

A Tendency for the Rate of Profit to Fall? From Primitive to Flexible Accumulation in Sweden 1800-2005

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Abstract

Using Swedish historical national accounts, this paper shows that, up to the 1970s, there has been a secular rise in the national capital/output ratio and a secular fall in the rate of exploitation, which tended to depress the profit rate. In Sweden, the nominal capital/output ratio increased fastest during the transition from primitive to accelerated accumulation in the 19th century. Since the 1970s, these secular trends have been reversed, which is connected to flexible accumulation that slims down the inventory stock to a minimum and destroys old consensus between capital and labor.

JEL classification: B51, E11, N13, N14

Keywords

profit rate, capital, accumulation, economic history, Sweden

1. Introduction

The Marxist theory of a tendency for the rate of profit to fall (TRPF) has been discussed for more than a century.¹ According to this theory competition between capitalists tends to increase the organic composition of capital, i.e. the ratio of constant capital (expenses on raw materials, the wear and tear of machines and buildings, etc.) to variable capital (expenses on wages).² Assuming that the rate of exploitation, the ratio of surplus value (profit) to variable capital, is constant, the profit rate falls as a consequence. Marx does not claim that the profit rate falls mechanically as capitalism develops; it does so in a mediated and contradictory way. The tendency is constantly contradicted by a set of counteracting influences that partly emanates from the main tendency itself, most importantly the cheapening of wage goods that increase the rate

¹See, for instance, Cullenberg (1994).

²Marx (1966: 211-266) and Marx (1965: 199-211).

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of exploitation and the fall in the labor value of constant capital.³ Marx calls this fall a law of a tendency, arguing that “it is only under certain circumstances and only after long periods that its effects become strikingly pronounced.”⁴

The main criticism of the theory of TRPF is that there is no reason why the counteracting forces cannot assert themselves also in the long run, thus eliminating any long-run TRPF.⁵ The most important microeconomic challenge to TRPF is the so-called Okishio theorem. The theorem states that if all goods are exchanged at their prices of production, and the wage bundle is unchanged, for any new technology for the production of one of the goods whose introduction, at the prevailing prices of production, yields super profits to an individual capitalist, the effect of a general introduction of this technology and of the associated changes in prices throughout the economy will be to raise the general competitive level of profits.⁶ Most of the writers defending TRPF have not done so on the basis that the Okishio theorem is wrong mathematically, but instead focus on the assumptions that are made by this theorem.⁷ If these assumptions are dropped, then it is not difficult to construct cases where the general profit ratio would fall at the new prices (a real empirical example is given in this paper). Especially rigid is the assumption of a constant real wage.

In the debate about the TRPF there has been surprisingly little reference to empirical studies. One explanation is that the operationalization of various Marxist concepts, such as the profit rate, surplus value, and capital, is problematic.

The purpose of this paper is to investigate the long-term changes in the value relations between produced assets (capital stock), output, labor income, and surplus in 1800-2005 using data from Swedish Historical National Accounts (see the appendix). The categories of national accounts have some affinity with various Marxist concepts, although there are some important differences.

Using national account data adds some additional problems when the various Marxist concepts are operationalized. For example, national accounts do not distinguish between capitalist and non-capitalist sectors and there is a difference between the profit rate based on national account data and based on business account data. Anwar Shaikh and Ahmet Tonak show that “the rate of surplus value... is typically almost 4 times as large as the ratio of profit-type income to employee compensation....”⁸ Fred Moseley distinguishes between the Marxist rate of profit and the conventional rate of profit.⁹ Such a “Marxist rate of profit” is quite problematic, however, as we then risk losing the connection between the concept of surplus value and actual profits, and the relation between profit and accumulation. Capitalists clearly cannot accumulate the part that goes to unproductive labor. Moseley also admits that the conventional rate of profit is a more important determinant of capital accumulation and capitalist crisis.

It is clear that capitalism behaves as if all paid labor would be productive, even though materially it is not productive. Where to put the “production boundary,” the term used in present-day official national accounting,¹⁰ is not just a technical issue but also depends on social factors and historical context.

Despite the various difficulties, assuming that relative changes of the Marxian categories follow the relative changes of the related national account categories, the latter can be used

³Marx (1966: 232-240).

⁴Marx (1966: 239). See also Burkett (2000).

⁵Cullenberg (1994).

⁶For a simplified version of this proof see Bowles (1981).

⁷See Laibman (1982), Laibman (1996), Kliman (1997), and Goldstein (2006: 587-588).

⁸Shaikh and Tonak (1994: 221).

⁹Moseley (1991: 103).

¹⁰*System of National Accounts 1993* (1993: 123-127).

as indicators for the former. One advantage with national account data is that they are the broadest possible measure encompassing the whole economy. Historical national accounts go further back in time than other empirical sources. National accounts can answer some questions concerning the process of accumulation and the debate on TRPF that a rigorous application of Marxist categories cannot. In this paper the terms national account profit rate, national account capital/output ratio, etc., are used when these ratios are estimated from national account data.

To give an empirical overview, the next section discusses different phases of accumulation in Sweden, while the subsequent sections deal more specifically with issues relating to the TRPF debate.

2. Phases of Accumulation in Sweden

To distinguish between various phases of accumulation, investments, savings, and consumption, and their different components, can be related to each other. Foreign trade must be taken into account, since accumulation also takes place at an international level. A part of investment can be financed from abroad by capital import or a net import, while a strong net export can contribute to increased net holdings of foreign assets. The term "phase of accumulation" as used in this paper has similarities to the term "regime of accumulation" as used by the Regulation school,¹¹ although the term phase is preferred here since it is a more open empirical description tool, allowing alternative periodizations. Although the periodization presented in this section is similar to the one applied by the Regulation school, there are some differences, due to the particular characteristics of the Swedish accumulation process. Any periodization of capitalism must also recognize that there is continuity alongside change.

Primitive accumulation "means the expropriation of the immediate producers, i.e., the dissolution of private property based on the labour of its owner,"¹² as Marx puts it, leading to the creation of a wage-proletariat, which lays the foundation for subsequent capitalist development. Semi-capitalist relations constituted an important feature of Swedish agriculture by the first half of the 19th century, although accumulation in a capitalist form proceeded mainly outside of agriculture and ancillaries. The growth rate of the stock of means of production was only slightly higher than population growth. The real wage in 1850 was at about the same level as in the Middle Ages.¹³ The weight of foreign trade in the overall economy was quite stable up to the mid-19th century (see Figure 1).

While the number of agriculturalists rose by 16 percent between 1750 and 1840, the number of the so-called lower classes rose by as much as 240 percent in the same period.¹⁴ This primitive accumulation of variable capital was a precondition for the acceleration in economic growth and accumulation in the subsequent decades. However, this process did not take the form of peasants being evicted from their farms by larger capitalist owners, as in Marx's classical description of the English enclosure. Rather the position of peasants was strengthened in this period, and the early phase of proletarianization was an effect of the population growth.

