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## PROBLEMS

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### *The Strategy of Public Investment in XIXth Century Germany*

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The rôle of capital formation and investment for XIXth century economic growth has been widely discussed by economists and economic historians during the last twenty years.<sup>1</sup> The first concern usually has been to arrive at estimates of magnitudes such as the ratio of investment to national income or GNP and to determine the share of capital inputs in the process of economic growth.<sup>2</sup> It is clear, however, that a more precise analysis of the performance of different economies (and at different times) can only be achieved if we break down these overall estimates into more specific ones by distinguishing between different types of capital formation, the investment in single sectors, and by taking into account the investment behaviour of the investors.

This paper is concerned with the investment strategy of one major group of investors, the public authorities in XIXth century Germany. To determine size, type and effect of their investments can help to clarify the rôle of governments — whether national, state or local ones — in economic development. Though many arguments have been exchanged about this rôle we do not know yet for sure if it was — from the point of view of economic growth — a positive, a negative or a neutral one.<sup>3</sup>

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<sup>1</sup> Cf. amongst many others S. KUZNETS, *Capital Formation in Modern Economic Growth (and Some Implications for the Past)*. Third International Conference of Economic History, 1965, vol. I, Paris and The Hague, 1968.

<sup>2</sup> Cf. S. KUZNETS, *Economic Growth of Nations. Total Output and Production Structure*, Cambridge, Mass., 1972, especially pp. 70-75; F. DENISON, *Why Growth Rates Differ. Postwar Experience in Nine Western Countries*, Washington D.C., 1967.

<sup>3</sup> Cf. W. FISCHER, *Government Activity and Industrialization in Germany (1815-1870)* in W.W. Rostow (ed.), « The Economics of Take-Off into Sustained Growth »,

## I. WAS THERE A STRATEGY OF PUBLIC INVESTMENT?

The answer is clearly "no" if we have Germany as a whole or if we have the century as a whole in mind. Since a central government did not exist before the seventies and since even after 1871 the economic competence and fiscal means of the *Reich* were limited, relevant investment strategies could only be developed by the states, still 30 odd at the beginning of the century and about half a dozen major ones at the end. In certain fields — schools, hospitals, but also communication and energy — part or all of the activities originated with the local governments. Literally hundreds of "public hands" with widely differing investment strategies have to be taken into account.

The answer is, however, partly "yes", if we limit ourselves to shorter periods and to specific purposes such as canal or road building, river improvement, amelioration of land and to specific governments. Most of these investment strategies did not aim at an overall economic development scheme but answered urgent needs. Often the tasks undertaken by some public authority were long overdue and had been discussed within the administration or the public for years, even decades. To take just one example: The canal system, connecting the Rhine and Ruhr with the river Elbe, central Germany and finally Berlin and the river Oder, though debated since the middle of the century, was begun only around the turn of the XXth century, since the Prussian government could not make up its mind whether to follow the interests of the Ruhr industry and the cities which demanded the canals or those of the agrarian pressure group which opposed it.<sup>4</sup>

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London, 1963, pp. 83-94 and the discussion of it pp. 344-354; also: *ibid.*, *Das Verhältnis von Staat und Wirtschaft in Deutschland am Beginn der Industrialisierung*, in: «Kyklos», 14, 1961, pp. 337-363. Reprinted in W. FISCHER, *Wirtschaft und Gesellschaft im Zeitalter der Industrialisierung*, Göttingen, 1972, pp. 60-74; *ibid.*, *Der Staat und die Anfänge der Industrialisierung in Baden 1800-1850*, vol. I, Die staatliche Gewerpolitik, Berlin, 1962; W. O. HENDERSON, *The State and the Industrial Revolution in Prussia*, Liverpool, 1958; I. MIECK, *Preußische Gewerpolitik in Berlin 1806-1844. Staatshilfe und Privatinitiative zwischen Merkantilismus und Liberalismus*, Berlin, 1965; U. P. RITTER, *Die Rolle des Staates in den Frühstadien der Industrialisierung. Die preußische Industrieförderung in der ersten Hälfte des 19. Jahrhunderts*, Berlin, 1961, particularly part V, «Die Förderung der Kapitalbildung, der Kapitalsammlung und des Kapitalverkehrs», pp. 115-137; R. TILLY, *The Political Economy of Public Finance and the Industrialization of Prussia, 1815-1866*, in: «Journal of Ec. History» 26, 1966, pp. 484-497; *ibid.*, *Fiscal Policy and Prussian Economic Development, 1815-1866*, in: «Troisième Conférence Internationale», Paris-The Hague, 1968, pp. 771-778.

