	35.1[3]	362.7[9]
Electricity	1.1[2]	15.3[6]	76.5[8]
Mechanised medium and small (farmer mills)	17.8[4]	22.8[7]	42.2[7]

[1] *We mention that the industrial survey from 1901-1902 comprised the big industry, enterprises with minimum 10000 lei capital, and using at least 5 workers and improved machinery; it also included all enterprises, encouraged and not encouraged as well, private and state-owned, and it included also the electric factories, without the extractive activity. The statistical situation of 1910 is only with respect to the encouraged industry, that is entities with at least 50000 lei invested capital, or minimum 25 workers, and improved machinery which increased about 5 times the criterion of large enterprise against the one from the 1901 Survey. These advantages were not addressed to, and hence there were not included the milling, alcohol, beer industry, as well as the extractive industry, thus diminishing even more the number of enterprises taken into account. The Statistics for the years 1912-1915 is with respect to the encouraged industry, but the criteria are those of the law from 1912. They provided for advantages for enterprises using at least 20 workers, leaving aside clerks and administrative personnel, with an engine power of minimum 5 hp, a criterion which expanded this time the comprising area more than the preceding statistics.*

Notes: 1) Computed based on the initial capital from the Tables contained in the work of N. Paianu, Large Industry 1866-1906, Bucharest 1906.

2) The fixed capital investment was computed according to the value of investment per hp after the Industrial Survey from 1901-1902, of 825 lei/hp at a total of 1325 hp in public factories in 1893.

3) It was estimated after the production quantity and the value of the oil production, by interpolation against the production of 1848 thousand tons in value of 127.2 thousand lei in 1913 for which in that year the investments were evaluated at 373.7 thousand lei in oil extraction; the investments of 3.2 million lei were added from the coal industry.

4) Computed after the number of farmer mills with steam machines estimated to 1047 units in 1893 and the average value of a mill of 17 thousand lei; this is the average value resulting from the Industrial Survey data from 1901-1902, vol. II, referring to special industries – mills, saw-mills, etc.

5) The Industrial Survey from 1901-1902 under the form of big industry, to the largest extent mechanised has cumulated the enterprises from the encouraged, not encouraged and state-owned manufacturing industries.

5[b]) Fixed capital of the state-owned industry in the year 1904 and 1915.

6) Industrial Survey from 1901-1902, vol. I Bucharest, 1904. Appendixes, Table 4.

7) According to the same source, volume II, Section Special Industries from which 134 farmer mills with engines were selected, evaluated at the average of 17000 lei and 17 saw-mills with steam engines evaluated in the survey at about 10000 lei per unit.

8) At an increase of 5.04 times of the installed power in public enterprises against 1902, it was estimated a growth equal to the fixed invested capital.

9) The investment of 353.7 million lei is comprised in the oil extraction and of 9 million lei in other mining, especially for coal.

Source: The Bulleting of the Ministry of Agriculture, Industry, Trade and Land 1892/1893, no. 12; Industrial Survey from the years 1901-1902, vol. II, Bucharest, 1904; Statistical Bulletin of Romania 1919, no. 2.

The data presented in the Table highlight the extraordinary growth of the invested capital in all sectors based on machinery production, in two decades, from 122 million lei to 965.2 million lei, that is respectively eight times, with a rate of almost 30% per year, giving proof of the strength of the industrial start up. The sector of manufacturing industry cumulated the largest part of the investments, over 480 million lei in 1915, of but the spectacular growth is shown by the extractive industry, mainly the oil industry, from 35 million lei in 1902 to 363 million lei in 1915, that is over 10 times, taking over the share of almost 38% from total. Just as remarkably strong are the investments in the electric power activity, from 1.1 million lei in 1893 to 76.5 million lei by the end of the period. A somewhat slower growth have the investments in the not encouraged industries, as well as the ones in the small and medium industries, which explains also why part of them acquire in time the statutes of encouraged enterprises, either because by development they reached the required criteria, or because the law from 1912 (as the

three sub-activities – alcohol, beer and flour) includes them in the category of encouraged industries.