The span from the 1840s to the 1870s could be described as a period of *bourgeois transformation* both in an economic and political sense. The struggle between the conservative and liberal political forces reached its pinnacle at the end of the 1830s, and was followed by several important liberal reforms in the period 1840-1866. The guild system was abolished in 1846. Full freedom of

¹¹Tickel and Peck (1992: 192-196).

¹²Marx (1965: 761).

¹³<http://www.riksbank.com/templates/Page.aspx?id=27406>.

¹⁴Jörberg (1966: 17).

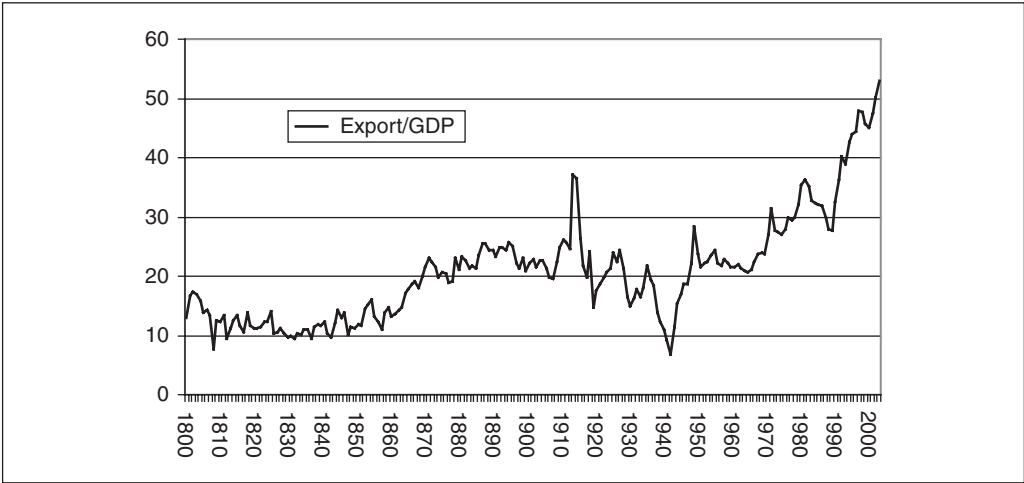


Figure 1. The ratio (in percent) of export to GDP in current prices 1800-2006.
Source: See appendix.

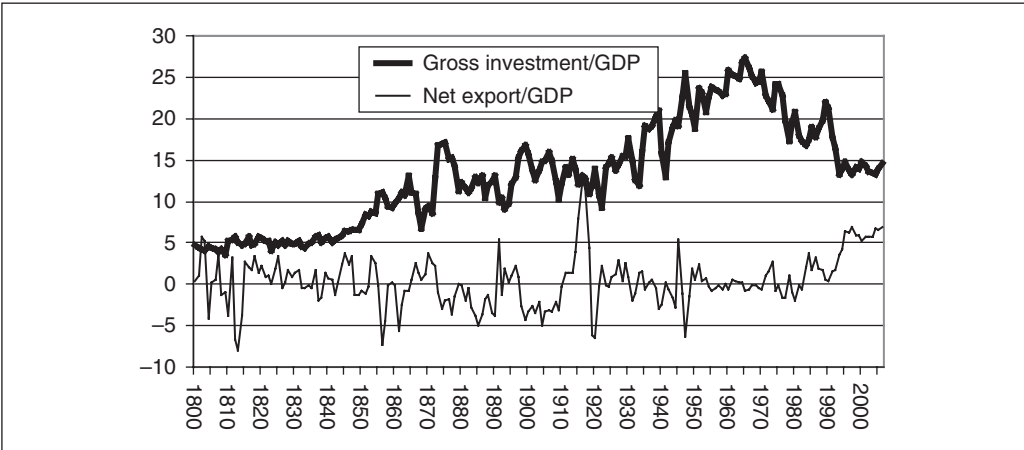


Figure 2. The ratios (in percent) of gross investment and net export to GDP in current prices, 1800-2006.
Source: See appendix.

trade was introduced in 1864.¹⁵ These political reforms laid the basis for the following capitalist development and accelerated accumulation. During the course of the 1850s and 1860s, the relative size of exports rose from around 10-15 to 20-25 percent of GDP and, with the exception of the two World Wars, remained roughly at this level for the next 100 years (see Figure 1).

Between 1842 and 1856, the relative size of gross investment doubled from 5.3 to 11.1 percent of GDP (see Figure 2), and the relative size of net investment quadrupled from 1.5 to 6.4 percent of GDP. Most of the rise in the investment ratio in this period can be explained by rising investment in agriculture and dwellings. The first wave of investment was an agrarian

15. Weibull (1993: 93-96) and Schön (2000: 109-118).

accumulation cycle and not an industrial one. However, the next investment drive, during the 1870s, was clearly an industrial accumulation cycle.

The span from around 1870 to around 1910 was a period of transformation from an agrarian to an industrial economy. It was in the 1870s that the shift toward industrial goods production and industrial activities in general accelerated significantly. At the international level, Tickel and Peck describe the regime of accumulation before the First World War as an “extensive accumulation system,” since accumulation occurred as the expansion of capitalist relations within the core countries.¹⁶ For Sweden, the period 1870–1910 could also be labelled as a phase of capital import based accumulation, considering that a substantial part of investment was financed by a net import. This led to a deterioration of Sweden’s financial position internationally.

The 1910s and 1920s could be viewed as period of transformation, when Sweden went from being a net importer dominated by foreign capital to a position at the upper ladder of the international imperialist system. In the 1910s, Sweden became a net exporter. Especially the large export drive during the First World War eliminated the financial dependence of the Swedish economy on foreign capital. Between the mid-19th century and the late 1880s the Swedish foreign debt increased from around zero to 80 percent of GDP, and stabilized at this level up to 1910. During the course of the First World War, the foreign debt decreased to around 20 percent of GDP.¹⁷ This transformation laid the foundation for further accelerating the process of accumulation. According to the Swedish economic historian Peter Vikström, a “rapid increase in trend growth... can be identified around 1920.”¹⁸

Tickel and Peck describe the inter-war period as a “‘long transition’ between the extensive regime and a phase of intensive accumulation or Fordism.”¹⁹ However, in Sweden the transition was already made in the inter-war period, which explains why, for example, the depression in the early 1930s was milder in Sweden than in other countries (the GDP fell only by four percent). In Sweden, the whole period 1921–1974 possessed quite common characteristics, and is associated with strong economic growth. It was the classical period of industrial capitalism, and of domestically financed accumulation. The relative size of industrial goods production reached a high point in the mid-1960s. Although the weight of foreign trade did not change much from the preceding period, the ratio of domestic investment to GDP increased continually, reflecting a shift to a more intensive form of accumulation, while the net import turned into a small net export.