<sup>4</sup> H. HORN, *Der Kampf um den Bau des Mittellandkanals. Eine politologische Untersuchung über die Rolle eines wirtschaftlichen Interessenverbandes im Preu Ben Wilhelms II*, Köln, 1964.

## II. FIELDS OF PUBLIC INVESTMENT.

At least four major fields of public investment can be discerned though they are interrelated with each other:

### 1. *General administration and political representation.*

Investment in this sector consists mainly in public buildings. Administrative needs and sometimes the desire for representation — e.g. the shaping of a capital — causes these investments. Their economic size and effect cannot be easily isolated; it may constitute the major part of public investments in buildings.

### 2. *Military investment.*

Again the purpose is mainly non-economic, the economic size and effect not easy to measure, particularly since the sources do not distinguish between consumption for military purpose and investment. Some of the military investment occurs in the following sections, infrastructure and public enterprises.

### 3. *Infrastructure.*

This is generally regarded as the main and proper field of public investment aiming at long-run economic and social improvements. Not all components of the infrastructure have been studied evenly. Communications and schools usually are in the forefront, since they form the most obvious, costly and probably also most efficient part of the infrastructure. A recent study on public investment in Württemberg has tried to include some other public activities.<sup>5</sup> It breaks the infrastructure down into the six components:

a) communications (roads, railways, canals, rivers, mail, telegraph, telephone);

b) energy-production and distribution (gas, electricity);

c) improvement of land (drainage, land redistribution, etc.);

d) education (elementary, trade & technical schools, higher education);

e) health (sanitation, hospitals, vaccinations);

f) "pre"-investments for the private sector (subsidies to private investors, public pioneer investment, technological information, fares, public marketing, etc.).

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<sup>5</sup> W. R. Ott, *Grundlageninvestitionen in Württemberg. Maßnahmen zur Verbesserung der materiellen Infrastruktur in der Zeit vom Beginn des 19. Jahrhunderts bis zum Ende des Ersten Weltkrieges*, Diss. Heidelberg, 1971.

It seems worthwhile to deal with all these aspects of public investment in the infrastructure of a country, even if some constitute only a small proportion of public investment.

#### 4. *Public enterprises.*

Students of growth or capital formation generally do not encounter public as distinct from private enterprises. They deal with economic sectors or factors of production. National statistics usually cannot be broken down into privately-owned and nationalized business. Nevertheless, for a study of the strategy of public investment it may well be of decisive value to know the size and the ways in which governments — whether national, state or local — used their landed property, their forests, their mining, manufacturing and service enterprises not only to attain income but also to foster the economic development of the country. Germany — like Japan — seems to be a particularly interesting case since the German governments (not only the Prussian one) kept a considerable part of their older royal or princely enterprises within the general framework of a market economy. During the XIXth century they even built up new government enterprises, principally in railways, energy-production and distribution, but also in mines, iron-works, and ship-yards. The reason was often military, but partly economic and political, e.g. to counteract growing private economic power, or to influence, if not determine the future allocation of resources.<sup>6</sup> The notion of “investment control” by public authorities though not explicitly developed was not altogether alien to German governments, particularly that of Prussia and the *Reich*. It was also present in the parliamentary debates foremost in the Prussian *Abgeordnetenhaus* and the *Reichstag*.<sup>7</sup>