Yet, in total the fixed capital of machine industry is 965.2 million lei, as we have seen, in the year 1915. In this amount is expressed only the immobilized capital to which , if hypothetically [1], is added in a ratio of 60:40 fixed and circulating capital, and the share of the circulating capital of 40% of the total, respectively 643.5 million lei, the total modern industrial capital placed in the year 1915 in the Romanian economy would represent 1608.9 millions Lei, exceeding by 20% the investments in the railroads, but also 2.5 times higher than the incomes to the state budget in the year 1914-1915. Even though the growth was spectacular, as compared figure, the total industrial capital seemed by the end of the period as a relatively modest size, representing 8.7% from the national wealth, while lands and forests of the country represented 44.7%, and the transport means and roads 13.9% from this wealth[2].

5. Expanding industrial production

The value of production might be appreciated only from the year 1893 on, when there are data about the large encouraged enterprises; in the time period 1893-1915 the statistics provides for certain years this basic indicator, meant to present the measurable results of the industrial production. In the following we present a global, novel calculation on the value of the industrial production, delivered to the largest extent by the mechanized enterprises.

[1] *Statistical sources provide data on the circulating capital only for the years 1904 and 1907, which might constitute a guidance element for computation, for instance, in 1904, in the manufacturing industry the ratio between fixed capital and circulating capital was of 111 mill. lei and 82.5 mill. lei, respectively 56% and 44%, and on activities there were large differences. N. Paianu, ibid. P. 39.*

[2] *Victor Axenciuc,* Avuția Națională a României *(National Wealth of Romania),* Cercetări istorice comparate*, 1860-1939, (Comparative historical researches, 1860-1939) Bucharest, 2000.*

Table 6

Estimated value of the mechanised industrial production, in the period 1893-1913, selected years

Industrial activities	1893	1902	1906	1913
1	2	3	4	5
Total mill. Lei	121.7	331.5	429	1157.9
Dynamics	100	272	353	961
Manufacturing industry, mill. lei	69.8[1]	229.8[2]	273.1[2]	660.3[3]
Dynamics	100	329	391	957
Medium manufacturing industry (farmer mills, saw-mills), mill. lei	36.5[4]	72	94.1[4]	289.0[4]
Dynamics	100	197	258	792
Extractive industry[5], mill. lei	11.7	20.7	46.1	144.3
Dynamics	100	177	394	1233
Electricity industry[6], mill. lei	3.3	9.0	16.7	64.3
Dynamics	100	243	424	1738

Notes: 1) By interpolation with output per worker from the data of the Industrial Survey from 1901-1902.

2) Comprising the encouraged, not encouraged and state-owned manufacturing industry.

3) Data referring to the value of production are from the fiscal year 1912, and they comprise the value of the encouraged industry, of the not encouraged sugar industry, and the value of the output of state-owned enterprises from 1906 in the absence of data for 1913. Due to the lack of figures, wherever estimates were made, for safety the minimum level was taken into account.

4) For the year 1893 the output value for the 1012 steam mills was computed by the average of the 35 thousands Lei on mill; for the year 1901 from those 1334 steam mills, the output value was computed with the average of 40.9 thousands Lei on mill according to the data of the Industrial Survey from 1901-1902, vol. II, Special Industry, Table 3. For the year 1906 when 1808 engine mills, with steam and oil were functional, the calculation was based on 65 thousands Lei average value of the output per mill, and for the year 1913 the production of the 2480 engine mills was computed by the average of 102 thousands Lei per mill after B.G. Assan, ibid.

5) The value of the extracted oil and coal output is comprised, and also the one of the sold salt.

6) After the installed power only in public plants. The industrial ones were recorded under the respective activities. It was computed by assuming that they operate in average 1500 hours per year, and the kWh was assessed in average at 0.60 Lei, at the lowest level, each electricity plant determining a different supply price for lighting and for power.