The period from around the 1970s could be described as a new phase of accumulation. The Swedish economy went through a second wave of internationalization. In my view, the term flexible accumulation best captures this phase (equivalent to post-Fordism),²⁰ although any term used is problematic since there are many interlinked processes. One important aspect of flexible accumulation is the new round of “time-space compression”; new communication technologies and declining transport costs have enabled the spreading of decision making to encompass an ever-wider space (so-called globalization). The old Fordist and Taylorist forms of capitalist organization demanded stability and depended on substantial investments and large stocks of inventories; accumulation then took a more intensive form based on long-term commitment. Flexible accumulation could, instead, be seen as a more extensive phase of accumulation (although not primarily implying the expansion of capitalist relations within the core capitalist countries, as before the First World War, but the expansion outside of this core). Lean production methods imply that investments in inventories are held to a minimum, which shortens the turnover time

¹⁶Tickel and Peck (1992: 194).

¹⁷Schön (2000: 281).

¹⁸Vikström (2002: 219).

¹⁹Tickel and Peck (1992: 195).

²⁰The term is used, for example, in Harvey (1989: 121–197), Tickel and Peck (1992), and Smith (2000: 16).

of capital and enhances profitability. Long-term commitments are shunned. At the international level, flexible accumulation presupposed globalization and the opening up of the whole world to the penetration of capital accumulation. The new flexibility is not on the terms of workers but on the terms of capital. The deregulation of the financial markets, privatization, and the destruction of the old consensus between capital and labor prepared the way for this transformation.

In Sweden during the last decades of the 20th century, the weight of foreign trade in the aggregate economy almost doubled (see Figure 1), and the investment ratio was almost halved (see Figure 2). The economic crisis of the early 1990s was deeper in Sweden than in other countries (GDP even fell by more than in the early 1930s), but in its aftermath profitability was restored, especially in manufacturing. In the 1990s, part of the accumulation took the form of a significant net export. In 1960-1980, the ratio of Sweden's outward foreign direct investment stock to GDP was quite stable at between 5 and 8 percent. From 1980 to 1990 it rose from 5.8 percent to 20.7 percent. In 1999 it reached 39.4 percent.²¹

3. The Total Stock of Produced Assets

One problem with Marx's theory is that the rise in the rate of exploitation theoretically can be sufficient to offset any putative increase in the value composition of capital. As David Laibman argues, a better expression to catch the effect on the profit rate is the capital/output ratio, where the constant capital stock is related to the "flow of living labor" or the value of the whole net product (variable capital plus surplus value, instead of only variable capital), which is invariant to changes in the rate of exploitation. The stock of variable capital, i.e. the money capital to meet payrolls, may be seen as negligible.²² The inverse of the capital/output ratio is the maximum rate of profit, i.e. what the profit rate would be if wages would be zero and the workers would live on air.²³ When the capital/output ratio approaches infinity the maximum profit rate, and so also the profit rate, approaches zero, which cannot be offset by any increase in the rate of exploitation. In fact, even when the profit is equal to the maximum rate of profit while the rate of exploitation increases to infinity, the profit rate must fall under such circumstances.

Neoclassical growth theory shows that there is an upper limit for the capital/output ratio. Beyond a certain level, depreciation of capital (provided it does not fall toward zero) becomes larger than output, which, in turn, must lead to a fall in the capital/output ratio. This also shows that there is a limit for how far the profit rate can fall as an effect of an increased capital/output ratio. However, a permanent increase in the capital/output ratio during the course of capitalist development has a permanent depressing effect on the profit rate.

In mainstream economics, the term capital is used both to refer narrowly to the humanly created means of production and broadly to any financial or non-financial assets that can provide an income, even if only potentially so. Both definitions implicitly imply that capital is intrinsic to all societies and social relations.²⁴ In contrast, Marx views capital not as a thing that exists in all societies, but as a social relation that lends a thing a specific capitalist character.²⁵

In this sense, a distinction can be made between capital accumulated by capitalists and the national account capital stock (or produced assets). The latter can be considered a broader concept, existing under all economic systems. Similarly, a distinction can be made between purely capitalist profit and national account surplus. The latter refers to the excess that arises from

²¹Palmer (2001: 51).

²²Laibman (1996: 35-36).

²³See for instance Cullenberg (1994: 46).

²⁴Mohun (1991: 68).

²⁵Marx (1966: 814-815).

Table 1. The volume value of the net stock of different types of produced assets per employed (index = 100 for the year 2000).

	Dwellings	Non-residential buildings and structures	Machinery and equipment	Fixed livestock	Inventory stock	Produced assets, total
1800	4.5	6.1	0.11	120.3	1.9	3.8
1850	4.5	5.6	0.16	110.8	3.0	4.0
1900	15.9	12.3	1.3	70.9	14.7	10.8
1950	33.1	23.7	12.8	80.0	72.6	27.5
1975	77.2	67.0	44.3	46.7	131.4	69.5
2000	100.0	100.0	100.0	100.0	100.0	100.0

Source: See appendix.

production above the means of subsistence of the laborers, which is appropriated either by a class of exploiters or by the laborers themselves (which can be used to expand the stock of means of production).

While the relation of constant capital to variable capital or value added is only relevant for a capitalist system, the relation of produced means of production to the means of subsistence of the direct producers or value added can be estimated for all economic systems. Similarly, while the profit rate is only relevant for the capitalist system, the ratio of surplus to produced means of production can be estimated for all economic systems. When non-capitalist relations are transformed into capitalist ones, the relation between produced means of production and output is not only transformed socially but also materially by speeding up the accumulation of produced assets. In this respect, the national account capital/output ratio can be investigated to test the hypothesis that the capitalist form of accumulating means of production implies a higher such ratio.

In this section, the national account capital/output ratio is investigated for the whole economy. Since the surplus is not a meaningful concept to apply on government services, the national account profit rate, the ratio of national account surplus to the national account capital stock, is only investigated for manufacturing and the private sector as a whole.

In Marxist theory a distinction is made between the value and technical composition of capital.²⁶ The technical composition of capital is the physical relation between the mass of material input and living labor, while the value composition is the same relation in exchange value terms. Although the technical composition of capital cannot be measured directly since it is composed of different types of items that are not additive, the volume (constant price) value of capital per employed could be seen as a suitable indicator of this concept (in the same way as growth in volume GDP is used to measure economic growth). Table 1 shows the development of the volume net stock of different types of produced assets per employed in Sweden. During the first half of the 19th century, the volume index of produced assets per employed was stagnant, but has risen steadily since the mid-19th century. Between 1850 and 2000, this ratio increased 25-fold. Looking at different types of produced assets, the most dramatic increase was for machinery and equipment per employed. Between 1800 and 2000, this ratio increased almost 1,000-fold in volume terms! The fixed livestock per employed was, on the other hand, roughly at the same level in 2000 as in the 19th century, although this does not take into account that much fewer people worked with animals in 2000.