### III. THE SIZE OF PUBLIC INVESTMENT.

At the present state of our knowledge it is not possible to estimate the size of public investment in XIXth century Germany with great accuracy. As usual, aggregate statistics are easier to come by for the second half of the century while for the first half we have to work with partial

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<sup>6</sup> A case in point is the attempt of the Prussian government to bury itself into the Ruhr by acquiring the majority of one of the largest enterprises, the *Hibernia*. A detailed account of this struggle is to be found in the chapter «Der Kampf um die Verstaatlichung der Bergwerksgesellschaft Hibernia», in H. WALTHER, *Theodor Adolf von Möller, 1840-1925. Lebensbild eines westfälischen Industriellen*, Neustadt a.d. Aisch 1958, pp. 84-100. See also H. NUßBAUM, *Ein neuer Hintergrund der Hibernia-Affäre*, in: «Jahrbuch für Wirtschaftsgeschichte», 1962, Teil III.

<sup>7</sup> F. BLAICH, *Kartell- und Monopolpolitik im kaiserlichen Deutschland. Das Problem der Marktmacht im deutschen Reichstag zwischen 1879 und 1914*, Düsseldorf, 1973.

and incomplete information, mainly taken from defective sources and restricted to single states.<sup>8</sup>

Karl Borchard has compiled investment figures for some major German states from the end of the XVIIIth to the middle of the XIXth century; but he only deals with investments in transportation: canals, rivers, roads and railways.<sup>9</sup> How large investments were in other parts of infrastructure may be extrapolated from the figures for Württemberg which are included in W. R. Ott's dissertation.<sup>10</sup> Since he covers the time up to World War I his figures could also be used to elucidate some of W. G. Hoffmann's very general estimates for overall investment in public buildings and underground construction (*Öffentlicher Tiefbau*) which begin in 1850.<sup>11</sup> As to investment in education not only statistical but conceptual difficulties arise which are dealt with by Knut Borchardt and P. Lundgreen.<sup>12</sup> Only occasional figures are available for investment in public enterprises.<sup>13</sup> Systematic research could reveal much more information since the state and city archives hold much material on various such enterprises. There is reason to believe that some of the German states were the biggest single investor within their territory during the first half of the century, and those which developed state-owned railways systems from the beginning like Baden, Württemberg, Hesse, Hannover, Brunswick may have channeled more than 50% of all investment through government agencies during the early rail-road period in the 1830s and 1840s, though they borrowed heavily for this purpose in the private market.

Later in the century, private railways were bought up by governments with the result that at the end of the century most railways like roads, canals, rivers and the postal service were publicly owned and administered. Though

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<sup>8</sup> For similar problems in Britain see S. POLLARD's Introduction to J.P.P. HIGGINS and S. POLLARD (Eds.), *Aspects of Capital Investment in Great Britain 1750-1850. A preliminary survey*, London, 1971, pp. 2-4.

<sup>9</sup> K. BORCHARD, *Staatsverbrauch und öffentliche Investitionen in Deutschland 1780-1850*, Diss. Göttingen, 1968, pp. 223-301.

<sup>10</sup> See footnote 5.

<sup>11</sup> W. G. HOFFMANN et al., *Das Wachstum der deutschen Wirtschaft seit der Mitte des 19. Jahrhunderts*, Berlin-Heidelberg-New York, 1965, pp. 142-149, 227-228, 248-261.

<sup>12</sup> K. BORCHARDT, *Zum Problem der Erziehungs- und Ausbildungsinvestitionen im 19. Jahrhundert*, in: A. AUBIN et al. (Eds.); *Beiträge zur Wirtschafts- und Stadtgeschichte. Festschrift für Hektor Ammann*, Wiesbaden, 1965, pp. 380-392; P. LUNDGREEN, *Bildung und Wirtschaftswachstum im Industrialisierungsprozeß des 19. Jahrhunderts*, Berlin, 1973, especially pp. 102-118. See also W. G. HOFFMANN, *Erziehungs- und Forschungsausgaben im wirtschaftlichen Wachstumsprozess*, in: G. HESS (Ed.), *Eine Freundesgabe der Wissenschaft für Ernst Hellmuth Vits*, Frankfurt 1963, pp. 103 ff.