Sources: Computed after the Bulletin of the Ministry of Agriculture, Industry, Trade and Lands 1892-1893, no. 12, Industrial Survey from the years 1901-1902 vol. I, Bucharest, 1904; N. Paianu, Big Industry 1866-1906, Bucharest, 1906, Statistical Yearbook of Romania 1915-1916.

For two decades the output of the mechanised industry of the country increased 9.6 times, at an average rate of 43%, increasing from 21.5% in the time interval 1893-1901 to 56.5% between the years 1901-1913. The most rapid development was realised in the extractive industry, mainly in the oil industry followed by electricity. The growth of industrial output at the beginning of the 20th century is spectacular as size, but also as

variety, the types of manufactured goods diversifying more than tenfold. By all means, it might be considered, without any reserves, that the period of start up, from 1887 to 1914 was the quickest of the entire time of Romania's industrial development between the mid-nineteenth century and the mid-twentieth century.

As concrete quantitative expression, according to the main goods, the output growth is presented according to the data in Table 7.

Table 7

Evolution of the main goods of the mechanised industry, in the period 1887-1913

Goods	Measure unit	1887	1895	1902	1907	1913
1	2	3	4	5	6	7
Extractive industry products						
Oil	**ths.t**	25	81	385	1148	1848
Coal	**ths. t**	26	17	123	163	241
Salt	**ths. t**	84	94	105	129	126
Manufacturing industry products						
Vegetal oil	**t**	-	---	1990	3411	5104
Sugar	**t**	2310	1709	15010	23530	27413
Alcohol	**ths hl**	88	214	128	183	193
Beer	**ths hl**	24	42	60	179	299
Bread derivates	**t**	---	---	746	1388	2102
Tobacco	**t**	3207	3628	4036	4602	6908
Wool fabrics	**t**	---	---	796	2241	2719
Cotton fabrics	**t**	---	---	206	891	1880
Cement	**t**	3270[1]	15500	12150	42320	128000
Timber	**ths m^3**	163	329	484	760	884[3]
Glass	**T**	---	---	9109	6594	20315
Paper and pasteboard	**T**	380	3620	5584	9005	17800
Thick tanning products	**T**	---	---	2133	2877	3682
Sulphuric acid	**T**	---	---	730[3]	1860	7255
Metallic constructions	**T**	---	---	17410	30833	45813
Wire, pins, screws	**T**	---	---	5051	7832	10200
Electric energy						
Electricity	**ths. kWh**[4]	0,7	6,5	15,1	23,9	114,4

Note: 1) 1890; 2) 1911; 3) 1904; 4) Data on electric power were computed after the production of the installations in each year and each county. They comprise sometimes also double records because of some dismantled electric installations but not mentioned by the source.

Source: Computed after Victor Axenciuc, ibid. vol. I, Industria (Industry), Bucharest, 1992; History of Power Industry and Electrotechnical industry in Romania, vol. I, Bucharest, annually per county.

Reading the data, deciphering the trends and sizes of the evolution for the various goods manufactured by the domestic industry in the studied time interval may be easily realised. The above table highlights, as the preceding one couldn't, certain quantitative increases, the most important for the representative goods of the activities, and their tens

of times multiplication during the start up period, especially considering the initial very narrow incipient base. It is especially noticeable the output of some light and food industry activities, preponderant in the manufacturing industry and in the oil extraction industry.

This brief presentation with respect to the explosive growth of the mechanised potential of the national economy, and of the value of the modern mechanised production in the more than two decades of the industrial start up show the rapid changes from the manual technique to the mechanised technique in Romania. The scale of these changes was still narrow, and their structure incomplete, but they opened a new era of technical progress which was finalised in the second half of the twentieth century during the fundamental industrialisation processes, during the processes of electrification and urbanisation of the country by putting to good use the own natural resources and human resources of the country.

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