²⁶Orzech and Groll (1989), Saad-Filho (1993), Saad-Filho (2002: 71-80), Marx (1966: 145-146), and Marx (1965: 612).

Table 2. The value ratios (in percent) of the net stocks of produced assets to GDP.

Year:	Current prices:					Volume ratio, total stock, reference prices of 2000	Relative price of capital goods (deflator of the capital/output ratio), 2000 = 100
	Dwellings	Non-residential buildings and structures	Machinery and equipment	Fixed livestock	Inventory stock	Total stock of produced assets	
1800	28	49	5	15	14	110	48
1850	33	52	6	20	19	130	70
1860	43	60	10	18	19	150	77
1870	44	61	10	18	18	151	73
1880	73	97	14	15	20	220	88
1890	80	89	15	16	24	223	88
1900	82	80	16	13	28	219	95
1910	81	78	15	12	28	215	96
1920	88	94	21	10	35	248	100
1930	96	100	17	6	31	250	117
1940	107	98	24	5	36	270	117
1950	89	80	30	3	34	237	106
1960	87	97	39	2	37	263	106
1970	89	102	38	2	35	266	104
1980	115	116	45	2	27	305	104
1990	122	107	46	2	15	292	102
2000	117	89	41	2	10	258	100

Source: See appendix.

The volume or technical relation between produced assets and employment must be distinguished from the exchange value ratio of produced assets to the value added created by the employed, i.e. the nominal capital/output ratio. As the produced assets have increased per employed, so has the value added per employed.

In growth theory, the price of capital and production goods are often set equal, which simplifies the model. Such models usually only focus on the constant price ratios, not on nominal (current price) ones. However, since the price indices of capital goods and production can develop differently, in reality volume and nominal ratios can substantially differ from each other. Furthermore, it is the nominal ratio that is the basis of economic decisions (for example, how large a part of the surplus that is accumulated), not the volume ratio.

Table 2 presents the ratio of different types of produced assets to GDP at current prices. The table shows that there has been a secular rise in the national account capital/output ratio. Buildings and structures have always constituted the main part of produced assets, and the development of the national account capital/output ratio followed quite closely the ratio of buildings and structures to GDP. The most dramatic increase was in the ratio of machinery and equipment to GDP, which rose from 5 percent in 1800 to 41 percent 200 years later.

Since the nominal capital stock in current prices (K_{nominal}) can be expressed as the product of the price deflator (price index) and the volume value of capital (P_K and K_{volume} , respectively), and the nominal output as the product of the price deflator and the volume value of output (P_Y and Y_{volume} , respectively), the nominal capital/output ratio (Ω) can be expressed as follows:

$$\Omega = \frac{K_{\text{nominal}}}{Y_{\text{nominal}}} = \frac{P_K}{P_Y} \frac{K_{\text{volume}}}{Y_{\text{volume}}} \quad (1)$$

P_K/P_Y is the price deflator of the capital/output ratio, which measures the average change in the relative prices of capital goods (compared to the goods and services constituting output). $K_{\text{volume}}/Y_{\text{volume}}$ is the volume capital/output ratio.

Logarithmic differentiation of equation (1) yields:

$$\frac{\Omega'}{\Omega} = \frac{P'_K}{P_K} - \frac{P'_Y}{P_Y} + \frac{K'_{\text{volume}}}{K_{\text{volume}}} - \frac{Y'_{\text{volume}}}{Y_{\text{volume}}} \quad (2)$$

Equation (2) shows that the growth rate of the nominal capital/output ratio (Ω) can be decomposed to four components. It is equal to the growth rates of the price and volume indices of capital goods less the growth rates of the price and volume indices of output, or equal to the growth rates of the relative price of capital goods and the volume capital/output ratio.

On average, the nominal national account capital/output ratio in Sweden has grown by 0.5 percent per year since 1850. Half of this long-term increase can be attributed to an increased volume national account capital/output ratio (i.e. the volume growth of capital goods was higher than the volume growth of GDP), and the other half to an increase in the relative price of capital goods.

The relative price of capital goods was increasing up to the 1930s, being the main factor behind the increase in the nominal national account capital/output ratio in this period, while the volume national account capital/output ratio was quite stable. It clearly demonstrates why an analysis of volume ratios is insufficient to understand the mechanisms of accumulation. After the 1930s, the relative price of capital goods has been declining (see Table 2), which can be explained by the rising weight of government services in GDP that accelerated the growth of the GDP price deflator. While the volume national account capital/output ratio increased by 12 percent between 1940 and 2000, the nominal national account capital/output ratio decreased by 4 percent.

From Table 2 it can be seen that there have been several "leaps" in the nominal national account capital/output ratio. In the 1870s, the ratio increased by as much as 3.8 percent per year on average (in total 45 percent), and in the 1850s, 1910s, and 1970s by 1.4 percent per year in each of these decades. In other periods, the ratio has been more stable. All four "leaps" coincided with transformations toward new phases of accumulation according to the periodization discussed in the previous section.

According to Marxist theory, in a capitalist economy competition drives the capitalists to accumulate a large part of the surplus to expand variable and constant capital. The pre-capitalist economy lacked the same impetus toward accumulation and expansion. Nicholas Kaldor concludes that in the first stage of capitalism the capital/output ratio "will show a steady increase, in accordance with both the Marxian and neo-classical models." However, this stage of capitalism "must sooner or later be brought to an end when the capital stock attains the level of 'desired capital.'"²⁷ The empirical evidence for Sweden speaks in favor of Kaldor's hypothesis. In Sweden, the capital/output ratio increased fastest in the second half of the 19th century, i.e. in the first phase of capitalism. However, it continued to rise secularly up to the 1970s, although not at the same pace as in the first phase of capitalism.

In the first half of the 19th century, the volume growth rate of capital goods was 0.9 percent per year on average, which was only slightly above the population growth (at 0.8 percent per year). The volume growth of capital goods was lower than the GDP growth. Therefore, the volume national account capital/output ratio fell. However, the nominal national account capital/output ratio increased from 110 to 130 percent in the same period (see Table 2), since the relative prices of capital goods increased.

²⁷Kaldor (1960: 295).

During the 1840s, the volume growth of capital goods sped up to an average of 1.6 percent per year. The net stock of machinery and equipment grew even faster, by 4.2 percent per year. In this sense, the 1840s could be seen as the first decade experiencing a substantial acceleration in accumulation. The first "leap" in the nominal national account capital/output ratio came in the 1850s, which can mainly be explained by rising relative prices of capital goods.