<sup>13</sup> The literature is too scattered to be enumerated here. For Prussia most convenient is still W. O. HENDERSON, *The State and the Industrial Revolution in Prussia*, Liverpool 1958, with its information on the activities of the Prussian Seehandlung, the Saar coalmines and the state activity in railways.

during the century governments had given up some of their businesses e.g. most though not all iron-works outside Prussia public enterprises accounted in 1907 — the year of the last census before World War I — for about a tenth of the industrial, commercial and communication sectors.<sup>14</sup>

If we take this as a rough indicator and assume that the share of public investment in these sectors is about the same size, and add the Hoffmann figures for public investment in buildings and underground construction which are at the same time about 10% of all investment, and the major parts of investment in railways (8.4%) we may estimate that between 20 and 25% of the investment in Germany in the years before World War I was effected through public authorities or businesses.<sup>15</sup> If we follow Hoffmann once more, taking the ratio of investment to national income in the period 1906-10 at 15.7:100, we can conclude that the ratio of public investment to national income was between 3 and 4:100.<sup>16</sup> Again according to Hoffmann the investment ratio was less than half around the middle of the century (7.4:100 in 1851-1855 and not more than 5:100 in 1831-1850).<sup>17</sup> If we assume the same share of public investment in this period the ratio of public investment to national income would have been only between 1 and 2:100 more towards the lower figure at the beginning, more towards the higher one at the middle of the century. But here serious doubts set in. To be sure, we are now in the realm of informed guesses, not more. My own guess would be that the ratio must have been somewhat higher; if this is right it would mean that more than 25% of all investment had been initiated by public authorities in the first half of the century. This conclusion is supported by Hoffmann's estimate that about 15% of the financing of investment occurred through public savings around 1850, but only 5% in 1906-10.<sup>18</sup> But his argument here is very shaky. He assumes that in both periods around 85% of the investment was financed by personal savings. For the latter period he attributes slightly more than 8% to undistributed profits and nearly 2% to social insurance, the rest, 5%, to public savings. For the earlier period he has no information on undistributed profits; therefore he attributes the rest, 15%, to public savings. But this is certainly wrong, since every economic historian knows how

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<sup>14</sup> 1.558 mill. persons — about one tenth of the labor force in these sectors — were employed in enterprises owned by the Reich, Federal States, local authorities, or other public bodies. (W. O. HENDERSON, *op. cit.*, p. XXIII).

<sup>15</sup> W. G. HOFFMANN, *Das Wachstum*, p. 147, table 62. The share of the category *Gewerbe* in net investment is in 1905-09 43.1%. There may be some double counting involved, particularly in the category of underground construction. But since railways form a separate category it can be only small.

<sup>16</sup> W. G. HOFFMANN, *The Take-Off in Germany*, in W. W. ROSTOW, *op. cit.*, pp. 115-116. Hoffman here makes the share of public buildings and underground construction slightly higher: 10.5%.

<sup>17</sup> *Ibid.*, p. 114.

<sup>18</sup> *Ibid.*, p. 116.

important a rôle ploughing back of undistributed profits played in the period of early industrialization. Nevertheless, it may still be true that public investment and the financing of investment through public savings played a larger rôle in the first half of the XIXth century than towards the end. To prove this assumption, however, much more basic research in the quantitative history of the earlier parts of the century is needed.

In the remainder of this paper some evidence is assembled which may lead to more reliable estimates which can then be compared with the findings of the Hoffmann team for the second half of the century.