The 1870s experienced the most rapid increase in the nominal capital/output ratio in any decade. This can be attributed to significant increases in both the relative prices of capital goods and the volume capital/output ratio. The price index of buildings and structures increased by as much as 4.1 percent per year, while the GDP price deflator only increased by 1.3 percent per year. The investment boost of the 1870s did not immediately translate into any significant GDP growth. To a large extent, the 1870s can be seen as going through an infrastructural transformation centered on transportation and the need for more residential buildings due to increased internal migration of labor, which laid the foundation for the rapid industrialization toward the end of the century and initiated the phase of capital import based accumulation discussed in the previous section. The 1870s were especially marked by large railway investments. The volume value of the net stock of buildings and structures in transport and communication increased by 8.5 percent per year (in total 127 percent), while the volume value of the net stock of dwellings increased by 4.6 percent per year (in total 56 percent).

In 1880-1910 the nominal national account capital/output ratio was quite stable. The volume growth of capital goods slowed down, while GDP growth sped up. This led to a decrease in the volume national account capital/output ratio, although it was offset by the increase in the relative price of capital goods.

During the 1910s, coinciding with the transformation to domestically financed accumulation, the nominal national account capital/output ratio increased quite significantly, but this was mainly due to a low GDP growth accompanying the First World War. The volume growth of capital goods continued at about the same level as in 1880-1910.

Between 1950 and 1970, "the golden years of capitalism," the volume growth rate of capital goods, at five percent per year, was even higher than in the 1870s. Since GDP growth also accelerated, the national account capital/output ratio did not increase much. Rapid economic development does not necessary increase the capital/output ratio. On the other hand, in the 1970s, the volume growth of GDP slowed down more than capital goods, which increased the national account capital/output ratio quite significantly.

In the course of the 1980s and 1990s, the national account capital/output ratio fell somewhat, which can be explained by the dramatic fall in the ratios of inventory stock and non-residential structures, respectively, to GDP, coinciding with the transformation toward flexible accumulation (which began in the 1970s).

The relative decline of the inventory stock occurred roughly between 1977 and 1992. Between those two years, the ratio of the inventory stock to GDP fell by two-thirds, from 36 to 13 percent, while the volume value of the inventory stock fell by one-third. If the ratio of the inventory stock to GDP had not fallen, the total national account capital/output ratio would have increased between 1975 and 2000.

The fall in the national account capital/output ratio in the course of the 1990s can mainly be explained by the fall in the ratio of buildings and structures to GDP, which is a specific Swedish phenomenon. During the five years preceding the 1990-1993 depression, the ratio of dwellings to GDP increased as much as 13 percent, which points toward overaccumulation of dwellings. During the 1990s, the volume value of the net stock of buildings and structures declined, which was the first time this occurred (at an annual rate) since the 1830s. Toward the end of the 20th century, residential investment in Sweden became by far the lowest in any OECD country in proportion to GDP.²⁸

²⁸OECD *Economic Surveys 2000-2001: Sweden* (2001: 28).

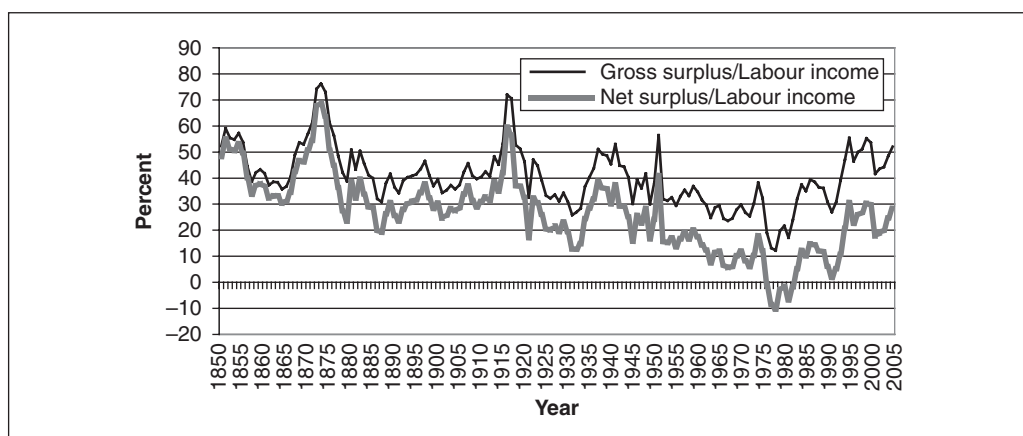


Figure 3. The nominal ratios (in percent) of gross and net surplus to labor income (the gross and net national account rates of exploitation) for manufacturing 1850-2005.

Sources: See appendix.

This analysis does not take into account other types of assets. For instance, if expenditures on advertising, R&D, and training of employees would be viewed as investments, it is possible that the capital/output ratio continued to rise in the late 20th century. In fact, the increased commodification of knowledge could itself be seen as an aspect of flexible accumulation.²⁹

4. The National Account Rate of Exploitation within Manufacturing

Figure 3 presents the development of the ratio of gross and net surplus, respectively, to labor income for manufacturing. Labor income includes compensation to employees and to the self-employed for their labor input. The ratio of net surplus to labor income is the closest to what Marx calls the rate of exploitation, although it also includes the self-employed in the calculation, and hence does not reflect a pure capitalist relation. However, for manufacturing the proportion of self-employed was quite low, at least in the 20th century. It has always been the most dynamic capitalist sector driving the development of other parts of the economy. Furthermore, the estimate of the surplus for manufacturing is more reliable than for the private sector as a whole. For these reasons, this section focuses on manufacturing.

The long-term movements of the rate of exploitation is connected to the periodization pattern discussed earlier in this paper. A fundamental question in relation to the TRPF debate is whether the rate of exploitation increases as a consequence of technical change or if it remains stable through time.

The change in the rate of exploitation is determined by two factors: the change in the nominal wage rate (nominal wage per employed or per hour worked)³⁰ and the change in nominal productivity (nominal value added per employed or per hour). If the nominal wage rate grows faster than nominal productivity, then the rate of exploitation decreases. It increases in the reverse scenario. The change in the nominal wage rate is, in turn, determined by the change in the real wage rate and the change in the price index of the wage (in this paper, set equal to the price

²⁹Harvey (1989: 159-160).

³⁰In this study, for manufacturing, the labor income rate of the self-employed is set equal to the wage rate (including salaries and social benefits) for employees in the same branch.

deflator of private final consumption). The change in nominal productivity is determined by the change in real productivity and the change in the price deflator of value added.

For manufacturing, the gross national account rate of exploitation (the ratio of gross surplus to labor income) was about the same in 2000 as in 1850 (see Figure 3), i.e. there was a long-term stability. This implies that the growth rates of the nominal wage and nominal productivity were equal, at 4.8 percent per year in that period. In spite of this, the volume value added per employed (real productivity) grew faster than the real annual wage rate. The reason for this divergence is that the price index of wage goods grew faster than the price index of value added in manufacturing.

In the long-term perspective, there was a decrease in the gross and net (national account) rates of exploitation up to the late 1970s. Since the consumption of fixed capital as a proportion of surplus has increased over time, the ratio of net surplus to labor income has decreased more than the ratio of gross surplus to labor income.