1. *Investment in canals.* According to Borchard public investment in canals amounted to 22.1 mill. thalers (66.3 mill. marks) between 1821 and 1850 or an annual average of about 737,000 thalers (2.3 mill. marks).<sup>19</sup> Since there was nearly no construction between 1801 and 1820 the sum nearly equals that for the first half of the century. The peak occurred between 1836 and 1845 when the Bavarian *Donau-Main-Kanal* was built which incidentally was the only canal not totally financed by public means. But even in this period only 16 km of canals were finished per year. Canal-building altogether was not very important in Germany as compared e.g. with France.<sup>20</sup> Altogether only 275 km of canals were constructed in Germany between 1801 and 1850, 5.5 km a year in the average.<sup>21</sup>

2. *River improvement* was more important for the modernization of the German water transport than canals. The main object was the Rhine. In the first half of the century Baden and France regulated the upper Rhine according to plans of a French trained engineer from Baden, Tulla. Baden invested between 1817 and 1850 more than 3 mill. thalers (9 mill. marks).<sup>22</sup> The improvement of the lower Rhine began later. Between 1831 and 1850 all Rhine-states (including also Holland) invested about 12 mill. thalers. These investments were carried on in the later half of the century and amounted to 30 mill. thalers 1851-1870 and to 35 mill. thalers 1871-1890. On improvements on the river Elbe Prussia invested between 1820 and 1850 about 2 mill. thalers, on the river Oder about 2.4 mill., on the river Weichsel 2 mill., for the Ems again 2 mill., less for the Weser. Bavaria

<sup>19</sup> K. BORCHARD, *Staatsverbrauch und öffentliche Investitionen*, p. 242.

<sup>20</sup> On French canal building in the first part of the XIXth century see Helmut Großkreutz, *Privatkapital und Kanalbau in Frankreich 1814-1848. Eine Fallstudie zur Rolle der Banken in der französischen Industrialisierung*, Berlin 1977.

<sup>21</sup> Calculated from K. BORCHARD, *Staatsausgaben*, p. 235, table 26.

<sup>22</sup> *Ibid.*, 247-248. Only the investments along the Baden-Bavarian border are fully known; on the border to France the accounts begin in 1838. Contributions of the communities along this border have to be added; they are included in the Baden-Bavarian parts where they amount to about 400,000 thalers. The real sum may be therefore rather 3.5 mill. thalers or 14 mill. marks. The French investments had about the same size (3.2 mill. thalers from 1815-1841).

invested at least 0.5 mill. for the Danube river and the Main, and other known investments on German rivers amount to nearly 1 mill. thalers.<sup>23</sup> Not including the many small investments of local communities, the public investment on river improvements by German states between 1820 and 1850 must have been at least 20 mill. thalers or 60 mill. marks, about the same amount as for canals.

3. The sources on investment in *roadbuilding* are even more incomplete since many lower-class roads were built and maintained by local communities and districts. In Prussia the length of the roads quadrupled between 1816 and 1852. Nearly 80% at the beginning and about 76% at the end of the period were state-roads, the rest district, communal, or private. 12,853 km of roads were constructed in this period. The Prussian government invested 76.6 mill. thalers (ca 230 mill. marks) either directly or by way of subventions and premiums for private and communal construction. Bavaria during this period put 2.5 mill. thalers (7.5 mill. marks) into road construction, Saxony 4.7 mill., Hanover 15 mill., Baden 1.4 mill., Hesse 1.3 mill. thalers.<sup>24</sup> Since these five states together with Prussia possessed in 1852 nearly 80% of all German roads (*Chausseen*), it can be estimated that the total public investment in roads between 1816 and 1852 has amounted to at least 125 mill. thalers (375 mill. marks), about three times as much as investment in canals and rivers together.

4. *Railroad construction* took of course the lion's share of investment in transport during the first half of the XIXth century and it is better documented than any other investment. By 1850 322 mill. thalers had been put into the German railways, 132.5 mill. for state-owned railways, 161.1 mill. for private ones and 28.4 mill. for public-administered but private-owned lines. Together with government shares in and subventions for private railways, the public investment in railway construction amounted to 155 mill. thalers (465 mill. marks) or 48.2% of all railway investment.<sup>25</sup> This is slightly more than all government expenditure of the 35 German states in the year 1850 (150 mill. thalers). It is clear that investment on such a scale could not be financed through the ordinary budget. Sixteen states therefore issued state loans for the purpose of railway construction to an amount of 97.2 mill. thalers. In addition five states issued paper money (*Eisenbahnkassenscheine*) amounting to 7.9 mill. thalers. Thus 105 mill. thalers of government investment in railways was done via the private capital market or money creation; only 50 mill. thalers can be counted as government investment through the budget.<sup>26</sup> The real share of government

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<sup>23</sup> *Ibid.*, p. 249 ff.

<sup>24</sup> *Ibid.*, pp. 264, table 30, 267, 269 ff.

<sup>25</sup> *Ibid.*, pp. 294, 295, table 34, the share of public investment outside Prussia was nearly 74%.

<sup>26</sup> *Ibid.*, pp. 298 ff.

in railroad investment is, therefore, not 48% but only 15.5%. The largest and most innovative investment in transport was financed in Germany as in most other XIXth century industrializing countries by means of mobilizing hitherto unknown quantities of private resources. More than in other Western European countries government was, however, instrumental in this mobilization. Prussia could not use this means of financing railroad construction before 1849 because of constitutional constraints. The issue of state loans would have made it necessary to call the diet (*Vereinigte Landstände*) into session. Because of political reasons the Prussian government wanted to prevent this; therefore Prussia much more than any other German state relied upon formally private railroads and gave concessions to railroad companies. Some of these received subsidies; most a state guarantee on their interest payments. In effect this was only another form of the same type of railroads financing, the tapping of private resources under the shelter of government credit.

5. Most *other infrastructure investments* do not amount to the same size as those in the transport sector. Agricultural improvements e.g. in Württemberg never took more than 0.5% of the annual government expenditure while road building had a share of 3.8% in the early twenties, 4.5% in the middle thirties and 6.3% in 1850-51, and river improvement amounted to 0.3%, 0.2% and 0.4% in the respective periods.<sup>27</sup> Investment in health seem to have accounted for less than 1% only at the beginning of the twenties. In the middle thirties it was 0.2% and rose only slowly to 0.4% in 1850 and again 1% in 1900. In Sachse-Weimar it had been closer to 1% throughout the first half of the century, in Bavaria it reached 1.2% in 1850. Government expenditure for the promotion of private business was about 0.5% in Württemberg in 1850, but less than 0.1% in Baden.<sup>28</sup>

6. The only other "big" investment in the XIXth century was in *education*. It is a matter of debate how to split expenditure in education into investment and current expenditure. If we define all government expenditure on schools etc. as investment, it took about 2% in the 1820s and seems to have risen to about 4% in 1850. There are considerable differences between the states, ranging from 1.8% in Oldenburg, and 2.2% in Bavaria to 5.6% in Württemberg and 6.6% in the Electorate of Hesse (*Kurbessen*). Prussia with 2.4% was rather in the lower range. But since for several states

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<sup>27</sup> W. R. OTT, *Grundlageninvestitionen in Württemberg*, pp. 174, Anhang p. 66, table 41. The cumulative investment in railways in the 6 first years (1845-1850) of railway-building in Württemberg equalled 61% of total government expenditure in these 6 years.