In the early 1850s, the rate of exploitation stood at a historically high level. Toward the end of the agrarian accumulation cycle of the 1840s and 1850s, it decreased to lower levels as wages rose faster than productivity.

The rate of exploitation was highest during two time spans in Swedish history, in the early 1870s and the 1910s, which in both cases was followed by important changes in the accumulation process. On both occasions, the rate initially increased because of external shocks causing real wages to decrease sharply, combined with advances in real productivity. The initial fall in real wages was an effect of the agricultural crisis during the latter half of the 1860s and war-time inflation during the First World War. The increase in the rate of exploitation played an important part behind the investment boom of the 1870s and the export drive during the First World War. When the rate bounced back to lower levels as a consequence of increased real wages and decline in manufacturing prices, the investment boom of the 1870s and the export drive during the First World War ended. However, the transformation in the process of accumulation was by then irreversible. The capital/output ratio increased to new levels and the process of industrialization accelerated following the 1870s, while the 1910s were followed by a phase of domestically financed accumulation.

During the 1960s and 1970s the gross rate of exploitation decreased significantly, reaching its lowest level ever in the late 1970s. In 1976-82, the ratio of net surplus to labor income even reached negative figures, which was the only time after 1850 that this occurred. This was the most severe crisis of profitability for manufacturing in modern times. It was to a large degree the expansion of government services that rescued the economy from collapsing.

Between the late 1970s and mid-1990s, the ratio of gross surplus to labor income increased to over 50 percent, a level not attained since 1951, a consequence of a decreased growth in real wages from the late 1970s onwards and increased growth of productivity from the early 1990s onwards. In the aftermath of the economic crises of the 1970s and 1990s profitability in Swedish industry was restored, at the same time as the rate of accumulation was being held down. The transition to a new phase of accumulation was completed.

5. Determinants of the National Account Profit Rate

The national account profit rate can mathematically be expressed as (where Y stands for value added, K for the national account capital stock, and S for surplus):

$$\frac{S}{K} = \frac{S}{Y} \frac{Y}{K} = \frac{S}{Y} / \frac{K}{Y} \quad (3)$$

The above formula implies that the profit rate could be seen as determined by two variables: the surplus share and the capital/output ratio. The lower the surplus share and the higher the

Table 3. Various nominal national account ratios (in percent) for manufacturing and the private sector without deductions for consumption of fixed capital (arithmetic averages for 1871-1900 and 1971-2000).

National account ratios:	Manufacturing:			Private sector:		
	1871-1900	1971-2000	Change (%)	1871-1900	1971-2000	Change (%)
Capital stock/output (K/Y)	170	260	53	210	300	43
Output/capital stock (Y/K)	60	39	-34	48	33	-31
Surplus share (S/Y)	31	22	-27	36	28	-22
Profit rate (S/K)	19	9	-51	18	9	-46

Source: See appendix.

Note: Output (valued added) and surplus are measured without deductions for consumption of fixed assets. The national account capital stock is measured in net terms, and includes buildings and structures, machinery and equipment, fixed livestock, and inventories.

Table 4. Various nominal national account ratios (in percent) for manufacturing and the private sector after deductions for consumption of fixed capital (arithmetic averages for 1871-1900 and 1971-2000).

Ratios:	Manufacturing:			Private sector:		
	1871-1900	1971-2000	Change (%)	1871-1900	1971-2000	Change (%)
Capital stock/output (K/Y)	183	307	68	228	351	54
Output/capital stock (Y/K)	56	33	-40	45	29	-36
Surplus share (S/Y)	26	8	-67	31	16	-48
Profit rate (S/K)	15	3	-78	14	5	-66

Source: See appendix.

Note: Output (valued added) and surplus are measured after deductions for consumption of fixed capital, and capital stocks in net terms.

capital/output ratio, the lower the profit rate. This reasoning is a reformulation of the two determinants of the rate of profit in the classical Marxist model (the rate of exploitation and the value composition of capital).

Table 3 illustrates the effect of long-term changes in the national account capital/output ratio and the gross surplus share on the national account profit rate in manufacturing and in the private sector as a whole. Table 4 illustrates the same relations but after deducting consumption of fixed capital from the value added and surplus.

Table 3 and Table 4 show that there has been a clear secular tendency for the national account profit rate to fall in manufacturing as well as in the private sector. The decrease was even more pronounced if value added and surplus are measured in net terms. For the gross ratios, this can primarily be explained by the rise in the capital/output ratio, at least for manufacturing. The fall in the surplus share also played an important part. In net terms, the fall in the surplus share had a more depressing effect on the national account profit rate than the rising capital/output ratio.

This constitutes support evidence of Marx's theory that there is a secular tendency for the profit rate to fall under capitalism, and that a growing capital stock appears to have a depressing effect on the profit rate in the long run, at least for the period under investigation.

These secular tendencies were, however, in operation only up to the 1970s, at least for Sweden. Table 5 and Table 6 illustrate this for manufacturing.

From 1871-1900 to 1971-75, the gross national account profit rate in manufacturing decreased from 19 to 9 percent, and the net profit rate decreased from 15 to 3 percent. During the second half of the 1970s the gross profit rate fell to even lower levels (the average for

Table 5. Different nominal national account ratios (in percent) for manufacturing without deductions for consumption of fixed capital (arithmetic averages for 1871-1900, 1971-75, and 1996-2000).

Ratios:	1871-1900	1971-1975	1996-2000	Change (%) 1871-1900 to 1971-75	Change (%) 1971-1975 to 1996-2000	Change (%) 1871-1900 to 1996-2000
Capital stock/output	170	264	206	55	-22	21
Buildings and structures/output	41	116	103	184	-11	151
Machinery and equipment/output	39	62	71	61	15	85
Fixed assets/output	79	178	174	124	-2	119
Inventory stock/ output	90	86	32	-5	-63	-65
Output/asset	60	38	49	-36	28	-18
Surplus share	31	21	32	-30	50	5
Profit rate	19	8	16	-56	93	-16
Investment/output	15	24	17	65	-31	15
Investment/surplus	49	113	52	133	-54	7
Investment/capital stock	9	9	8	5	-11	-7

Source: See appendix.

Note: Output (value added), surplus, and investment are measured without deductions for consumption of fixed assets, and capital stocks in net terms.

Table 6. Different nominal national account ratios (in percent) for manufacturing after deductions for consumption of fixed capital (arithmetic averages for 1871-1900, 1971-75, and 1996-2000).

Ratios:	1871-1900	1971-1975	1996-2000	Change (%) 1871-1900 to 1971-75	Change (%) 1971-1975 to 1996-2000	Change (%) 1871-1900 to 1996-2000
Capital stock/ output	183	303	239	66	-21	31
Output/capital stock	56	33	42	-41	27	-25
Surplus share	26	10	21	-62	119	-17
Profit rate	15	3	9	-78	178	-39
Investment/output	8	13	3	54	-74	-60
Investment/surplus	33	138	16	318	-88	-51
Investment/capital stock	5	4	1	-11	-68	-71
Capital stock/labor income	245	336	303	37	-10	24
Surplus/labor income	36	11	27	-69	149	-24

Source: See appendix.