<sup>28</sup> *Ibid.*, p. 67, table 41, K. BORCHARD, *Staatsverbrauch*, p. 200, table 22.

expenditure on education and on churches and other cultural institutions is counted together, a margin of uncertainty remains and some major swings such as a growth from 2.2% (1819-25) to 3.8% in 1831-37 and a fall to 2.2% in 1849-51 in Bavaria, or a change from 7.5% (1822-23) to 9.4% (1835-36) and to 5.6% 1850-51 in Württemberg have yet to be explained.<sup>29</sup>

I shall not dare at the present stage to undertake such explanations or to identify all public expenditure of the 30 odd German states which could be defined as investment and add them up to aggregate figures on public investment. But the task seems not impossible if one puts several years of research into it. Much harder is a similar task for private investment or the major macro-economic indicators to which such figures had to be related (national income, GNP). Nevertheless, the effort should be made to extend the work of the Hoffmann team on German economic growth back to the beginning of the XIXth century. Only then can we expect more definite answers to problems like the often raised question of the rôle of the state at the beginning of industrialization in Germany or the exact nature and timing of take-off in this country.

For the second half of the century Hoffmann's monumental volume is by no means the last word. But having no better evidence I might finish this paper by quoting his figures as they apply to our topic. His categories for public investment are too narrow since he includes only public housing and underground construction. Because of the specific nature of investment in railways I also give its share without counting it as "public".

TABLE 1

PUBLIC INVESTMENT AS PERCENTAGE OF NET INVESTMENT 1850-1900  
(current prices)

	Public Investment %	Railways %	Net Investment (mill. marks)
1860-64	7.7	14.6	1,204
1851-54	9.5	19.4	706
1855-59	10.3	16.5	678
1865-69	9.6	18.8	1,148
1870-74	7.8	22.0	2,282
1875-79	11.1	25.5	1,946
1880-84	10.8	13.2	1,648
1885-89	9.6	5.6	2,303
1890-94	10.2	6.6	2,808
1896-99	7.8	5.8	4,258

Source: W.G. HOFFMANN et al., *Das Wachstum der deutschen Wirtschaft*, S. 147, table 62.

<sup>29</sup> K. BORCHARD, *op. cit.*, W. R. OTT, *op. cit.*

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TABLE 2

PUBLIC INVESTMENT \* AND EXPENDITURE FOR EDUCATION  
AS A PERCENTAGE OF PUBLIC EXPENDITURE 1850-1900

	a) public investment (current prices)		b) expenditure on education	
	%	public expenditure (mill. M.)		%
1850-54	14.5	161		....
1855-59	14.0	167		....
1860-64	15.2	193		18.1
1865-69	13.4	273		15.4
1870-74	13.4	442		13.1
1875-79	15.1	476		17.6
1880-84	12.7	468		20.8
1885-89	12.0	559		19.9
1890-94	13.2	722		18.9
1895-99	13.4	832		21.0

Source: W.G. HOFFMANN et al., *Das Wachstum der deutschen Wirtschaft*, pp. 148-49, tables 63-64.  
\* Public investment excludes investment in postal services and railways.

TABLE 3

NET PUBLIC INVESTMENT AND EXPENDITURE ON EDUCATION  
AS A PERCENTAGE OF NET SOCIAL PRODUCT (current market prices)

	Public Investment %	Education %
1850-54	1.0	...
1855-59	0.8	...
1860-64	0.9	1.1
1865-69	1.0	1.1
1870-74	1.1	1.1
1875-79	1.2	1.4
1880-84	1.0	1.7
1885-89	1.0	1.7
1890-94	1.2	1.7
1895-99	1.1	1.8

Sources: Calculated from W.G. HOFFMANN et al., *Das Wachstum der deutschen Wirtschaft*, pp. 29, table 5b, 279 ff., table 42, 825 ff., table 248.

Neither of the series shows a clear-cut trend, except that investment in railways goes rapidly down after 1880 when the major German railroads had been built and the percentage of educational expenditure rises. It cannot

be decided from the information Hoffmann provides, whether some abrupt changes are due to policy decisions or to changes in the nature and quality of his sources, or to his Method of estimating. Large assumptions are made in his work which lead to generous extra- and inter-polations and the artificial "production" of figures. His results can serve, therefore, only as very broad first approximations which will have to be tested by further, more detailed research.