Note: Output (value added), surplus, and investment are measured after deductions for consumption of fixed assets, and capital stocks in net terms.

1976-80 was five percent). In 1976-82, the net profit rate turned negative (reaching -2.9 percent in 1978).³¹

³¹The decline in profitability in the postwar period up to the early 1980s is confirmed by the majority of Swedish studies, in spite of various definitions of profitability. See Erixon (1987: 49).

The fall of the gross profit rate between 1871-1900 to 1971-75 in manufacturing can be explained (in logarithmic terms) to 56 percent by the increase in the national account capital/output ratio, while the decrease in the surplus share explains the remaining 44 percent. Between these two periods, it was entirely the rise of the ratio of fixed capital to value added that increased the overall national account capital/output ratio, while the inventory stock decreased somewhat relative to value added.³²

Since the early 1970s up to the end of the 20th century, the gross national account profit rate in manufacturing almost doubled, to 16 percent. The rise was most significant from the end of the 1990s' depression up to the initial recovery. Between 1991 and 1995, the gross national account profit rate in manufacturing rose from 7 to 16 percent, the first time since the 1930s that such a level had been attained and just slightly below the average in 1871-1900. Since the ratio of consumption of fixed capital to value added continued to be high, the revival of the net national account profit rate was not as impressive, reaching an average of 9 percent in 1996-2000 compared to an average of 15 percent in 1871-1900.

The increase in the surplus share explains 62 percent, and the decrease in the national account capital/output ratio the remaining 38 percent, of the rise in the gross national account profit rate between 1971/75 and 1996/2000 in manufacturing. The slashing of the inventory stock relative to gross value added explains almost the entire fall in the capital/output ratio, which is connected to the introduction of lean production methods. In fact, the ratio of fixed capital to gross value added only decreased by two percent between the two periods, and the ratio of machinery and equipment to gross value added increased by as much as 15 percent. The ratio of gross investment to the net stock of produced assets in manufacturing has been quite stable over time at an average of 8 percent in the period 1871-2000. The stability can partly be explained by the increase in the ratio of consumption of fixed capital to the net stock of produced assets. The ratio of net investment to the net stock of produced assets is more a measure of the actual growth of produced assets. From 1855 to 1976, the ratio was quite stable at around 4-5 percent, while the average in 1977-2000 was only 0.6 percent, which could be compared to an average of 1.3 percent in 1800-1850. This was partly connected to the decline of the relative size of manufacturing in the late 20th century, but was also a symptom of the downswing in accumulation in the overall Swedish economy.

6. Is the Historical Observation Compatible with Microeconomics?

Is the observation in this paper that an increased capital/output ratio had a depressing effect on the profit rate compatible with how firms react to new technology?

One interpretation of the consequences of the Okishio theorem is that technical change tends to increase the rate of exploitation and the profit rate.³³ This is logical if we assume a constant real wage. David Laibman labels the latter assumption a physicalist interpretation of the wage. He points out that the hallmark of class struggle neutrality rather is a constant rate of exploitation, since the latter expresses the balance of class forces at a given time.³⁴ This is also more consistent with development of the rate of exploitation discussed earlier. Abandoning the assumption of a constant real wage implies that the profit rate can fall following technical change.

An empirical example of how the introduction of new technology can lead to a fall in the rate of profit is given in Table 7. The table illustrates key data for a capitalist firm operating under the general conditions of Swedish manufacturing in 1860 and 1885. Four cases are given: technology

³²This stable long-run relation between the inventory stock and output is, however, an assumption that is made for the whole period before 1950 in this enquiry, and is not based on very reliable empirical sources.

³³See, for example, Thompson (1998: 91).

³⁴Laibman (1982: 10).

Table 7. Four cases illustrating key data of a capitalist manufacturing firm operating under the technology of 1860 and 1885, respectively, and prices and wages in 1860 and 1885, respectively.

Case	K/E	W/E	S/E	Y/E	V _{K/E}	V _{W/E}	V _{Y/E}	Ω	s	p
1. Prices and wages of 1860, technology of 1860	838	432	158	590	100	100	100	1.420	0.268	0.189
2. Prices and wages of 1860, technology of 1885	1506	432	371	802	180	100	234	1.877	0.462	0.246
3. Prices and wages of 1885, technology of 1885	1373	546	156	702	180	122	234	1.957	0.222	0.113
4. Prices and wages of 1885, technology of 1860	764	546	-30	516	100	122	100	1.480	-0.058	-0.039

E – Number of employed

K – Net stock of produced assets (stock of constant capital), nominal value (SEK).

W – Labor income (wages) during one year in nominal value (SEK).

S – Net surplus (profit) during one year in nominal value (SEK).

Y – Net nominal value added during one year (SEK), $Y = S + W$

V_{K/E} – Volume value of net stock of produced assets per employed (technical composition of capital), 1860 = 100

V_{W/E} – Real wage per employed and year, 1860 = 100

V_{Y/E} – Volume net value added per employed (labor productivity), 1860 = 100

Ω – Nominal ratio of net stock of produced assets to net value added (capital/output ratio), $\Omega = K/Y$

s – Net surplus share, $s = S/Y$

p – Ratio of net surplus to the net stock of produced assets (profit rate), $p = S/K = s/\Omega$

Source: See appendix.

of 1860 and 1885, respectively, under prices and wages in 1860 and 1885, respectively. The technology of year X is defined as the volume capital per employed (related to the technical composition of capital) and labor productivity (volume net value added per employed) of that year. Only cases 1 and 3 are real ones, while cases 2 and 4 are hypothetical.

In case 1, reflecting the conditions in 1860, the capital/output ratio is 1.42, the net surplus share 0.268, and the profit rate 18.9 percent. By 1885, case 3, the capital/output ratio had increased to 1.957, the net surplus share decreased to 0.222, causing the profit rate to fall to just 11.3 percent. In case 3, the volume of capital per employed is 1.8 larger than in case 1, and the volume of net value added 2.34 times larger. Was the fall in the profit rate the result of irrational behavior by the Swedish capitalists? Case 2 clearly shows not. Case 2 is the hypothetical example of a capitalist firm in 1860, facing the prices and wages of 1860, but operating under the technology of 1885. In case 2, the profit rate was as high as 24.6 percent. Henceforth, if the technology of 1885 would have existed in 1860 (which of course was not the case since technical change was most likely implemented in several steps), it would be fully rational for the individual capitalist firm to implement it, dramatically increasing the rate of exploitation and allowing it to initially earn super profits. And yet the result at the macro-level was case 3, a much lower profit rate: a classical prisoner's dilemma. Continuing with the old technology would be quite irrational from the point of view of the individual capitalist firm. Case 4, a capitalist firm operating in 1885 on the technology of 1860, shows that it would be making a negative profit rate (-3.9 percent). If such a firm would be able to pay the same real wage as in 1860, the profit rate would be positive, although much lower (at 9.2 percent) than in 1860 because of adjustments in the relative prices of capital, manufacturing, and consumer goods.

The argument that a wage increase must be treated as independent from the technological development is problematic. As shown in Table 7, the wage increase was only made possible by the new technology, i.e. by case 3. Wage increases resulting in negative profit rates, as in case 4, would not have been compatible with the system.

The effect on the profit rate from the capital/output ratio cannot be separated from the effect of the rate of exploitation. Technological development is not generally associated with an increased rate of exploitation. Rather the opposite seems to be true. For example, during the period 1850–2000, the correlation between the capital/output ratio and the net surplus share in manufacturing was -0.87 , i.e. strongly negative (although if autocorrelation and cyclical effects are considered, the negative correlation is somewhat weakened).

Increasing real wages can in itself stimulate technological development. In anticipation of rising wages and assuming that introduction of new technology takes a long time, firms could introduce the new technology before the increase in wages, since being on old technology after the rise in wages and other adjustments in relative prices could imply a negative profit rate. Such a long-term perspective from the point of view of the individual firm could explain why the investment ratio continued to be high during the 1960s and 1970s in Sweden, despite the declining profit rate.

7. Conclusions

In this paper, Marx's theory of a long-term tendency for the rate of profit to fall is slightly reformulated by studying two determinants of the profit rate. The profit rate is proportionately related to the surplus share and inversely related to the capital/output ratio. As shown in this paper, these ratios cannot be reduced to a study of volume (constant price) relations, as is often made by various growth models, since the development of the price indices of private consumption, output, and capital goods can differ substantially from each other. For example, up to the 1930s the increase in the relative prices of capital goods was the main factor behind the increase in the capital/output ratio. The profit rate is not a physical relation between things, but a social relation between exchange values.

The increase in the capital/output ratio could be seen as a historical tendency for capitalism. The inverse of the capital/output ratio is the maximum rate of profit. From a theoretical point (as shown by neoclassical growth theory) it could be questioned whether the capital/output ratio would increase indefinitely, and therefore that the maximum profit rate would fall toward zero. An increasing capital/output ratio is an expansion path for capital accumulation, but this path is limited. What the tendency rather implies is that the capital/output ratio is most likely to be higher at the end of a period of upswing in accumulation and in the later phases of capitalism, so contributing to depressed profitability.

The empirical material of this study does not allow a full operationalization of Marxist concepts such as capital and profit, since the historical national accounts include non-capitalist parts of the economy. However, the national account profit rate should be strongly related to the actual capitalist profit rate, especially for later periods.

This paper confirms that there has been a secular rise in the nominal capital/output ratio during the course of capitalist development in Sweden. This rise continued roughly up to the 1970s. But since then it has declined somewhat, which is connected to flexible accumulation. It is especially the inventory stock that has been slashed relative the value added.

Both within manufacturing and the private sector there was a secular decline in the national account profit rate. This decline can be explained by an increased capital/output ratio as well as a decreased surplus share. These two effects are interrelated since accelerated accumulation of constant capital also tends to put pressure upwards on the cost of variable capital, which shows that the assumption of a constant real wage is quite unrealistic. In fact, the rate of exploitation was highest during the early phases of capitalist development. The decline in the profit rate was not the result of irrational behavior, since operating under new technology initially enabled a capitalist firm to earn super profits. Since the 1970s these two secular trends seem to have stopped

being in operation. Under flexible accumulation, the profit rate is kept at a higher level by keeping investments, especially in inventories, to a minimum and increasing the surplus share. The new phase of accumulation at the same time blocks the road to the more intensive forms of accumulation associated with an increased capital/output ratio.

In Sweden, the largest increase in the capital/output ratio occurred during the transition from primitive to accelerated accumulation, roughly 1840-1880. The depressing effect of a rising capital/output ratio on the profit rate was more strongly felt during 19th century capitalism, at the time when Marx wrote *Capital*, than during 20th century capitalism.

The rise in the capital/output ratio between the 1840s and 1970s can be viewed as part of the process of industrialization and introduction of capitalism in the Swedish economy, and this meant that the economy moved from one level of the capital/output ratio to another through several "leaps." The investment ratio continued to rise in this period. As some processes of industrialization were more or less completed in the 1960s and 1970s (and the relative size of industrial goods production even started to decline), the tendency for the capital/output ratio to rise ceased to be in operation. This was also connected to the fall in the investment ratio during the last decades of the 20th century. The depressed effect on profitability remains, nevertheless, as the higher capital/output ratio impedes the economy in achieving the higher profit rate that existed at the beginning of capitalist development.

Appendix

The data of this paper

All the data of this paper are based on <http://www.historicalstatistics.org> and <http://www.scb.se>.

In national accounts, there are two main types of assets: financial and non-financial. Non-financial assets are either produced or non-produced. Produced assets (the capital stock) consist of fixed assets (fixed capital), inventories, and valuables. Fixed assets consist of machinery and equipment, and buildings and structures.³⁵ In this study, only fixed assets and inventories are considered.

The stock of fixed assets can be calculated either gross or net. The gross stock is estimated at the replacement costs of existing fixed assets, which does not take into account that the existing stock of fixed assets is also depreciated. The net stock is defined as the value of the stock after the consumption of fixed capital (capital depreciation) of the existing stock is deducted, at written down replacement costs.³⁶ The stock of fixed assets used in this paper is based on the so-called perpetual inventory method (PIM). The latter calculates the stock of produced assets indirectly from investment in preceding accounting periods. Unless otherwise stated, the capital stock refers to the net stock.

In national accounts, gross value added is divided between operating surplus, mixed income, wages and salaries (including social benefits), and consumption of fixed capital. The existence of mixed income complicates a Marxist analysis, since it does not relate to pure capitalist conditions. For simplification, in this study, gross value added is divided between gross surplus and total labor income. The latter includes compensation to employees and to the self-employed for their labor input. Gross surplus is simply defined as gross value added less labor income. Gross surplus also includes consumption of fixed capital. If consumption of fixed capital is deducted we get net surplus. The net value added is the gross value added less consumption of fixed capital. The net surplus is more closely related to the concept of profit. However, since measures of consumption of fixed capital are not very reliable, gross surplus could be preferable.

35. *System of National Accounts 1993* (1993: 217-221).

36. *System of National Accounts 1993* (1993: 150).

The data used in this study do not distinguish between capitalist and non-capitalist sectors, or between productive and unproductive activities. Produced assets consist both of means of production and assets that are not means of production in a strict sense, such as residential buildings.³⁷ It must, however, be considered that renting out residential buildings is an important source of profit in contemporary society, and the rents paid are important components of the expenses of wage workers.

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³⁷See Moseley (1991: 38-39).

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